

VI. Environmental Effects of the Proposed Action

ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

This chapter presents the conclusions reached in the assessment of environmental effects that the proposed Conjunctive Use Agreement would have on system yield, surface flows, groundwater levels, water quality, aquatic and terrestrial biota, land use, recreation, and water resources.

EFFECTS ON SURFACE WATER AND GROUNDWATER

The proposed Conjunctive Use Agreement will cause some changes in surface water and groundwater conditions in various parts of the Ventura River-Casitas Reservoir system. Estimates of the probable changes are discussed below. These estimates are based on the following sources:

1. Extensive review of records of past surfacewater and groundwater conditions of the river.
2. Results of computer studies carried out for the purpose of estimating future yield of the Ventura River-Casitas Reservoir system. These computer studies were not designed to predict exact changes in local surface water and groundwater conditions but rather to evaluate changes in system yield under various operating assumptions. (It is not possible to build into the computer program all the hydrologic data necessary for specific forecasts of local environmental changes.) Regardless, the analysis of impacts has relied heavily on the computer studies.

3. Discussions with engineers, geologists, groundwater specialists, and area residents who are familiar with the river.
4. Field observations made by the consultants during the 1976-77 season.
5. Judgment of the consultants. Some of the predicted effects are based in large part on professional judgment and are necessarily simply "best estimates" rather than precise predictions.

For convenience, a summary comparison of the impacts of the agreement and the "no project" alternative on yield, surface flows, and groundwater is presented in Table VI-1.

Surface Water Flows

Upper Ventura River, Robles Diversion Dam to San Antonio Creek. Surface flows in this reach of the Ventura River (in the vicinity of Meiners Oaks, Highway 150 bridge, Oak View) will be significantly changed. Under present conditions, the first 20 cfs arriving at Robles Diversion Dam is allowed to pass down the river where it continues as surface flow, although at diminishing quantities, downstream as it percolates into the ground. At present, some flow occurs in this reach for generally at least a few days every winter and up to 180 days during wetter years. If the proposed agreement is implemented, this flow will be diverted out of the river at Robles, and the only surface flows that pass Robles will be occasional flood flows that exceed the 500-cfs capacity of the diversion works. Subsurface seepage of water will continue to occur, bypassing the Robles Diversion Dam, just as it does at present. Table VI-2 presents a comparison of

Table VI-I. SUMMARY COMPARISON OF SURFACE AND GROUNDWATER IMPACTS UNDER PROJECT AND "NO PROJECT" ALTERNATIVES

| Action | | Yield (AF/Y)* | | | Impact on Surface Water | Impact on Groundwater |
|---|---|---------------|---------|--------------|---|---|
| | | To City | To CMWD | Total System | | |
| <u>Project:</u> | <u>Assumption 1:</u> | | | | <u>Robles Dam to San Antonio Creek</u> | <u>For Assumption 1:</u> |
| - Conjunctive Use Agreement between City and CMWD | City continues to use 6000 AF/Y groundwater as in past (Study 6000/0/20,000) | 6000 | 19,900 | 30,420 | Surface flows will be greatly reduced except for floods every few years. | Groundwater basin above Foster Park is low 147 months in 420-month, 35-year period of record. |
| - No minimum bypass at Robles Dam | <u>Assumption 2 (more probable):</u> | | | | <u>San Antonio Creek to Foster Park</u> | <u>For Assumption 2:</u> |
| - CMWD guarantees 6000 AF/Y to City | City increases pumping to 7300 AF/Y (Study 7300/0/20,000) | 6620 | 19,780 | 30,910 | Flows in the Casitas Springs live stretch will cease more often than in the past, the onset of low flow conditions will begin sooner. | Groundwater basin above Foster Park is low 173 months in 420-month (35-year) period, potential reduction in groundwater quality compared to past. |
| | | | | | <u>Below Foster Park</u> | |
| | | | | | Small winter-spring flows bypassing Foster Park will be reduced, but flows during winter storms will probably not be much affected. | |
| | | | | | <u>Casitas Reservoir</u> | |
| | | | | | Reservoir levels will be increased 15-20,000 AF at end of study period. | |
| <u>No Project:</u> | <u>Assumption 1:</u> | | | | Surface flows remain generally similar to past: | <u>For Assumption 1:</u> |
| - No agreement between City and CMWD | City continues to pump 6000 AF/Y as in past (continue existing operations) (Study 6000/20/20,000) | 5440 | 20,000 | 29,710 | <u>Robles Dam to San Antonio Creek</u> | Same as past: groundwater basin above Foster Park is low 58 months in 420-month period. |
| - Continued 20-cfs minimum bypass at Robles Dam | | | | | Dry except for winter flows to 20 cfs for a few days in dry years, up to 90 days in wet years. | <u>For Assumption 2:</u> |
| - No makeup obligation | <u>Assumption 2 (more probable):</u> | | | | <u>San Antonio Creek to Foster Park</u> | Groundwater basin above Foster Park is low 96 months in 420-month period. |
| | City increases pumping to 7300 AF/Y (Study 7300/20/20,000) | 6240 | 20,000 | 30,380 | Generally year-round flow, except flow ceases in summer-fall during droughts, approximately once every decade. Assumption 2 would cause flow cessation more often, perhaps several times/decade. | |
| | | | | | <u>Below Foster Park</u> | |
| | | | | | Flow made up of sewage treatment plant effluent (1-2 cfs) plus some diluting flow (1-2 cfs typical in winter-spring) bypassing Foster Park diversion. Assumption 2 would cause less flow bypassing Foster Park. | |

* See Table III for information on dry-year deficiencies.

Table VI-2. COMPARISON OF ACTUAL AND PROJECTED SURFACE FLOWS
IN UPPER VENTURA RIVER (NEAR HIGHWAY 150 BRIDGE)

| Water Year | Days With Flow Greater Than 0.1 cfs | | Days With Flow Greater Than 10 cfs | |
|------------|--|------------|---------------------------------------|------------|
| | Recorded | Projected* | Recorded | Projected* |
| 1959-60 | 4 | 0 | 0 | 0 |
| 1960-61 | 4 | 0 | 0 | 0 |
| 1961-62 | 79 | 12 | 11 | 11 |
| 1962-63 | 70 | 0 | 5 | 0 |
| 1963-64 | 31 | 0 | 4 | 0 |

Note: Comparison is for a relatively dry 5-year period (1960-1964). It is based on a review of gaging station records taken immediately below the Robles Diversion Dam (USGS gaging station 1165.5) and at the Highway 150 bridge. A flow of 0.1 cfs (45 gpm) is a small stream; and 10 cfs is a medium-sized stream, a few feet across and several inches deep.

*Projections are for flows that would have occurred if the proposed agreement had been in effect.

the surface flows in this reach of the river, with and without the proposed agreement.

Ventura River, San Antonio Creek to Foster Park Diversion.

This live stretch of the stream usually flows year-round, with flows in late summer and fall typically in the range of 0 to 2 cfs. The year-round flow in this stretch appears to be caused by some irregularity in the subsurface geology (perhaps a fault) which causes groundwater to be forced to the surface above San Antonio Creek and then to flow on top of the river gravels down as far as the City's wells at Foster Park. Observations of flow in this stretch were made by Ventura County hydrographers from 1934 through 1966. Their records show that flow actually ceased in this stretch for periods up to several months in 1951-52, 1961, and 1964. Flows in this stretch are stimulated by rising groundwater in the Ventura River (which will be diminished by the proposed agreement) and, to a lesser degree, by water from San Antonio Creek (which will be unaffected by the agreement). Flows in the live stretch are affected by both the rate of recharge of the upper part of the Ventura River groundwater basin and by the rate of groundwater extraction from wells in the river. Detailed observation of the "live stretch" on December 8, 1977, showed some slight continuing flow and surviving fish, although habitat was becoming marginal. Flow at the historical observation point stopped altogether at this time. Implementation of the agreement would reduce the recharge to the upper part of the basin. If groundwater extraction were continued at historical rates, the stored groundwater would be depleted more rapidly and perhaps more often with the agreement than without it. Table VI-3 presents one estimate based on computer simulation studies of the effect of the agreement on surface flows at the observation point 200 feet below San

Table VI-3. ESTIMATE OF NUMBER OF MONTHS WHEN "LIVE STRETCH"
GOES DRY AT OBSERVATION POINT 200 FEET DOWNSTREAM
FROM SAN ANTONIO CREEK

| <u>Calendar Year</u> | <u>Dry Months</u> | |
|----------------------|--------------------------|-----------------------|
| | <u>Without Agreement</u> | <u>With Agreement</u> |
| 1939 | | 2 |
| 1940 | | 10 |
| 1941 | | |
| 1942 | | |
| 1943 | | |
| 1944 | | |
| 1945 | | |
| 1946 | | |
| 1947 | | 8 |
| 1948 | 3 | 12 |
| 1949 | 12 | 12 |
| 1950 | 10 | 12 |
| 1951 | 12 | 12 |
| 1952 | | |
| 1953 | | |
| 1954 | | 10 |
| 1955 | 6 | 12 |
| 1956 | 5 | 7 |
| 1957 | 11 | 12 |
| 1958 | 1 | 1 |
| 1959 | | |
| 1960 | | 9 |
| 1961 | 9 | 12 |
| 1962 | 1 | 1 |
| 1963 | | 2 |
| 1964 | 4 | 12 |
| 1965 | 5 | 10 |
| 1966 | | |
| 1967 | | |
| 1968 | | |
| 1969 | | |
| 1970 | | |
| 1971 | | 3 |
| 1972 | | 8 |
| 1973 | | |

Source: ESA Interpretation of Hydrographs
from Stetson Engineers

Antonio Creek, in terms of the number of months the stream is dry at the observation point. Some small continuing flow and pools may persist downstream when observation point goes dry, so this does not necessarily mean that no fish will survive in the live stretch, although habitat is doubtless becoming marginal when the observation point goes dry.

As a rough rule of thumb, it appears likely that dry season flows at the observation point will be reduced by about 2 cfs if the agreement is put into effect. An estimate of flows 250 feet below San Antonio Creek under the proposed agreement can be made by subtracting 2 cfs from the hydrograph at the top of Figure V-4.

Comparison of the dry-season flow in this stretch of the river with the level of water in wells upstream reveals a close correlation between the two. For example, using as an indicator a well that is located just upstream of the Highway 150 bridge (Ventura River County Water District Well 4N23W16C4, index no. W-13 on Figure V-10), comparison of its water level (which is recorded regularly by County hydrographers) with the flow in the live stretch below San Antonio Creek shows that flow is about 5 cfs when the well level is at elevation 520 but it drops to zero when the well level is at elevation 495 or lower.

Ventura River, Foster Park to Pacific Ocean. This reach of the river can be divided into two differing flow regimes because of the contribution of effluent from the Oak View Sewage Treatment Plant located 1 mile downstream of Foster Park.

During the summer months, and throughout the entire year during periods of drought, there will be no impact between

Foster Park and the treatment plant since there is no flow under present operations and this condition will not change. There will also be no major change in flow from the treatment plant to the ocean during these same dry periods, since effluent makes up most of the flow in this reach, with minor additions from springs, seeps, and rising water in the riverbed.

During the winter and spring there will be essentially no change in flow during storm flows either upstream or downstream of the treatment plant. The effect of the agreement on stormwater flows in the lower Ventura River in the vicinity of the tidal lagoon should be negligible because the release of 20 cfs of flow at Robles is only remotely associated with surface flow at this point. Flood spills at Robles and natural flows down San Antonio Creek and other tributaries, none of which will be affected by the agreement, are probably the controlling factors in winter flows that flush the lagoon and breach the lagoon barrier.

However, during much of the time between the short-duration periods of high flow there will be some impact both upstream and downstream of the sewage treatment plant. Some flows (1 to 2 cfs or more) now spill over or bypass the concrete subsurface dam at Foster Park during many of the winter and spring months, and this flow will be reduced by about 2 cfs (i.e., it will be largely, if not wholly, eliminated). Downstream of the plant, the flow during these periods will be decreased by approximately half, since the flow of effluent will continue unchanged.

Lake Casitas. The proposed agreement will cause more water to be diverted to Lake Casitas (on the average, 3500 to 4000 AF/Y more than without the agreement). However, given the

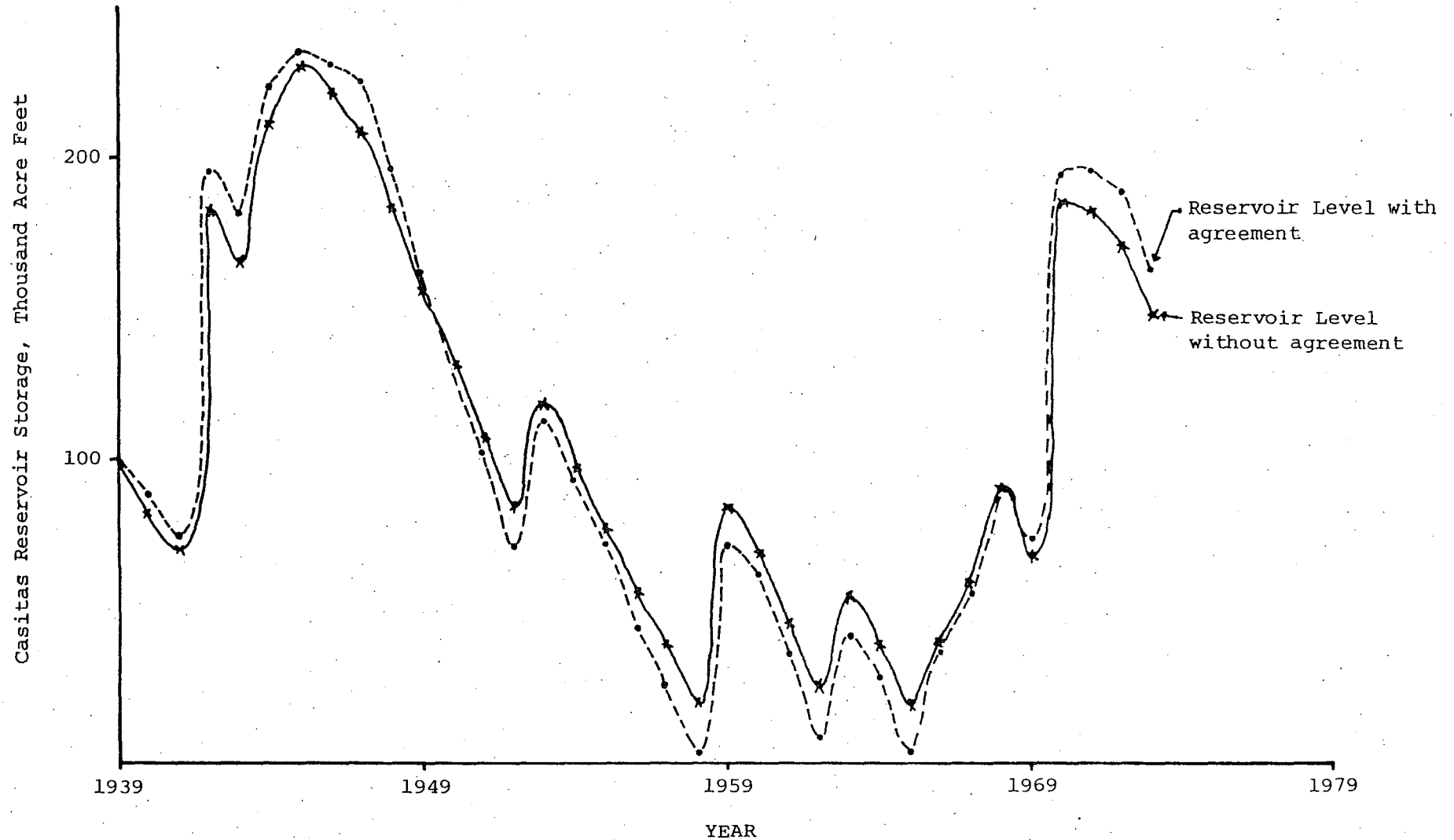
various additional demands placed on the reservoir, including makeup to well owners upstream of Foster Park, evaporation, etc., it appears that the reservoir level will be affected very little by the agreement. A plot comparing reservoir storage for a 35-year period, with and without the agreement, is shown on Figure VI-1.

Groundwater Quantity

Historically, every few years (such as 1957, 1961, 1964, and late 1976) the groundwater basin underlying the Ventura River above Foster Park has been exhausted to the extent that water levels have fallen markedly for a few months. As a result, the production of wells upstream of the Foster Park Diversion Dam has dropped off to a fraction of normal during this period. With the agreement, this condition of lowered groundwater levels and resulting decreased well production in all wells between Robles and Foster Park will occur more frequently, and will begin earlier, but groundwater levels will begin to recover at the same time as they have in the past. Lowered groundwater conditions will persist for longer periods of time. Instead of occurring for only 10 to 20 months per decade as in the past, lowered groundwater levels will persist roughly half the time. Hence, groundwater users will have to draw on Casitas Reservoir water a significant part of the time.

The proposed agreement will reduce the quantity of surface and subsurface water passing Foster Park, thereby reducing the quantity of water available for recharge in the groundwater basin below Foster Park. However, the quantity of groundwater below Foster Park is not in short supply and is not an important resource because it is of poor quality.

Note: Assumed Starting Point = 100,000 AF Storage. (1977 Level Actually 175,000 + AF)
7300 AF Groundwater Use by City Assumed.



Casitas Reservoir Levels

Comparison of Casitas Reservoir Levels With and Without Agreement

6/20/77

Figure VI-1

Surface Water Quality

The quality of surface water during storm and flood flows from Robles Diversion to San Antonio Creek will not be affected.

The quality of surface water in the live stretch between San Antonio Creek and Foster Park will be affected somewhat, assuming no mitigation measures. Chemical quality will decline slightly because of increased salt concentration caused by higher evaporation during reduced flows. Reduced rising groundwater in the Ventura River may raise summertime surface flow temperatures and reduce levels of dissolved oxygen.

The quality of surface water downstream of the sewage treatment plant will be adversely affected during late summer months because the sewage effluent will no longer be diluted with the equivalent volume of better-quality water coming from upstream. However, during storm flows, which will not be affected by the agreement, surface water quality in the lower part of the river will be similar to that in the past.

Groundwater Quality

This section deals only with impacts on dissolved solids (the mineral content) of groundwater in the Upper and Lower Ventura River basins, since there will be essentially no change in groundwater temperature and dissolved oxygen content.

Upper Ventura River Basin. Within the Upper Ventura River Basin, groundwater levels will be drawn down more frequently because of decreased surface and subsurface flows. As a

result, poorer-quality subsurface seepage from the bedrock underlying the alluvium into the basin will probably increase. Also, surface flows from San Antonio Creek that are of poorer quality than surface flow in the main Ventura River will make up a larger percentage of the basin recharge. Consequently, the chemical quality of the groundwater will decline. This condition commonly occurs, especially in Southern California, when river gravels are heavily pumped or recharge is reduced. For example, following the 1961 drought, during which groundwater levels were depressed for about six months, the total dissolved solids (TDS) in groundwater in a well near Casitas Springs increased from a normal value of 750 ppm to almost 1000 ppm and boron content rose from a normal value of 0.41 ppm to 0.88 ppm. Similar declines in quality have occurred in wells upstream of San Antonio Creek and in City wells during periods of lowered groundwater levels. With longer periods of low groundwater in this area, greater increases in dissolved solids will probably occur and the water will be less attractive for domestic use or irrigation of certain crops. It seems likely that groundwater TDS of approximately 800 ppm and boron content of approximately 0.5 ppm may occur in typical dry years instead of only in rare droughts.*

Elevated TDS in the Foster Park well water is not seen as a serious problem by the city since, as in the past, the Foster Park water would be blended with higher quality water from Casitas Reservoir. Elevated boron concentrations do represent a hazard to some crops.

Lower Ventura River Basin. Groundwater quality in the Lower Ventura River Basin is poor. The proposed agreement will result in a somewhat decreased inflow of good-quality surface and subsurface water, as discussed above, which will lead to

* These values are based on actual observations during the drought of 1977. Higher values are possible with sustained drawdown of the basin, but no historical data exist to substantiate such a prediction.

increased dissolved solids over the years. This does not appear to be a significant impact, however, since the groundwater in this basin is now unsuitable for both domestic and agricultural uses.

EFFECTS ON AQUATIC BIOLOGY

The following assessment of impacts on aquatic biology is based on a comparison (presented in Appendix C of this EIR) of probable steelhead migration and spawning in the Ventura River between 1958 and 1965, with and without the proposed agreement.

Ventura River Lagoon

The small reduction in freshwater outflow during the winter will slightly modify the salinity gradient in this estuary. The expected changes are minuscule compared to the normal changes that occur throughout each winter and in years of different rainfall. The proposed agreement is not expected to have any adverse impacts on the biota of the lagoon.

Ventura River Lagoon to Oak View Sewage Treatment Plant

The predicted reduction in base winter flows between storms by about 2 cfs is not expected to have a significant effect on the California native fishes, aquatic insects, other resident fauna, or the flora of this reach of the river. The status of resident biota is primarily controlled by the long dry periods when the flow is almost 100 percent effluent from the Oak View Sewage Treatment Plant.

Reduced flow and reduced dilution of the waste effluent are, however, apt to have an adverse impact on steelhead migrations

in from a third to half of the years. During the wetter years, when base flows between storms remain above, say, 10 cfs, the proposed action is unlikely to have any measurable effect on either upstream or downstream migrations through this reach. In many years, however, the freshets are small, never exceeding a few hundred cubic feet per second, and the streamflows drop to 5 or less cfs within a few days. The reduction of such low flows by 2 cfs (a result of the proposed agreement) may be detrimental to the migration of adult steelhead. Without adequate mitigation measures, significant numbers of the downstream-migrating yearlings may be stranded in unsuitable habitat or be killed by pollution instead of moving on to the sea.

Ventura River, Oak View Sewage Treatment Plant to City Diversion

The biota here is limited by the very small amount of rising groundwater that provides the only surface flows from spring to winter. The reduction of winter surface flows proposed by the agreement would probably have no significant impact on the permanent biota, but the upstream and downstream migrations of steelhead through this reach may become slightly more difficult in some of the drier years.

Ventura River, City Diversion to Just Above San Antonio

One method of prediction indicates that the proposed action will reduce the normal spring-summer base flow of rising water in this reach by about one-third and will eliminate surface flow completely for a full summer and fall two or three times each decade in the future.

Between 1959 and 1965, surface flows at an observation point 200 feet downstream from the mouth of San Antonio Creek

ceased, or nearly ceased, four times (Table D-1, Appendix D): once very briefly in October 1960; once for more than five months, from July through December 1961; and probably for about two months at the end of 1964 and 1965. Had the project been in operation during this seven-year period, the streamflows would have ceased at the same years, but for longer periods of time on each occasion. With the cessation of surface flow for several months in this stretch, most pools would probably dry up, as they have on occasion in the past. In any case, the character of the biota of the river at Casitas Springs could change and become very much like that found in the shorter reach just above the Oak View Sewage Treatment Plant, which has less rising groundwater. This section would lose most of its characteristics as a permanent spring-fed stream, which so much of the flora and fauna there depend on for survival. There could be a reduction in the diversity and abundance of invertebrate fauna. The resident trout and steelhead populations that depend on this area disappear (see Appendix C).

Ventura River, San Antonio Creek to Robles Dam

This section of the river is dry most of the time, so the project would have little effect on its biota.

There is no evidence that steelhead use this section to migrate upstream to Robles Dam or above there, but in very wet years they may do so. The proposed action would limit any remaining opportunity for restoring steelhead runs upstream of Robles Dam. Serious efforts by the California Department of Fish and Game to bring about such restoration are unlikely because of the combined lack of flows below Robles Dam and the relatively small amount of spawning area that still exists above there.

Casitas Reservoir

The proposed action is not expected to have measurable or significant impact on the biota of Lake Casitas. Water levels in Casitas Reservoir will continue to fluctuate in response to the pattern of wet and dry cycles (Figure VI-1). The proposed agreement will reduce the risk of Casitas Reservoir ever being completely emptied.

EFFECTS ON TERRESTRIAL BIOLOGY

Before discussing potential impacts on terrestrial plant and animal life, it is important to point out that neither the present state of the art of determining instream flow needs for wildlife nor the ability to predict the effects of lowered groundwater levels or altered flow patterns on vegetation is very advanced. Kadlec (1976) points out that formal methodologies for determining in-stream flow requirements for wildlife do not exist and that substantially more research is needed. Future studies should investigate effects of altered water supply under a variety of geologic, hydrologic, climatic, and vegetative conditions in several regions before predictive techniques can be used with confidence. Robert Ohmart of Arizona State University (personal communication, May 26, 1977) is currently directing studies on the Colorado River in an attempt to determine the effects of altered flows on riparian habitat and associated wildlife, and Jack Howerton of the Washington Department of Game (personal communication, May 24, 1977) is conducting similar investigations on the Snake and Columbia rivers. These studies have not yet progressed to the point of yielding definitive information. No studies of this kind are known to be in progress in California.

Due to the lack of predictive techniques, it is necessary to discuss the effects of the proposed agreement in terms of potential for inducing impacts on vegetation and wildlife.

The operational assumption in the following assessment is that where surface flow and groundwater conditions under the proposed agreement would be altered from present conditions there is potential for impact; but where conditions remain nearly the same as those in the past, no significant impacts are likely. This assessment is based on the discussion of project-induced changes in surface flows and groundwater presented in this report.

Types of Effects

In general, there are four ways in which altered surface flows and groundwater levels can affect terrestrial wildlife and/or vegetation:

1. Removal of drinking water for those terrestrial species requiring it.
2. Alteration of flow patterns and volumes for aquatic and amphibious wildlife that depend directly upon aquatic habitat for all or part of their lives.
3. Modification of riparian habitat through lowered groundwater tables or surface saturation.
4. Alteration of flood patterns (thereby affecting flood-dependent species such as willow).

The proposed agreement will have no effect on present flood flows, but in some sections of the river there is the poten-

tial for alteration of riparian vegetation and reduction of the availability of drinking water for terrestrial wildlife. This potential exists where surface flows will be reduced or eliminated to some extent and where groundwater levels will be drawn down for extended periods.

Wildlife species in the area may be grouped in the following classes according to their dependence on instream flows:

- a) Aquatic (totally dependent on aquatic flows) for example, waterfowl, some shorebirds, and some amphibians.
- b) Riparian (strongly dependent on in-stream flow or riparian habitat) for example, shorebirds and herons.
- c) Associated terrestrial (abundance strongly influenced by aquatic ecosystems) for example, skunk, deer, and mourning dove.
- d) Terrestrial (little dependence on instream flows) for example, jackrabbit, coyote, and many small mammals.

Utilizing the forementioned categories of effect and groups of wildlife, Table VI-4 summarizes the potential impacts to vegetation and wildlife from the proposed agreement. In addition to the information presented there, the following merit additional discussion.

Rare, Endangered, or Threatened Species

It is not likely that the proposed agreement would affect any rare, endangered, or threatened plant or wildlife species.

Table VI-4. POTENTIAL IMPACTS TO VEGETATION AND WILDLIFE FROM
THE PROPOSED AGREEMENT

| Project Area | Potential Impacts* | | Comments |
|---|--------------------|---------|---|
| | Types | Groups | |
| Upper Ventura River (Robles Dam to San Antonio Creek) | 1, 2, 3 | A, B, C | Except for very high rainfall years, surface flows are projected to be eliminated for the entire year. Several years in a row could pass with little or no flows. Existing riparian habitat may be reduced or altered substantially. Over 5 year period similar to that of 1959-1964, total days with 0.1 cfs surface flow or greater will be reduced from 188 to 12. Relationship of groundwater to riparian maintenance unknown. Much of riparian habitat has already been lost to agriculture. |
| Ventura River (San Antonio Creek to Foster Park) | 1, 3 | A, B | Flows now stop average of once for a few months each decade; projected to maybe stop 2 or 3 times each decade for full summer and fall or average 2 cfs reduction. High quality riparian habitat in Foster Park area may be modified to unknown extent, but probably not drastically. |
| Ventura River (Foster Park to Pacific Ocean, excluding mouth) | 2, 3 | A, B | No significant change during drought years or flood flows. Present spillover at Foster Park (1-2 cfs) during other times will be largely or entirely eliminated to STP; flows below STP will be halved. Reduction of flows will reduce aquatic habitat; unknown effect on riparian habitat. Water quality will be significantly reduced; unknown effect. Wildlife value in this section is presently limited by surrounding urbanization. |
| Ventura River Mouth | 2, 3 | A, B | Winter storm flows will remain essentially unchanged, but normal flows will be reduced (see previous section) with lowered water quality due to undiluted STP outflow. Reduced volumes may reduce habitat for aquatic-dependent species (e.g., waterfowl). Salinity regimes will likely change with resultant scuffs in marsh/riparian plant species distribution, composition, and/or abundance; extent unknown. This, in turn, could alter invertebrate community. |

Table VI-4. (continued)

| Project Area | Potential Impacts* | | Comments |
|---|--------------------|--------|---|
| | Types | Groups | |
| Lake Casitas, Coyote Creek, San Antonio Creek | None | None | There will be no change from existing conditions to these components. |

*Key:

Impact Type:

1. Reduced drinking water availability.
2. Alteration of normal (existing) flow patterns or volumes for aquatic-dependent species.
3. Riparian (or marsh) habitat modification or reduction.
4. Alteration of flood patterns.

Wildlife Groups:

- A. Aquatic -- totally dependent on water for continued presence.
- B. Riparian -- strongly dependent on riparian (or marsh) habitat.
- C. Associated Terrestrial -- abundance influenced by aquatic ecosystems.
- D. Terrestrial -- little dependence on stream flows or riparian habitat.

EFFECTS ON LAND USE AND FEATURES

Implementation of the proposed Conjunctive Use Agreement is likely to have little effect on land use in Ventura County as a whole or locally along the Ventura River. The provision of a more dependable supply of water to the City and to well owners upstream from Foster Park is not expected to induce any major changes in land use. This applies to agricultural, residential, and industrial land uses. It is possible to argue, however, that the adoption of the proposed Conjunctive Use Agreement may interfere with the goals for increased recreational use along the river.

Agricultural Land Use

Agricultural land use within the Ventura River Valley is not likely to be changed as a result of the proposed conjunctive use of the river-reservoir system. The proposed agreement will make no more water available to agricultural water users in the Ventura River Valley but, under the agreement, well owners will be guaranteed an annual water supply. According to the agreement, CMWD will provide a firm supply of water, making up deficiencies in the well owners' groundwater supplies with water from Casitas Reservoir.

At present, some slight expansion of agricultural acreage is occurring in the Ventura River Valley as a few landowners with irrigable land have decided to increase their acreage under irrigation and to take advantage of CMWD's favorable water rate (\$25.00 per acre-foot) for water used on prime agricultural land.

No such shifts in agricultural land use are expected as a result of implementation of the proposed Conjunctive Use

Agreement; nor is the agreement expected to have any effect on CMWD's rate structure. The guarantee of a firm supply of water is not expected to induce any expansion of irrigated acreage.

Residential Land Use

Residential land use is not expected to be affected by the proposed Conjunctive Use Agreement either throughout the county or locally. There is some possibility that the proposed agreement may generate a slight added inducement for residential development of agricultural land in limited areas of the Ventura River Valley between Foster Park and the Robles Diversion Dam. While most of the property in this part of the valley is now supplied through water distribution systems of the CMWD or other local water purveyors, CMWD expects to have to extend its distribution system to deliver makeup water to some of the well owners whose groundwater supplies will be affected by the proposed operations. The extension of 6- or 8-inch water mains will make a ready supply of water available to potential residential users.

The main area where the installation of a new water main may facilitate residential development is on the west side of the Ventura River along Santa Ana Road, north of Foster Park and south of Santa Ana Boulevard. The nature of change to residential use probably would be in the subdivision of a limited amount of valley land into a small number of 1-acre lots. Aside from this limited area, the county zoning regulations establish minimum parcel sizes of 20 and 40 acres in this part of the valley.

Recreational Land Use

To some extent, implementation of the proposed Conjunctive Use Agreement may conflict with development of recreational use of the Ventura River. Recreational land use along the Ventura River is likely to increase in the future as a result of public efforts to develop the recreational potential of the river.

As discussed in Chapter V, several public agencies have been planning to develop recreational facilities, including parks and a bicycle/equestrian/hiking trail, along various sections of the Ventura River.

Water is recognized as an element of the landscape that contributes considerably to the visual and aesthetic quality of the environment. The reduction and/or elimination of surface flows in the river will diminish the aesthetic quality of the environment and the value of the river's riparian areas for recreational use.

The principal example of this difficult-to-measure impact on recreational use is expected at Foster Park. A citizens' advisory committee working with the Ventura County Property Administration Agency is investigating possibilities for the expansion of Foster Park, which could include the development of a 137-acre City-owned parcel just north of Foster Park. The County would like to obtain rights to develop this parcel, on which the City's wells are located, for primitive camping and other uses that would require minimum alterations of the site. The year-round live stretch of the Ventura River at Casitas Springs runs through the City-owned property. Reduction and occasional elimination of flows in this stretch will reduce its value as a recreation resource.

Little if any effect on recreational use at the Ventura River mouth ("Hobo Jungle" and Emma Wood State Beach) is expected since the proposed agreement is not expected to create a noticeable effect in the Ventura River Lagoon.

The recreational use of Casitas Reservoir, an important part of the Ventura River-Casitas Reservoir system, will be unaffected by the adoption of the proposed new operational criteria. A plot comparing reservoir levels under the proposed agreement and under existing operating conditions shows only minor differences in storage under the two operating schemes (see Figure VI-1). Although an average of 3500-4000 AF/Y more water will be diverted to the reservoir under the proposed agreement, most of this increase will be used to satisfy CMWD's makeup obligation to the City and other water diverters.

Historic and Archaeological Resources

While the Ventura River Valley is rich in historic and archaeological resources, implementation of the proposed agreement is not expected to have any impact on cultural resources. The implementation of the agreement involves mainly a change in the operation of existing equipment and requires no major construction. CMWD may extend its water distribution system to reach a few of those well owners above Foster Park who presently obtain water from their own wells and have no supplemental water supply. This construction would be of temporary nature and pipelines would not be buried.

EFFECTS ON WATER RESOURCES

Casitas Municipal Water District

According to the computer studies, CMWD's supply from Casitas Reservoir will become slightly more variable if the proposed agreement is implemented. This can be seen on Table III-2. Whereas under the present operations the computer studies show that CMWD can operate the system to obtain 20,000 AF annually with no years of deficiency, under the proposed agreement there might be 1 to 3 years over a 35-year period in which CMWD would experience a deficiency. The number of years with a deficiency and the severity of the deficiency depend in part on the demand objective set by the City. If the City sets a demand objective of 6000 AF/Y, CMWD would have 1 year of deficiency in 35 years, with a maximum deficiency of 18 percent. If the City sets a demand objective of 7300 AF/Y, CMWD would have 3 years of deficiency in 35 years, with a maximum deficiency of 36 percent. These occasional deficiencies represent only a slight change from the system's present reliability.

City of San Buenaventura

Chapter III discusses at some length the role the Foster Park water supply plays in the City's plans for satisfying future water needs. As discussed in Chapter III, the City's average water supply from Foster Park will increase if the proposed agreement is implemented and the reliability of this supply will improve significantly. In recent years the City has pumped an average of 5550 AF/Y. Under the proposed agreement, the City will be able to get an average of 6000 to 6620 AF/Y, with a guarantee of 6000 AF in dry years. At present the City has no such assurance of a firm supply in

serious drought years. There have been serious deficiencies in past years, such as 1951, when the City recovered only 1463 AF from Foster Park.

Water Diverters Upstream of Robles Dam

The proposed agreement will have no effect on water resources upstream of Robles Diversion Dam.

Water Diverters Between Foster Park and Robles Dam

In addition to the City, approximately 25 well owners in the Ventura River Valley between Robles Dam and Foster Park will have a firm supply guaranteed to them under the proposed Conjunctive Use Agreement. Under individual agreements that CMWD may negotiate with the well owners, the District would guarantee an annual supply. Combined demand of these upstream well owners has been estimated at 2200 AF/Y.

Since the provision of makeup water under the individual agreements will not provide a different level of availability of their water supply, it is unlikely that the proposed agreement will induce any changes in water use among these well owners.

Water Diverters Downstream from Foster Park

Downstream from Foster Park there are two water diverters that pump water directly from the Ventura River for irrigation of citrus crops. Because surface flows down to the Oak View Sewage Treatment Plant are stimulated by flows past Foster Park and by some rising groundwater downstream of Foster Park, these flows will be reduced under the proposed agreement. This reduction may reduce the water available at the citrus

growers' pumps in the river. The river is not their sole source of water, however, as one now purchases water from CMWD and the other is supplied from City's raw water line. In the future, these citrus growers may have to rely more heavily on water supplied by the City or CMWD.

In the lowest reach of the Ventura River, surface diversions operated by a farmer irrigating field crops and the sand and gravel operation are not likely to have any reduction in water available for their use.

SUMMARY

In summary, the principal negative impacts of the proposed Conjunctive Use Agreement relate to the reduction of surface flows and groundwater levels in the Ventura River system. Except during floods in excess of 500 cfs which spill over Robles Dam, surface water flows below the dam will be reduced most of the time. Flows in the Casitas Springs live stretch will be reduced by about 2 cfs much of the time and will cease for longer periods of time than they have in the past (see Table VI-3). Also, the effect of the project for the period 1960-64 can be roughly indicated by subtracting 2 cfs from the flow hydrograph on Figure V-4. Whereas the flow stops now on the average of once for a few months each decade, it might stop for a full summer and fall two or three times each decade in the future. Winter flows below Foster Park will be reduced between storms, thereby reducing the dilution of wastewater effluent from the Oak View Sewage Treatment Plant.

Groundwater levels in the Upper Ventura River Basin will be drawn down more frequently and for prolonged periods. During these periods of prolonged drawdown, water quality of this resource will decline.

Reduction and cessation of surface flows over long dry periods would greatly change the character of aquatic biota in the Casitas Springs live stretch. With repeated and more frequent episodes of little or no water the diversity and abundance of invertebrate fauna would be reduced and native populations of steelhead and rainbow trout could disappear from this area.

Riparian vegetation from Robles Dam to Foster Park is likely to undergo some changes in species composition and diversity as less drought tolerant species are replaced. Some terrestrial wildlife that live in or frequent riparian habitat for drinking water may be lost from the area because of reduced carrying capacity of the habitat.

Reduction and cessation of flows will reduce the recreational and aesthetic value of riparian areas, notably at Foster Park and its proposed expansion, including the 82 acres of City property containing the live stretch immediately upstream from Foster Park.

Casitas Reservoir will receive increased inflow but will also have to meet increased demands. As a result, changes in reservoir levels will be slight. The City of San Buenaventura and approximately 25 other water diverters will benefit from increased water supply reliability as dry-year deficiencies from wells in the Upper Ventura River groundwater basin will be made up by deliveries from Casitas Reservoir. A few water diverters below Foster Park may also require Lake Casitas water to make up for reduction of water available from the river.

VII. Unavoidable Environmental Effects

UNAVOIDABLE ENVIRONMENTAL EFFECTS

It is likely that the following environmental effects cannot be avoided if the proposed Conjunctive Use Agreement is implemented and if no mitigation measures are undertaken:

- o Surface flows in the Ventura River below Robles Dam will be reduced and the usual year-round flows in the live stretch at Casitas Springs will cease more often and for longer periods of time than they have in the past.

The Casitas Springs live stretch of rising groundwater is the last significant remaining habitat for the remnant run of steelhead in the Ventura River which now numbers about 100 adults. Reduction of flows in this portion of the river would reduce the chances for the survival of the native wild steelhead population in the Ventura River.

It is important to understand that conditions are far from perfect for steelhead in the Ventura River. Many factors have reduced the suitable habitat for steelhead and thus now 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.

- o Surface water quality downstream from the Oak View Sewage Treatment Plant may be adversely affected during

relatively dry winter and spring months between storm flows because of reduction of quantity of effluent-diluting flows from Foster Park.

- o The groundwater level in the Upper Ventura River groundwater basin will be drawn down more often and for longer periods than in the past, with a resulting decrease of production in wells between Robles Dam and Foster Park.

During periods of prolonged lowered groundwater levels the mineral content of the groundwater is expected to increase, with TDS content of 800 ppm and boron content of 0.5 ppm likely in typical dry years instead of only in rare droughts. These values are based on actual observations during the drought of 1977. Higher values are possible with sustained drawdown of the basin, but no historical data exist to substantiate such a prediction.

- o Some less drought-tolerant species of riparian vegetation may be eliminated in certain stretches of the river, principally from Robles Dam to San Antonio Creek, as surface flows will be reduced and groundwater levels will be maintained in drawn-down condition for prolonged periods.
- o Surface drinking water supplies for terrestrial wildlife species will be reduced or eliminated for prolonged periods between Robles Dam and San Antonio Creek, with possible reductions in local populations of animal species that depend on surface flows.

VIII. Mitigation Measures

SURFACE WATER FLOW

The principal impacts that have been considered from the standpoint of mitigation measures are (1) the reduction or cessation of surface flows in the live stretch of the Ventura River between San Antonio Creek and Foster Park, and (2) reduction of flows below Foster Park.

It would be desirable to preserve, to the extent possible, some minimum dry-season summer flow in the San Antonio Creek-Foster Park live stretch in order to maintain this stretch as a recreational, scenic, and biological resource. If such a flow could be maintained, it would actually constitute an improvement over the past and probable future conditions (flow has stopped from time to time in past dry seasons and would probably stop more frequently if development of groundwater supplies continues in the Ventura River Basin above San Antonio Creek).

Potential methods for maintaining dry-season flow in the stretch between San Antonio Creek and Foster Park are as follows:

1. Place a limit on the elevation in the groundwater basin below which water cannot be taken. Study of data available to the consultant indicates that the flow in this stretch is controlled in large degree by the groundwater levels in the river alluvium above San Antonio Creek (see Chapter V). Live year-round flow

could be maintained by limiting the drawdown in wells above San Antonio Creek to stated levels (for example, elevation 505 to 515 feet in well 4N/23W-16C4, should correlate with approximately 2 cfs flow. Well 4N/23W16C4 is shown as index no. W-13 on Figure V-10; see also Figure V-4). If groundwater were maintained at such levels, flow would continue to rise in the live stretch; it would be picked up farther downstream at the Foster Park diversion and therefore not escape the system. In dry years, this would essentially mean a transfer of useable groundwater reserves from upstream diverters to the City. However, this presumably would be equalized by CMWD by direct deliveries to well owners in the groundwater basin.

2. Artificially recharge the live stretch with water from Lake Casitas delivered via the CMWD distribution system. This could be accomplished by releasing water from the CMWD distribution system into San Antonio Creek just upstream of the San Antonio Creek-Ventura River confluence. This water would have to be dechlorinated before it would be suitable for release into fish and wildlife habitat. The experience of CMWD during the winter of 1978 indicates that dechlorination is economically and technically feasible. The Oak View Sanitary District has also indicated that it routinely dechlorinates wastewater which is released into the Ventura River without adverse effects.
3. Artificially recharge the live stretch with well water. This could be accomplished by using the existing or a new well at Casitas Springs or by developing a new well in the Ventura River above San Antonio Creek. The availability and effect of developing groundwater at these two locations would differ somewhat because they

are in different cells of the Upper Ventura River groundwater basin. A well with approximately 1-cfs (450-gpm) capacity would be suitable to maintain dry-season flow. The risk involved in this mitigation measure is that the well might go dry at the very time when its water was needed most -- i.e., when other wells had exhausted the groundwater reserves to the point that rising groundwater stopped. Some care would have to be taken to locate this well to exploit the last of the available groundwater reserves.

Maintenance of dry-season flows, or flow between storms, in the stretch below Foster Park is more problematical, since such a measure would defeat the very purpose of the proposed agreement, which is to preserve or enhance the yield of the system. From this standpoint, released water below Foster Park escapes the system and is not available for domestic water supply.

GROUNDWATER AVAILABILITY

The proposed agreement contains provisions whereby the present users of groundwater will be provided with water from Lake Casitas under specified conditions of groundwater shortage. Therefore, although recharge and yield of the groundwater basin will be affected, mitigation measures are provided in the agreement.

SURFACE WATER QUALITY

Impacts on surface water quality are expected to be minimal, with the exception of those associated with reduced flows in the San Antonio Creek-Foster Park live stretch and a reduction of diluting flows below Foster Park. Maintenance of water quality in these stretches is a matter of maintaining flow quantity, which has been discussed previously.

One measure to mitigate the deterioration of water quality below Foster Park that is beyond the purview of the city and CMWD, but is nevertheless identified here, would be to improve the quality of effluent leaving the Oak View Sewage Treatment Plant; so the water quality below the plant would not depend as it does upon the diluting flows that pass Foster Park.

GROUNDWATER QUALITY

As discussed in Chapter VI, the Upper Ventura River groundwater basin will be subjected to heavier drawdown pressures and will have less recharge water available in the future if the proposed agreement is implemented. This means that there will be not only less flushing of minerals but also a greater degree of mineral infiltration into the groundwater because the basin will be drawn down for longer periods. This impact is a natural result of full exploitation of the basin.

Mitigation measures that could be considered to minimize the deterioration of groundwater quality include:

1. Limiting groundwater withdrawals in one or both of the cells of the basin (above and below San Antonio Creek) as discussed previously. This has the disadvantage of effectively reducing the amount of groundwater storage available to the system, thereby decreasing the yield of the system.
2. Improving the present groundwater quality monitoring system in such a way as to be able to anticipate development of potential problems. Steps have been taken by the City already, for example, to run routine boron checks on the water obtained from Foster Park.

It should be understood that while considerable study of the relationships between surface flows, groundwater levels and water quality has led to these concepts for mitigating impacts, no program for carrying out the mitigation efforts has been developed as an integral component of the proposed agreement. It is expected that such a program would be developed by the City, CMWD, and their consultants.

IX. Growth-Inducing Impact

Implementation of the proposed Conjunctive Use Agreement is not expected to induce economic or population growth in the Ventura River Valley or in the City of San Buenaventura.

While such growth might be stimulated by the availability of water in previously undeveloped areas or by large increases in supplies in developed areas, the increase in water supply with the proposed agreement would add such a small increment above the present supply that it would not be expected to have any growth-inducing impact.

The economy of Ventura County and the City of San Buenaventura is already well developed. Growth in the City is stimulated principally by the general economic climate, industrial expansion, and good weather, rather than by the availability of water.

While incremental increases in water supplies do not necessarily induce growth; shortages of water and the failure to develop an adequate supply have retarded growth in some areas. In the case of San Buenaventura, the failure to execute the proposed agreement alone is not likely to result in the retardation of growth, since the City has some latitude to develop other groundwater resources (Victoria Well and Golf Course wells), though the quality of water from these other sources is significantly lower than from the Ventura River-Casitas Reservoir system.

X. Evaluation of Other Operational Schemes

EVALUATION OF OTHER OPERATIONAL SCHEMES

There is considerable public and private interest in the management of the resources of the Ventura River, and there are some clearly conflicting values with regard to the proposed uses of the available water.

A number of ideas and operational schemes have been proposed by agencies, special-interest groups, and consultants that would accomplish various goals such as increased system yield, protection of water quality, habitat preservation, and fishery restoration.

In addition to the "no project" alternative, the concepts, purposes, and probable environmental effects of five alternative operational schemes are discussed in this chapter. Table X-1 permits a comparison of these proposals with the proposed Conjunctive Use Agreement and the "no project" alternative.

- o "No project" alternative: no Conjunctive Use Agreement
- o Increase minimum bypass flow at Robles Dam from 20 to 40 cfs.
- o Enlarge Robles Diversion Dam and Robles-Casitas Diversion Canal from 500- to 2200-cfs capacity.
- o Release increased yield from conjunctive operation to Coyote Creek
- o Supply water for use by oil companies for secondary recovery operations by releasing upstream and delivering via Ventura River
- o Improve Foster Park facilities and pump to Casitas Reservoir

Table X-1. SUMMARY OF EFFECTS OF PROPOSED CONJUNCTIVE USE AGREEMENT, "NO PROJECT" ALTERNATIVE, AND OTHER OPERATIONAL SCHEMES

| ALTERNATIVE ACTIONS | Satisfaction of City/CHMD Objectives | Surface Water | Groundwater | Aquatic Biology | Terrestrial Biology | Casitas Reservoir | Recreational Use | Economic Costs/Energy Use |
|---|--|--|---|---|---|--|--|---|
| Implement Proposed Agreement (eliminate 20-cfs downstream flow) | -City yield is increased -CHMD yield is slightly reduced -City supply reliability is strongly increased -Basis for settling water-rights dispute -Increased reliability for upstream users | -Significantly reduced flows below Nobles in Casitas Springs live stretch and below Foster Park -Potential reduction in water quality | -Basin above Foster Park low 147 to 171 months in 420 months -Potential reduction in quality | -Major risk to aquatic biota, including remnant steelhead run | -Riparian habitat may change, Nobles Dam to Foster Park -Possible impact on wildlife | -Slight effect on range of water-level variation | -Reduced recreational value, Foster Park and above, from reduction of flow | -Minor city pumping costs and energy use will increase if pumping is increased |
| No project; continue under present criteria (maintain 20-cfs release) • Assumption 1: City sets objective of 6000 AF/Y, pumps 5440 AF/Y • Assumption 2: City sets objective of 7300 AF/Y, pumps 6240 AF/Y | -City yield may increase -CHMD yield is unchanged -City supply reliability is reduced -No basis for settling water-rights issue | -Similar to past -With increased pumping, flows in live stretch may cease more often | -Groundwater basin above Foster Park low 58 to 96 months in 420 months | -If no change in city pumping, biota will continue unchanged -If city pumping increases, undefined risk to present biota | -No effect | -No effect | -No effect | -Minor city pumping costs and energy use will increase if pumping is increased |
| Increase downstream release to 40 cfs • Assume City sets demand objective of 7300 AF/Y and pumps 6340 AF/Y | -City yield is increased -CHMD yield is unchanged -City supply reliability is reduced -No basis for settling water-rights dispute | -Similar to past | -Groundwater basin low 90 months in 420 months -Very similar to 20-cfs release | -No significant effect | -No significant effect | -Reduced water level | -No effect | -No effect |
| Enlarge Nobles-Casitas Canal to 2200 cfs | -City yield is not increased -CHMD yield is increased by 2250 AF/Y -City supply reliability is reduced -No basis for settling water-rights dispute | -Small flood flows in upper river will be reduced -Will be reduced by 2250 AF/Y and less frequent | -Reduced recharge of groundwater basin above Foster Park | -Major risk to remnant steelhead run | -Some habitat alteration, probably slight | -Increased water level | -Possible reduction in recreational value at and above Foster Park, probably insignificant | -Capital costs estimated at \$11 million in 1974 |
| Release additional yield to Coyote Creek | -City yield is unaffected -CHMD yield is unaffected -City supply reliability is unaffected -No basis for settling water-rights dispute | -Surface flow introduced at Coyote Creek and augmented in lower river | -No significant effect | -No significant effect | -No significant effect | -No effect | -No effect | -No effect |
| Deliver water to oil companies by releasing upstream | -City yield is unaffected -CHMD yield is unaffected -City supply reliability is unaffected -No basis for settling water-rights dispute | -Several cfs increase in year-round flow between point of release and downstream diversion point | -No significant effect | -Possible enhancement | -No significant effect | -No effect | -Possible enhancement, especially at Foster Park | -Undetermined capital costs of new diversion -Increased energy use and pumping costs during operation |
| Improve Foster Park diversion facilities, pump to Lake Casitas | -City yield is increased -CHMD yield is unaffected -City supply reliability will probably improve | -Eliminate some flows bypassing Foster Park -Minimal effect on live stretch if pumping is done at Foster Park | -Prolonged drawdown -Probable decline in water quality | -Reduction of aquatic habitat below Foster Park | -Possible effects on vegetation and wildlife habitat downstream from Foster Park | -Increased water level | -No effect | -Undetermined capital costs of new facilities -Increased energy use and pumping costs during operation |

THE "NO PROJECT" ALTERNATIVE

The "no project" alternative (continued operation without the proposed Conjunctive Use Agreement) and some of the resultant options are discussed in Chapter IV. Future yield to the City and CMWD and the possible effects on surface flows, groundwater levels, and water quality are discussed in the first part of Chapter VI as a comparison with the effects of the proposed agreement. Principal effects if the agreement is not signed are given below.

Effect on City

- o City could continue with 6000 AF/Y demand objective but will probably increase demand objective to 7300 AF/Y and pump all it can at Foster Park.
- o Annual yield can be increased to approximately 6240 AF (see Table IV-1).
- o Reliability of yield will not increase; variability will increase; there will be greater dry-year deficiencies.

Effect on CMWD

- o CMWD will continue present operations, with 20-cfs downstream bypass at Robles Dam.
- o CMWD will still face threat of water-rights suit by City and adjudication of rights.
- o CMWD will still face the possibility of having to increase releases in the future to maintain downstream well levels.
- o Annual yield to CMWD will be 20,000 AF.
- o Annual system yield will be 30,380 AF.

Effect on Surface Water

- o Surface flows will remain generally similar to flows in past.

- o If the City maintains 6000 AF/Y pumping objective, there will be no change from the present.
- o If the City increases pumping objective to 7300 AF/Y, flow at Casitas Springs live stretch will cease more often (see Table VI-3) and 1-2 cfs less flow will bypass Foster Park in winter and spring.

Effect on Groundwater

- o If City's demand objective remains the same as in the past, groundwater basin above Foster Park would be low 58 months in 420 months (35-year period).
- o If City increases demand objective to 7300 AF/Y, groundwater basin above Foster Park would be low 96 months in 420 months (35-year period).

Effect on Aquatic Biology

- o If the City continues to use about 6000 AF/Y groundwater, the aquatic habitat of the Ventura River will probably gradually improve because of increased awareness and efforts by agencies and conservation groups. Large steelhead runs will never be restored in the Ventura River, but the remnant run will probably be protected. Water quality in the lower reaches is likely to improve, and more attention will be paid to such matters as the protection of riparian vegetation.
- o If the City increases groundwater use, the quality of the aquatic habitat in the Ventura River will decline. Survival of the remnant steelhead run would probably depend upon what mitigation measures were applied.

Effect on Terrestrial Biology

- o If the City pumps more groundwater, changes in aquatic and riparian habitats may result over time but would probably be insignificant.

Effect on Casitas Reservoir

- o None.

INCREASE MINIMUM DOWNSTREAM BYPASS TO 40 CFS

It was thought that increasing the minimum downstream bypass at Robles Dam to some volume greater than the present 20 cfs might improve conditions in the river for aquatic biota, including the remnant steelhead population. Such an increase would also improve groundwater conditions and thus provide a basis for resolution of the downstream water-rights issue.

A minimum bypass flow of 40 cfs was chosen as a significant increase over 20 cfs, and computer studies were made of system yield. If the present CMWD operations continued, without the agreement but with this modification, and the City increased its demand objective to 7300 AF/Y, the following effects would result.

Effect on City

- o Average yield would increase to 6340 AF/Y (study 7300/40/20,000).
- o City would gain no improvement in reliability of supply.
- o Would not provide an adequate basis for settlement of the water-rights issue.

Effects on CMWD

- o CMWD average yield would be 19,730 AF/Y.
- o Total system yield would be 30,250 AF/Y.

Effects on Surface Water

- o Surface water flows will be similar to flows in the past except that diversion of water to Casitas Reservoir would not begin until flow at Robles reached 40 cfs (instead of present 20 cfs). Flows in range of 20-40 cfs would occur below Robles on the order of 30 days per year. Dry-season flows in the Foster Park-San Antonio Creek live stretch would be the same as with 20-cfs releases.

Effect on Groundwater

- o Groundwater basin above Foster Park would be low 90 months in 35-year period, very similar to present operation.

Effect on Aquatic Biology

- o No significant effects.
- o Would probably increase opportunities for steelhead to migrate to Robles Dam in some years.
- o With fish ladder at Robles, there would be some additional spawning and rearing habitat upstream; might increase the adult steelhead run by less than 200 fish.

Effect on Terrestrial Biology

- o No effects.

Effects on Casitas Reservoir

- o Casitas Reservoir would not be replenished as it is now; on the average, it would have lower levels and would have a higher probability of being emptied more times than under present operations.
- o Possible reduction in recreational carrying capacity.

ENLARGE ROBLES-CASITAS CANAL TO 2200 CFS

A feasibility study on the enlargement of the Robles-Casitas Canal was made by the U.S. Bureau of Reclamation in 1968. The increased capacity would permit diversion of a larger volume of storm flows. Annual increase would amount to 2250 AF/Y, with a total project cost estimated in 1968 at \$6,975,000 and revised to \$11,000,000 in 1974. If the canal were enlarged, present 20-cfs downstream releases were continued, and the Conjunctive Use Agreement were not signed, the following effects would be expected.

Effect on City

- o Would reduce recharge of groundwater above Foster Park, but some increased minimum bypass might resolve that problem.
- o Would not satisfy City's need for improved reliability of supply.
- o Would not provide an adequate basis for solving the water rights dispute.

Effect on CMWD

- o CMWD would be able to capture more of flows between 500 and 2200 cfs.
- o Increase in yield to CMWD would be 2250 AF/Y.
- o Capital costs of project were estimated at \$11 million in 1974.

Effect on Surface Water

- o Small flood flows in upper river would be reduced and less frequent.
- o Major floods would not be greatly affected.

Effect on Groundwater

- o Spills over Robles Dam would be less frequent. This would reduce the rate of flood recharge, thereby

affecting (lowering) groundwater levels somewhat.
Effect would probably not be significant.

Effect on Aquatic Biology

- o Would eliminate many freshets on which adult steelhead migrate upstream to spawning area at Casitas Springs and on which the young migrate out to sea. This would be detrimental to the survival of the remnant steelhead run. Magnitude of risk is unknown but it would be significant.

Effect on Terrestrial Biology

- o Could reduce distribution and extent of some areas of riparian habitat but probably only slightly.
- o Might affect animal species dependent on riparian habitat.

Effect on Casitas Reservoir

- o Increase in average area and storage in Casitas Reservoir.
- o Some benefit to reservoir fishery.
- o Possible increase in recreational carrying capacity.

RELEASE ADDITIONAL YIELD FROM CONJUNCTIVE USE TO COYOTE CREEK

It was thought that the release of all or a portion of the increased yield from conjunctive use operation to Coyote Creek for streamflow maintenance would improve aquatic habitat on Coyote Creek and the Ventura River below Foster Park. Some program of maintenance flows might improve the potential for restoration and enhancement of the steelhead fishery in the river.

If the Conjunctive Use Agreement were implemented, and all or part of the increased yield were released to Coyote Creek, the following effects would be expected.

Effect on City

- o City would not gain increased yield it seeks.
- o Does not offer a basis for solution of water-rights dispute.

Effect on CMWD

- o Would reduce potential annual yield to CMWD and customers.

Effect on Surface Water

- o Reduction of surface flows at live stretch between Foster Park and San Antonio Creek would have effects similar to those with proposed agreement.

Effect on Groundwater

- o Prolonged drawdown of groundwater basin above Foster Park would be similar to condition with proposed agreement.
- o Groundwater quality would deteriorate.

Effect on Aquatic Biology

- o Concept of restoring Coyote Creek to aquatic habitat is not valid, since aquatic habitat has been modified by Casitas Dam. The streambed is filled with sand and silt and has been invaded by riparian vegetation.
- o Effect of releases to Coyote Creek would depend on their magnitude and timing. Without occasional large flushing flows, a small release would not restore steelhead or trout habitat.
- o Potential for steelhead habitat improvement exists elsewhere (i.e., Casitas Springs).
- o Releases would augment flows below Foster Park in the Ventura River, with some habitat improvement.

Effect on Terrestrial Biology

- o Regular releases might rehabilitate decadent riparian habitat, but effect would probably be insignificant.

Effect on Casitas Reservoir

- o Would lower average area and volume of water stored in Casitas Reservoir.
- o Possible reduction in recreational carrying capacity.

DELIVER WATER TO OIL COMPANIES VIA COYOTE CREEK AND VENTURA RIVER

As an alternative plan for streamflow maintenance it was thought that the water required by the petroleum industry, including secondary recovery of oil in the Ventura Avenue oil fields (6600 AF in 1975 and projected to increase to 9200 AF/Y in 1980), might be delivered by releases from Casitas Reservoir to Coyote Creek, from CMWD's Ventura Avenue pumping plant to San Antonio Creek, or from the Ventura River above Foster Park and be intercepted by a new diversion at a point downstream adjacent to the oil fields. On one hand this scheme could be implemented independently from the proposed agreement because it involves no changes in operation that would alter yield or reliability; it involves only an alternative means of water delivery. On the other hand, it might be developed as a measure to mitigate impacts of the proposed action, notably reduction of flows in the Casitas Springs live stretch of the river.

Principal resistance to the scheme comes from the oil companies, which require high-quality water for secondary recovery operations. Contamination by sewage treatment plant effluent would undoubtedly be a problem. This alternative would require construction of new diversion facilities at an undetermined cost, and the need to pump water from the river would result in significant energy and operational costs.

Effect on City

- o Probably none.

Effect on CMWD

- o Open-channel delivery would result in inability of CMWD to guarantee quantity and quality of water.
- o There would probably be some additional evapotranspiration losses in transit.

Effect on Oil Companies

- o Major cost for conversion of facilities.

Effect on Surface Water

- o Would cause year-round flow of several cubic feet per second between Foster Park (or other point of release) and diversion point.
- o For concept of release above Casitas Springs live stretch water delivered by pipeline would not be suitable for aquatic biota, because it is chlorinated.

Effect on Groundwater

- o Would probably increase groundwater quality downstream from Coyote Creek.

Effect on Aquatic Biology

- o Similar to previous scheme.
- o Would result in no improvement to aquatic habitat at Casitas Springs.
- o No significant improvement for remnant steelhead run.

Effect on Terrestrial Biology

- o Regular releases might rehabilitate decadent riparian vegetation.
- o Probably insignificant.

Effect on Casitas Reservoir

- o None.

IMPROVE FOSTER PARK DIVERSION FACILITIES, PUMP TO CASITAS RESERVOIR

Pump diversion facilities at two alternative sites above Foster Park to capture overflows from Robles Dam and flows from San Antonio Creek have been investigated by the U.S. Bureau of Reclamation (1968, p. 56). Boyle Engineering (1971) recommended that a 24-inch intake drain pipe be constructed at Foster Park with a 3600-gpm pump station and 24-inch pipeline to convey the water to Lake Casitas.

Effect on City

- o Could improve yield but has not been evaluated in detail.
- o Improvement in reliability is probable, but has not been determined in this study.
- o Would include significant construction costs.
- o Pumping to Lake Casitas would incur energy and operating costs.

Effect on CMWD

- o Would increase storage in Casitas Reservoir an unknown amount.

Effect on Surface Water

- o Would eliminate some flows that now bypass Foster Park.
- o Some reduction of surface water quality downstream from Oak View Sewage Treatment Plant.
- o Minimal effects on live stretch if pumping were confined to Foster Park.

Effect on Groundwater

- o Sustained drawdown.
- o Probable decline in water quality.

Effect on Aquatic Biology

- o Reduction in aquatic habitat below Foster Park.
- o No effects on Casitas Springs live stretch.

Effect on Terrestrial Biology

- o Possible effect on riparian habitat downstream from Foster Park.

Effect on Casitas Reservoir

- o Would increase average storage an unknown amount.

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Appendix A: Trial Operation Criteria for Robles-Casitas Diversion Facilities

TRIAL OPERATION CRITERIA
FOR ROBLES CASITAS DIVERSION FACILITIES

Introduction

The Robles Diversion Dam was constructed on the Ventura River as a portion of the Ventura River Project in order to make possible the diversion of water from the Ventura River to offstream storage in Casitas Reservoir.

The Ventura River Municipal Water District, as operator of the Ventura River Project facilities, has obtained permits from the State Water Rights Board for such operation. Following is an interpretation of these permits, as prepared jointly by representatives of Ventura River Municipal Water District and Ventura County Department of Public Works, dated July 1, 1959:

INTERPRETATION OF PERMITS ISSUED TO VENTURA RIVER MUNICIPAL
WATER DISTRICT WITH RESPECT TO DIVERSION OF WATER FROM VENTURA
RIVER FOR STORAGE IN CASITAS RESERVOIR.

Water rights permits have been issued by the State Water Rights Board to the Ventura River Municipal Water District to divert water from Ventura River for off-stream storage in Casitas Reservoir for future application to beneficial use.

These permits cover unappropriated water available from the point of diversion in Ventura River, but do not have preference over the prior rights of users below the point of diversion who obtain their water from surface or underground Ventura River sources.

Holders of these prior rights are entitled to the amount of water which can reasonably be put to beneficial use on the land to which these rights are appurtenant and which would have been available under natural conditions.

In operating the diversion works on the Ventura River, it is incumbent on the Ventura River Municipal Water District to divert only that portion of the natural flow that is in excess of the amount which, when added to the inflow from downstream tributary sources, will equal the quantity of water that would have been available to satisfy the beneficial use requirements of the holders of prior vested rights in the absence of such diversions.

Following is a quotation from a letter received from the State Water Rights Board dated June 22, 1959, with regard to this interpretation:

"We have received the interpretation and consider it to be an accurate statement conforming with the policies of this Board and with the laws of this State". (Sgn.)
L. K. Hill, Executive Officer.

Prior Rights

Various studies have been made to determine the extent of the prior vested rights in the Ventura River, downstream from the Robles Diversion Dam. In 1948, Harold Conkling determined the annual water use of the overlying and riparian users to be approximately 7,100 acre feet. In 1953 this use was determined by the State Division of Water Resources to be 7,700 acre feet. Studies undertaken by the United States Bureau of Reclamation indicate that total rights of overlying riparian owners amount to 9,000 acre feet per year in those years when such water is available in the Ventura River. Of this amount, 6,600 acre feet were determined as the right of the City of Ventura at Foster Park. This is the sum of the maximum nonconsecutive monthly diversions of record. The remaining quantity, 2,400 acre feet, was determined as the total required to cover the rights of others for use on overlying lands above the Ventura City Intake.

Part of the requirements can be met by inflow between Robles Diversion Dam and Foster Park. The remaining requirement must be met by downstream releases at the Robles Diversion Dam to the extent that there is natural flow of the Ventura River available to meet the requirement.

Percolation and Storage in River Gravels

The reach of Ventura River between Robles Diversion Dam and Foster Park has a steep gradient toward the ocean, falling at the rate of approximately 75 feet per mile. The streambed is well defined and underlaid by gravelly material varying in depth from 20 to 70 feet. The percolation rate of these gravels varies greatly, as some of the gravels are well cemented and tight while others readily percolate water. Detailed information concerning percolation rates is not available. However, studies undertaken by Ventura County indicate that most of the percolation occurs in the reach of the river between Robles Diversion Dam and the Santa Ana Boulevard crossing near Oak View, and primarily in the portion of this reach above the Highway 150 crossing. Under these circumstances, the storage capacity of the river basin is limited, and only temporary retention of water percolated in these gravels can be expected.

Trial Period of Operation

In the absence of detailed information concerning the behavior of the river gravels with respect to the movement and retention of percolated

water, it has been determined jointly by the Ventura County Department of Public Works and Ventura River Municipal Water District that a trial period of operation is desirable. During this period, which has tentatively been set at 5 years, operating criteria will apply which these agencies agree should result in meeting the full entitlement of downstream users to the natural flows of the river. It is expected that these criteria will be revised from time to time as additional information is developed through additional measurements of streamflow, diversion, and well levels.

Initial Operation Criteria

Commencing with 1959-60 water year, the following criteria will govern the operation of Robles Diversion Dam:

In general, when the natural flow of the Ventura River at the Robles Diversion Dam is less than 20 c.f.s., the entire flow will be passed down river and when the natural flow is greater than 20 c.f.s., not less than 20 c.f.s. will be passed down river; provided that such release down river shall be increased or decreased under the following circumstances:

1. If the water level in the river gravels fails to rise to the extent that would be expected under natural conditions for the time of year and type of year as evidenced by periodic measurement of wells along the river, the release shall be increased to correct this condition.
2. If surface flow occurs at Santa Ana Boulevard, river releases shall be decreased appropriately.
3. If rising water above the mouth of San Antonio Creek occurs in such amounts that it is apparent that water will waste to the ocean, the river release shall be decreased so that such waste shall not occur.

Under integrated project organization, flood flows temporarily stored in Matilija will be released down river for diversion to Casitas Reservoir at the Robles Diversion Dam. Such operational releases will be deducted from the total flow at Robles in order to determine the amount of natural flow available for releases at the Robles Diversion Dam.

Appendix B: Proposed Conjunctive Use Agreement

CONJUNCTIVE USE AGREEMENT

AGREEMENT made this day of , 197_, between the City of San Buenaventura, a municipal corporation, hereinafter called the "City", and the Casitas Municipal Water District, a public agency, hereinafter called the "District".

RECITALS

1. The Ventura River System consists of the Ventura River and its tributaries, and several groundwater basins which are replenished by river flow and at times contribute to such surface flow. The principal tributaries to the Ventura River are Coyote Creek, Santa Ana Creek, Matilija Creek, North Fork of the Ventura River (also known as North Fork Matilija Creek), and San Antonio Creek. The Ventura River and its tributaries rise in the Santa Ynez and Topa Topa Mountains and adjacent foothills, and the River flows generally in a southerly direction into the Pacific Ocean and the west side of the City.

2. The City claims certain rights to the use of water from the Ventura River System, based in part upon 1923 conveyances and notices of appropriation dating back to 1870. Since 1923 the City has owned and operated its own municipal water system which has been supplied by water taken from the Ventura River System at Foster Park, from City wells, and by water purchased from the District and from others.

3. The City's Foster Park Facilities consist of a subsurface concrete dam, constructed in 1907-08, and located approximately 1,200 feet upstream from the Foster Park Bridge; temporary training dikes and intake works for the diversion of surface flows; subsurface diversion facilities and wells which have a total pumping capacity of approximately 5,040 gallons per minute and the Avenue Treatment Plant and Reservoir. All water taken by the City through its Foster Park Facilities, whether surface or subsurface flow, is delivered to a raw water reservoir at the treatment plant. Such water then goes either through the treatment plant for use in the City's domestic water system, or is delivered without treatment for certain agricultural and industrial uses. The capacity of the City's Foster Park Facilities, including the subsurface diversion facilities and wells, is approximately 14 million gallons per day (mgd). The capacity of the Avenue Treatment Plant is 10 mgd.

4. The District controls and operates Matilija Dam and Reservoir on Matilija Creek, construction of which was completed in 1948. The District also controls and operates the Ventura River Project consisting of (a) Casitas Dam and Reservoir situated upstream from Foster Park on Coyote and Santa Ana Creeks, and (b) the Robles-Casitas Diversion Facilities and Canal, which divert and transport

surface flows from the Ventura River northerly of Meiners Oaks into storage in Casitas Reservoir. Construction of this project was completed in 1958. The capacity of the Casitas Reservoir is about 254,000 acre feet. The capacity of the Robles Canal is approximately 500 cubic feet per second (cfs). The District also controls and operates a water distribution system providing both wholesale and retail water service from the supply stored in Casitas Reservoir, including deliveries to the City.

5. The District holds certain permits and licenses from the State Water Resources Control Board under which it has appropriative rights to divert and store water in these facilities. Since 1959 the District has operated the Ventura River Project pursuant to certain criteria under which essentially the first 20 cfs of flow in the Ventura River have been allowed to pass the Robles Diversion Facilities, dependent upon downstream conditions, for the benefit of downstream uses. Flows in excess of that amount, up to the capacity of the Robles Canal, have been diverted into storage in Casitas Reservoir. Storm flows in excess of the capacity of the Robles Canal have continued to flow down the Ventura River and, to the extent that they have not been diverted and used or have not replenished the groundwater basins, to the ocean.

6. In 1974 and 1975 the parties conducted certain joint studies to determine whether the total yield of the Ventura River System might be increased through the conjunctive use of groundwater and surface supplies and storage, utilizing various operating criteria. These studies indicated that it is possible to increase the system yield.

7. The parties hold conflicting views over the nature, extent and priority of their respective water rights in the Ventura River System, and it is the purpose of the Agreement, as between the parties, and in the context of the conjunctive use operation provided for herein, to settle all questions concerning such rights.

BASED UPON THE FOREGOING FACTS, AND IN CONSIDERATION OF THE MUTUAL COVENANTS OF THE PARTIES, IT IS HEREBY AGREED AS FOLLOWS:

8. District's Diversions. The District shall have the right to divert at its Robles Diversion Facilities all of the flow of the Ventura River up to the present capacity of the Robles Canal, and to store such water up to the present capacity of Casitas Reservoir for beneficial use.

9. City's Diversions. The City shall have the right to take all of the water, both surface and subsurface, which is physically available at Foster Park. This right

shall not be limited to the capacity of the City's present Foster Park Facilities, and the City is encouraged to take as much water as is physically available and can be beneficially used, and to construct additional facilities if it chooses.

10. City's Place of Use. The water taken by the City at Foster Park or provided by the District as make-up water pursuant to Paragraphs 11 and 12 may be delivered to City customers for beneficial use without respect to whether such customers are within the boundaries of the District.

11. District's Make-Up Obligation. In any calendar year, if less than \$6,000 acre feet of surface and subsurface water is physically available for taking by the City within the capacity of its Foster Park Facilities, or any replacement, improvement or enlargement thereof, the District shall make up the difference by delivery of water to the City from Casitas Reservoir. Such make-up water shall be delivered at no cost to the City and, subject to the provisions of Paragraph 12, shall be provided by pipeline delivery during the following calendar year at times and locations as requested by the City, taking into account the District's operating capability. Any make-up obligation of the District may be satisfied, with the approval of the City, by allowing the City a credit against its water purchases from the District.

12. Reservoir Supply. If at any time the surface elevation of water in Casitas Reservoir is less than 350 feet above mean sea level, delivery of water to the City under any make-up obligation, or part thereof, shall be deferred and carried over until the surface elevation of water in the Reservoir is at 420 feet above mean sea level; provided, that to the extent the District diverts flows of the Ventura River into the Robles Canal on any day during such times that the water surface elevation in the Reservoir is less than 420 feet, the District shall deliver as make-up water to the City such quantity of Ventura River water diverted that day up to one-half the quantity available at Robles, limited to a maximum of 20 cfs, minus the quantity of water diverted that day by the City through its Foster Park Facilities subject to the City's responsibility under Paragraph 13; provided further, that the City may elect at any time to have the make-up obligation satisfied by a credit against its water purchases from the District.

13. Maintenance and Utilization of City Facilities. The City shall be responsible for maintenance of its Foster Park Facilities and its water diversion and production capabilities at Foster Park, and shall utilize them to their full capacity as required to take a minimum of 6,000 acre feet of physically available surface and subsurface water each calendar year.

Should the City fail to take such physically available water at Foster Park, such failure shall not contribute to or result in any make-up obligation of the District. Any water, however, which may be released from Casitas Reservoir for other than City use, and is not permitted to be taken by the City, shall not be deemed to be water physically available to the City.

14. Records.

(a) The City shall maintain records of the following information and shall submit the information to the District monthly:

(1) The total amount of water diverted daily at the Foster Park Facilities.

(2) The total amount of surface flow diverted daily at the Foster Park Facilities.

(3) Quantities diverted daily through the raw water bypass for the City's customers who do not require treated water.

(4) Total daily inflow to the Avenue Treatment Plant Facilities.

(5) Total daily outflow from the Avenue Treatment Plant Facilities.

(6) Weekly readings of the depth to the water level in each of the wells which are a part of the Foster Park Facilities.

(7) The total number of pumping hours of each well pump unit at the Foster Park Facilities on a monthly basis.

(8) Amounts of water produced daily by the City from its various sources.

(b) The official records published by the U.S. Geological Survey for its "Ventura River Near Ventura" gaging station less the surface flow measured at USGS gaging station on Coyote Creek shall be used to determine the total amount of water which bypassed the Foster Park Facilities. The District shall be responsible for verification that these gaging stations are functioning and shall furnish copies of such records to the City.

(c) In the event that any condition arises which may prevent the City from fulfilling its obligations as set forth in Paragraph 13 or which might contribute to or result in a make-up obligation of the District, the City shall notify the District of such condition as soon as practicable following its occurrence. Such conditions shall include, but not be limited to, mechanical failure of any of the components of the Foster Park Facilities, breaking of suction of one or more of the well pump units, and turbidity problems.

15. Purchases from District. Nothing in this Agreement shall affect the right of the City to purchase water from the District pursuant to applicable provisions of law, and the established rules, regulations and rates of the District.

16. Water Rights. As between the parties, this Agreement shall be in full settlement of all of their respective water rights or claims thereto, of whatever nature, to the waters of the Ventura River System. Should this Agreement be terminated for any reason, however, any water taken and used pursuant to the terms hereof shall not establish any rights in such party, or be used as a basis for laches, estoppel or loss of rights against the other party.

Appendix C: Aquatic Biology

Appendix C

AQUATIC BIOLOGY

- Extent of Biological Investigation
- The Ventura River Steelhead Run
- Estimate of the Present and Potential Steelhead Production in the Ventura River and Tributaries
- Comparison of Probable Steelhead Migration and Spawning in the Ventura River, 1958-1965, with and Without the Project
- Ventura River Warmwater Fishes
- Food Habits of Rainbow Trout from the Ventura River
- The Benthos of the Ventura River and San Antonio Creek, December 1976
- Fishes and Other Aquatic Animals of the Ventura River System
- Riparian and Aquatic Vegetation of the Ventura River System

Appendix C
AQUATIC BIOLOGY

EXTENT OF BIOLOGICAL INVESTIGATION

Field investigations were conducted during the winter of 1976-77 by aquatic biologists D. W. Kelley and W. Tippetts, assisted at various times and places by Mark Moore; Friends of the Ventura River; L. B. Boydston, Marine Biologist, Anadromous Fish Branch, California Department of Fish and Game; Shoken Sasaki, District Biologist, California Department of Fish and Game; Thor Willsrud, Professor of Biology, Ventura College; Linda Hagen, and other students from the college. Benthic fauna were collected with a Surber Sampler, counted, and identified in the laboratory by Hydrozoology, Inc., of Newcastle, California. They retain a reference collection. Fish were sampled with a Mark VII Smith Root Electrofisher. Algae were identified by Professor Norma Lang, University of California, Davis, and William Tippetts. Dr. Arlo Fast, Biologist provided much of the information about Casitas Reservoir.

THE VENTURA RIVER STEELHEAD RUN

Prior to 1947, the Ventura River supported a steelhead run. Migration of adult steelhead to the spawning grounds in the headwaters is now blocked by those dams. Changes in downstream flow may also have limited their ability to migrate.

The Ventura County Fish and Game Commission has written an interesting and useful history of the steelhead runs (1973).

The California Department of Fish and Game still classifies the Ventura River as a steelhead stream and regulates fishing accordingly. Occasionally, a few adult steelhead are still caught during winter periods of high flow. The Friends of the Ventura River have collected a series of photographs and clippings as evidence of this.

No adult steelhead were observed in the Ventura River during the course of the field observations in the winter of 1976-77. It is possible that outflows were too brief for any upstream migration.

To verify the presence of a population of native steelhead, it was necessary to determine whether any of the young trout taken from the river in the course of the field investigation were anadromous steelhead. It is difficult to distinguish young steelhead from young resident trout by simple visual examination. They are the same species, and the genetic differences that determine whether they will or will not migrate to the ocean as steelhead are not visible. Even the planted steelhead collected were indistinguishable from the unmarked fish except for their clipped fins.

Young steelhead may be distinguished, however, from young rainbow trout on the basis of the steelhead's migratory behavior and on the basis of a subtle anatomical difference. The size of the inner ear bone, or otolith, of the steelhead is larger than the resident rainbow trout.

Therefore, migratory behavior and otolith size were studied to determine if the unmarked trout were resident rainbow or steelhead.

Out-migration of Young Trout

Estimates of population were made to determine whether there was any out-migration of young trout to the ocean. Two estimates were necessary: one before and one after at least one rainstorm had created a surface flow all the way to the ocean in which the young fish could have migrated if they were steelhead.

On December 12, a 316-foot reach of the river that included a long pool and a short riffle was blocked off with a net and sampled with electrofishing gear (Plate C-1). The 50 trout captured on the first pass through the reach with this gear were removed and held in a cage. A second pass yielded 24 trout.

These data and those from subsequent sampling in this and other reaches have been used in Table C-1 to estimate the trout populations of the river near Casitas Springs. The sampling sites are shown in Figure C-1. Between mid-December and mid-February, the estimated trout population at Casitas Springs declined by about 75 percent.

Extensive sampling in all parts of the river believed to be suitable trout habitat indicated that the fish were not in the river. Angling was prohibited in this reach during this period and the limited poaching possible here could not account for the reduced number of fish. Either they had suffered extremely high mortality during this period when



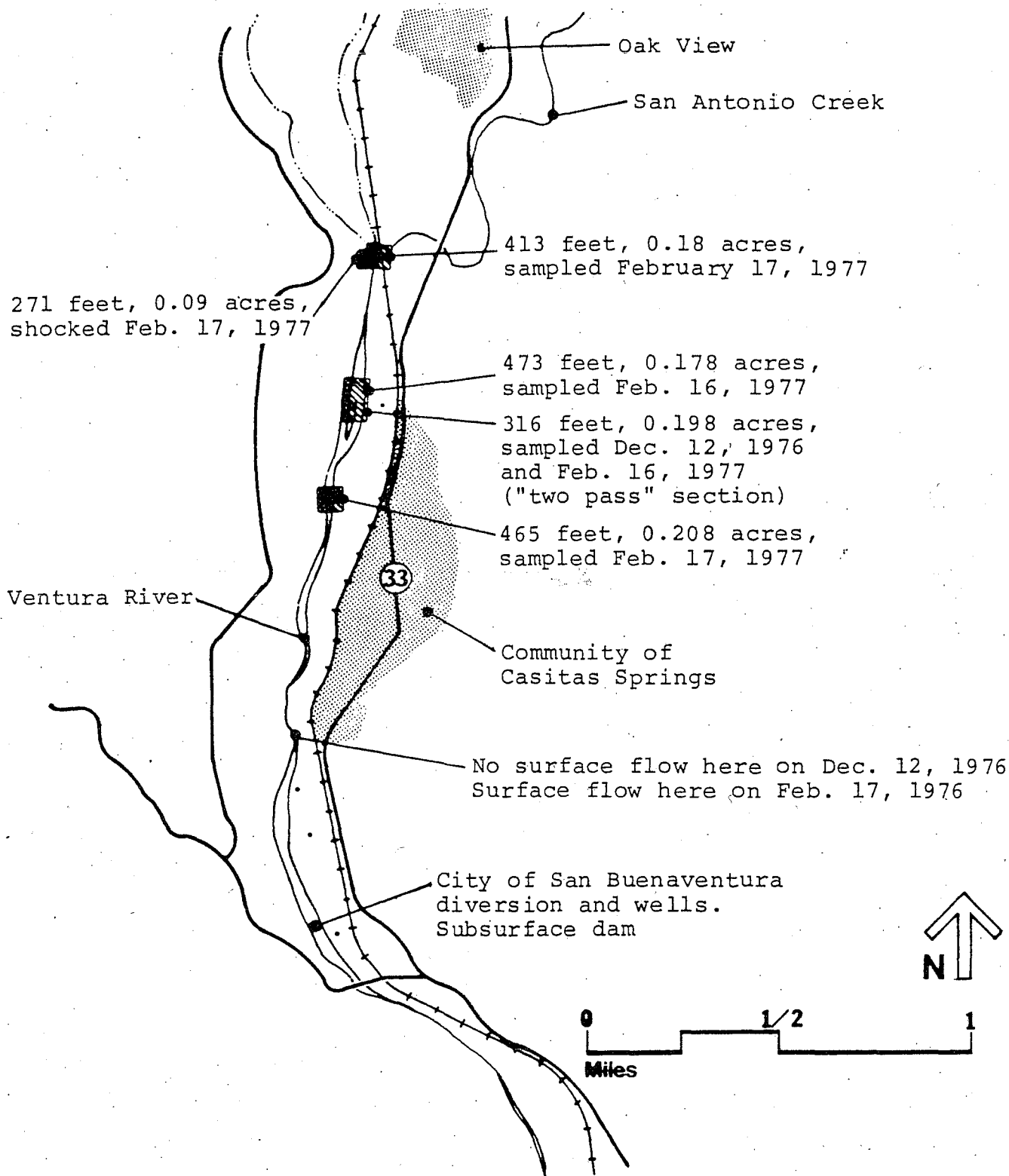
Plate C-1 Electrofishing in the Ventura
River at Casitas Springs,
December 12, 1976

The population is composed of young steelhead stocked June 30, 1976, young steelhead from natural spawning during the winter of 1975-1976, wild resident rainbow trout, arroyo chubs, stickleback, and a few mosquitofish and green sunfish.

Table C-1. DENSITIES OF TROUT AND/OR STEELHEAD IN THE VENTURA RIVER
NEAR CASITAS SPRINGS, WINTER 1976-77

| Section Censused | | | | Number of Trout Collected by Electrofishing | | | Estimated Number of Trout Per Acre* | |
|------------------|--|------------------|-----------------|--|----------|----------|--|----------|
| Date | Location | Length (feet) | Area (acres) | 1st pass | 2nd pass | 3rd pass | Mean | Interval |
| 12/12 | A. Just above trailer park | 316 | 0.198 | 50 | 24 | - | 511 | 303-616 |
| 2/16-17 | Just above trailer park | 316 | 0.198 | 12 | 8 | 2 | 131 | 116-146 |
| | B. Just below trailer park | 465 | 0.208 | 11 | - | - | 101 | 34-168 |
| | C. Long riffle above Section A | 473 | 0.178 | 14 | - | - | 152 | 56-247 |
| | D. Right branch just below San Antonio Creek | 271 | 0.090 | 9 | - | - | 188 | 56-311 |
| | E. Left branch just below San Antonio Creek | 413 | 0.180 | 20 | - | - | 211 | 89-333 |

*Estimates were calculated using the formulas of Serber and LeCren (1967) and of Everhart et al. (1975).
They have a 95 percent probability of being within the given range.



Casitas Springs Fish Sampling

Map locations and dates of fish sampling in
the Casitas Springs section of the Ventura River.

environmental conditions were improving, or they had migrated out to sea. A 75 percent mortality of such large, obviously healthy trout (especially during a period when food was plentiful and habitat was improving because of increasing water flows) is not likely. It is more likely that the fish had migrated out to sea.

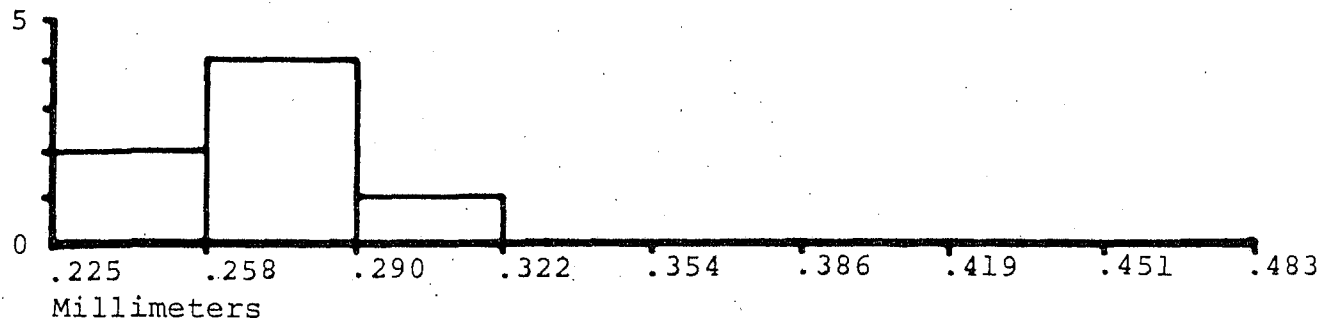
Otolith Measurements

Measurement of the nuclei of trout otoliths, or inner ear bones, is a recently developed method of distinguishing young steelhead from young rainbow trout. The size of trout otolith nuclei is a sensitive anatomical indicator of subtle differences between races of rainbow trout. The microscopic examination of the fishes' otoliths to help determine if they were steelhead or resident rainbow trout was suggested by L. B. Boydstun, a marine biologist with the California Department of Fish and Game.

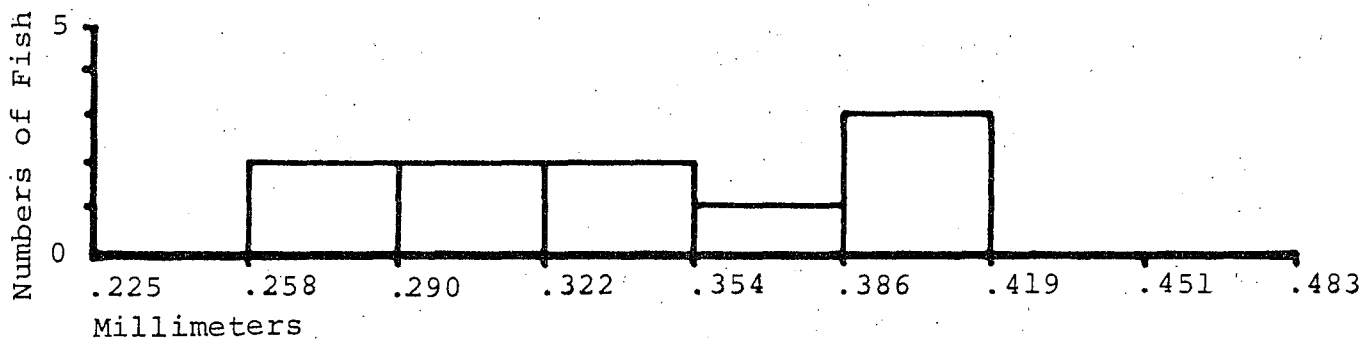
Using this method, Oregon scientists have distinguished wild from hatchery fish and winter from summer spawning races (McKern et al., 1974). The method has also been used in Oregon to separate juvenile rainbow trout from juvenile steelhead (Rybock et al., 1975). Because steelhead eggs are larger, the otolith nucleus is also larger.

Otoliths were collected from marked steelhead and unmarked trout at Casitas Springs and from unmarked trout captured above Robles Dam. When measured under the microscope the widths of otolith nuclei taken from rainbow trout collected above Robles Dam were substantially smaller than those taken from marked steelhead planted in Casitas Springs (Figure C-2, a and c).

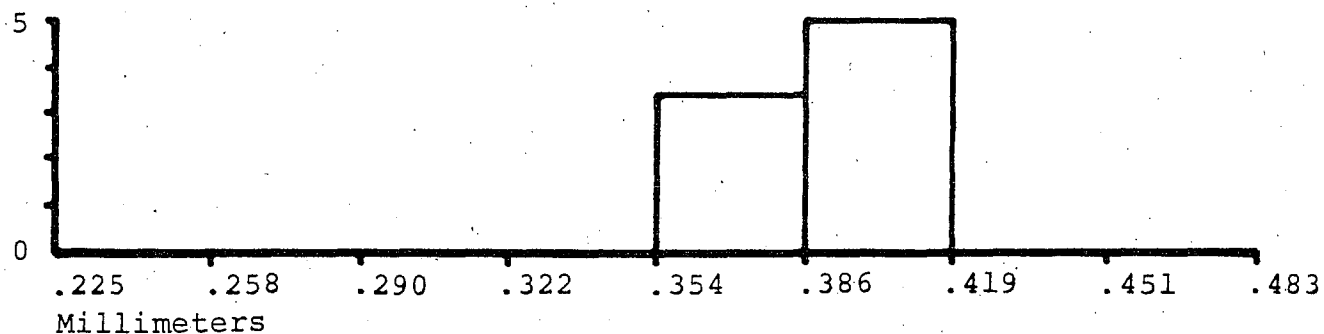
(a) Rainbow Trout From Above Robles Dam



(b) Unmarked (wild) Trout From Above Casitas Springs



(c) Marked Steelhead Trout From Casitas Springs



Otolith Nuclei Width (mm)

Frequency Distribution of Otolith Nuclei Widths From Trout of the Ventura River - Captured February 16 & 17, 1977.

The widths of otolith nuclei in the Casitas Springs unmarked trout fell into both resident rainbow and steelhead categories. This suggests that the Casitas Springs trout population is a mixture of resident rainbow trout and steelhead. The widths of otolith nuclei of trout from above Robles Dam were within the range of those collected from resident trout in Oregon and measured by Rybock. Those of planted steelhead from Casitas Springs were similar to those of steelhead measured by both McKern and Rybock.

Evidence of a Wild Steelhead Population

There are three kinds of evidence that a small wild steelhead run still exists in the Ventura River.

1. The California Department of Fish and Game reported large runs of steelhead in the Ventura River until 1946, and a few are still caught during or after periods of high runoff in most years.
2. Populations of both planted marked steelhead and unmarked wild trout declined by about 75 percent between December 12, 1976, and February 17, 1977, when fishes of both groups were large enough to move downstream and enter salt water. The second sampling followed a rain-storm that would have made migration possible.
3. Otolith examination indicates that even after what was probably extensive smolting, about half the unmarked trout were steelhead produced by natural spawning during the winter of 1975-76.

The present steelhead run in the Ventura River probably averages around 100 adult fish. The derivation of this estimate is presented in the following section.

ESTIMATE OF THE PRESENT AND POTENTIAL STEELHEAD PRODUCTION IN THE VENTURA RIVER AND TRIBUTARIES

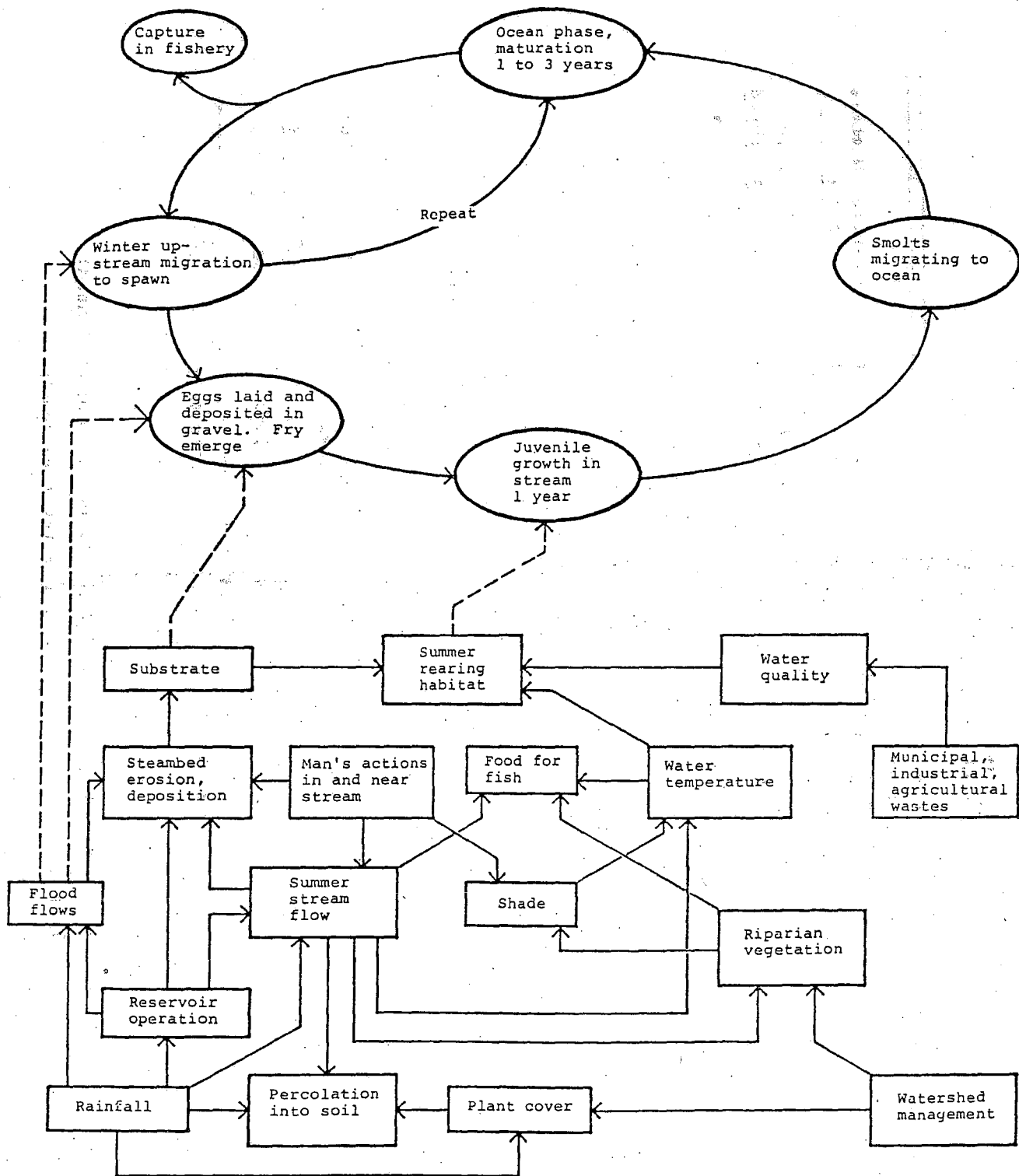
Factors Limiting Steelhead Numbers

While many factors influence the size of the Ventura River wild steelhead population (Figure C-3), the major determinant is the quantity and quality of the summer juvenile rearing habitat. Field surveys of the Ventura River and tributaries during the 1976-77 winter, coupled with a review of flow records for the river, led to the conclusion that juvenile steelhead are now reared only in the reach of rising water of the Ventura River and lower San Antonio Creek near Casitas Springs. Several other areas could rear steelhead with changes in water quality or streamflow.

Assessment of Rearing Habitat

Measurements and qualitative judgments were made of the rearing habitat in each section of the river that is believed to support juvenile trout or steelhead, or that could support them with improvements in water quality. The assessment considered substrate composition and stream bed morphology, summer flow, water temperature and water quality, riparian growth, and measurements of food abundance.

These measurements and judgments were then used to rate each section listed in Table C-2 as inadequate, poor, fair, good, or excellent trout or steelhead rearing habitat. Because



Factors Influencing the Steelhead Population

Conceptual model of the factors influencing the steelhead population in the Ventura River.

Table C-2. HABITAT QUALITY, PRESENT AND POTENTIAL NUMBERS OF TROUT IN VENTURA RIVER

| Location | Flow (cfs) | Length (miles) | Surface Area (acres) and Distribution by Habitat Quality (acres) | | | | Present Numbers of Trout (Dec.) | | Potential Numbers of Trout | |
|--|---------------|-------------------|--|-------------------|-------------------|-------------------|--|--|-------------------------------|--------------------------------|
| | | | Total Area | Poor ¹ | Fair ¹ | Good ¹ | Total | All Steelhead ² | Trout | Wild Steelhead ³ |
| A. Lagoon to Shell Road | 6.2 | 2.5 | 6.6 | 3.5 | 2.6 | 0.5 | | | 2,675 | 2,354 |
| B. Shell Road to Oak View Sewage Treatment Plant | 6.2 | 2.0 | 5.3 | 2.3 | 2.1 | 0.9 | Sections A and B need improved shade and water quality | | 2,525 | 2,222 |
| C. Casitas Springs | 4.4 | 1.2 | 2.8 | 0.0 | 1.5 | 1.3 | 2,050 | 1,927 | 2,050 | 1,804 |
| D. Lower San Antonio Creek | 0.5 | 1.1 | 1.2 | 0.3 | 0.6 | 0.3 | 675 | 634 | 675 | 594 |
| E. Robles Dam to Matilija Creek | 4.5 | 1.2 | 2.1 | 0.3 | 1.4 | 0.4 | 1,175 | Sec. E, F, G need ladder and transport flows | 1,175 | 1,034 |
| F. Matilija Creek | 3.0 | 0.7 | 1.9 | 0.0 | 1.4 | 0.5 | 1,200 | | 1,200 | 1,056 |
| G. North Fork | 1.5 | 3.5 | 3.6 | 0.2 | 3.1 | 0.3 | <u>1,900</u> | | <u>1,900</u> | <u>1,672</u> |
| Total: | | | | | | | 7,000 | 2,561 | 12,200 | 10,786 |

Note: Data taken during periods of low flow, December 1976 and February 1977; potential numbers of trout are those that could be reared if water quality and flow were improved.

¹Poor = 250 trout/acre; Fair = 500 trout/acre; Good = 1000 trout/acre.

²Calculated as 94 percent of the December total trout abundance (includes planted steelhead).

³Calculated as 88 percent of the total trout abundance (excludes planted steelhead).

the sections were long and of diverse character, each was partitioned into smaller reaches and each reach was rated separately.

The streamflows at which these sections were rated are listed in Table C-2 and are similar to summer streamflows during a "normal" year. The measured area then was probably similar in size and quality to the summer rearing area during an average water year.

Estimated Numbers of Juvenile Steelhead

How many young steelhead can be reared per acre of suitable rearing habitat? Rearing capacities of streams and of habitats within streams vary greatly. The best estimate can be based on what actually was reared in a section of average or "fair" habitat at Casitas Springs in 1976-77.

In December, before any high flows that might have caused a migration to the sea, the total trout population in this section was 511 trout per acre. This population was made up of planted and marked steelhead, wild steelhead, and wild resident rainbow. It is estimated that 94 percent of these were steelhead.

This estimate is made in the following way:

1. In December, 49 percent (or 250 trout per acre) at Casitas Springs were unmarked. They were either naturally produced steelhead or resident rainbow.
2. In February the population of unmarked trout had declined to 63 per acre, 50 percent (or 31) of which were resident rainbow, as determined by otolith examination.

3. Since there is no reason to believe these resident rainbow would have left the stream between the two estimates, the December population of resident trout would have been the same, i.e., 31 per acre.
4. Therefore, the total locally spawned steelhead population before migration to the sea can be estimated as:

| | | | | |
|--|---|------------------------|---|-------------------------------------|
| 250 unmarked trout per acre in December | - | 31 resident rainbow | = | 219 locally spawned steelhead |
|--|---|------------------------|---|-------------------------------------|

5. The total steelhead reared can be estimated as:

| | | | | |
|--|---|---|---|---|
| 219 per acre from local spawning | + | 261 per acre from planted steelhead | = | 480 per acre total steelhead reared to smolt size |
|--|---|---|---|---|

6. $480 \div 511$ total trout = 94 percent.

Better habitat was sampled in February closer to the mouth of San Antonio Creek; there the February total trout population was estimated at 211 fish per acre. Using the December-to-February population ratio of 3.9:1 found in the "fair" habitat, the December population in this "fair to good" habitat is roughly estimated at 211×3.9 , or 823 trout per acre.

On the basis of these estimates, it is reasonable to estimate that "good" habitat in the Ventura River can rear about 1000 smolt-size steelhead or small trout per acre and that "fair" habitat can support about 500. No measures of trout populations in "poor" habitat were made, but it is reasonable to assume a figure of 250 trout per acre there.

In Table C-2 these estimated production capacities have been multiplied by the total area of poor, fair, and good rearing habitats measured on the stream. Based upon the previous calculations that 94 percent of the young trout found in December are steelhead, it is estimated in Table C-2 that probably between 2500 and 2600 steelhead smolts were reared in the reach of rising water at Casitas Springs and in lower San Antonio Creek. This estimate includes the planted fish. The planted fish grew from a mean 1.9 to 5.8 inches competing with all others for food, space, and any other factors that limit the carrying capacity of the river. As long as adults can migrate and spawn at Casitas Springs, the planted fish would not add significantly to the total production of trout in this section.

It is, however, reasonable to believe that the stocking did increase the proportion of steelhead to resident rainbow. To estimate the numbers of wild steelhead that could be reared in the various reaches of the river and tributaries, the estimates of total trout have been multiplied by 88 percent, the previous estimate of the fraction of all naturally reproduced trout that were naturally produced steelhead. Elimination of the stocked fish from the estimate does not reduce the estimate of the total number of trout at Casitas Springs, but it does slightly reduce the estimate of the numbers of steelhead that could be reared there.

The predictions in Table C-2 that various numbers of steelhead smolts could be reared in the 4.5 miles of the Ventura River between the ocean and the Oak View Sewage Treatment Plant, and in the 5.4 miles of the river above Robles Dam, in Matilija Creek below Matilija Reservoir, and in the North Fork of Matilija Creek, permit the assessment of the maximum

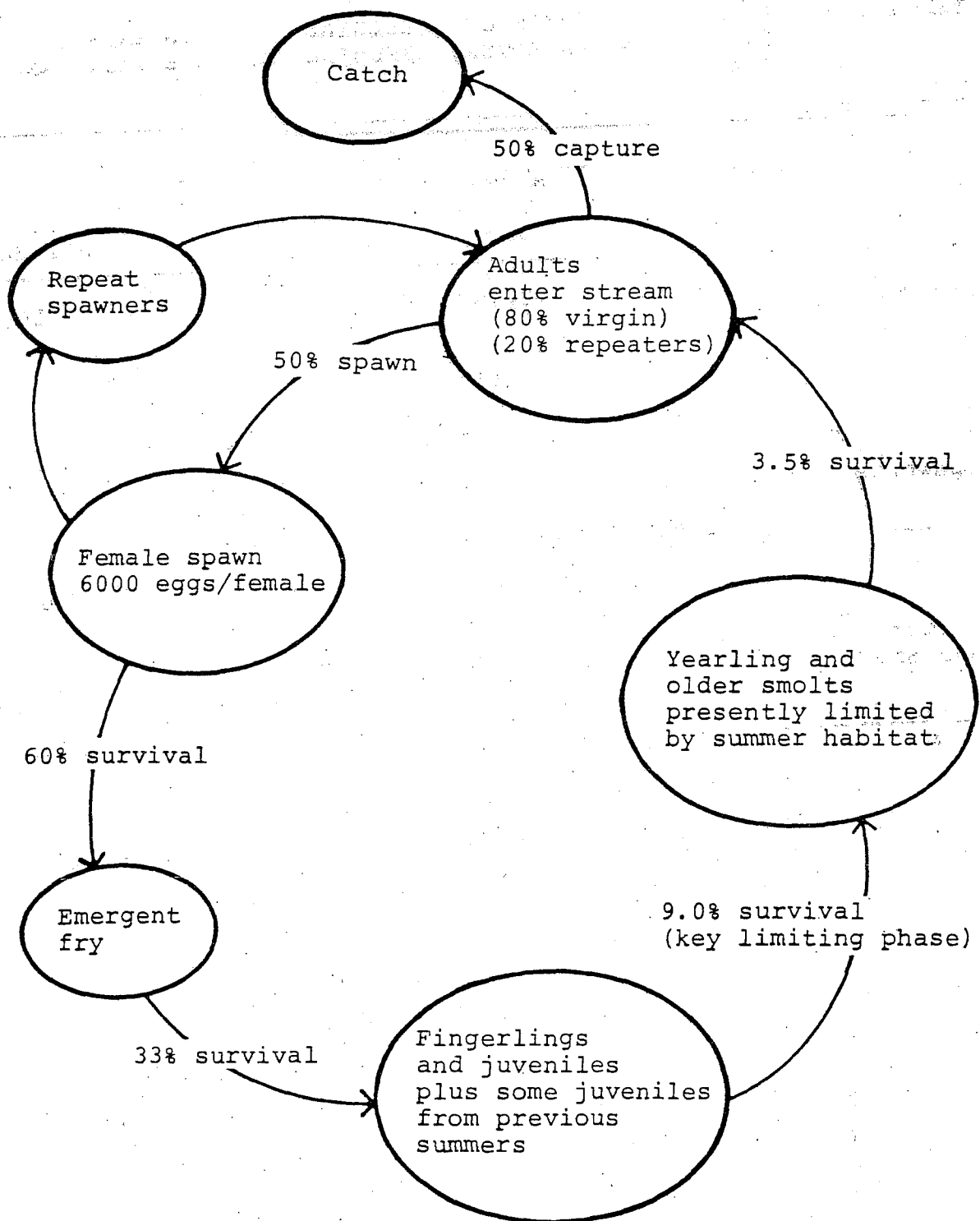
steelhead run that could be produced in the Ventura River if environmental changes advocated by Friends of the Ventura River were ever made. Assessment of the effort and cost needed to make those potentials real are not a part of this investigation.

Estimates of the Present and Potential Steelhead Run

Calculations of the size of the steelhead population for each life stage can be derived by using the life history model (Figure C-4).

The estimates of survival rates in this model were obtained from the available scientific literature reporting on measurements made elsewhere. In Table C-3, the estimated potential production of wild steelhead smolts (from Table C-2) has been combined with the model to provide rough estimates of the probable size of natural steelhead runs that now exist or could be created in the Ventura River under several sets of conditions.

1. Existing outflows to the sea and the rearing area of rising water near Casitas Springs will support an annual steelhead run averaging about one hundred adults.
2. If sufficient flows were provided below Robles Dam to permit migration of steelhead to that point, and if some means of passage were provided over or around the dam, there is sufficient spawning and rearing area above there to increase the run by an additional 160 adults.



Steelhead Life History

Model of the predicted steelhead life history in the Ventura River.

Table C-3. PROJECTED NUMBERS OF STEELHEAD TROUT IN EACH LIFE STAGE IN THE VENTURA RIVER, ASSUMING ADEQUATE FLOWS AND WATER QUALITY

| Projected Number | Reach | | | Total of All Habitat |
|---------------------------------|-----------------|------------------|---------------------------------------|----------------------|
| | Casitas Springs | Above Robles Dam | Below Oak View Sewage Treatment Plant | |
| Smolts | 2,398 | 3,762 | 4,576 | 10,736 |
| Returning Adults | 101 | 158 | 190 | 449 |
| Catch | 51 | 79 | 95 | 225 |
| Spawners | 51 | 79 | 95 | 224 |
| Females | 25 | 39 | 47 | 111 |
| Fry | 90,000 | 140,400 | 169,200 | 399,600 |
| Fingerlings and Small Juveniles | 29,700 | 46,332 | 55,836 | 131,868 |

3. If water quality were improved from the Oak View Sewage Treatment Plant to the ocean, either by extensive treatment of the waste discharge or adequate dilution, and if riparian vegetation were permitted to grow densely enough so the stream would be well shaded throughout its length, an additional 190 or so adults could probably be added to the Ventura River steelhead run. "Probably" is stressed in this case because it is not certain whether summer water temperatures would remain cool enough throughout this reach to provide suitable rearing habitat even if the river were densely shaded.

These calculations provide a rough estimate that the total potential for restoring naturally reproducing steelhead runs in the Ventura River amounts to somewhere between 400 and 500 adult steelhead in an average year.

COMPARISON OF PROBABLE STEELHEAD MIGRATION AND SPAWNING IN THE VENTURA RIVER, 1958-1965, WITH AND WITHOUT THE PROJECT

Conditions in the Ventura River are far from perfect for steelhead. In some years the winter freshets on which adults and young migrate from the sea are meager, and in some dry falls and winters the surface flow in the principal rearing area near Casitas Springs drops very low and sometimes even ceases.

The following discussion is an account of how steelhead migration and rearing of young would have been possible or why it would not have been possible from 1958 through 1965, the only years for which there is a large series of streamflow measurements made in the key rearing area (Appendix D). It

also discusses how the proposed Conjunctive Use Agreement would have affected these possibilities had it been in operation without measures to mitigate damages.

The account is based on the following:

1. Ventura County Flood Control District streamflow measurements at Casitas Springs (Appendix D).
2. Knowledge of steelhead life histories and environmental requirements at different times of the year and knowledge of the Ventura River gained during these investigations.
3. U.S. Geological Survey streamflow measurements at gage 11-1185 below Coyote Creek (Appendix D).
4. Conclusions of investigators from Earth Sciences Associates that the proposed project would reduce the flow in both places by about 2 cfs.

This approximate rule of thumb applies to a particular observation point on the Ventura River 250 feet downstream from the mouth of San Antonio Creek. Subsequent observations in late 1977 also in Appendix D show that some live flow continues further downstream even when flow stops at this observation point. Hence, some marginal rearing habitat would probably remain in the river when the predicted flow is zero. Hence, the following analysis is probably on the conservative side with respect to rearing habitat.

In January and February 1959 there were four freshets large enough to break the sandbar across the mouth of the lagoon and to attract and encourage adult steelhead waiting in the ocean to begin their upstream migration. With each freshet,

streamflows rose quickly to several hundred cubic feet per second and dropped within a few days to a base flow of about 4 cfs. Adults could have migrated up to the live stretch of water near Casitas Springs during, and for about a week after, each of those freshets.

Base flow in the spawning area at Casitas Springs was between 5 and 6 cfs during this period. The freshets and this base flow would have provided the few spawning sites required by this small run. Steelhead usually spawn quickly and migrate back to the sea. The streamflows were adequate for this purpose much of the time until late March.

Steelhead eggs, buried by the adults in the streambed gravel near Casitas Springs, would have been continuously bathed by the clear, cold water flowing at about 6 cfs until they hatched in February or March 1959. Upon hatching, they would have wiggled up through the crevices in the gravel to begin residence there as young fish.

Streamflow in the most important rearing area was 4 to 6 cfs until late September 1959. It then dropped gradually to a low of about 1 cfs in late November and began to increase in late December. Field investigations indicate that at 4 cfs there is abundant food (a great diversity of aquatic insects) and adequate shelter in approximately 4 acres of rearing area and that food and shelter decline rapidly as flows drop. The ability of this rearing area to support young steelhead declined during October and November.

On February 1 and 2, 1960, a freshet occurred that would have stimulated the surviving young steelhead to migrate downstream. Another occurred late in April. The February freshet was very brief, and the flow declined to less than 1

cfs by February 3. If some of the young steelhead migrated downstream on this freshet they may well have been stranded in lower parts of the river, where water quality was unsuitable, once flows dropped. The freshet in late April was followed by sustained streamflows above 5 cfs for about a week and probably provided a better opportunity for the young steelhead to reach the ocean safely.

The number of young steelhead that actually reached the sea was probably only fair in 1958-59.

The proposed agreement would have caused a reduction of 2 cfs from the low base flows of 4 cfs between freshets. These reduced flows would, however, have required adult steelhead to move very quickly up into the Casitas Springs area to avoid the difficulties of swimming upstream over numerous wide riffles when flows dropped to 1.5 cfs. It is reasonable to assume that some of the upstream-migrating adults would have been discouraged and returned to the sea without spawning, that some would have been captured by predators (primarily birds and poachers), but that some would have reached their spawning grounds successfully.

The streamflow at Casitas Springs would have been reduced by about one-third. Conditions for spawning and egg incubation in most of the steelhead habitat would have certainly been less favorable than without the project. Even so, some of the eggs would probably have hatched and the young would have lived until the surface flows ceased in early November 1959. At that time the young steelhead would have retreated to standing pools or crowded up into lower San Antonio Creek. Only a few, and often none, can survive in standing pools for more than a week or so. Many of the aquatic insects that the fish feed on die for lack of current veloc-

ities. And instead of waiting in an established territory for drifting food, young fish must, under these conditions, forage for the remaining invertebrates in open, shallow, quiet water. Had the agreement been in effect, all of the young steelhead from the 1959 spawning would probably have died of starvation or predation by birds and snakes in November and December 1959.

The three small, brief freshets that occurred during the winter of 1959-60, combined with the extremely low permanent flows following those freshets, make it unlikely that any steelhead would have successfully migrated up to their spawning and rearing area that year, with or without the proposed agreement.

Water year 1960-61 was even worse for upstream-migrating steelhead than 1959-60. Only one freshet occurred, early in November 1960. It lasted only two days before streamflow dropped to less than 2 cfs. It is unlikely that any migration of adult steelhead occurred that year. Streamflows in the spawning area near Casitas Springs were less than 1 cfs in November and December; and it is hardly possible that spawning there would have been successful, even if a few fish had been able to reach their spawning grounds. The proposed agreement would have had no effect on steelhead migration or spawning in 1960-61.

A very large storm and flood occurred in February 1962, and Ventura River streamflows remained relatively high until mid-March. The adult steelhead would have successfully migrated and spawned. Surface flows in the rearing area at Casitas Springs remained unusually high throughout the following summer, fall, and winter; and survival of the young steelhead would probably have been excellent. These

young fish would have migrated downstream on a freshet that occurred in mid-February 1963 and on a smaller one in March. Conditions for downstream migration were good, and several thousand young steelhead probably entered the ocean.

The proposed agreement would have had no effect on upstream or downstream migration of adult steelhead. It would, however, have reduced surface flows in the rearing area by about 50 percent in November and December 1961. It would have lowered them to about 1.5 cfs in January 1962 and to less than 1 cfs in early February, before the opportunity for out-migration came with the freshet. That reduction in streamflow would probably have reduced the number of young steelhead surviving to migrate downstream to the sea to half, or less, of the number that would have survived without the project. The problem, of course, is that current velocities (so important to the maintenance of aquatic insects, the transport of fish food, and the maintenance of fish territories) drop much more rapidly than the volume of flow itself.

The two freshets in mid-February and mid-March 1963 would have encouraged and permitted successful steelhead migration to the spawning grounds; once there, the adults would have found streamflows quite suitable for spawning, egg incubation, and rearing. In November and December 1963, when the surface flow at Casitas Springs declined to about 1.5 cfs, the young fish would have been crowded and survival would have been only fair. Most of the survivors would have probably taken advantage of a freshet in mid-November 1963 to migrate out to sea. That freshet was not well sustained, and some young may have been stranded.

The reduction of streamflows in the lower Ventura River by about 2 cfs, if the proposed agreement were in effect, would have required the upstream-migrating steelhead to accomplish their migration more swiftly; but it is quite possible that they would have done so.

A similar reduction of streamflow in the rearing area would have reduced current velocities and the quantity and quality of rearing habitat. From late October through December 1963 the surface flow would have ceased completely. A very few of the young fish may have survived in standing pools, some would have crowded into lower San Antonio Creek, but most would have died.

There were only two freshets during the winter of 1963-64. The one in mid-November 1963 was probably too early to expect steelhead migrations, and the one in January 1964 was simply too small. Implementation of the proposed agreement would have had no effect on these conditions.

A very brief freshet occurred in mid-December 1964 and a much larger and more sustained one early in April 1965. It is unlikely that steelhead would have migrated up to the spawning ground on the December freshet. In any case, the Ventura County streamflow records suggest that the surface flow at Casitas Springs was probably still zero at that time.

Conditions were much better for both upstream migration and spawning in April. Streamflows in the spawning and rearing area were good until September 1965, but surface flow ceased briefly in early November and some young steelhead would have been lost. In mid-November a large and sustained storm occurred and streamflows were unusually high throughout the

rest of the winter. Survival and successful out-migration of the young spawned in April 1965 probably would have been only fair.

Implementation of the proposed agreement would not have interfered with upstream or downstream migration of adults, but it would have eliminated surface flows in the rearing area from about mid-September until the storm in mid-November 1965. Only a very few young steelhead would have survived.

Conclusions

Table C-4 is a summary of the foregoing assessments. Although conditions for steelhead in the Ventura River are rarely good, a remnant run has survived. Steelhead are opportunistic fish, and the populations can survive an occasional year or two when reproduction is impossible. A run cannot survive, however, when migration, spawning, or rearing is impossible in most years.

Unless there were adequate mitigation measures, implementation of the proposed agreement would be a serious risk to the survival of the remnant steelhead run in the Ventura River. There are two problems. The first, and most serious, is that without mitigation measures, most of the rearing area would cease to have a surface flow for long periods of time during fall and winter of many, perhaps most, years. The numbers of young fish that survive in such years would probably decline from a few thousand to a few hundred. Such would have been the case in all but one of the seven years assessed for this study (1958-1965). Even in good years the survival rates of young steelhead would be reduced by half or more. It is unlikely that the Ventura River steelhead run would survive under these conditions.

Table C-4. CONDITIONS FOR MIGRATION AND REARING OF STEELHEAD IN THE VENTURA RIVER, 1958-1965, WITH AND WITHOUT THE PROPOSED AGREEMENT

| Year | Adult Migration to Spawning Grounds | | Spawning and Rearing Conditions | | Downstream Migration of Young the Following Winter | | Success of Reproduction in Terms of Steelhead Smolts Reaching the Ocean | | Total Runoff (AF) * |
|---------|-------------------------------------|-----------|---------------------------------|-----------|--|-----------|---|------|---------------------|
| | Without | With | Without | With | Without | With | Without | With | |
| 1958-59 | fair | poor | fair | very poor | fair | poor | fair | none | 5,960 |
| 1959-60 | unlikely | unlikely | poor | very poor | poor | very poor | none | none | 1,370 |
| 1960-61 | unlikely | unlikely | very poor | very poor | excellent | excellent | none | none | 209 |
| 1961-62 | excellent | excellent | excellent | poor | good | good | excellent | fair | 59,100 |
| 1962-63 | good | fair | fair | very poor | poor | very poor | fair-poor | none | 2,600 |
| 1963-64 | unlikely | unlikely | poor | very poor | good | good | none | none | 222 |
| 1964-65 | good | good | fair | very poor | excellent | excellent | fair | none | 1,800 |

*Compare with average discharge of 40,350 AF/Y. Measured at USGS Gaging Station 1185 (see Table D-2).

The second problem is that the terms of the proposed agreement would reduce base flows between freshets by about 2 cfs; in some years this would increase the risks that adult steelhead would not migrate up to the rearing area, find spawning sites, build nests, spawn, and return to sea. In the following year the downstream-migrating young may be trapped in unsuitable areas as flows fall or may be unable to survive because of poor water quality. In three out of the seven years assessed, implementation of the proposed agreement probably would have impaired migration and subsequent survival of steelhead.

VENTURA RIVER WARMWATER FISHES

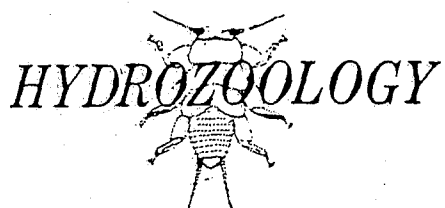
Fish collections made throughout the Ventura River and tributaries yielded, in addition to rainbow and steelhead trout, four warmwater species: arroyo chub, threespine stickleback, mosquitofish, and green sunfish. The trout and stickleback are native to the river; the arroyo chub is probably a long-established, introduced native California species; and the mosquitofish and green sunfish are more recent introductions.

The threespine stickleback/steelhead/arroyo chub assemblage is typical of coastal streams of the Los Angeles Basin (Moyle, 1976). Arroyo chubs of the Ventura River were likely introduced from one of those streams and have become very well established. Urban encroachment on those streams and hybridization of many arroyo chub populations has significantly reduced their distribution within the Los Angeles Basin. This has led Dr. Moyle to recommend that sections of those streams having good pure populations of arroyo chub be managed to protect them. This idea reflects an emerging belief by many biologists that native nongame fish should be

preserved and not displaced or eliminated by introduced fishes.

These fishes prefer slow-moving, warm, and nutrient-rich waters having moderate to heavy in-stream vegetation. They are very abundant in the lower Ventura River where water temperatures and water quality are presently inadequate for trout, and in upper San Antonio Creek where low summer flows and warm water temperatures prevent trout survival. All of these fish spawn in mid- to late spring. They are small (arroyo chub and green sunfish are less than 15 cm total length, mosquitofish and stickleback less than 6 to 8 cm total length); and, except for the sometimes piscivorous green sunfish, feed on insects and other invertebrates, organic detritus, and algae.

In summary, the habitat preferences, spawning periods, and other life history aspects of the warmwater fishes are very different from those of trout. The two groups probably experience little competition where they coexist. None of the warmwater fishes, except perhaps the green sunfish, are undesirable residents or pose any constraint to the potential enhancement of the steelhead population of the Ventura River.



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Food Habits of Rainbow Trout (Salmo gairdneri) from
The Ventura River

December 1976

Ventura River Trout Food Habits

Eight small trout (rainbow and steelhead) were collected from the Ventura River in December 1976 for the purpose of determining their feeding habits and/or preferences. All were year class 0, with a F.L. range of from 108-133 mm. (\bar{X} = 116 mm.). Two were marked with a dorsal fin clip identifying them as planted steelhead.

For this study only the cardiac portion of the stomachs of these trout were inspected since organisms in the pylorus would have been broken down by digestive processes long before, leaving only hard sclerotized body materials.

The attached table lists all taxa identified from the stomachs and breaks the taxa down into three categories. The first (Terrestrials) lists terrestrial insects as well as adult flying aquatics, all of which had to have been eaten on the water surface. The second (Drift) includes organisms with a propensity for movement (actively or passively) in the water column. The third (Benthics), and by far the largest, lists those organisms normally limited in their existence to the stream substrate.

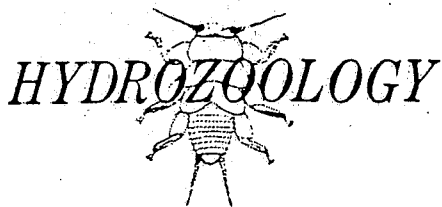
It can be seen from the table that these trout fed primarily on the bottom, feeding only to a limited extent on aquatic organisms which venture up into the water column or on those classified as terrestrial. By far the most important group of organisms to the trout were the caddisflies (Trichoptera) and particularly Hydropsyche and the unidentified Psychomyiid larva. Other important benthics were the mayfly nymph Tricorythodes fallax and the larva of the Stratiomyid fly Euparyphus sp. All of these were abundant in the benthos and all are relatively large organisms. The only other important groups were adult mayflies and the mayfly nymph Baetis, which may have been taken by the trout as a benthic form as well.

The Food of Ventura River Rainbow Trout - December 1976

| TAXON | Terrestrials | Drift | Benthics |
|---|--------------------------------|------------|------------|
| Adult mayflies | 2 [*] 9 ^{**} | | |
| Adult Chironomids | 2/5 | | |
| Chrysomelidae (leaf beetle) | 1/1 | | |
| Aphididae (aphid) | <u>1/1</u> | | |
| number of individuals: | 16 | | |
| <u>Baetis</u> sp. | | 4/26 | |
| unidentified Corixid | | 1/1 | |
| <u>Hyalella azteca</u> | | 1/2 | |
| aquatic Acari | | <u>1/1</u> | |
| number of individuals: | 30 | | |
| <u>Caenis</u> sp. | | | 1/2 |
| <u>Tricorythodes fallax</u> | | | 4/8 |
| <u>Ambrysus occidentalis</u> | | | 1/1 |
| <u>Hydropsyche</u> sp. | | | 5/35 |
| <u>Cheumatopsyche</u> sp. | | | 3/4 |
| unidentified Psychomyid | | | 2/18 |
| <u>Hydroptila</u> sp. | | | 2/8 |
| <u>Oxyethira</u> sp. | | | 1/1 |
| unidentified Hydroptilid | | | 1/1 |
| <u>Micrasema</u> sp. | | | 2/2 |
| <u>Oecetis disjuncta</u> | | | 1/2 |
| unidentified Simuliid | | | 1/1 |
| <u>Conchapelopia</u> or <u>Arctopelopia</u> sp. | | | 1/1 |
| <u>Cricotopus</u> sp. B | | | 2/4 |
| <u>Glyptotendipes</u> sp. | | | 1/1 |
| <u>Dicrotendipes</u> sp. | | | 1/1 |
| <u>Trichocladius</u> sp. | | | 1/2 |
| <u>Euparyphus</u> sp. | | | <u>4/8</u> |
| number of individuals: | | | 100 |

* the first number signifies the number of stomachs in which the taxon was found.

**the second number is the total number of individuals in the taxon.



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Aquatic Biologists specializing in Benthic Macroinvertebrates

The Benthos of The Ventura River and San Antonio Creek

December 1976

Ventura River Project

Bottom samples were taken between December 6 and December 12, 1976 at six locations on the Ventura River and its tributary, San Antonio Creek. One sample was taken from a riffle and one from a pool at each location using a Surber sampler.

Ventura River

A careful assessment of the general diversity of the benthos and of the nature of the ecosystem is difficult due to three factors: the lumping together of samples from both riffles and pools (except at one location), the small number of samples taken (one from each habitat) and the nature of the preserving fluid. In reference to the latter, many species of oligochaetes were lost because they simply dissolved. There were many fragments in the samples but not one was complete enough to be identified even to the family level. Isopropyl alcohol is very hard on the tissues of these organisms and ten per cent formalin is recommended.

Samples taken at Casitas Springs showed the major differences between riffle and pool faunas. This was also the station with the highest diversity in terms of numbers of different organisms. The major riffle organisms were revealed as Cheumatopsyche, Hydropsyche, and Baetis, and the major pool organisms as Hyaella azteca and Tricorythodes fallax. The pool habitat shows a low species diversity (an overwhelming abundance of two species, very low numbers of all others). The riffle was more diverse: three abundant taxa, two slightly less abundant, and five or six others containing significant numbers of individuals.

Although the samples were not separated, it is possible to infer their general diversity in a very rough fashion if we ignore those organisms not present in bulk at Casitas Springs and those about whose general habitat preferences we have no knowledge (primarily chironomids). The inference is that while riffles were more diverse than pools, the general diversity is low. In nearly every case no more than two species represent the bulk of the numbers of organisms present by habitat type.

The benthos of the stream can best be characterized generally as a warm-water fauna, based on the known habitats of many of its species at least in other parts of the state: H. azteca, T. fallax, Caenis sp., Argia vivida, Sigara mckinstryi, and Physa spp.

The condition of the stream in terms of its inhabitants' response to organic pollution is not as easily deciphered. EPA lists a group of organisms according to their tolerance of decomposable organic waste. The most abundant taxa from the two lower stations (below Shell Avenue and below the petroleum plant) would fall into the category "facultatively tolerant". Few taxa there could be considered "intolerant" of organic pollution. The upper stations (above Oakview waste discharge and at Casitas Springs) possess some organisms in the facultative category and a few fairly numerous taxa considered intolerant.

San Antonio Creek

Samples collected at Frasier Road possessed the most species diversity of any taken in the area. Those taken at Camp Comfort were very different, but this may be merely a reflection of sampling difficulty. On this stream the major species were the same as those found in the river, and would be classified as facultative organisms. As with the upper stations on the river, there were other taxa present which are considered intolerant of organic pollution, but in slightly higher numbers, indicating (perhaps) slightly better conditions.

Errata

Four (three?) species of blackflies were present in these streams. The most numerous (Simulium vittatum) was found only in the lower portion of the river. S. vittatum is listed by EPA as being "tolerant", "facultative", or "intolerant" of pollution, depending on your choice of author. This greatly confuses the issue of existing stream conditions. The loss of the oligochaetes is regrettable since these (when in abundance) sometimes speak volumes about the condition of a body of water. One striking aspect of these streams is the complete absence of stoneflies, which usually indicates a low dissolved oxygen content in the water, sometimes reflecting a high B.O.D.

VENTURA RIVER PROJECT - SPECIES LIST
INVERTEBRATES OTHER THAN INSECTS

| 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | |
|-----------------------------------|-----------------|---|--|--------------|-----------|---|-----------------------------------|--|---------------------------------|-----------|---|--------------------------------|-----|---------------------------------|---|---|--|
| ORDER | FAMILY | — | | GENUS | SPECIES | VENTURA RIVER Below Petrochem Plant | VENTURA RIVER Below Shell Ave. | VENTURA RIVER Above Oakview Garage Discharge | VENTURA RIVER CARMAS SPRINGS | LOCATIONS | | San Antonio Co. Foster Road | | San Antonio Co. Camp Comfort | | | |
| | | | | | | | | | Rifle | Pool | | | | | | | |
| (Planerminathae-) TRICLADIDA | PLANARIIDAE | | | CURA | formanici | | | | 2 | 18 | 7 | | 3 | | 2 | | |
| (Hirudinaria-) Rhynchobdellida | Glossiphoniidae | | | Placobdella | sp. | | 1 | | | 1 | | | | | | | |
| | | | | Oligobdella? | sp. | | | | | | | | | | | | |
| | Pisicolidae | | | Unidentified | species | 4 | | 1 | | | | | | | 1 | | |
| (Ostracoda-) Podocypoda | Cypreidae | | | Stenocypis? | sp. | | | | 1 | 3 | | | 5 | | 2 | | |
| | | | | Potamocypis? | sp. | | | | 3 | 2 | | | | | | | |
| Amphipoda | TALITRIDAE | | | Hyalella | azteca | 525 | 101 | 60 | 11 | 100 | | | 169 | | | | |
| (Gastropoda-) Basommatophora | Physidae | | | Physa | sp. A | 17 | | | | 6 | | | 1 | | | | |
| | | | | Physa | sp. B | | | 1 | | 4 | | | | | | | |
| | Planorbidae | | | Gyraulus | sp. | 2 | | | | | | | | | | | |
| | | | | Helisoma | sp. | | | 1 | | | | | | | | | |
| (Pelecypoda-) HERTZOGONTA | SPHAERIIDAE | | | Psidium | sp. | | | | 1 | | | | | | | | |
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VENTURA RIVER PROJECT - SPECIES LIST INSECTS

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| | | 1 | | 2 | | 3 | | 4 | | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | |
|---------------|------------------|-----------------------------|--|----------------|--|-----------------|-----|--|-----------------------------------|---|----------------------------------|------|--------------------------------|----|---------------------------------|--|---|--|---|--|----|--|
| ORDER | FAMILY | SUBFAMILY (Chironomidae) | | GENUS | | SPECIES | | VENTURA RIVER Below Petroleum Plant | VENTURA RIVER Below Shell Ave. | VENTURA RIVER ABOVE OAKVIEW WASTE DISCHARGE | VENTURA RIVER CASITAS SPRINGS | | SAN ANTONIO RR FRASIER ROAD | | SAN ANTONIO RR ORAMP COMFORT | | | | | | | |
| EPHEMEROPTERA | BAETIDAE | | | BAETIS | | SP. | | | | 7 | 252 | 8 | 135 | 43 | | | | | | | | |
| | CAENIDAE | | | CAENIS | | SP. | 10 | 1 | 18 | 11 | 9 | 117 | 57 | | | | | | | | | |
| | TRICORYTHIDAE | | | TRICORYTHODES | | fallax | | | 13 | 88 | 317 | 1103 | 74 | | | | | | | | | |
| | LEPTOPHEBIIDAE | | | CHORDIERPES | | terramoma | | | 1 | 1 | | 4 | 18 | | | | | | | | | |
| ODONATA | AESHNIDAE | | | ANAX | | ambigua | | 1 | 2 | | | | | | | | | | | | | |
| | COENAGRIONIDAE | | | ARGIA | | vivida | 26 | 5 | 8 | 3 | 5 | 6 | 8 | | | | | | | | | |
| HEMIPTERA | AGRIONIDAE | | | Ischnura | | ramburei | 9 | 2 | | | 5 | 1 | | | | | | | | | | |
| | CORIXIDAE | | | Heterocera | | americana | | | | 1 | | | | | | | | | | | | |
| | NAUCORIDAE | | | Sigara | | maculipennis | | | 13 | | 1 | | | | | | | | | | | |
| | BELOSTOMATIDAE | | | Amorbus | | occidentalis | | | 2 | | | | | | | | | | | | | |
| COLEOPTERA | HYDROPHILIDAE | | | Agabus | | indianatus | | | | 1 | | | | | | | | | | | | |
| | ELMIDAE | | | Derocetes | | striatellus (A) | | | | | | 1 | | | | | | | | | | |
| | PSYCHOMYIIDAE | | | Agabus | | sp. (L) | | | | | | 2 | | | | | | | | | | |
| | HYDROPTILIDAE | | | Rhantus | | sp. (L) | | | | | | 1 | | | | | | | | | | |
| TRICHOPTERA | PSYCHOMYIIDAE | | | Tropisternus | | obscurus (A) | | | 1 | | | | | | | | | | | | | |
| | HYDROPSYCHIDAE | | | Ophreoceras | | sp. (L) | 1 | | | 2 | 1 | | | | | | | | | | | |
| | HYDROPTILIDAE | | | Microgyllops | | sp. (L) | | | 1 | 1 | | | | | | | | | | | | |
| | LEPTOCERIDAE | | | Polycntropus | | sp. (L) | | | 3 | 6 | 1 | 2 | | | | | | | | | | |
| DIPTERA | BRACHYCENTRIDAE | | | Unidentified | | species (L) | | | 1 | 3 | 2 | 8 | | | | | | | | | | |
| | SERICOSTOMATIDAE | | | Cheumatopsyche | | sp. (L) | | | 34 | 375 | | 101 | 2 | | | | | | | | | |
| | SIMULIIDAE | | | Hydropsyche | | sp. (L) | | | 2 | 112 | 1 | 5 | 1 | | | | | | | | | |
| | SERICOPTERIDAE | | | Oxyethira | | sp. (L) | | | | | 7 | | | | | | | | | | | |
| DIPTERA | BRACHYCENTRIDAE | | | Ochrotrichia | | sp. (L) | | | 1 | 24 | | | | | | | | | | | | |
| | SERICOSTOMATIDAE | | | Hydroptila | | sp. (L) | | | | 7 | | 1 | | | | | | | | | | |
| | SIMULIIDAE | | | Oecetis | | disjuncta (L) | | | 1 | 1 | 3 | | | | | | | | | | | |
| | SERICOPTERIDAE | | | Microsema | | sp. (L) | | | | 15 | 1 | | | | | | | | | | | |
| DIPTERA | BRACHYCENTRIDAE | | | SERICOSTOMA | | griseolum (L) | | | | | | | 12 | 36 | | | | | | | | |
| | SERICOSTOMATIDAE | | | Simulium | | vittatum (L) | 130 | 106 | | | | | | | | | | | | | | |
| | SIMULIIDAE | | | Simulium | | vittatum (P) | 52 | 18 | | | | | | | | | | | | | | |
| | SERICOPTERIDAE | | | Simulium | | aureum (P) | | 1 | | | | | | | | | | | | | | |
| DIPTERA | SERICOSTOMATIDAE | | | Simulium | | sp. A (L) | 1 | 15 | 86 | 2 | 1 | | | | | | | | | | | |
| | SIMULIIDAE | | | Simulium | | sp. B (L) | | | 8 | 20 | | 37 | 6 | | | | | | | | | |

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| Order | Family | Subfamily (Chironomids) | Genus | Species | SAMPLING | | | LOCATIONS | | | SAN ANTONIO R. FRASIER ROAD | SAN ANTONIO R. CAMP COMFORT |
|---------|-----------------|----------------------------|-------------------------|---------|---|-----------------------------------|---|---|-------|--|--------------------------------|--------------------------------|
| | | | | | VENTURA RIVER BROWN P. / ANTELOPE PLANT | VENTURA RIVER BELOW SHILL AVE. | VENTURA RIVER ABOVE OAKVIEW WASTE DISCHARGE | VENTURA RIVER CASITAS SPRINGS RIFLE | POOL | | | |
| DIPTERA | CHIRONOMIDAE | TANYPODINAE | <i>Conchospira</i> | SP. | | | 7(L) | 10(L) | 3(L) | | 35(L) 1(P) | 2(L) |
| | | | <i>Abolobrynia</i> | SP. | 4(L) 2(P) | 1(L) 2(P) | 1(L) | 2(L) | | | 1(P) | |
| | | | <i>Labrundinia</i> | SP. | | | | | | | 9(L) 5(P) | |
| | | | <i>Chironominae</i> | SP. | 8(L) 1(P) | 1(L) | 52(L) 4(P) | 4(L) | | | 1(P) | |
| | | | <i>Microsetra</i> | SP. | 2(L) | 25(L) | 1(L) | 1(L) | | | | |
| | | Orthocladiinae | <i>Chironomus</i> | SP. | 1(L) 5(P) | 18(L) | | | | | | |
| | | | <i>Cryptochironomus</i> | SP. | | | | | 1(L) | | | |
| | | | <i>Dirotendipes</i> | SP. | 97(L) | 84(L) 3(P) | 1(L) | 1(L) | 3(L) | | 95(L) 1(P) | |
| | | | <i>Glyptotendipes</i> | SP. | | | | 1(L) | 1(L) | | 2(L) | |
| | | | <i>Microtendipes</i> | SP. | | | 1(L) | | | | | |
| | | | <i>Phaenopsatra</i> | SP. | | | | | | | 1(L) | |
| | | | <i>Corynoneura</i> | SP. | | | | | | | 18(L) 1(P) | |
| | | | <i>Cricotopus</i> | SP. A | 66(L) 122(P) | 63(L) 72(P) | | 1(L) | 1(L) | | 70(L) 17(P) | |
| | | | <i>Cricotopus</i> | SP. B | 66(L) 2(P) | 9(L) 3(P) | 1(L) | 5(L) | 19(L) | | 135(L) 5(P) | |
| | | | <i>Cricotopus</i> | SP. C | | 15(L) 10(P) | | | 1(P) | | | |
| | | DIAMASINAE | <i>Eukiefferiella</i> | SP. | | | | 8(L) | | | | |
| | | | <i>Thienemannella</i> | SP. A | | | | 1(L) | | | 9(L) 1(P) | |
| | | | <i>Thienemannella</i> | SP. B | | | | 1(L) | | | | |
| | | | <i>Trichocladius</i> | SP. | | 2(L) | | 58(L) | | | | |
| | | | <i>Diamasa?</i> | SP. | | 2(P) | | | | | | |
| | CERATOPOGONIDAE | | <i>DASYHELA</i> | SP. (L) | | 1 | | | | | | |
| | STRATIOMYIDAE | | <i>EUPHEYPUS</i> | SP. | 1(L) | | | 1(L) | 1(P) | | 10(L) | 3(L) |
| | Empididae | | <i>Hemerodromia</i> | SP. | | | 1 | 4 | | | | |

FISHES AND OTHER AQUATIC ANIMALS OF THE VENTURA RIVER SYSTEM

| Common Name | Scientific Name |
|--------------------------------|--------------------------------|
| <u>Fish</u> | |
| Rainbow and steelhead trout | <i>Salmo gairdneri</i> |
| Arroyo chub | <i>Gila orcutti</i> |
| Threespine stickleback | <i>Gasterosteus aculeatus</i> |
| Green sunfish | <i>Lepomis cyanellus</i> |
| Mosquitofish | <i>Gambusia affinis</i> |
| Largemouth bass (R) | <i>Micropterus salmoides</i> |
| Red-ear sunfish (R) | <i>Lepomis microlophus</i> |
| Channel catfish (R) | <i>Ictalurus punctatus</i> |
| Threadfin shad (R) | <i>Dorosoma petenense</i> |
| Walleye* | <i>Stizostedion vitreum</i> |
| Crappie* | <i>Pomoxis</i> spp. |
| Topsmelt (L) | <i>Atherinops affinis</i> |
| Tidewater goby (L) | <i>Eucyclogobius newberryi</i> |
| Staghorn sculpin (L) | <i>Leptocottus armatus</i> |
| Surfperches (L) | <i>Embiotocidae</i> |
| <u>Other Aquatic Animals</u> | |
| Crayfish | <i>Procambarus clarki</i> |
| Bullfrog | <i>Rana catesbeiana</i> |
| Pacific tree frog | <i>Hyla regilla</i> |
| Common toad | <i>Bufo boreas</i> |
| Western garter snake (aquatic) | <i>Thamnophis elegans</i> |

*Fish species introduced to the reservoir that did not persist.

(R) = reservoir fish.

(L) = lagoon fish.

RIPARIAN AND AQUATIC VEGETATION OF THE VENTURA RIVER SYSTEM

| Common Name | Scientific Name |
|------------------------------------|------------------------------|
| <u>Riparian and Aquatic Plants</u> | |
| Pacific willow. | <i>Salix lasiandra</i> |
| White alder | <i>Alnus rhombifolia</i> |
| Big leaf maple | <i>Acer sp.</i> |
| California sycamore | <i>Platanus racemosa</i> |
| Black cottonwood | <i>Populus trichocarpa</i> |
| Water speedwell | <i>Veronica americana</i> |
| Watercress | <i>Nasturtium officinale</i> |
| Monkeyflower | <i>Mimulus guttatus</i> |
| Common reed | <i>Phragmites communis</i> |
| Smartweed | <i>Polygonum sp.</i> |
| Pickleweed | <i>Salicornia sp.</i> |
| Cattail | <i>Typha latifolia</i> |
| Stinging nettle | <i>Urtica holosericea</i> |
| <u>Algae</u> | |
| Green algae | <i>Cladophora spp.</i> |
| Green alga | <i>Fygnema sp.</i> |
| Green alga | <i>Enteromorpha sp.</i> |
| Green alga | <i>Chara sp.</i> |

Appendix D: Ventura River Surface Water Flow

Table D-1. SURFACE WATER FLOW, VENTURA RIVER, 250 FEET BELOW SAN ANTONIO CREEK, 1959- 1965

| Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) | Date | Time of Day (hr) | Discharge (cfs) |
|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|-------|------------------|-----------------|
| 1959 | | | 1960 | | | 1961 | | | 1962 | | | 1963 | | | 1964 | | | 1965 | | | | | |
| 1/15 | 1310 | 5.55 | 1/19 | 1030 | 7.15 | 1/13 | 1305 | 0.41 | 1/5 | 1400 | 0.12 | 1/4 | 1510 | 0.51 | 1/5 | 1400 | 0.17 | 1/4 | 1510 | 0.51 | 1/5 | 1400 | 0.17 |
| 3/6 | 1410 | 0.91 | 1/27 | 1510 | 7.29 | 2/3 | 1340 | 0.92 | 1/19 | 1250 | 0.55 | 1/10 | 1540 | 0.92 | 3/19 | 1250 | 0.55 | 1/10 | 1540 | 0.92 | 3/19 | 1250 | 0.55 |
| 1/27 | 0915 | 6.49 | 2/11 | 1520 | 3.04 | 2/17 | 1310 | 1.05 | 2/6 | 1515 | 0.89 | 1/25 | 1600 | 1.05 | 2/6 | 1515 | 0.89 | 1/25 | 1600 | 1.05 | 2/6 | 1515 | 0.89 |
| 4/17 | 1104 | 6.78 | 2/26 | 1030 | 6.54 | 2/3 | 1410 | 1.10 | 4/9 | 1500 | 0.1 | 2/8 | 0930 | 2.10 | 4/9 | 1500 | 0.1 | 2/8 | 0930 | 2.10 | 4/9 | 1500 | 0.1 |
| 5/11 | 1515 | 7.23 | 3/4 | 1400 | 4.00 | 3/17 | 0930 | 2.33 | 5/2 | 1410 | 9.3 | 2/26 | 1050 | 2.53 | 5/2 | 1410 | 9.3 | 2/26 | 1050 | 2.53 | 5/2 | 1410 | 9.3 |
| 5/29 | 1440 | 6.10 | 3/11 | 1405 | 4.77 | 3/21 | 1425 | 2.51 | 5/19 | 1015 | 11.3 | 3/12 | 1455 | 2.51 | 5/19 | 1015 | 11.3 | 3/12 | 1455 | 2.51 | 5/19 | 1015 | 11.3 |
| 6/5 | 1500 | 5.73 | 3/10 | 1510 | 4.69 | 4/14 | 1240 | 1.83 | 6/24 | 1310 | 11.5 | 3/25 | 1510 | 2.61 | 6/24 | 1310 | 11.5 | 3/25 | 1510 | 2.61 | 6/24 | 1310 | 11.5 |
| 6/13 | 1530 | 5.30 | 3/25 | 1415 | 3.03 | 4/20 | 1130 | 1.53 | 6/14 | 1110 | 11.5 | 4/5 | 0930 | 2.53 | 6/14 | 1110 | 11.5 | 4/5 | 0930 | 2.53 | 6/14 | 1110 | 11.5 |
| 6/19 | 1510 | 5.52 | 4/11 | 1355 | 5.15 | 5/13 | 1506 | 1.00 | 7/2 | 1300 | 12.0 | 4/19 | 0955 | 1.00 | 7/2 | 1300 | 12.0 | 4/19 | 0955 | 1.00 | 7/2 | 1300 | 12.0 |
| 6/24 | 1530 | 5.94 | 4/8 | 1340 | 5.24 | 6/26 | 1510 | 1.01 | 7/23 | 1330 | 12.0 | 5/1 | 0905 | 1.01 | 7/23 | 1330 | 12.0 | 5/1 | 0905 | 1.01 | 7/23 | 1330 | 12.0 |
| 7/3 | 1050 | 6.15 | 4/29 | 1415 | 6.06 | 6/9 | 0040 | 1.30 | 8/3 | 1440 | 9.4 | 5/20 | 1415 | 1.20 | 8/3 | 1440 | 9.4 | 5/20 | 1415 | 1.20 | 8/3 | 1440 | 9.4 |
| 7/13 | 1340 | 5.90 | 5/4 | 1410 | 6.23 | 6/23 | 1440 | 0.50 | 8/13 | 1410 | 9.7 | 6/3 | 1450 | 0.50 | 8/13 | 1410 | 9.7 | 6/3 | 1450 | 0.50 | 8/13 | 1410 | 9.7 |
| 7/27 | 1440 | 5.60 | 5/10 | 1400 | 5.07 | 6/30 | 1410 | 0.70 | 8/27 | ----- | 9.6 | 6/14 | 1435 | 0.30 | 8/27 | ----- | 9.6 | 6/14 | 1435 | 0.30 | 8/27 | ----- | 9.6 |
| 8/10 | 1470 | 5.32 | 6/1 | 1470 | 5.54 | 7/7 | 1470 | 0.71 | 9/16 | 1510 | 0.0 | 6/20 | 1435 | 0.71 | 9/16 | 1510 | 0.0 | 6/20 | 1435 | 0.71 | 9/16 | 1510 | 0.0 |
| 8/17 | 1540 | 1.20 | 6/13 | 1430 | 5.11 | 7/14 | ----- | 0.09 | 10/5 | 1500 | 7.7 | 7/10 | 0910 | 0.09 | 10/5 | 1500 | 7.7 | 7/10 | 0910 | 0.09 | 10/5 | 1500 | 7.7 |
| 8/24 | 1500 | 1.32 | 6/24 | 1430 | 4.59 | 7/21 | 1300 | 0.00 | 10/19 | 1305 | 7.2 | 8/5 | 1445 | 0.00 | 10/19 | 1305 | 7.2 | 8/5 | 1445 | 0.00 | 10/19 | 1305 | 7.2 |
| 9/4 | 0910 | 4.75 | 7/11 | 1445 | 4.14 | 7/26 | ----- | 0.00 | 11/16 | 1510 | 4.5 | 8/19 | 1320 | 0.00 | 11/16 | 1510 | 4.5 | 8/19 | 1320 | 0.00 | 11/16 | 1510 | 4.5 |
| 9/21 | 1400 | 3.90 | 7/25 | 1500 | 3.75 | 9/8 | 0745 | 0.00 | 12/7 | 1450 | 4.4 | 9/17 | 0005 | 0.00 | 12/7 | 1450 | 4.4 | 9/17 | 0005 | 0.00 | 12/7 | 1450 | 4.4 |
| 9/28 | 0940 | 3.70 | 8/6 | 1430 | 3.32 | 12/29 | 1300 | 0.00 | 12/21 | 1410 | 4.1 | 10/2 | 1505 | 0.00 | 12/21 | 1410 | 4.1 | 10/2 | 1505 | 0.00 | 12/21 | 1410 | 4.1 |
| 10/5 | 1020 | 3.50 | 8/19 | 1435 | 2.73 | | | | 11/1 | 1550 | | 11/1 | 1550 | | 11/1 | 1550 | | 11/1 | 1550 | | 11/1 | 1550 | |
| 10/15 | 1410 | 2.77 | 9/24 | 1455 | 3.41 | | | | 12/5 | 0050 | | 12/5 | 0050 | | 12/5 | 0050 | | 12/5 | 0050 | | 12/5 | 0050 | |
| 10/23 | 0915 | 2.34 | 10/4 | 1505 | 0.64 | | | | 12/11 | 0910 | | 12/11 | 0910 | | 12/11 | 0910 | | 12/11 | 0910 | | 12/11 | 0910 | |
| 11/5 | 1155 | 1.42 | 10/14 | 1115 | 4.34 | | | | | | | | | | | | | | | | | | |
| 11/17 | 1146 | 1.34 | 10/30 | 1410 | 0.06 | | | | | | | | | | | | | | | | | | |
| 11/27 | 0940 | 1.09 | 11/11 | 1535 | 0.34 | | | | | | | | | | | | | | | | | | |
| 12/4 | 1550 | 1.13 | 12/9 | 1425 | 0.43 | | | | | | | | | | | | | | | | | | |
| 12/11 | 1900 | 1.10 | 12/30 | 1410 | 0.44 | | | | | | | | | | | | | | | | | | |
| 12/10 | 1435 | 1.22 | | | | | | | | | | | | | | | | | | | | | |

Source: Ventura County Flood Control District; Water Survey, Miscellaneous Discharge Measurements
250 Feet Below Mouth of San Antonio Creek, 1934-1966.

*No flow from San Antonio Creek.

Table D-2. SURFACE WATER FLOW IN THE VENTURA RIVER BELOW COYOTE CREEK, 1958-59 THROUGH 1964-65

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VENTURA RIVER BASIN

1185. Ventura River near Ventura, Calif.

Location--Lat 34°21'05", long 119°18'23", in southeast corner of Santa Ana Grant, on right bank 500 ft downstream from county highway bridge at Poster Memorial Park, 0.2 mile downstream from Coyote Creek, and 5 miles north of Ventura, Ventura County.

Drainage area--187 sq mi.

Records available--September 1911 to January 1914, October 1929 to September 1959.

Gage--Water-stage recorder. Altitude of gage is 200 ft (from topographic map). Prior to Jan. 18, 1914, chain gage at site 370 ft upstream at different datum (destroyed by flood). October 1929 to Nov. 2, 1949, at site 370 ft upstream at present datum.

Average discharge--32 years (1911-13, 1929-59), 61.5 cfs (44,520 acre-ft per year); median of yearly mean discharges, 27 cfs (19,500 acre-ft per year). Average combined discharge of river and diversion, 26 years (1933-59), 75.0 cfs (54,300 acre-ft per year); median of combined yearly mean discharges, 33 cfs (23,900 acre-ft per year).

Extremes--Maximum discharge during year, 3,220 cfs Feb. 16 (gage height, 9.50 ft); minimum daily, 0.8 cfs Aug. 17, 18, 1911-14, 1929-59; Maximum discharge, 39,200 cfs Mar. 2, 1929 (gage height, 19.2 ft), from rating curve extended above 7,700 cfs on basis of slope-area and contracted-opening measurement of peak flow; no flow at times in many years.

Remarks--Records good. Discharge measurements generally made twice a month. Flow partly regulated by Matillija Reservoir since Mar. 14, 1948 (see p. 177). Water diverted through pipeline at dam (Matillija Reservoir) to Ojai Valley for irrigation since May 1951. City of Ventura diverts water above station for municipal supply. For records of combined discharge of river and diversion, see following page.

Cooperation--Gage-height record for diversion weir furnished by city of Ventura.

Revisions (water years)--WSP 1565: 1957.

| Discharge, in cubic feet per second, water year October 1958 to September 1959 | | | | | | | | | | | | |
|---|-------|------|------|-------|---------|-------|-------|------|------|------|------|-------|
| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
| 1 | 9.7 | 2.6 | 2.5 | 2.9 | 3.6 | 3.6 | 3.4 | 1.9 | 2.6 | 1.6 | 1.2 | 2.2 |
| 2 | 10 | 2.6 | 2.5 | 3.0 | 3.6 | 4.5 | 2.6 | 2.8 | 1.7 | 2.0 | 1.5 | 2.5 |
| 3 | 10 | 3.2 | 2.6 | 2.0 | 3.4 | 4.5 | 2.5 | 4.3 | 1.5 | 2.7 | 1.5 | 2.0 |
| 4 | 9.7 | 3.6 | 2.8 | 2.0 | 3.8 | 9.5 | 2.6 | 3.4 | 1.5 | 2.4 | 1.3 | 2.6 |
| 5 | 10 | 4.0 | 3.0 | 2.6 | 3.6 | 11 | 2.8 | 2.2 | 2.3 | 1.5 | 1.1 | 2.6 |
| 6 | 8.5 | 6.8 | 3.0 | 262 | 3.4 | 10 | 3.0 | 2.6 | 3.6 | 2.0 | .8 | 2.3 |
| 7 | 6.5 | 6.9 | 3.0 | 23 | 3.8 | 8.9 | 2.6 | 2.5 | 3.5 | 2.1 | .8 | 1.9 |
| 8 | 6.8 | 3.6 | 3.6 | 18 | 4.8 | 8.9 | 2.5 | 2.5 | 3.0 | 2.3 | .8 | 2.0 |
| 9 | 7.8 | 4.3 | 3.2 | 16 | 4.5 | 9.7 | 2.3 | 4.3 | 2.2 | 1.9 | .8 | 2.2 |
| 10 | 7.1 | 4.3 | 3.2 | 15 | 10 | 9.3 | 2.0 | 5.3 | 4.3 | 1.5 | .7 | 1.9 |
| 11 | 5.6 | 3.2 | 3.4 | 11 | 453 | 7.8 | 1.9 | 3.4 | 2.0 | 1.5 | .8 | 1.7 |
| 12 | 5.6 | 2.2 | 3.4 | 10 | 14 | 7.8 | 2.3 | 2.0 | 1.9 | 1.5 | .8 | 1.7 |
| 13 | 6.5 | 2.3 | 3.2 | 9.7 | 6.2 | 8.2 | 1.7 | 1.7 | 2.5 | 1.4 | .8 | 1.6 |
| 14 | 9.8 | 2.5 | 3.6 | 6.8 | 4.5 | 9.3 | 1.6 | 1.7 | 2.9 | 1.4 | .7 | 1.5 |
| 15 | 6.5 | 3.0 | 3.6 | 5.0 | 4.0 | 8.9 | 1.6 | 2.0 | 2.2 | 1.4 | .7 | 1.8 |
| 16 | 7.4 | 3.2 | 3.2 | 3.8 | 822 | 8.5 | 1.4 | 2.8 | 3.4 | 1.4 | .7 | 1.5 |
| 17 | 7.4 | 2.8 | 2.5 | 3.6 | 47 | 8.5 | 1.3 | 3.2 | 3.0 | 1.4 | .6 | 1.6 |
| 18 | 7.8 | 2.6 | 2.8 | 4.3 | 12 | 8.5 | 1.7 | 3.8 | 2.2 | 1.4 | .6 | 1.6 |
| 19 | 8.2 | 2.5 | 3.0 | 4.5 | 8.5 | 8.5 | 1.9 | 2.0 | 1.7 | 1.5 | .7 | 1.3 |
| 20 | 8.2 | 2.3 | 3.2 | 4.6 | 5.8 | 8.5 | 2.2 | 2.8 | 1.8 | 1.6 | .6 | 1.9 |
| 21 | 8.2 | 2.5 | 2.8 | 4.8 | 115 | 8.2 | 1.7 | 1.0 | 1.8 | 1.5 | .8 | 2.2 |
| 22 | 7.4 | 2.5 | 2.2 | 4.8 | 28 | 7.8 | 1.4 | 1.8 | 1.2 | 1.0 | .3 | 2.3 |
| 23 | 3.8 | 2.3 | 1.9 | 4.8 | 15 | 7.1 | 1.5 | 2.6 | 1.8 | 1.3 | 1.0 | 2.3 |
| 24 | 3.2 | 2.3 | 1.8 | 4.5 | 7.4 | 4.3 | 1.5 | 4.8 | 1.9 | 1.2 | 1.2 | 2.6 |
| 25 | 2.5 | 2.6 | 2.8 | 4.8 | 3.2 | 2.8 | 5.6 | 3.8 | 1.9 | 1.1 | 1.3 | 2.2 |
| 26 | 7.8 | 2.3 | 3.0 | 4.3 | 3.2 | 2.8 | 11 | 1.8 | 1.7 | 1.1 | 1.4 | 2.3 |
| 27 | 3.7 | 2.5 | 2.0 | 3.8 | 3.2 | 2.8 | 3.6 | 1.8 | 1.5 | 1.1 | 1.4 | 2.5 |
| 28 | 1.8 | 2.8 | 1.9 | 4.0 | 5.4 | 3.0 | 2.1 | 1.9 | 1.5 | 1.3 | 1.1 | 2.5 |
| 29 | 2.8 | 3.0 | 1.8 | 4.0 | - | 3.6 | 2.0 | 2.0 | 1.6 | 1.3 | 1.0 | 1.8 |
| 30 | 2.8 | 2.5 | 1.8 | 3.4 | - | 5.6 | 1.3 | 3.1 | 1.6 | 1.3 | 1.6 | 1.8 |
| 31 | 2.6 | - | 1.9 | 3.2 | - | 4.3 | - | 3.4 | - | 1.3 | 1.0 | - |
| Total | 137.0 | 95.8 | 85.2 | 449.6 | 1,594.9 | 210.7 | 76.4 | 85.0 | 84.5 | 48.0 | 32.0 | 21.0 |
| Mean | 6.35 | 3.12 | 2.75 | 14.5 | 51.0 | 6.97 | 2.54 | 2.74 | 2.15 | 1.58 | 1.04 | 1.00 |
| Ac-ft | 321 | 190 | 160 | 897 | 3,160 | 430 | 151 | 169 | 123 | 95 | 64 | 107 |
| Calendar year 1958: Max | 95.8 | Min | 0.3 | Mean | 24.0 | Ac-ft | 151.0 | | | | | |
| Water year 1958-59: Max | 920 | Min | 0.8 | Mean | 8.74 | Ac-ft | 5,900 | | | | | |
| Peak discharge (base, 500 cfs)--Jan. 1 (4 a.m.) 1,910 cfs (9.19 ft); Feb. 11 (4 a.m.) 3,410 cfs (11.64 ft); Feb. 11 (2 p.m.) 3,230 cfs (9.53 ft). | | | | | | | | | | | | |

Source: U.S. Geological Survey, 1959, Surface Water Supply, California, Water Supply Paper 1635.

Table D-2 (continued)

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VENTURA RIVER BASIN

1184, Ventura River near Ventura, Calif.

Location.--Lat 34°21'00", Long 119°19'00", in southeast corner of Santa Ana Grant, on
 1.5 mile east of 100 ft downstream from county Highway bridge at Foster Memorial Park,
 0.2 mile downstream from Coyote Creek, and 5 miles north of Ventura, Ventura County.

Drainage area.--187 sq mi.

Records available.--September 1911 to January 1914, October 1929 to September 1960.

Gage.--Water-stage recorder. Altitude of gage is 200 ft (from topographic map). Prior
 to Jan. 14, 1914, chain gage at site 370 ft upstream at different datum (destroyed
 by flood). October 1929 to Nov. 2, 1949, at site 370 ft upstream at present datum.

Average discharge.--33 years (1911-13, 1929-60), 59.7 cfs (43,220 acre-ft per year);
 median of yearly mean discharges, 26 cfs (18,800 acre-ft per year). Average combined
 discharge of river and diversion, 23 years (1932-60), 70.3 cfs (51,200 acre-ft per
 year); median of combined yearly mean discharges, 25 cfs (21,000 acre-ft per year).

Extremes.--Maximum discharge during year, 966 cfs Feb. 1 (gage height, 7.38 ft); no
 flow Sept. 12-16.
 1911-14, 1929-60: Maximum discharge, 39,200 cfs Mar. 2, 1932 (gage height, 19.2 ft),
 from rating curve extended above 7,705 cfs on basis of slope-area and contracted-
 opening measurement of peak flow; no flow at times in many years.

Remarks.--Records good. Discharge measurements generally made twice a month. Flow
 partly regulated by Matillija Reservoir since Mar. 14, 1945 (see p. 149) and by Casitas
 Reservoir since Oct. 1, 1959. Water diverted through pipeline at dam (Matillija Reser-
 voir) to Ojai Valley for irrigation since May 1951. Water diverted to Casitas Reser-
 voir since January 1959. City of Ventura diverts water above station for municipal
 supply. For records of combined discharge of river and diversion, see following page.

Cooperation.--Gage-height record for diversion weir furnished by city of Ventura.

Revisions (water years).--WSP 1565: 1957.

| Discharge, in cubic feet per second, water year October 1959 to September 1960 | | | | | | | | | | | | |
|---|------|------|------|------|-------|------|-------|------|------|------|------|-------|
| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
| 1 | 1.6 | 1.6 | 0.7 | 0.8 | 1.8 | 0.4 | 1.2 | 5.5 | 3.0 | 1.7 | 0.4 | 0.2 |
| 2 | 1.8 | 1.8 | .7 | .9 | 1.9 | .4 | 1.3 | 5.5 | 1.5 | 1.7 | .4 | .2 |
| 3 | 1.5 | 2.0 | .6 | 1.0 | .8 | .4 | 1.4 | 5.7 | 1.3 | 1.7 | .5 | .2 |
| 4 | 1.1 | 1.8 | .6 | 1.0 | .4 | .4 | 1.2 | 1.7 | 1.5 | 1.7 | .6 | .1 |
| 5 | 1.1 | 1.5 | .6 | 1.0 | .4 | .4 | 1.1 | 1.7 | 1.7 | 1.7 | .6 | .1 |
| 6 | 1.1 | 1.5 | .6 | 1.0 | .4 | .4 | 1.1 | 1.7 | 1.8 | 1.7 | .5 | .1 |
| 7 | 1.1 | 1.7 | .6 | 1.0 | .4 | .4 | 1.3 | 1.8 | 2.2 | 1.7 | .5 | .1 |
| 8 | 1.1 | 1.7 | .7 | 1.1 | .5 | .6 | 1.4 | 2.0 | 2.2 | 1.7 | .5 | .1 |
| 9 | 1.3 | 1.4 | .6 | 1.3 | .6 | .7 | 1.8 | 2.3 | 2.0 | 1.7 | .5 | .1 |
| 10 | 1.4 | 1.3 | .6 | 1.6 | .6 | .7 | 2.2 | 2.2 | 1.7 | 1.7 | .5 | .1 |
| 11 | 1.3 | 1.2 | .7 | 2.8 | .6 | .7 | 2.8 | 2.8 | 1.7 | 1.7 | .5 | .1 |
| 12 | 1.1 | 1.3 | .7 | 5.4 | .5 | .8 | 2.8 | 5.4 | 1.5 | 1.7 | .4 | 0 |
| 13 | 1.0 | 1.3 | .7 | 1.8 | .5 | .9 | 2.5 | 1.8 | 1.5 | 1.7 | .4 | 0 |
| 14 | 1.0 | 1.2 | .8 | 1.4 | .4 | .8 | 1.8 | 1.7 | 1.4 | 1.7 | .3 | 0 |
| 15 | 1.0 | 1.2 | .9 | .8 | .4 | .7 | 2.0 | 1.8 | 1.3 | 1.5 | .2 | 0 |
| 16 | .9 | 1.3 | 1.0 | .8 | .4 | .7 | 2.6 | 2.0 | 1.2 | 1.4 | .2 | 0 |
| 17 | .9 | 1.4 | 1.1 | .8 | .4 | .7 | 2.2 | 1.7 | 1.1 | 1.3 | .2 | .1 |
| 18 | .9 | 1.4 | 1.1 | .6 | .4 | .7 | 2.6 | 1.8 | 1.1 | 1.2 | .2 | .1 |
| 19 | 1.0 | 1.4 | 1.0 | .6 | .5 | .8 | 2.3 | 1.7 | 1.1 | 1.0 | .2 | .1 |
| 20 | 1.1 | 1.5 | 1.0 | .5 | .5 | .8 | 2.3 | 1.5 | 1.1 | 1.0 | .1 | .1 |
| 21 | 1.3 | 1.6 | 1.1 | .4 | .5 | 1.0 | 2.5 | 1.4 | 1.2 | 1.0 | .1 | .1 |
| 22 | 1.3 | 1.5 | 1.0 | .4 | .5 | 1.0 | 1.8 | 1.4 | 1.3 | 1.0 | .1 | .1 |
| 23 | 1.1 | 1.3 | .8 | .3 | .5 | 1.0 | 1.4 | 1.2 | 1.3 | .9 | .1 | .1 |
| 24 | 1.0 | 1.2 | 1.0 | .2 | .4 | 1.1 | 2.0 | 1.2 | 1.2 | .8 | .1 | .1 |
| 25 | 1.0 | 1.1 | 1.0 | .2 | .4 | 1.4 | 3.8 | 1.2 | 1.2 | .7 | .1 | .1 |
| 26 | 1.1 | 1.1 | 1.0 | .2 | .4 | 1.7 | 7.1 | 1.2 | 1.3 | .7 | .1 | .1 |
| 27 | 1.3 | 1.1 | 1.0 | .1 | .3 | 2.2 | 5.4 | 1.3 | 1.6 | .6 | .1 | .2 |
| 28 | 1.4 | 1.9 | .7 | .1 | .4 | 2.5 | 12 | 2.0 | 1.7 | .5 | .1 | .2 |
| 29 | 1.4 | 1.8 | .7 | .1 | .4 | 1.5 | 6.5 | 3.0 | 1.7 | .4 | .2 | .2 |
| 30 | 1.3 | 1.8 | .8 | .1 | .1 | 1.5 | 6.5 | 2.5 | 1.7 | .4 | .2 | .2 |
| 31 | 1.5 | 1.5 | .8 | .1 | .1 | 1.5 | 3.6 | 3.6 | 1.4 | .4 | .2 | .2 |
| Total | 36.8 | 40.7 | 25.2 | 42.8 | 209.5 | 88.9 | 135.5 | 72.3 | 46.3 | 38.6 | 9.1 | 3.2 |
| Mean | 1.19 | 1.36 | 0.81 | 1.38 | 7.22 | 0.93 | 4.52 | 2.33 | 1.54 | 1.25 | 0.29 | 0.11 |
| Ac-ft | 73 | 81 | 50 | 85 | 416 | 57 | 269 | 143 | 92 | 77 | 18 | 6.3 |
| Calendar year 1959: Max 820 Min 0.8 Mean 7.48 Ac-ft 5,420 | | | | | | | | | | | | |
| Water year 1959-60: Max 148 Min 0 Mean 1.88 Ac-ft 1,370 | | | | | | | | | | | | |
| Peak discharge (base, 500 cfs).--Feb. 1 (8 p.m.) 966 cfs (7.38 ft). | | | | | | | | | | | | |
| a No gage-height record; discharge estimated on basis of recorded range in stage or interpolated. | | | | | | | | | | | | |

Source: U.S. Geological Survey, 1960, Surface Water Supply of the
 United States, Pacific Slope Basins in California, 1960, Water Supply
 Paper 1715, Part 11.

Table D-2 (continued)

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VENTURA RIVER BASIN

11-1185. Ventura River near Ventura, Calif.--Continued

| DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1960 TO SEPTEMBER 1961 | | | | | | | | | | | | |
|--|-------|-------|------|-------|----------|-------|-------|-------|-------|-------|-------|-------|
| DAY | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. |
| 1 | .20 | .70 | .10 | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | .30 | .70 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | .40 | .AC | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | .40 | .80 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | .70 | 9.3 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | .60 | .40 | .20 | 0 | 0 | .10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | .70 | 1.4 | .20 | 0 | 0 | .10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | .80 | 1.7 | .20 | 0 | 0 | .10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 1.0 | 1.6 | .20 | 0 | 0 | .10 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 1.0 | 1.4 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 1.0 | 1.1 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 1.0 | 3.7 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 1.0 | 1.7 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 1.90 | 1.4 | .10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | .90 | 1.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | .80 | .40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | .80 | .80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | .80 | .70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | .80 | .60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | .80 | .50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | .70 | .50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | .70 | .40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | .80 | .40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | .80 | .40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | .90 | .40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 | 1.0 | .50 | 0 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | 1.0 | .30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | .90 | .30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | .80 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | .70 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | .70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 23.70 | 75.10 | 2.50 | 3.7 | 0 | 0.40 | 0 | 0 | 0 | 0 | 0 | 0 |
| MEAN | .76 | 2.30 | .081 | .12 | 0 | .013 | 0 | 0 | 0 | 0 | 0 | 0 |
| MAX | 1.0 | .40 | .30 | 3.7 | 0 | .10 | 0 | 0 | 0 | 0 | 0 | 0 |
| MIN | .20 | .20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| AC-FT | 47 | 149 | 5.0 | 7.3 | 0 | .8 | 0 | 0 | 0 | 0 | 0 | 0 |
| CAL YR 1960: TOTAL 687.50 MEAN 1.88 MAX 148 MIN 0 AC-FT 1,360 | | | | | | | | | | | | |
| MAY YR 1961: TOTAL 105.40 MEAN .29 MAX 40 MIN 0 AC-FT 209 | | | | | | | | | | | | |
| DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1961 TO SEPTEMBER 1962 | | | | | | | | | | | | |
| DAY | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. |
| 1 | 0 | 0 | 0 | 0 | .4 | 37 | 6.3 | 5.5 | 8.2 | 4.4 | 2.1 | 1.3 |
| 2 | 0 | 0 | 32 | 0 | .4 | 33 | 5.2 | 6.3 | 8.8 | 4.4 | 1.5 | 1.4 |
| 3 | 0 | 0 | 3.2 | 0 | .5 | 21 | 5.2 | 5.8 | 9.2 | 4.4 | 1.6 | 1.4 |
| 4 | 0 | 0 | 0 | 0 | .5 | 21 | 6.1 | 4.7 | 8.8 | 4.2 | 2.1 | 1.4 |
| 5 | 0 | 0 | 0 | 0 | .6 | 26 | 6.5 | 6.1 | 8.2 | 4.2 | 2.3 | 2.1 |
| 6 | 0 | 0 | 0 | 0 | .6 | 57 | 7.2 | 6.6 | 8.5 | 5.2 | 2.3 | 2.3 |
| 7 | 0 | 0 | 0 | 0 | .8 | 40 | 6.2 | 7.6 | 8.8 | 5.5 | 1.6 | 2.1 |
| 8 | 0 | 0 | 0 | 0 | 610 | 28 | 3.9 | 6.2 | 9.2 | 5.2 | 1.5 | 1.2 |
| 9 | 0 | 0 | 0 | 0 | 1,350 | 27 | 6.4 | 13 | 9.5 | 5.2 | 1.3 | 2.3 |
| 10 | 0 | 0 | 0 | 0 | 9,100 | 24 | 6.0 | 13 | 9.5 | 6.7 | .90 | 2.3 |
| 11 | 0 | 0 | 0 | 0 | 9,420 | 21 | 5.2 | 9.8 | 9.5 | 4.4 | .80 | 2.1 |
| 12 | 0 | 0 | 0 | 0 | 2,520 | 18 | 5.2 | 11 | 8.8 | 4.2 | .90 | 1.8 |
| 13 | 0 | 0 | 0 | 0 | 922 | 12 | 6.4 | 11 | 8.5 | 4.7 | 1.1 | .80 |
| 14 | 0 | 0 | 0 | 0 | 193 | 7.6 | 6.2 | 12 | 8.2 | 5.2 | 1.1 | 1.5 |
| 15 | 0 | 0 | 0 | 0 | 1,340 | 7.2 | 3.9 | 11 | 8.2 | 4.7 | 1.1 | .30 |
| 16 | 0 | 0 | 0 | 0 | 321 | 7.2 | 3.9 | 8.8 | 7.9 | 4.2 | 1.0 | .40 |
| 17 | 0 | 0 | 0 | 0 | 120 | 7.6 | 3.9 | 8.5 | 7.9 | 4.7 | .90 | .70 |
| 18 | 0 | 0 | 0 | 0 | 76 | 7.9 | 3.7 | 8.8 | 7.6 | 4.2 | .90 | .80 |
| 19 | 0 | 0 | 0 | 0 | 1,450 | 7.6 | 3.7 | 8.8 | 7.2 | 4.4 | 1.2 | 1.0 |
| 20 | 0 | 24 | 0 | 4.1 | 329 | 6.9 | 3.7 | 8.5 | 7.2 | 6.2 | 1.6 | .30 |
| 21 | 0 | 0 | 0 | .20 | 201 | 7.4 | 3.7 | 6.5 | 6.4 | 3.7 | 2.1 | .20 |
| 22 | 0 | 0 | 0 | 10 | 130 | 13 | 3.7 | 6.2 | 6.1 | 4.2 | 1.6 | .20 |
| 23 | 0 | 0 | 0 | 20 | 94 | 16 | 3.7 | 6.5 | 6.3 | 3.9 | 1.5 | .30 |
| 24 | 0 | 0 | 0 | .20 | 70 | 6.4 | 3.7 | 6.2 | 6.1 | 3.9 | 1.5 | .90 |
| 25 | 0 | .10 | 0 | .20 | 61 | 6.3 | 3.9 | 6.2 | 6.3 | 3.7 | 1.8 | .40 |
| 26 | 0 | 0 | 0 | .20 | 52 | 6.6 | 4.2 | 6.5 | 5.8 | 3.7 | 2.0 | .40 |
| 27 | 0 | 0 | 0 | .20 | 44 | 6.8 | 4.2 | 6.5 | 3.0 | 3.0 | 2.3 | 1.6 |
| 28 | 0 | 0 | 0 | .20 | 41 | 6.4 | 4.2 | 6.5 | 5.0 | 2.8 | 2.5 | 1.1 |
| 29 | 0 | 0 | 0 | .20 | 41 | 6.4 | 4.2 | 6.5 | 4.4 | 2.8 | 2.5 | .40 |
| 30 | 0 | 0 | 0 | .30 | 41 | 6.9 | 3.7 | 8.2 | 4.4 | 2.8 | 2.5 | .20 |
| 31 | 0 | 0 | 0 | .30 | 41 | 6.9 | 3.7 | 7.9 | 4.4 | 2.8 | 2.3 | .20 |
| TOTAL | 0 | 24.10 | 35.2 | 34.10 | 28,949.8 | 506.0 | 136.0 | 244.7 | 223.9 | 179.6 | 50.40 | 33.40 |
| MEAN | 0 | .80 | 1.14 | 1.16 | 1,012 | 16.4 | 4.40 | 8.40 | 7.46 | 4.18 | 1.63 | 1.11 |
| MAX | 0 | .24 | .32 | .20 | 9,420 | 57 | 8.5 | 13 | 9.5 | 5.5 | 2.9 | 2.3 |
| MIN | 0 | 0 | 0 | 0 | .40 | 6.3 | 3.7 | 4.7 | 3.0 | 2.6 | .80 | .20 |
| AC-FT | 0 | .48 | .70 | .72 | 54,230 | 1,010 | 274 | 529 | 444 | 257 | 100 | .80 |
| CAL YR 1961: TOTAL 63.40 MEAN .17 MAX 32 MIN 0 AC-FT 126 | | | | | | | | | | | | |
| MAY YR 1962: TOTAL 29,794.20 MEAN 81.6 MAX 9,420 MIN 0 AC-FT 59,100 | | | | | | | | | | | | |

Source: U.S. Geological Survey, 1965, Surface Water Supply, California, 1960-1965, Water Supply Paper 1928, Part 11.

Table D-2 (continued)

VENTURA RIVER BASIN

591

11-1185. Ventura River near Ventura, Calif.--Continued

| DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1962 TO SEPTEMBER 1963 | | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| DAY | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | SEPT. |
| 1 | .20 | 1.8 | .50 | .70 | 2.5 | 2.0 | 3.5 | 3.9 | 6.3 | 2.6 | 1.4 |
| 2 | .10 | .30 | .40 | 1.3 | 1.8 | 2.0 | 3.5 | 4.2 | 5.0 | 1.5 | 1.5 |
| 3 | .50 | .40 | 1.8 | .60 | 1.8 | 2.6 | 3.5 | 3.5 | 4.7 | 2.1 | 1.9 |
| 4 | .50 | .30 | 1.0 | .50 | 1.9 | 1.8 | 3.5 | 3.7 | 4.4 | 1.2 | 2.5 |
| 5 | 2.2 | 2.3 | .60 | .50 | 1.0 | 3.0 | 3.5 | 4.4 | 4.2 | 1.1 | 2.6 |
| 6 | 1.9 | 1.0 | 1.3 | 1.3 | 1.5 | 3.7 | 3.5 | 4.4 | 3.7 | 1.0 | |
| 7 | .30 | .50 | .50 | .60 | 1.4 | 3.4 | 3.0 | 3.9 | 3.7 | 2.0 | 1.0 |
| 8 | 1.9 | 1.0 | .20 | .40 | 1.2 | 2.8 | 3.0 | 4.2 | 4.6 | 2.0 | 1.0 |
| 9 | 1.9 | 2.3 | .70 | 1.4 | 203 | 2.0 | 3.7 | 4.2 | 3.7 | 2.1 | 1.0 |
| 10 | 3.0 | 2.0 | .40 | 1.0 | 123 | 2.3 | 3.7 | 4.2 | 3.9 | 3.4 | 1.0 |
| 11 | 3.0 | 2.0 | .30 | .70 | 24 | 3.0 | 3.7 | 4.4 | 4.7 | 3.0 | 1.0 |
| 12 | 1.9 | 2.9 | .30 | .80 | 14 | 2.8 | 3.9 | 5.2 | 3.5 | 2.1 | 1.5 |
| 13 | .50 | 2.8 | 1.0 | 1.2 | 8.8 | 2.7 | 4.4 | 5.7 | 3.0 | 1.3 | 1.0 |
| 14 | .40 | 2.8 | 2.3 | 1.2 | 6.9 | 2.0 | 10 | 3.7 | 3.9 | 1.0 | 1.0 |
| 15 | 3.1 | 2.8 | 2.6 | 1.0 | 6.1 | 2.9 | 7.3 | 2.8 | 3.7 | 2.6 | 1.0 |
| 16 | 1.2 | 2.8 | 1.9 | .90 | 5.5 | 21 | 3.9 | 3.7 | 3.5 | 3.2 | 1.0 |
| 17 | .20 | 2.8 | .70 | .90 | 6.11 | 22 | 3.7 | 3.7 | 3.5 | 1.5 | 1.0 |
| 18 | 1.1 | 2.8 | .60 | .80 | 6.3 | 9.2 | 3.7 | 3.4 | 3.4 | 1.4 | 1.0 |
| 19 | 1.0 | 2.8 | 1.6 | .70 | 5.2 | 7.9 | 3.9 | 5.8 | 3.4 | 1.5 | 1.0 |
| 20 | 1.9 | 2.8 | .60 | .60 | 4.2 | 7.2 | 5.0 | 4.4 | 3.7 | 2.3 | 1.0 |
| 21 | 1.9 | 2.8 | .30 | .60 | 3.0 | 4.4 | 6.4 | 3.4 | 3.5 | 1.4 | 1.0 |
| 22 | 3.7 | 2.8 | .30 | .60 | 3.0 | 4.4 | 3.7 | 3.4 | 3.5 | 1.4 | 1.0 |
| 23 | 3.7 | 2.8 | .30 | .60 | 3.0 | 4.4 | 3.7 | 3.4 | 3.5 | 1.4 | 1.0 |
| 24 | 2.0 | 1.0 | .30 | .50 | 3.5 | 3.2 | 3.4 | 5.0 | 3.0 | 1.0 | 1.0 |
| 25 | 2.0 | .80 | 1.3 | .40 | 3.0 | 3.4 | 5.2 | 7.2 | 3.0 | 1.0 | 1.0 |
| 26 | 2.0 | 2.3 | 1.4 | .40 | 3.0 | 3.4 | 3.0 | 6.6 | 2.8 | 1.4 | 1.0 |
| 27 | 2.0 | 1.9 | .40 | .50 | 2.8 | 3.4 | 11 | 5.5 | 2.8 | 1.3 | 1.0 |
| 28 | 2.5 | .70 | .40 | .50 | 2.5 | 19 | 3.5 | 5.8 | 2.6 | 2.3 | 1.0 |
| 29 | 2.0 | .40 | 1.4 | .50 | | 9.7 | 3.5 | 6.6 | 3.4 | 1.3 | 1.0 |
| 30 | 3.0 | 1.4 | 1.3 | .60 | | 3.7 | 3.7 | 7.2 | 3.4 | 1.4 | 1.0 |
| 31 | 1.9 | | .70 | 6.1 | | 3.5 | | 6.6 | | 2.3 | 1.0 |
| TOTAL | 53.00 | 59.10 | 28.50 | 29.00 | 453.9 | 167.4 | 106.0 | 147.4 | 112.8 | 53.4 | 30.2 |
| MEAN | 1.71 | 1.97 | .92 | .94 | 16.2 | 5.40 | 3.53 | 4.75 | 3.76 | 1.79 | 1.00 |
| MAX | 3.7 | 2.8 | 2.6 | 6.1 | 203 | 22 | 30 | 7.2 | 6.3 | 3.4 | 2.5 |
| MIN | .10 | .30 | .20 | .40 | 1.2 | 2.0 | 3.4 | 2.8 | 2.0 | 1.0 | 1.0 |
| AC-FT | 105 | 117 | 57 | 58 | 960 | 332 | 329 | 292 | 224 | 110 | 73 |

CAL YR 1962: TOTAL 29,877.50 MEAN 61.9 MAX 9.420 MIN 0 AC-FT 99,240
 MAY YR 1963: TOTAL 1,311.00 MEAN 3.66 MAX 203 MIN 0 AC-FT 2,600

| DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1963 TO SEPTEMBER 1964 | | | | | | | | | | | |
|--|------|-------|------|-------|-------|------|-------|-------|------|------|-------|
| DAY | OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | SEPT. |
| 1 | 0 | 0 | 1.2 | .20 | .20 | .20 | 3.0 | .30 | .10 | | |
| 2 | 0 | 0 | 1.1 | .20 | .20 | .30 | .70 | .30 | .10 | | |
| 3 | 0 | 0 | 1.0 | .20 | .20 | .20 | .80 | .40 | .10 | | |
| 4 | 0 | 0 | .70 | .20 | .20 | .20 | .90 | 1.0 | .10 | | |
| 5 | 0 | 0 | .40 | .20 | .20 | .20 | 1.0 | 1.0 | .10 | | |
| 6 | 0 | 0 | .30 | .20 | .20 | .20 | .80 | .80 | .10 | | |
| 7 | 0 | 0 | .20 | .10 | .20 | .20 | .70 | .70 | .10 | | |
| 8 | 0 | 0 | .20 | .10 | .20 | .20 | .60 | .70 | .10 | | |
| 9 | 0 | 0 | .20 | 0 | .30 | .20 | .50 | .70 | .10 | | |
| 10 | 0 | 0 | .20 | 0 | .40 | .30 | .40 | .70 | 0 | | |
| 11 | 0 | 0 | .10 | 0 | .60 | .20 | .40 | .60 | 0 | | |
| 12 | 0 | 0 | .10 | 0 | .60 | .30 | .40 | .60 | 0 | | |
| 13 | 0 | 0 | .20 | 0 | .60 | .20 | .40 | .60 | 0 | | |
| 14 | 0 | 0 | .30 | 0 | .50 | .20 | .30 | .70 | .10 | | |
| 15 | 0 | 0 | .30 | 0 | .50 | .20 | .30 | .60 | .10 | | |
| 16 | 0 | 0 | .20 | 0 | .50 | .20 | .30 | .50 | .20 | | |
| 17 | 0 | 0 | .20 | 0 | .80 | .20 | .30 | .40 | .20 | | |
| 18 | 0 | 0 | .20 | 0 | .80 | .20 | .30 | .30 | .10 | | |
| 19 | 0 | 0 | .20 | 0 | .70 | .20 | .30 | .30 | .10 | | |
| 20 | 0 | 2.4 | .10 | 0 | .60 | .20 | .40 | .20 | .10 | | |
| 21 | 0 | 3.1 | .10 | 2.9 | .40 | .20 | 1.0 | .20 | .10 | | |
| 22 | 0 | .60 | .10 | 7.2 | .30 | 2.0 | .80 | .20 | 0 | | |
| 23 | 0 | .70 | .10 | .40 | .20 | 1.0 | .30 | .20 | 0 | | |
| 24 | 0 | .80 | .20 | .60 | .20 | .50 | .30 | .20 | 0 | | |
| 25 | 0 | 1.0 | .30 | .30 | .20 | .30 | .30 | .20 | 0 | | |
| 26 | 0 | 1.0 | .40 | .30 | .20 | .20 | .30 | .20 | 0 | | |
| 27 | 0 | 1.2 | .30 | .20 | .20 | .10 | .30 | .10 | 0 | | |
| 28 | 0 | 1.2 | .20 | .20 | .20 | .10 | .30 | .10 | 0 | | |
| 29 | 0 | 1.3 | .20 | .20 | .20 | .10 | .30 | .10 | 0 | | |
| 30 | 0 | 1.3 | .20 | .20 | .20 | .10 | .30 | .10 | 0 | | |
| 31 | 0 | | .20 | .20 | .20 | .40 | | .10 | | | |
| TOTAL | 0 | 34.30 | 9.70 | 13.90 | 10.60 | 9.30 | 17.00 | 13.10 | 1.90 | 0 | 0 |
| MEAN | 0 | 1.21 | .31 | .45 | .37 | .30 | .57 | .42 | .063 | 0 | 0 |
| MAX | 0 | 2.4 | 1.2 | 7.2 | .80 | 2.0 | 3.0 | 1.0 | .20 | 0 | 0 |
| MIN | 0 | 0 | .10 | 0 | .20 | .10 | .30 | .10 | 0 | 0 | 0 |
| AC-FT | 0 | 72 | 19 | 28 | 21 | 18 | 34 | 26 | 3.8 | 0 | 0 |

CAL YR 1963: TOTAL 1,218.40 MEAN 3.34 MAX 203 MIN 0 AC-FT 2,420
 MAY YR 1964: TOTAL 111.80 MEAN .31 MAX 24 MIN 0 AC-FT 222

Source: U.S. Geological Survey, 1965, Surface Water Supply, California, 1960-1965, Water Supply Paper 1928, Part 11.

Table D-2 (concluded)

VENTURA RIVER BASIN

225

11-1185. Ventura River near Ventura, Calif.

Location.--Lat 34°21'05", long 119°18'23", in southeast corner of Santa Ana Grant, on right bank 500 ft downstream from county highway bridge at Foster Memorial Park, 0.2 mile downstream from Coyote Creek, and 5 miles north of Ventura, Ventura County.

Drainage area.--188 sq mi.

Records available.--September 1911 to January 1914, October 1929 to September 1965; combined records of river and diversion, October 1932 to September 1965.

Gage.--Water stage recorder on river; water-stage recorder (digital) and Parshall flume on diversion. Altitude of gage is 200 ft (from topographic map). Prior to Jan. 18, 1914, chain gage at site 370 ft upstream at different datum (destroyed by flood). October 1929 to Nov. 2, 1949, at site 370 ft upstream at present datum.

Average discharge (river only).--38 years (1911-13, 1929-65), 54.2 cfs (39,240 acre-ft per year); median of yearly mean discharges, 21 cfs (15,200 acre-ft per year).
(combined).--33 years, 63.6 cfs (46,040 acre-ft per year); median of yearly mean discharges, 25 cfs (18,100 acre-ft per year).

Extremes (river only).--Maximum discharge during year, 744 cfs Apr. 9 (gage height, 11.43 ft); no flow for several months.
 1911-14, 1929-65: Maximum discharge, 39,200 cfs Mar. 2, 1938 (gage height, 19.2 ft), from rating curve extended above 7,700 cfs on basis of slope-area and contracted opening measurement of maximum flow; no flow at times in many years.
(combined).--Maximum discharge during year, 750 cfs Apr. 9; minimum daily 1.0 cfs Dec. 9.
 1932-65: Maximum discharge, 39,200 cfs Mar. 2, 1938; minimum daily, 0.1 cfs Sept. 3, 4, 13, 1961.

Remarks.--Combined records good; river records fair. Flow partly regulated since March 1948 by Matilija Reservoir (see p. 218) and since October 1959 by Casitas Reservoir (capacity, 267,000 acre-ft). Water diverted since May 1951 through pipeline at dam (Matilija Reservoir) to Ojai Valley for irrigation. Water diverted to Casitas Reservoir on Coyote Creek since January 1959. Diversion by City of Ventura for municipal supply began prior to 1911. For records of combined discharge of river and Ventura City diversion, see following page. Average discharge (river only) represents flow to ocean, regardless of upstream development.

Discharge, in cubic feet per second, water year October 1964 to September 1965

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|-------|------|------|------|------|-------|------|-------|------|-------|------|------|-------|
| 1 | | | 0 | 0.6 | 1.2 | 0.4 | 2.8 | 2.7 | 3.5 | 0.4 | 0.3 | |
| 2 | | | 0 | .8 | .5 | .4 | 3.4 | 2.7 | 2.5 | .4 | .3 | |
| 3 | | | 0 | 1.5 | .3 | .4 | 3.9 | 2.7 | 2.8 | .3 | .3 | |
| 4 | | | 0 | 2.0 | .3 | .3 | 7.7 | 2.7 | 3.2 | .8 | .3 | |
| 5 | | | 0 | 1.1 | .8 | .3 | 6.9 | 2.7 | 3.9 | 1.9 | .3 | |
| 6 | | | 0 | .7 | 1.2 | .3 | 16 | 2.6 | 5.5 | 1.1 | .2 | |
| 7 | | | 0 | 2.0 | 1.4 | .3 | 15 | 2.6 | 7.6 | .6 | .2 | |
| 8 | | | 0 | 1.3 | 1.4 | .4 | 6.4 | 2.6 | 6.9 | .4 | .2 | |
| 9 | | | 0 | .9 | 1.6 | .4 | 179 | 2.6 | 3.5 | .3 | .2 | |
| 10 | | | 0 | .8 | 1.3 | .4 | 68 | 2.6 | 1.5 | .2 | .3 | |
| 11 | | | 0 | 1.3 | .8 | .4 | 35 | 2.5 | 2.1 | .2 | .3 | |
| 12 | | | 0 | 2.1 | .8 | .4 | 25 | 2.5 | 6.3 | .2 | .3 | |
| 13 | | | 0 | 1.0 | .8 | .4 | 21 | 2.5 | 5.2 | .2 | .2 | |
| 14 | | | 0 | .5 | .8 | .6 | 16 | 2.5 | 4.7 | .2 | .2 | |
| 15 | | | 0 | .3 | .7 | .4 | 13 | 2.8 | 3.5 | .1 | .2 | |
| 16 | | | 0 | .2 | .7 | .4 | 18 | 3.0 | 1.4 | .1 | .2 | |
| 17 | | | 0 | .2 | .7 | .4 | 13 | 3.2 | .8 | .1 | .2 | |
| 18 | | | 0 | .1 | .7 | .4 | 12 | 3.1 | 1.6 | .1 | .2 | |
| 19 | | | 2 | 0 | .5 | .4 | 11 | 2.6 | 5.5 | .1 | .2 | |
| 20 | | | 55 | 0 | .5 | .4 | 11 | 2.8 | 3.5 | .1 | .2 | |
| 21 | | | .6 | 0 | .5 | .4 | 6.6 | 2.8 | 2.5 | .1 | .2 | |
| 22 | | | .3 | 0 | .5 | .6 | 4.2 | 2.6 | 1.1 | .1 | .2 | |
| 23 | | | .3 | 0 | .4 | .6 | 4.7 | 2.6 | 1.0 | .1 | .2 | |
| 24 | | | .2 | 0 | .4 | .6 | 4.4 | 2.6 | .8 | .1 | .2 | |
| 25 | | | .2 | 0 | .4 | .5 | 5.0 | 2.8 | 1.0 | .2 | .2 | |
| 26 | | | .2 | .2 | .3 | .5 | 5.5 | 3.1 | 2.1 | .4 | .2 | |
| 27 | | | .5 | .3 | .3 | .5 | 6.6 | 2.5 | 2.1 | .6 | .1 | |
| 28 | | | .4 | .6 | .3 | .6 | 5.5 | 4.2 | 1.4 | .4 | .1 | |
| 29 | | | .4 | 1.1 | ----- | .9 | 3.2 | 5.8 | .7 | .4 | .1 | |
| 30 | | | .5 | 1.4 | ----- | 1.0 | 2.7 | 5.8 | .5 | .4 | .1 | |
| 31 | | | .6 | 1.4 | ----- | 1.9 | ----- | 5.2 | ----- | .3 | .1 | ----- |
| Total | 0 | 0 | 59.4 | 22.4 | 20.1 | 15.9 | 590.1 | 94.0 | 88.7 | 10.9 | 6.5 | 0 |
| Mean | 0 | 0 | 1.92 | 0.72 | 0.72 | 0.51 | 19.7 | 3.03 | 2.96 | 0.35 | 0.21 | 0 |
| Ac-ft | 0 | 0 | 118 | 44 | 40 | 32 | 1,170 | 186 | 176 | 22 | 13 | 0 |

Calendar year 1964 Max 55 Min 0 Mean 0.34 Ac-ft 248
 Water year 1964-65 Max 179 Min 0 Mean 2.49 Ac-ft 1,800.

Peak discharge (base, 500 cfs).--Apr. 9 (1700 hrs) 744 cfs (11.43 ft).

Source: U.S. Geological Survey, 1965, Surface Water Supply, California, 1960-1965, Water Supply Paper 1928, Part 11.

Casitas Municipal Water District

INTER-DEPARTMENTAL MEMORANDUM

DATE: April 10, 1978
TO: Job File
FROM: Water Quality Supervisor *RAC*
SUBJECT: VENTURA RIVER E.I.R. - OBSERVATIONS OF CONDITIONS IN VENTURA RIVER -
SUMMER AND FALL 1977

During the summer and fall of 1977, I made several flow measurements and observed conditions in the "live" stretch of the Ventura River between its confluence with San Antonio Creek and Casitas Springs. Following is a summary of conditions which I noted on specific dates:

September 14, 1977:

- (1) Ventura River approximately 200' below its confluence with San Antonio Creek - 2:20 p.m.

Measured 1.15 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

Approximately 50 percent of the flow appeared to be rising water in San Antonio Creek. Rising water occurred in a reach of San Antonio Creek within 100' of its confluence with the river.

Approximately 50 percent of the flow appeared to be rising water in the Ventura River. Rising water in Ventura River occurred in a reach of the river within 300' of its confluence with San Antonio Creek.

- (2) Ventura River approximately 200' below southern end of Riverside Rancho Trailer Park - Casitas Springs - 3:05 p.m.

Measured 3.08 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

Flow was measured in a riffle at the downstream end of a large pool. This pool was approximately 300' long with an average width of approximately 30'. Pool contains large areas of watercress and other aquatic growth. Several large crayfish and many small (1-3") fish were noted.

The flow ceased approximately 600-800' above the City of San Buenaventura's diversion facilities.

October 12, 1977:

- (1) Ventura River approximately 200' below its confluence with San Antonio Creek - 10:25 a.m.

Measured 0.75 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

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Page 2
April 10, 1978

Approximately 25 percent of the flow appeared to be water which was "rising" in San Antonio Creek within 50' of its confluence with the Ventura River.

Approximately 75 percent of the flow appeared to be water which was rising in the Ventura River within 200' of its confluence with the Ventura River.

- (2) Ventura River approximately 200' below southern end of Riverside Rancho Trailer Park - Casitas Springs - 11 a.m.

Measured 2.04 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

The large pool in back of the trailer park remains in much the same condition as noted in September. Watercress, crayfish and small (1-3") fish are abundant.

The flow ceases approximately 1,000'± above the City of San Buenaventura's diversion facilities.

November 8, 1977

- (1) Ventura River approximately 200' below its confluence with San Antonio Creek - 11:30 a.m.

Measured 0.28 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

Flow was rising in Ventura River above confluence and San Antonio Creek above confluence. Estimated 0.05 cfs at the confluence. Most of the flow came from rising water in the 200' stretch between the confluence and the measuring point.

- (2) Ventura River approximately 200' below the southern end of Riverside Rancho Trailer Park - Casitas Springs - 11:55 a.m.

Measured 0.80 cfs with a standard "Price" current meter. This should be a "good" measurement ($\pm 5\%$).

Conditions in the large pool in back of the trailer park are similar to those noted in September and October.

Flow ceases 1,000'± above the City of San Buenaventura's diversion facilities.

November 9, 1977

Water sample was collected for general mineral analysis and analyzed by Fruit Growers Laboratory in Santa Paula. A copy is attached.

December 8, 1977

- (1) Ventura River approximately 200' below its confluence with San Antonio Creek - 1:05 p.m.

There was no flow or standing water at the measuring point. There was standing

Job File
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April 10, 1978

water in the Ventura River from its confluence with San Antonio Creek to a point approximately 50' above the measuring point. Standing water began again approximately 30' below the measuring point. The first flow was noted approximately 200' below the measuring point. There appeared to be continuous flow from here to below the Riverside Rancho Trailer Park.

There was one standing pool approximately 50' below the measuring point which contained several dozen fish. Many of these were 3-4" long trout. At least two trout 8-10" long were in the pool. Several crayfish were also present. No fish were seen between the pool and 300' downstream.

(2) Ventura River approximately 200' below the southern end of the Riverside Rancho Trailer Park - 1:30 p.m.

Measured 0.16 cfs with a "Price" pygmy current meter. This should have been a "good" measurement ($\pm 5\%$).

The area with the highest rate of flow appeared to be approximately 200' upstream. The large pools were still standing. Aquatic growth (watercress, etc.) was dying off and appeared to be causing stagnation. Some of this die-off appeared to be from seasonal effects and some was obviously due to lowered water levels. Some very small (approximately 1") fish were observed. Only dead crayfish were seen.

Attachment

Copy to: EDAW, Inc. ✓
General Manager and Chief Engineer
Assistant General Manager
Engr. - 2
File (A)

WATER ANALYSIS REPORT

OWNER - Casitas Municipal Water District
SAMPLER - LR
LAB. NO. - 38002-4
DATE SUBMITTED - November 9, 1977
ANALYSIS REPORTED - November 14, 1977

MATERIAL Ventura River near Riverside Rancho Trailer Park
Sampled: 11/9/77

| | MILLIGRAM EQUIVALENTS PER LITER | MILLIGRAMS PER LITER | % | MILLIGRAMS PER LITER |
|---------------------------------|---------------------------------------|-------------------------|------|----------------------------|
| CALCIUM (Ca) | 6.1 | 122 | 55.5 | Boron 0.5 |
| MAGNESIUM (Mg) | 2.7 | 33 | 24.5 | Fluoride 0.5 |
| SODIUM (Na) | 2.2 | 50 | 20.0 | Iron less than 0.1 |
| POTASSIUM (K) | | | | Manganese less than 0.05 |
| CARBONATE (CO ₃) | None Detected | | | |
| BICARBONATE (HCO ₃) | 4.3 | 262 | 32.8 | |
| CHLORIDE (Cl) | 1.2 | 41 | 11.1 | |
| SULPHATE (SO ₄) | 5.3 | 253 | 49.1 | |
| NITRATE (NO ₃) | None Detected | | | |
| NITRATE -N (NO ₃ -N) | | | | |
| TOTAL DISSOLVED SOLIDS | 1. Summation | 761 | | 2. Residue @ 103° C 755 |

pH 8.0
EC X 10-6 at 25° C 1000

HARDNESS Grains Per Gallon (as Ca CO₃)

Calcium 17.8
Magnesium 7.9
Total Hardness 25.7

These results were obtained by following standard laboratory procedures; the liability of the corporation shall not exceed the amount paid for this report.

Appendix E: Terrestrial Wildlife

Appendix E

TERRESTRIAL WILDLIFE

A representative list of vertebrate terrestrial wildlife species known or expected to inhabit or visit the Ventura River floodplain, upland, and coastal habitats.

MAMMALS

| Common Name | Scientific Name | Notes |
|---------------------------------|---|-------|
| Common opossum | <i>Didelphis marsupialis</i> | 2 |
| Ornate shrew | <i>Sorex ornatus</i> | |
| California myotis | <i>Myotis californicus</i> | |
| Fringed myotis | <i>Myotis thysanodes</i> | |
| Long-eared myotis | <i>Myotis evotis</i> | |
| Silvery-haired bat | <i>Lasionycteris noctivagans</i> | |
| Hoary bat | <i>Lasiurus cinereus</i> | |
| Red bat | <i>Lasiurus borealis</i> | |
| Big brown bat | <i>Eptesicus fuscus</i> | |
| Brazilian free-tailed bat | <i>Tadarida brasiliensis</i> | |
| Black-tailed rabbit | <i>Lepus californicus</i> | |
| Brush rabbit | <i>Sylvilagus bachmani</i> | |
| Audubon cottontail | <i>Sylvilagus audubonii</i> | |
| Beechy (Calif.) ground squirrel | <i>Otospermophilus beecheyi</i> | |
| Sonoma chipmunk | <i>Eutamias sonomae</i> | |
| Merriam chipmunk | <i>Eutamias merriami</i> | |
| Botta pocket gopher | <i>Thomomys bottae</i> | |
| Little pocket mouse | <i>Perognathus longimembris</i> | |
| Heerman kangaroo rat | <i>Dipodomys heermanni</i> | |
| Big-eared kangaroo rat | <i>Dipodomys elephantinus</i> | |
| Western harvest mouse | <i>Reithrodontomys megalotis</i> | |
| California mouse | <i>Peromyscus californicus</i> | |
| Brush mouse | <i>P. boylii</i> | |
| Deer mouse | <i>P. maniculatus</i> | |
| Dusky-footed wood rat | <i>Neotoma fuscipes</i> | |
| Gray fox | <i>Urocyon cinereoargenteus</i> | |
| Coyote | <i>Canis latrans</i> | |
| Ringtail | <i>Bassariscus astutus</i> | 2 |
| Long-tailed weasel | <i>Mustela frenata</i> | 2 |
| Badger | <i>Taxidea taxus</i> | |
| Spotted skunk | <i>Spilogale putorius</i> | 2 |
| Mountain lion | <i>Felis concolor</i> | |
| Bobcat | <i>Lynx rufus</i> | |
| California mule deer | <i>Odocoileus hemionus californicus</i> | |
| Broad-handed mole | <i>Scapanus latimanus</i> | |
| Raccoon | <i>Procyon lotor</i> | 2 |
| Striped skunk | <i>Mephitis mephitis</i> | |
| Small-footed myotis | <i>Myotis ubulatus</i> | |
| Western mastiff bat | <i>Eumops perotis</i> | |
| Western pipistrelle | <i>Pipistrellus hesperus</i> | |
| Pallid bat | <i>Antrozous pallidus</i> | |
| Lump-nosed bat | <i>Plecotus townsendii</i> | |
| Western gray squirrel | <i>Sciurus griseus</i> | |
| California pocket mouse | <i>Perognathus californicus</i> | |
| California meadow mouse | <i>Microtus californicus</i> | |
| House mouse | <i>Mus musculus</i> | |
| Yuma myotis | <i>Myotis yumanensis</i> | |
| Gray shrew | <i>Notiosorex crawfordi</i> | |
| Little brown myotis | <i>Myotis lucifugus</i> | |

BIRDS

| Common Name | Scientific Name | Notes |
|---|----------------------------------|-------|
| House sparrow | <i>Passer domesticus</i> | |
| Western meadowlark | <i>Sturnella neglecta</i> | |
| Red-winged blackbird | <i>Agelaius phoeniceus</i> | |
| Brewer's blackbird | <i>Euphagus cyanocephalus</i> | |
| Brown-headed cowbird | <i>Molothrus ater</i> | |
| Bullock's oriole | <i>Icterus bullockii</i> | |
| Lazuli bunting | <i>Passerina amoena</i> | |
| House finch | <i>Carpodacus mexicanus</i> | |
| American goldfinch | <i>Spinus tristis</i> | |
| Lesser goldfinch | <i>Spinus psaltria</i> | |
| Rufous-sided towhee | <i>Pipilo erythrophthalmus</i> | |
| Brown towhee | <i>Pipilo fuscus</i> | |
| Savannah sparrow | <i>Passerculus sandwichensis</i> | |
| Vesper sparrow | <i>Pooecetes gramineus</i> | |
| Lark sparrow | <i>Chondestes grammacus</i> | |
| Slate-colored junco | <i>Junco hyemalis</i> | |
| Rufous-crowned sparrow | <i>Aemophila ruficeps</i> | |
| Chipping sparrow | <i>Spizella passerina</i> | |
| Black-chinned sparrow | <i>S. atrogularis</i> | |
| White-crowned sparrow | <i>Zonotrichia leucophrys</i> | |
| Gold-crowned sparrow | <i>Z. atricapilla</i> | |
| Fox sparrow | <i>Passerella iliaca</i> | |
| Song sparrow | <i>Melospiza melodia</i> | |
| Black-crowned night heron | <i>Nycticorax nycticorax</i> | 2 |
| Common egret | <i>Casmerodius albus</i> | 2 |
| Snowy egret | <i>Leucophoyx thula</i> | 2 |
| Turkey vulture | <i>Cathartes aura</i> | |
| Golden eagle | <i>Aquila chrysaetos</i> | |
| Southern bald eagle | <i>Haliaeetus leucocephalus</i> | 1,3 |
| White-tailed kite | <i>leucocephalus</i> | |
| Sparrow hawk | <i>Elanus leucurus</i> | |
| Red-tailed hawk | <i>Falco sparverius</i> | |
| Sharp-skinned hawk | <i>Buteo jamaicensis</i> | |
| California quail | <i>Accipiter striatus</i> | |
| Mountain quail | <i>Lophortyx californicus</i> | |
| Band-tailed pigeon | <i>Oreortyx pictus</i> | |
| Great horned owl | <i>Columba fasciata</i> | |
| Screech owl | <i>Bubo virginianus</i> | |
| Short-eared owl | <i>Otus asio</i> | 2 |
| Poor-will | <i>Asio flammeus</i> | |
| Calliope hummingbird | <i>Phalaenoptilus nuttali</i> | |
| Anna's hummingbird | <i>Stellula calliope</i> | |
| Red-shafted flicker | <i>Calypte anna</i> | |
| Acorn woodpecker and several other woodpecker species | <i>Colaptes cafer</i> | |
| | <i>Melanerpes formicivorus</i> | |

BIRDS (Continued)

| Common Name | Scientific Name | Notes |
|-----------------------------|---------------------------------------|-------|
| Western kingbird | <i>Tyrannus verticalis</i> | |
| Black phoebe | <i>Sayornis nigricans</i> | |
| Traill's flycatcher | <i>Empidonax traillii</i> | 2 |
| Western wood peewee | <i>Contopus sordidulus</i> | |
| Violet-green swallow | <i>Tachycineta thalassina</i> | |
| Cliff swallow | <i>Petrochelidon pyrrhonota</i> | |
| Scrub jay | <i>Aphelocoma coerulescens</i> | |
| Crow | <i>Corvus brachyrhynchos</i> | |
| Bushtit | <i>Psaltiriparus minimus</i> | |
| Wrentit | <i>Chamaea fasciata</i> | |
| White-breasted nuthatch | <i>Sitta carolinensis</i> | |
| House wren | <i>Troglodytes aedon</i> | |
| Bewick's wren | <i>Thryomanes bewickii</i> | |
| Long-billed marsh wren | <i>Telmatodytes palustris</i> | 2 |
| Mockingbird | <i>Mimus polyglottos</i> | |
| California thrasher | <i>Toxostoma redivivum</i> | |
| Western bluebird | <i>Sialia mexicana</i> | |
| Blue-gray gnatcatcher | <i>Polioptila caerulea</i> | |
| Ruby-crowned kinglet | <i>Regulus calendula</i> | |
| Loggerhead shrike | <i>Lanius ludovicianus</i> | |
| Starling | <i>Sturnus vulgaris</i> | |
| Orange-crowned warbler | <i>Vermivora celata</i> | |
| Audubon's warbler | <i>Dendroica auduboni</i> | |
| Black-throated gray warbler | <i>Dendroica nigrescens</i> | |
| Osprey | <i>Pandion haliaetus carolinensis</i> | 2 |
| Redhead | <i>Aythya americana</i> | 2 |
| California condor | <i>Gymnogyps californianus</i> | 1, 3 |
| Foster's tern | <i>Sterna forsteri</i> | 2 |
| Mourning dove | <i>Zenaidura macroura</i> | |
| Roadrunner | <i>Geococcyx californianus</i> | |
| Robin | <i>Turdus migratorius</i> | |
| Hermit thrush | <i>Itylocichla guttata</i> | |
| Phainopepla | <i>Phainopepla nitens</i> | |
| Oregon junco | <i>Junco oreganus</i> | |
| Lincoln's sparrow | <i>Melospiza lincolni</i> | |
| Double-crested cormorant | <i>Phalacrocorax auritus</i> | 2 |
| Gadwall | <i>Anas strepera</i> | 2 |
| Wood duck | <i>Aix sponsa</i> | 2 |
| Marsh hawk | <i>Circus syaneus</i> | |
| Ring-necked pheasant | <i>Phasianus colchicus</i> | |
| Common gallinule | <i>Gallinula chloropus</i> | 2 |
| Sora rail | <i>Porzana carolina</i> | 2 |
| Spotted sandpiper | <i>Actitis macularis</i> | 2 |
| Greater yellowlegs | <i>Totanus melanoleucus</i> | 2 |
| American coot | <i>Fulica americana</i> | 2 |
| Lesser yellowlegs | <i>Totanus flavipes</i> | 2 |

BIRDS (Continued)

| <u>Common Name</u> | <u>Scientific Name</u> | <u>Notes</u> |
|--------------------------|--------------------------------------|--------------|
| Least sandpiper | <i>Erolia minutilla</i> | 2 |
| Short-billed dowitcher | <i>Limnodromus ariseus</i> | 2 |
| Long-billed dowitcher | <i>Limnodromus scolopaceus</i> | 2 |
| Western sandpiper | <i>Ereunetes mauri</i> | 2 |
| Glaucous-winged gull | <i>Larus glaucescens</i> | 2 |
| California gull | <i>Larus californicus</i> | 2 |
| Ring-billed gull | <i>Larus delawarensis</i> | 2 |
| Burrowing owl | <i>Speotyto cunicularia</i> | |
| Purple finch | <i>Carpodacus purpureus</i> | |
| Lawrence's goldfinch | <i>Spinus lawrencei</i> | |
| Yellow-bellied sapsucker | <i>Sphyrapicus varius</i> | |
| Downy woodpecker | <i>Dendrocopos pubescens</i> | |
| Nuttall's woodpecker | <i>Dendrocopos nuttallii</i> | |
| Cassin's kingbird | <i>Tyrannus vociferans</i> | |
| Say's phoebe | <i>Sayornis saya</i> | |
| Brown creeper | <i>Certhia familiaris</i> | |
| Rock wren | <i>Salpinctes obsoletus</i> | |
| Cactus wren | <i>Campylorhynchus brunneipillum</i> | |
| Water pipit | <i>Anthus spinoletta</i> | 2 |
| Cedar waxwing | <i>Bombycilla cedrorum</i> | |
| Hutton's vireo | <i>Vireo huttoni</i> | |
| Bell's vireo | <i>Vireo bellii</i> | 2,3 |
| Warbling vireo | <i>Vireo gilvus</i> | |
| California least tern | <i>Sterna albifrons browni</i> | 2,3 |
| Myrtle warbler | <i>Dendroica coronata</i> | |
| Townsend's warbler | <i>Dendroica townsendi</i> | |
| Yellow-breasted chat | <i>Icteria virens</i> | 2,3 |
| Tri-colored blackbird | <i>Agelaius tricolor</i> | |
| Scott's oriole | <i>Icterus parisorum</i> | |
| Western tanager | <i>Piranga ludoviciana</i> | |
| White-throated sparrow | <i>Zonotrichia albicollis</i> | |

REPTILES

| Common Name | Scientific Name | Notes |
|-------------------------------|-----------------------------------|-------|
| Western pond turtle | <i>Clemmys marmorata</i> | 2 |
| Western fence lizard | <i>Sceloporus occidentalis</i> | |
| Side-blotched lizard | <i>Uta stansburiana</i> | |
| Coast horned lizard | <i>Phrynosoma coronatum</i> | |
| Western skink | <i>Eumeces skiltonianus</i> | |
| Western whiptail | <i>Chemidophorus tigris</i> | |
| Southern alligator lizard | <i>Gerrhonotus multicarinatus</i> | |
| Striped racer | <i>Masticophis lateralis</i> | |
| Coachwhip | <i>Masticophis flagellum</i> | |
| Racer | <i>Coluber constrictor</i> | |
| Gopher snake | <i>Pituophis melanoleucus</i> | |
| California mountain kingsnake | <i>Lampropeltis zonata</i> | |
| Common kingsnake | <i>Lampropeltis getulus</i> | 2 |
| Common garter snake | <i>Thamnophis sirtalis</i> | 2 |
| Western aquatic garter snake | <i>Thamnophis couchi</i> | 2 |
| Night snake | <i>Hypsiglena torquata</i> | |
| Western rattlesnake | <i>Crotalis viridis</i> | |
| California newt | <i>Taricha torosa</i> | |
| Ensatina | <i>Ensatina eschscholtzi</i> | |
| California slender salamander | <i>Batrachoseps attenuatus</i> | |
| Arboreal salamander | <i>Aneides lugubris</i> | |
| Western spadefoot toad | <i>Scaphiopus hammondi</i> | |
| Western toad | <i>Bufo boreas</i> | |
| Southwestern toad | <i>Bufo microscaphus</i> | |
| Pacific treefrog | <i>Flyla regilla</i> | 2 |
| Red-legged frog | <i>Rana aurora</i> | 2 |
| Foothill yellow-legged frog | <i>Rana boylei</i> | 2 |
| Bullfrog | <i>Rana catesbeiana</i> | 2 |

NOTES

1. Rare or endangered species.
2. Species largely restricted to, highly dependent upon, and/or most commonly associated with riparian, marsh, and aquatic habitats.
3. See text for further discussion of this species.

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Appendix F: Terrestrial Vegetation

Appendix F

TERRESTRIAL VEGETATION

A representative list of common plant species occurring in the Ventura River floodplain, upland, and coastal habitats.

RIPARIAN

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------|--|
| Cattail | <i>Typha domingensis</i> |
| Three-square bulrush | <i>Scirpus Olneyi</i> |
| Giant reed | <i>Arundo donax</i> |
| Arroyo willow | <i>Salix lasiolepis</i> |
| Black cottonwood | <i>Populus trichocarpa</i> |
| Fremont cottonwood | <i>Populus fremontii</i> |
| Mule fat | <i>Baccharis viminea</i> |
| Tree tobacco | <i>Nicotiana glauca</i> |
| Russian thistle | <i>Salsola pestifers</i> |
| Cocklebur | <i>Xanthium strumarium</i> |
| Gourd (calabazilla) | <i>Cucurbita foetidissima</i> |
| Western sycamore | <i>Platanus racemosa</i> |
| Pigweeds | <i>Chenopodium spp. & Amaranthus</i> |
| Red willow | <i>Salix laevigata</i> |
| Sandbar willow | <i>Salix hindsiana</i> |
| White alder | <i>Alnus rhombifolia</i> |
| Creek nettle | <i>Urtica holosericea</i> |
| Water cress | <i>Nasturtium officinale</i> |
| White sweet clover | <i>Melilotus alba</i> |
| Western ragweed | <i>Ambrosia psilostachya</i> |
| Brome grass | <i>Bromus spp.</i> |
| Black medic | <i>Medicago lupulina</i> |
| Clover | <i>Trifolium spp.</i> |
| Sages | <i>Salvia spp.</i> |
| Horseweed | <i>Erigeron canadensis</i> |
| Eucalyptus | <i>Eucalyptus spp.</i> |
| California Buckwheat | <i>Erigonum fasciculatum</i> |
| Castor bean | <i>Ricinus communis</i> |
| Mustard | <i>Brassica campestris</i> |
| Jimson weed | <i>Datura meteloides</i> |
| Cheeseweed | <i>Malva parviflora</i> |
| Smartweed | <i>Polygonum spp.</i> |
| Bermuda grass | <i>Cynodon dactylon</i> |

OAK SAVANNAH AND GRASSLAND

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|--------------------------------|
| Coastal live oak | <i>Quercus agrifolia</i> |
| Valley oak | <i>Quercus lobata</i> |
| California walnut | <i>Juglans californica</i> |
| Lemonade sumac | <i>Rhus integrifolia</i> |
| Sugar sumac | <i>Rhus ovata</i> |
| Toyon | <i>Heteromeles arbutifolia</i> |

OAK SAVANNAH AND GRASSLAND (Continued)

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|----------------------------|
| Coyote brush | <i>Baccharis pilularis</i> |
| Wild oat | <i>Avena fatua</i> |
| Foxtail brome | <i>Bromus rubens</i> |
| Soft cheat | <i>Bromus mollis</i> |
| Six-weeks fescue | <i>Festuca octoflora</i> |
| Ceanothus | <i>Ceanothus</i> spp. |

COASTAL SAGE SCRUB

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------|-------------------------------|
| California sagebrush | <i>Artemisia californica</i> |
| Buckwheat brush | <i>Eriogonum fasciculatum</i> |
| Purple sage | <i>Salvia leucophylla</i> |
| California encelia | <i>Encelia californica</i> |
| Black sage | <i>Salvia mellifera</i> |
| Eriophyllum | <i>Eriophyllum</i> spp. |
| Prickly-pear | <i>Opuntia</i> spp. |
| Nolina | <i>Nolina</i> spp. |
| Horkelia | <i>Horkelia cuneata</i> |
| Yerba Santa | <i>Eriodictyon</i> spp. |

OAK WOODLAND

| <u>Common Name</u> | <u>Scientific Name</u> |
|------------------------------|----------------------------------|
| Southern Calif. black walnut | <i>Juglans californica</i> |
| Sycamore | <i>Platanus racemosa</i> |
| Big cone spruce | <i>Pseudotsuga maerocarpa</i> |
| Oaks | <i>Quercus</i> spp. |
| Lemonade berry | <i>Rhus integrifolia</i> |
| Sugar bush | <i>Rhus ovata</i> |
| Currants | <i>Ribes</i> spp. |
| California laurel | <i>Umbrellularia californica</i> |

CHAPARRAL

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|--------------------------------|
| Chamise | <i>Adenostoma fasciculatum</i> |
| Manzanitas | <i>Arctostaphylos</i> spp. |
| Wild lilacs | <i>Ceanothus</i> spp. |

CHAPARRAL (Continued)

| <u>Common Name</u> | <u>Scientific Name</u> |
|----------------------|--------------------------------|
| Toyon | <i>Heteromeles arbutifolia</i> |
| Penstemons | <i>Penstemon</i> spp. |
| California scrub oak | <i>Quercus dumosa</i> |
| Coffee berry | <i>Rhamnus californica</i> |
| Poison oak | <i>Rhus diversiloba</i> |
| Sugar bush | <i>Rhus ovata</i> |

SALTWATER MARSH AND ESTUARINE

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|--------------------------|
| Pickleweeds | <i>Salicornia</i> spp. |
| Common Tule | <i>Scirpus acutus</i> |
| Sea bite | <i>Sueda californica</i> |
| Salt grass | <i>Distichis spicata</i> |
| Cord grass | <i>Spartina foliosa</i> |

FRESHWATER MARSH

| <u>Common Name</u> | <u>Scientific Name</u> |
|--------------------|-----------------------------|
| Common tule | <i>Scirpus acutus</i> |
| California bulrush | <i>Scirpus californicus</i> |
| Cattails | <i>Typus</i> spp. |
| Spike rushes | <i>Eleocharis</i> spp. |
| Pondweeds | <i>Potamogeton</i> spp. |
| Sedges | <i>Carex</i> spp. |

COASTAL STRAND

| <u>Common Name</u> | <u>Scientific Name</u> |
|---------------------|---|
| Mock heather | <i>Haplopappus ericoides</i> |
| Sea rocket | <i>Cakile maritima</i> |
| Sand verbena | <i>Abronia</i> |
| Beach morning glory | <i>Convolvulus soldanella</i> |
| Jaumea | <i>Jaumea carnosa</i> |
| Sea fig | <i>Mesembryanthemum chilense</i> |
| Beach primrose | <i>Oenothera cheiranthifolia suffruticosa</i> |
| Sea spinach | <i>Tetragonia expansa</i> |
| Silver beach weed | <i>Franseria chamissonis bipinnatisecta</i> |

NOTE TO APPENDIX F:

1. Although a given species may be listed as representative of a particular habitat, it may also occur in several others.

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