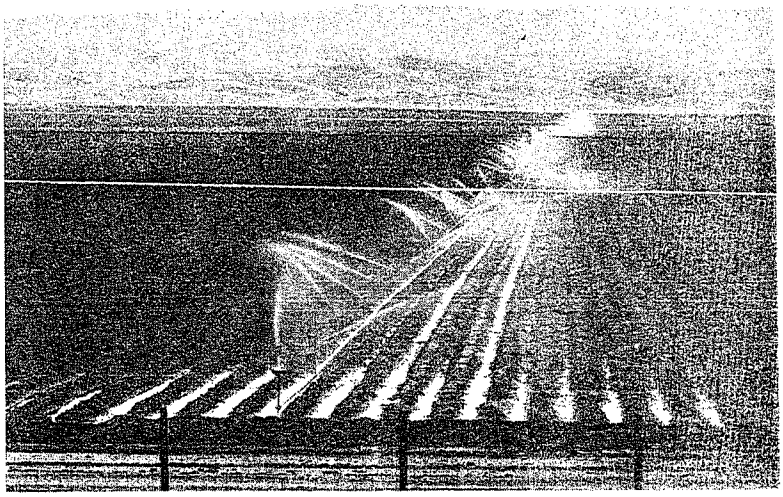
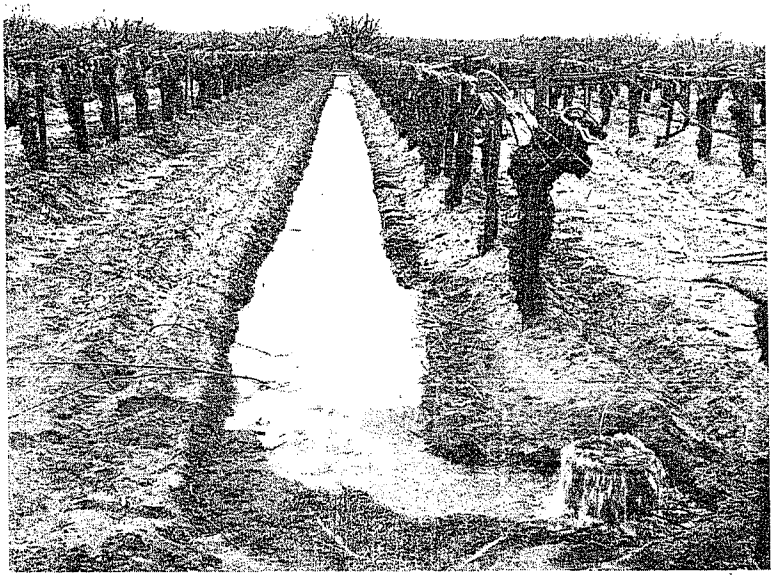
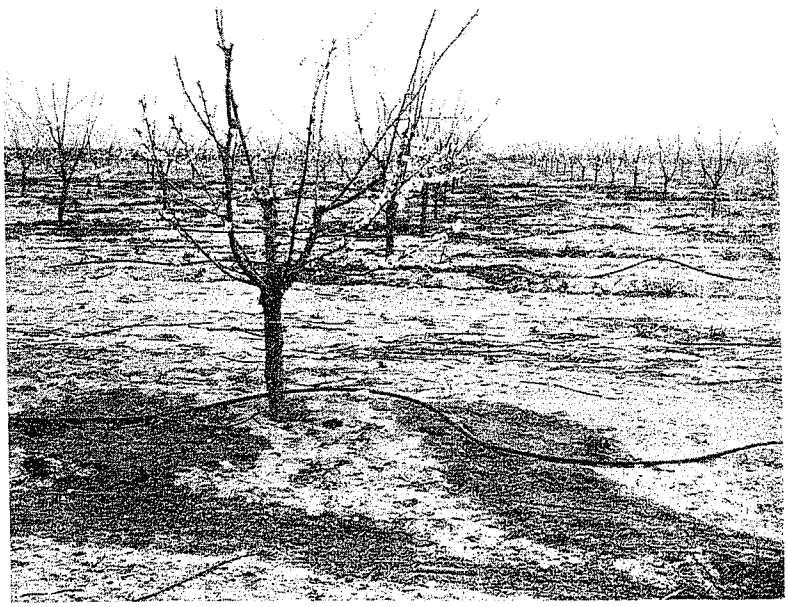
BULLETIN NO. 113-3

APRIL 1975

VEGETATIVE WATER USE IN CALIFORNIA, 1974







STATE OF CALIFORNIA

THE RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

On the Cover

EARLY SPRING IRRIGATION IN SOUTHERN SAN JOAQUIN VALLEY

(Upper left)

Pre-irrigation by hand-move sprinklers before a spring crop is planted

(Upper right)

Water flowing from an underground pipeline riser into a shallow wide bottom furrow irrigates a vineyard

(Lower left)

Drip irrigation of young pistachio trees

(Lower right)

Hand-move sprinkler lines placed between rows of peach trees

Photos by Department of Water Resources

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3rd Printing: December 1981

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GOVERNOR
STATE OF CALIFORNIA

CLAIRE T. DEDRICK
SECRETARY FOR RESOURCES
THE RESOURCES AGENCY

RONALD B. ROBIE
DIRECTOR
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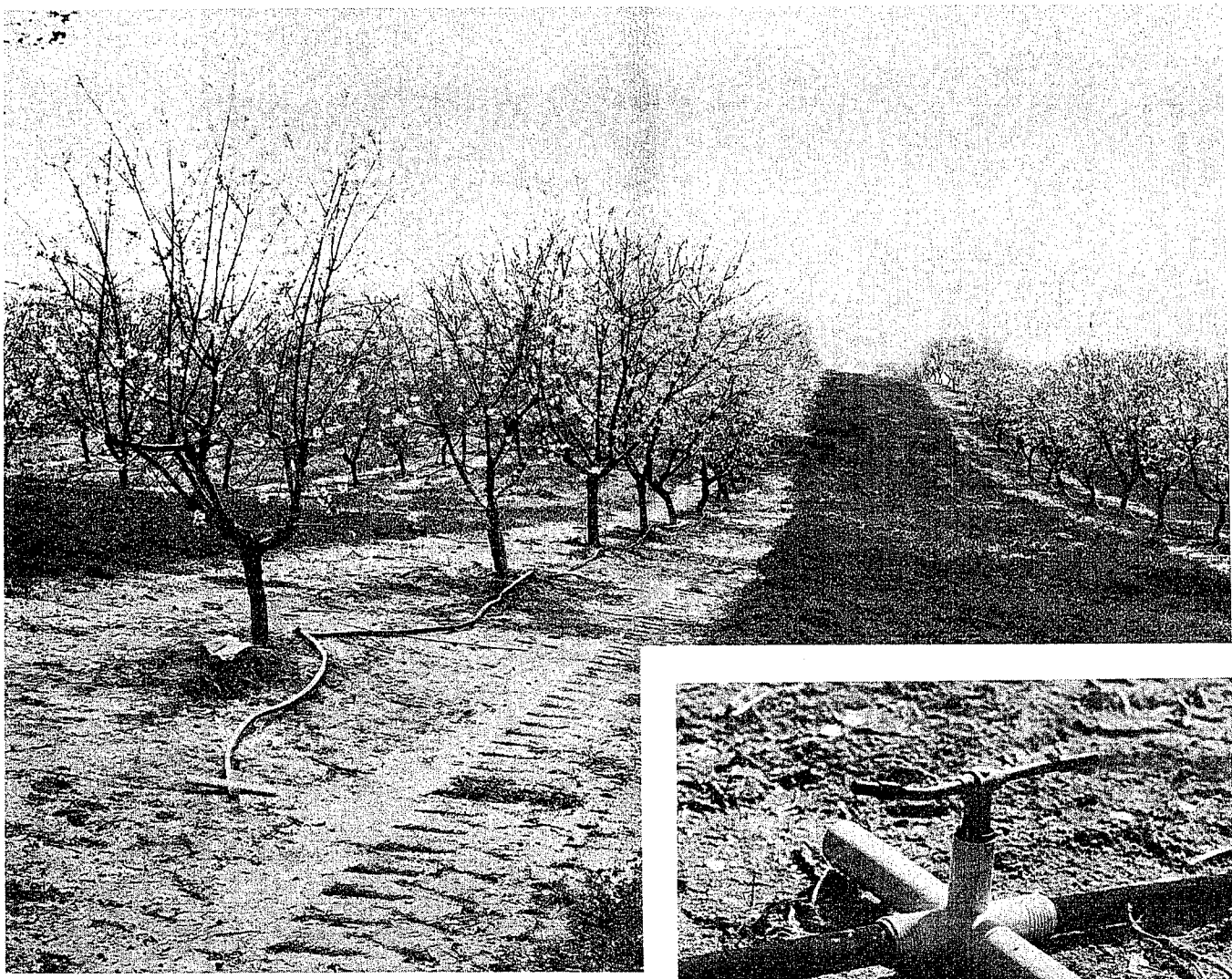


Almond orchard irrigated by small under-tree sprinklers, a method well suited to rolling terrain.

(Photos by Department of Water Resources)

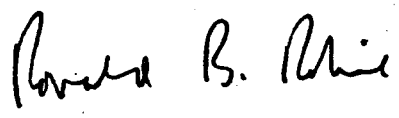
An under-tree sprinkler.

FOREWORD

As a leading agricultural producer, California consumes more water for irrigating crops than for any other purpose -- virtually 85 percent of its total water use, in fact. This high level of use emphasizes the importance of being able to predict what total quantity of water is needed, as well as when and where it is needed. Bulletin No. 113-3 is the third in a series of Department of Water Resources' publications on the rate of water use by crops.

Based on field studies conducted from 1954 to 1972, the report expands the previously published body of basic vegetative water use data for California. It summarizes growing season evapotranspiration and evapotranspiration of applied water for principal crops grown in major agricultural regions of the State, tabulates evaporation and other climatic indexes and provides the data required to calculate irrigation efficiencies. For the first time in this series of reports, data on applied water are included.

The usefulness of the evapotranspiration measurements for a large number of irrigated crops was broadened by correlating measured values to local evaporation rates and then projecting the ratios derived to other areas of the State where only evaporation data were available.



Ronald B. Robie, Director
Department of Water Resources
The Resources Agency
State of California

OTHER BULLETINS IN THIS SERIES

Bulletin No. 113, "Vegetative Water Use Studies, 1954-1960" (1963)

Describes field procedures and presents Detailed tabulations of data collected.

Bulletin No. 113-2, "Vegetative Water Use" (1967)

Covers factors affecting evapotranspiration, sets forth criteria for selecting and operating field plots, and summarizes data collected.

STATE OF CALIFORNIA
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CONTENTS

Appendixes

Photographs

Figures

Tables

Tables (continued)

Tables (continued)

Plates

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In appreciation of the valuable assistance received in conducting this study, the Department of Water Resources acknowledges the contributions of many individuals and organizations.

Sites for agroclimatic stations and evapotranspiration field plots were provided by many growers throughout the State.

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Department of Water Science and Engineering, University of California, Davis

U. S. Soil Conservation Service

U. S. Agricultural Research Service

U. S. Bureau of Reclamation

National Weather Service

Pacific Southwest Forest and Range Experiment Station, U. S. Forest Service

and numerous irrigation and water districts in California.

CHAPTER I. INTRODUCTION

Irrigated agriculture is the largest single user of water in California and it is expected to remain so, even with the anticipated growth in urban and industrial water demand. Present estimates place agricultural water use at about 85 percent of the developed water in the State.

Reliable agricultural water use values are necessary for water project planning, for water management, and for many other water-related activities as well. This report summarizes results of vegetative water use field studies conducted by the Department of Water Resources and cooperating agencies on various aspects of agricultural water use during the period 1954 to 1972.

Based upon data included in this report, three components of agricultural water use -- crop growing season evapotranspiration, evapotranspiration of applied water, and applied water requirements -- were estimated for the principal irrigated crops grown in nine zones of particular agricultural importance in the State.

Summary of Investigation

1. Evaporative demand zones are areas in which annual total and monthly patterns of evaporation are essentially the same. Evaporative demand data provide a basis for transferring related crop evapotranspiration measured in one area to another where ET measurements are unavailable.

On the basis of data collected in this investigation, California was divided into 11 evaporative demand zones whose boundaries are defined by evaporation rates and other agroclimatic data.

Eight of these zones lie in Northern and Central California. They are:

North Coast, Coastal Valleys and Plains
North Coast, Interior Valleys
Northeastern Mountain Valleys
Sacramento Valley Floor
San Joaquin Valley Floor
Central Coast, Coastal Valleys and Plains
Central Coast, Interior Valleys
Sierra

In Southern California, where very limited agroclimatic data are available, three zones have been delineated from empirical estimates of evaporation and from general knowledge of the areas. These zones are:

South Coast, Coastal Valleys and Plains
South Coast, Interior Valleys
Southern California Desert

2. Averages of four climatic parameters -- pan evaporation[1], net atmometer evaporation, incoming solar radiation, and potential evapotranspiration -- are tabulated by month for each evaporative demand zone. These values are believed to be sufficiently reliable to provide reasonable averages for each zone.

Because evaporation data for the Sierra and Southern California Desert Zones are generally unavailable, tabulations for these regions have been omitted.

3. Ocean influence on evaporative demand in coastal valleys was observed to be limited to a relatively narrow coastal strip that varied from 15 to 25 miles wide, depending on the size, topography, and geographic orientation of the valleys in which evaporation rates were measured.

The steep coastal zone gradients observed suggest the importance of selecting evaporation data measured, or adjusted, to characterize the location for which crop evapotranspiration is being estimated -- at the same distance inland and with the same prevailing winds.

4. Observed monthly evapotranspiration of grass (potential evapotranspiration) is compared to measured pan evaporation, net atmometer evaporation, solar radiation, and the Blaney-Criddle "f" factor[2] at eight differing climatic/geographic locations. The evapotranspiration of grass was found to correlate closely to each climatic parameter at individual locations; however, pan evaporation was found to have the most consistent relationship for all locations -- within ± 10 percent on a seasonal basis.

5. Field measurements of monthly evapotranspiration for several irrigated crops made by the Department of Water Resources and cooperating agencies are summarized in this report. These data were obtained under conditions that characterized the upper levels of prevalent grower management practices.

6. Growing season evapotranspiration is summarized for principal crops grown in several evaporative demand zones of the State.

---

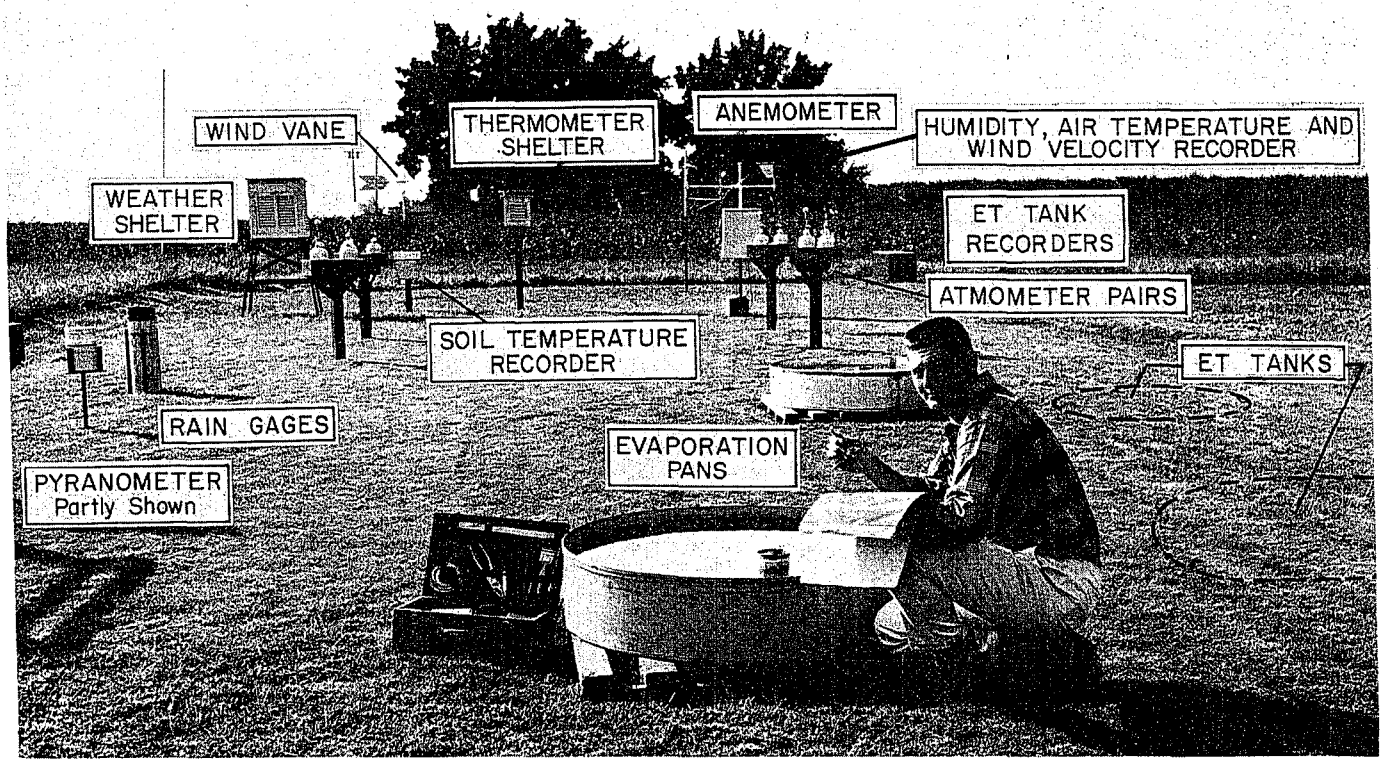
[1] Pan evaporation data, wherever discussed or illustrated in this report, was measured in an irrigated pasture environment or the equivalent, unless otherwise stated.

[2] In the Blaney-Criddle formula ($u = kf$) for determining evapotranspiration, f = the product of mean monthly temperature and monthly percent of annual daytime hours ÷ 100; this is sometimes called the consumptive use factor.

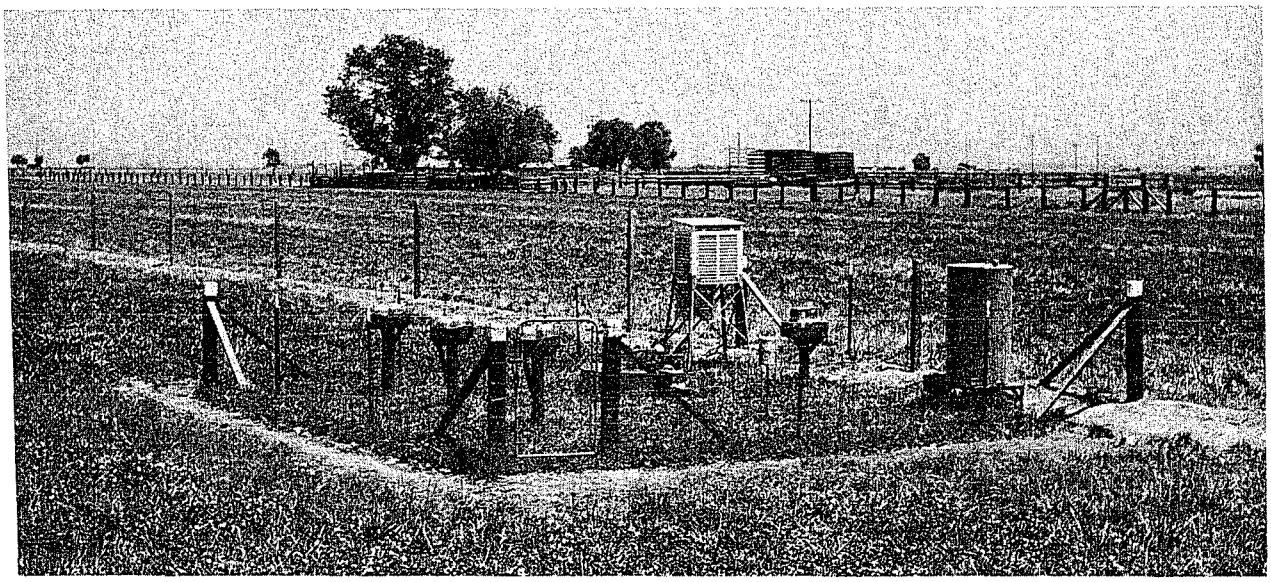
7. Recommended ratios of evapotranspiration/evaporation, summarized in this report for many crops, can be used with evaporation data reported here to estimate crop evapotranspiration for areas where ET measurements are unavailable.

8. The contribution of precipitation toward meeting evapotranspiration demand was calculated, and the evapotranspiration of applied water is summarized by rainfall zones for the principal crops in several areas of the State.

9. Average values of applied water for principal crops or crop categories in 10 evaporative demand zones were subjectively selected after review of considerable applied water data. In addition, high and low values given represent the range most commonly found in the area.



MASTER AGROCLIMATIC STATION, Arvin 2.5 NW. Because crop evapotranspiration observed in nearby field plots was correlated to data from this station, more elaborate instrumentation was used here than in the typical agroclimatic stations.



TYPICAL AGROCLIMATIC STATION, Bakersfield 10 S. Located in a large irrigated pasture. Evaporation from a Class "A" pan and Livingston atmometers was observed weekly. Grass within the fenced enclosure was maintained at 4-inch to 5-inch heights by periodic mowing.

CHAPTER II. EVAPORATIVE DEMAND

Analysis of agroclimatic data that has been collected over a number of years makes possible delineation of zones of similar evaporative demand within the State. The agroclimatic field studies, analysis of data collected, and the results of that analysis are described below.

Agroclimatic Field Studies

The objective of the Department's agroclimatic studies is to determine the monthly magnitudes and geographic variations of evaporative demand within the major agricultural areas of the State. Evaporative demand data is important because it provides a basis for estimating crop evapotranspiration (ET) -- a climatically-controlled process -- and thus serves as a means of transferring ET values from areas for which measurements are available to areas for which such information is unknown or measurements are unavailable.

Eighty-four agroclimatic stations were operated for various lengths of time and in various locations in the major agricultural areas of Northern and Central California by 11 observers, including the Department of Water Resources. Station locations are shown on Plate 1 and described in Appendix C. The names of the 10 cooperating agencies are also listed in Appendix C.

The primary instruments at these stations were either U. S. Weather Bureau Class "A" evaporation pans or Livingston black and white spherical atmometers (5)[1] or both. All stations were equipped with precipitation gages, and several had instruments for measuring incoming solar radiation. Certain stations located near the ET plots and used to provide the data to which measured ET was correlated (master stations) were generally more elaborately equipped. In addition to the instruments listed above, these master stations were instrumented to make observations of wind movement, air temperatures, and relative humidity. Locations of the master stations are shown on Plate 1 and in Appendix C. Views of a master agroclimatic station and a typical agroclimatic station appear on page 4. While the typical agroclimatic stations were serviced only at weekly intervals, the master stations were serviced more frequently.

In 1960 the marked effects of pan surroundings upon measured evaporation rates were demonstrated by W. O. Pruitt and associates at the University of California, Davis (15). Subsequent analysis of evaporation data collected by the Department

[1] Numerals in parentheses in this and subsequent chapters refer to bibliography (Appendix A).

of Water Resources indicated that differences attributable to station environment were great enough to mask differences attributable to geographic location.

The significant differences in evaporation rates resulting from differing station environments are illustrated in the following data collected at sites within a few miles of one another in southwestern San Joaquin Valley.

Monthly Evaporation in 1965 and 1966
In inches

Station Environment	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Totals	
													M-O[1]	J-D[2]
Irrigated Pasture[3]	2.0	2.4	4.6	7.4	9.5	9.9	9.9	7.8	6.1	4.6	1.8	1.0	59.8	67.0
Dry Land[4]	2.3	2.5	5.8	10.8	14.6	14.3	17.3	15.5	11.1	8.7	3.4	0.9	98.1	107.2

In 1960, large, well-managed irrigated pastures were selected as the prescribed standard environment for all agro-climatic stations. With the elimination (or minimization) of evaporation variations resulting from environmental differences, the variations attributable to geographic location could be determined. Except for a few stations that were operated for specific reasons in other surroundings, since 1960 all agro-climatic stations have been situated in irrigated pastures or comparable settings.

Because depth of water in evaporation pans also affects evaporation rates (14), measures were taken to maintain the water in the pans at a near-constant level.

It was found that, unlike pan evaporation, net atmometer evaporation (the difference in evaporation between the black and white Livingston atmometers (5)) was not significantly affected by differences in station environment. Since net atmometer evaporation is insensitive to the immediate environment,

---

1 March through October

2 January through December

3 Buttonwillow 1S (station is located one mile south of the town of Buttonwillow), 4 miles east of the western edge of irrigated lands.

4 Station D-40-080 (Reference 8, Appendix A) 21 miles west of pasture site (9 miles west of western edge of irrigated land). Dry land surrounds station for many miles in all directions.

atmometers can be operated in unirrigated areas, for example. Disadvantages to the use of atmometers are that they cannot be operated during periods of subfreezing temperatures, and they require more attention than do evaporation pans (9, 20).

As with atmometers, observations of solar radiation are not influenced by the surroundings of the recording instrument. The strict requirements for instrument location used for evaporation pans were therefore not required.

Details of routine station operation and tabulation of data have been described in previous publications (5, 6).

A summary of monthly pan evaporation data for stations meeting the above requirements is presented in Appendix D. Appendix E presents a summary of observed monthly net atmometer evaporation. Department of Water Resources records, combined with generally longer-term solar radiation records collected by other agencies, are presented in Appendix F (4). Locations of the radiation stations are shown in Appendix C and on Plate 1.

Evaporative Demand Zones

Evaporation pan data were screened for conformance to both environmental and operational standards. Only stations located in irrigated pasture, or in a comparable environment, and stations where pan water depths remained constant were used. Under these standardized conditions of station operation, differences in observed evaporation were attributed to the geographic locations of the stations.

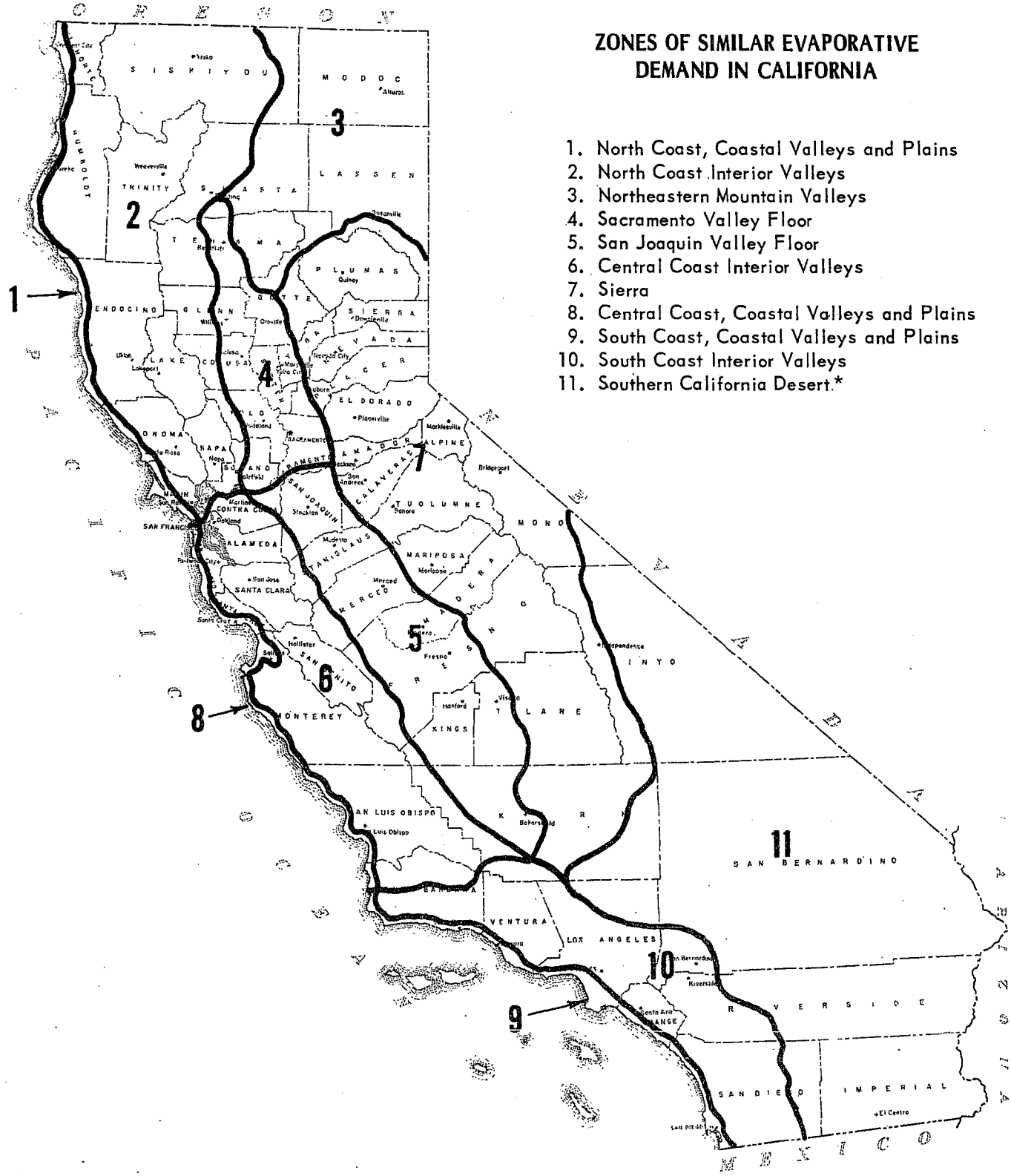
Analysis of Data

Boundaries of zones of similar evaporative demand were defined primarily by observed rates of evaporation from the select group of Class "A" pans. Solar radiation and net atmometer evaporation data were used to supplement the pan evaporation data in defining those zones.

Monthly evaporation rates for the individual stations were tabulated and stations were grouped on the basis of similar monthly patterns of evaporation. These zones are shown in Figure 1. Average monthly pan evaporation, net atmometer evaporation, and solar radiation for the zones are shown in Tables 1, 2, and 3. Little or no evaporation data from pasture sites were available in Southern California; therefore, boundaries of the three evaporative demand zones in this region were based upon empirical estimates that were modified by experienced judgment. Studies are currently being conducted by other agencies in the Southern California Desert zone -- a major agricultural area of Southern California. The evaporative demand zones in Southern California shown in Figure 1 will probably be modified as information becomes available.

ZONES OF SIMILAR EVAPORATIVE DEMAND IN CALIFORNIA

1. North Coast, Coastal Valleys and Plains
2. North Coast Interior Valleys
3. Northeastern Mountain Valleys
4. Sacramento Valley Floor
5. San Joaquin Valley Floor
6. Central Coast Interior Valleys
7. Sierra
8. Central Coast, Coastal Valleys and Plains
9. South Coast, Coastal Valleys and Plains
10. South Coast Interior Valleys
11. Southern California Desert.*



*Reliable Data on evaporative demand is generally unavailable in the Southern California Desert. Studies by other agencies are in progress in Imperial Valley and Palo Verde Valley (Zone 11)

Table 1. SUMMARY OF AVERAGE PAN EVAPORATION IN CALIFORNIA[1/]
In inches

MONTH / ZONE	Northeastern - Mountain Valleys 3	North Coast - Coastal Valleys and Plains 1	North Coast - Interior Valleys 2	Sacramento Valley 4	San Joaquin Valley 5	Central Coast - Coastal Valleys and Plains 8	Central Coast Interior Valleys 6	South Coast - Coastal Valleys and Plains [2/] 9	South Coast - Interior Valleys [2/] 10
Jan	0.8	0.7	1.2	1.5	1.3	2.5	2.3	2.5	2.4
Feb	1.3	1.3	1.6	2.4	2.3	2.9	2.9	3.3	3.2
Mar	2.8	2.6	3.1	3.9	4.2	4.1	4.3	4.1	4.4
Apr	4.8	3.2	4.4	5.7	5.9	5.1	5.6	4.9	5.5
May	6.4	4.2	6.4	7.5	8.3	6.0	7.3	5.8	6.5
Jun	7.5	4.6	7.6	9.3	9.6	6.3	7.9	6.6	7.7
Jul	10.1	4.5	9.1	10.1	10.0	6.8	8.6	7.0	8.8
Aug	9.0	4.3	8.0	8.6	8.5	6.1	7.7	7.0	8.6
Sep	6.3	3.6	6.0	6.8	6.3	5.0	6.2	5.8	6.8
Oct	3.8	2.3	3.6	4.6	4.4	4.3	5.0	4.6	5.1
Nov	1.3	1.5	1.6	2.2	2.1	3.0	3.1	3.6	3.2
Dec	0.7	1.0	1.0	1.4	1.0	2.1	2.1	3.1	2.6
M - O [3/]	50.7	29.3	48.2	56.5	57.2	43.7	52.6	45.8	53.4
J - D [4/]	54.8	33.8	53.6	64.0	63.9	54.2	63.0	58.3	64.8

1/ Evaporation from USWB - Class "A" pans located in irrigated pasture (or comparable) environment.

2/ No evaporation data (irrigated pasture environment) available. Monthly evaporation rates listed are subjective estimates based upon dry land pan evaporation and other climatological data.

3/ March through October (principal growing season)

4/ January through December

Table 2. SUMMARY OF OBSERVED NET ATMOMETER EVAPORATION IN CALIFORNIA
In milliliters

MONTH / ZONE	Northeastern - Mountain Valleys 3	North Coast - Coastal Valleys and Plains 1	North Coast - Interior Valleys 2	Sacramento Valley 4	San Joaquin Valley 5	Central Coast - Coastal Valleys and Plains 8	Central Coast - Interior Valleys 6	South Coast - Coastal Valleys and Plains 9	South Coast - Interior Valleys 10	Southern California Desert 11
Jan	-		-	-	-	235	200			
Feb	-		-	-	-	265	225			
Mar	-		325	330	355	345	355			
Apr	-	--	335	410	430	390	410	--	--	--
May	445	No Data Available	445	500	510	425	480	No Data Available	No Data Available	No Data Available
Jun	535		525	570	540	425	480			
Jul	580		560	615	570	450	500			
Aug	540		515	540	535	420	455			
Sep	430		400	440	445	365	380			
Oct	-		290	345	355	310	320			
Nov	-	--	210	170	-	230	220	--	--	--
Dec	-		-	-	-	230	200			
M - O[1/]	-		3395	3750	3740	3130	3380			
J - D[2/]	-		-	-	-	4090	4225			

1/ March through October (principal growing season)
2/ January through December

Table 3. SUMMARY OF SOLAR RADIATION IN CALIFORNIA
In equivalent inches of evaporation[1/]

MONTH / ZONE	Northeastern - Mountain Valleys 3	North Coast - Coastal Valleys and Plains 1	North Coast - Interior Valleys 2	Sacramento Valley 4	San Joaquin Valley 5	Central Coast - Coastal Valleys and Plains 8	Central Coast - Interior Valleys 6	South Coast - Interior Valleys 10	Southern California Desert 11
Jan	3.3	-- No data available --	4.7	3.8	4.0	5.5	3.9	5.5	5.7
Feb	5.0		5.1	5.4	5.5	6.6	5.6	6.4	6.6
Mar	7.8		8.3	8.6	8.8	9.8	8.3	9.2	9.6
Apr	9.5		11.1	10.9	10.8	11.7	10.1	10.5	12.4
May	12.4		13.3	13.7	13.0	12.9	11.6	12.3	12.8
Jun	13.3		13.8	14.0	13.4	12.7	12.1	12.7	13.0
Jul	15.0		14.9	14.8	13.8	13.3	12.5	13.2	12.2
Aug	12.5		12.9	13.0	12.4	12.2	11.0	12.1	11.3
Sep	9.6		9.6	10.2	10.0	9.7	8.9	10.0	9.7
Oct	6.5		7.7	7.7	7.7	8.0	6.8	8.0	8.4
Nov	3.2		4.3	4.4	4.7	5.7	4.4	6.1	5.9
Dec	2.7	--	3.3	3.4	3.2	5.0	3.8	5.1	5.2
M - O[2/]	86.6		91.6	92.9	89.9	90.3	81.3	88.0	89.4
J - D[3/]	100.8		109.0	109.9	107.3	113.1	99.0	111.1	112.8

1/ Solar Radiation expressed as equivalent inches of evaporation. 1486 Langleys equals 1 inch of evaporation.
2/ March through October (principal growing season).
3/ January through December.

The averages shown in Tables 1, 2, and 3 are reasonable values for use within those zones. Little variation was indicated throughout each of the inland zones. In the coastal valleys and plains, the reported values are reasonable averages for entire zones. However, evaporation was observed to vary with distance from the coast.

Qualification of Data

A valid comparison of evaporation rates at different locations requires the use of data for the same time periods. Agroclimatic stations, however, were operated for various periods of time at different places. The data thus reflect the effects of both geographic locations and year-to-year variations in evaporative demand.

To determine the influence of seasonal variations on average evaporation for an area, two methods for determining the area average were compared. Observed evaporation for 12 stations which were operated during different periods of time in the San Joaquin Valley was extrapolated to the same time period on the basis of the long-term record for one continuously operated station. The monthly and seasonal extrapolated values for the 12 stations were then averaged to obtain average evaporation for the area. The value thus obtained was compared to an area mean that was determined by averaging the monthly observed evaporation rate for each of the 12 stations. Results of this comparison indicate that, for this area, differences in average areal evaporation determined by the two methods were not significant. Average evaporation rates for the area as determined by the two methods are compared as follows:

Average Evaporative Demand, San Joaquin Valley; 1959-1967
In inches

Average Determined From	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Totals	
													M-O[1]	J-D[2]
Extrapolated Data	1.3	2.2	4.1	5.8	8.4	9.5	10.0	8.6	6.3	4.6	2.1	1.0	57.3	63.9
Observed Data	1.3	2.3	4.2	5.9	8.3	9.5	9.9	8.4	6.2	4.5	2.0	1.0	56.9	63.5

1 March through October
2 January through December

A long-term station record needed to correlate and extrapolate individual station records was not available in all areas of the State; therefore, because the straight averaging method appears to provide an adequate appraisal of average evaporation for an area, that method was used to determine average evaporation rates for the evaporative demand zones.

Evaporation Gradients Near the Coast

Previous studies have shown evaporation rates observed at single locations within the coastal fogbelt to be significantly lower than those measured at interior valley locations (6, 13). For this study, several stations situated within the central coast fogbelt were analyzed. Results show that the coastal influence is limited to a relatively narrow coastal strip.

Evaporation gradients based upon data from eight stations in irrigated pasture environments in four central coastal valleys appear in Figure 2.

The gradient for the Salinas Valley, more gradual than that for the other valleys, indicates that the coastal influence there extends some 25 miles inland. Coastal influence for the other valleys was observed to extend only 15 miles inland. The differences between the gradients are believed to be real, resulting from the shape, topography, and orientation of the valleys.

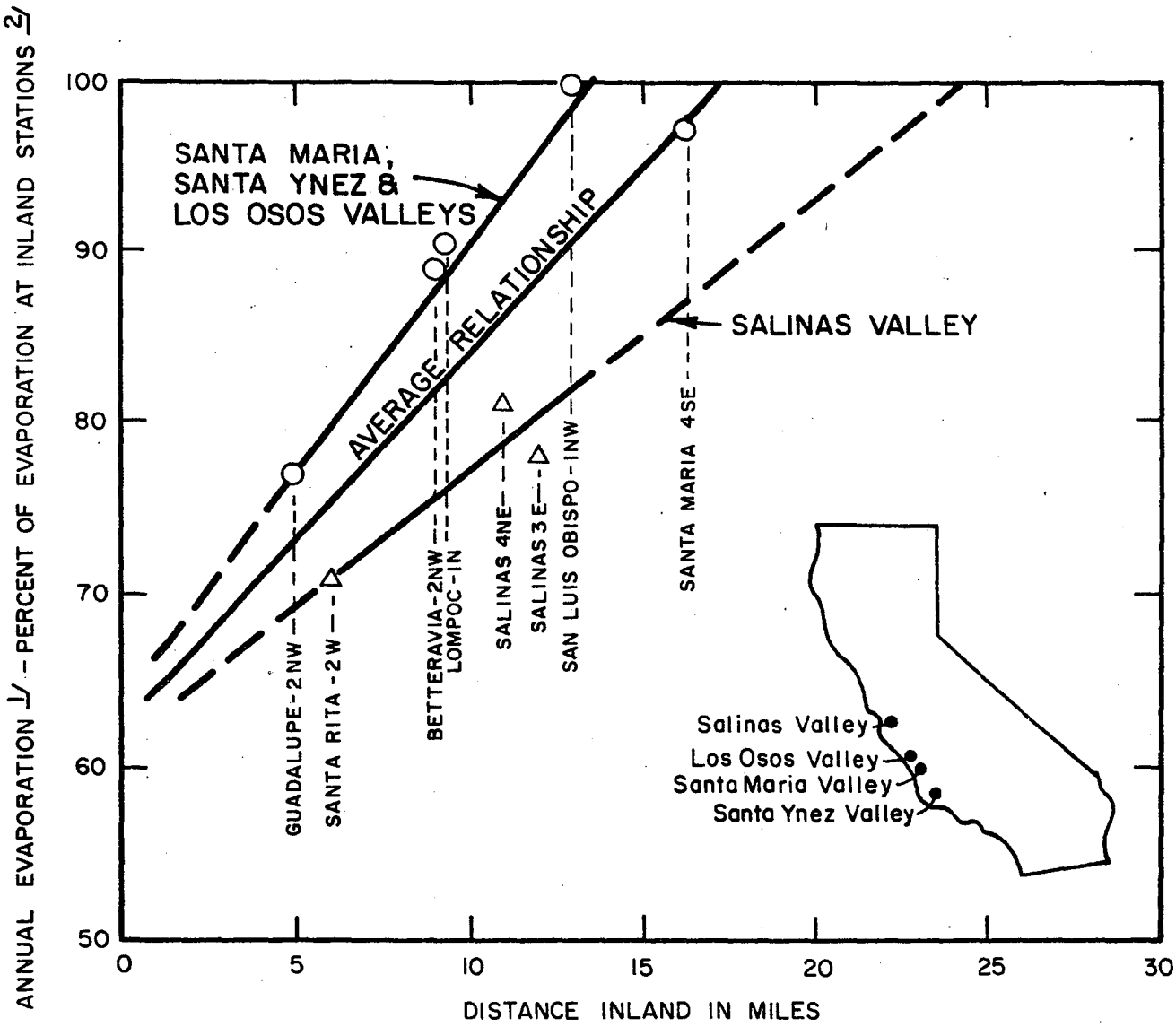
Because of the steep coastal evaporation gradients, care should be exercised in selecting evaporation data used to estimate ET of crops for specific locations within these zones.

Evaporative Demand Map

Plate 1, a fold-out map bound at the back of this report, shows our best present estimate of evaporative demand within the State. Lines of equal evaporative demand were based upon observed evaporation from Class "A" pans located in irrigated pasture (or equivalent) environments where such data were available. These lines are shown as solid black lines on the plate. "Pasture pan" data were available only for the major agricultural areas of Northern and Central California.

For the balance of the State, lines of equal evaporative demand were estimated from evaporation records collected in mostly unirrigated environments (7). Evaporation data from those dry land sites were subjectively adjusted to approximate evaporation from irrigated pasture environment. The adjustment of individual station records was based upon descriptions of the immediate pan environment and knowledge of the general area in which the pan was located. To indicate a lesser degree of confidence, these lines of estimated evaporative demand are shown on Plate 1 as dashed lines.

The use of annual evaporative demand data, such as that shown on Plate 1, to compare the evaporation of different geographic areas must be tempered by knowledge of the monthly distribution of evaporation. While annual evaporative totals for two areas may be similar, monthly patterns of evaporation



1/ Annual Evaporation From Class 'A' Pans in Irrigated Pasture Environments

2/ Annual Evaporation For Inland Stations Based on Average Evaporation at Soledad C.T.F. 35 miles Inland (65.3 inches/year) And San Lucas 63 miles Inland (64.2 inches/year).

Figure 2. RELATIONSHIP BETWEEN ANNUAL EVAPORATION 1/ AND DISTANCE FROM OCEAN FOR EIGHT CENTRAL COAST LOCATIONS

may differ significantly. For example, average annual evaporation for the Central Coast, Interior Valleys Zone is similar to that for the Sacramento Valley and San Joaquin Valley Zones. In winter, when the two inland valleys are shrouded in fog much of the time, evaporation rates are lower there than in the Central Coast, Interior Valleys Zone, where clear skies are more common. In summer, this condition reverses, with hot, clear days and greater evaporation in the inland valleys, and cool days and lower evaporation rates in the Central Coast, Interior Valleys Zone (Table 1).

CHAPTER III. EVAPOTRANSPIRATION

Evapotranspiration is the process whereby water is transpired by plants and evaporated from the earth's surface (see page 57, "Definition of Terms"). Because it can no longer be reclaimed, the water that is evapotranspired is "lost". Knowledge of evapotranspiration rates is necessary to properly plan, design, and operate water development projects, to manage water, and to perform other water-related functions.

This chapter includes summaries of observed evapotranspiration rates for a number of agricultural crops. It also describes methods for transferring measured ET values developed in one area to other areas where direct ET measurements are unavailable. Using evaporative demand data to transfer evapotranspiration values, estimated growing season evapotranspiration has been calculated for the principal crops in several agricultural areas of the State. The contribution of precipitation toward meeting crop ET demand has been estimated, and the ET of applied water calculated. Summaries of three components of agricultural water use -- crop growing season ET, ET of applied water, and applied water requirements -- are presented for a number of crops in the various evaporative demand zones.

Measured Evapotranspiration

Evapotranspiration field studies began as part of the Department's Vegetative Water Use Program in 1954. During the program's early years, data were collected by the gravimetric technique (soil tube sampling) and with evapotranspirometers (lysimeters) of various designs. In 1959 neutron probes replaced the gravimetric technique as the principal method for determining evapotranspiration.

The importance of the movement of unsaturated moisture from the crop root zone was not fully recognized until the late 1950s. With the advent of neutron probes in 1959, field plots were selected and managed to eliminate deep percolation. Because field plot surroundings, too, can affect the observed evapotranspiration rate, the plots were located within large, well-managed fields. (Details of field plot criteria and measurement techniques are described in previously published reports (5, 6).)

All ET data were screened and those data not meeting the field plot criteria were excluded. Monthly observed evapotranspiration data for measured crops are summarized in Table 4. This table also shows the location and year and method of measurement. These values represent the actual evapotranspiration rates for fields managed at the higher levels of agricultural practice.

Until the late 1960s, the Department assisted financially in support of evapotranspiration studies conducted by the Agricultural Research Service (ARS) of the U. S. Department of Agriculture and the University of California at Davis. The ARS data was collected by gravimetric, neutron probe, and lysimetric methods in grower-operated fields (3, 11, 12, 13). The University used neutron probes, two 20-foot-diameter lysimeters, and one 6-foot-by-8-foot lysimeter to determine the ET of various crops in large experimental plots (15, 16, 17, and 18) and Bowen Ratio energy balance apparatus (10) to determine the ET of rice for a large grower-managed field.

The high quality ET data collected by these cooperating agencies are also summarized in Table 4.

Correlating Measured Evapotranspiration to Evaporation

Observed monthly ET rates were correlated to rates of evaporation from Class "A" pans located in irrigated pasture, or comparable settings, near the ET field plots. Ratios of ET to evaporation were calculated for all plots where the necessary evaporation data were available. Evaporation data collected in irrigated pasture environments were not available for some of the early ET plots in the Central Coastal zones. The calculated ratios of ET/Ep are shown in Appendix I. Smoothed curves were fitted to the observed ET-to-evaporation ratios for each crop. Monthly ratios determined from the smoothed curves are shown in Table 5.

Transfer of Evapotranspiration Data

While it is essential to water planning and management studies, measurement of crop evapotranspiration is a costly and time-consuming procedure. Practical considerations limit actual measurement of crop ET to a few well-chosen locations.

Since the 1930s methods have been developed for transferring observed ET of crops from the area of measurement to other areas. These range from simple heat budget methods to complex quasi-theoretical methods. Because ET is a climatically-related process, almost all are based upon climatic data.

While many of the recently developed theoretical equations for estimating evapotranspiration are quite acceptable, the lack of readily available data and the complexity of calculations make the use of these methods impractical. These formulas do, however, increase our understanding of the ET process and the factors influencing ET rates. In practical application, a reliable, simple method to estimate crop ET is needed.

Table 4. MEASURED MONTHLY EVAPOTRANSPIRATION FOR SEVERAL PRINCIPAL CROPS IN CALIFORNIA[1]/ (in inches)

Crop	Location	Method of Measurement	Observer	Year	Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals Growing Season	Totals Annual
Alfalfa (Hay)	Arvin 2.5NW	Neutron probe	DWR	1959	Perennial (Active Growth Mar-Oct)	-	-	-	4.5	4.5	5.8	6.3	6.1	5.3	3.2	2.8	1.9	-	-
				1960	"	-	-	-	-	-	7.7	6.0	6.6	4.1	2.6	-	-	-	-
				1963	"	1.8	2.1	3.9	3.8	6.3	7.0	8.3	7.0	4.7	3.1	1.4	0.8	44.1	50.2
				Average	"	1.8	2.1	3.9	4.2	5.4	6.8	6.9	6.6	4.7	3.0	2.1	1.4	41.5	48.9
	Brawley 2SW	Weighing ET Tank	ARS[2]/	1971	Perennial (Active Growth Feb-Nov)	-	-	6.2	7.0	9.3	10.9	12.2	8.8	9.2	5.8	3.7	1.9	-	-
				1972	"	2.6	3.0	-	-	-	-	-	-	-	-	-	-	-	-
				Average	"	2.6	3.0	6.2	7.0	9.3	10.9	12.2	8.8	9.2	5.8	3.7	1.9	76.1	80.6
	Lompoc 4.4NW	Neutron probe	ARS[3]/	1960	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.8	4.8	3.4	4.0	1.5	1.5	1.4	-	-
				1961	"	0.4	0.4	0.6	4.6	5.3	5.8	3.6	3.7	4.0	-	-	-	-	-
				Average	"	0.4	0.4	0.6	4.6	5.3	5.3	4.2	3.6	4.0	1.5	1.5	1.4	29.1	32.8
	Lompoc 3.1W	Neutron probe	ARS[3]/	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.8	5.6	4.0	4.6	-	-	-	-	-
	Lompoc 2.9W	Neutron probe	ARS[3]/	1961	Perennial (Active Growth Mar-Oct)	-	-	-	4.4	4.5	3.6	4.9	4.1	3.8	-	-	-	-	-
	Lompoc 2.6NE	Neutron probe	ARS[3]/	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.5	4.9	5.6	5.5	3.9	2.3	2.7	-	-
				1960	"	2.2	1.8	2.1	4.2	5.1	-	-	-	-	-	-	-	-	-
				Average	"	2.2	1.8	2.1	4.2	5.1	4.5	4.9	5.6	5.5	3.9	2.3	2.7	35.8	44.8
	McArthur 4ESE	Neutron probe	DWR	1959	Perennial (Active Growth Apr-Sep)	-	-	-	-	6.8	6.9	9.0	6.2	6.9	-	-	-	-	-
				1960	"	-	-	-	2.8	6.4	5.6	8.4	8.9	5.1	3.8	-	-	37.2	-
				1961	"	-	-	0.8	4.4	5.4	6.5	-	6.6	5.1	2.1	0.5	0.1	-	-
				1962	"	-	-	-	4.6	6.0	6.7	6.4	5.5	7.0	-	-	-	36.2	-
				1963	"	-	-	-	-	6.5	7.0	9.4	6.8	4.4	2.9	1.4	-	-	-
				1964	"	-	-	-	3.6	7.8	3.6	6.8	7.5	4.2	4.4	-	-	33.5	-
				1965	"	-	1.5	2.4	1.6	6.0	6.5	7.0	6.5	6.1	-	-	-	33.7	-
				Average	"	-	1.5	1.6	3.4	6.4	6.1	7.8	6.9	5.5	3.3	1.0	0.1	36.1	-
	Solvang 1.6WNW	Neutron probe	ARS[3]/	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	7.7	8.6	6.4	6.0	4.2	2.8	2.2	-	-
				1960	"	2.5	2.5	2.6	2.9	6.6	7.0	6.4	6.7	6.2	-	-	-	-	-
				1961	"	-	-	-	5.2	7.2	8.0	5.9	5.3	4.9	-	-	-	-	-
				Average	"	2.5	2.5	2.6	4.0	6.9	7.6	7.0	6.1	5.7	4.2	2.8	2.2	44.1	54.2
Barley (Irrigated)	Davis 2W (Grain crop)	Floating ET Tank	U.C.[4]/	1969-70	11/1-5/31	1.0	2.1	4.7	4.4	2.6	-	-	-	-	-	0.6	0.6	16.0	-
	Wasco 2W	Neutron probe	DWR	1972	1/12-6/6	-	1.0	6.2	6.1	1.7	0.3	-	-	-	-	-	-	15.3	-
	Arvin 2.8NW (Winter cover)	Neutron probe	DWR	1966-67	9/23-1/5	0.1	-	-	-	-	-	-	-	-	0.5	1.7	0.9	3.2	-
Beans (Dry)	Davis 2W	Floating ET Tank	U.C.[4]/	1968	6/21-9/24	-	-	-	-	-	0.5	4.7	7.6	3.1	-	-	-	15.9	-
	Lompoc 4.5WNW	Neutron probe	ARS[3]/	1957	6/1-9/15	-	-	-	-	-	2.2	2.7	3.0	-	-	-	-	7.9	-
				1958	5/20-9/26	-	-	-	-	0.4	1.4	3.9	1.5	1.0	-	-	-	8.2	-
				Average	5/25-9/20	-	-	-	-	0.2	1.8	3.3	2.2	0.5	-	-	-	8.0	-
	Lompoc 4.6NW	Neutron probe	ARS[3]/	1958	5/15-9/4	-	-	-	-	1.1	2.4	5.7	5.1	0.2	-	-	-	14.5	-
	Solvang 2.0WNW	Neutron probe	ARS[3]/	1958	5/30-8/31	-	-	-	-	-	2.4	7.4	7.0	-	-	-	-	16.8	-
Cantaloupes	Arvin 2.5S	Neutron probe	DWR	1970	3/25-7/8	1.2	1.6	1.2	1.0	2.9	8.4	1.2	-	-	-	-	-	13.5	-
Carrots	Lompoc 4.6NW	Neutron probe	ARS[3]/	1960	Jul-Oct	-	-	-	-	-	-	2.4	3.8	3.8	3.4	-	-	13.4	-
Castor Beans	Arvin 2.9NW	Neutron probe	DWR	1970	3/25-2/8/71 (Active Growth May-Oct)	0.9	0.6	1.5	0.4	1.3	6.5	9.7	8.5	4.9	2.6	1.0	0.6	33.5	38.5
Corn (Field)	Davis 2W	Floating ET Tank	U.C.[4]/	Average 1970-71	5/15-9/20	-	-	-	-	0.7	4.5	9.5	7.8	2.9	-	-	-	25.4	-
Cotton	Arvin 2.5NW (Solid plant)	Neutron probe	DWR	1959	4/1-10/19 (Active Growth May-Oct)	-	-	-	-	1.6	7.5	10.7	7.8	5.1	3.0	0.2	-	35.7	-
				1960	4/7-10/19 "	-	-	1.1	0.8	0.3	5.3	10.1	8.9	5.0	1.0	1.0	0.4	30.6	-
				1961	4/5-10/30 "	0.4	1.4	1.1	0.4	1.1	5.5	8.6	8.2	5.7	2.4	0.7	0.4	31.5	-
				Average	Apr-Oct	0.4	1.4	1.1	0.6	1.0	6.1	9.8	8.3	5.3	2.1	0.6	0.4	32.6	-

Table 4. MEASURED MONTHLY EVAPOTRANSPIRATION FOR SEVERAL PRINCIPAL CROPS IN CALIFORNIA[1/]
(in inches)

Crop	Location	Method of Measurement	Observer	Year	Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals: Growing Season	Totals: Annual
Cotton (Continued)	Brawley 6NW (Solid plant)	Hydraulic ET Tank	ARS[2/]	1967	4/1-10/31	-	-	-	4.0	2.9	4.6	9.0	9.1	6.8	2.9	-	-	39.3	-
				1968	4/25-11/21	-	-	-	1.3	7.7	5.0	6.7	8.0	7.2	3.6	0.7	-	40.2	-
				1969	4/1-11/25	-	-	-	3.8	4.1	8.4	7.7	7.2	6.7	2.2	1.9	-	42.0	-
				Average	Apr-Nov	-	-	-	3.0	4.9	6.0	7.8	8.1	6.9	2.9	1.3	-	40.9	-
	Buttonwillow 2.5SE (Skip 2 x 2)	Neutron probe (Fine textured soil)	DWR	1965	4/8-10/30 (Active Growth May-Oct)	-	-	-	-	0.4	1.4	6.8	6.9	3.8	1.2	0.2	0.2	20.5	-
	Arvin 2.5NW (Skip 2 x 2)	Neutron probe	DWR	1962	3/31-10/26	0.6	0.6	1.0	1.1	0.7	3.9	9.1	7.9	5.0	1.6	0.3	-	29.3	-
	Arvin 2.5NW	Neutron probe	DWR	1963	4/8-10/31	0.1	0.8	1.2	1.5	1.6	4.7	8.8	8.3	4.8	2.6	0.4	0.2	30.8	35.0
Deciduous Orchard	Arvin 3NNW (Plums)	Neutron probe	DWR	1959	Perennial (Active Growth 3/20-10/31)	-	-	-	3.6	6.0	6.4	8.1	6.5	2.5	1.0	0.1	-	-	-
				1960	"	-	-	-	-	-	8.2	8.7	6.4	4.7	1.4	0.4	-	-	-
				1962	"	0.6	1.3	1.1	2.7	5.1	6.5	6.9	4.1	4.1	3.4	2.0	0.6	33.9	38.4
				1963	"	0.7	1.7	3.0	4.8	5.4	5.9	6.7	7.0	5.2	2.8	1.6	0.3	40.8	45.1
				1964	"	0.8	1.1	-	-	-	5.6	7.6	7.0	5.7	3.8	0.6	0.9	-	-
				Average	"	0.7	1.4	2.0	3.7	5.5	6.5	7.6	6.2	4.4	2.5	0.9	0.6	38.4	42.0
	Buellton 1.7W (Walnuts)	Neutron probe	ARS	1960	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	5.4	5.7	4.2	3.3	1.9	1.6	1.3	-	-
				1961	"	1.8	2.7	2.0	2.4	3.3	2.2	2.4	2.5	1.6	-	-	-	-	-
				Average	"	1.8	2.7	2.0	2.4	3.3	3.8	4.0	3.4	2.4	1.9	1.6	1.3	23.2	30.6
	Lompoc 2.4NE (Walnuts)	Neutron probe[5/]	ARS[3/]	1960	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.2	4.1	5.5	4.1	2.4	1.1	1.2	-	-
				1961	"	1.3	2.4	2.6	2.4	4.6	5.5	5.2	5.2	3.6	-	-	-	-	-
				Average	"	1.3	2.4	2.6	2.4	4.6	4.8	4.6	5.4	3.8	2.4	1.1	1.2	30.6	36.6
Grain Sorghum (Milo)	Bakersfield 9W	Neutron probe	DWR	1971	6/29-11/8	-	-	-	-	-	-		8.9	5.3	1.7	0.4	0.4	19.0	-
Pasture (Improved) and Grass	Arvin 2.5NW	Neutron probe	DWR	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	-	-	7.3	4.3	-	-	-	-	-
				1960	"	-	-	3.6	-	-	7.0	-	6.8	5.0	4.5	1.6	0.8	-	-
		Floating ET Tank		1961	"	0.6	2.5	4.1	5.1	5.7	7.0	7.0	8.4	5.4	4.3	1.5	1.0	47.0	52.6
				1962	"	0.8	1.0	3.9	5.5	6.1	7.0	8.6	7.4	6.3	2.6	1.5	1.0	47.4	51.7
				1963	"	0.2	1.5	3.7	3.8	7.9	8.3	7.6	6.8	5.1	2.7	2.2	0.4	45.9	50.2
				1964	"	1.0	1.9	3.2	3.5	6.0	6.8	8.5	7.9	5.9	3.8	1.8	1.4	45.6	51.7
				1965	"	1.0	2.0	3.5	5.1	7.6	7.4	8.2	6.2	5.1	-	-	-	-	-
				Average	"	0.7	1.8	3.7	4.6	6.7	7.2	8.0	7.3	5.3	3.6	1.7	0.9	46.4	51.5
	Davis 2W (Grass)	Weighing ET Tank	U.C.[4/]	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	-	8.8	7.3	5.8	4.5	2.2	1.4	-	-
				1960	"	1.0	2.2	3.2	4.6	6.4	8.7	8.4	7.4	5.2	3.8	1.4	1.0	47.7	53.3
				1961	"	0.6	2.0	3.0	4.9	6.4	8.2	8.8	6.7	5.1	3.6	1.6	0.9	46.7	51.8
				1962	"	1.2	1.5	2.9	4.9	6.3	8.2	8.2	6.8	5.0	2.8	1.7	0.8	45.1	50.3
				1963	"	0.9	1.5	2.3	3.3	5.1	8.0	8.1	6.6	4.5	-	-	-	-	-
				1964	"	-	-	-	-	-	6.7	8.3	7.7	6.4	3.9	1.5	1.1	-	-
				1965	"	1.0	2.8	3.1	4.0	7.4	7.3	7.9	6.8	5.5	3.4	1.2	0.8	45.4	51.2
				1966	"	1.3	1.8	3.4	6.0	6.8	8.1	7.6	7.0	5.4	3.8	1.6	0.9	48.1	53.7
				1967	"	1.3	1.9	2.7	2.7	6.4	6.5	7.8	7.1	5.3	3.8	1.7	1.6	42.3	48.8
				1968	"	1.2	1.1	3.3	5.8	6.3	8.1	8.2	6.8	6.0	3.2	1.5	1.1	47.7	52.6
				1969	"	1.2	1.7	3.6	4.8	7.4	6.8	8.1	7.4	5.3	3.6	1.7	1.2	47.0	52.8
				1970	"	1.1	1.9	3.9	4.3	7.1	7.3	8.2	7.0	5.8	3.5	1.3	0.7	47.1	52.1
				1971	"	1.3	1.9	3.1	4.9	5.5	7.6	8.3	7.3	6.0	3.7	2.1	1.2	46.4	52.9
				Average	"	1.1	1.8	3.1	4.6	6.5	7.6	8.2	7.1	5.5	3.6	1.6	1.1	46.2	51.8
	Davis 2W (Grass)	Weighing ET Tank	DWR	1959	Perennial (Active Growth Mar-Oct)	1.2	2.6	4.3	4.4	6.0	7.4	8.7	7.0	6.0	4.6	1.9	1.2	48.4	55.3
				1960	"	0.9	1.8	3.1	5.3	7.1	5.9	-	-	-	-	-	-	-	-
				Average	"	1.0	2.2	3.7	4.8	6.6	6.6	8.7	7.0	6.0	4.6	1.9	1.2	48.0	54.3
	Glenburn 0.3SE (Improved pasture)	Floating ET Tank	DWR	1964	Perennial (Active Growth Apr-Sep)	-	-	-	2.9	4.4	5.6	6.6	8.5	5.1	2.5	-	-	33.1	-
				1965	"	-	-	-	2.9	4.8	5.7	6.8	7.3	4.8	3.3	0.5	-	32.3	-
				1966	"	-	-	-	4.6	5.2	6.0	7.5	7.5	4.7	-	-	-	35.5	-
				Average	"	-	-	-	3.5	4.8	5.8	7.0	7.8	4.9	2.9	0.5	-	33.8	-

Table 4. MEASURED MONTHLY EVAPOTRANSPIRATION FOR SEVERAL PRINCIPAL CROPS IN CALIFORNIA[1/]
(in inches)

Crop	Location	Method of Measurement	Observer	Year	Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals: Growing Season	Totals: Annual
Pasture (Improved) and Grass (continued)	Guadalupe 2NW (Improved pasture)	Floating ET Tank	SLOFCD & DWR[6/]	1963	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	-	4.3	4.8	4.2	3.0	2.5	2.2	-	-
				1964	"	1.9	2.6	2.7	3.5	3.3	3.9	4.6	4.2	3.7	2.7	1.8	1.3	28.6	36.2
				1965	"	2.1	2.7	3.4	3.1	4.8	5.0	5.4	5.7	4.1	4.1	1.9	1.5	35.6	43.8
				1966	"	2.1	2.2	3.7	4.5	4.2	5.5	5.6	4.4	3.7	3.3	1.9	1.1	34.9	42.2
				1967	"	2.0	2.5	2.7	3.3	4.3	2.5	3.6	3.8	3.2	3.8	-	-	27.2	-
				Average	"	2.0	2.5	3.1	3.6	4.2	4.2	4.7	4.6	3.8	3.4	2.0	1.5	31.6	39.6
	Lompoc 2.5ESE (Improved pasture)	Neutron probe	ARS[3/]	1958	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	7.1	4.9	4.7	4.5	3.7	2.2	1.9	-	-
				1959	"	-	-	-	4.6	5.4	3.5	5.7	3.1	2.6	2.9	2.8	1.5	-	-
				1960	"	1.8	2.7	2.4	4.5	3.3	-	-	-	-	-	-	-	-	-
				Average	"	1.8	2.7	2.4	4.6	4.4	5.3	5.3	3.9	3.6	3.3	2.5	1.7	32.8	41.5
	Lompoc 2.2N (Improved pasture)	Neutron probe	ARS[3/]	1959	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.1	3.4	4.8	3.6	3.6	4.1	1.7	-	-
				1960		1.8	2.3	2.6	3.1	4.7	-	-	-	-	-	-	-	-	-
				Average	"	1.8	2.3	2.6	3.1	4.7	4.1	3.4	4.8	3.6	3.6	4.1	1.7	29.9	39.8
	Lompoc 1.9NNW (Grass)	Hydraulic and/or electronic ET Tank	ARS[3/]	1968	Perennial (Active Growth Mar-Oct)	1.8	2.2	4.5	4.1	5.0	4.3	5.0	4.6	2.9	2.9	2.0	1.1	33.3	40.6
				1969	"	1.0	1.5	2.9	4.0	4.7	4.1	4.5	4.8	3.6	3.4	2.3	1.1	32.0	38.0
				1970	"	1.2	2.6	4.8	-	-	-	-	-	-	-	-	-	-	-
				Average	"	1.3	2.1	4.1	4.0	4.8	4.2	4.8	4.7	3.2	3.2	2.2	1.1	33.0	39.8
	San Luis Obispo 1NW (Improved pasture)	Floating ET Tank	CSPC & DWR[7/]	1969	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	-	-	-	-	4.0	3.5	1.1	-	-
				1970	"	1.9	3.4	4.9	3.8	6.0	5.3	6.0	3.8	5.0	3.0	3.0	-	37.8	-
				1971	"	-	3.1	3.5	3.4	4.6	3.7	6.8	6.2	5.9	2.6	2.8	1.1	36.7	-
				1972	"	2.8	2.8	3.6	4.0	5.0	4.4	4.7	3.0	3.0	3.2	-	-	30.9	-
				Average	"	2.4	3.1	4.0	3.7	5.2	4.5	5.8	4.3	4.6	3.2	3.1	1.1	35.3	45.7
	Soledad 3.5NW (Improved pasture)	Weighing ET Tank	CDC & DWR[8/]	1963	Perennial (Active Growth Mar-Oct	-	-	-	4.0	5.0	5.3	6.4	6.3	4.8	3.4	2.0	1.1	-	-
				1964	"	1.4	2.6	3.4	4.4	5.8	5.6	6.0	5.4	5.3	2.4	2.1	1.1	38.3	45.8
				1965	"	1.5	2.3	3.0	3.8	4.8	4.8	5.9	-	-	-	-	-	-	-
				1966	"	2.1	2.6	3.8	4.8	5.5	6.8	7.3	6.9	4.5	4.4	2.2	1.1	44.0	52.6
				1967	"	2.3	2.8	3.0	3.6	5.6	5.9	7.2	7.4	5.8	4.9	2.8	1.1	43.4	52.7
				1968	"	2.0	2.0	4.4	5.7	6.0	4.2	5.2	5.4	4.8	3.6	1.7	1.1	39.3	46.3
				1969	"	1.1	1.0	3.7	4.8	5.1	4.7	-	6.9	-	-	-	-	-	-
				1970	"	2.3	2.6	3.6	4.1	5.1	6.0	6.8	6.6	5.7	4.5	2.9	1.1	42.4	51.4
				Average	"	1.8	2.3	3.6	4.4	5.4	5.4	6.4	6.4	5.2	3.9	2.3	1.1	40.7	48.5
	Thornton 2S (Improved pasture)	Floating ET Tank	DWR	1963	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	-	-	-	5.2	2.2	0.2	0.1	-	-
				1964	"	0.6	1.1	2.8	6.3	6.5	7.7	9.8	6.7	4.5	3.1	0.9	0.1	47.4	60.5
				1965	"	0.8	2.1	2.2	3.4	7.4	7.4	8.3	6.6	4.0	2.3	1.0	0.1	41.6	56.2
				1966	"	1.3	1.6	3.0	5.8	6.2	8.2	8.0	8.2	5.3	3.2	1.6	0.1	47.9	62.6
				1967	"	0.5	1.4	1.8	2.8	5.7	6.4	7.6	6.4	4.6	3.1	1.0	0.1	38.4	51.9
				1968	"	0.5	0.7	2.2	5.8	6.1	8.5	8.0	5.7	4.4	2.0	1.1	0.1	42.7	55.5
				Average	"	0.7	1.4	2.4	4.8	6.4	7.6	8.3	6.7	4.7	2.6	1.0	0.1	43.5	57.1
Pasture (Native) (High water table meadow)	Alturas 2SE	Inflow-Outflow ET Tank	DWR	1959	Perennial (Active Growth Apr-Sep)	-	-	-	5.2	6.0	9.0	10.4	9.0	4.9	2.8	-	-	44.5	-
				1960	"	-	-	-	3.0	4.8	6.6	9.6	9.3	6.0	3.6	0.5	0.1	39.3	-
				1961	"	0.2	0.7	2.0	4.7	6.6	8.3	10.2	7.3	6.6	3.1	-	-	43.7	-
				1962	"	-	-	0.8	4.4	4.8	7.4	8.6	8.4	5.9	2.3	1.1	1.1	39.5	-
				1963	"	0.5	0.4	1.3	1.6	3.5	5.7	7.3	7.6	4.7	3.0	-	-	30.4	-
				1964	"	-	-	-	2.4	3.9	5.0	8.1	8.5	5.0	3.1	-	-	32.9	-
				Average	"	0.4	0.6	1.4	3.6	4.9	7.0	9.0	8.4	5.5	3.0	0.8	1.1	38.4	56.8
	Lookout 3S	Inflow-Outflow ET Tank	DWR	1961	Perennial (Active Growth Apr-Sep)	0.2	0.3	1.0	3.8	5.1	7.8	9.0	7.4	6.0	3.0	-	-	39.1	-
				1962	"	0.3	0.5	1.0	3.8	5.5	7.1	8.5	8.0	5.8	2.3	1.0	0.5	38.7	44.3
				1963	"	-	-	1.4	-	-	6.4	9.5	8.7	4.8	3.8	-	-	-	-
				Average	"	0.2	0.4	1.1	3.8	5.3	7.1	9.0	8.0	5.5	3.0	1.0	0.5	38.7	44.9
	Coleville 2W	Inflow-Outflow ET Tank	DWR	1957	Perennial (Active Growth Apr-Sep)	-	-	-	-	-	7.5	9.1	7.8	-	-	-	-	-	-

Table 4. MEASURED MONTHLY EVAPOTRANSPIRATION FOR SEVERAL PRINCIPAL CROPS IN CALIFORNIA[1/] (in inches)

Crop	Location	Method of Measurement	Observer	Year	Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals Growing Season	Annual
Potatoes	Arvin 2.8NW (Spring crop)	Neutron probe	DWR	1966	2/3-6/15 (Active Growth Mar 27-Jun 15)	-	-	-	6.2	8.4	1.9	-	-	-	-	-	-	16.5	-
				1967	2/15-7/5 (Active Growth Mar 22-Jul 15)	-	-	0.6	2.6	7.3	4.7	0.7	-	-	-	-	-	15.9	
				Average		-	-	0.6	4.4	7.8	3.3	0.7	-	-	-	-	-	16.8	-
Rice	Knights Landing 3NW	Bowen ratio	U.C.[4/]	Average 1968-69	Apr-Sep	-	-	-	-	6.8	8.0	8.4	7.3	5.8	-	-	-	36.3	-
Subtropical Orchard	Goleta 2N (Avocados)	Neutron probe	ARS[3/]	1958	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	4.0	4.1	3.5	3.7	2.7	1.9	2.2	-	-
				1959	"	-	-	-	2.4	3.2	4.6	4.0	4.2	3.4	2.4	2.1	1.7	-	-
				1960	"	1.3	2.0	3.0	-	-	-	-	-	-	-	-	-	-	-
				Average	"	1.3	2.0	3.0	2.4	3.2	4.3	4.0	3.8	3.6	2.6	2.0	2.0	26.9	34.
	Carpenteria 2N (Avocados)	Neutron probe	ARS[3/]	1958	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	3.8	3.2	2.8	2.7	1.8	1.4	1.4	-	-
				1959	"	-	-	-	2.8	2.4	3.2	4.0	2.6	2.5	2.4	2.6	1.6	-	-
				1960	"	1.4	2.1	2.0	-	-	-	-	-	-	-	-	-	-	-
				Average	"	1.4	2.1	2.0	2.8	2.4	3.5	3.6	2.7	2.6	2.1	2.0	1.5	21.7	28.
	Goleta 2N (Lemons)	Neutron probe	ARS[3/]	1958	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	3.2	3.2	2.6	3.0	2.2	2.0	2.1	-	-
				1959	"	-	-	-	2.0	3.2	3.6	4.8	4.5	4.8	3.1	2.2	1.6	-	-
				1960	"	1.3	2.3	2.2	-	-	-	-	-	-	-	-	-	-	-
				Average	"	1.3	2.3	2.2	2.0	3.2	3.4	4.0	3.6	3.9	2.6	2.1	1.8	24.9	32.
	Carpenteria 2N (Lemons)	Neutron probe	ARS[3/]	1958	Perennial (Active Growth Mar-Oct)	-	-	-	-	-	2.6	2.8	3.0	2.8	2.9	1.3	1.4	-	-
				1959	"	-	-	-	3.6	3.4	3.2	5.2	5.0	4.2	2.6	2.2	2.0	-	-
				1960	"	2.0	2.2	2.3	-	-	-	-	-	-	-	-	-	-	-
				Average	"	2.0	2.2	2.3	3.6	3.4	2.9	4.0	4.0	3.5	2.8	1.8	1.7	26.5	34.
Sugar Beets	Arvin 2.5S	Neutron probe	DWR	1966	2/20-8/8 (Active Growth Mar 20-Aug 8)	-	-	0.3	4.2	8.4	9.2	6.1	1.9	-	-	-	-	30.1	-
	Davis 2W	Hydraulic ET Tank	U.C.[4/]	1965	Jun 14-Nov 3	-	-	-	-	-	0.9	4.2	7.6	6.3	3.8	0.1	-	22.9	-
				1966	Mar 25-Sep 20	-	-	0.1	1.3	3.1	8.4	8.8	7.8	4.0	-	-	-	33.5	-
	Lompoc 4.3WNW	Gravimetric	ARS[3/]	1957	Feb - Sep 18	-	-	-	-	-	1.9	3.4	2.6	-	-	-	-	-	-
	Lompoc 3.1ESE	Gravimetric	ARS[3/]	1957	Feb - Sep 9	-	-	-	-	-	3.6	4.0	3.2	-	-	-	-	-	-
	Solvang 3.2WNW	Gravimetric	ARS[3/]	1957	Mar - Nov	-	-	-	-	-	2.6	6.3	4.4	2.4	-	-	-	-	-
Tomatoes	Arvin 2.5NW (Mach. harvest)	Neutron probe	DWR	1968	Feb 20-Jul 24 (Active Growth Mar 21-Jul 24)	-	-	0.3	1.0	5.9	6.6	4.8	-	-	-	-	-	18.6	-
				1969	Feb 28-Jul 18 (Active Growth Apr 1-Jul 18)	-	-	-	2.0	6.9	8.0	4.0	-	-	-	-	-	20.9	-
				Average		-	-	0.3	1.5	6.4	7.3	4.4	-	-	-	-	-	19.9	-
	Davis 2W (Mach. harvest)	Floating ET Tank	U.C.[4/]	1969	Apr 30-Sep 24	-	-	-	-	2.0	3.5	9.1	8.5	3.5	-	-	-	26.6	-
Vineyard	Arvin 1NW (Thompson table grapes)	Neutron probe	DWR	1966	Perennial (Active Growth May-Oct)	-	-	-	-	3.4	5.1	7.0	4.0	1.9	-	-	-	-	-
				1967	"	-	-	-	-	-	4.7	6.8	7.4	4.2	1.6	0.1	0.7	-	-
				1968	"	0.8	0.6	0.6	0.9	5.2	7.1	5.9	4.0	4.4	0.8	0.2	0.6	27.4	
				1969	"	1.3	0.5	0.5	0.7	2.8	5.7	5.9	5.9	4.1	1.4	0.4	0.2	25.8	-
				Average	"	1.0	0.6	0.6	0.8	3.8	5.6	6.4	5.3	3.6	1.3	0.2	0.5	26.0	-
Wheat (irrigated)	Brawley 2 SW	Hydraulic ET Tank	ARS[2/]	1973	Dec 22-May 24	1.4	3.1	6.0	8.4	5.6	-	-	-	-	-	-	-	25.2	-

1/ Monthly evaporation rates determined by Department of Water Resources and cooperating agencies.
2/ Data contributed by R. D. LeMert, Agricultural Research Technician, USDA, Agricultural Research Service, Imperial Valley Conservation Research Center, Brawley.
3/ Data contributed by P. R. Nixon, Agricultural Engineer, USDA, Agricultural Research Service, Weslaco, Texas (formerly project leader ARS-Lompoc).
4/ Data contributed by W. O. Pruitt, Irrigation Engineer, Department of Water Science & Engineering, University of California at Davis.
5/ Plots had only 3 access tubes. Research investigator states, "Evapotranspiration amounts . . . . in these walnuts can be considered only as general indications of actual magnitudes". Pg. 33, Annual Research Report, 1961, ARS-SWC, Lompoc.
6/ Data collected by San Luis Obispo County Flood Control District in cooperation with DWR.
7/ Data collected by California State Polytechnic University.
8/ Data collected by California Department of Corrections, Soledad Correctional Training Facility in cooperation with DWR.

Table 5. RECOMMENDED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS[1]

RECOMMENDED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS[1]

Crop	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Potential ET	0.71	0.74	0.76	0.77	0.78	0.78	0.78	0.78	0.77	0.75	0.73	0.70
Field Crops												
Alfalfa (Hay)	0.71	0.74	0.70	0.70	0.71	0.73	0.76	0.80	0.80	0.77	0.73	0.70
Barley (Fall)	0.67	0.95	0.82	0.50	0.20	-	-	-	-	-	0.10	0.30
Barley (Winter)	0.30	0.67	0.95	0.82	0.50	0.20	-	-	-	-	-	-
Beans (Dry)	-	-	-	-	-	-	0.42	0.85	0.43	-	-	-
Cantaloupes	-	-	-	0.15	0.32	0.86	0.13	-	-	-	-	-
Castor Beans[2]	-	-	-	0.06	0.14	0.67	1.01	0.95	0.78	0.69	0.39	-
Corn (Field)	-	-	-	-	0.12	0.48	0.94	0.84	0.50	-	-	-
Cotton (Solid)	-	-	-	-	0.10	0.54	1.02	1.01	0.87	0.49	-	-
(2 x 1)	-	-	-	-	0.10	0.49	0.91	1.06	0.87	0.76	-	-
(2 x 2)	-	-	-	-	0.10	0.37	0.88	0.92	0.83	0.41	-	-
(2 x 2)[3]	-	-	-	-	0.10	0.15	0.68	0.88	0.62	0.26	-	-
Grain Sorghum	-	-	-	-	0.10	0.25	0.90	0.82	0.40	-	-	-
Pasture (Improved)	0.71	0.74	0.76	0.77	0.78	0.78	0.78	0.78	0.77	0.75	0.73	0.70
Meadow Pasture (High water table)	0.22	0.38	0.55	0.70	0.83	0.93	0.96	0.96	0.92	0.84	0.78	0.54
Rice	-	-	-	0.80[4]	0.90	1.00	1.00	1.00	0.90	0.30	-	-
Sugar Beets (Annual)	-	-	-	0.03	0.39	0.78	0.92	0.80	0.80	0.59	0.40	-
(Overwintered)	0.71	0.74	0.76	0.38	0.03	0.39	0.78	0.92	0.80	0.80	0.73	0.70
Tomatoes (Machine-harvested)	-	-	-	0.22	0.60	0.88	0.83	0.62	-	-	-	-
Trees and Vines												
Deciduous Orchard[5]	-	-	0.45	0.55	0.65	0.70	0.75	0.75	0.70	0.60	-	-
Almonds[6]	-	-	0.33	0.40	0.50	0.52	0.55	0.55	0.35	0.30	-	-
Subtropical Orchard[7]	-	-	0.45	0.45	0.50	0.50	0.50	0.50	0.45	0.45	-	-
Vineyard (Table grapes)	-	-	-	0.12	0.45	0.60	0.66	0.65	0.55	0.30	-	-
Vineyard (Wine grapes)[8]	-	-	-	0.12	0.45	0.55	0.50	0.35	0.20	0.05	-	-
Truck Crops												
Carrots	-	-	-	-	-	-	0.35[4]	0.62	0.76	0.79	-	-
Cauliflower (Early crop)[9]	-	-	-	-	-	-	0.78[4]	0.78	0.77	0.75	-	-
Cauliflower (Late crop)[9]	-	-	-	-	-	-	-	0.78	0.77	0.75	0.73	0.70
Lettuce (Spring crop)[9]	-	0.74	0.76	0.77	0.78[4]	-	-	-	-	-	-	-
Lettuce (Summer crop)[9]	-	-	-	0.78	0.78	0.78	-	-	-	-	-	-
Lettuce (Fall crop)[9]	-	-	-	-	-	-	0.78[4]	0.78	0.77	-	-	-
Potatoes (Spring crop)	-	-	0.50	0.83	0.94	0.50	-	-	-	-	-	-
Tomatoes (Handpicked)	-	-	0.22	0.60	0.88	0.88	0.75	0.50	0.30	-	-	-

1/ Developed from smoothed curves of monthly observed ET/Ep ratios, except as noted. Monthly ratios shown are for principal growing seasons in State. They must be modified for use in areas of different growing seasons.
2/ An example of a very rough surface field crop.
3/ For extremely fine-textured (clay) soils.
4/ Planted or harvested at mid-month. Evaporation for partial month should be used with ratios shown.
5/ Deciduous trees except almonds.
6/ No ET data available. Ratios estimated from deciduous orchard modified to reflect differences in irrigation and cultural practices.
7/ Citrus, avocados and olives. No observed ratios available. Ratios estimated from potential ET modified to reflect prevalent irrigation and cultural practices.
8/ No ET data available. Ratios estimated from data for table grapes modified to reflect differences in irrigation and cultural practices.
9/ No ET data available. Ratios estimated from potential ET data modified to reflect prevalent irrigation and cultural practices.

In the mid-1950s, after consulting with Professor F. J. Veihmeyer and his associates at the University of California at Davis, the Department of Water Resources adopted the use of evaporation data as the best means to transfer crop ET data from the area of measurement to other areas. This empirical method has been suggested by the close correlation of ET and evaporation observed by many investigators. However, other investigators have found the relationship between ET and evaporation to show differing relationships between various areas. These anomalies are possibly due to environmental differences surrounding the evaporimeters.

Evaluation of Evapotranspiration/Evaporation Correlation Technique for Transferring ET Data

To test the reliability of the ET/evaporation correlation technique in estimating ET rates, evapotranspiration data for a single crop, grass, was evaluated for eight locations. These locations range from sites near the ocean to sites in the Central Valley and the northeastern mountains. Six stations were operated either directly by the Department or in cooperation with local agencies. The Agricultural Research Service and the University of California at Davis each operated one ET tank.

At each location, the evapotranspiration of grass (or pasture) was measured with evapotranspirometers of various designs. Vegetative cover was either grass or mixed improved pasture species, which was adequately irrigated and periodically clipped to maintain a low, smooth, complete crop surface in and around the ET tanks.

The ET data observed at the various locations are believed to be comparable in all respects, except for climatic differences. Measured monthly evapotranspiration of grass was compared to four climatic parameters observed near each ET tank: pan evaporation, net atmometer evaporation, solar radiation, and the Blaney-Criddle "f" factor (1) (Appendix G).

While each of the four climatic parameters correlated well to evapotranspiration at individual stations, the calculated relationships for net atmometer evaporation, solar radiation, and the Blaney-Criddle "f" factor varied between locations. The best correlation was found between ET and pan evaporation. The seasonal relationship was found to be within $\pm$ 10 percent for all locations. For these reasons, pan evaporation was used to transfer crop ET from the area of measurement to other areas. The calculated relationships between ET of grass and the four climatic indexes for each of the eight locations are shown in Appendix H.

The observed monthly average ET/Ep ratio for each of the eight locations was plotted in a single smoothed fitted curve.

Monthly ET/Ep ratios taken from the smoothed curve are shown (as potential ET) in Table 5. Potential ET (ET of grass) calculated for each of nine evaporative demand zones using the monthly ratios and average pan evaporation for each zone (Table 1) is shown in Table 6.

Estimating Crop Growing Season Evapotranspiration

The formula for estimating crop ET by the ET/evaporation method is:

$$ET' = (ET/Ep)\ (Ep')$$

where

ET' = estimated ET for area

(ET/Ep) = the monthly ratio of crop ET to pan evaporation determined at field plot locations

(Ep') = pan evaporation for the area for which ET is being estimated

(All evaporation measured in irrigated pasture or comparable environment.)

In transferring evapotranspiration data, monthly ET/Ep ratios must be selected to reflect the stage of crop development. When the proper selection has been made, differences that may exist in growing seasons or crop development between the area of measurement and the area to which the ET value is to be transferred may be easily adjusted.

The crop growing seasons used to estimate ET for evaporative demand zones were determined from interviews with growers, farm advisors, and other persons having knowledge of agricultural practices. The information obtained was assembled on the basis of the prevalent practice for each crop within each area. For those areas in which farming techniques vary from prevailing agricultural practices, the ET can be calculated by adjusting ET/Ep ratios. (Growing seasons used to estimate crop ET appear in Appendix J.) Growing season ET was then calculated for principal crops in nine evaporative demand zones (even-numbered tables from Table 8 through Table 24). Insufficient evaporation data were available to make adequate estimates of crop ET in Zone 7 (Sierra) and Zone 11 (Southern California Desert).

Estimating Evapotranspiration of Applied Water

In most agricultural areas of the State, part of the crop ET demand can be met by precipitation. The part of the

Table 6. SUMMARY OF ESTIMATED POTENTIAL EVAPOTRANSPIRATION IN CALIFORNIA [1/] [2/]
In inches

MONTH / ZONE	Northeastern Mountain Valleys 3	North Coast - Coastal Valleys and Plains 1	North Coast - Interior Valleys 2	Sacramento Valley 4	San Joaquin Valley 5	Central Coast - Coastal Valleys and Plains 8	Central Coast - Interior Valleys 6	South Coast - Coastal Valleys and Plains [3/] 9	South Coast - Interior Valleys [3/] 10	Southern California Desert [4/] 11
Jan	0.6	0.5	0.8	1.1	0.9	1.8	1.6	1.8	1.7	2.7
Feb	1.0	1.0	1.2	1.8	1.7	2.1	2.1	2.4	2.4	3.6
Mar	2.1	2.0	2.4	3.0	3.2	3.1	3.3	3.1	3.3	5.9
Apr	3.7	2.5	3.4	4.4	4.5	3.9	4.3	3.8	4.2	7.6
May	5.0	3.3	5.0	5.8	6.5	4.7	5.7	4.5	5.1	10.1
Jun	5.8	3.6	5.9	7.3	7.5	4.9	6.2	5.1	6.0	11.4
Jul	7.9	3.5	7.1	7.9	7.8	5.3	6.7	5.5	6.9	11.6
Aug	7.0	3.4	6.2	6.7	6.6	4.8	6.0	5.5	6.7	9.6
Sep	4.9	2.8	4.6	5.2	4.8	3.8	4.8	4.5	5.2	8.5
Oct	2.8	1.7	2.7	3.4	3.3	3.2	3.8	3.4	3.8	6.3
Nov	0.9	1.1	1.2	1.6	1.5	2.2	2.3	2.6	2.3	3.5
Dec	0.5	0.7	0.7	1.0	0.7	1.5	1.5	2.2	1.8	2.0
M - O [5/]	39.2	22.8	37.3	43.7	44.3	33.7	40.8	35.4	41.2	71.0
J - D [6/]	42.2	26.1	41.2	49.2	49.0	41.3	48.3	44.4	49.4	82.8

1/ Potential ET = ET of grass.
2/ Calculated from statewide average ET/Ep coefficient and area average Ep, except as noted.
3/ No evaporation data (irrigated pasture environment) available. PET estimates based upon estimated evaporation.
4/ An estimate of ET - grass for Imperial Valley. Calculated by W. O. Pruitt, U.C. Davis, from ET by alfalfa (excluding 2 weeks following cutting) as observed by Robert D. LeMert, USDA-ARS, Brawley. (A 10-15% lower ET by grass than by alfalfa was assumed.)
5/ March through October (principal growing season).
6/ January through December.

total which is used by the crop is termed "effective precipitation". Most of the precipitation that falls during the growing season is effective. The portion that falls during the nongrowing season which is stored in the soil profile and is available for crop use in the next growing season is also effective (21). In California's agricultural areas about two-thirds of the annual precipitation occurs during winter, normally the nongrowing season for most crops (see Table 7).

Estimates of effective precipitation were developed for this study from the following assumptions.

- All precipitation occurring during the crop growing season is assumed to be effective precipitation. (The validity of such an assumption is modified by the fact that part of the precipitation falling early in the season before crop vegetative cover has fully developed evaporates from the soil surface and does not contribute substantially to the crop's water needs for the season.)

- To calculate amounts of nongrowing season precipitation that are effective, it is assumed that only that amount of monthly precipitation exceeding potential ET can be stored each month.

- In these computations, 1½ inches of soil moisture storage are assumed to be available per foot of root zone depth. (Assumed rooting depths are shown in Appendix J).

- Furthermore, the intensity of individual storms is assumed to be so moderate that no surface runoff will occur from the generally flat agricultural terrain.

Evapotranspiration and precipitation are evenly distributed throughout the month.

Other assumptions are: (1) evaporation from soil surfaces between the end of the winter rainy season and the start of the crop growing season decreases the amount of stored moisture; however, a maximum of 0.75 inches per month of moisture can be so evaporated; (2) evaporation of rainfall plus evaporation of soil moisture will not exceed potential evapotranspiration; (3) as land is tilled for planting, the drier surface soil is turned under and replaced with moist soil from the plowing depth. As a result of this practice, the maximum amount of soil moisture evaporated from the soil surface is 2.25 inches (0.75 inch per month for three months).

Table 7. MONTHLY PERCENTAGE DISTRIBUTION OF MEAN ANNUAL PRECIPITATION IN CALIFORNIA[1/] [2/]

Month	North Coast - Coastal and Interior Valleys	Sacramento Valley	San Joaquin Valley	Central Coast - Coastal and Interior Valleys	South Coast - Coastal and Interior Valleys	Average of Five Areas
	Number of Stations					
	8	9	9	9	7	42
Jan	20.3	19.5	18.8	21.2	20.1	20.0
Feb	16.4	17.7	18.3	19.8	21.4	18.7
Mar	12.8	13.4	16.3	14.8	14.9	14.4
Apr	6.9	8.3	10.7	8.4	8.2	8.5
May	4.0	3.9	3.5	2.3	1.4	3.0
Jun	1.5	1.3	0.7	0.6	0.4	0.9
Jul	0.2	0.1	0.1	0.1	0.1	0.1
Aug	0.2	0.2	0.0	0.2	0.6	0.2
Sep	1.1	1.3	1.1	0.9	1.0	1.1
Oct	6.4	5.3	4.4	3.5	3.7	4.7
Nov	11.0	9.2	8.2	8.0	8.4	9.0
Dec	19.2	19.8	17.9	20.2	19.8	19.4
M - O Total[3/]	33.1	33,8	36.8	30.8	30.3	32.9
N - F Total[4/]	66.9	66.2	63.2	69.2	69.7	67.1

1/ That portion of California west of the crest of the Cascade-Sierra Nevada mountain ranges.
2/ Monthly percentages calculated from long-term mean annual precipitation as reported in National Weather Service, "Climatological Data".
3/ March - October.
4/ November - February.

Long-term annual precipitation for the State is shown on an isohyetal map compiled by the U. S. Geological Survey (19) (Plate 2).

The following method was used to determine the mean monthly precipitation within the agricultural regions for which growing season ET was calculated. An analysis of monthly percentage distribution of mean annual precipitation made for a large number of locations throughout the State indicated that while the total annual rainfall amounts varied greatly, the monthly percent of precipitation was nearly uniform for the portion of the State west of the Sierra Nevada-Cascade mountain ranges. These monthly percentages are shown in Table 7. Using the monthly percentage distribution, long-term mean precipitation was calculated for the various rainfall zones within each of the evaporative demand zones.

This method could not be used for the Northeastern Mountain Valleys evaporative demand zone because of the uneven distribution resulting from summertime local convectional storms within that zone. Long-term mean precipitation for several stations located in the agricultural valleys of this area were used to characterize monthly precipitation.

To determine the amount of effective precipitation for each evaporative demand zone, monthly soil moisture budgets were calculated for each of the principal crops. The ET of applied water was then determined for each crop (odd-numbered tables from Table 9 through Table 25).

Table 8. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - NORTHEAST MOUNTAIN VALLEYS[1/]
In inches

Month	Potential ET [2/]	Alfalfa (Hay)	Barley	Corn (Field)	Pasture		Potatoes
					Improved	Meadow [3/]	
Jan	0.6	-	-	-	-	-	-
Feb	1.0	-	-	-	-	-	-
Mar	2.1	-	-	-	-	-	-
Apr	3.7	3.4	3.2	-	3.7	3.7	-
May	5.0	4.5	6.1	-	5.0	5.0	-
Jun	5.8	5.5	6.2	3.6	5.8	5.8	6.2
Jul	7.9	7.7	5.0	9.5	7.9	5.0	9.5
Aug	7.0	7.2	-	7.6	7.0	2.9	4.4
Sep	4.9	5.0	-	3.2	4.9	-	-
Oct	2.8	-	-	-	-	-	-
Nov	0.9	-	-	-	-	-	-
Dec	0.5	-	-	-	-	-	-
Total	42.2	33.3	20.5	23.9	34.3	22.4	20.1

1/ Calculated from average evaporation (irrigated pasture environment) for area and observed ET/Ep ratios.
2/ ET of large plot of well-watered, clipped grass.
3/ For prevalent practice of deficit irrigation - evapotranspiration limited by soil moisture available.

Table 9. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - NORTHEAST MOUNTAIN VALLEYS

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches		
		10-12	12-14	14-16
		ET of Applied Water, AF/A		
Alfalfa (Hay)	2.8	2.3	2.2	2.0
Barley	1.7	1.3	1.2	1.0
Corn (Field)	2.0	1.8	1.7	1.6
Pasture (Improved)	2.9	2.4	2.3	2.2
Pasture (Meadow)	1.9	1.5 [1/]	1.5 [1/]	1.5 [1/]
Potatoes	1.7	1.6	1.5	1.4

1/ Evapotranspiration limited by soil moisture available.

Table 10. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - NORTH COAST, COASTAL VALLEYS AND PLAINS[1/]
In inches

Month	Potential ET[2/]	Pasture (Improved)
Jan	0.5	-
Feb	1.0	-
Mar	2.0	2.0
Apr	2.5	2.5
May	3.3	3.3
Jun	3.6	3.6
Jul	3.5	3.5
Aug	3.4	3.4
Sep	2.8	2.8
Oct	1.7	1.7
Nov	1.1	-
Dec	0.7	-
Total	26.1	22.8

1/ Calculated from average evaporation (irrigated pasture environment) for area, and ET/Ep ratio.
2/ ET of large plot of well-watered, clipped grass.

Table 11. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - NORTH COAST, COASTAL VALLEYS AND PLAINS
In acre-feet/acre

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches											
		24-26	26-28	28-30	30-32	32-38	38-44	44-50	50-56	56-62	62-68	68-74	74-80
Pasture (improved)	1.9	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.7

Table 12. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - NORTH COAST, INTERIOR VALLEYS[1/]
In inches

Month	Potential ET[2/]	Alfalfa (Hay)	Barley	Corn (Field)	Deciduous Orchard	Pasture (Improved)	Vineyard (Wine grapes)
Jan	0.8	-	0.4	-	-	-	-
Feb	1.2	-	1.1	-	-	-	-
Mar	2.4	2.2	2.9	-	1.4	2.4	-
Apr	3.4	3.1	3.6	-	2.4	3.4	-
May	5.0	4.5	3.2	-	4.2	5.0	2.9
Jun	5.9	5.5	1.5	3.6	5.3	5.9	4.3
Jul	7.1	5.4	-	8.6	6.8	7.1	4.6
Aug	6.2	6.4	-	6.7	6.0	6.2	2.9
Sep	4.6	4.8	-	3.0	4.2	4.6	1.2
Oct	2.7	2.8	-	-	2.2	2.7	0.2
Nov	1.2	-	-	-	-	-	-
Dec	0.7	-	-	-	-	-	-
Total	41.2	34.7	12.7	21.9	32.5	37.3	16.1

1/ Calculated from average evaporation (irrigated pasture environment) for area, and ET/Ep ratios.
2/ ET of large plot of well-watered, clipped grass.

Table 13. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - NORTH COAST, INTERIOR VALLEYS

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches									
		16-18	18-20	20-22	22-24	24-26	26-28	28-30	30-32	32-38	38-44
		ET of Applied Water, AF/A									
Alfalfa (Hay)	2.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.4
Barley	1.1	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Corn (Field)	1.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4
Deciduous Orchard	2.7	1.7	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.3
Pasture (Improved)	3.1	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.1	2.1	2.0
Vineyard[1/]	1.3	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4

1/ Estimated ET and ET applied water based on ET of table grapes, precipitation and applied water data.

Table 14. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - CENTRAL COAST, COASTAL VALLEYS AND PLAINS[1/]
In inches

Month	Potential ET [2/]	Alfalfa (Hay)	Barley	Beans (Dry)	Carrots (Summer Crop) [3/]	Cauliflower (Early Crop) [4/]	Cauliflower (Late Crop) [4/]	Corn (Field)	Deciduous Orchard	Lettuce Spring Crop [4/]	Lettuce Summer Crop [4/]	Lettuce Fall Crop [4/]	Pasture (Improved)	Potatoes	Sugar Beets	Tomatoes (Canning) [5/]
Jan	1.8	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb	2.1	-	2.8	-	-	-	-	-	-	2.1	-	-	-	-	-	-
Mar	3.1	2.9	3.4	-	-	-	-	-	1.8	3.1	-	-	3.1	-	0.4	-
Apr	3.9	3.6	2.6	-	-	-	-	-	2.8	3.9	-	-	3.9	-	1.0	-
May	4.7	4.3	3.8	-	-	-	-	-	3.9	2.4 [6/]	4.7	-	4.7	-	3.7	1.3
Jun	4.9	4.6	-	2.6	-	-	-	3.0	4.4	-	4.9	-	4.9	1.6 [6/]	6.0	3.8
Jul	5.3	5.2	-	5.8	2.4 [6/]	2.6 [6/]	-	6.4	5.1	-	5.3	2.6 [6/]	5.3	5.6	6.3	6.0
Aug	4.8	4.9	-	2.6	3.8	4.8	4.8	5.1	4.6	-	-	4.8	4.8	5.7	4.9	5.1
Sep	3.8	4.0	-	-	3.8	3.8	3.8	2.5	3.5	-	-	3.8	3.8	2.4	3.0	3.1
Oct	3.2	3.3	-	-	3.4	3.2	3.2	-	2.6	-	-	-	3.2	1.6 [6/]	1.9	-
Nov	2.2	-	0.3	-	-	-	2.2	-	-	-	-	-	-	-	-	-
Dec	1.5	-	0.6	-	-	-	1.5	-	-	-	-	-	-	-	-	-
Total	41.3	32.8	15.2	11.0	13.4	14.4	15.5	17.0	28.7	11.5	14.9	11.2	33.7	16.9	27.2	19.3

1/ Calculated from average evaporation (irrigated pasture environment) for area, and (except as noted) ET/Ep ratios observed in Central Valley.
2/ ET of large plot, well-watered, clipped grass.
3/ Calculated from ET observations within area and average evaporation for area.
4/ No ET data available. ET estimated from potential ET modified by crop cultural and irrigation practices.
5/ Mechanically harvested varieties.
6/ Crop planted or harvested at mid-month. ET estimate for 1/2 month.

Table 15. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - CENTRAL COAST, COASTAL VALLEYS AND PLAINS

Crop [1/]	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches: 14-16	16-18	18-20	20-22	22-24	24-26	26-28	28-30
		ET of Applied Water, AF/A							
Alfalfa (Hay)	2.7	2.0	1.9	1.7	1.6	1.6	1.5	1.5	1.5
Barley	1.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Beans (Dry)	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.6
Carrots (Summer Crop) [2/]	1.1	1.1	1.1	1.0	-	-	-	-	-
Cauliflower (Early Crop) [2/3/]	1.2	1.2	1.1	1.1	-	-	-	-	-
Cauliflower (Late Crop) [2/3/]	1.3	1.0	1.0	1.0	-	-	-	-	-
Corn (Field)	1.4	1.3	1.2	1.2	1.1	1.1	1.1	1.1	1.1
Deciduous Orchard	2.4	1.7	1.6	1.5	1.4	1.3	1.3	1.3	1.2
Lettuce (Spring Crop) [3/]	1.0	0.4	0.3	0.3	-	-	-	-	-
Lettuce (Summer Crop) [2/3/]	1.2	1.2	1.2	1.2	-	-	-	-	-
Lettuce (Fall Crop) [2/3/]	0.9	0.9	0.9	0.9	-	-	-	-	-
Pasture (Improved)	2.8	2.2	2.1	2.1	2.0	2.0	2.0	2.0	1.9
Potatoes [2/]	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Sugar Beets	2.3	1.8	1.7	1.5	1.4	1.4	1.4	1.4	1.3
Tomatoes [4/]	1.6	1.4	1.2	1.1	1.0	1.0	1.0	1.0	0.9

1/ Crops for which ET was measured by University of California or Department of Water Resources in Central Valley locations. Growing season ET for coastal area estimated from evaporation and observed ET/Ep ratios.
2/ Assumed to follow a summer harvested truck crop - precipitation stored as soil moisture and carried to growing season = 0.0.
3/ No ET data available. ET estimated from potential ET data.
4/ Mechanically harvested canning tomatoes.

Table 16. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - CENTRAL COAST, INTERIOR VALLEYS[1/]
In inches

Month	Potential ET [2/]	Alfalfa (Hay)	Barley	Beans (Dry)	Corn (Field)	Deciduous Orchard	Pasture (Improved)	Sugar Beets	Tomatoes (Canning) [3/]	Vineyard (Wine Grapes) [4/]
Jan	1.6	-	1.5	-	-	-	-	-	-	-
Feb	2.1	-	2.2	-	-	-	-	-	-	-
Mar	3.3	3.0	3.5	-	-	1.9	3.3	0.4	-	-
Apr	4.3	3.9	2.8	-	-	3.1	4.3	1.1	-	-
May	5.7	5.2	1.5	-	0.9	4.7	5.7	4.5	1.6	3.4
Jun	6.2	5.8	-	3.3	3.8	5.5	6.2	7.5	4.7	4.4
Jul	6.7	6.5	-	7.3	8.1	6.4	6.7	8.0	7.6	4.3
Aug	6.0	6.2	-	3.3	6.5	5.8	6.0	6.2	6.4	2.8
Sep	4.8	5.0	-	-	3.1	4.3	4.8	3.7	3.8	1.2
Oct	3.8	3.8	-	-	-	3.0	3.8	2.2	-	0.3
Nov	2.3	-	0.3	-	-	-	-	-	-	-
Dec	1.5	-	0.6	-	-	-	-	-	-	-
Total	48.3	39.4	12.4	13.9	22.4	34.7	40.8	33.6	24.1	16.1

1/ Calculated from average evaporation (irrigated pasture environment) for area and observed ET/Ep ratios.
2/ ET of large plot of well-watered, clipped grass.
3/ Machine-harvested varieties.
4/ No ET measurements available. ET estimated from ET of table grapes, adjusted for difference in prevalent irrigation practice.

Table 17. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - CENTRAL COAST, INTERIOR VALLEYS

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches					
		12-14	14-16	16-18	18-20	20-22	22-24
		ET of Applied Water, AF/A					
Alfalfa (Hay)	3.3	2.7	2.6	2.4	2.3	2.1	2.1
Barley	1.0	0.2	0.0	0.0	0.0	0.0	0.0
Beans (Dry)	1.2	1.1	1.0	1.0	0.9	0.9	0.9
Corn (Field)	1.9	1.7	1.6	1.6	1.5	1.5	1.5
Deciduous Orchard	2.9	2.3	2.2	2.1	2.0	1.8	1.8
Pasture (Improved)	3.4	2.8	2.8	2.7	2.7	2.6	2.6
Sugar Beets	2.8	2.4	2.3	2.1	2.0	1.9	1.9
Tomatoes [1/]	2.0	1.9	1.8	1.6	1.5	1.4	1.4
Vineyard [2/]	1.3	1.2	1.0	0.9	0.8	0.7	0.6

1/ Machine-harvested canning tomatoes.
2/ Wine grapes.

Table 18. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - SOUTH COAST, INTERIOR VALLEYS[1/]
In inches

Month	Potential ET[2/]	Alfalfa (Hay)	Barley	Deciduous Orchard	Pasture (Improved)	Potatoes	Subtropical Orchard[3/]	Sugar Beets	Vineyard	
									Table Grapes	Wine Grapes
Jan	1.7	-	1.6	-	-	-	1.7	-	-	-
Feb	2.4	-	3.0	-	-	-	2.4	-	-	-
Mar	3.3	3.1	3.6	2.0	3.3	-	2.0	0.4	-	-
Apr	4.2	3.8	2.8	3.0	4.2	-	1.9	1.1	-	-
May	5.1	4.6	1.3	4.2	5.1	-	2.4	4.0	3.0	3.0
Jun	6.0	5.6	-	5.4	6.0	6.4	2.8	7.3	4.7	4.3
Jul	6.9	6.7	-	6.6	6.9	8.3	3.2	8.2	5.9	4.4
Aug	6.7	6.9	-	6.4	6.7	4.2	3.1	6.9	5.6	3.1
Sep	5.2	5.4	-	4.8	5.2	-	2.4	4.1	3.7	1.4
Oct	3.8	3.9	-	3.1	3.8	-	1.7	2.3	1.6	0.3
Nov	2.3	-	-	-	-	-	2.3	-	-	-
Dec	1.8	-	0.8	-	-	-	1.8	-	-	-
Total	49.4	40.0	13.1	35.5	41.2	18.9	27.7	34.3	24.5	16.5

1/ No evaporation data (irrigated pasture environment) available. ET estimates based upon ratios of ET/Ep observed in other areas and evaporation estimated from dry land pan data and other climatological data.
2/ ET of large plot of well-watered, clipped grass.
3/ No ET measurements available. ET estimates based upon crop development and prevalent cultural and irrigation practices.

Table 19. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - SOUTH COAST, INTERIOR VALLEYS[1/]

Crop	Estimated Growing Season ET, AF/A[1/]	Rainfall Zone, Average Annual Precipitation - Inches[2/]							
		10-12	12-14	14-16	16-18	18-20	20-22	22-24	24-26
		ET of Applied Water, AF/A							
Alfalfa (Hay)	3.3	3.0	2.8	2.7	2.5	2.4	2.2	2.2	2.1
Barley	1.1	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Deciduous Orchard	3.0	2.6	2.4	2.3	2.2	2.1	1.9	1.9	1.8
Pasture (Improved)	3.4	3.1	2.9	2.8	2.8	2.7	2.7	2.6	2.6
Potatoes[3/]	1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4
Potatoes[4/]	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Subtropical Orchard	2.3	1.4	1.3	1.2	1.2	1.1	1.1	1.1	1.0
Sugar Beets	2.9	2.6	2.5	2.4	2.3	2.1	2.0	2.0	2.0
Vineyard[5/]	2.0	2.0	1.9	1.8	1.7	1.5	1.4	1.3	1.3
Vineyard[6/]	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.7

1/ No evaporation data (pasture environment) available. ET estimates based upon estimated monthly Ep (pasture environment).
2/ Long term average monthly precipitation.
3/ Single crop.
4/ Potatoes following barley or other crop which leaves soil profile dry at harvest. No carry-over stored soil moisture.
5/ Table grapes - no moisture stress.
6/ Wine grapes - sparsely irrigated - vines stressed. Estimated from table grapes data.

Table 20. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - SOUTH COAST, COASTAL VALLEYS AND PLAINS[1/]
In inches

Month	Potential ET [2/]	Alfalfa (Hay)	Deciduous Orchard	Pasture (Improved)	Strawberries [3/]	Subtropical Orchard [3/]	Tomatoes (Market)
Jan	1.8	-	-	-	1.8	1.8	-
Feb	2.4	-	-	-	2.4	2.4	-
Mar	3.1	2.9	1.8	3.1	3.1	1.8	0.9
Apr	3.8	3.4	2.7	3.8	3.1	2.3	2.9
May	4.5	4.1	3.8	4.5	1.4[4/]	2.7	5.1
Jun	5.1	4.8	4.6	5.1	-	3.1	5.8
Jul	5.5	5.3	5.2	5.5	-	3.3	5.2
Aug	5.5	5.6	5.2	5.5	1.1[4/]	3.3	3.5
Sep	4.5	4.6	4.1	4.5	3.6	2.7	1.7
Oct	3.4	3.5	1.3	3.4	3.4	2.1	-
Nov	2.6	-	-	-	2.6	2.6	-
Dec	2.2	-	-	-	2.2	2.2	-
Total	44.4	34.2	28.7	35.4	24.7	30.3	25.1

1/ No evaporation data (irrigated pasture environment) available. ET estimates based upon ratios of ET/Ep observed in other areas, and evaporation estimated from dry land pan data and other climatological data.
2/ ET of large plot of well-watered, clipped grass.
3/ No ET measurements available. ET estimates based upon crop development and prevalent cultural and irrigation practices.
4/ Crop planted or harvested at mid-month.

Table 21. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - SOUTH COAST, COASTAL VALLEYS AND PLAINS [1/]

Crop	Estimated Growing Season ET, AF/A [1/]	Rainfall Zone, Average Annual Precipitation - Inches [2/]			
		12-14	14-16	16-18	18-20
		ET of Applied Water, AF/A			
Alfalfa (Hay)	2.8	2.4	2.2	2.1	1.9
Deciduous Orchard	2.4	2.0	1.9	1.7	1.6
Pasture (Improved)	3.0	2.5	2.3	2.3	2.2
Strawberries [3/]	2.1	1.1	1.0	1.0	0.9
Subtropical Orchard [4/]	2.5	1.5	1.5	1.4	1.4
Tomatoes (Market) [5/]	2.1	1.8	1.7	1.6	1.4

1/ No evaporation data (irrigated pasture environment) available. Evaporation estimated from dry land evapotranspiration and other climatological data. This estimated evaporative demand used as basis for estimating crop ET.
2/ Rainfall zone - average annual precipitation in inches.
3/ No ET data available. Growing season ET estimated from crop development, prevalent cultural and irrigation practice data.
4/ 12-month growing season.
5/ Hand-picked market tomatoes.

Table 22. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - SACRAMENTO VALLEY[1]
In inches

Month	Potential ET [2]	Alfalfa (Hay)	Barley	Beans (Dry)	Corn (Field)	Deciduous Orchard Except Almonds	Deciduous Orchard Almonds [3]	Grain Sorghum	Pasture (Improved)	Potatoes	Rice	Subtropical Orchard [3]	Sugar Beets	Tomatoes (Canning) [4]	Vineyard (Table Grapes)
Jan	1.1	-	1.0	-	-	-	-	-	-	-	-	1.1	-	-	-
Feb	1.8	-	2.3	-	-	-	-	-	-	-	-	1.8	-	-	-
Mar	3.0	2.7	3.2	-	-	1.8	1.4[5]	-	3.0	-	-	1.8	-	-	-
Apr	4.4	4.0	2.8	-	-	3.1	2.3	-	4.4	-	2.2[5]	2.6	-	-	-
May	5.8	5.3	1.5	-	-	4.9	3.7	-	5.8	6.2	6.8	3.5	0.8[5]	1.6	3.4
Jun	7.3	6.8	-	3.9	4.5	6.5	4.9	2.4	7.3	8.7	9.2	4.4	1.9	5.6	5.7
Jul	7.9	7.7	-	8.6	9.5	7.6	5.7	9.2	7.9	4.9	9.1	4.7	6.3	8.9	6.8
Aug	6.7	6.9	-	3.7	7.2	6.4	4.8	7.0	6.7	-	7.8	4.0	8.2	7.1	5.6
Sep	5.2	5.4	-	-	3.4	4.8	3.6	2.7	5.2	-	5.6	2.6	6.3	4.2	3.7
Oct	3.4	3.5	-	-	-	2.8	2.1[5]	-	3.4	-	1.3[5]	2.1	3.7	-	1.5
Nov	1.6	-	0.2[5]	-	-	-	-	-	-	-	-	1.6	1.6	-	-
Dec	1.0	-	0.4	-	-	-	-	-	-	-	-	1.0	1.0[5]	-	-
Total	49.2	42.3	11.4	16.2	24.6	37.9	28.5	21.3	43.7	19.8	42.0	31.2	29.8	27.4	26.7

1/ Calculated from average evaporation (irrigated pasture environment) for Valley and observed ET/Ep ratios.
2/ ET of large plot of well-watered, clipped grass.
3/ No ET measurements available. ET estimates based upon crop development and prevalent cultural and irrigation practice data.
4/ Machine-harvested varieties.
5/ Assume mid-month planting or harvest. ET for 1/2 month.

Table 23. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - SACRAMENTO VALLEY[1]

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches: 12-14	14-16	16-18	18-20	20-22	22-24	24-28	28-32
		ET of Applied Water, AF/A							
Alfalfa	3.5	2.8	2.7	2.6	2.4	2.3	-	-	-
Barley	1.0	0.1	0.0	0.0	0.0	0.0	0.0	-	-
Beans (Dry)	1.4	1.2	1.1	1.1	1.1	1.1	1.1	-	-
Corn (Field)	2.0	1.9	1.8	1.8	1.8	1.8	1.7	-	-
Deciduous Orchard [2]	3.2	2.5	2.4	2.2	2.0	1.9	1.9	1.8	1.8
Almonds [3]	2.4	-	1.7	1.6	1.4	1.3	-	-	-
Grain Sorghum (Milo)	1.8	1.6	1.5	1.4	1.4	1.4	1.3	-	-
Pasture (Improved)	3.6	3.0	3.0	2.9	2.9	2.8	2.8	2.7	2.6
Potatoes	1.6	1.5	1.4	-	-	-	-	-	-
Rice	3.5	3.3	3.3	3.3	3.3	-	-	-	-
Subtropical Orchard [4]	2.6	-	-	1.6	1.6	-	-	-	-
Sugar Beets	2.5	2.0	1.9	1.7	1.6	1.5	1.5	-	-
Tomatoes [5]	2.3	2.0	1.9	1.7	-	-	-	-	-
Vineyard [6]	2.2	1.9	1.8	1.7	1.6	1.5	1.4	1.4	1.4

1/ Averages for entire Valley floor - differences in crop cultural practices may result in small variations from reported amounts.
2/ Deciduous orchard, except almonds.
3/ Not based upon crop ET measurements. Almond ET estimated as .75 x ET deciduous orchard.
4/ ET citrus estimated from: ET citrus = 0.60 x PET for active growing season, ET maximum = PET winter 12-month growing season.
5/ Machine-harvested canning tomatoes.
6/ Table grapes - use as maximum for vineyard, wine grapes may be lower.

Table 24. ESTIMATED GROWING SEASON EVAPOTRANSPIRATION FOR PRINCIPAL CROPS - SAN JOAQUIN VALLEY

In inches

Month	Potential ET 2/	Alfalfa (Hay)	Barley	Beans (Dry)	Cantaloupes	Corn (Field)	Cotton 3/	Deciduous Orchard: Except Almonds	Deciduous Orchard: Almonds 4/	Grain Sorghum	Pasture (Improved)	Potatoes	Rice	Subtropical Orchard 4/	Sugar Beets	Tomatoes (Canning) 5/	Vineyard (Table Grapes)
Jan	0.9	-	0.4	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-
Feb	1.7	-	1.5	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-
Mar	3.2	2.9	4.0	-	-	-	-	1.9	1.4	-	3.2	2.1	-	1.9	0.8 6/	-	-
Apr	4.5	4.1	4.8	-	0.9	-	-	3.2	2.4	-	4.5	4.9	2.4 6/	2.7	3.7	-	0.7 6/
May	6.5	5.9	4.2	-	2.7	-	0.8	5.4	4.0	-	6.5	7.8	7.5	3.9	7.9	1.8	3.8
Jun	7.5	7.0	1.9 6/	4.0	8.3	4.6	4.5	6.7	5.0	2.5	7.5	4.7	9.6	4.5	8.9	5.8	5.8
Jul	7.8	7.6	-	6.5	1.3	9.4	9.4	7.5	5.6	9.1	7.8	-	10.0	4.7	8.0	8.8	6.7
Aug	6.6	6.8	-	3.7	-	7.1	8.5	6.4	4.8	7.0	6.6	-	8.5	4.0	5.1	7.1	5.5
Sep	4.8	5.0	-	-	-	3.2	5.4	4.4	2.2	2.5	4.8	-	5.7	2.9	-	3.9	3.5
Oct	3.3	2.5	-	-	-	-	2.4	2.6	1.3 6/	-	3.3	-	1.3	2.0	-	-	1.4
Nov	1.5	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-
Dec	0.7	-	-	-	-	-	-	-	-	-	-	-	-	0.7	-	-	-
Total	49.0	41.8	16.8	16.2	13.2	24.3	31.0	38.1	26.7	21.1	44.2	19.5	45.0	31.4	34.4	27.4	27.4

1/ Calculated from average evaporation (irrigated pasture environment) for Valley and observed ET/Ep ratios.
2/ ET of large plot of well-watered, clipped grass.
3/ Assumed 1/3 solid plant, 1/3 skip row 2 x 1, 1/3 skip row 2 x 2.
4/ No ET measurements available. ET estimates based upon crop development and prevalent cultural and irrigation practices.
5/ Machine-harvested.
6/ Assume mid-month planting or harvest. ET for 1/2 month.

Table 25. ESTIMATED EVAPOTRANSPIRATION OF APPLIED WATER FOR PRINCIPAL CROPS - SAN JOAQUIN VALLEY

Crop	Estimated Growing Season ET, AF/A	Rainfall Zone, Average Annual Precipitation - Inches: 4-6	6-8	8-10	10-12	12-14	14-16
		ET of Applied Water, AF/A					
Alfalfa (Hay)	3.5	3.3	3.2	3.1	2.9	2.8	2.6
Barley	1.4	1.2	1.0	0.9	0.7	0.6	0.4
Beans (Dry)	1.4	1.4	1.4	1.3	1.3	1.2	1.1
Cantaloupes	1.1	1.0	1.0	1.0	0.9	0.8	0.7
Corn (Field)	2.0	2.0	2.0	2.0	2.0	1.9	1.8
Cotton 1/	2.6	2.5	2.5	2.5	2.4	2.3	2.2
Deciduous Orchard 2/	3.2	3.0	2.9	2.8	2.6	2.5	2.3
Almonds 3/	2.2 3/	2.1	2.0	1.9	1.7	1.6	1.5
Grain Sorghum (Milo)	1.8	1.8	1.8	1.7	1.7	1.6	1.5
Pasture (Improved)	3.7	3.5	3.4	3.3	3.1	3.0	3.0
Potatoes	1.6	1.5	1.4	1.2	1.1	1.0	1.0
Rice	3.8	3.7	3.6	3.5	3.4	3.4	3.1
Subtropical Orchard 3/4/	2.6 3/	-	-	1.9	1.8	1.7	1.7
Sugar Beets	2.9	2.7	2.6	2.5	2.4	2.3	2.2
Tomatoes 5/	2.3	2.3	2.3	2.2	2.1	2.0	1.9
Vineyard 6/	2.3	2.2	2.2	2.1	2.0	1.9	1.7

1/ Assumed 1/3 solid plant, 1/3 skip row 2 x 1, 1/3 skip row 2 x 2.
2/ Except almonds.
3/ No observed ET data available. Growing season ET estimated from ground cover, irrigation practices, applied water and other available data. Active growing season ET estimated as 60% of PET. Assume 12-month growing season. For rainy season (November to February) maximum ET = PET.
4/ Citrus and avocados.
5/ Machine-harvested canning tomatoes.
6/ Table grapes.

CHAPTER IV. APPLIED WATER

Amounts of applied water are usually greater than amounts of moisture lost through evapotranspiration because part of the applied water percolates through the soil profile to depths below the crop root zone and/or leaves the field as surface runoff.

Except in areas adjacent to the ocean, or areas where the ground water or surface water is unacceptable for reuse, irrigation water applied to fields in excess of crop ET requirements is available to downstream users or to growers pumping from the ground water reservoir.

The amount of water applied varies widely, depending upon such factors as soil texture, land slope, cost of water, water table depths, leaching requirements, irrigation methods, and management practices (22, 23, 24). Usually some water in excess of ET and leaching requirements is applied, even with the most carefully managed irrigation systems.

Average applied water amounts for the principal crops for major subareas of each of the evaporative demand zones are shown in Tables 26 through 35. Areas for which the applied water is tabulated are shown in Figure 3. Typical high and low values found within each area are also shown. The average values are reasonable estimates for an entire zone. The high and low values reflect the influence of variations in soil texture, cost of water, management practices, and method of irrigation within the area. Amounts of irrigation water applied by individual growers vary even more widely than those shown by the high and low values.

Comparison of applied water values with estimated ET of applied water presented in Chapter III indicates apparent anomalies in a few cases. Average applied water values for certain crops in some areas are lower than would be expected when compared to ET of applied water for those same crops. These anomalies are attributable in part to crop ET estimates for those cultural practices which result in optimum production, while applied water data reflect the current deficit irrigation practices prevalent in some areas.

Different methods of irrigation in use today are shown in the photographs on pages 46 through 50.

The Department continues to gather data on applied water (headgate delivery); however, the amount of information is not yet adequate to define practices in all locations.

FIGURE 3

AREAS AND MAJOR SUBAREAS OF ESTIMATED APPLIED WATER

Data are shown in Tables 26 through 35

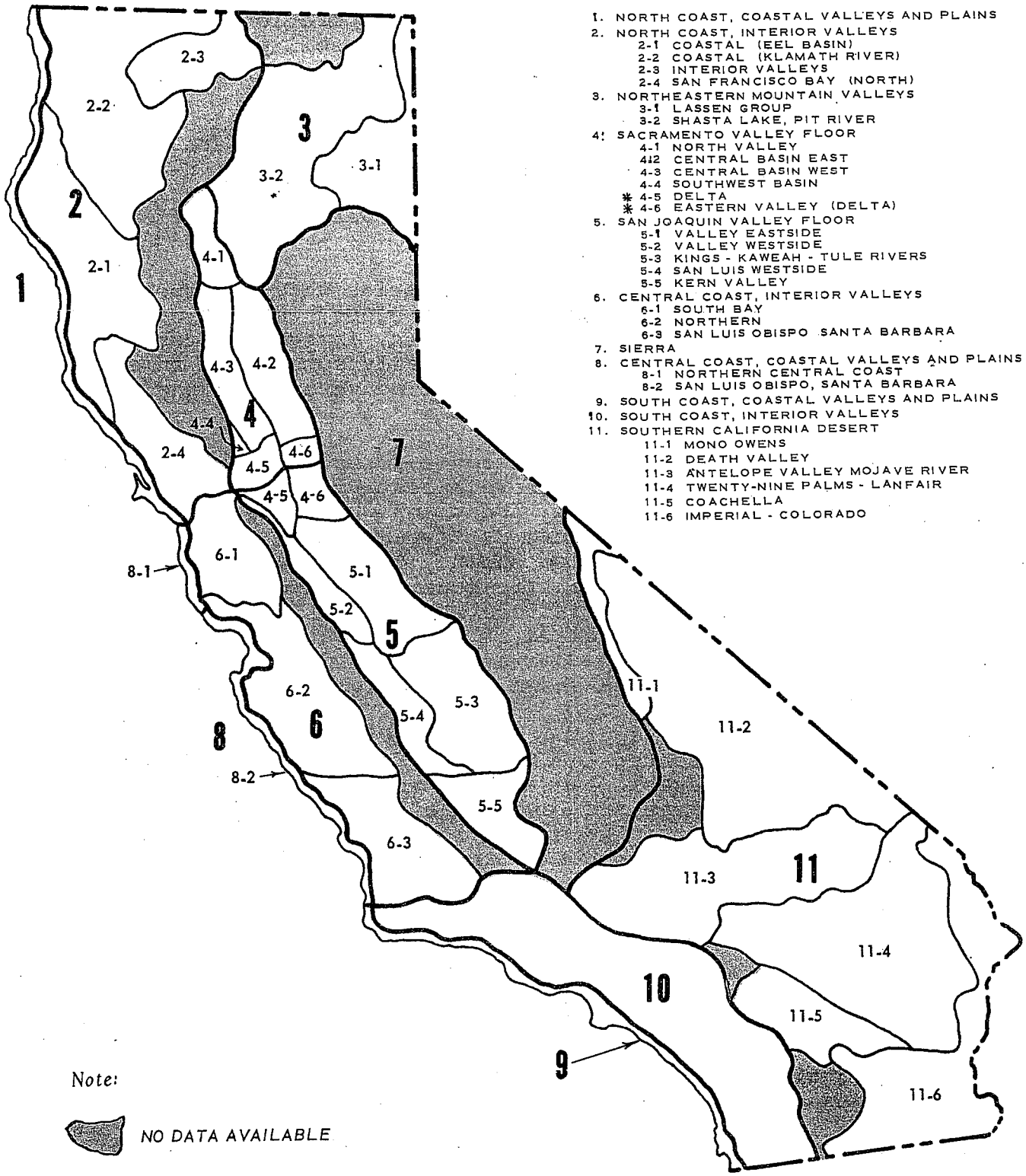


Table 26. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - NORTH COAST, COASTAL VALLEYS AND PLAINS
In acre-feet/acre

Crop	Major Subarea		
	North Coast (Coastal)		
	Average	High	Low
Pasture (Improved)	2.1	2.7	1.7

Table 27. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - NORTH COAST, INTERIOR VALLEYS
In acre-feet/acre

Crop	Major Subarea											
	Coastal[1] (Eel Basin)			Coastal[1] (Klamath River)			Interior Valleys			San Francisco Bay (North)		
	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low
Alfalfa (Hay)	1.8	1.8	1.5	3.4	3.6	2.5	3.8	4.2	3.6	3.1	-	-
Barley[2]	-	-	-	1.0	-	0.9	2.0	-	-	-	-	-
Corn (Field)	1.4	1.4	1.0	-	-	-	-	-	-	-	-	-
Deciduous Orchard[3]	2.0	2.0	1.5	2.0	-	1.4	-	-	-	2.0	-	-
Field (Miscellaneous)[4]	-	-	-	-	-	-	2.5	-	-	1.7	-	-
Pasture (Improved)	2.1	2.1	1	3.2	3.9	2.7	4.2	4.7	3.9	3.4	-	-
Pasture (Meadow)	-	-	-	-	-	-	1.9	3.0	1.5	-	-	-
Potatoes	-	-	-	-	-	-	3.2	3.3	2.8	-	-	-
Truck (Miscellaneous)	1.0[5]	-	-	1.0[6]	2.0	1.0	3.2[7]	-	3.0	1.7	-	-
Vineyard (Wine grapes)	-	-	-	-	-	-	-	-	-	1.5	-	-

1/ Interior portion of coastal hydrographic study area
2/ Barley and small grains
3/ Apples
4/ Field corn, grain sorghum and dry beans
5/ Cole crops, potatoes and carrots
6/ Nursery and bulbs
7/ Onions and strawberries

Table 28. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - NORTHEAST MOUNTAIN VALLEYS
In acre-feet/acre

Crop	Major Subarea					
	Lassen Group			Shasta Lake - Pit River		
	Average	High	Low	Average	High	Low
Alfalfa (Hay)	4.2	-	-	3.7	-	-
Barley [1/]	2.1	-	-	1.6	-	-
Deciduous Orchard [2/]	-	-	-	2.0	-	-
Field (Miscellaneous)	2.5 [3/]	-	-	2.0 [4/]	-	-
Pasture (Improved)	3.0	-	-	4.2	-	-
Pasture (Meadow)	1.5 [5/]	-	-	1.5 [5/]	-	-
Truck (Miscellaneous)	3.3 [6/]	-	-	2.8 [7/]	-	-

1/ Barley and other small grains.
2/ Apples only.
3/ Field corn only
4/ Field corn and grain sorghum.
5/ Deficit irrigation, the prevailing practice for meadow pasture.
6/ Onions and potatoes.
7/ Onions, potatoes and seed strawberries.

Table 29. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - CENTRAL COAST, COASTAL VALLEYS AND PLAINS
In acre-feet/acre

Crop	Major Subarea					
	Northern Central Coast			San Luis Obispo & Santa Barbara		
	Average	High	Low	Average	High	Low
Alfalfa (Hay)	3.5	-	-	3.4	-	-
Barley [1/]	-	-	-	1.0	-	-
Beans (Dry)	2.1	2.5	1.5	-	-	-
Broccoli	2.5	3.0	1.5	-	-	-
Cabbage	2.2	2.8	1.4	-	-	-
Carrots	3.7	4.0	1.9	-	-	-
Cauliflower	1.5	2.1	0.9	-	-	-
Celery	3.1	4.0	2.7	-	-	-
Lettuce	1.4	1.7	1.1	-	-	-
Peas	1.0	-	-	-	-	-
Potatoes	2.0	2.6	1.5	-	-	-
Truck (Miscellaneous)	-	-	-	3.2	-	-
Deciduous Orchard	-	-	-	1.6	-	-
Field (Miscellaneous)	-	-	-	2.4	-	-
Pasture (Improved)	3.2	3.9	2.6	3.6	-	-
Subtropical Orchard	-	-	-	1.6	-	-
Sugar Beets	3.3	3.7	1.6	-	-	-
Vineyard (Wine grapes)	-	-	-	0.9	-	-

1/ Barley and small grains

Table 30. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - CENTRAL COAST, INTERIOR VALLEYS
In acre-feet/acre

Crop	Major Subarea								
	South Bay			Northern			San Luis Obispo & Santa Barbara		
	Average	High	Low	Average	High	Low	Average	High	Low
Alfalfa (Hay)	3.4	-	-	3.5	-	-	-	6.4	3.4
Barley 1/	-	-	-	-	-	-	-	1.0	0.8
Deciduous Orchard	2.8	-	-	2.5	-	-	-	3.0	2.1
Field (Misc.)	2.7	-	-	2.8	-	-	-	2.6	1.4
Pasture (Improved)	3.4	-	-	3.2	3.9	2.6	-	6.4	3.4
Subtropical Orchard	-	-	-	-	-	-	-	2.3	2.1
Sugar Beets	-	-	-	3.3	3.7	-	-	-	-
Tomatoes (Canning)	-	-	-	2.2	2.8	1.7	-	-	-
Truck (Misc.)	2.3	-	-	1.8	2.2	1.1	-	2.5	1.8
Vineyard (Wine grapes)	0.8	-	-	1.1	1.3	0.5	-	1.4	1.0

1/ Barley and small grains

Table 31. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - SOUTH COAST, COASTAL VALLEYS AND PLAINS
In acre-feet/acre

Crop	Major Subarea		
	South Coastal (Coast)		
	Average	High	Low
Alfalfa (Hay)	3.4	-	-
Barley 1/	1.0	1.0	0.7
Deciduous Orchard	2.3	2.4	1.9
Field (Miscellaneous)	2.4	2.4	2.0
Pasture (Improved)	3.4	3.4	3.3
Subtropical Orchard	1.6	5.4	1.0
Tomatoes (Market)	1.8	2.0	1.5
Truck (Miscellaneous)	3.2	-	1.9
Strawberries	5.3	-	-

1/ Barley and other small grains

Table 32. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - SOUTH COAST, INTERIOR VALLEYS
In acre-feet/acre

Crop	Major Subarea		
	South Coastal (Interior)		
	Average	High	Low
Alfalfa (Hay)	3.6	3.7	3.3
Barley 1/	1.0	-	0.6
Deciduous Orchard	2.3	2.6	2.1
Field (Miscellaneous)	1.7	3.3	1.1
Pasture (Improved)	3.5	3.7	3.4
Subtropical Orchard	1.9	2.1	1.8
Truck (Miscellaneous)	2.0	3.2	1.6
Vineyard (Wine grapes)	1.5	2.1	0.9

1/ Barley and small grains

Table 33. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - SACRAMENTO VALLEY
In acre-feet/acre

Crop	Major Subarea																	
	North Valley			Central Basin East			Central Basin West			Southwest Basin			Delta			Eastern Valley (Delta)		
	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low
Alfalfa (Hay)	3.6	-	-	3.4	3.7	3.2	3.8	4.1	3.7	3.6	-	3.5	3.5	-	-	3.4	-	-
Barley	1.0	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-
Deciduous Orchard	2.7 1/	-	-	3.0 1/	-	2.9	3.0 1/	3.1	2.9	2.1	2.8	-	2.8	-	-	3.0	-	-
Field (Miscellaneous)	2.1 2/	2.2	-	1.8 2/	2.0	1.7	1.9 2/	2.2	1.7	1.8 3/	-	-	2.4	-	-	1.9	-	-
Pasture (Improved)	4.7	4.8	4.6	3.5	4.3	3.4	5.1	5.7	4.3	3.8	-	-	4.3	-	-	3.7	-	-
Rice	8.0	8.3	-	7.4	8.3	7.1	9.0	9.4	6.7	-	-	-	8.2	-	-	7.6	-	-
Safflower	-	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	0.5	-	-
Subtropical Orchard 4/	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sugar Beets	3.1	-	3.0	3.0	3.1	-	3.1	3.3	3.0	3.0	-	-	2.9	-	-	3.1	-	-
Tomatoes (Canning)	2.4	-	-	2.7	3.0	2.3	2.4	-	-	-	-	-	2.5	-	-	2.9	-	-
Truck (Miscellaneous)	3.0 5/	-	-	1.7 6/	2.0	1.6	1.6 6/	1.8	-	2.0 7/	2.8	2.1	2.7	-	-	1.8	-	-
Vineyard (Wine grapes)	3.0	-	-	-	-	-	3.0	-	-	2.5 8/	-	-	2.5	-	-	2.4	-	-

1/ Almonds 37%, walnuts 31%, prunes 27%, other 5%
2/ Dry beans, field corn, grain sorghum and safflower
3/ Grain sorghum and field corn
4/ Navel oranges and olives
5/ Melons and cucumbers for seed
6/ Melons and squash for seed
7/ Sweet corn and green beans
8/ Estimated 0.5 acre-feet for frost control; 2.0 acre-feet during growing season

Table 34. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - SAN JOAQUIN VALLEY In acre-feet/acre

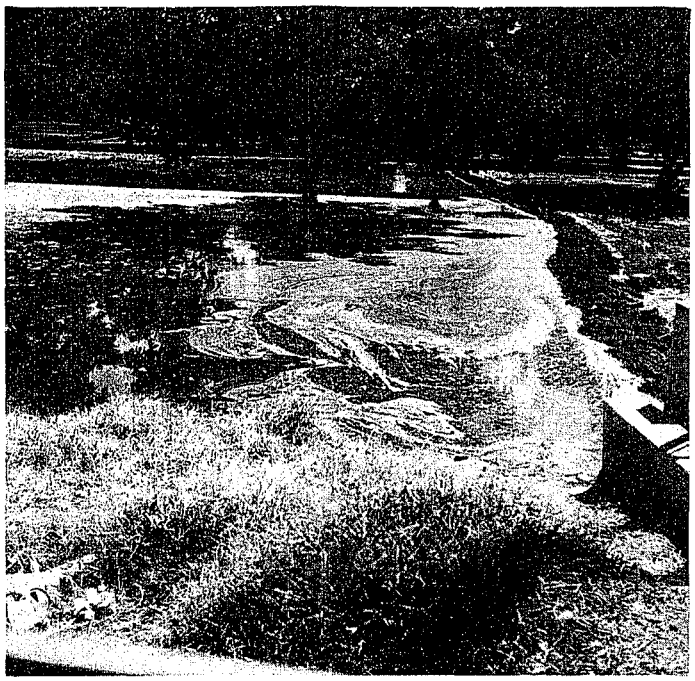
Crop	Major Subarea														
	Valley Eastside			Valley Westside			Kings-Kaweah-Tule Rivers			San Luis Westside			Kern Valley		
	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low
Alfalfa (Hay)	4.8	5.6	4.0	4.7	5.6	4.1	5.0	5.3	4.5	4.6	-	-	5.4	8.0	4.0
Barley 1/	1.4	1.4	1.3	1.4	1.5	0.9	1.5	2.0	0.5	1.5	1.5	1.4	1.8	3.0	1.0
Beans (Dry)	2.4	2.6	2.2	2.6	2.6	2.5	2.0	2.5	2.2	2.0	-	-	3.0	3.5	2.0
Cantaloupes	-	-	-	3.1	3.7	3.0	3.5	4.0	3.4	3.1	-	-	3.0	-	-
Corn (Field)	3.2	3.6	3.0	3.2	3.6	2.9	3.4	3.6	3.1	2.9	-	-	3.5	6.0	3.0
Cotton	3.9	4.2	3.6	3.7	4.5	3.0	3.9	4.0	3.5	3.6	-	-	4.0	5.0	3.0
Deciduous Orchard	3.3	4.4	3.1	3.5	4.6	3.3	3.7	4.3	3.5	3.6	-	-	3.7	6.0	3.0
Almonds	3.3	3.7	3.0	-	-	-	-	-	-	-	-	-	3.5	-	-
Grain Sorghum	2.7	3.0	2.5	2.5	3.0	2.3	2.8	3.1	2.5	2.4	-	-	3.0	-	-
Pasture (Improved)	5.7	6.0	4.4	6.0	6.2	4.6	6.5	6.8	6.2	4.9	-	-	6.9	7.0	5.0
Potatoes	-	-	-	-	-	-	3.7	4.0	3.3	-	-	-	3.7	5.0	3.0
Rice	6.7	-	-	6.7	-	-	6.7	-	-	6.7	-	-	6.7	-	-
Subtropical Orchard	2.7	-	-	-	-	-	2.7	2.8	2.0	2.9	-	-	3.0	-	-
Sugar Beets	3.8	4.0	3.4	3.9	5.0	3.6	4.0	4.5	3.2	3.6	-	-	4.2	4.7	3.9
Tomatoes (Canning)	-	-	-	3.1	3.5	1.9	-	-	-	3.3	-	-	3.3	-	-
Tomatoes (Market)	3.0	3.2	2.4	-	-	-	3.0	3.3	2.2	-	-	-	3.3	3.5	2.5
Vineyard (Table grapes)	3.4	4.3	2.2	3.4	3.5	2.9	3.8	4.3	3.1	3.7	-	-	3.9	5.0	3.0

1/ Barley and small grains

Table 35. ESTIMATED APPLIED WATER FOR PRINCIPAL CROPS - SOUTHERN CALIFORNIA DESERT In acre-feet/acre

Crop	Major Subarea																	
	Mono-Owens			Death Valley			Antelope Valley-Mojave River			Twenty-nine Palms-Lanfair			Coachella			Imperial - Colorado		
	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	High	Low
Alfalfa (Hay)	4.0	-	-	4.3	-	-	4.2	4.3	4.0	4.1	-	-	6.1	-	-	6.3	13.2	3.3
Barley 1/	-	-	-	1.6	-	-	1.2	1.3	1.1	1.4	-	-	3.0	-	-	2.9	4.1	1.2
Cotton	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	5.4	7.8	2.7
Deciduous Orchard	3.0	-	-	-	-	-	3.0	3.1	3.0	3.1	-	-	3.8	-	-	3.8	-	-
Field (Miscellaneous)	2.4	-	-	2.3	-	-	2.1	-	-	-	-	-	4.0	-	-	4.0	6.6	1.3
Pasture (Improved)	3.6	-	-	4.0	-	-	4.0	4.0	3.9	3.8	-	-	8.3	-	-	8.3	-	-
Subtropical Orchard	-	-	-	-	-	-	4.0	-	-	-	-	-	6.7	9.0	6.0	6.7	-	-
Sugar Beets	-	-	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	-
Truck (Miscellaneous)	2.8	-	-	2.3	-	-	2.0	2.1	2.0	2.1	-	-	5.0	-	-	5.0	-	-
Vineyard (Table grapes)	-	-	-	-	-	-	3.4	-	-	-	-	-	6.0	7.0	5.5	6.0	-	-

1/ Barley and small grains

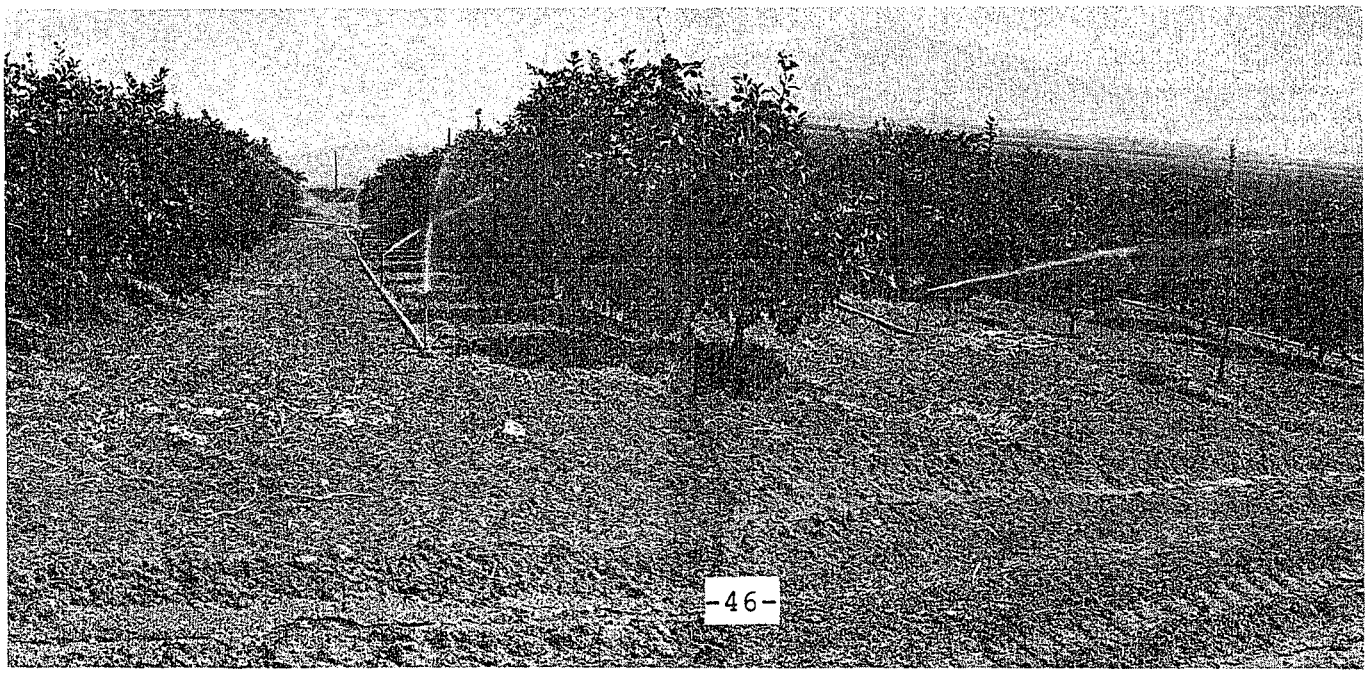


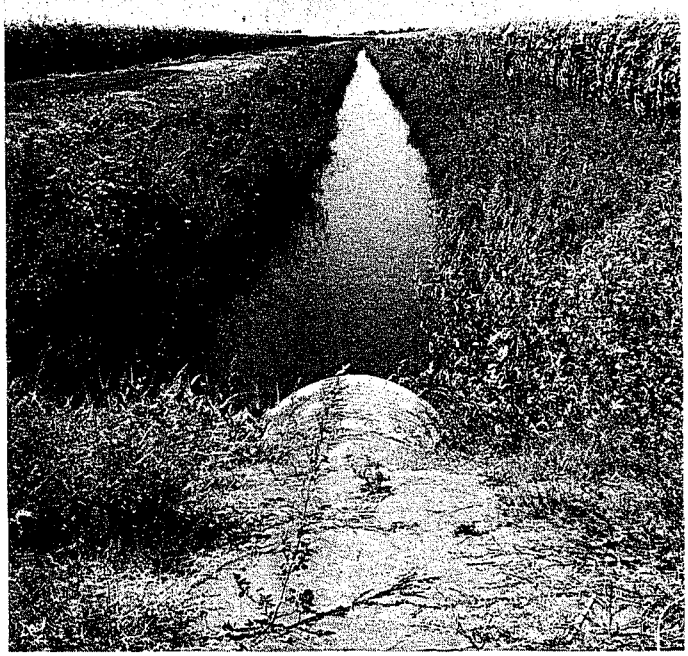
BASIN IRRIGATION (upper left and right). A common method of irrigating deep-rooted tree crops.

UNDER-TREE SPRINKLER (left). Low-volume sprinklers permit irrigation of sloping land.

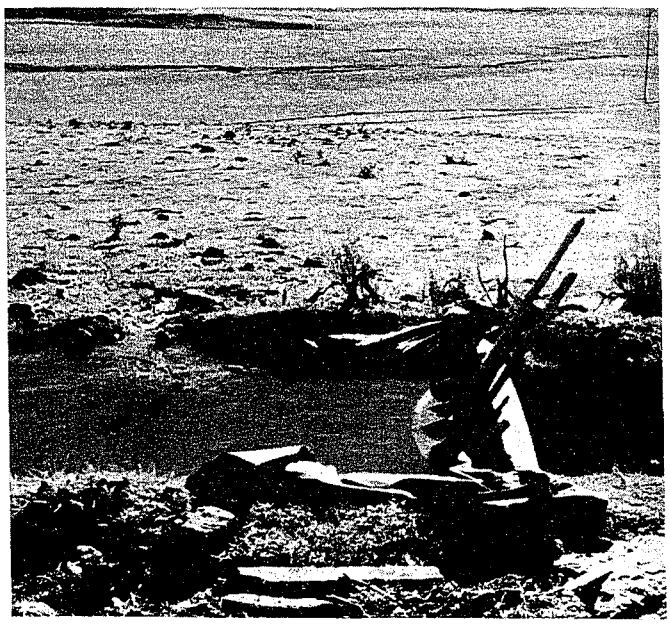
PORTABLE SPRINKLER SYSTEM (below). Hand-move sprinkler systems are being used increasingly for irrigating crops on sloping land and problem soils.

(DWR photos)

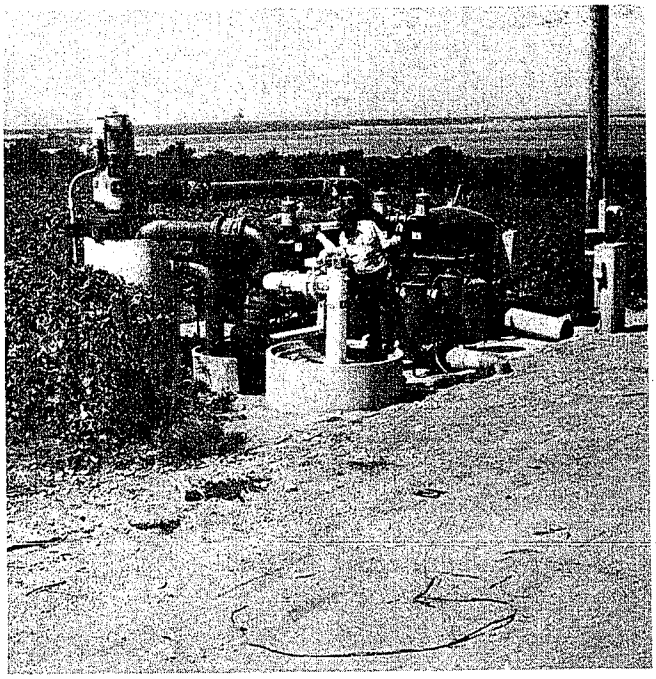


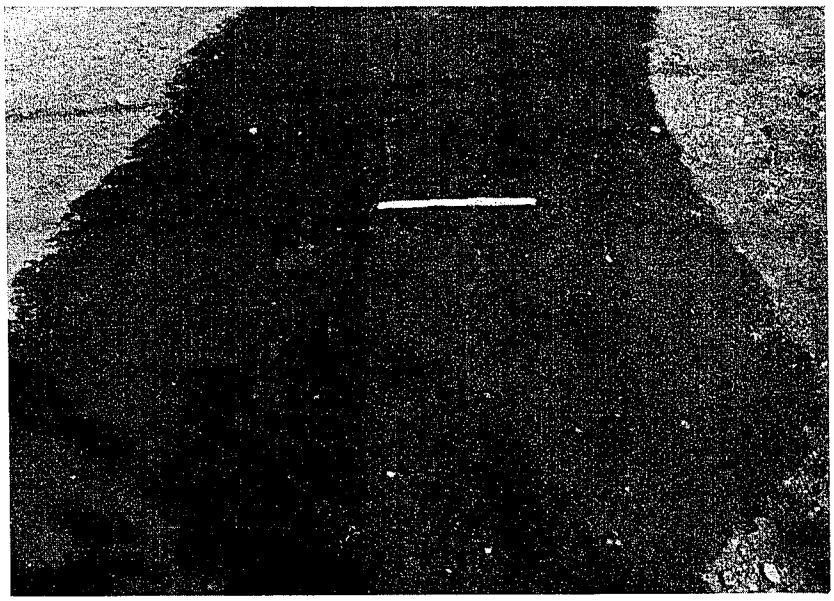


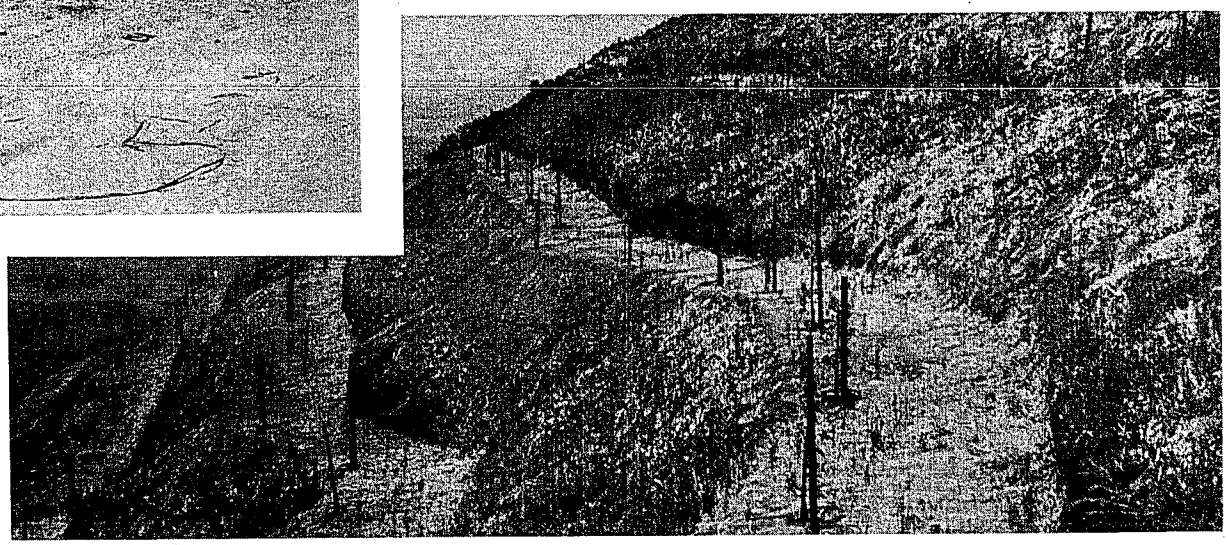
SUBIRRIGATION. Plants obtain water from the capillary fringe above the regulated free water surface. This is a common method of irrigating crops in the organic soils of the Sacramento-San Joaquin Delta. (DWR photo)

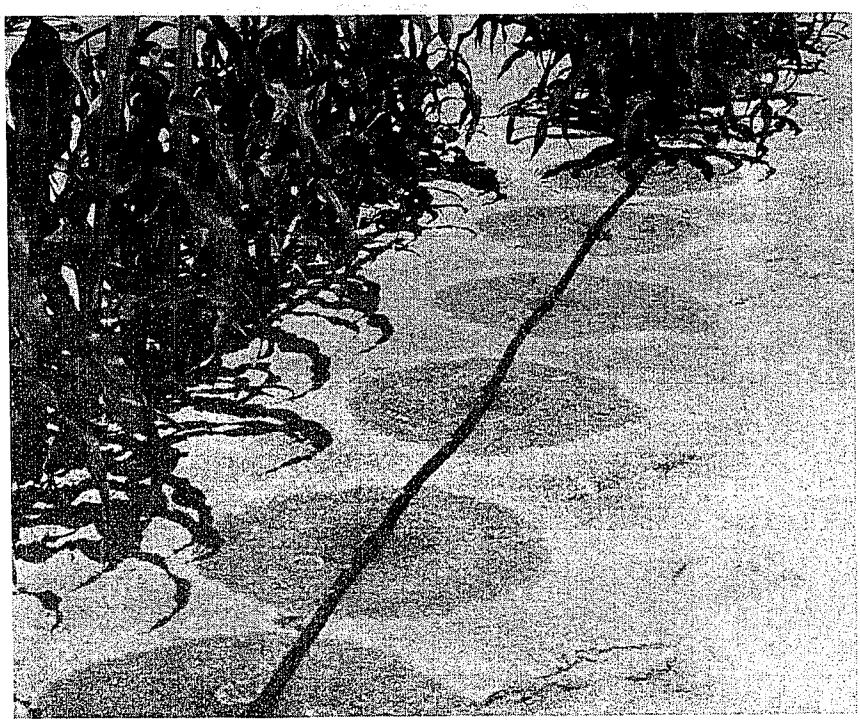


WILD FLOODING. An inefficient practice being replaced in some areas by improved systems, wild flooding of irrigated pasture requires minimal effort to regulate the amount of water applied. Here water is being allowed to spill from overlying ditches onto the fields beyond. (DWR photos)







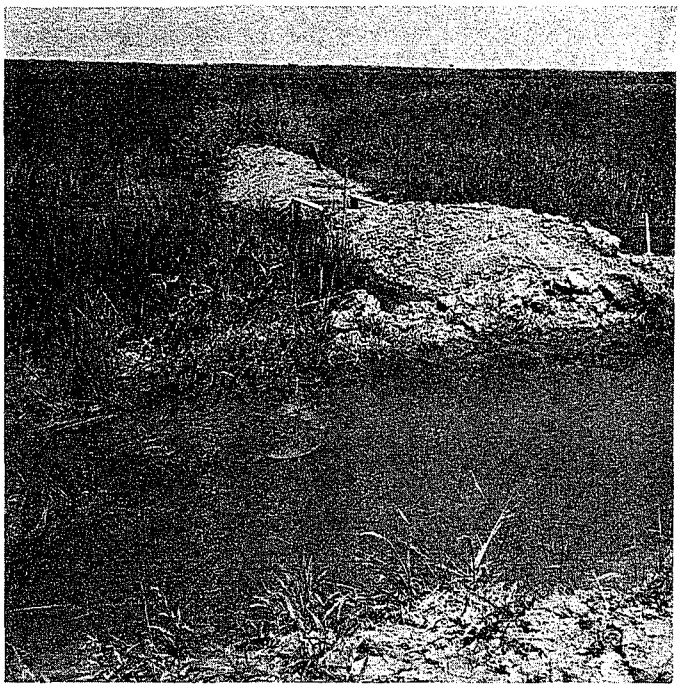


DRIP (TRICKLE) IRRIGATION

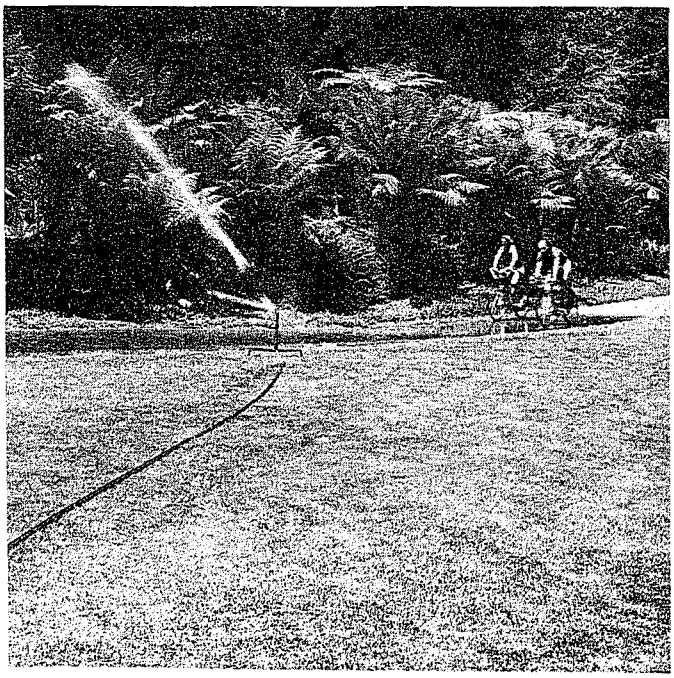
A 64-inch wetted pattern (top right). The method promotes greater efficiency by irrigating only the root zone to controlled depths. (Photo by WESPAC, South El Monte, Calif.)

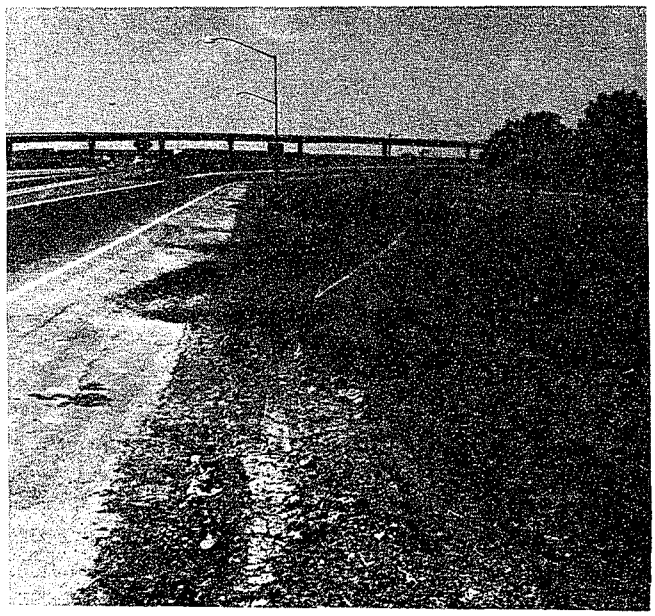
An elaborate filtering system (top left) is required to remove sediment before water is distributed to the lateral lines. (DWR photo)

Terraced planting (center) is an example of the type of terrain suited to this method. Irrigation of a corn field (left) showing a smaller wetted pattern. (Photos by University of California Agricultural Extension Service)

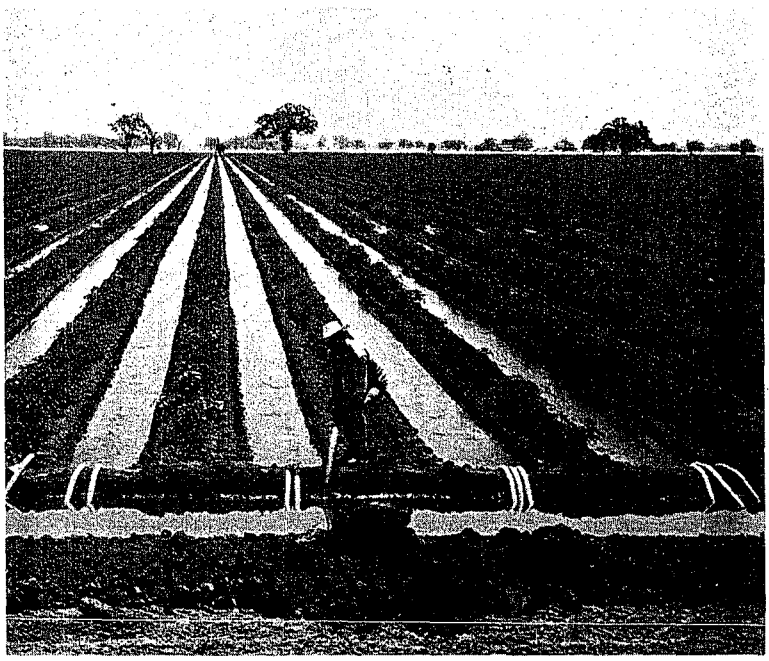


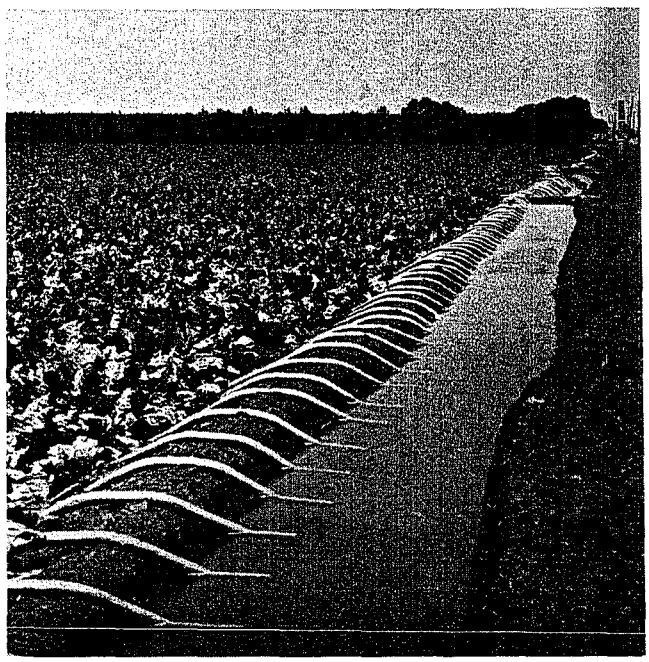
RICE CULTURE. Large contour basins are used to control the water to irrigate rice crops. (DWR photos)



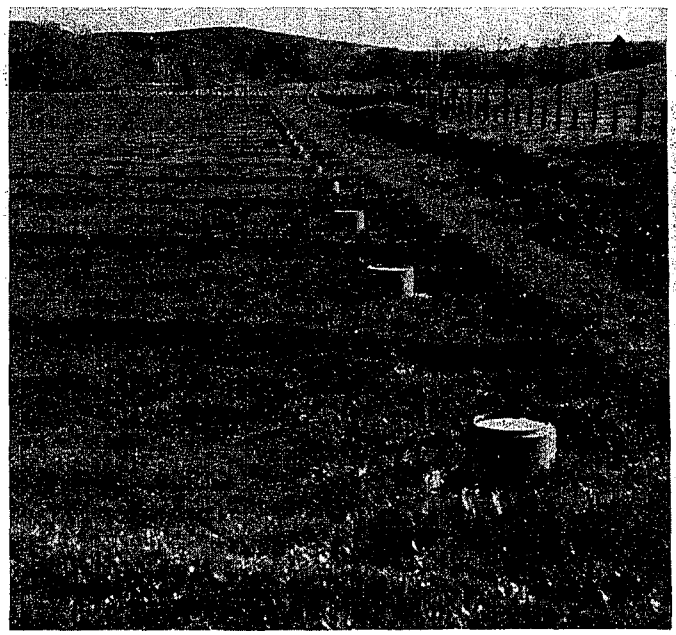


SPRINKLERS. These are as adaptable to nonfarming uses as to agricultural irrigation. Examples shown here are irrigation of turf (left) and landscaped areas along highways. (DWR photos)



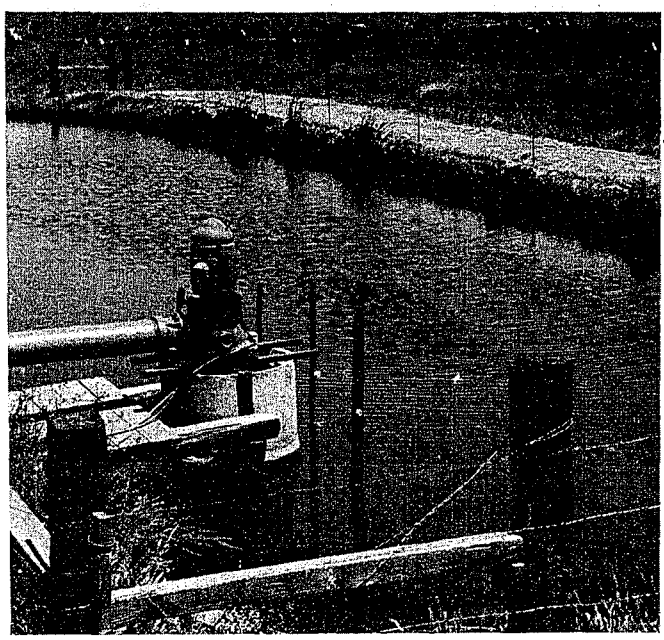


FURROW IRRIGATION. Currently the most common method of irrigating field and truck crops. Water is delivered to the furrows by siphoning over the bank of the head ditch. (DWR photos)



BORDER STRIP IRRIGATION. Narrow border strips receiving water from underground concrete pipe allow good water management, even with a steep side fall of the land surface.

(Photos by U. S. Soil Conservation Service)



SUMP AND RETURN SYSTEM. Surface runoff from adjacent irrigated pasture is collected in a sump and pumped to the irrigation distribution system for reuse. Frequently used in border strip irrigation, this method is an example of effective on-farm water conservation.

APPENDIX A

BIBLIOGRAPHY

APPENDIX A

BIBLIOGRAPHY

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APPENDIX B

DEFINITION OF TERMS

APPENDIX B

DEFINITION OF TERMS

Agroclimatic - Climatic conditions within an agricultural or vegetated area that influence, and are influenced by, the agriculture of the area.

Agroclimatic Station - A small site, normally irrigated and grass covered, having a prescribed exposure in which instruments are placed to measure selected climatic variables under conditions representative of an irrigated agricultural environment.

Applied Water Requirement (Irrigation Requirement) - The depth of water per unit area required to be delivered to a field headgate for a specific crop. It does not include direct precipitation.

Atmometer - See "Evaporimeter". In this report, atmometer refers to Livingston black and white porous porcelain spheres.

Atmometer Evaporation - Evaporation of water from Livingston black or white atmometers, measured in milliliters.

Available Moisture - The amount of water held in the soil that can be extracted by a crop. Often expressed in inches per foot of soil depth.

Consumptive Use - See "Evapotranspiration".

Effective Precipitation - That portion of precipitation evapotranspired during the crop growing season which reduces the applied water requirement. It includes the ET of precipitation which occurs during the growing season, as well as that which occurs before the growing season and is carried over into the following season as stored soil moisture.

ET - See "Evapotranspiration".

ET Tanks - See "Evapotranspirometer".

ET/E Ratio - The numerical ratio of the depth of water in inches lost from a crop through evapotranspiration (ET) divided by an evaporation value (E), in inches or milliliters. The evaporation value, considered an index of evaporative demand, is measured in the vicinity of the crop under carefully standardized conditions during the same time period.

Evaporation Pan - See "Evaporimeter". In this report, "evaporation pan" refers to a U. S. Weather Bureau Class "A" evaporation pan. See "U. S. Weather Bureau Pan".

Evaporative Demand - The collective influence of all climatic factors on the rate of evaporation of water.

Evaporimeter - Any instrument for measuring or estimating evaporative demand.

Evapotranspiration (ET) - The quantity of water transpired by plants, retained in plant tissue, and evaporated from adjacent soil surfaces in a specified time period. Usually expressed in depth of water per unit area. As used here, evapotranspiration is synonymous with consumptive use.

Evapotranspirometer (Lysimeter, ET Tanks) - A device confining a soil mass of known dimensions in such a manner that measurements of evapotranspiration from the specific soil mass may be made. Provision is made in the system for the periodic or continuous determination of the amount of water removed.

Ground Cover Percentage - The percentage of a specified area covered or shaded by transpiring vegetation, when viewed from directly overhead.

Growing Season - The period during which crops experience their greatest growth and water use, normally considered to be planting-to-harvest for annual crops and leaf-out to leaf-drop for perennials.

Irrigation Efficiency - The percentage of the total amount of water applied that is directly evaporated from soil and plant surfaces or retained within the root zone to be transpired at a later time.

Irrigation Requirement - See "Applied Water Requirement".

Lysimeter - See "Evapotranspirometer".

Net Atmometer Evaporation (E_{b-w}) - The difference between black atmometer evaporation and white atmometer evaporation, usually expressed in milliliters.

Net Water Use - Evapotranspiration of applied water plus irrecoverable losses.

Neutron Probe - An instrument, based upon the principle of neutron moderation, for determination of soil moisture content.

Percent Ground Cover - See "Ground Cover Percentage".

Potential Evapotranspiration (PET) - The amount of water transpired by a low-growing green crop of about the same color as grass, which completely covers the ground and has an unlimited supply of water and an extensive fetch.

Root Zone - The portion of the soil profile through which plant roots readily penetrate to obtain water and plant nutrients, expressed in inches or feet of depth.

Soil Moisture - The water in soils. Usually expressed as a percentage of the dry weight of the soil. Can also be expressed on a wet weight or a volume basis.

Solar Radiation - Essentially short-wave energy originating from the sun. Solar radiation is the earth's principal source of energy.

Transpiration - The process by which water vapor is transferred to the atmosphere through living plants.

U. S. Weather Bureau Pan (Class "A") - An open-topped metal container, 4 feet in diameter and 10 inches deep, used to measure evaporation rates of water.

Water Demand - This term has been used in several ways; however, as most commonly used, it refers to the quantity of water required to support a given type of land development.

APPENDIX C

AGROCLIMATIC STATIONS IN CALIFORNIA

Appendix C

AGROCLIMATIC STATIONS IN CALIFORNIA

Station[1]	Observer	County	Location: Township, Range, Section, Tract	Location: Base & Meridian[2]	Elevation feet M.S.L.	Environment	Instrumentation[3]: Evapo pan	Instrumentation[3]: Atmometers	Instrumentation[3]: Solar Radiation	Remarks
NORTHEASTERN MOUNTAIN VALLEY										
Alturas 2SE	DWR	Modoc	T42N/R13E, Sec 19L	MD	4360	Irrig. native pasture		X	X	ET tank location
Canby 2SW	DWR	Modoc	T42N/R9E, Sec 35R	MD	4310	Dry land alfalfa		X		
Coleville 2W	DWR	Mono	T8N/R22E, Sec 3K	MD	5120	Irrig. native pasture	X	X		ET tank location
Cedarville 2ESE	DWR	Modoc	T42N/R16E, Sec 9J	MD	4500	Irrig. native pasture	X			
Davis Creek 2WNW	DWR	Modoc	T45N/R13E, Sec 13B	MD	4725	Irrig. native pasture	X			
Fall River Mills R.S.	DWR	Shasta	T37N/R5E, Sec 30Q	MD	3325	Dry land		X		
Fall River Mills 2NW	DWR	Shasta	T37N/R4E, Sec 25M	MD	3325	Dry land		X		
Glenburn 0.3SE	DWR	Shasta	T37N/R4E, Sec 10J	MD	3310	Irrig. pasture	X	X	X	ET tank location
Hat Creek 1SE	DWR	Shasta	T33N/R4E, Sec 1K	MD	3660	Irrig. alfalfa		X		
Likely 2NW	DWR	Modoc	T40N/R13E, Sec 31E	MD	4400	Irrig. pasture		X		
Lookout 3S	DWR	Lassen	T39N/R7E, Sec 35P	MD	4132	Irrig. native pasture	X	X		ET tank location
McArthur 2SE	DWR	Shasta	T37N/R5E, Sec 24A	MD	3325	Irrig. alfalfa		X		
McArthur 4ESE	DWR	Shasta	T37N/R5E, Sec 13R	MD	3300	Irrig. alfalfa		X		ET field plot location
Standish 4NW	DWR	Lassen	T29N/R13E, Sec 11N	MD	4100	Irrig. pasture		X		
NORTH COAST - COASTAL VALLEYS AND PLAINS										
Elk 4SSE	DWR	Mendocino	T14N/R16W, Sec 13D	MD	275	Non-irrig. pasture	X			Pasture green all year
Ferndale 2NW	NWS	Humboldt	T3N/R2W, Sec 34M	H	10	Native grasses	X			Grasses green all year
NORTH COAST - INTERIOR VALLEYS										
Covelo 1E	DWR	Mendocino	T22N/R12W, Sec 6K	MD	1365	Irrig. pasture	X			
Covelo 1NW	DWR	Mendocino	T22N/R13W, Sec 1F	MD	1410	Dry land			X	
Fort Jones R. S.	DWR	Siskiyou	T43N/R9W, Sec 2C	MD	2720	Dry land		X		
Gazelle 1NNE	DWR	Siskiyou	T43N/R6W, Sec 35E	MD	2720	Irrig. pasture		X		
Geyserville 1E	DWR	Sonoma	T10N/R9W, Sec 18J	MD	200	Irrig. pasture	X			
Hayfork 1SE	DWR	Trinity	T31N/R12W, Sec 12E	MD	2346	Dry land		X		
Montague 3NE	DWR	Siskiyou	T45N/R6W, Sec 13B	MD	2600	Irrig. pasture	X			
Santa Rosa 6SSW	DWR	Sonoma	T6N/R8W, Sec 16R	MD	90	Irrig. pasture	X			
Talmage 1SE	DWR	Mendocino	T4N/R5E, Sec 23J	MD	600	Irrig. pasture	X			
Upper Lake 1SE	DWR	Lake	T15N/N9W, Sec 7R	MD	1330	Irrig. pasture			X	
Yountville 2N	DWR	Napa	T7N/R5W, Sec 24P	MD	120	Irrig. pasture	X			
SACRAMENTO VALLEY										
Anderson 4E	DWR	Shasta	T30N/R3W, Sec 17F	MD	390	Irrig. pasture	X	X		
Arbuckle 1S	DWR	Colusa	T13N/R2W, Sec 11E	MD	960	Dry land		X		
Bella Vista 4NE	DWR	Shasta	T31N/R3W, Sec 22L	MD	960	Dry land		X		
Corning 3NE	DWR	Tehama	T24N/R3W, Sec 12L	MD	240	Irrig. pasture		X		
Corning 3W	DWR	Tehama	T24N/R3W, Sec 20D	MD	307	Irrig. alfalfa		X		
Davis 2W	U.C.[4]	Yolo	T8N/R2E, Sec 17K	MD	60	Irrig. grass	X		X	ET tank location
Elk Grove 4NW	DWR	Sacramento	T7N/R5E, Sec 28E	MD	23	Irrig. pasture	X			
Hamilton City 2W	DWR	Glenn	T22N/R2W, Sec 26F	MD	175	Dry land		X		
Newcastle 2NW	DWR	Placer	T12N/R7E, Sec 12D	MD	730	Irrig. pasture	X			
Newville 1E	DWR	Glenn	T22N/R6W, Sec 2E	MD	650	Dry land		X	X	
Palermo 3SW	DWR	Butte	T18N/R4E, Sec 19D	MD	169	Irrig. pasture	X			
Penn Valley	DWR	Nevada	T16N/R7E, Sec 28H	MD	1388	Irrig. pasture	X			
Red Bluff 5E	DWR	Tehama	T27N/R2W, Sec 30D	MD	278	Irrig pasture	X			
Redding 5SE	DWR	Shasta	T31N/R4W, Sec 15G	MD	515	Irrig. pasture		X		
Richvale 2SE	DWR	Butte	T19N/R2E, Sec 23D	MD	105	Dry land		X		
Thornton 2S	DWR	San Joaquin	T4N/R5E, Sec 15H	MD	7	Irrig. pasture	X	X	X	ET tank location
Vina 1S	DWR	Tehama	T24N/R2W, Sec 23Q	MD	188	Irrig. alfalfa		X		
Willows 6S	DWR	Glenn	T18N/R3W, Sec 10F	MD	95	Dry land		X	X	
Yuba City 7W	DWR	Sutter	T15N/R2E, Sec 21R	MD	43	Irrig. pasture	X	X		
SAN JOAQUIN VALLEY										
Arvin 2.5NW	DWR	Kern	T31S/R29E, Sec 16F	MD	437	Irrig. grass	X	X	X	ET tank & field plot location
Bakersfield 10S	DWR	Kern	T31S/R28E, Sec 8Q	MD	329	Irrig. pasture	X	X	X	
Berenda 2N	DWR	Madera	T10S/R17E, Sec 8P	MD	270	Irrig. pasture	X	X	X	
Buttonwillow 1S	DWR	Kern	T29S/R23E, Sec 24M	MD	270	Irrig. pasture	X	X	X	Field plot location

Appendix C (Continued)

AGROCLIMATIC STATIONS IN CALIFORNIA

Station[1]	Observer	County	Location: Township, Range, Section, Tract	Location: Base & Meridian[2]	Elevation Feet M.S.L.	Environment	Instrumentation[3]: Evapo pan	Instrumentation[3]: Atmometers	Instrumentation[3]: Solar Radiation	Remarks
SAN JOAQUIN VALLEY (Continued)										
Ceres 3E	DWR[4]	Stanislaus	T4S-R10E, Sec 7K	MD	104	Irrig. alfalfa		X		
Fresno A.P.	NWS[5]	Fresno	T13S/R21E, Sec 30J	MD	331	Dry land			X	Station located approx. 4 miles east of Fresno
Fresno State College	DWR	Fresno	T13S/R20E, Sec 12C	MD	340	Irrig. pasture	X	X		Station located approx. 4 miles NE of Fresno
Kerman 2ESE	DWR	Fresno	T14S/R16E, Sec 17H	MD	225	Irrig. pasture	X	X	X	
Kingsburg 5S	DWR	Kings	T17S/R22E, Sec 16H	MD	277	Irrig. pasture	X	X		
Los Banos 3.5SW	USBR[6]	Merced	T10S/R10E, Sec 32K	MD	161	Dry land			X	
Maze Bridge 2S	DWR	Stanislaus	T4S/R7E, Sec 5J	MD	35	Irrig. pasture	X	X	X	
Mendota 6SW	DWR	Fresno	T15S/R14E, Sec 4N	MD	253	Irrig. alfalfa		X		
Merced 5SE #1	DWR	Merced	T8S/R15E, Sec 6M	MD	198	Irrig. pasture		X		
Merced 5SE #2	DWR	Merced	T8S/R15E, Sec 7D	MD	195	Irrig. pasture	X	X		
Newman 1SE	DWR	Merced	T7S/R9E, Sec 29B	MD	78	Irrig. pasture	X	X		
Old River 3S	DWR	Kern	T31S/R27E, Sec 20D	MD	315	Irrig. pasture	X	X	X	
Old River 3W	DWR	Kern	T30S/R26E, Sec 35A	MD	334	Irrig. alfalfa		X		
Pond 1N	DWR	Kern	T25S/R25E, Sec 19E	MD	268	Irrig. pasture	X	X		
Stockton 9S	DWR	San Joaquin	T1S/R7E, Sec 19H	MD	27	Irrig. pasture	X	X	X	
Traver 4ESE	DWR	Tulare	T17S/R24E, Sec 19B	MD	285	Irrig. pasture	X	X		
CENTRAL COAST - COASTAL VALLEYS AND PLAINS										
Betteravia 2NW	DWR	Santa Barbara	T10N/R34W, Sec 18L	SB	150	Irrig. pasture	X			
Guadalupe 2NW	SLOCFC & DWR[7]	San Luis Obispo	T11N/R35W, Sec 35E	SB	96	Irrig. pasture	X	X	X	ET tank location
Lompoc 0.2N	ARS[8]	Santa Barbara	T7N/R34W, Sec 28R	SB	95	Dry land		X		
Lompoc 1N	ARS[8]	Santa Barbara	T7N/R34W, Sec 21J	SB	80	Irrig. grass	X		X	ET tank and field plot location
Salinas 3E	MCFC & DWR[9]	Monterey	T14S/R3E, Sec 35K	MD	85	Irrig. pasture	X	X		
Salinas 4NE	MCFC & DWR[9]	Monterey	T14S/R3E, Sec 13P	MD	125	Irrig. pasture	X	X		
San Luis Obispo 1NW	CSPC & DWR[10]	San Luis Obispo	T30S/R12E, Sec 23C	MD	320	Irrig. pasture	X		X	ET tank location
Santa Maria A.P.	NWS[5]	Santa Barbara	T10N/R34W, Sec 34L	SB	238	Dry land			X	Station located approx. 4 miles SSW of Santa Maria
Santa Maria 4SE	DWR	Santa Barbara	T10N/R33W, Sec 20Q	SB	310	Irrig. pasture	X			
Santa Rita 2W	DWR	Monterey	T14S/R2E, Sec 12H	MD	80	Irrig. pasture	X	X		
CENTRAL COAST - INTERIOR VALLEYS										
Hollister 6NNW	DWR	San Benito	T11S/R5E, Sec 32P	MD	170	Irrig. alfalfa	X	X		
San Lucas 0.3S	DWR	Monterey	T21S/R9E, Sec 8B	MD	380	Irrig. alfalfa	X	X		
Soledad 3.5NW	CDC & DWR[11]	Monterey	T17S/R5E, Sec 12B	MD	230	Irrig. pasture	X	X	X	ET tank location
SOUTH COAST - INTERIOR VALLEYS										
Riverside, U.C.	U.C.[4]	Riverside	T2S/R4W, Sec 30K	MD	1015	Dry land			X	
SOUTHERN CALIFORNIA DESERT										
Blythe	U.C.E[12]	Riverside	T6S/R23E, Sec 32	SB	266	Dry land			X	Radiometer located on rooftop in downtown Blythe
Brawley 2SW	ARS[8]	Imperial	T14S/R14E, Sec 7A	SB	-100	Dry land			X	ET tank location
Coachella 1SE	USBR[6]	Riverside	T6S/R8E, Sec 5-	SB	- 80	Dry land			X	
El Centro 7NW	USN[13]	Imperial	T15S/R13E, Sec 30J	SB	- 45	Dry land			X	

1/ Station name indicates distance (miles) and direction from nearest town, i.e., Alturas 2SE is located 2 miles SE of Alturas post office.
2/ Base and meridian: MD = Mount Diablo, H = Humboldt, SB = San Bernadino.
3/ All stations equipped with evaporation pans, and most stations equipped with atmometers and precipitation gages. Many of the stations also were equipped for observation of dry bulb air temperature, wet bulb air temperature and wind movement. Data collected are available in DWR District files.
4/ University of California
5/ National Weather Service
6/ U. S. Bureau of Reclamation
7/ San Luis Obispo County Flood Control District in cooperation with Department of Water Resources.
8/ USDA - Agricultural Research Service
9/ Monterey County Flood Control District in cooperation with Department of Water Resources.
10/ California State Polytechnic College in cooperation with Department of Water Resources.
11/ California Department of Corrections - Soledad Correctional Training Facility in cooperation with Department of Water Resources.
12/ University of California - Agricultural Extension Service
13/ U. S. Navy - Aerospace Recovery Facility

APPENDIX D

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS

Appendix D

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1]

In inches

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
NORTHEASTERN MOUNTAIN VALLEYS															
Cedarville 2ESE[2]	1962	1.20	1.00	3.10	6.38	6.59	8.59	10.96	10.73	8.35	3.36	2.17	0.94	58.06	63.37
	1963	1.15	1.72	2.83	3.28	7.10	8.56	9.96	9.06	5.44	4.00	1.22	0.76	50.23	55.08
	1964	0.45	1.75	2.50	6.45	6.92	6.84	10.39	9.77	7.36	5.01	1.20	0.60	55.24	59.24
	1965	0.58	1.87	3.79	4.96	6.79	-	-	-	-	-	-	-	-	-
	Average	0.84	1.58	3.06	5.27	6.85	8.00	10.44	9.85	7.05	4.12	1.53	0.77	54.64	59.36
Davis Creek 2WNW[2]	1962	1.03	0.87	2.30	6.07	5.89	9.08	11.24	11.02	8.34	3.35	1.92	1.09	57.29	62.20
	1963	1.04	1.11	2.42	2.80	6.29	6.61	10.04	8.81	6.81	3.50	1.19	0.73	47.28	51.35
	1964	0.50	1.80	2.50	5.17	6.61	5.72	8.36	10.18	6.98	4.24	1.09	0.41	49.76	53.56
	1965	0.80	0.99	3.79	4.50	6.78	5.58	-	-	-	-	-	-	-	-
	Average	0.84	1.19	2.75	4.64	6.39	6.75	9.88	10.00	7.38	3.70	1.40	0.74	51.49	55.66
Glenburn 0.3SE	1960	-	-	-	-	-	8.69	10.40	9.20	5.85	3.97	1.74	0.58	-	-
	1961	0.68	0.95	2.78	5.33	6.21	8.35	9.99	7.71	5.96	4.11	1.50	0.67	50.44	54.24
	1962	1.07	0.79	2.76	6.19	6.50	9.34	10.43	9.03	6.59	3.19	1.18	0.79	53.94	57.77
	1963	1.20	1.32	2.80	3.07	6.64	7.92	10.39	8.70	5.78	3.64	0.85	0.70	48.94	53.01
	1964	0.55	1.94	2.70	5.39	6.12	7.00	9.99	8.80	5.82	3.71	0.88	0.42	49.53	53.27
	1965	0.66	1.75	3.43	3.97	7.08	7.23	8.70	6.77	5.09	3.82	1.13	0.79	46.09	50.42
	1966	0.60	1.35	3.12	5.69	7.53	7.81	9.72	8.85	6.31	4.19	1.13	0.70	53.22	57.00
	Average	0.79	1.35	2.93	4.94	6.68	8.05	9.94	8.44	5.91	3.80	1.20	0.66	50.69	54.69
Lookout 3S[2]	1959	-	-	-	5.63	6.02	7.71	10.07	-	6.11	4.10	2.17	-	-	-
	1960	0.97	1.08	3.22	4.37	5.32	8.76	9.67	9.15	6.00	3.71	0.82	0.74	50.20	53.81
	1961	0.97	0.95	2.36	5.62	6.22	7.83	10.68	7.58	6.42	3.92	1.64	0.59	50.63	54.78
	1962	0.97	1.24	1.82	5.51	5.83	8.46	9.84	9.74	6.77	3.27	1.59	0.87	51.24	55.91
	1963	0.99	1.07	2.33	2.72	5.74	6.75	10.47	8.83	4.79	3.32	0.86	0.77	44.95	48.64
	1964	0.83	1.46	2.18	4.75	5.95	5.54	9.87	8.64	5.72	3.40	1.02	0.47	46.05	49.83
	1965	0.50	1.66	3.51	3.74	6.49	6.03	-	-	-	-	-	-	-	-
	Average	0.87	1.24	2.57	4.62	5.94	7.30	10.10	8.79	5.97	3.62	1.35	0.69	48.91	53.06
Area Average		0.84	1.33	2.81	4.84	6.41	7.54	10.06	9.03	6.34	3.78	1.33	0.70	50.81	55.01
NORTH COAST - COASTAL VALLEYS AND PLAINS															
Elk 4SSE[3]	1966	-	-	2.81	-	-	-	-	3.99	3.55	3.32	3.72	2.76	-	-
	1967	-	1.70	-	-	4.93	5.08	4.45	5.36	3.97	3.46	3.03	1.67	-	-
	1968	-	2.05	5.32	4.12	6.72	6.67	5.33	4.91	-	-	2.17	-	-	-
	Average	-	1.88	4.06	4.12	5.82	5.88	4.89	4.75	3.76	3.39	2.97	2.22	36.67	-
Ferndale 2NW[3]	1963	0.75	1.34	2.50	3.06	3.40	5.22	5.31	3.79	3.65	1.91	1.45	0.80	28.84	33.18
	1964	0.70	1.80	2.32	3.42	3.91	4.15	4.42	4.79	3.77	2.45	1.08	0.85	29.23	33.66
	1965	0.80	1.55	2.36	2.66	4.32	4.23	3.98	4.23	3.22	2.03	1.18	1.02	27.03	31.58
	1966	0.89	1.29	1.87	3.30	4.06	5.18	4.41	4.00	3.74	1.94	0.96	0.74	28.50	32.38
	1967	0.83	1.25	2.17	2.49	4.15	3.55	4.38	3.85	3.55	2.31	1.19	1.00	26.45	30.72
	1968	1.02	1.13	2.56	3.77	4.06	4.59	4.27	3.89	3.11	1.99	0.79	0.75	28.24	31.93
	1969	0.49	0.83	2.70	3.15	3.81	3.19	4.66	4.60	3.60	2.32	1.03	0.59	28.03	30.97
	1970	0.51	1.50	2.53	3.46	4.62	4.43	4.74	3.57	4.17	1.98	0.91	0.65	29.50	33.07
	1971	0.59	0.83	1.90	2.47	3.30	4.22	4.35	4.28	3.55	1.88	1.11	0.59	25.95	29.07
	1972	0.62	0.82	1.99	3.60	3.56	4.38	4.16	4.40	3.60	1.73	0.70	0.43	27.42	29.99
	Average	0.72	1.23	2.29	3.14	3.92	4.31	4.47	4.14	3.60	2.05	1.04	0.74	27.92	31.65
Area Average		0.72	1.34	2.59	3.23	4.24	4.57	4.54	4.28	3.62	2.28	1.49	0.99	29.35	33.89

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]
In inches

Station name	Year of record	Months												Mar-Oct	Jan-Dec
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
NORTH COAST - INTERIOR VALLEYS															
Covelo 1E	1964	-	-	-	-	-	-	-	9.74	6.52	4.25	-	-	-	-
	1965	-	-	-	-	6.41	6.87	7.80	7.31	5.58	3.00	-	-	-	-
	1966	1.00	1.47	2.91	4.85	6.69	8.00	8.67	10.22	6.27	4.07	1.20	0.50	51.68	55.85
	1967	1.80	1.49	2.40	2.79	5.99	6.90	9.72	8.31	6.16	3.93	1.32	1.00	46.20	51.81
	1968	0.90	1.34	2.76	5.14	6.32	8.56	9.89	8.66	6.29	2.88	1.20	0.40	50.50	54.34
	1969	0.57	0.59	3.18	4.21	6.72	6.91	10.16	9.80	6.95	3.17	1.54	1.00	51.10	54.80
	1970	1.00	1.12	3.80	4.89	6.70	8.33	10.53	9.54	7.18	3.52	0.70	0.50	54.99	57.81
	Average	1.05	1.20	3.01	4.38	6.47	7.60	9.46	9.08	6.42	3.55	1.19	0.68	49.97	54.09
Geyserville 1E	1965	-	-	-	-	5.91	6.10	7.34	7.40	4.47	3.59	1.67	0.74	-	-
	1966	-	0.67	3.07	4.32	7.15	9.10	7.14	7.64	4.79	3.97	1.37	0.75	47.18	-
	1967	-	1.98	2.87	3.00	6.45	7.02	7.99	6.04	4.66	5.09	2.79	1.64	43.12	-
	1968	1.08	1.37	2.81	4.94	6.95	8.59	6.80	5.64	5.50	2.12	1.36	-	43.35	-
	Average	1.08	1.34	2.92	4.09	6.62	7.70	7.32	6.68	4.86	3.69	1.80	1.04	43.88	49.14
Montague 3NE	1959	-	-	-	5.34	8.09	8.74	12.50	8.56	6.30	-	-	-	-	-
	1960	-	-	-	3.82	5.81	8.79	9.62	8.33	6.07	-	-	-	-	-
	1961	-	-	-	-	5.76	9.10	10.83	10.18	5.85	3.15	1.95	0.93	-	-
	1962	1.02	1.59	2.81	5.78	5.40	9.89	11.10	9.15	7.08	1.48	2.15	1.02	52.69	58.47
	1963	1.08	1.27	2.95	3.40	6.58	7.68	9.60	8.22	5.90	3.14	0.90	0.54	47.47	51.26
	1964	0.53	1.70	2.78	5.28	7.01	7.60	9.79	9.47	6.13	3.82	0.98	0.35	51.88	55.44
	1965	0.67	1.88	4.15	4.05	7.35	8.35	-	-	-	-	-	-	-	-
	Average	0.82	1.61	3.17	4.61	6.57	8.59	10.57	8.98	6.22	2.90	1.50	0.71	51.61	56.25
Santa Rosa 6SSW	1962	-	-	-	-	-	-	7.08	7.03	4.88	2.73	1.77	0.78	-	-
	1963	1.06	1.65	2.77	2.97	4.86	5.50	6.90	4.79	3.74	2.85	1.60	0.98	34.38	39.67
	1964	0.87	2.89	2.58	5.02	6.05	7.19	9.17	9.73	7.95	5.04	2.29	0.92	52.73	59.70
	Average	0.96	2.27	2.68	4.00	5.46	6.34	7.72	7.18	5.52	3.54	1.89	0.89	42.44	48.45
Talmage	1972	-	0.92	3.75	5.28	7.18	9.33	10.55	8.65	5.94	-	-	-	-	-
Yountville 2N	1962	-	-	-	-	-	-	8.33	7.75	5.53	3.35	2.72	0.97	-	-
	1963	1.32	1.41	2.72	2.87	4.92	7.43	8.43	5.72	4.29	3.28	1.04	0.89	39.66	44.32
	1964	1.18	3.44	3.51	5.60	6.31	7.35	8.55	8.32	7.32	3.66	1.53	1.09	50.62	57.86
	1965	1.15	1.86	2.28	3.45	7.25	6.67	9.12	6.42	5.96	4.02	1.72	1.19	45.17	51.09
	1966	2.21	-	3.94	4.54	5.13	5.34	8.58	7.58	6.73	4.91	2.08	1.33	46.75	-
	1967	1.70	1.74	2.51	2.95	5.44	4.87	9.15	7.23	7.84	4.36	2.55	2.92	44.35	53.26
	1968	1.70	1.60	5.26	5.74	6.28	7.51	10.18	7.00	6.94	3.36	1.63	-	52.27	-
	Average	1.54	2.01	3.37	4.19	5.89	6.53	8.91	7.15	6.37	3.85	1.90	1.40	46.26	53.11
Area Average		1.16	1.60	3.12	4.36	6.35	7.60	9.09	8.02	6.03	3.55	1.65	0.97	48.12	53.50

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]

In inches

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SACRAMENTO VALLEY															
Anderson 4E	1958	-	-	-	-	-	-	-	8.09	6.23	4.01	1.65	-	-	-
	1959	1.00	1.99	4.19	5.61	7.26	8.92	9.54	7.72	6.62	4.64	2.76	1.58	54.50	61.83
	1960	0.91	2.31	3.77	4.68	6.49	9.31	9.58	8.70	6.15	3.91	1.65	1.32	52.59	58.78
	1961	0.68	1.94	3.14	5.84	6.59	7.87	9.46	7.19	6.44	3.40	3.53	1.58	49.93	57.66
	1962	2.29	2.25	3.00	6.21	6.58	9.00	10.37	7.59	6.18	3.96	1.83	2.25	52.89	61.51
	1963	1.58	1.60	3.82	4.99	5.96	8.72	10.03	7.20	5.78	3.30	2.00	0.92	49.80	55.90
	1964	1.65	3.82	3.82	6.09	6.89	7.75	9.72	7.93	6.94	3.85	1.83	1.56	52.99	61.85
	1965	1.27	2.52	3.46	4.15	8.69	7.94	9.72	6.93	5.93	3.76	2.10	1.00	50.58	57.47
	1966	1.59	1.77	3.68	6.29	7.10	9.63	9.29	9.01	6.68	4.51	1.95	0.79	56.19	62.29
	Average	1.37	2.28	3.61	5.48	6.94	8.64	9.71	7.82	6.33	3.93	2.14	1.38	52.46	59.63
Davis 2W [5/]	1959	-	-	-	-	-	-	11.19	9.15	8.19	7.19	3.57	3.04	-	-
	1960	1.77	3.54	4.56	7.20	9.39	11.70	11.38	9.08	7.41	6.51	2.37	1.67	67.23	76.58
	1961	0.50	2.86	4.59	6.54	8.06	9.96	10.73	9.05	6.99	5.89	4.20	1.12	61.81	70.49
	1962	1.83	1.74	3.66	6.84	8.09	9.75	9.52	8.65	6.09	4.06	2.07	0.81	56.66	63.11
	1963	1.05	2.30	4.19	4.38	6.82	10.29	9.91	8.12	5.88	-	-	-	-	-
	1964	-	-	-	-	-	8.68	10.44	9.50	7.92	4.80	1.67	1.50	-	-
	1965	0.89	3.17	3.69	4.76	9.33	8.95	10.05	8.32	7.21	4.71	1.74	0.93	57.02	63.75
	1966	1.74	2.47	4.36	7.84	8.57	9.84	9.40	9.34	7.19	5.21	1.88	0.94	61.75	68.78
	1967	1.74	1.92	3.30	3.55	7.66	7.90	10.07	9.19	7.24	5.38	2.28	2.56	54.29	62.79
	1968	1.22	1.71	4.17	8.85	7.85	11.36	10.97	8.98	8.43	4.45	1.94	1.43	65.06	71.36
	1969	1.38	1.98	4.48	6.59	9.32	9.10	10.50	9.42	6.98	5.82	2.33	1.29	62.21	69.19
	1970	1.50	2.22	6.50	6.90	10.21	9.35	10.61	9.03	8.44	4.98	1.89	0.84	66.02	72.47
	1971	1.63	2.59	4.70	6.36	7.50	9.36	10.68	9.58	8.20	5.07	3.55	1.95	61.45	71.17
	1972	1.37	1.97	5.28	7.43	8.60	9.56	10.52	9.39	-	-	-	-	-	-
	Average	1.38	2.37	4.46	6.44	8.45	9.68	10.43	9.06	7.40	5.34	2.46	1.51	61.26	68.98
Elk Grove 4NW	1960	1.34	2.32	2.96	4.94	6.90	9.15	9.35	7.56	5.69	4.39	1.75	0.79	50.94	57.14
Newcastle 2NW	1958	-	-	-	-	-	-	-	-	-	-	2.52	1.92	-	-
	1959	1.49	2.36	4.25	5.80	6.93	9.68	11.32	8.91	6.37	5.98	3.35	2.24	59.24	68.68
	1960	1.83	2.72	3.59	5.69	6.60	9.96	10.74	8.91	6.63	5.16	2.05	1.07	57.28	64.95
	Average	1.66	2.54	3.92	5.74	6.76	9.82	11.03	8.91	6.50	5.57	2.64	1.74	58.25	66.83
Palermo 3SW	1960	1.80	2.49	3.43	5.49	7.22	9.72	10.31	9.43	6.62	5.27	2.39	1.55	57.49	65.72
Penn Valley	1958	-	-	-	-	-	-	-	10.19	6.16	4.80	1.77	1.51	-	-
	1959	1.36	-	3.54	5.25	5.83	9.08	10.79	9.38	6.43	4.61	1.93	1.60	54.91	-
	1960	1.39	1.70	2.85	4.02	5.85	7.87	9.78	8.98	6.00	4.51	1.97	1.12	49.86	56.04
	Average	1.38	1.70	3.20	4.64	5.84	8.48	10.28	9.52	6.20	4.64	1.89	1.41	52.80	59.18
Red Bluff 5E	1959	1.88	2.18	5.07	6.23	6.91	10.10	10.81	8.72	8.32	5.54	3.34	2.23	61.70	71.33
	1960	1.43	2.76	3.68	4.95	6.86	10.62	11.37	8.36	7.05	5.70	2.00	1.81	58.59	66.59
	1961	1.21	2.29	3.49	6.05	6.52	9.48	11.24	8.62	7.50	4.48	3.45	1.65	57.38	65.98
	1962	2.74	2.27	3.41	6.65	7.56	10.31	10.68	9.18	6.56	4.27	2.21	2.35	58.62	68.19
	1963	1.72	1.86	3.62	5.02	6.65	9.89	10.36	8.60	5.93	3.65	1.63	0.86	53.72	59.79
	1964	1.78	4.13	4.09	6.52	7.44	8.48	10.43	8.94	7.08	4.16	1.97	1.76	57.14	66.78
	1965	1.83	2.77	3.30	4.05	8.32	8.27	8.87	7.26	6.36	4.41	2.06	1.25	50.84	58.75
	1966	1.63	2.56	4.53	7.18	8.05	10.26	9.35	9.17	6.82	5.15	2.13	0.88	60.51	67.71

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]
In inches

Station name	Year of record	Months												Mar-Oct	Jan-Dec
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
SACRAMENTO VALLEY (Continued)															
Red Bluff 5E(Continued)	1967	2.16	2.40	3.18	2.98	7.31	8.13	9.70	9.22	7.02	4.58	1.98	2.84	52.12	61.50
	1968	1.82	1.40	3.46	6.91	7.45	9.85	9.42	7.43	7.36	3.90	1.53	0.84	55.78	61.37
	1969	1.00	1.44	3.96	5.15	9.75	9.74	10.53	8.76	6.42	5.06	3.65	2.43	59.37	67.89
	1970	1.43	2.03	5.47	6.27	8.82	9.29	10.02	9.07	8.45	4.74	1.45	0.90	62.13	67.94
	1971	1.91	2.66	3.51	5.27	6.38	9.40	12.45	9.23	8.46	5.28	2.78	1.49	59.98	68.82
	1972	2.12	2.00	3.98	-	-	-	-	-	-	-	-	-	-	-
	Average	1.76	2.34	3.91	5.63	7.54	9.52	10.40	8.66	7.18	4.69	2.32	1.64	57.53	65.59
Thornton 2S	1963	-	-	-	-	-	-	-	8.10	5.58	3.58	1.34	0.47	-	-
	1964	0.82	2.97	4.50	6.28	7.64	7.88	10.39	9.84	6.88	4.08	1.92	1.35	57.49	64.55
	1965	0.75	2.01	2.94	4.10	7.58	8.55	11.05	8.86	5.77	3.63	1.77	0.83	52.48	57.84
	1966	1.37	2.03	4.00	6.26	7.61	10.25	9.55	9.10	6.55	4.33	1.43	0.34	57.65	62.82
	1967	0.59	1.94	2.29	3.34	6.97	8.19	9.27	7.98	5.76	3.89	1.38	0.79	47.69	52.39
	1968	0.90	2.21	3.04	6.92	7.50	9.38	10.75	7.01	6.90	2.49	1.79	0.91	53.99	59.80
	Average	0.89	2.23	3.35	5.38	7.46	8.85	10.20	8.48	6.24	3.67	1.60	0.78	53.63	59.13
Yuba City	1960	1.50	2.88	3.44	5.20	7.06	10.08	8.84	8.31	5.91	5.60	2.45	1.59	54.44	62.86
	1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1962	-	-	-	-	-	-	8.95	7.71	5.59	4.05	1.96	1.88	-	-
	1963	1.49	1.80	3.63	4.40	6.48	9.48	9.27	8.12	5.24	3.55	1.34	0.59	50.17	55.39
	1964	1.88	4.01	4.92	7.25	7.79	8.12	9.94	7.68	8.20	3.54	1.84	1.42	57.44	66.59
	1965	1.55	2.91	3.28	3.84	8.99	9.53	9.21	6.85	5.49	4.08	2.08	1.29	51.27	59.10
	1966	1.35	2.05	3.75	7.48	7.40	8.69	8.33	7.89	6.72	4.87	2.15	0.95	55.13	61.63
	Average	1.55	2.73	3.80	5.63	7.54	9.18	9.09	7.76	6.19	4.28	1.97	1.29	53.47	61.01
Area Average		1.47	2.36	3.87	5.73	7.54	9.29	10.13	8.56	6.76	4.58	2.19	1.41	56.46	63.89
SAN JOAQUIN VALLEY															
Arvin 2.5NW	1959	1.87	2.54	4.60	7.11	8.58	9.31	9.78	8.61	5.92	4.45	2.60	1.65	58.36	67.02
	1960	1.96	2.24	4.30	5.82	8.72	9.98	9.39	8.09	6.13	4.08	1.89	1.08	56.51	63.68
	1961	0.86	2.63	3.91	6.58	7.61	9.91	9.64	7.82	6.22	4.41	2.44	1.17	56.10	63.20
	1962	1.55	1.91	4.31	7.65	8.57	10.54	10.42	8.56	6.04	3.91	2.24	1.75	60.00	67.45
	1963	1.75	2.38	5.35	5.25	8.06	9.55	9.69	7.85	5.50	3.35	2.05	0.77	54.70	61.55
	1964	1.47	3.32	4.46	6.06	8.18	9.79	9.24	8.06	5.98	4.29	1.90	1.54	56.06	64.29
	1965	1.29	2.40	4.55	4.98	9.01	8.98	9.91	8.98	6.34	-	-	-	-	-
	Average	1.54	2.49	4.50	6.21	8.39	9.72	9.72	8.28	6.02	4.08	2.19	1.33	56.92	64.47
Bakersfield 10S	1969	-	-	-	-	7.93	8.24	8.91	8.22	6.36	3.67	3.35	1.32	-	-
	1970	2.13	1.82	3.75	5.61	9.36	9.34	-	-	-	-	-	-	-	-
	Average	2.13	1.82	3.75	5.61	8.64	8.79	8.91	8.22	6.36	3.67	3.35	1.32	53.95	62.57
Berenda 2N	1960	-	-	-	-	9.06	10.31	10.74	9.49	6.43	4.46	1.43	0.74	-	-
	1961	0.86	1.97	3.83	6.26	8.09	9.56	11.87	8.05	6.45	5.18	2.41	0.80	59.29	65.33
	1962	0.83	1.31	3.59	6.71	7.84	9.56	11.09	9.77	6.65	4.15	1.95	1.10	59.36	64.55
	1963	0.98	1.81	3.44	4.62	6.68	8.47	10.56	9.17	6.04	4.00	1.71	0.45	52.98	57.93
	Average	0.89	1.70	3.62	5.86	7.92	9.48	11.06	9.12	6.39	4.45	1.88	0.77	57.90	63.14

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]
In inches

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SAN JOAQUIN VALLEY (Continued)															
Buttonwillow 1S	1965	-	-	-	-	-	9.90	9.90	7.83	6.07	4.65	1.79	0.95	-	-
	1966	1.97	2.42	4.60	7.41	9.51	-	-	-	-	-	-	-	-	-
	Average	1.97	2.42	4.60	7.41	9.51	9.90	9.90	7.83	6.07	4.65	1.79	0.95	59.87	67.00
Fresno State College	1968	-	-	-	-	-	-	-	-	6.86	3.64	1.53	1.28	-	-
	1969	0.85	0.91	3.95	6.04	8.84	9.47	10.73	9.14	6.69	3.63	1.71	1.01	58.49	62.97
	1970	1.43	2.67	5.73	7.18	8.96	10.05	9.57	7.92	6.28	3.76	2.58	1.29	59.45	67.42
	1971	1.15	2.05	2.55	5.40	6.40	12.11	11.99	9.85	6.45	4.25	1.70	0.85	59.00	64.75
	1972	0.53	2.08	5.19	6.96	-	-	10.65	9.10	6.95	3.98	1.57	0.40	-	-
	Average	0.99	1.93	4.36	6.40	8.07	10.54	10.74	9.00	6.65	3.85	1.82	0.97	59.61	65.32
Kerman 2ESE	1960	-	-	-	-	9.15	10.05	8.81	7.43	6.02	4.28	1.63	0.80	-	-
	1961	0.81	2.45	4.50	6.86	8.43	8.39	8.04	7.36	6.44	5.36	2.38	0.84	55.38	61.86
	1962	1.02	1.66	4.10	6.61	8.04	10.06	9.99	9.27	6.76	4.33	2.13	1.06	59.16	65.03
	1963	1.01	1.86	4.18	4.85	7.89	9.72	11.04	8.55	5.46	3.63	1.74	0.38	55.32	60.31
	1964	1.27	2.63	4.13	6.15	8.22	9.73	9.65	9.61	6.50	4.56	1.98	1.25	58.55	65.68
	Average	1.03	2.15	4.23	6.12	8.35	9.59	9.51	8.44	6.24	4.43	1.97	0.87	56.91	62.93
Kingsburg 5S	1959	-	2.14	4.17	5.37	8.39	9.93	9.26	7.57	5.74	4.31	2.16	1.38	54.74	-
	1960	1.63	2.15	3.97	6.09	8.81	9.67	9.37	8.36	6.20	4.04	1.62	0.86	56.51	62.77
	1961	1.01	2.37	4.25	6.48	7.93	8.84	8.64	7.44	6.44	-	-	-	-	-
	Average	1.32	2.22	4.13	5.98	8.38	9.48	9.09	7.79	6.13	4.18	1.89	1.12	55.16	61.71
Maze Bridge 2S	1959	-	1.73	3.86	5.97	9.52	11.12	10.66	9.01	7.17	5.47	2.53	2.10	62.78	-
	1960	1.67	2.76	4.14	6.17	9.02	10.34	9.15	8.55	6.43	4.94	1.79	1.09	58.74	66.05
	1961	0.65	2.47	4.12	6.75	7.35	10.12	10.72	8.36	6.20	5.20	3.67	1.19	58.82	66.80
	1962	1.46	1.72	3.94	7.48	8.46	10.19	10.03	7.82	6.12	4.22	2.72	1.12	58.26	65.28
	1963	1.04	1.98	3.93	4.06	7.22	9.44	9.98	8.05	5.25	4.66	1.60	0.49	52.59	57.70
	1964	1.56	3.78	4.66	6.54	7.27	7.73	9.41	8.06	7.25	4.36	1.81	1.25	55.28	63.68
	1965	0.90	2.95	4.18	4.41	8.96	8.48	-	-	-	-	-	-	-	-
	Average	1.21	2.48	4.12	5.91	8.26	9.63	9.99	8.31	6.40	4.81	2.35	1.21	57.43	64.68
Merced 5SE #2	1964	-	-	-	-	-	-	-	9.10	6.45	4.67	2.16	1.66	-	-
	1965	1.19	2.13	3.78	4.94	8.96	9.10	10.18	8.66	6.46	4.63	1.89	1.18	56.71	63.10
	1966	1.76	2.63	4.48	6.98	8.93	10.64	11.43	10.27	7.27	4.99	2.21	0.65	64.99	72.24
	1967	1.39	1.53	3.85	4.06	7.43	9.15	11.21	9.28	6.02	4.60	2.24	1.24	55.60	62.00
	1968	1.46	1.74	4.37	6.78	10.21	11.97	11.33	-	-	-	-	-	-	-
	Average	1.45	2.01	4.12	5.69	8.88	10.22	11.04	9.33	6.55	4.72	2.12	1.18	60.55	67.31
Newman 1SE	1960	-	-	-	-	-	10.15	9.25	8.77	6.60	6.24	1.98	0.95	-	-
	1961	0.51	2.80	4.04	6.84	7.72	9.58	10.00	8.38	6.78	5.73	2.61	0.81	59.07	65.80
	1962	0.99	1.65	3.68	6.46	8.18	9.52	10.14	8.72	6.30	4.14	2.40	0.85	57.14	63.03
	1963	1.11	1.84	3.78	3.62	6.96	8.91	9.85	8.91	6.10	4.10	1.37	0.50	52.23	57.05
	1964	1.76	3.98	5.27	6.88	7.59	8.32	11.03	9.35	7.20	4.81	1.75	1.32	60.45	69.26
	1965	1.08	3.41	3.74	5.26	9.58	9.08	-	-	-	-	-	-	-	-
	Average	1.09	2.74	4.10	5.81	8.01	9.26	10.05	8.83	6.60	5.00	2.02	0.89	57.66	64.40

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]

In inches

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SAN JOAQUIN VALLEY (Continued)															
Old River 3S	1965	-	-	-	-	-	-	-	-	-	-	1.85	0.89	-	-
	1966	1.94	2.52	4.74	6.18	8.28	9.05	8.91	8.87	6.34	4.19	1.91	0.97	56.56	63.90
	1967	1.57	1.97	4.18	3.79	8.29	9.26	10.28	9.40	6.65	5.01	2.43	1.37	56.86	64.20
	Average	1.76	2.24	4.46	4.98	8.28	9.16	9.60	9.14	6.50	4.60	2.06	1.08	56.72	63.86
Pond 1N	1962	-	-	-	-	-	9.66	9.99	8.17	6.29	4.00	2.08	0.96	-	-
	1963	1.19	1.50	3.99	4.81	7.55	8.45	9.50	8.64	5.47	3.82	1.92	0.57	52.23	57.41
	1964	1.15	2.86	4.40	5.89	8.60	9.40	9.58	8.73	6.22	4.56	1.85	1.14	57.38	64.38
	1965	1.10	2.49	4.03	5.39	9.21	9.07	9.79	7.97	6.46	4.42	1.68	0.87	56.34	62.48
	Average	1.15	2.28	4.14	5.36	8.45	9.14	9.72	8.38	6.11	4.20	1.88	0.88	55.50	61.69
Stockton 9S	1959	-	-	-	6.33	9.16	11.05	10.70	8.70	6.37	4.82	2.43	1.55	-	-
	1960	1.84	2.48	4.34	6.40	8.56	10.32	10.42	8.84	6.18	5.66	2.07	1.06	60.72	68.17
	1961	0.97	2.55	4.41	6.66	7.87	9.05	9.45	7.01	6.78	6.25	3.23	1.21	57.48	65.44
	Average	1.40	2.52	4.38	6.46	8.53	10.14	10.19	8.18	6.44	5.58	2.58	1.27	59.90	67.67
Traver 4ESE	1962	-	-	3.64	6.12	7.79	9.08	9.88	7.94	6.21	3.63	1.44	0.89	54.29	-
	1963	1.03	1.55	3.48	4.06	7.19	8.61	9.07	7.94	5.33	3.43	1.61	0.38	49.11	53.68
	1964	1.03	2.30	3.67	4.91	6.98	9.77	10.76	8.38	5.52	4.14	1.78	0.92	54.13	60.16
	1965	0.87	1.91	3.33	4.56	8.29	8.55	8.97	7.65	6.00	3.80	1.71	0.84	51.15	56.48
	Average	0.98	1.92	3.53	4.91	7.56	9.00	9.67	7.98	5.76	3.75	1.64	0.76	52.16	57.46
Area Average		1.26	2.26	4.15	5.89	8.29	9.57	10.01	8.52	6.30	4.44	2.06	1.03	57.17	63.78
CENTRAL COAST - COASTAL VALLEYS AND PLAINS															
Betteravia 2NW	1961	-	-	5.10	5.88	6.97	6.49	6.84	6.41	5.00	4.64	3.53	2.28	47.33	-
	1962	3.39	2.13	3.70	5.46	6.12	-	-	-	-	-	-	-	-	-
	Average	3.39	2.13	4.40	5.67	6.54	6.49	6.84	6.41	5.00	4.64	3.53	2.28	45.99	57.32
Guadalupe 2NW [6/]	1963	-	-	-	-	-	-	5.91	5.38	4.67	3.84	2.69	2.20	-	-
	1964	3.14	3.75	4.52	4.71	5.19	6.43	6.23	5.46	4.46	3.44	2.61	2.37	40.44	52.31
	1965	2.30	3.29	4.13	3.71	5.96	5.69	5.77	5.71	4.79	4.38	2.05	1.67	40.14	49.45
	1966	2.65	2.64	4.20	5.07	4.79	6.70	6.65	5.21	4.28	3.78	1.94	1.40	40.68	49.31
	1967	2.20	2.77	3.37	4.00	5.80	5.67	6.05	5.09	3.99	4.24	-	-	38.21	-
	Average	2.57	3.11	4.06	4.37	5.44	6.12	6.12	5.37	4.44	3.94	2.32	1.91	39.86	49.77
Lompoc 1N [7/]	1968	3.56	2.51	4.66	5.93	6.65	8.10	6.83	7.12	7.06	4.79	3.35	2.79	51.14	63.35
	1969	2.74	2.28	4.43	5.83	6.69	5.20	6.12	6.37	4.48	4.87	2.96	2.07	43.99	54.04
	Average	3.15	2.40	4.54	5.88	6.67	6.65	6.48	6.74	5.77	4.83	3.16	2.43	47.56	58.70
Salinas 3E [8/]	1969	-	-	-	3.85	6.05	5.73	6.77	6.35	4.85	4.25	3.75	2.00	-	-
	1970	1.88	2.34	4.22	5.29	6.67	5.30	8.20	4.75	3.93	3.22	2.50	2.58	41.58	50.88
	1971	1.90	3.12	3.83	4.25	-	-	-	-	-	-	-	-	-	-
	Average	1.89	2.73	4.02	4.46	6.36	5.52	7.48	5.55	4.39	3.74	3.12	2.29	41.52	51.55

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1/]
In inches

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
CENTRAL COAST - COASTAL VALLEYS AND PLAINS															
Salinas 4NE [8/]	1965	-	-	-	-	6.98	6.47	7.91	4.77	4.61	4.19	2.56	1.95	-	-
	1966	2.07	2.43	3.35	4.40	7.06	6.64	7.37	7.29	5.28	4.38	3.18	1.42	45.77	54.87
	1967	2.55	2.10	3.23	4.55	3.89	4.61	6.64	6.03	5.13	4.51	2.53	2.30	38.59	48.07
	1968	1.47	1.95	2.95	5.50	5.65	7.35	-	-	-	-	-	-	-	-
	Average	2.03	2.16	3.18	4.82	5.90	6.27	7.31	6.03	5.01	4.36	2.76	1.89	42.88	51.72
San Luis Obispo 1NW	1969	-	-	-	-	-	-	8.4	7.6	5.9	5.7	4.1	2.8	-	-
	1970	1.7	3.2	6.1	7.2	7.5	6.7	7.6	7.7	6.4	-	3.6	-	-	-
	1971	4.3	4.2	4.4	5.1	5.8	7.5	7.9	8.1	6.8	5.8	3.6	1.7	51.4	65.2
	1972	3.5	3.8	5.8	6.5	7.2	7.3	8.8	6.1	6.3	3.9	3.7	2.5	51.9	65.4
	Average	3.2	3.7	5.4	6.3	6.8	7.2	8.2	7.4	6.4	5.1	3.8	2.3	52.8	65.8
Santa Maria 4SE	1961	3.40	2.98	4.93	5.96	6.78	6.74	7.23	6.62	5.46	5.28	4.18	3.48	49.00	63.04
Santa Rita 2W	1962	-	-	-	-	-	-	4.13	5.05	3.21	3.39	2.12	1.82	-	-
	1963	2.02	2.68	3.04	3.82	4.52	5.89	6.10	5.17	4.17	3.30	2.31	1.93	36.01	44.95
	1964	1.06	4.57	2.72	4.14	4.75	5.61	5.88	5.30	4.96	4.23	2.76	1.29	37.59	47.27
	1965	2.12	2.41	3.52	-	-	-	-	-	-	-	-	-	-	-
	Average	1.73	3.22	3.09	3.98	4.64	5.75	5.37	5.17	4.11	3.64	2.40	1.68	35.75	44.78
Area Average		2.52	2.90	4.11	5.06	6.05	6.32	6.83	6.08	5.03	4.31	3.00	2.13	43.79	54.34
CENTRAL COAST - INTERIOR VALLEYS															
Hollister 6NNW [4/]	1962	-	-	-	5.78	7.19	6.65	9.04	8.14	5.12	3.57	3.15	2.26	-	-
	1963	1.73	2.47	3.34	3.01	5.14	6.58	7.50	7.04	6.02	5.20	2.27	2.16	43.83	52.46
	1964	2.45	3.25	4.05	5.82	5.29	7.30	8.80	7.82	7.47	5.81	4.12	1.90	52.36	64.08
	1965	1.61	1.96	3.25	3.79	7.08	7.67	6.93	6.75	4.58	3.98	2.64	1.87	44.03	52.11
	Average	1.93	2.56	3.55	4.60	6.18	7.05	8.07	7.44	5.80	4.64	3.04	2.05	47.33	56.91
San Lucas 0.3S [4/]	1962	-	-	-	6.38	7.61	8.69	9.01	8.32	5.82	4.56	3.48	2.67	-	-
	1963	3.18	3.67	3.78	4.33	6.78	7.27	9.72	7.58	4.50	4.19	2.09	1.79	48.15	58.88
	1964	1.76	3.58	4.87	7.17	7.04	8.06	10.37	7.23	6.04	4.32	3.17	1.89	55.10	65.50
	1965	1.72	2.72	4.15	4.42	7.44	8.45	8.38	8.47	5.97	4.74	4.02	1.78	52.02	62.26
	Average	2.22	3.32	4.27	5.58	7.22	8.12	9.37	7.90	5.58	4.45	3.19	2.03	52.49	63.25
Soledad 3.5NW [9/]	1961	-	-	4.51	7.28	7.99	9.40	10.41	7.76	6.94	6.72	3.71	1.86	61.01	-
	1962	2.46	2.65	4.30	7.18	8.44	8.31	7.95	7.79	5.56	5.16	3.12	2.67	54.69	65.59
	1963	2.65	2.85	4.17	4.79	6.40	7.75	8.96	8.26	6.99	4.49	2.46	2.69	51.81	62.46
	1964	2.36	3.82	5.06	6.06	7.22	8.40	8.21	7.36	7.18	5.08	2.57	2.01	54.57	65.33
	1965	1.93	3.48	4.26	5.06	8.16	7.53	7.99	7.45	6.27	6.14	3.21	2.00	52.86	63.48

Appendix D (Continued)

SUMMARY OF OBSERVED EVAPORATION FROM CLASS "A" PANS LOCATED IN IRRIGATED PASTURE ENVIRONMENTS[1]
In inches

Station name	Year of record	Months												Mar-Oct	Jan-Dec
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
CENTRAL COAST - INTERIOR VALLEYS															
Soledad 3.5NW [9] (Continued)	1966	2.10	2.81	4.87	6.28	7.06	8.85	8.09	7.47	6.22	5.24	3.15	1.96	54.08	64.10
	1967	2.80	2.62	3.87	4.27	7.19	6.82	8.72	-	6.18	5.82	2.93	2.32	-	-
	1968	2.54	2.39	4.42	6.21	7.97	8.84	8.04	7.74	7.14	4.74	2.88	2.50	55.10	65.41
	1969	2.47	2.21	4.92	6.14	7.76	7.39	7.87	7.90	5.92	5.25	4.25	2.75	53.15	64.83
	1970	2.57	3.06	5.32	6.68	8.93	8.80	9.18	8.19	7.56	4.54	2.82	1.51	59.20	69.16
	1971	2.23	3.11	4.71	5.84	7.50	-	-	-	-	-	-	-	-	-
	Average	2.41	2.90	4.58	5.98	7.69	8.21	8.54	7.77	6.60	5.32	3.11	2.23	54.69	65.34
Area Average		2.28	2.92	4.34	5.60	7.27	7.93	8.62	7.72	6.19	4.98	3.11	2.14	52.65	63.10

1/ Stations located in well-managed irrigated pastures except as noted.
2/ Flood irrigated native pasture.
3/ Non-irrigated pasture, received sufficient precipitation (rain and fog) to keep grasses green all year.
4/ Irrigated alfalfa environment.
5/ Data contributed by W. O. Pruitt, U. C.-Davis.
6/ Station serviced by San Luis Obispo County Flood Control and Water Conservation District.
7/ Data contributed by Paul R. Nixon, USDA-ARS.
8/ Station serviced by Monterey County Flood Control and Water Conservation District.
9/ Station serviced by Department of Corrections, Soledad Correctional Training Facility.

APPENDIX E

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA

Appendix E

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1]
In milliliters[2]

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
NORTHEASTERN MOUNTAIN VALLEYS															
Alturas 2SE	1956	-	-	-	-	402	547	661	599	-	-	-	-	-	-
	1957	-	-	-	-	380	544	607	538	387	-	-	-	-	-
	1958	-	-	-	-	476	471	535	501	-	-	-	-	-	-
	1959	-	-	-	-	-	547	643	551	-	-	-	-	-	-
	1960	-	-	-	-	-	562	560	501	422	-	-	-	-	-
	1961	-	-	-	-	-	575	602	491	414	-	-	-	-	-
	1962	-	-	-	-	418	597	586	552	444	-	-	-	-	-
	1963	-	-	-	-	406	478	584	540	401	-	-	-	-	-
	1964	-	-	-	-	-	400	571	488	419	-	-	-	-	-
	Average	-	-	-	-	416	524	594	529	414	-	-	-	-	-
Canby 2SW [3]	1958	-	-	-	-	-	499	572	546	-	-	-	-	-	-
	1959	-	-	-	-	-	514	530	463	357	-	-	-	-	-
	Average	-	-	-	-	-	506	551	504	357	-	-	-	-	-
Fall River Mills R. S. [4]	1955	-	-	-	-	474	534	594	628	479	342	-	-	-	-
	1956	-	-	-	-	-	536	612	563	451	-	-	-	-	-
	1957	-	-	-	-	493	554	508	513	418	-	-	-	-	-
	Average	-	-	-	-	484	541	571	568	449	342	-	-	-	-
Fall River Mills 2NW [4]	1956	-	-	-	-	-	512	575	497	512	-	-	-	-	-
	1957	-	-	-	-	408	581	-	-	-	-	-	-	-	-
	Average	-	-	-	-	408	546	575	497	512	-	-	-	-	-
Glenburn 0.3SE	1960	-	-	-	-	-	588	584	550	452	-	-	-	-	-
	1961	-	-	-	-	470	616	609	481	441	-	-	-	-	-
	1962	-	-	-	-	431	564	658	529	438	-	-	-	-	-
	1963	-	-	-	-	432	528	600	548	395	-	-	-	-	-
	1964	-	-	-	-	-	463	526	566	462	-	-	-	-	-
	1965	-	-	-	-	-	503	587	538	384	-	-	-	-	-
	1966	-	-	-	-	507	519	579	523	388	-	-	-	-	-
	Average	-	-	-	-	460	540	592	534	423	-	-	-	-	-
Hat Creek 3SE	1958	-	-	-	-	-	374	378	521	-	-	-	-	-	-
	1959	-	-	-	-	-	549	540	555	438	-	-	-	-	-
	Average	-	-	-	-	-	462	459	538	438	-	-	-	-	-
Likely 2NW	1958	-	-	-	-	-	584	663	545	401	-	-	-	-	-
	1959	-	-	-	-	510	505	556	535	-	-	-	-	-	-
	Average	-	-	-	-	510	544	610	540	401	-	-	-	-	-
Lookout 3S [5]	1959	-	-	-	-	-	586	650	567	424	-	-	-	-	-
	1960	-	-	-	-	-	-	584	561	458	-	-	-	-	-
	1961	-	-	-	-	-	564	578	478	404	-	-	-	-	-
	1962	-	-	-	-	390	568	568	504	407	-	-	-	-	-
	1963	-	-	-	-	443	509	619	539	406	-	-	-	-	-
	Average	-	-	-	-	416	557	600	530	420	-	-	-	-	-
McArthur 2SE [6]	1955	-	-	-	-	-	-	-	619	519	-	-	-	-	-
	1956	-	-	-	-	428	563	591	540	448	-	-	-	-	-
	Average	-	-	-	-	428	563	591	580	484	-	-	-	-	-
McArthur 4ESE [6]	1956	-	-	-	-	-	-	-	537	434	-	-	-	-	-
	1957	-	-	-	-	484	626	634	549	457	-	-	-	-	-
	1958	-	-	-	-	-	474	579	602	450	-	-	-	-	-
	1959	-	-	-	-	-	606	659	646	481	-	-	-	-	-
	Average	-	-	-	-	484	569	624	584	456	-	-	-	-	-

Appendix E (Continued)

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1]
In milliliters[2]

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
NORTHEASTERN MOUNTAIN VALLEYS (Continued)															
Standish 4NW	1959	-	-	-	-	460	556	456	418	412	-	-	-	-	-
	1960	-	-	-	-	-	-	552	537	-	-	-	-	-	-
	Average	-	-	-	-	460	556	504	478	412	-	-	-	-	-
Area Average		-	-	-	-	445	536	581	537	431	342	-	-	-	-
NORTH COAST - INTERIOR VALLEYS															
Fort Jones R. S.[4]	1954	-	-	-	-	-	-	618	427	371	-	-	-	-	-
	1955	-	-	-	-	320	525	566	578	-	-	-	-	-	-
	Average	-	-	-	-	320	525	592	502	371	-	-	-	-	-
Gazelle 1NE	1958	-	-	-	-	530	486	569	507	438	-	-	-	-	-
	1959	-	-	-	388	444	556	599	541	370	-	-	-	-	-
	1960	-	-	-	-	489	661	758	682	534	-	-	-	-	-
	Average	-	-	-	388	488	568	642	577	447	-	-	-	-	-
Hayfork 1SE[4]	1954	-	-	-	-	-	-	-	466	350	-	-	-	-	-
	1955	-	-	-	226	462	486	493	473	-	-	-	-	-	-
	1956	-	-	-	-	463	513	575	560	396	-	-	-	-	-
	1957	-	-	-	-	429	566	582	567	448	-	-	-	-	-
	1958	-	-	-	-	464	369	416	519	421	-	-	-	-	-
	1959	-	-	-	-	428	537	607	513	398	332	-	-	-	-
	1960	-	-	-	234	377	598	589	612	-	-	-	-	-	-
	Average	-	-	-	230	437	512	544	530	403	332	-	-	-	-
Montague 3NE	1959	-	-	-	-	454	575	624	531	368	-	-	-	-	-
	1960	-	-	-	-	450	621	634	559	452	-	-	-	-	-
	1961	-	-	-	-	-	536	576	489	389	-	-	-	-	-
	Average	-	-	-	-	452	577	611	526	403	-	-	-	-	-
Santa Rosa 6SSW	1962	-	-	-	-	-	-	506	478	396	283	237	-	-	-
	1963	-	-	319	345	402	462	525	466	361	286	160	-	3166	-
	1964	-	-	354	438	471	483	553	496	374	227	-	-	3396	-
	Average	-	-	336	392	436	472	528	480	377	265	198	-	3288	-
Yountville 2N	1962	-	-	-	-	-	-	547	513	411	298	245	-	-	-
	1963	-	-	321	309	419	495	453	479	372	287	181	-	3135	-
	1964	-	318	300	405	480	477	505	496	405	333	213	-	3401	-
	1965	-	-	-	-	459	465	483	360	286	-	-	-	-	
	Average	-	318	310	357	453	479	497	462	368	306	213	-	3232	-
Area Average		-	318	324	335	444	523	561	514	397	292	207	-	3390	-
SACRAMENTO VALLEY															
Anderson 4E	1958	-	-	-	-	-	-	602	563	483	385	-	-	-	-
	1959	-	-	377	433	466	548	592	540	412	356	-	-	3724	-
	1960	-	-	284	357	442	572	598	515	421	308	-	-	3497	-
	1961	-	-	211	380	436	551	656	504	442	343	-	-	3523	-
	1962	-	-	-	-	457	537	546	487	391	273	-	-	-	-
	1963	-	-	-	288	404	508	519	466	360	244	-	-	-	-
	1964	-	-	-	-	537	547	611	633	472	320	-	-	-	-
	Average	-	-	291	364	457	544	589	530	426	318	-	-	3519	-
Arbuckle 1S[4]	1958	-	-	-	432	561	552	601	557	482	452	-	-	-	-
	1959	-	-	404	450	497	589	609	508	416	357	-	-	3830	-
	1960	-	-	330	392	504	555	559	516	430	334	-	-	3620	-
	1961	-	-	343	454	527	552	664	479	365	334	-	-	3718	-
	Average	-	-	359	432	522	562	608	515	423	369	-	-	3790	-
Bella Vista 4NE[4]	1959	-	-	-	404	437	494	674	493	393	343	-	-	-	-
	1960	-	-	272	330	436	535	-	-	353	350	112	-	-	-
	1961	-	-	-	-	-	487	522	436	388	292	-	-	-	-
	Average	-	-	272	367	436	505	598	464	378	328	112	-	3348	-

Appendix E (Continued)

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1]/ In milliters[2]/

Station name	Year of record	Months												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SACRAMENTO VALLEY (Continued)															
Corning 3NE	1960	-	-	326	417	476	568	633	562	462	385	168	-	3629	-
	1961	-	-	294	458	514	579	609	507	456	351	-	-	3768	-
	1962	-	-	-	-	517	567	636	584	431	271	-	-	-	-
	1963	-	-	-	335	463	519	581	509	424	296	-	-	-	-
	Average	-	-	310	403	492	558	615	540	443	326	168	-	3687	-
Corning 3W 6/	1958	-	-	-	430	561	572	644	611	481	454	-	-	-	-
	1959	-	-	-	463	524	604	660	573	456	381	-	-	-	-
	Average	-	-	-	446	542	588	652	592	468	418	-	-	-	-
Hamilton City 2W 6/	1954	-	-	-	-	-	-	-	-	459	373	-	-	-	-
	1955	-	-	-	386	514	547	601	570	457	362	-	-	-	-
	Average	-	-	-	386	514	547	601	570	458	368	-	-	-	-
Newville 1E 4/	1959	-	-	383	437	499	595	632	573	470	409	-	-	3998	-
	1960	-	-	314	410	501	681	667	713	614	451	199	-	4351	-
	1961	-	-	288	395	450	543	604	486	436	333	-	-	3535	-
	Average	-	-	328	414	483	606	634	591	507	398	199	-	3961	-
Red Bluff 5E	1959	-	-	369	460	481	641	680	544	444	376	-	-	3995	-
	1960	-	-	301	393	487	600	606	499	412	323	150	-	3621	-
	1961	-	-	263	409	476	566	657	528	442	337	-	-	3678	-
	1962	-	-	-	-	510	579	603	530	415	299	-	-	-	-
	1963	-	-	-	310	407	480	513	441	360	280	-	-	-	-
	1964	-	-	-	-	539	559	634	593	507	361	-	-	-	-
	Average	-	-	311	393	483	571	616	522	430	329	150	-	3655	-
Redding 5SE	1955	-	-	-	270	578	613	640	691	490	195	-	-	-	-
	1956	-	-	-	-	464	564	607	548	430	-	-	-	-	-
	1957	-	-	-	432	461	622	597	485	379	252	-	-	-	-
	1958	-	-	-	-	506	510	571	547	500	397	-	-	-	-
	1959	-	-	389	449	491	633	739	602	456	396	-	-	-	-
	1960	-	-	281	373	470	632	677	567	463	316	-	-	3779	-
	1961	-	-	224	378	419	563	566	465	386	305	-	-	3306	-
	Average	-	-	298	380	484	591	628	558	443	310	-	-	3692	-
Richvale 2SE 4/	1957	-	-	-	-	-	-	-	668	428	314	-	-	-	-
	1958	-	-	-	436	553	585	666	577	448	350	-	-	-	-
	1959	-	-	355	473	533	613	703	573	451	390	-	-	4091	-
	1960	-	-	309	425	516	639	636	612	474	370	179	-	3981	-
	Average	-	-	332	445	534	612	668	608	450	356	179	-	4005	-
Thornton 2S	1963	-	-	-	-	-	-	-	429	398	337	-	-	-	-
	1964	-	-	-	421	509	512	574	500	428	344	-	-	-	-
	1965	-	-	-	365	511	545	580	505	437	375	-	-	-	-
	1966	-	-	-	442	515	518	547	488	400	323	-	-	-	-
	1967	-	-	-	400	511	509	541	472	394	316	-	-	-	-
	1968	-	-	-	427	542	522	543	487	414	336	-	-	-	-
	Average	-	-	-	411	518	521	557	480	411	338	-	-	-	-
Vina 1S 6/	1958	-	-	-	449	546	615	644	581	445	419	-	-	-	-
	1959	-	-	440	446	507	579	612	552	457	379	-	-	-	-
	1960	-	-	-	448	530	615	592	498	-	-	-	-	-	-
	Average	-	-	440	448	528	603	616	544	451	399	-	-	4029	-
Willows 6S 4/	1955	-	-	-	-	-	504	641	614	529	421	-	-	-	-
	1956	-	-	-	-	510	615	690	645	515	377	-	-	-	-
	1957	-	-	-	-	533	638	681	618	486	330	-	-	-	-
	1958	-	-	-	458	538	589	659	573	457	357	-	-	-	-
	1959	-	-	419	489	539	637	662	559	481	405	-	-	4191	-
	1960	-	-	353	434	518	623	623	570	464	371	194	-	3956	-
	1961	-	-	304	430	516	523	584	474	422	315	-	-	3568	-
	1962	-	-	-	-	492	567	621	549	455	295	-	-	-	-
	1963	-	-	-	355	469	570	618	518	433	361	-	-	-	-
	Average	-	-	359	433	514	585	642	569	471	359	194	-	3932	

Appendix E (Continued)

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1/]
In milliliters[2/]

Station name	Year of record	Months												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SACRAMENTO VALLEY (Continued)															
Yuba City 7W	1958	-	-	-	416	535	559	648	576	521	426	-	-	-	-
	1959	-	-	417	488	545	619	634	551	451	390	-	-	4095	-
	1960	-	-	339	429	519	601	591	530	427	337	176	-	3773	-
	1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1962	-	-	-	-	-	-	540	490	440	295	-	-	-	-
	1963	-	-	-	356	459	531	562	493	403	330	-	-	-	-
	1964	-	-	-	-	492	499	530	516	411	293	-	-	-	-
	Average	-	-	378	422	510	562	584	526	442	345	176	-	3769	-
Area Average		-	-	330	411	499	569	613	541	442	346	168	-	3751	-
SAN JOAQUIN VALLEY															
Arvin 2.5NW	1959	-	-	390	473	498	571	582	548	473	413	-	-	3948	-
	1960	-	-	-	438	570	670	639	582	480	372	-	-	-	-
	1961	-	-	364	475	504	610	610	529	485	350	-	-	3927	-
	1962	-	-	344	444	500	601	622	576	498	355	-	-	3940	-
	1963	-	-	365	355	437	475	562	551	465	340	-	-	3550	-
	1964	-	-	360	434	496	528	563	516	466	381	-	-	3744	-
	1965	-	-	327	370	527	525	551	529	434	-	-	-	-	-
	Average	-	-	358	427	505	569	590	547	472	368	-	-	3836	-
Bakersfield 10S	1969	-	-	-	-	486	453	489	479	410	330	-	-	-	-
	1970	-	-	356	420	510	495	-	-	-	-	-	-	-	-
	Average	-	-	356	420	498	474	489	479	410	330	-	-	3456	-
Berenda 2N	1959	-	-	-	-	528	598	620	571	471	413	-	-	-	-
	1960	-	-	353	441	538	558	511	495	436	347	-	-	3679	-
	1961	-	-	369	453	495	551	552	476	456	346	-	-	3698	-
	1962	-	-	350	476	497	529	544	582	488	354	-	-	3820	-
	1963	-	-	319	338	465	525	578	518	399	347	-	-	3489	-
	Average	-	-	348	427	505	552	561	528	450	361	-	-	3732	-
Buttonwillow 1S	1965	-	-	-	-	-	508	555	509	432	382	-	-	-	-
	1966	-	-	323	423	421	-	-	-	-	-	-	-	-	-
	Average	-	-	323	423	421	508	555	509	432	382	-	-	3553	-
Ceres 3E[6/]	1959	-	-	400	460	520	573	549	513	379	335	-	-	3729	-
	1960	-	-	373	445	569	600	577	554	501	402	-	-	4021	-
	1961	-	-	370	466	481	539	490	441	443	368	-	-	3598	-
	1962	-	-	366	482	493	-	-	-	-	-	-	-	-	-
	Average	-	-	377	463	516	571	539	503	441	368	-	-	3778	-
Fresno State College	1969	-	-	374	467	524	478	536	553	413	329	-	-	3674	-
	1970	-	-	-	-	542	467	468	512	500	366	-	-	-	-
	1971	-	-	-	375	387	466	490	472	290	228	-	-	-	-
	1972	-	-	395	388	494	472	491	424	336	251	-	-	3251	-
	Average	-	-	384	410	487	471	496	490	385	294	-	-	3417	-
Kerman 2ESE	1960	-	-	-	-	490	536	540	516	415	343	-	-	-	-
	1961	-	-	331	435	472	521	604	479	456	360	-	-	3658	-
	1962	-	-	372	457	462	460	540	530	447	349	-	-	3617	-
	1963	-	-	358	373	481	463	494	523	395	325	-	-	3412	-
	1964	-	-	313	443	464	508	540	516	435	366	-	-	3585	-
	Average	-	-	344	427	474	498	544	513	430	349	-	-	3579	-
Kingsburg 5S	1959	-	-	421	455	517	544	604	529	431	371	-	-	3872	-
	1960	-	-	-	427	502	511	507	494	395	330	-	-	-	-
	1961	-	-	381	466	506	552	529	558	474	-	-	-	-	-
	Average	-	-	401	449	508	536	547	527	433	350	-	-	3751	-
Maze Bridge 2S	1959	-	-	427	476	531	590	610	515	419	366	-	-	3934	-
	1960	-	-	362	438	528	583	591	547	452	350	-	-	3851	-
	1961	-	-	364	440	482	569	555	488	419	332	-	-	3649	-
	1962	-	-	344	459	492	523	581	569	491	307	-	-	3766	-
	1963	-	-	333	330	503	491	600	496	404	287	-	-	3444	-
	1964	-	-	312	469	540	442	599	549	486	372	-	-	3769	-
	1965	-	-	316	300	592	552	-	-	-	-	-	-	-	-
	Average	-	-	351	416	524	536	589	527	445	336	-	-	3724	-

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1]
In milliliters[2]

Station name	Year of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
SAN JOAQUIN VALLEY (Continued)															
Mendota 6SW[6]	1959	-	-	-	473	561	595	590	561	456	420	-	-	-	-
	1960	-	-	410	452	-	-	-	593	502	371	-	-	-	-
	1961	-	-	383	483	544	630	615	528	516	406	-	-	4105	-
	1962	-	-	364	464	514	-	-	-	-	-	-	-	-	-
	Average	-	-	386	468	540	612	602	561	491	399	-	-	4059	-
Merced 5SE #1	1959	-	-	415	475	515	588	576	536	427	388	-	-	3920	-
	1960	-	-	371	457	526	578	567	541	442	359	-	-	3841	-
	1961	-	-	359	477	528	614	730	583	463	407	-	-	4181	-
	1962	-	-	356	453	513	571	571	535	436	310	-	-	3745	-
	1963	-	-	316	353	568	525	570	548	442	353	-	-	3675	-
	1964	-	-	268	448	504	549	581	584	460	345	-	-	3739	-
	Average	-	-	348	444	526	571	599	554	448	360	-	-	3850	-
Merced 5SE #2	1964	-	-	-	-	-	-	-	500	435	385	-	-	-	-
	1965	-	-	203	420	508	590	646	587	485	442	-	-	3881	-
	1966	-	-	-	508	556	605	607	625	491	401	-	-	-	-
	1967	-	-	340	345	480	500	550	610	445	394	-	-	3664	-
	1968	-	-	347	495	564	647	621	-	-	-	-	-	-	-
	Average	-	-	297	442	527	586	606	580	464	406	-	-	3908	-
Newman 1SE	1960	-	-	-	-	-	543	542	533	426	321	-	-	-	-
	1961	-	-	351	449	484	566	556	486	417	348	-	-	3657	-
	1962	-	-	347	466	493	520	562	570	448	313	-	-	3719	-
	1963	-	-	348	349	506	564	593	538	447	351	-	-	3696	-
	1964	-	-	298	435	579	427	562	513	435	372	-	-	3621	-
	1965	-	-	320	305	478	491	-	-	-	-	-	-	-	-
	Average	-	-	333	401	508	518	563	528	435	341	-	-	3627	-
Old River 3S	1966	-	-	353	456	479	520	531	529	426	343	-	-	3637	-
	1967	-	-	355	337	493	546	614	565	443	396	-	-	3749	-
	Average	-	-	354	396	486	533	572	547	434	370	-	-	3692	-
Old River 3W[6]	1968	-	-	-	-	-	537	529	462	438	325	-	-	-	-
	1969	-	-	355	432	569	544	585	552	435	355	-	-	3827	-
	1970	-	-	407	455	583	554	565	569	493	369	-	-	3995	-
	1971	-	-	364	389	448	512	497	456	368	308	-	-	3342	-
	1972	-	-	430	474	547	532	542	499	411	313	159	-	3748	-
	Average	-	-	389	438	537	536	544	508	429	334	159	-	3715	-
Pond 1N	1962	-	-	-	-	-	615	647	602	503	351	-	-	-	-
	1963	-	-	399	356	433	502	558	508	471	325	-	-	3552	-
	1964	-	-	401	444	554	572	622	598	496	403	-	-	4090	-
	1965	-	-	329	376	552	547	-	-	-	-	-	-	-	-
	Average	-	-	376	392	513	559	609	569	490	360	-	-	3868	-
Stockton 9S	1959	-	-	-	481	484	523	587	535	444	378	-	-	-	-
	1960	-	-	310	442	612	588	612	618	484	354	-	-	4020	-
	1961	-	-	337	424	452	536	537	509	464	371	-	-	3630	-
	Average	-	-	324	449	516	549	579	554	464	368	-	-	3803	-
Traver 4ESE	1962	-	-	345	489	483	561	606	565	458	318	-	-	3825	-
	1963	-	-	338	392	477	503	561	542	409	291	-	-	3513	-
	1964	-	-	386	415	546	462	611	573	442	389	-	-	3824	-
	1965	-	-	312	393	595	564	-	-	-	-	-	-	-	-
	Average	-	-	345	422	525	522	593	560	436	333	-	-	3736	-
Area Average		-	-	355	430	511	541	569	535	446	354	159	-	3741	
CENTRAL COAST - COASTAL VALLEYS AND PLAINS															
Betteravia 2NW	1961	-	-	365	404	430	388	433	410	335	318	203	201	3083	
	1962	-	-	-	-	442	-	-	-	-	-	-	-	-	-
	Average	-	-	365	404	436	388	433	410	335	318	203	201	3089	-
Guadalupe 2NW[7]	1963	-	-	-	-	-	-	480	420	367	313	267	-	-	-
	1964	-	-	-	395	402	413	464	411	369	303	257	-	-	-
	1965	-	-	-	349	409	342	428	452	362	363	242	-	-	-
	Average	-	-	-	372	406	378	457	428	366	326	255	-	-	-

Appendix E (Continued)

SUMMARY OF OBSERVED MONTHLY NET ATMOMETER EVAPORATION IN CALIFORNIA[1]
In milliliters[2]

Station name	Year of record	Months													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar-Oct	Jan-Dec
CENTRAL COAST - COASTAL VALLEYS AND PLAINS (Continued)															
Lompoc 0.2N[8]	1957	-	-	-	-	506	520	545	486	480	301	289	252	-	-
	1958	276	257	283	380	484	538	485	467	454	386	-	263	3477	-
	1959	285	272	420	404	509	495	478	420	354	-	-	-	-	-
	1960	-	-	- Data not available							-	-	-	-	-
	1961	-	-	-	-	-	473	475	425	364	-	-	-	-	-
	Average	280	264	352	392	500	506	496	450	413	344	289	258	3453	4544
Salinas 3E[9]	1969	-	-	-	373	406	321	428	449	380	266	225	-	-	-
	1970	-	-	-	-	406	384	325	350	293	262	276	-	-	-
	1971	-	-	-	377	334	408	-	-	-	-	-	-	-	-
	Average	-	-	-	375	382	371	376	400	336	264	250	-	-	-
Salinas 4NE[9]	1965	-	-	-	-	405	361	387	391	311	273	188	224	-	-
Santa Maria 4SE	1961	-	-	396	440	458	442	484	444	368	355	247	238	3387	-
	1962	-	-	-	-	427	-	-	-	-	-	-	-	-	-
	Average	-	-	396	440	442	442	484	444	368	355	247	238	3371	-
Santa Rita 2N	1962	-	-	-	-	-	-	397	422	294	319	241	206	-	-
	1963	-	-	356	380	379	420	514	393	379	288	194	238	3109	-
	1964	228	297	348	379	408	416	423	377	332	293	145	235	2976	3881
	1965	145	242	239	-	-	-	-	-	-	-	-	-	-	-
	Average	186	270	314	380	394	418	445	397	335	300	193	226	2983	3858
Area Average		234	267	344	388	427	423	450	421	363	311	231	232	3127	4091
CENTRAL COAST - INTERIOR VALLEYS															
Hollister 6NNW[6]	1962	-	-	-	468	502	534	557	549	421	347	249	-	-	-
	1963	-	-	330	343	422	507	533	472	376	283	172	-	3266	-
	1964	-	-	-	432	460	498	515	455	258	161	-	-	-	-
	Average	-	-	330	414	461	513	535	492	352	264	210	-	3361	-
San Lucas 0.3S[6]	1962	-	-	-	497	542	543	548	538	437	346	251	-	-	-
	1963	-	-	386	411	456	521	570	486	387	310	244	248	3527	-
	1964	-	-	-	421	665	522	581	558	561	432	-	-	-	-
	1965	-	-	-	-	-	381	485	429	340	333	169	-	-	-
	Average	-	-	386	443	554	492	546	503	431	355	221	248	3710	-
Soledad 3.5NW[10]	1961	-	-	362	458	470	483	501	414	382	326	196	186	3396	-
	1962	222	177	349	466	483	490	509	520	417	376	291	246	3610	4546
	1963	-	212	343	375	414	480	512	454	422	335	237	239	3335	-
	1964	221	265	323	372	431	467	454	444	372	252	242	173	3115	4016
	1965	218	286	317	350	508	494	527	534	420	549	277	-	3699	-
	1966	-	-	606	590	705	763	515	515	432	361	234	161	4487	-
	1967	238	309	324	314	447	368	419	340	291	302	210	190	2805	3752
	1968	168	165	281	318	342	361	479	352	315	257	195	131	2705	3364
	1969	128	154	258	298	345	318	330	245	229	183	129	-	2206	-
	1970	-	-	-	-	485	435	432	405	389	262	-	-	-	-
	Average.	199	224	351	393	463	466	468	422	367	320	223	189	3250	4085
Area Average		199	224	353	408	480	480	498	454	379	319	221	197	3371	4212

1/ Irrigated pasture environments except as noted.
2/ Calculated from observed evaporation from Livingston black and white spherical atmometers. Data reported are the average of three atmometer pairs at each station.
3/ Non-irrigated alfalfa environment.
4/ Dry land environment.
5/ Flood irrigated native pasture.
6/ Irrigated alfalfa.
7/ Station serviced by San Luis Obispo County Flood Control and Water Conservation District.
8/ Data contributed by Paul R. Nixon, USDA-ARS. Average represents the ARS estimate of long-term average monthly net atmometer evaporation.
9/ Station serviced by Monterey County Flood Control and Water Conservation District.
10/ Station serviced by California Dept. of Corrections, Soledad Correctional Training Facility.

APPENDIX F

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA

Appendix F

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA
In equivalent inches of evaporation[1/] [2/]

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar - Oct	Jan - Dec
NORTHEASTERN MOUNTAIN VALLEYS															
Alturas 2SE	1963	3.17	5.39	7.93	-	-	-	-	-	-	-	-	-	-	-
	1964	3.57	3.99	7.26	8.28	11.72	12.88	15.04	12.89	8.46	6.09	3.09	2.73	82.62	96.00
	Average	3.37	4.69	7.60	8.28	11.72	12.88	15.04	12.89	8.46	6.09	3.09	2.73	82.96	96.84
Glenburn 0.3SE	1963	3.94	4.41	7.49	8.62	11.43	13.36	14.73	12.60	8.48	5.92	2.58	2.65	82.63	96.21
	1964	2.75	5.65	7.80	10.62	12.09	12.23	13.97	12.26	9.33	6.27	-	-	84.57	-
	1965	2.86	4.52	7.24	7.99	12.72	12.47	14.64	12.30	10.42	7.60	3.83	-	85.38	-
	1966	-	5.92	8.97	12.14	13.95	15.45	16.42	12.28	11.36	-	-	-	-	-
	Average	3.18	5.12	7.88	9.84	12.55	13.38	14.94	12.36	9.90	6.60	3.20	2.65	87.45	101.60
Area Average		3.26	4.98	7.78	9.53	12.38	13.28	14.96	12.47	9.61	6.47	3.17	2.69	86.48	100.58
NORTH COAST - INTERIOR VALLEYS															
Covelo 1NW	1966	-	5.29	8.20	11.22	13.27	13.34	-	12.48	6.58	7.43	3.76	3.07	-	-
	1967	-	5.33	6.57	8.58	13.73	-	14.90	13.25	10.13	7.74	4.62	-	-	-
	1968	-	4.69	8.24	13.02	13.27	-	14.46	11.60	10.20	6.82	3.73	3.13	-	-
	1969	-	3.77	9.37	10.72	-	-	-	-	-	-	-	-	-	-
	Average	-	4.77	8.10	10.88	13.42	13.34	14.68	12.44	8.97	7.33	4.04	3.10	89.16	-
Upper Lake 1SE	1970	-	-	-	-	-	-	-	-	-	-	-	3.17	-	-
	1971	4.76	6.99	8.49	11.53	12.39	14.23	15.40	14.10	11.29	8.72	5.17	4.01	96.15	117.08
	1972	4.55	4.71	9.03	11.49	13.68	-	14.83	13.12	-	-	-	-	-	-
	Average	4.66	5.85	8.76	11.51	13.04	14.23	15.12	13.61	11.29	8.72	5.17	3.59	96.28	115.55
Area Average		4.66	5.13	8.32	11.09	13.27	13.78	14.90	12.91	9.55	7.68	4.32	3.34	91.50	108.95
SACRAMENTO VALLEY															
Davis 2W [3/]	1959	-	-	-	-	-	-	14.67	12.98	8.44	7.94	5.69	4.38	-	-
	1960	4.75	6.73	9.35	12.44	14.92	15.01	14.51	13.39	10.08	7.47	5.27	3.69	97.17	117.61
	1961	2.87	5.99	9.47	11.62	13.98	14.73	15.26	12.82	10.53	7.82	5.23	3.38	96.23	113.70
	1962	4.78	5.79	9.32	12.04	13.98	15.37	15.54	14.13	10.83	7.10	5.39	3.56	98.31	117.83
	1963	4.14	5.27	8.65	9.75	12.56	15.44	15.77	13.78	9.88	7.76	3.93	2.26	93.59	109.19
	1964	3.92	7.69	9.39	12.96	14.50	13.47	15.06	13.68	10.10	7.05	4.14	3.17	96.21	115.13
	1965	2.88	5.64	7.06	8.34	13.22	14.16	14.27	12.40	9.80	8.08	4.11	2.86	87.33	102.82
	1966	4.51	5.65	9.21	12.07	13.85	14.33	14.91	13.26	10.54	8.02	4.12	2.63	96.19	113.10
	1967	3.92	5.60	8.34	9.79	14.35	13.53	15.24	13.41	10.38	8.05	4.59	4.53	93.09	111.73
	1968	4.02	5.08	8.95	12.34	13.88	14.71	15.27	12.72	10.96	7.36	3.87	3.56	96.19	112.72
	1969	3.10	4.09	9.73	11.19	14.83	13.61	15.26	13.58	10.50	7.27	5.22	3.32	95.97	111.70
	1970	3.41	5.46	9.38	11.51	13.81	14.10	15.19	13.99	11.19	7.84	4.01	3.14	97.01	113.03
	1971	3.98	6.23	8.91	11.99	11.80	14.22	14.73	13.73	10.85	8.35	5.28	3.79	94.58	113.86
	Average	3.86	5.77	8.98	11.34	13.81	14.39	15.05	13.37	10.31	7.70	4.68	3.41	94.95	112.67

Appendix F (Continued)

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA
In equivalent inches of evaporation[1/] [2/]

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar - Oct	Jan - Dec
SACRAMENTO VALLEY (Continued)															
Newville 1E	1966	-	-	-	-	-	-	-	-	-	8.26	3.55	2.87	-	-
	1967	3.82	5.92	8.03	6.86	14.21	13.34	14.79	13.08	10.26	7.95	4.50	4.44	88.52	107.20
	1968	4.13	4.30	8.49	12.11	13.35	14.27	14.23	11.91	10.62	7.47	3.67	3.23	92.45	107.78
	1969	3.19	3.71	8.74	11.08	14.77	14.35	15.12	13.39	9.25	6.36	4.32	2.61	93.06	106.89
	1970	2.61	4.94	9.28	11.95	13.35	13.28	15.17	13.85	11.02	7.64	3.63	2.92	95.54	109.64
	Average	3.44	4.72	8.64	10.50	13.92	13.81	14.83	13.06	10.29	7.54	3.93	3.21	92.59	107.89
Red Bluff 5E	1967	-	5.45	7.76	8.36	13.71	13.53	14.21	12.54	9.87	7.13	3.94	-	87.11	-
	1968	3.80	4.45	8.51	12.34	13.89	-	14.10	10.60	-	-	3.53	-	-	-
	1969	-	3.50	8.74	-	-	-	-	-	-	-	-	-	-	-
	Average	3.80	4.47	8.34	10.35	13.80	13.53	14.16	11.57	9.87	7.13	3.74	-	88.75	-
Thornton 2S	1963	-	-	-	-	-	-	-	-	8.84	7.11	3.49	2.25	-	-
	1964	3.17	6.10	8.18	11.43	12.83	12.07	13.81	11.01	8.72	6.03	3.57	3.09	84.08	100.01
	1965	4.59	5.80	7.66	7.83	11.62	13.77	14.00	12.52	9.63	7.26	4.72	3.25	84.29	102.65
	1966	4.67	5.76	9.20	12.98	13.58	13.63	14.39	13.25	10.70	8.03	4.22	2.65	95.76	113.06
	1967	3.78	4.97	7.95	9.00	14.54	13.57	15.25	13.39	11.10	9.91	6.38	5.13	94.71	114.97
	1968	3.96	5.39	7.91	10.18	12.48	12.96	14.56	10.75	9.33	8.28	4.44	3.98	86.45	104.22
	Average	4.03	5.60	8.18	10.28	13.01	13.20	14.40	12.18	9.72	7.77	4.47	3.39	88.74	106.23
Willows 6S	1958	-	5.54	7.32	11.95	14.83	14.84	15.25	13.81	11.16	8.39	-	-	97.55	-
Area Average		3.82	5.40	8.62	10.92	13.70	14.01	14.82	12.96	10.18	7.69	4.42	3.36	92.90	109.90
SAN JOAQUIN VALLEY															
Arvin 2.5NW	1959	4.53	6.09	10.08	11.91	14.10	13.97	13.87	13.14	10.88	8.59	6.12	4.40	96.54	117.68
	1960	4.86	5.88	9.80	11.87	13.96	14.45	13.62	13.66	10.76	8.30	5.23	4.03	96.42	116.42
	1961	3.73	6.16	8.78	11.83	12.66	13.42	13.31	11.81	10.44	7.61	5.07	3.44	89.86	108.26
	1962	4.65	4.58	8.82	11.24	13.10	13.44	13.64	12.68	10.50	7.74	5.19	3.34	91.16	108.92
	1963	4.78	5.43	9.14	10.09	11.62	12.80	13.73	11.83	9.39	6.72	4.46	3.04	85.32	103.03
	1964	4.19	6.42	8.47	10.28	12.34	13.14	13.52	12.14	10.42	8.16	5.09	3.90	88.47	108.07
	1965	4.67	6.03	8.28	8.36	12.66	11.91	13.27	12.10	9.77	-	-	-	-	-
	Average	4.49	5.80	9.05	10.80	12.92	13.30	13.57	12.48	10.31	7.85	5.19	3.69	90.28	109.45
Bakersfield 10S	1969	-	-	-	-	10.93	10.80	11.85	10.35	8.08	6.30	4.40	3.76	-	-
	1970	3.82	5.35	7.26	9.73	11.45	10.62	-	-	-	-	-	-	-	-
	Average	3.82	5.35	7.26	9.73	11.19	10.71	11.85	10.35	8.08	6.30	4.40	3.76	75.47	92.80
Berenda 2N	1962	-	-	-	-	13.43	13.67	14.42	13.35	10.36	7.32	4.93	3.25	-	-
	1963	3.76	5.16	9.45	10.60	12.79	14.09	14.83	12.27	8.84	6.91	3.53	1.13	89.78	103.36
	Average	3.76	5.16	9.45	10.60	13.11	13.88	14.62	12.81	9.60	7.12	4.23	2.19	91.19	106.53
Buttonwillow 1S	1965	-	-	-	-	-	-	13.10	11.43	9.71	8.01	4.56	2.80	-	-
	1966	4.76	5.75	8.68	11.00	12.43	13.00	-	-	-	-	-	-	-	-
	Average	4.76	5.75	8.68	11.00	12.43	13.00	13.10	11.43	9.71	8.01	4.56	2.80	87.36	105.23

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA
In equivalent inches of evaporation 1/ 2/

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar - Oct	Jan - Dec
SAN JOAQUIN VALLEY (Continued)															
Fresno NWS 4/	1959	3.48	5.26	9.22	10.82	13.12	13.22	12.64	11.47	9.51	7.55	5.15	3.92	87.55	105.36
	1960	4.13	4.71	8.05	10.42	12.60	12.80	11.58	11.31	8.90	7.09	4.04	3.02	82.75	98.65
	1961	2.80	5.20	8.37	10.60	11.89	12.23	13.00	10.74	9.17	6.99	4.62	2.34	82.99	97.95
	1962	3.36	3.66	8.28	10.84	11.93	14.60	15.77	14.33	11.57	8.34	5.27	-	95.66	-
	1963	-	4.58	9.05	10.26	13.33	14.39	15.40	13.37	9.69	7.36	3.86	1.98	92.85	-
	1964	3.80	6.54	8.97	11.65	13.69	14.15	14.92	12.91	10.74	7.76	4.93	3.07	94.79	113.13
	1965	3.36	5.92	8.55	9.65	14.27	13.91	14.00	12.56	9.97	8.26	4.16	3.05	91.17	107.66
	1966	4.61	5.80	9.33	11.95	13.12	13.85	14.21	12.95	9.91	7.55	4.38	2.07	92.87	109.73
	1967	3.40	5.05	7.97	9.21	13.77	13.89	14.14	12.87	10.03	8.39	4.06	4.13	90.27	106.91
	1968	3.84	4.26	8.53	12.13	13.87	-	-	-	-	-	3.71	3.11	-	-
	1969	2.13	4.11	8.59	10.70	13.06	12.64	13.27	12.10	9.55	7.05	4.85	3.46	86.96	101.51
	1970	4.01	5.69	9.64	12.03	14.71	14.07	14.50	13.60	11.18	8.03	4.85	3.46	97.76	115.77
	1971	4.15	5.67	9.60	11.37	12.04	15.12	14.62	12.79	10.48	8.09	5.07	3.48	94.11	112.48
	Average	3.59	5.11	8.78	10.89	13.18	13.74	14.00	12.58	10.06	7.70	4.53	3.09	90.93	107.25
Kerman 2ESE	1964	3.88	6.05	8.57	11.14	12.58	13.08	14.46	11.54	10.01	7.64	4.62	3.17	89.02	106.74
Los Banos 3.5SW	1959	-	-	-	-	13.73	13.26	12.50	11.54	9.45	7.66	5.49	4.13	-	-
	1960	4.44	6.58	9.14	12.23	14.31	14.90	11.83	12.27	9.39	7.26	4.68	3.59	91.33	110.62
	1961	3.48	6.16	-	12.07	13.89	13.38	13.41	11.56	10.15	7.72	5.05	-	-	-
	1962	4.42	5.09	8.93	-	-	-	-	-	-	-	-	-	-	-
	Average	4.11	5.94	9.04	12.15	13.98	13.85	12.58	11.79	9.66	7.55	5.07	3.86	90.60	109.58
Maze Bridge 2S	1962	-	-	-	-	-	14.29	14.25	12.87	10.36	7.13	5.43	2.82	-	-
	1963	4.09	5.58	8.80	9.53	12.62	14.11	14.37	12.16	9.25	7.20	3.63	1.86	88.04	103.20
	1964	3.71	6.56	8.24	10.92	12.41	12.54	14.04	12.25	10.01	7.30	5.11	3.82	87.71	106.91
	1965	3.67	6.43	8.66	8.56	12.60	-	-	-	-	-	-	-	-	-
	Average	3.82	6.19	8.57	9.67	12.54	13.65	14.22	12.43	9.87	7.21	4.72	2.83	88.16	105.72
Old River 3S	1965	-	-	-	-	-	-	-	-	-	-	4.36	3.28	-	-
	1966	4.80	6.03	8.97	10.94	12.04	13.38	13.66	13.02	10.58	8.34	5.17	3.00	90.93	109.93
	1967	4.80	5.18	8.74	8.96	12.60	12.98	13.81	12.45	9.39	8.14	4.22	4.05	87.07	105.32
	Average	4.80	5.60	8.86	9.95	12.32	13.18	13.74	12.74	9.98	8.24	4.58	3.44	89.01	107.43
Stockton 9S	1960	-	-	-	-	-	-	-	-	-	8.12	4.46	3.61	-	-
	1961	2.67	5.95	9.03	12.13	13.91	14.80	15.00	12.75	11.20	8.18	4.62	-	97.00	-
	Average	2.67	5.95	9.03	12.13	13.91	14.80	15.00	12.75	11.20	8.15	4.54	3.61	96.97	113.74
Area Average		3.96	5.54	8.81	10.78	12.96	13.44	13.77	12.37	9.99	7.66	4.70	3.23	89.78	107.21
CENTRAL COAST - COASTAL VALLEYS AND PLAINS															
Guadalupe 2NW 5/	1963	-	-	-	-	-	-	-	-	8.90	7.05	5.19	5.01	-	-
	1964	5.78	7.16	9.30	11.26	12.39	12.78	12.70	11.06	-	-	-	-	-	-
	Average	5.78	7.16	9.30	11.26	12.39	12.78	12.70	11.06	8.90	7.05	5.19	5.01	85.44	108.58

Appendix F (Continued)

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA
In equivalent inches of evaporation[1/] [2/]

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar - Oct	Jan - Dec
CENTRAL COAST - COASTAL VALLEYS AND PLAINS (Continued)															
Lompoc 1N[6/]	1968	5.17	5.37	8.84	11.73	13.14	13.32	13.14	12.35	10.22	8.14	6.28	5.01	90.88	112.71
	1969	3.91	5.63	10.66	11.58	12.15	9.60	13.14	12.83	10.26	8.56	5.46	5.08	88.78	108.86
	Average	4.54	5.50	9.75	11.66	12.64	11.46	13.14	12.59	10.24	8.35	5.87	5.04	89.83	110.78
San Luis Obispo 1NW[5/]	1969	-	-	-	-	-	10.12	12.05	11.81	9.41	8.32	5.68	5.02	-	-
	1970	4.88	6.30	9.99	11.89	13.01	11.76	12.93	11.88	10.38	7.19	5.68	4.69	89.03	110.58
	1971	6.04	6.62	9.61	11.53	11.67	13.12	13.73	11.93	9.25	8.06	6.18	5.09	88.92	112.85
	1972	6.28	6.88	9.94	11.99	12.95	12.66	13.09	11.91	9.62	6.74	6.32	5.54	88.90	113.92
	Average	5.73	6.60	9.85	11.80	12.54	11.92	12.95	11.88	9.66	7.58	5.96	5.08	88.18	111.55
Santa Maria NWS[4/]	1959	6.13	9.27	12.29	14.60	14.62	15.67	13.31	12.33	10.42	8.16	5.63	4.13	101.40	126.56
	1960	4.99	5.90	10.24	-	14.81	13.38	13.71	13.02	10.24	8.85	6.00	5.82	-	-
	1961	6.15	7.42	11.01	12.92	13.83	14.39	14.52	12.56	10.28	8.47	5.96	5.36	97.98	122.87
	1962	6.15	5.60	9.28	13.43	14.71	13.45	14.25	13.50	10.15	8.49	6.00	5.15	97.26	120.16
	1963	5.42	-	10.01	11.71	10.22	-	-	-	-	-	-	5.86	-	-
	1964	6.28	7.59	9.91	11.29	12.93	13.53	14.04	11.93	9.71	7.36	5.75	4.23	90.70	114.55
	1965	5.34	6.43	8.57	9.49	12.81	11.39	12.87	12.18	8.96	8.05	4.62	4.53	84.32	105.24
	1966	5.55	6.18	9.10	9.99	10.56	12.82	12.83	11.47	8.82	7.13	4.42	4.44	82.72	103.31
	1967	4.86	7.08	8.53	10.20	13.46	11.10	13.48	11.95	8.94	8.82	5.25	5.44	86.48	109.11
	1968	5.22	5.14	9.16	11.69	13.60	13.95	13.46	12.87	9.75	8.12	6.08	4.88	92.60	113.92
	Average	5.61	6.73	9.81	11.70	13.16	13.30	13.61	12.42	9.70	8.16	5.52	4.98	91.86	114.70
Area Average		5.51	6.57	9.78	11.69	12.93	12.69	13.33	12.22	9.71	7.97	5.66	5.02	90.32	113.08
CENTRAL COAST - INTERIOR VALLEYS															
Soledad 3.5NW	1963	-	-	-	10.52	12.41	14.84	14.98	12.70	10.03	7.76	4.70	4.59	-	-
	1964	4.74	6.74	9.26	12.01	12.77	12.68	13.96	11.72	9.93	6.59	4.64	3.13	88.92	108.17
	1965	3.98	5.94	10.20	9.53	13.43	12.70	13.25	11.56	9.49	7.26	4.46	4.05	87.42	105.85
	1966	3.96	7.08	8.95	10.64	11.89	13.10	12.31	11.72	9.16	7.57	4.87	4.86	85.34	106.11
	1967	4.94	7.08	7.55	9.43	11.87	10.74	12.10	10.12	7.25	6.72	4.18	3.92	75.78	95.90
	1968	4.30	4.07	7.61	10.15	11.20	11.57	10.79	9.58	8.26	5.67	3.84	3.23	74.83	90.27
	1969	2.90	3.75	8.05	9.17	10.78	10.32	11.79	11.24	8.62	6.97	4.52	4.15	76.94	92.26
	1970	3.40	5.48	7.84	9.97	10.74	10.70	10.47	9.66	8.60	6.07	4.36	2.46	74.05	89.75
	1971	3.23	4.80	6.82	9.17	9.49	-	-	-	-	-	-	-	-	-
	Average	3.93	5.62	8.28	10.07	11.62	12.08	12.46	11.04	8.92	6.83	4.45	3.80	81.30	99.10
SOUTH COAST - INTERIOR VALLEYS															
Riverside U.C.[3/]	1935-1964	5.48	6.38	9.18	10.47	12.26	12.69	13.23	12.10	10.02	7.99	6.06	5.09	87.94	110.95

Appendix F (Continued)

SUMMARY OF OBSERVED INCOMING SOLAR RADIATION IN CALIFORNIA
(In equivalent inches of evaporation)1/ 2/

Station	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar - Oct	Jan - Dec
SOUTHERN CALIFORNIA DESERT															
Blythe U.C.E. 7/	1966-1971	4.67	5.62	8.34	9.89	11.18	10.82	10.51	9.39	7.83	6.51	4.93	4.30	74.47	93.99
Brawley 2SW 6/	1967	6.84	7.95	10.35	12.11	14.14	14.35	12.98	11.81	10.15	9.47	6.64	5.99	95.36	122.78
	1968	6.76	7.30	10.39	13.14	14.60	14.52	13.43	12.85	11.26	9.55	7.30	6.32	99.74	127.42
	1969	6.45	7.69	11.29	13.18	14.35	14.35	12.60	12.50	10.46	9.55	6.88	6.84	98.28	126.14
	Average	6.68	7.65	10.68	12.81	14.36	14.41	13.00	12.39	10.62	9.52	6.94	6.38	97.79	125.44
Coachella 1SE 8/	1966	5.15	6.36	11.09	17.48	12.88	12.89	12.05	10.91	9.85	7.78	5.50	4.83	94.93	116.77
	1967	4.79	6.50	7.84	11.90	12.34	13.20	12.35	11.04	9.04	8.82	5.29	4.30	86.53	107.41
	1968	6.23	5.67	8.29	11.85	10.19	11.20	11.42	11.10	9.91	7.79	5.72	4.63	81.75	104.00
	1969	4.17	5.32	8.56	10.58	11.93	12.18	11.98	11.08	9.00	7.39	4.76	4.08	82.70	101.03
	Average	5.08	5.96	8.94	12.95	11.84	12.37	11.95	11.03	9.45	7.94	5.32	4.46	86.47	107.29
El Centro 7NW 9/	1971	6.17	7.24	10.39	11.93	13.35	13.38	12.81	10.76	9.73	8.26	6.30	5.30	90.61	115.62
Area Average		5.69	6.63	9.62	12.45	12.77	12.99	12.24	11.27	9.69	8.35	5.92	5.18	89.38	112.80

1/ Solar radiation expressed as equivalent inches of evaporation, 1486 Langleys = 1 inch of evaporation.
2/ Except as noted, radiation determined with Instruments Corporation's "Pyrheliometer" (more correctly described as Robitzsch type pyranometer or actinograph). These instruments were periodically standardized to Eppley pyranometers at NWS Fresno or U.C.-Davis.
3/ Data collected by University of California using Eppley pyranometer.
4/ Data collected by National Weather Service using Eppley pyranometer.
5/ Instrument standardization to NWS Eppley at Santa Maria A.P., May 1965, used to correct all data collected.
6/ Data collected by USDA, Agricultural Extension Service, using Eppley pyranometer.
7/ Data collected by University of California, Agricultural Extension Service, using actinograph. Monthly data reported are the averages for the period 1966-1971.
8/ Data collected by U. S. Bureau of Reclamation using sol-a-meter Mk. II, Type MV, 1966-1968, and sol-a-meter Mk. IV, 1969.
9/ Data collected by U. S. Navy Aerospace Recovery Facility - El Centro, using Eppley pyranometer.

APPENDIX G

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Table G-1. ARVIN STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Near Bakersfield in southern San Joaquin Valley
Latitude 35°03' N, longitude 118°02' W
Elevation 437 feet, mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1959	-	-	-	-	-	-	-	7.3	4.3	-	-	-	-	-
1960	-	-	3.6	-	-	7.0	-	6.8	5.0	4.5	1.6	0.8	-	-
1961	0.6	2.5	4.1	5.1	5.7	7.0	7.0	8.4	5.4	4.3	1.5	1.0	47.0	52.6
1962	0.8	1.0	3.9	5.5	6.1	7.0	8.6	7.4	6.3	2.6	1.5	1.0	47.4	51.7
1963	0.2	1.5	3.7	3.8	7.9	8.3	7.6	6.8	5.1	2.7	2.2	0.4	45.9	50.2
1964	1.0	1.9	3.2	3.5	6.0	6.8	8.5	7.9	5.9	3.8	1.8	1.4	45.6	51.7
1965	1.0	2.0	3.5	5.1	7.6	7.4	8.2	6.2	5.1	-	-	-	-	-
Avg.	0.7	1.8	3.7	4.6	6.7	7.2	8.0	7.3	5.3	3.6	1.7	0.9	46.4	51.5
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1959	-	-	-	-	-	-	-	8.6	5.9	-	-	-	-	-
1960	-	-	4.3	-	-	10.0	-	8.1	6.1	4.1	1.9	1.1	-	-
1961	0.9	2.6	3.9	6.6	7.6	9.9	9.6	7.8	6.2	4.4	2.4	1.2	56.0	63.1
1962	1.6	1.9	4.3	7.6	8.6	10.5	10.4	8.6	6.0	3.9	2.2	1.8	59.9	67.4
1963	1.8	2.4	5.4	5.2	8.1	9.6	9.7	7.8	5.5	3.4	2.0	0.8	54.7	61.7
1964	1.5	3.3	4.5	6.1	8.2	9.8	9.2	8.1	6.0	4.3	1.9	1.5	56.2	64.4
1965	1.3	2.4	4.6	5.0	9.0	9.0	9.9	9.0	6.3	-	-	-	-	-
Avg.	1.4	2.5	4.5	6.1	8.3	9.8	9.8	8.3	6.0	4.0	2.1	1.3	56.8	64.1
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1959	-	-	-	-	-	-	-	548	473	-	-	-	-	-
1960	-	-	-	-	-	670	-	582	480	372	-	-	-	-
1961	-	-	364	475	504	610	610	529	485	350	-	-	3927	-
1962	-	-	344	444	500	601	622	576	498	355	-	-	3940	-
1963	-	-	365	355	437	475	562	551	465	340	-	-	3550	-
1964	-	-	360	434	496	528	563	516	466	381	-	-	3744	-
1965	-	-	327	370	527	525	551	529	434	-	-	-	-	-
Avg.	-	-	352	416	493	568	582	547	472	360	-	-	3790	-
INCOMING SOLAR RADIATION, (Rs) - EQUIVALENT INCHES OF EVAPORATION														
1959	-	-	-	-	-	-	-	13.14	10.88	-	-	-	-	-
1960	-	-	9.80	-	-	14.45	-	13.66	10.76	8.30	5.23	4.03	-	-
1961	3.73	6.16	8.78	11.83	12.66	13.42	13.31	11.81	10.44	7.61	5.07	3.44	89.86	108.26
1962	4.65	4.58	8.82	11.24	13.10	13.44	13.64	12.68	10.50	7.74	5.19	3.34	91.16	108.92
1963	4.78	5.43	9.14	10.09	11.62	12.80	13.73	11.83	9.39	6.72	4.46	3.04	85.32	103.03
1964	4.19	6.42	8.47	10.28	12.34	13.14	13.52	12.14	10.42	8.16	5.09	3.90	88.47	108.07
1965	4.67	6.03	8.28	8.36	12.66	11.91	13.27	12.10	9.77	-	-	-	-	-
Avg.	4.40	5.72	8.88	10.36	12.48	13.19	13.49	12.48	10.31	7.71	5.01	3.55	88.90	107.58
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$														
1959	-	-	-	-	-	-	-	7.09	5.85	-	-	-	-	-
1960	-	-	4.74	-	-	7.67	-	7.17	6.09	4.74	3.46	2.81	-	-
1961	2.73	3.26	4.27	5.40	6.09	7.61	8.04	7.44	5.73	4.67	3.37	2.84	49.25	61.45
1962	2.67	3.18	4.12	5.16	5.70	6.71	7.26	6.71	5.53	4.48	3.30	2.78	45.67	57.60
1963	2.72	4.01	4.31	4.74	6.48	6.81	7.42	6.98	6.08	4.86	3.44	2.44	47.68	60.29
1964	2.84	3.09	4.16	4.92	6.05	6.87	7.60	7.04	5.59	5.11	3.18	3.11	47.34	59.56
1965	3.03	3.10	4.41	5.00	6.05	6.58	7.59	7.22	5.51	-	-	-	-	-
Avg.	2.80	3.33	4.34	5.04	6.07	7.04	7.58	7.09	5.77	4.77	3.35	2.80	47.70	59.98
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.50	0.72	0.82	0.75	0.81	0.74	0.82	0.88	0.88	0.90	0.81	0.69	0.82	0.80
ET/E_{b-w}	-	-	0.0105	0.0111	0.0136	0.0127	0.0137	0.0133	0.0112	0.0100	-	-	0.0122	-
ET/Rs	0.16	0.31	0.42	0.44	0.54	0.55	0.59	0.58	0.51	0.47	0.34	0.25	0.52	0.48
ET/'f'	0.25	0.54	0.85	0.91	1.10	1.02	1.06	1.03	0.92	0.75	0.51	0.32	0.97	0.86

1/ March - October
2/ January - December
3/ Evapotranspiration determined with 6-foot diameter, Wisconsin type, floating evapotranspirometer.

Table G-2. DAVIS STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

In southern Sacramento Valley
Latitude 38°32' N, longitude 121°46' W
Elevation 60 ft. mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1959	-	-	-	-	-	-	8.8	7.3	5.8	4.5	2.2	1.4	-	-
1960	1.0	2.2	3.2	4.6	6.4	8.7	8.4	7.4	5.2	3.8	1.4	1.0	47.7	53.3
1961	0.6	2.0	3.0	4.9	6.4	8.2	8.8	6.7	5.1	3.6	1.6	0.9	46.7	51.8
1962	1.2	1.5	2.9	4.9	6.3	8.2	8.2	6.8	5.0	2.8	1.7	0.8	45.1	50.3
1963	0.9	1.5	2.3	3.3	5.1	8.0	8.1	6.6	4.5	-	-	-	-	-
1964	-	-	-	-	-	6.7	8.3	7.7	6.4	3.9	1.5	1.1	-	-
1965	1.0	2.8	3.1	4.0	7.4	7.3	7.9	6.8	5.5	3.4	1.2	0.8	45.4	51.2
1966	1.3	1.8	3.4	6.0	6.8	8.1	7.6	7.0	5.4	3.8	1.6	0.9	48.1	53.7
1967	1.3	1.9	2.7	2.7	6.4	6.5	7.8	7.1	5.3	3.8	1.7	1.6	42.3	48.8
1968	1.2	1.1	3.3	5.8	6.3	8.1	8.2	6.8	6.0	3.2	1.5	1.1	47.7	52.6
1969	1.2	1.7	3.6	4.8	7.4	6.8	8.1	7.4	5.3	3.6	1.7	1.2	47.0	52.8
1970	1.1	1.9	3.9	4.3	7.1	7.3	8.2	7.0	5.8	3.5	1.3	0.7	47.1	52.1
1971	1.3	1.9	3.1	4.9	5.5	7.6	8.3	7.3	6.0	3.7	2.1	1.2	46.4	52.9
AVG.	1.1	1.8	3.1	4.6	6.5	7.6	8.2	7.1	5.5	3.6	1.6	1.1	46.2	51.8
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1959	-	-	-	-	-	-	11.2	9.2	8.2	7.2	3.6	3.0	-	-
1960	1.8	3.5	4.6	7.2	9.4	11.7	11.4	9.1	7.4	6.5	2.4	1.7	67.3	76.7
1961	0.5	2.9	4.6	6.5	8.1	10.0	10.7	9.0	7.0	5.9	4.2	1.1	61.8	70.5
1962	1.8	1.7	3.7	6.8	8.1	9.8	9.5	8.6	6.1	4.1	2.1	0.8	56.7	63.1
1963	1.0	2.3	4.2	4.4	6.8	10.3	9.9	8.1	5.9	-	-	-	-	-
1964	-	-	-	-	-	8.7	10.4	9.5	7.9	4.8	1.7	1.5	-	-
1965	0.9	3.2	3.7	4.8	9.3	9.0	10.0	8.3	7.2	4.7	1.7	0.9	57.0	63.7
1966	1.7	2.5	4.4	7.8	8.6	9.8	9.4	9.3	7.2	5.2	1.9	0.9	61.7	68.7
1967	1.7	1.9	3.3	3.6	7.7	7.9	10.1	9.2	7.2	5.4	2.3	2.6	54.4	62.9
1968	1.2	1.7	4.2	8.8	7.8	11.4	11.0	9.0	8.4	4.4	1.9	1.4	65.0	71.2
1969	1.4	2.0	4.5	6.6	9.3	9.1	10.5	9.4	7.0	5.8	2.3	1.3	62.2	69.2
1970	1.5	2.2	6.5	6.9	10.2	9.4	10.6	9.0	8.4	5.0	1.9	0.8	66.0	72.4
1971	1.6	2.6	4.7	6.4	7.5	9.4	10.7	9.6	8.2	5.1	3.6	2.0	61.6	71.4
AVG.	1.4	2.4	4.4	6.3	8.4	9.7	10.4	9.0	7.4	5.3	2.5	1.5	60.9	68.7
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1959	-	-	-	-	-	-	629	412	562	449	-	-	-	-
1960	-	-	-	-	532	608	653	597	514	398	-	-	-	-
1961	- ATMOMETER DATA NOT AVAILABLE -													
1962	"													
1963	"													
1964	"													
1965	"													
1966	"													
1967	"													
1968	"													
1969	"													
1970	"													
1971	"													
1972	"													
AVG.	-	-	-	-	532	608	641	504	538	424	-	-	-	-
INCOMING SOLAR RADIATION, (R_s) - EQUIVALENT INCHES OF EVAPORATION[4]														
1959	-	-	-	-	-	-	14.67	12.98	8.44	7.94	5.69	4.38	-	-
1960	4.75	6.73	9.35	12.44	14.92	15.01	14.51	13.39	10.08	7.47	5.27	3.69	97.17	117.61
1961	2.87	5.99	9.47	11.62	13.98	14.73	15.26	12.82	10.53	7.82	5.23	3.38	96.23	113.70
1962	4.78	5.79	9.32	12.04	13.98	15.37	15.54	14.13	10.88	7.10	5.39	3.56	98.31	117.83
1963	4.14	5.27	8.65	9.75	12.56	15.44	15.77	13.78	9.88	-	-	-	-	-
1964	-	-	-	-	-	13.47	15.06	13.68	10.10	7.05	4.14	3.17	-	-
1965	2.88	5.64	7.06	8.34	13.22	14.16	14.27	12.40	9.80	8.08	4.11	2.86	87.33	102.82
1966	4.51	5.65	9.21	12.07	13.85	14.33	14.91	13.26	10.54	8.02	4.12	2.63	96.19	113.10
1967	3.92	5.60	8.34	9.79	14.35	13.53	15.24	13.41	10.38	8.05	4.59	4.53	93.09	111.73
1968	4.02	5.08	8.95	12.34	13.88	14.71	15.27	12.72	10.96	7.36	3.87	3.56	96.19	112.72
1969	3.10	4.09	9.73	11.19	14.83	13.61	15.26	13.58	10.50	7.27	5.22	3.32	95.97	111.70
1970	3.41	5.46	9.38	11.51	13.81	14.10	15.19	13.99	11.19	7.84	4.01	3.14	97.01	113.03
1971	3.98	6.23	8.91	11.99	11.80	14.22	14.73	13.73	10.85	8.35	5.28	3.79	94.58	113.86
AVG.	3.85	5.59	8.94	11.19	13.74	14.39	15.05	13.37	10.31	7.70	4.74	3.50	94.69	112.37

Table G-2. DAVIS STATION (Continued)

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$[5]														
1959	-	-	-	-	-	-	7.64	6.61	5.72	5.32	3.62	3.12	-	-
1960	3.10	3.34	4.59	5.08	6.21	7.35	7.64	6.80	5.77	4.86	3.51	2.99	48.30	61.24
1961	3.01	3.50	4.40	5.22	5.99	7.32	7.65	7.09	5.66	4.83	3.48	2.90	48.16	61.05
1962	2.91	3.26	4.20	5.39	6.09	6.93	7.29	6.72	5.65	4.78	3.72	3.10	47.05	60.04
1963	2.83	3.77	4.25	4.65	6.09	6.83	7.14	6.80	5.88	-	-	-	-	-
1964	-	-	-	-	-	6.69	7.29	6.82	5.68	5.03	3.42	3.31	-	-
1965	3.11	3.29	4.39	5.11	6.41	6.66	7.36	7.02	5.49	5.05	3.70	2.74	47.49	60.33
1966	3.07	3.18	4.45	5.54	6.54	7.11	7.17	7.05	5.87	4.89	3.68	3.04	48.62	61.59
1967	3.11	3.29	4.22	4.30	6.36	6.82	7.73	7.37	6.16	5.02	3.81	2.97	47.98	61.16
1968	2.94	3.66	4.56	5.37	6.37	7.35	7.51	6.77	5.99	4.79	3.55	2.90	48.71	61.76
1969	2.99	3.16	4.36	5.14	6.74	7.01	7.61	7.18	6.07	4.77	3.66	3.24	48.88	61.93
1970	3.43	3.54	4.56	4.93	6.63	7.07	7.63	6.77	5.88	4.76	3.74	3.06	48.23	62.00
1971	3.13	3.31	4.32	4.93	6.08	6.87	7.21	6.86	5.27	3.97	2.99	2.11	45.51	57. 5
AVG.	3.06	3.39	4.39	5.06	6.32	7.00	7.45	6.91	5.78	4.84	3.57	2.96	47.75	60.73
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.79	0.75	0.70	0.73	0.77	0.78	0.79	0.79	0.74	0.68	0.64	0.73	0.76	0.75
ET/E_{b-w}[6]	-	-	-	-	0.0120	0.0143	0.0134	0.0147	0.0102	0.0099	-	-	-	-
ET/R	0.29	0.32	0.35	0.41	0.47	0.53	0.54	0.53	0.53	0.47	0.34	0.31	0.49	0.46
ET/f	0.36	0.53	0.71	0.91	1.03	1.09	1.10	1.03	0.95	0.74	0.45	0.37	0.97	0.85

Data contributed by W. O. Pruitt, Irrigation Engineer, Department of Water Science and Engineering, University of California, Davis.

1/ March - October
2/ January - December
3/ Data collected with 20-foot weighing lysimeter
4/ Radiation data collected with Eppley pyranometer by H. B. Schultz, Professor, Department Agricultural Engineering, University of California, Davis. This data obtained through the courtesy of W. O. Pruitt.
5/ Blaney-Criddle 'f' factor calculated using mean monthly air temperatures from NWS Davis 2WSW station (H. B. SCHULTZ - observer). Temperatures may be slightly higher than at the grassed lysimeter site.
6/ Ratio of ET - Grass to net atmometer based upon the 1- to 2-year record available.

Table G-3. GLENBURN STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Near Fall River Mills in northeastern California
Latitude 41°03' N, longitude 121°29' W
Elevation 3,314 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Apr-Oct
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[1/]													
1964	-	-	-	2.9	4.4	5.6	6.6	8.5	5.1	2.5	-	-	35.6
1965	-	-	-	2.9	4.8	5.7	6.8	7.3	4.8	3.3	0.5	-	35.6
1966	-	-	-	4.6	5.2	6.0	7.5	7.5	4.7	-	-	-	-
Avg.	-	-	-	3.5	4.8	5.8	7.0	7.8	4.9	2.9	0.5	-	36.7
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES													
1964	-	-	-	5.4	6.1	7.0	10.0	8.8	5.8	3.7	-	-	46.8
1965	-	-	-	4.0	7.1	7.2	8.7	6.8	5.1	3.8	1.1	-	42.7
1966	-	-	-	5.7	7.5	7.8	9.7	8.8	6.3	-	-	-	-
Avg.	-	-	-	5.0	6.9	7.3	9.5	8.1	5.7	3.8	1.1	-	46.3
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS													
1964	-	-	-	-	-	463	526	566	462	-	-	-	-
1965	-	-	-	-	-	503	587	538	384	-	-	-	-
1966	-	-	-	-	507	519	579	523	388	-	-	-	-
Avg.	-	-	-	-	507	495	564	542	411	-	-	-	-
INCOMING SOLAR RADIATION, (Rs) - EQUIVALENT INCHES OF EVAPORATION													
1964	-	-	-	10.62	12.09	12.23	13.97	12.26	9.33	6.27	-	-	76.77
1965	-	-	-	7.99	12.72	12.47	14.64	12.30	10.42	7.60	3.83	-	78.14
1966	-	-	-	12.14	13.95	15.45	16.42	12.28	11.36	-	-	-	-
Avg.	-	-	-	10.25	12.92	13.38	15.01	12.28	10.37	6.94	3.83	-	81.15
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$													
1964	-	-	-	4.00	5.08	5.88	6.77	6.14	4.68	4.08	-	-	36.63
1965	-	-	-	4.15	5.08	5.96	6.66	6.08	4.62	3.98	2.73	-	36.53
1966	-	-	-	4.37	5.63	5.93	6.34	6.34	4.99	-	-	-	-
Avg.	-	-	-	4.17	5.26	5.92	6.59	6.19	4.76	4.03	2.73	-	36.92
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES													
ET/Ep	-	-	-	0.70	0.70	0.79	0.74	0.96	0.86	0.76	0.45	-	0.79
ET/E_{b-w}	-	-	-	-	0.0103	0.0117	0.0124	0.0144	0.0119	-	-	-	-
ET/Rs	-	-	-	0.34	0.37	0.43	0.47	0.64	0.47	0.42	0.13	-	0.45
ET/'f'	-	-	-	0.84	0.91	0.98	1.06	1.26	1.03	0.72	0.18	-	0.99

1/ Evapotranspiration determined with 6-foot diameter, Wisconsin type, floating evapotranspirometer.

Table G-4. GUADALUPE STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Five miles inland in the Santa Maria Valley
Latitude 35°00' N, longitude 120°33'W
Elevation 96 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1963	-	-	-	-	-	-	4.3	4.8	4.2	3.0	2.5	2.2	-	-
1964	1.9	2.6	2.7	3.5	3.3	3.9	4.6	4.2	3.7	2.7	1.8	1.3	28.6	36.2
1965	2.1	2.7	3.4	3.1	4.8	5.0	5.4	5.7	4.1	4.1	1.9	1.5	35.6	43.8
1966	2.1	2.2	3.7	4.5	4.2	5.5	5.6	4.4	3.7	3.3	1.9	1.1	34.9	42.2
1967	2.0	2.5	2.7	3.3	4.3	2.5	3.6	3.8	3.2	3.8	-	-	27.2	-
Avg.	2.0	2.5	3.1	3.6	4.2	4.2	4.7	4.6	3.8	3.4	2.0	1.5	31.6	39.6
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1963	-	-	-	-	-	-	5.9	5.4	4.7	3.8	2.7	2.2	-	-
1964	3.1	3.8	4.5	4.7	5.2	6.4	6.2	5.5	4.5	3.4	2.6	2.4	40.4	52.3
1965	2.3	3.3	4.1	3.7	6.0	5.7	5.8	5.7	4.8	4.4	2.0	1.7	40.2	49.5
1966	2.6	2.6	4.2	5.1	4.8	6.7	6.6	5.2	4.3	3.8	1.9	1.4	40.7	49.2
1967	2.2	2.8	3.4	4.0	5.8	5.7	6.0	5.1	4.0	4.2	-	-	38.2	-
Avg.	2.6	3.1	4.0	4.4	5.4	6.1	6.1	5.4	4.5	3.9	2.3	1.9	39.8	49.7
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1963	-	-	-	-	-	-	480	420	367	313	267	-	-	-
1964	-	-	-	395	402	413	464	411	369	303	257	-	-	-
1965	-	-	-	349	409	342	428	452	362	363	242	-	-	-
1966					- DATA NOT AVAILABLE -									
1967					- DATA NOT AVAILABLE -									
Avg.	-	-	-	372	406	378	457	428	366	326	255	-	-	-
INCOMING SOLAR RADIATION (Rs) - EQUIVALENT INCHES OF EVAPORATION[4]														
1963	-	-	-	-	-	-	N.R.	N.R.	8.90	7.05	5.19	5.01	-	-
1964	5.78	7.16	9.30	11.26	12.39	12.78	12.70	11.06	10.09	6.55	5.01	3.61	86.13	107.69
1965	4.92	5.97	8.05	9.00	12.16	10.82	12.10	11.20	8.08	7.18	4.02	3.84	78.59	97.34
1966	5.11	5.75	8.55	9.49	10.03	12.17	12.06	10.55	7.93	6.34	3.86	3.78	77.12	95.62
1967	4.46	6.60	8.01	9.69	12.79	10.54	12.66	10.99	8.06	7.84	-	-	80.58	-
Avg.	5.07	6.37	8.48	9.86	11.84	11.58	12.38	10.95	8.61	6.99	4.52	4.06	80.69	100.71
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$[5]														
1963	-	-	-	-	-	-	5.57	5.40	5.14	4.74	3.83	3.51	-	-
1964	3.41	3.37	4.05	4.45	4.96	5.32	5.61	5.35	4.75	4.63	3.55	3.60	39.12	53.05
1965	3.65	3.43	4.29	4.70	5.17	5.35	5.68	5.56	4.90	4.88	3.88	3.38	40.53	54.87
1966	3.33	3.30	4.33	4.94	5.40	5.58	5.69	5.47	5.01	4.63	3.88	3.47	41.05	55.03
1967	3.58	3.52	4.15	4.11	5.30	5.39	5.88	5.53	5.10	4.74	-	-	40.20	-
Avg.	3.49	3.40	4.20	4.55	5.21	5.41	5.69	5.46	4.98	4.72	3.78	3.49	40.22	54.38
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.77	0.81	0.78	0.82	0.78	0.69	0.77	0.85	0.84	0.87	0.87	0.79	0.79	0.80
ET/E_{b-w}[6]	-	-	-	0.0089	0.0099	0.0116	0.0105	0.0114	0.0109	0.0101	0.0082	-	-	-
ET/Rs	0.39	0.39	0.37	0.37	0.35	0.36	0.38	0.42	0.44	0.49	0.44	0.37	0.39	0.39
ET/'f'	0.57	0.74	0.74	0.79	0.81	0.78	0.83	0.84	0.76	0.72	0.53	0.43	0.79	0.73

1/ March - October
2/ January - December
3/ Evapotranspiration determined with 6-foot diameter, Wisconsin type, floating evapotranspirometer.
4/ Observed radiation data at ET tank site for period 9/63 - 8/64. Rs estimated from the monthly relationship between Rs at the Guadalupe ET tank site and N.W.S. Santa Maria Station for the period 9/63 - 8/64, and the observed Rs at N. W. S. Santa Maria for the period 9/64 - 10/67.
5/ Based upon average monthly air temperature °F observed at ET tank site for period 1/66 - 12/66. Average air temperatures for all other months estimated for ET tank site from the monthly relationship between air temperatures at that location and at N.W.S. Santa Maria - A. P. station and the Santa Maria temperature record.
6/ Average monthly ratios of evapotranspiration/net atmometer evaporation calculated for months corresponding to atmometer evaporation only.

Table G-5. LOMPOC STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

Eight miles inland in Santa Ynez Valley
Latitude 34°41' N, longitude 120°21' W
Elevation 90 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1968	1.8	2.2	4.5	4.1	5.0	4.3	5.0	4.6	2.9	2.9	2.0	1.3	33.3	40.6
1969	1.0	1.5	2.9	4.0	4.7	4.1	4.5	4.8	3.6	3.4	2.3	1.2	32.0	38.0
1970[4]	1.2	2.6	4.8	-	-	-	-	-	-	-	-	-	-	-
AVG.[4]	1.5	2.2	3.7	4.3	4.8	4.8	4.9	4.6	3.8	3.0	2.0	1.4	33.9	41.0
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1968	3.6	2.5	4.7	5.9	6.6	8.1	6.8	7.1	7.1	4.8	3.4	2.8	51.1	63.4
1969	2.7	2.3	4.4	5.8	6.7	5.2	6.1	6.4	4.5	4.9	3.0	2.1	44.0	54.1
1970						- DATA NOT AVAILABLE -								
AVG.	3.2	2.4	4.6	5.8	6.6	6.6	6.4	6.8	5.8	4.8	3.2	2.4	47.4	58.6
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1968						- NO DATA AVAILABLE -								
1969						- NO DATA AVAILABLE -								
1970						- NO DATA AVAILABLE -								
AVG.[5]	275	270	352	399	500	497	496	460	400	379	299	249	3,483	4,576
INCOMING SOLAR RADIATION, (Rs) - EQUIVALENT INCHES OF EVAPORATION														
1968	5.17	5.37	8.84	11.73	13.14	13.32	13.14	12.35	10.22	8.14	6.28	5.01	90.88	112.71
1969	3.91	5.63	10.66	11.58	12.15	9.60	13.14	12.83	10.26	8.56	5.46	5.08	88.78	108.86
1970						- DATA NOT AVAILABLE -								
AVG.	4.54	5.50	9.75	11.66	12.64	11.46	13.14	12.59	10.24	8.35	5.87	5.04	89.83	110.78
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$[6]														
1968	3.67	4.03	4.67	4.97	5.70	5.93	6.18	5.93	5.30	4.89	4.06	3.44	43.57	58.77
1969	3.76	3.57	4.44	4.89	5.60	5.98	6.13	5.77	5.20	4.83	4.13	3.68	42.84	57.98
1970	3.84	3.84	4.64	-	-	-	-	-	-	-	-	-	-	-
AVG.	3.76	3.81	4.58	4.93	5.65	5.96	6.16	5.85	5.25	4.86	4.10	3.56	43.24	58.47
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep[7]	0.44	0.75	0.80	0.69	0.73	0.64	0.75	0.69	0.55	0.67	0.69	0.50	0.69	0.67
ET/E_{b-w}[8]	0.0055	0.0081	0.0105	0.0108	0.0096	0.0097	0.0099	0.0100	0.0095	0.0079	0.0067	0.0056	0.0097	0.0090
ET/Rs	0.31	0.33	0.38	0.34	0.38	0.37	0.37	0.37	0.31	0.38	0.37	0.24	0.36	0.35
ET/'f'[9]	0.35	0.55	0.90	0.81	0.85	0.70	0.78	0.80	0.61	0.66	0.54	0.34	0.78	0.70

Data contributed by Paul R. Nixon, formerly Project Leader, USDA, Agricultural Research Service, Lompoc, California.

1/ March - October
2/ January - December
3/ ET data observed with 1-meter square hydraulic pillow lysimeter and/or 4-foot diameter electronic weighing lysimeter.
4/ Average of all available ET-grass data 1965, 1968-1970.
5/ Average net atmometer evaporation during 1957-1961. Atmometers operated at 35" above ground at a site 9 miles inland.
6/ Calculated from mean monthly air temperature observed at Lompoc Sewer plant as published in N.W.S. "Climatological Data - Annual Summaries", 1968-1970.
7/ Monthly ratios calculated from 1968 and 1969 data.
8/ Monthly ratios calculated from average ET, 1965, 1968-1970 and average net atmometer evaporation, 1957-1961.
9/ Ratios calculated from average monthly ET and 'f' data for the period 1/1968 - 3/1970.

Table G-6. SAN LUIS OBISPO STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

13 miles inland in the Los Osos Valley
Latitude 35°18' N, longitude 120°40' W
Elevation 300 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS - INCHES[3]														
1969	-	-	-	-	-	-	-	-	-	4.0	3.5	1.9	-	-
1970	1.9	3.4	4.9	3.8	6.0	5.3	6.0	3.8	5.0	3.0	3.0	-	37.8	-
1971	-	3.1	3.5	3.4	4.6	3.7	6.8	6.2	5.9	2.6	2.8	1.8	36.7	-
1972	2.8	2.8	3.6	4.0	5.0	4.4	4.7	3.0	3.0	3.2	-	-	30.9	-
AVG.	2.4	3.1	4.0	3.7	5.2	4.5	5.8	4.3	4.6	3.2	3.1	1.8	35.3	45.7
EVAPORATION FROM CLASS "A" PAN - INCHES														
1969	-	-	-	-	-	-	-	-	-	5.7	4.1	2.8	-	-
1970	1.7	3.2	6.1	7.2	7.5	6.7	7.6	7.7	6.4	5.1	3.6	-	54.3	-
1971	-	4.2	4.4	5.1	5.8	7.5	7.9	8.1	6.8	5.8	3.6	1.7	51.4	-
1972	3.5	3.8	5.8	6.5	7.2	7.3	8.8	6.1	6.3	3.9	-	-	51.9	-
AVG.	2.6	3.7	5.4	6.3	6.8	7.2	8.1	7.3	6.5	5.1	3.8	2.2	52.7	65.0
NET ATMOMETER EVAPORATION - MILLILITERS														
1969	- NO DATA AVAILABLE -													
1970	- NO DATA AVAILABLE -													
1971	- NO DATA AVAILABLE -													
1972	- NO DATA AVAILABLE -													
AVG.	- NO DATA AVAILABLE -													
INCOMING SOLAR RADIATION - EQUIVALENT INCHES OF EVAPORATION														
1969	-	-	-	-	-	-	-	-	-	8.32	5.68	5.02	-	-
1970	4.88	6.30	9.99	11.89	13.01	11.76	12.93	11.88	10.38	7.19	5.68	-	89.03	-
1971	-	6.62	9.61	11.53	11.67	13.12	13.73	11.93	9.25	8.08	6.18	5.09	88.92	-
1972	6.28	6.88	9.94	11.99	12.95	12.66	13.09	11.91	9.62	6.74	-	-	88.90	-
AVG.	5.58	6.60	9.85	11.80	12.54	12.51	13.25	11.91	9.75	7.58	5.85	5.06	89.19	112.28
BLANEY-CRIDDLE 'f' FACTOR $\frac{t \times p}{100}$[4]														
1969	-	-	-	-	-	-	-	-	-	4.93	4.26	3.79	-	-
1970	3.79	3.80	4.57	4.69	5.91	5.90	6.61	5.95	5.42	4.73	3.96	-	43.78	-
1971	-	3.58	4.46	4.82	5.47	5.97	6.31	6.36	5.63	4.65	3.76	3.16	43.67	-
1972	3.42	3.78	4.87	5.04	5.81	6.11	6.48	6.17	5.43	4.86	-	-	44.77	-
AVG.	3.60	3.72	4.63	4.85	5.73	5.99	6.47	6.16	5.49	4.79	3.99	3.48	44.11	58.90
RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.92	0.84	0.74	0.59	0.76	0.62	0.72	0.59	0.71	0.63	0.82	0.82	0.67	0.70
ET/E_{b-w}	- NO DATA AVAILABLE -													
ET/Rs	0.43	0.47	0.41	0.31	0.41	0.36	0.44	0.36	0.47	0.42	0.53	0.36	0.40	0.41
ET/'f'	0.67	0.83	0.86	0.76	0.91	0.75	0.90	0.70	0.84	0.67	0.78	0.52	0.80	0.78

Data collected by California Polytechnic University in cooperation with Department of Water Resources, Southern District.

1/ March - October
2/ January - December
3/ Evapotranspiration determined with 6-foot diameter, Wisconsin type, floating evapotranspirometer.
4/ Calculated from temperature record at San Luis Obispo - Poly N.W.S. station.

Table G-7. SOLEDAD STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

35 miles inland in the Salinas Valley
Latitude 36°28' N, longitude 121°23' W
Elevation 230 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1963	-	-	-	4.0	5.0	5.3	6.4	6.3	4.8	3.4	2.0	1.6	-	-
1964	1.4	2.6	3.4	4.4	5.8	5.6	6.0	5.4	5.3	2.4	2.1	1.4	38.3	45.8
1965	1.5	2.3	3.0	3.8	4.8	4.8	5.9	-	-	-	-	-	-	-
1966	2.1	2.6	3.8	4.8	5.5	6.8	7.3	6.9	4.5	4.4	2.2	1.7	44.0	52.6
1967	2.3	2.8	3.0	3.6	5.6	5.9	7.2	7.4	5.8	4.9	2.8	1.4	43.4	52.7
1968	2.0	2.0	4.4	5.7	6.0	4.2	5.2	5.4	4.8	3.6	1.7	1.3	39.3	46.3
1969	1.1	1.0	3.7	4.8	5.1	4.7	-	6.9	-	-	-	-	-	-
1970	2.3	2.6	3.6	4.1	5.1	6.0	6.8	6.6	5.7	4.5	2.9	1.2	42.4	51.4
Avg.	1.8	2.3	3.6	4.4	5.4	5.4	6.4	6.4	5.2	3.9	2.3	1.4	40.7	48.5
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1963	-	-	-	4.8	6.4	7.8	9.0	8.3	7.0	4.5	2.5	2.7	-	-
1964	2.4	3.8	5.1	6.1	7.2	8.4	8.2	7.4	7.2	5.1	2.6	2.0	54.7	65.5
1965	1.9	3.5	4.3	5.1	8.2	7.5	8.0	-	-	-	-	-	-	-
1966	2.1	2.8	4.9	6.3	7.1	8.8	8.1	7.5	6.2	5.2	3.2	2.0	54.1	64.2
1967	2.8	2.6	3.9	4.3	7.2	6.8	8.7	7.8	6.2	5.8	2.9	2.3	50.7	61.3
1968	2.5	2.4	4.4	6.2	8.0	8.8	8.0	7.7	7.1	4.7	2.9	2.5	54.9	65.2
1969	2.5	2.2	4.9	6.1	7.8	7.4	-	7.9	-	-	-	-	-	-
1970	2.6	3.1	5.3	6.7	8.9	8.8	9.2	8.2	7.6	4.5	2.8	1.5	59.2	69.2
Avg.	2.4	2.9	4.7	5.7	7.6	8.0	8.5	7.8	6.9	5.0	2.8	2.2	54.2	64.5
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1963	-	-	-	375	414	480	512	454	422	335	237	239	-	-
1964	221	265	323	372	431	467	454	444	372	252	242	173	3115	4016
1965	218	286	317	350	508	494	527	-	-	-	-	-	-	-
1966	199	224	320	369	436	433	515	515	432	361	234	161	3381	4199
1967	238	309	324	314	447	368	419	340	291	302	210	190	2805	3752
1968	168	165	281	318	342	361	479	352	315	257	195	131	2705	3364
1969	128	154	258	298	345	318	-	345	-	-	-	-	-	-
1970	199	224	320	369	485	435	432	405	389	262	223	189	3097	3932
Avg.	196	232	306	346	426	420	477	394	370	295	224	180	3034	3866
INCOMING SOLAR RADIATION, (Rs) - EQUIVALENT INCHES OF EVAPORATION														
1963	-	-	-	10.52	12.41	14.84	14.98	12.70	10.03	7.76	4.70	4.59	-	-
1964	4.74	6.74	9.26	12.01	12.77	12.68	13.96	11.72	9.93	6.59	4.64	3.13	88.92	108.17
1965	3.98	5.94	10.20	9.53	13.43	12.70	13.25	-	-	-	-	-	-	-
1966	3.96	7.08	8.95	10.64	11.89	13.10	12.31	11.72	9.16	7.57	4.87	4.86	85.34	106.11
1967	4.94	7.08	7.55	9.43	11.87	10.74	12.10	10.12	7.25	6.72	4.18	3.92	75.78	88.82
1968	4.30	4.07	7.61	10.15	11.20	11.57	10.79	9.58	8.26	5.67	3.84	3.23	74.83	90.27
1969	2.90	3.75	8.05	9.17	10.78	10.32	-	11.24	-	-	-	-	-	-
1970	3.40	5.48	7.84	9.97	10.74	10.70	10.47	9.66	8.60	6.07	4.36	2.46	74.05	89.75
Avg.	4.03	5.73	8.49	10.18	11.89	12.08	12.55	10.96	8.87	6.73	4.43	3.70	81.75	99.64
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$														
1963	-	-	-	4.67	5.67	5.95	6.22	5.84	5.52	4.79	3.73	3.41	-	-
1964	3.34	3.40	3.95	4.71	5.36	5.95	6.27	6.00	5.54	5.10	3.56	3.54	42.88	56.72
1965	3.45	3.46	4.33	4.85	5.37	5.59	5.95	-	-	-	-	-	-	-
1966	3.30	3.31	4.46	5.22	5.53	6.06	6.74	6.02	5.30	4.82	3.90	3.37	44.15	58.03
1967	3.33	3.57	4.34	4.34	5.79	5.86	7.04	6.00	5.56	4.90	4.00	3.16	43.83	57.89
1968	3.41	3.85	4.57	4.88	5.68	6.11	6.33	5.98	5.30	4.71	3.78	3.09	43.56	57.69
1969	3.41	3.31	4.36	4.51	5.77	6.09	-	5.62	-	-	-	-	-	-
1970	3.61	3.68	4.47	4.66	5.75	6.15	6.20	5.81	5.32	4.61	3.84	3.25	42.97	57.35
Avg.	3.41	3.51	4.35	4.73	5.62	5.97	6.39	5.90	5.42	4.82	3.80	3.30	43.20	57.22
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.75	0.79	0.77	0.77	0.71	0.68	0.75	0.82	0.75	0.78	0.82	0.64	0.75	0.75
ET/E_{b-w}	0.0092	0.0099	0.0118	0.0127	0.0127	0.0129	0.0134	0.0162	0.0141	0.0132	0.0103	0.0078	0.0134	0.0125
ET/Rs	0.45	0.40	0.42	0.43	0.45	0.45	0.51	0.58	0.59	0.58	0.52	0.38	0.50	0.49
ET/'f'	0.53	0.66	0.83	0.93	0.96	0.90	1.00	1.08	0.96	0.81	0.61	0.42	0.94	0.85

Data collected by California Department of Corrections - Soledad Correctional Training Facility, in cooperation with Department of Water Resources.

1/ March - October
2/ January - December
3/ Evapotranspiration determined with three 32-inch-diameter weighing evapotranspirometers; reported ET is the average of the three tanks.

Table G-8. THORNTON STATION

SUMMARY OF MONTHLY EVAPOTRANSPIRATION OF GRASS, RELATED CLIMATIC INDEXES, AND RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES

In southern Sacramento Valley near the eastern edge of the Sacramento-San Joaquin Delta
Latitude 38°12' N, longitude 121°25' W
Elevation 7 ft., mean sea level

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Totals M-O[1]	Totals J-D[2]
EVAPOTRANSPIRATION OF GRASS, (ET) - INCHES[3]														
1963	-	-	-	-	-	-	-	-	5.2	2.2	0.2	0.4	-	-
1964	0.6	1.1	2.8	6.3	6.5	7.7	9.8	6.7	4.5	3.1	0.9	0.5	47.4	50.5
1965	0.8	2.1	2.2	3.4	7.4	7.4	8.3	6.6	4.0	2.3	1.0	0.7	41.6	46.2
1966	1.3	1.6	3.0	5.8	6.2	8.2	8.0	8.2	5.3	3.2	1.6	0.2	47.9	52.6
1967	0.5	1.4	1.8	2.8	5.7	6.4	7.6	6.4	4.6	3.1	1.0	0.6	38.4	41.9
1968	0.5	0.7	2.2	5.8	6.1	8.5	8.0	5.7	4.4	2.0	1.1	0.5	42.7	45.5
Avg.	0.7	1.4	2.4	4.8	6.4	7.6	8.3	6.7	4.7	2.6	1.0	0.5	43.5	47.1
EVAPORATION FROM CLASS "A" PAN, (Ep) - INCHES														
1963	-	-	-	-	-	-	-	-	5.6	3.6	1.3	0.5	-	-
1964	0.8	3.0	4.5	6.3	7.6	7.9	10.4	9.8	6.9	4.1	1.9	1.4	57.5	64.6
1965	0.8	2.0	2.9	4.1	7.6	8.6	11.0	8.9	5.8	3.6	1.8	0.8	52.5	57.9
1966	1.4	2.0	4.0	6.3	7.6	10.2	9.6	9.1	6.6	4.3	1.4	0.3	57.7	62.8
1967	0.6	1.9	2.3	3.3	7.0	8.2	9.3	8.0	5.8	3.9	1.4	0.8	47.8	52.5
1968	0.9	2.2	3.0	6.9	7.5	9.4	10.8	7.0	6.9	2.5	1.8	0.9	54.0	59.8
Avg.	0.9	2.2	3.3	5.4	7.5	8.9	10.2	8.6	6.3	3.7	1.6	0.8	53.9	59.4
NET ATMOMETER EVAPORATION, (E_{b-w}) - MILLILITERS														
1963	-	-	-	-	-	-	-	-	398	337	-	-	-	-
1964	-	-	-	421	509	512	574	500	428	344	-	-	-	-
1965	-	-	-	365	511	545	580	505	437	375	-	-	-	-
1966	-	-	-	442	515	518	547	488	400	323	-	-	-	-
1967	-	-	-	440	511	509	541	472	394	316	-	-	-	-
1968	-	-	-	427	542	522	543	487	414	336	-	-	-	-
Avg.	-	-	-	419	518	521	557	490	412	338	-	-	-	-
INCOMING SOLAR RADIATION, (Rs) - EQUIVALENT INCHES OF EVAPORATION														
1963	-	-	-	-	-	-	-	-	8.84	7.11	3.49	2.25	-	-
1964	3.17	6.10	8.18	11.43	12.83	12.07	13.81	11.01	8.72	6.03	3.57	3.09	84.08	100.01
1965	4.59	5.80	7.66	7.83	11.62	13.77	14.00	12.52	9.63	7.26	4.72	3.25	84.29	102.65
1966	4.67	5.76	9.20	12.98	13.58	13.63	14.39	13.25	10.70	8.03	4.22	2.65	95.76	113.06
1967	3.78	4.97	7.95	9.00	14.54	13.57	15.25	13.39	11.10	9.91	6.38	5.13	94.71	114.97
1968	3.96	5.39	7.91	10.18	12.48	12.96	14.56	10.75	9.33	8.28	4.44	3.98	86.45	104.22
Avg.	4.03	5.60	8.18	10.28	13.01	13.20	14.40	12.18	9.72	7.77	4.47	3.39	88.74	106.23
BLANEY-CRIDDLE CONSUMPTIVE USE FACTOR, (f) - $\frac{t \times p}{100}$														
1963	-	-	-	-	-	-	-	-	5.58	4.56	3.23	2.73	-	-
1964	2.97	3.09	3.96	4.76	5.60	6.27	6.92	6.44	5.56	4.88	3.30	3.32	44.39	57.07
1965	2.97	3.16	4.21	4.92	5.87	6.14	6.92	6.65	5.18	4.84	3.61	2.60	44.73	57.07
1966	2.91	3.06	4.24	5.20	6.07	6.65	6.79	6.68	5.63	4.71	3.55	2.91	45.97	58.40
1967	3.10	3.20	4.56	4.21	6.06	6.17	7.38	6.36	5.88	5.10	3.08	2.88	45.72	57.98
1968	2.85	3.13	4.34	4.77	6.10	6.96	7.42	6.72	5.99	4.76	3.43	2.84	47.06	59.31
Avg.	2.96	3.13	4.26	4.77	5.94	6.44	7.09	6.57	5.64	4.81	3.37	2.88	45.52	57.86
AVERAGE RATIOS OF EVAPOTRANSPIRATION TO CLIMATIC INDEXES														
ET/Ep	0.78	0.64	0.73	0.89	0.85	0.85	0.81	0.78	0.75	0.70	0.62	0.62	0.81	0.79
ET/E_{b-w}	-	-	-	0.0115	0.0124	0.0146	0.0149	0.0137	0.0114	0.0077	-	-	-	-
ET/Rs	0.17	0.25	0.29	0.47	0.49	0.58	0.58	0.55	0.48	0.33	0.22	0.15	0.49	0.44
ET/'f'	0.24	0.45	0.56	1.01	1.08	1.18	1.17	1.02	0.83	0.54	0.30	0.17	0.96	0.81

1/ March - October
2/ January - December
3/ Evapotranspiration determined with 6-foot-diameter floating evapotranspirometer.

APPENDIX H

LINEAR RELATIONSHIPS BETWEEN OBSERVED MONTHLY EVAPOTRANSPIRATION OF GRASS AND FOUR CLIMATIC INDEXES

Appendix H

LINEAR RELATIONSHIPS BETWEEN OBSERVED MONTHLY EVAPOTRANSPIRATION OF GRASS AND FOUR CLIMATIC INDEXES[1]

Derived from data shown in Appendix G

Stations	Relationship between observed monthly evapotranspiration and -											
	Pan evaporation (Ep)	Correlation coefficient "r"	$S_{\bar{y}x}$[3]	Net atmometer evaporation (E_{B-W})	Correlation coefficient "r"	$S_{\bar{y}x}$	Solar Radiation[2] (R_s)	Correlation coefficient "r"	$S_{\bar{y}x}$	Blaney-Criddle 'f' factor (f)	Correlation coefficient "r"	$S_{\bar{y}x}$
Arvin	0.00 + 0.807 Ep	0.96	0.74	-1.64 + 0.0157 E_{B-W}	0.82	1.00	-1.97 + 0.699 R_s	0.95	0.82	-3.07 + 1.468 f	0.96	0.76
Davis	-0.14 + 0.777 Ep	0.99	0.41	-1.35 + 0.0149 E_{B-W}	0.76	1.22	-1.28 + 0.600 R_s	0.97	0.66	-3.76 + 1.595 f	0.98	0.53
Thornton	-0.25 + 0.846 Ep	0.98	0.59	-5.19 + 0.0238 E_{B-W}	0.89	0.96	-2.17 + 0.689 R_s	0.94	0.93	-4.89 + 1.804 f	0.94	0.95
Glenburn	-0.16 + 0.811 Ep	0.91	0.82	-1.50 + 0.0154 E_{B-W}	0.82	0.71	-0.79 + 0.515 R_s	0.81	1.18	-3.63 + 1.676 f	0.93	0.75
Soledad	0.22 + 0.707 Ep	0.93	0.67	-0.46 + 0.0139 E_{B-W}	0.82	1.03	-0.20 + 0.458 R_s	0.86	0.93	-3.34 + 1.548 f	0.93	0.68
Guadalupe	0.24 + 0.747 Ep	0.89	0.54	-1.01 + 0.0130 E_{B-W}	0.81	0.64	-0.52 + 0.334 R_s	0.83	0.66	-2.26 + 1.228 f	0.86	0.61
Lompoc	0.10 + 0.649 Ep	0.87	0.68	-1.83 + 0.0138 E_{B-W}	0.96	0.40	-0.26 + 0.382 R_s	0.93	0.50	-3.12 + 1.328 f	0.88	0.66
San Luis Obispo	0.86 + 0.547 Ep	0.79	0.79	No atmometer data			-0.78 + 0.327 R_s	0.74	0.88	-1.01 + 0.984 f	0.76	0.85
Central Valley Arvin Davis Thornton	-0.12 + 0.796 Ep	0.98	0.57	-2.58 + 0.0178 E_{B-W}	0.83	1.05	-1.61 + 0.639 R_s	0.95	0.79	-3.81 + 1.604 f	0.96	0.72
Central Coast Soledad Guadalupe Lompoc San Luis Obispo	0.37 + 0.670 Ep	0.89	0.69	-0.36 + 0.0128 E_{B-W}	0.78	1.04	0.32 + 0.392 R_s	0.80	0.92	-2.77 + 1.364 f	0.87	0.77
All eight locations	-0.05 + 0.772 Ep	0.96	0.65	-0.96 + 0.0144 E_{B-W}	0.85	1.05	-1.01 + 0.561 R_s	0.91	0.96	-3.63 + 1.564 f	0.94	0.76

1/ Calculated by least squares method
2/ Solar radiation = Equivalent inches evaporation
3/ $S_{\bar{y}x}$ = Standard error of estimate

APPENDIX I

SUMMARY OF OBSERVED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS

Appendix I

SUMMARY OF OBSERVED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS[1/]

Crop	Location	Observer	Year	Active Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season Average[2/]
Alfalfa (Hay)	Arvin 2.5NW	DWR	1959	Mar-Oct	-	-	-	0.64	0.52	0.64	0.63	0.70	0.90	0.71	1.04	1.12	-
			1960	"	-	-	-	-	-	0.77	0.64	0.81	0.67	0.63	-	-	-
			1963	"	1.00	0.88	0.72	0.73	0.78	0.73	0.86	0.90	0.85	0.91	0.70	1.00	0.81
			Average		1.00	0.88	0.72	0.69	0.64	0.71	0.71	0.80	0.81	0.75	0.88	1.17	0.73
	McArthur 4ESE	DWR	1960	Apr-Sep	-	-	-	-	-	0.64	0.81	0.97	0.86	0.95	-	-	-
			1961	"	-	-	0.28	0.83	0.87	0.77	-	0.86	0.85	0.51	0.33	0.14	-
			1962	"	-	-	-	0.74	0.92	0.72	0.61	0.61	1.06	-	-	-	0.75
			1963	"	-	-	-	-	0.98	0.88	0.90	0.79	0.77	0.79	1.63	-	-
			1964	"	-	-	-	0.67	1.27	0.52	0.68	0.85	0.71	1.18	-	-	0.78
			1965	"	-	0.70	0.69	0.41	0.85	0.90	0.80	0.96	1.19	-	-	-	0.87
			Average		-	0.70	0.52	0.69	0.98	0.74	0.76	0.83	0.91	0.87	0.83	0.14	0.82
Barley	Davis 2W (Grain Crop)	U.C.	1969-70	Nov-May	0.70	0.95	0.72	0.64	0.25	-	-	-	-	-	0.27	0.50	0.52
	Wasco 2W (Grain Crop)	DWR	1972	Feb-May	-	0.48	1.22	0.83	0.18	-	-	-	-	-	-	-	0.62
	Arvin 2.8NW (Winter Cover)	DWR	1966-67	Oct-Dec	-	-	-	-	-	-	-	-	-	0.12	0.90	0.95	0.46
Beans (Dry)	Davis 2W	U.C.	1968	Jul-Sep	-	-	-	-	-	-	0.42	0.85	0.43	-	-	-	0.56
Cantaloupes	Arvin 2.5S	DWR	1970	Mar 25-Jul 10	-	-	-	0.15	0.32	0.86	0.38	-	-	-	-	-	0.48
Castor Beans	Arvin 2.9NW	DWR	1970	May-Oct	0.49	0.28	0.32	0.06	0.14	0.67	1.01	0.95	0.78	0.69	0.39	0.44	0.71
Corn (Field)	Davis 2W	U.C.	Average 1970-71	Jun-Sep	-	-	-	-	0.12	0.48	0.89	0.84	0.50	-	-	-	0.62

1/ Ratios of observed evapotranspiration to evaporation from Class "A" pans in irrigated pasture, or comparable environments data collected by Department of Water Resources and/or cooperative agencies.
2/ Growing season ratios calculated from seasonal totals of ET and evaporation.

Appendix I (Continued)

SUMMARY OF OBSERVED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS[1/]

Crop	Location	Observer	Year	Active Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season Average
Cotton	Arvin 2.5NW (Solid Plant)	DWR	1959	May-Oct	-	-	-	-	0.19	0.81	1.09	0.91	0.86	0.68	0.08	-	0.77
			1960	"	-	-	0.26	0.14	0.03	0.53	1.07	1.10	0.82	0.24	0.53	0.36	0.66
			1961	"	0.44	0.54	0.28	0.06	0.14	0.55	0.90	1.05	0.92	0.54	0.29	0.33	0.69
			Average		0.44	0.54	0.27	0.10	0.13	0.63	1.02	1.01	0.87	0.49	0.26	0.33	0.70
	Arvin 2.5NW (Skip 2 x 2)	DWR	1962	May-Oct	0.38	0.32	0.23	0.14	0.08	0.37	0.88	0.92	0.83	0.41	0.14	-	0.59
	Arvin 2.5NW (Skip 2 x 1)	DWR	1963	May-Oct	0.06	0.33	0.22	0.28	0.20	0.49	0.91	1.06	0.87	0.76	0.20	0.25	0.70
	Buttonwillow 2.5SE (Skip 2 x 2) (Fine textured soil)	DWR	1965	May-Oct	-	-	-	-	0.07	0.15	0.68	0.88	0.62	0.26	0.14	0.26	0.46
Deciduous Orchard	Arvin 3NNW (Plums)	DWR	1959	Apr-Oct	-	-	-	0.51	0.70	0.69	0.83	0.76	0.42	0.23	0.04	-	0.59
			1960	"	-	-	-	-	-	0.82	0.92	0.79	0.77	0.34	0.21	-	-
			1962	"	0.38	0.68	0.26	0.36	0.59	0.62	0.66	0.48	0.68	0.87	0.91	0.33	0.61
			1963	"	0.39	0.71	0.56	0.92	0.67	0.61	0.69	0.90	0.94	0.82	0.84	0.38	0.79
			1964	"	0.53	0.33	-	-	-	0.57	0.83	0.86	0.95	0.88	0.32	0.60	-
			Average		0.44	0.56	0.42	0.56	0.65	0.66	0.78	0.76	0.74	0.62	0.43	0.43	0.69
Grain Sorghum (Milo)	Bakersfield 9W	DWR	1971	Jul-Oct	-	-	-	-	-	-	0.26	0.91	0.82	0.40	-	-	0.58
Pasture (Improved) & Grass	Arvin 2.5NW (Grass)	DWR	1959-65 Average	Mar-Oct	0.50	0.72	0.82	0.75	0.81	0.74	0.82	0.88	0.88	0.90	0.81	0.69	0.82
	Davis 2W (Grass)	U.C.	1959-71 Average	"	0.79	0.75	0.70	0.73	0.77	0.78	0.79	0.79	0.74	0.68	0.64	0.73	0.76
	Davis 2W (Grass)	DWR	1959-60 Average	"	0.50	0.51	0.67	0.74	0.76	0.50	0.78	0.76	0.73	0.64	0.53	0.40	0.69
	Glenburn 0.3SE (Improved Pasture)	DWR	1964-66 Average	Apr-Sep	-	-	-	0.70	0.70	0.79	0.74	0.96	0.86	0.76	0.45	-	0.79
	Guadalupe 2NW (Improved Pasture)	SLOFC & DWR	1963-67 Average	Mar-Oct	0.77	0.81	0.78	0.82	0.78	0.69	0.77	0.85	0.84	0.87	0.87	0.79	0.79
	Lompoc 1N (Grass)	ARS	1968-70	"	0.44	0.75	0.80	0.69	0.73	0.64	0.75	0.69	0.55	0.67	0.69	0.50	0.69
	San Luis Obispo 1NW (Improved Pasture)	CSPC & DWR	1969-72 Average	"	0.92	0.84	0.74	0.59	0.76	0.62	0.72	0.59	0.71	0.63	0.82	0.82	0.67
	Soledad 3.5NW (Improved Pasture)	CDC & DWR	1963-70	"	0.75	0.79	0.77	0.77	0.71	0.68	0.75	0.82	0.75	0.78	0.82	0.64	0.75
	Thornton 2S (Improved Pasture)	DWR	1963-68	"	0.78	0.64	0.73	0.89	0.85	0.85	0.81	0.78	0.75	0.70	0.62	0.62	0.81

Appendix I (Continued)

SUMMARY OF OBSERVED MONTHLY ET/Ep RATIOS FOR PRINCIPAL IRRIGATED CROPS 1/

Crop	Location	Observer	Year	Active Growing Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season Average
Pasture (Native) (High Water Table Meadow)	Alturas 2SE	DWR	1959	Apr-Sep	-	-	-	0.94	0.98	1.14	1.06	1.05	0.96	0.78	-	-	1.03
			1960	"	-	-	-	0.67	0.81	0.82	1.09	1.12	1.02	0.97	-	1.33	0.95
			1961	"	0.17	0.47	0.74	0.78	1.00	1.00	1.19	0.96	1.12	1.00	-	-	1.02
			1962	"	-	-	0.35	0.72	0.76	0.86	0.96	0.98	0.95	0.77	0.69	0.60	0.88
			1963	"	0.42	0.36	0.48	0.59	0.61	0.98	0.81	0.89	0.89	0.83	-	-	0.82
			1964	"	-	-	-	0.56	0.66	0.86	0.93	0.99	0.89	0.86	-	-	0.85
			Average	"	0.44	0.40	0.56	0.75	0.80	0.94	1.00	1.00	0.96	0.85	0.69	0.88	0.93
Pasture (Native) (Continued)	Lookout 3S	DWR	1961	Apr-Sep	0.20	0.30	0.42	0.68	0.82	1.00	0.84	0.97	0.94	0.77	-	-	0.88
			1962	"	-	-	-	0.69	0.95	0.84	0.87	0.82	0.85	0.70	0.62	0.56	0.84
			1963	"	-	-	0.61	-	-	0.94	1.06	0.99	1.00	1.15	-	-	-
			Average	"	0.20	0.30	0.50	0.68	0.88	0.92	0.92	0.92	0.92	0.86	-	-	0.88
Potatoes	Arvin 2.8NW	DWR	1966	Apr-Jun	-	-	-	0.91	1.01	0.49	-	-	-	-	-	-	0.87
			1967	"	-	-	0.50	0.66	0.90	0.51	0.38	-	-	-	-	-	0.66
			Average	"	-	-	0.50	0.83	0.94	0.49	0.38	-	-	-	-	-	0.76
Sugar Beets	Arvin 2.5S	DWR	1966	Apr-Jul	-	-	-	0.68	1.01	1.02	0.68	-	-	-	-	-	0.86
	Davis 2W	U.C.	1965	Jul-Oct	-	-	-	-	-	-	0.41	0.92	0.88	0.88	0.57	-	0.66
			1966	Apr-Sep	-	-	-	0.17	0.36	0.86	0.93	0.83	0.91	-	-	-	0.64
Tomatoes	Arvin 2.5NW	DWR	1968	Apr-Jul	-	-	-	0.14	0.72	0.70	0.50	-	-	-	-	-	0.53
			1969	"	-	-	-	0.35	0.86	0.98	0.82	-	-	-	-	-	0.78
			Average	"	-	-	-	0.25	0.80	0.84	0.76	-	-	-	-	-	0.64
	Davis 2W	U.C.	1969		-	-	-	-	0.22	0.39	0.87	0.90	0.62	-	-	-	0.59
Vineyard	Arvin 1NW (Thompson Table Grapes)	DWR	1966	May-Oct	-	-	-	-	0.41	0.57	0.79	0.45	0.30	-	-	-	-
			1967	"	-	-	-	-	-	0.51	0.66	0.79	0.64	0.32	0.04	0.50	-
			1968	"	0.50	0.31	0.16	0.13	0.62	0.68	0.58	0.51	0.65	0.24	0.11	0.42	0.58
			1969	"	0.87	0.20	0.11	0.11	0.35	0.68	0.72	0.65	0.64	0.38	0.12	0.15	0.60
			Average	"	0.62	0.27	0.15	0.12	0.46	0.61	0.67	0.62	0.55	0.32	0.08	0.35	0.56

APPENDIX J

GROWING SEASONS AND ROOTING DEPTHS USED IN ESTIMATING CROP EVAPOTRANSPIRATION

Appendix J

GROWING SEASONS AND ROOTING DEPTHS USED IN ESTIMATING CROP EVAPOTRANSPIRATION

	Root Zone Depth, Feet	Evaporative Demand Zones								
		Northeastern Mountain Valleys	North Coast, Coastal Valleys and Plains	North Coast, Interior Valleys	Sacramento Valley	San Joaquin Valley	Central Coast, Coastal Valleys and Plains	Central Coast, Interior Valleys	South Coast, Coastal Valleys and Plains	South Coast, Interior Valleys
Alfalfa (Hay)	5.0	4/1-9/30	-	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31
Barley[1]	3.0	4/1-7/31	-	1/1-6/30	11/15-5/31	1/1-6/15	11/15-5/31	11/1-5/31	-	12/1-5/31
Beans (Dry)	3.0	-	-	-	6/1-8/31	6/1-8/31	6/1-8/31	6/1-8/31	-	-
Cantaloupes	3.0	-	-	-	-	4/1-7/31	-	-	-	-
Carrots	4.0	-	-	-	-	-	7/15-10/31	-	-	-
Corn (Field)	3.0	6/1-9/30	-	6/1-9/30	6/1-9/30	6/1-9/30	6/1-9/30	5/1-9/30	-	-
Cotton	5.0	-	-	-	-	5/1-10/31	-	-	-	-
Cauliflower (Early)[2]	1.0	-	-	-	-	-	7/15-10/31	-	-	-
Cauliflower (Late)[2]	1.0	-	-	-	-	-	8/1-12/31	-	-	-
Deciduous Orchard[3]	5.0[4]	-	-	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31
Almonds	5.0	-	-	-	3/15-10/15	3/1-10/15	-	-	-	-
Grain Sorghum	4.0	-	-	-	6/1-9/30	6/1-9/30	-	-	-	-
Lettuce (Spring)[2]	1.0	-	-	-	-	-	2/1-5/15	-	-	-
Lettuce (Summer)[2]	1.0	-	-	-	-	-	5/1-7/31	-	-	-
Lettuce (Fall)[2]	1.0	-	-	-	-	-	7/15-9/30	-	-	-
Pasture (Improved)	2.0	4/1-9/30	3/1/-10/31	3/1-10/31	-	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31	3/1-10/31
Pasture (Meadow)	0.5-3.0	4/1-8/31	-	-	-	-	-	-	-	-
Potatoes	2.0	6/1-8/31	-	-	5/1-7/31	3/1-6/30	6/15-10/15	-	-	6/1-8/31
Rice	2.0	-	-	-	4/15-10/15	4/15-10/31	-	-	-	-
Strawberries	1.0	-	-	-	-	-	-	-	8/15-3/15	-
Subtropical Orchard[5]	3.0	-	-	-	1/1-12/31[6]	1/1-12/31[6]	-	-	1/1-12/31[6]	1/1-12/31[6]
Sugar Beets	5.0	-	-		5/15-12/15	2/15-8/31	3/1-10/31	3/1-10/31	-	3/1-10/31
Tomatoes (Canning)[7]	5.0	-	-	-	5/1/9/30	5/1-9/30	5/1-9/30	5/1-9/30	-	-
Tomatoes (Market)[8]	5.0	-	-	-	-	-	-	-	3/1-9/30	-
Vineyard (Table)	5.0	-	-	-	5/1-10/31	4/15-10/31	-	-	-	-
Vineyard (Wine)	5.0	-	-	5/15-10/31	-	-	-	5/1-10/31	-	5/1-10/31

1/ Barley and small grains.
2/ Crop has wide range of planting and harvest date. Growing season shown was selected to be representative of typical practice in area.
3/ Except almonds.
4/ Root zone depth for all areas except Sacramento and San Joaquin Valley where 6.0' was used.
5/ Citrus, avocados and olives.
6/ Evergreen - active growing season 3/1-10/31.
7/ Machine-harvested varieties.
8/ Hand-picked.

PLATE

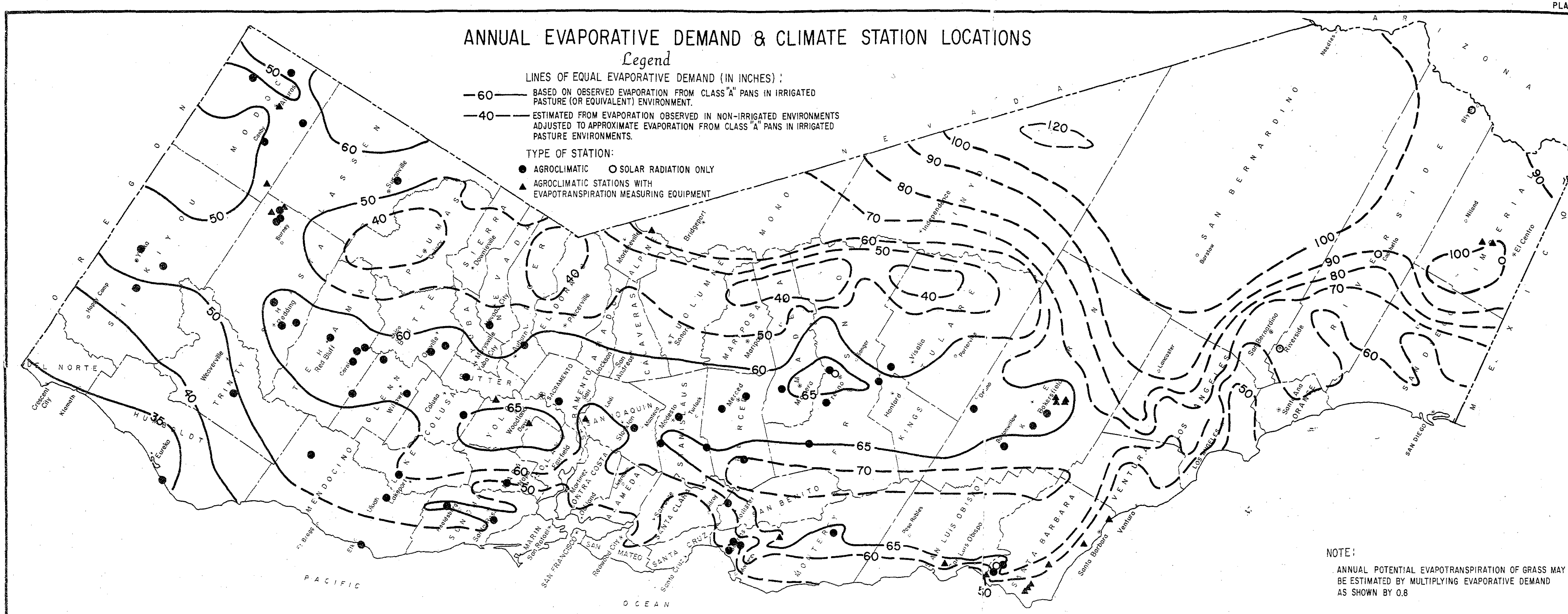
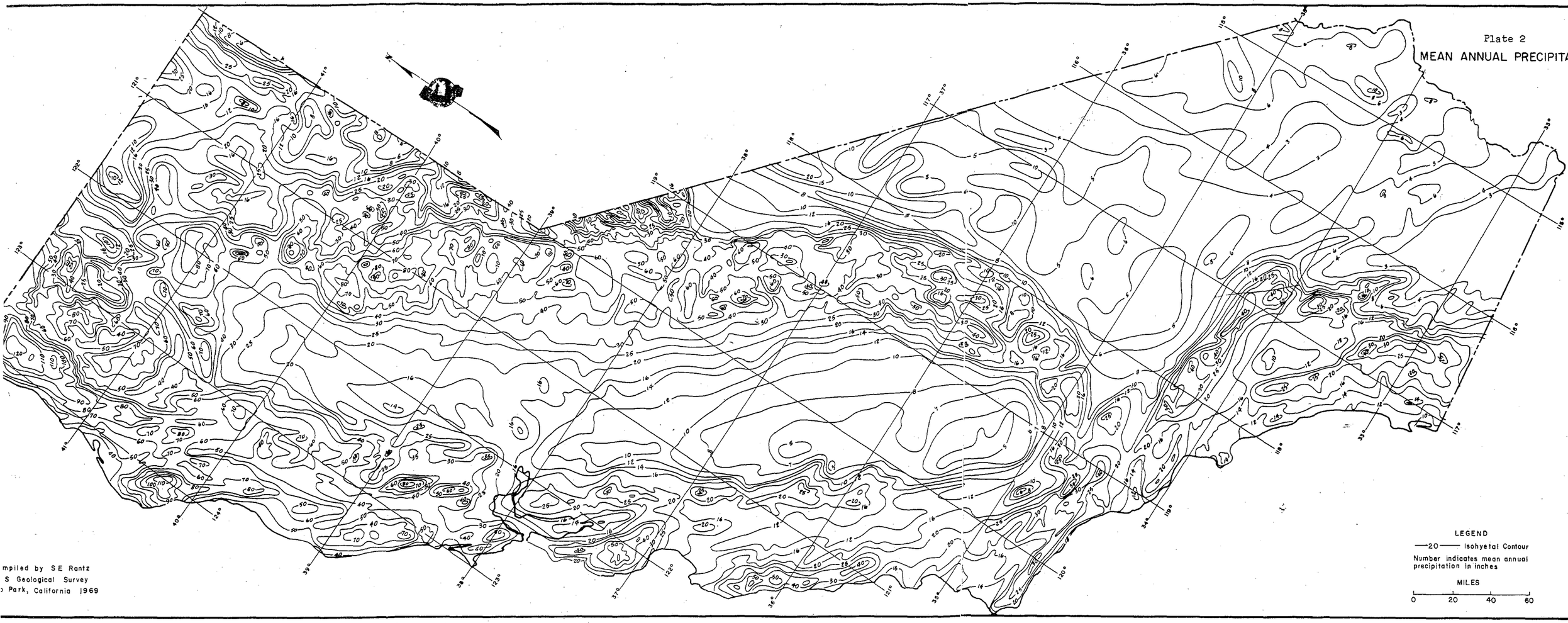


Plate 2

MEAN ANNUAL PRECIPITATION



mpiled by S E Rantz
S Geological Survey
Park, California 1969