

PINE FLAT LAKE

Kings River, California

RESERVOIR REGULATION MANUAL

November 1953
Revised September 1979

DEPARTMENT OF THE ARMY

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

USACE Sacramento District Datum Documentation Report

Project: Pine Flat Dam and Lake

NGVD 29To NAVD 88 Datum Conversion Factor: add 2.72 ft.

Datum Conversion Procedure: The USACE Mapping Unit and A-E Contractor performed field measurements with known historical elevations. All documentation and raw data is filed with the USACE Sacramento District Mapping Unit. All survey and gage control is in US feet and is tied to NGS monument PID: BBDN56. For questions or comments contact the Sacramento District Datum Coordinator. The results of this survey produced an averaged difference between NGVD 29 and NAVD 88 of 2.72 feet for the USACE Pine Flat Dam and Lake civil works project.

Station ID	COE-NGVD29 record	NAVD 88	Difference
KI-136 PID: BBDN56	574.43	577.17	2.74
W1016	970.264	972.94	2.68
BM#2	565.91	568.66	2.75
			Average = 2.723
			2.72
Averaged Delta = 2.72ft conversion factor			

Accuracy Statement: The NAVD88 datum conversion accuracy is: ± 0.25 feet to real work NAVD 88 elevations per EC- 1110-2-6065 Comprehensive Evaluation of Project Datums. The stated conversion factor is for planning, operations, water management and legacy conversion only. All future design work and survey work shall adhere to the NAVD 88 datum and follow EM 1110-1-1005 Control and Topographic Surveying. Contact the USACE Sacramento District’s survey unit or the district’s datum coordinator for current survey control.

**PINE FLAT LAKE
KINGS RIVER, CALIFORNIA
PERTINENT DATA**

Drainage Areas	
Pine Flat Dam	1,545 sq mi
Helms Creek at Courtright Dam	39.7 sq mi
Wishon Dam	177 sq mi
Kings River below North Fork, near Trimmer	1,342 sq mi
Mill Creek at gaging station	127 sq mi
Unimpaired Flows at Pine Flat Dam	
Mean Annual Runoff (1955-1978)	1,622,800 ac-ft
Average Flow	2,240 cfs
Min Mean Daily Inflow (25 & 29 JUL 77)	0 cfs
Max Mean Daily Inflow (23 Dec 55)	85,200 cfs
Max Instantaneous (23 Dec 55)	112,000 cfs
Max Mean Daily Outflow (3,4,8,9 Jun 69)	17,100 cfs

GENERAL

Min Mean Daily Outflow (26-27 Jun 62)	1.1 cfs
Kings River b/w Pine Flat Dam (1953-1977)	1,527,000 ac-ft
Standard Project Flood	
Peak Inflow	186,600 cfs
Peak Outflow	34,000 cfs
Spillway Design Flood	
Peak Inflow	437,000 cfs
Peak Outflow	391,000 cfs
Estimated tail-water elevations	
For mean annual flow (2,290 cfs)	561 feet
For design release (16,000 cfs)	568 feet
For spillway capacity (391,000 cfs)	621 feet

RESERVOIR

Elevation	
Gross pool	951.5 feet
Taking line	961.0 feet
Spillway flood pool	969.3 feet
Area	
Gross pool	5,956 acres
Taking line	6,150 acres
Spillway flood pool	6,300 acres
Storage capacity	
Gross pool	1,000,000 ac-ft
Taking line	1,059,000 ac-ft
Spillway flood pool	1,110,800 ac-ft
Reservoir length at gross pool elevation	20 miles

UPSTREAM RESERVOIRS

COURTRIGHT RESERVOIR



WISHON RESERVOIR



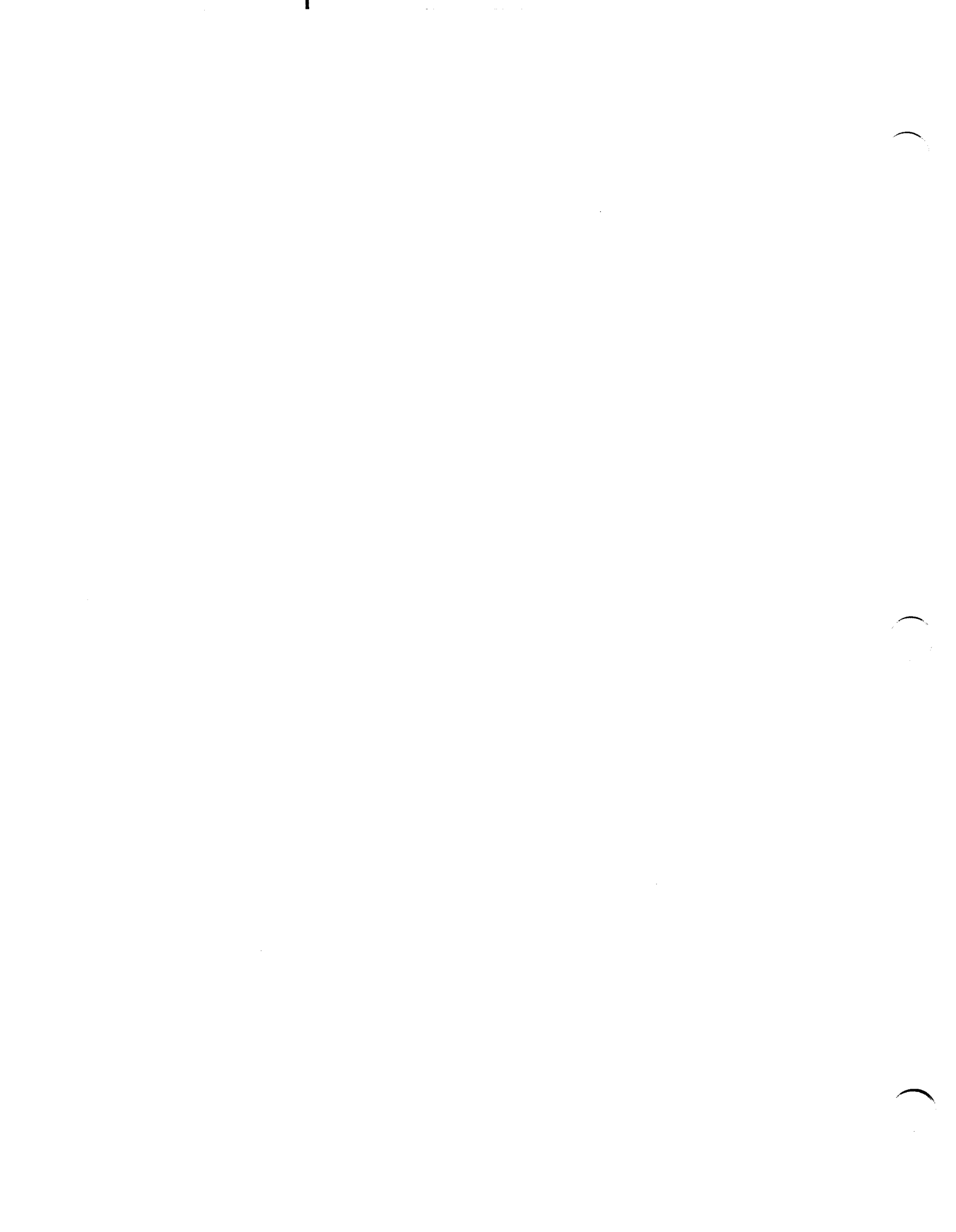
RESERVOIR

Stream	Helms Creek
Drainage area	39.7 sq mi
Maximum storage capacity	123,300 ac-ft
Area at maximum storage	1,632 acres

RESERVOIR

Stream	North Fork Kings River
Drainage area	177 sq mi
Maximum storage capacity	128,600 ac-ft
Area at maximum storage	1,000 acres





RESERVOIR REGULATION MANUAL

FOR

PINE FLAT LAKE

KINGS RIVER, CALIFORNIA

APPENDIX I

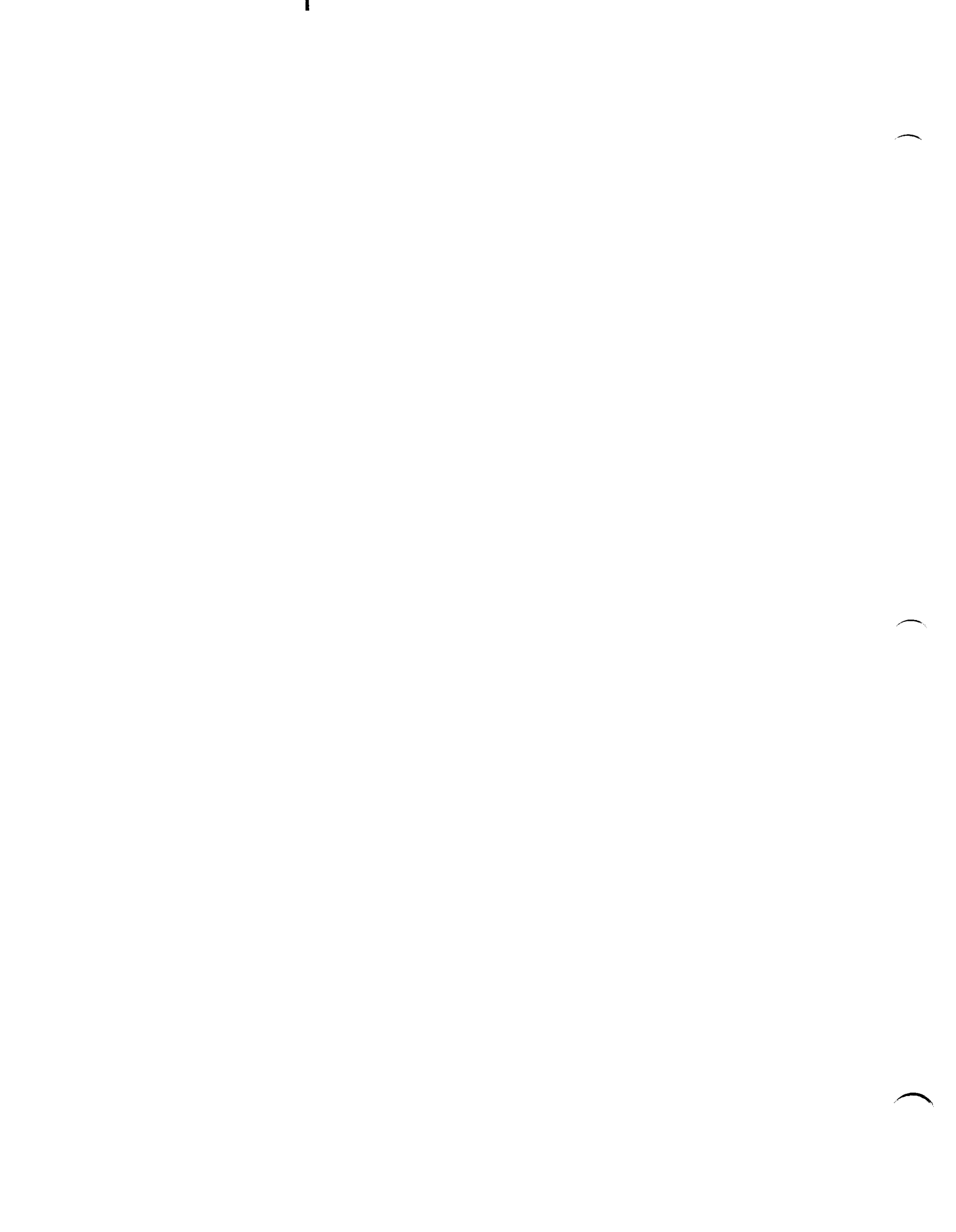
TO

MASTER MANUAL OF RESERVOIR REGULATION

TULARE LAKE BASIN, CALIFORNIA

November 1953
Revised September 1979

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA



RESERVOIR REGULATION MANUAL
PINE FLAT LAKE
FRESNO, CALIFORNIA

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PART A

PINE FLAT LAKE KINGS RIVER, CALIFORNIA

CHAPTER I - GENERAL INFORMATION

1. AUTHORITY AND SCOPE

This reservoir regulation manual is an appendix to the "Master Manual of Reservoir Regulation, Tulare Lake Basin, California," and has been prepared in accordance with instructions contained in ER 1110-2-240 and EM 110-2-3600.

2. PROJECT AUTHORIZATION

The Pine Flat Project was authorized by the Flood Control Act of 1944, approved 22 December 1944, the pertinent portion of which follows:

"The project for flood control and other purposes for the Kings River and Tulare Lake Basin, California, is hereby authorized substantially in accordance with plans contained in House Document No. 630, Seventy-sixth Congress, third session, with such modifications thereof as in the discretion of the Secretary of War and the Chief of Engineers may be advisable . . . Provided, that the conditions of local cooperation specified in said document shall not apply . . ."

In 1943 an act of Congress (Public Law 138, 78th Congress, Chapter 224, 1st Session, approved 12 July 1943) provided funds for emergency repair and restoration of levees and other flood control features damaged or destroyed by floods immediately prior to that time. Allocations were made from these funds for the construction of channel improvements to the lower Kings River.

CHAPTER II - BASIN DESCRIPTION

3. DESCRIPTION OF THE PROJECT AREA

a. The project area, shown on chart 1, is located in Tulare Lake Basin in the southern portion of the San Joaquin Valley. It is comprised of the Kings River watershed above the valley floor, the alluvial-fan area, the Kings River North and Kings River South areas on the valley floor, and the Tulare Lakebed.

b. The watershed area includes about 1,700 square miles above Piedra 1,545 of which lies above Pine Flat Dam. It lies along the westward face of the highest portion of the Sierra Nevada. Elevations range from a maximum of about 14,000 feet at the headwaters to about 400 feet at the edge of the valley floor. This basin is among the most rugged of the entire Sierra Nevada, and is characterized by sharp peaks and ridges, precipitous canyons, and granite domes. Kings River has its source in many small glacial lakes at elevations of 12,000 feet or more, near the crest of the Sierra Nevada. Nearly all of the tributaries flow in deep granite canyons, and the main canyon below the junction of the Middle and South Forks is more than 5,000 feet deep. The soil cover, except for granite outcroppings and precipitous canyons, ranges from moderate, in the lower area, to non-existent above 10,000 feet elevation. Vegetative cover is distributed approximately as follows:

<u>Type of Vegetation</u>	<u>Range of Elevation (feet)</u>	<u>Percent of Basin Area</u>
Grass land (with scattered timber)	400 - 2,000	4
Brush land (chaparral, etc.)	2,000 - 6,000	17
Deciduous forest	400 - 3,000	16
Light coniferous forest (20-50% cover)	5,000 - 9,000	25
Heavy coniferous forest (over 50% cover)	6,000 - 8,000	4
Sub-alpine timber (juniper, lodgepole, etc.)	9,000 - 10,000	13
Open ground (barren and lakes)	10,000 and above	21

c. The watershed area is suitable for grazing, lumbering, hydroelectric power generation, mining, and recreation. It is sparsely populated. There are presently two hydroelectric power projects: the Kings River Project and the Balch Project, in the Kings River Basin, both operated by Pacific Gas and Electric Company. The Kings River Project consists of Courtright and Wishon Reservoirs and the Haas and Kings River power houses. The Balch Project consists of Balch power houses number one and two, a small upstream diversion dam and an afterbay.

d. The alluvial-fan portion of the basin, an area of about 1,200,000 acres, decreases in elevation from about 400 feet at the foothill line to about 200 feet at the edge of Tulare Lakebed and about 180 feet along the Kings River North area. There are a few small towns in this area, but no large population centers except Fresno which is approximately thirty miles northwest of the river. Excellent soils, moderate climate, and availability of summer stream flow and ground water for irrigation have made this a predominantly agricultural area. Several oil and gas wells are producing in the area. Also, numerous agricultural processing plants and manufacturing plants are spread throughout the area. The main line of the Atchison, Topeka, and Santa Fe Railroad and the valley route of the Southern Pacific Railroad between San Francisco and Los Angeles pass through the Kings River area. Branch lines serve important agricultural centers within the area. U. S. Highway 99 crosses Kings River at Kingsburg. Numerous state highways and an extensive system of county roads also serve the area.

e. From the mouth of the canyon below Piedra, Kings River flows southwesterly in a single channel to near Centerville, where it divides into numerous channels, reuniting as a single channel below Centerville Bottoms. Small intermittent levees exist through this reach. Near Kingsburg, the river emerges on the crown of the alluvial cone and is provided with continuous levees through the lower reaches of the river. The channel has a sandy shifting bottom and is crossed at intervals by permanent weirs, which divert water into numerous large diversion canals.

. Locations of these structures are shown on chart A-6. As a result of numerous diversions, the river flow is intensely modified and is usually depleted before reaching the lower reaches. The capacity of the river system decreases progressively downstream to 11,000 cfs at the head of Army Weir.

f. The Kings River North and Kings River South areas are of predominately heavy soils which formerly were traversed by many channels and sloughs. Most of the areas have been developed for agricultural use by leveling the land, restricting river flows to the principal channels, (or construction of a new channel, as in the case of the James Bypass) and by construction of levees along these channels. The use of pervious materials (sand and tules) in much of the levee system along Fresno Slough has created a seepage problem during periods of high flow. The principal crops in this area are cotton, small grains, and forage. Extensive oil and gas development exists in the Fresno Slough area. State Highways 41, 198, and 180, Interstate Highway 5, and numerous county roads serve the area. Rail service to the area is provided by the Southern Pacific and the Atchison, Topeka, and Santa Fe Railroads.

g. The Tulare Lakebed is a closed depression with a bottom elevation of about 175 feet. The only outlet is to the north (at elevation 207 feet) into the San Joaquin River. This lakebed area receives runoff from Kings River South and from the Kaweah, Tule and Kern Rivers. During large rainflood years, runoff from the Coast Range Mountains also reaches the lakebed. Agricultural

development in the lakebed has been facilitated by a cellular dike system designed to confine flood waters to the smallest possible area.

h. Agricultural development of the Kings River service area is dependent on an irrigation supply from surface runoff and ground-water pumping, since precipitation on the valley floor is not sufficient to support normal farm crops. At present, approximately 1,100,000 acres receive water, directly or indirectly, from Kings River. Extensive irrigation systems for the diversion and distribution of water have been developed by individuals, companies and irrigation districts. Some historic irrigation diversions for the Kings River service area are listed on chart A-6.

4. CLIMATE

a. Average annual precipitation varies greatly throughout the project area, ranging from about 6 inches on the valley floor to about 60 inches high in the mountains. About 90 percent of the runoff-producing precipitation occurs during the months of November through April as demonstrated by the following table:

Normal Precipitation								
Month	: Pine Flat I/ : (elev 610)		: Balch P.H. : (elev 1720)		: Grant Grove : (elev 6600)		: Huntington L. : (elev 7020)	
	: Amount	: %	: Amount	: %	: Amount	: %	: Amount	: %
Jul	.03	.00	.02	.00	.06	.00	.17	.01
Aug	.02	.00	T	.00	.08	.00	.07	.00
Sep	.24	.01	.56	.02	.52	.01	.68	.02
Oct	.67	.04	.87	.03	1.46	.03	1.57	.05
Nov	2.07	.11	3.45	.12	5.14	.12	2.91	.09
Dec	3.28	.18	5.70	.19	7.56	.17	6.26	.19
Jan	3.46	.19	5.45	.19	7.83	.18	5.23	.16
Feb	2.84	.16	4.45	.15	7.16	.17	5.99	.18
Mar	2.62	.15	3.73	.13	6.78	.16	4.37	.14
Apr	1.93	.11	3.27	.11	4.81	.11	3.00	.09
May	.64	.04	1.35	.05	1.55	.04	1.68	.05
Jun	.14	.01	.25	.01	.39	.01	.52	.02
Total	17.94	100	29.1	100	43.34	100	32.45	100

I/ 1953-1978 avg.

b. Normal annual precipitation for the Kings River Basin is shown on chart 2. Precipitation usually occurs as rain at elevations below 5,000 feet and as snow at higher elevations, although snow has occurred in the valley and rain at elevations above 12,000 feet. Generally the snow pack accumulates during the winter months until about 1 April, when increased temperatures cause the pack to begin melting. Snow pack data for 1969, 1975 and 1977, representing wet, normal and dry years, are presented in the following tabulation.

1 April Snow Survey Data
Kings River Basin

Index: No.	Snow Course	Elev in feet	Depth in inches			Water Content						
			1969	1975	1977	Inches			Average ^{1/}	% of Average		
			1969	1975	1977	1969	1975	1977	1931-75	1969	1975	1977
222	Bishop Pass	11,200	176.8	101.0	30.2	78.4	36.9	8.0	31.0	253	119	26
223	Blackcap Basin	10,300	156.2	108.8	26.6	66.4	37.1	7.6	34.0	195	109	22
225	Beard Meadow	9,800	168.4	95.8	24.2	72.2	34.4	7.5	32.0	226	108	23
233	Statum Meadow	8,300	162.3	103.6	17.1	83.3	40.6	8.1	31.0	269	131	26
240	Grant Grove	6,600	94.2	60.1	3.1	42.4	24.8	1.1	15.0	283	165	7

^{1/} Average values of 1 April water content in inches and averages for 45-year period (1931-1975) from Snow Survey Data, California Cooperative Snow Surveys, 1978.

c. The valley area is characterized by hot, dry summers and moderate winters. Temperatures in the mountains decrease generally with increasing elevation. At higher elevations the summers are cool and winters are severe. Observed temperature extremes are 114° and 18° at Fresno in the valley, 90° and -5° at Grant Grove and 89° and -18° at Huntington Lake. The monthly temperature distributions at representative stations follow:

Normal Temperature (°F)

Month	Fresno WSO AP (Elev. 328)	Pine Flat Dam 1/ (Elev. 610)	Balch Power House 2/ (Elev. 1,720)	Grant Grove (Elev. 6,600)	Huntington Lake (Elev. 7,020)
Jan	45.3	44.7	44.7	33.2	31.1
Feb	49.9	49.2	49.4	33.6	31.1
Mar	53.9	52.9	52.5	34.5	32.0
Apr	60.3	58.2	56.0	39.5	37.2
May	67.4	65.7	65.1	46.4	44.2
Jun	73.9	74.2	72.8	54.1	52.2
Jul	80.6	80.4	80.4	62.6	60.6
Aug	78.3	79.1	80.3	61.3	59.7
Sep	73.8	74.1	74.8	57.0	55.4
Oct	64.2	64.4	65.1	49.1	47.2
Nov	53.5	52.7	52.6	40.5	39.0
Dec	45.8	45.3	45.3	35.3	33.5
Normal Annual	62.2	61.7	61.6	45.6	43.6

1/ Average Temperatures from 1954 - 1977.

2/ Average Temperatures from 1962 - 1977.

5. RUNOFF

a. Stream flow records on the Kings River date back to 1896 at Piedra. However, a stream gage was not installed at the Pine Flat damsite until 1953. Pertinent data (adjusted for upstream storage and evaporation) for the Kings River flow into Pine Flat Lake is shown below. More gage data may be found on chart 3.

Unimpaired Kings River Flow Into Pine Flat Lake

Period of Record Included	1955-1978
Drainage Area, sq. mi.	1,545
Instantaneous Flows, cfs	
Maximum	112,000 (25 Jan 1956)
Minimum	0 (25 and 29 July 1977)
Instantaneous Flow, cfs/sq. mi.	
Maximum	72.5
Minimum	0.0
Mean Daily	2,240
Mean Daily Flow, cfs/sq. mi.	1.4
Annual Flow, ac-ft	
Maximum	4,207,000 (1969) ^{1/}
Minimum	385,000 (1977) ^{2/}
Mean	1,620,000
Annual Flow, inches	
Maximum	51.1
Minimum	4.7
Mean	19.7
Apr-July Flow, ac-ft	
Maximum	3,116,000 (1969) ^{1/}
Minimum	274,000 (1977) ^{2/}
Mean	1,179,000
Apr-Jul Flow, inches	
Maximum	37.8
Minimum	3.3
Mean	14.3

^{1/} 1969 had the largest volume of runoff for the period of record at Piedra (1896 to date).

^{2/} 1977 had the smallest volume of runoff for the period of record at Piedra (1896 to date).

b. Approximately two-thirds of the annual runoff into Pine Flat Lake occurs April through July. The seasonal variation of runoff into Pine Flat Lake (1955-1978) is illustrated in the following table (adjusted for upstream storage and evaporation):

Average Monthly Unimpaired Runoff Into Pine Flat Lake

<u>Month</u>	<u>Acre-feet</u>	:	<u>%</u>
Oct	17,000		1
Nov	26,000		2
Dec	63,000		4
Jan	75,000		5
Feb	76,000		5
Mar	103,000		6
Apr	190,000		12
May	422,000		26
Jun	396,000		24
Jul	170,000		10
Aug	54,000		3
Sep	28,000		2
Totals	1,620,000		100

c. Mill Creek, the major source of local runoff below the dam, discharges about 26,000 acre-feet per year. Mill Creek has been gaged since 1938. A rough estimate of the total volume of local runoff between the dam and Reedley during major floods can be obtained by multiplying Mill Creek flows by 1.2. Local runoff into the Kings River below Reedley is negligible.

d. Historical inflow to Pine Flat Lake is shown on chart 4.

CHAPTER III - PROJECT DESCRIPTION

6. DESCRIPTION OF THE PROJECT

a. Pine Flat Lake is located about thirty miles northeast of Fresno. The Project consists of Pine Flat multiple-purpose reservoir on Kings River, improvements on certain downstream channels, and structures for controlling the division of flow between the channels of Kings River North and Kings River South. A brief description of the project and associated facilities follows:



(5) The downstream channel improvements which have been constructed as a part of this project include: (1) Channel restoration and debris removal in Centerville Bottoms area; (2) new levee construction and levee repair from Cole Slough Weir to Stinson Weir; (3) excavation of a new channel from Kings River immediately upstream from Island Weir southward into Clarks Fork; (4) clearing, widening, straightening, and constructing confining levees on the South Fork below Army Weir; (5)

and (7) timber removal in the Kings River South channel. Chart 7 shows the locations of the downstream improvements.



7. RECREATION FACILITIES

a. Although recreation was not an authorized project purpose, recreation use of the Pine Flat Lake area is significant. There is no established minimum pool, but the water stored for irrigation purposes is generally ample for recreation.

b. There are presently eleven areas identified for recreation development. Existing and proposed activities in these areas include picnicking, camping, boat-launching, fishing, swimming, marina concessions, a visitor center, public access, cycling, hiking, equestrian and nature trails. These facilities have been provided and are administered by the Corps of Engineers, the Forest Service and Fresno County. Coordination is maintained with the Fish and Wildlife Service and the California Department of Fish and Game.

c. Pine Flat Lake became fully operational in 1954 and records for recreation use began in 1955. The annual visitation for the period of record at 5 year intervals and for the last 3 years is shown below.

<u>Calendar Year</u>	<u>Recreation Days</u>
1955	270,000
1960	345,400
1965	491,000
1970	609,000
1975	467,200
1976 *	694,190
1977 *	625,500

* Extreme drought years.

d. Recreation development is shown on chart 6 and is described in detail in the "Pine Flat Lake Master Plan".

8. CHANGES TO AUTHORIZED PLAN

The Pine Flat Project as constructed is essentially the same as authorized, with the exception that a first-class stream gaging station on Kings River below the North Fork has been substituted for the inflow weir pursuant to agreement with local interests.

9. CONSTRUCTION HISTORY

a. Excavation for Pine Flat Dam was initiated in July 1948. Concrete placement and reservoir clearing were initiated in 1950 and the dam and appurtenances were completed in 1954. Pine Flat Lake was first operated for flood control in May 1952 and for conservation in February 1954.

b. In 1943 and 1944 a portion of the downstream channel improvements was completed with emergency funds. The remainder of the downstream channel improvements were completed during the period 1968 through 1976.

CHAPTER IV - FLOOD POTENTIAL

10. FLOOD CHARACTERISTICS

a. Precipitation in the area is largely orographic in nature and usually results from air masses traveling inland from a westerly direction. Flood flows on Kings River are of two types, winter rain floods and spring snowmelt floods. Winter rain floods, which generally occur during the period of November through March, are caused by heavy rains and sometimes augmented by the melting of snow at intermediate elevations. These winter floods have sharp, high peaks and are usually of short duration and comparatively small volume. Generally, a major portion of winter precipitation occurs as snow and remains in the mountains above the 5,000 foot elevation until the spring. Snowmelt floods have comparatively moderate peak flows, but very large volumes extending over a two to four month period. Generally sixty-five percent of the annual runoff occurs between the first of April and the end of July.

b. The largest rainflood of record on Kings River occurred on 23 December 1955 and had an estimated peak inflow to Pine Flat Lake of 112,000 c.f.s. Maximum release from Pine Flat during the peak of the December 1955 rainflood was about 70 c.f.s. A comparison of large flows experienced in Kings River Basin follows:

	<u>23 Dec 55</u>	<u>6 Dec 66</u>	<u>25 Jan 69</u>	<u>1 Feb 63</u>
Inflow to Pine Flat Lake				
Peak (cfs)	112,000 <u>1/</u>	91,000 <u>1/</u>	70,600 <u>1/</u>	76,800 <u>1/</u>
5-day volume (acre-feet)	316,541	195,603	175,254	152,684
Kings River above N. Fork				
Peak (cfs)	59,100	41,000	35,000	29,000
5-day volume (acre-feet)	159,711	112,524	90,904	79,122
N. Fork Kings River below Dinky Creek <u>2/</u>				
Peak (cfs)	N/A	22,100	15,000	27,400
5-day volume (acre-feet)	N/A	43,698	26,184	44,301
Mill Creek near Piedra				
Peak (cfs)	N/A	11,000	9,860	3,120
5-day volume (acre-feet)	20,618	16,747	31,704	4,151

1/ Estimated peak flow.

2/ Does not include upstream diversions for power.

c. Mill Creek contributes roughly eighty percent of the local flow below Pine Flat Lake. During periods of high flow, releases from the project are reduced to minimize damages in the lower channel and in Tulare Lake area.

d. The largest snowmelt flood of record occurred in 1969 when the unimpaired April through July runoff was 3,116,000 acre-feet at the dam and 3,141,000 acre-feet at Piedra. The 1906 April through July runoff at Piedra was 2,979,000 acre-feet.

11. RAINFLOOD POTENTIAL

The major rainflood threat to areas protected by Pine Flat Lake is from local runoff below the project. For rainfloods likely to occur more often than once in three hundred years on the average, the peak local flow below Pine Flat will most likely exceed the releases from the project. To date, no flood releases to Tulare Lake have been made during a rain flood. Rain flow frequency curves for the Kings River at Pine Flat and at Piedra, and for Mill Creek are shown on charts 8, 9, and 10 respectively.

12. SEASONAL VARIATION OF RAINFLOOD POTENTIAL

Large rainfloods in the Tulare Lake Basin occur most frequently in the months of November through March and are not known to occur in the months of June through August. The seasonal variation of storm potential is defined by criteria contained in office report, "Reservoir Operation Criteria for Flood Control," dated October 1959.

13. SNOWMELT FLOOD POTENTIAL

Snowmelt floods on Kings River result from large volumes of spring runoff created by the melting snow pack above Pine Flat Lake. If the snowmelt volume exceeds the available storage within the basin plus the irrigation and spreading demand, supplemental releases must be made. Normally the supplemental releases can be sent to Mendota Pool through Kings River North, and from there to the San Joaquin River. However, in large runoff years, excess Kings River snowmelt flood water goes to Tulare Lake. Snowmelt flow frequency curves are shown on charts 11 and 12.

14. STANDARD PROJECT FLOOD

The standard project flood presented in this manual was developed in 1970. The average precipitation on the contributing area is 18.98 inches and the excess is 5.09. The peak inflow is 186,000 c.f.s. and the total volume of the main wave is 418,000 acre-feet. A routing of the standard project flood is shown on chart 13.

15. RESERVOIR DESIGN FLOOD

a. The 1906 snowmelt flood, which was the largest known snowmelt flood prior to project authorization, was adopted as the design flood for Pine Flat Lake. The rainflood reservation was based on a hypothetical flood estimated to be as large as any prerecord flood known to have occurred.

b. In 1969, the snowmelt runoff slightly exceeded that of 1906. Routings of both floods are shown on chart 14. The frequency of occurrence of both floods is estimated to be about once in sixty years.

c. The flood used to size the rainflood reservation in Pine Flat Lake had a sixteen day volume of 400,000 acre-feet. The December 1955 rainflood, which is the largest of record, also had a sixteen day volume of about 400,000 acre-feet. A routing of the 1955 flood through the rainflood reservation portion of Pine Flat Lake is shown on chart 15. The frequency of occurrence of the December 1955 flood is estimated to be about once in 80 years.

16. SPILLWAY DESIGN FLOOD

a. The Pine Flat Lake spillway design flood is based on a storm having 28.5 inches of precipitation and 4.7 inches of snowmelt in 66 hours with an excess of 13.41 inches. The peak inflow is 437,000 c.f.s. and the volume 1,186,000 acre-feet, 84,000 acre-feet of which was base flow. A routing of the SDF is shown on chart 16.

CHAPTER V - GENERAL PROJECT OPERATION

17. OBJECTIVES

a. Pine Flat Lake will be operated for flood control and conservation in accordance with the regulations contained herein to achieve the following objectives:

(1) To restrict flows in downstream channels of Kings River and its distributaries to non-damaging rates.

(2) To eliminate or minimize flood flows from Kings River into Tulare Lakebed, without causing flooding along the channels of Kings River North or causing flood damage along San Joaquin River below Mendota Dam over that which would occur under preproject conditions.

(3) To assist indirectly in providing flood protection along the San Joaquin River.

(4) To provide the maximum practicable amount of storage space for irrigation water without impairment of the flood-control functions.

b. In achieving the above objectives, forecasting of snowmelt runoff is important. When it is anticipated that flood water might be discharged into the San Joaquin River through Kings River North or to Tulare Lake, the Watermaster will be alerted so that he may update irrigation and spreading capabilities to make all possible use of the water for irrigation and spreading. Since the rate at which water can be used for irrigation and spreading may be relatively small, releases for such purposes should be initiated as soon as possible.

18. RESPONSIBILITY FOR OPERATION

a. Pine Flat Lake is operated by the U.S. Army Corps of Engineers and is under the jurisdiction of the District Engineer, Sacramento, California.



Accordingly, the Kings River Water Association is the operating agency for the purpose of these regulations until such time as the Corps of Engineers, on its own initiative or at the request of the Kings River Water Association, again assumes direct responsibility for operation. However, the Corps of Engineers is still responsible for maintaining Army Weir.

19. UPSTREAM REGULATION

a. The river above Pine Flat Lake is used for hydroelectric power generation by four Pacific Gas and Electric Company power plants and appurtenant facilities. The only major storage facilities connected with the power development are Wishon and Courtright Reservoirs. They have storage capacities of 128,600 acre-feet and 123,300 acre-feet respectively. The power facilities are shown on chart 1.

b. Due to their high elevation, Wishon and Courtright Reservoirs have relatively little effect on rainfloods. However, they do store snowmelt runoff that might otherwise have to be stored in Pine Flat Lake. Therefore, space available in these reservoirs less 20,000 acre-feet may be credited to Pine Flat Lake for the control of snowmelt floods.

20. DOWNSTREAM REGULATION

There are no significant storage facilities below Pine Flat Lake. However, Pine Flat Lake releases are reregulated by numerous downstream diversion structures for purposes of irrigation and flood control. The diversion structures are shown on chart A-6.

21. RELEASE REQUIREMENTS

a. The Kings River Water Association and California Department of Fish and Game signed an agreement, dated 11 September 1964, establishing minimum releases and rates of change for releases to benefit fish and wildlife on the Kings River. Basically, the agreement provides for a minimum release of 25 c.f.s. from Pine Flat Lake and for the maintenance of slightly larger flows up to 100 c.f.s. at Centerville Bottoms depending on the time of year and the volume of runoff during the previous water year. A brief summary of the agreement is shown on chart 17.

b. Releases for fish and wildlife will be initiated by the watermaster. Such requests will normally be made directly to the reservoir operator.

22. DOWNSTREAM CHANNEL CAPACITIES

a. The channel capacities downstream from Pine Flat Lake are shown on chart A-6. To illustrate the historic performance of the channels, the maximum 30-day and 1-day flows during 1969 are shown for critical reaches. However, it should be noted that the passage of the 1969 flows required continuous surveillance and maintenance to prevent seepage, erosion and levee failure.

b. The critical channel reaches for determining permissible releases are those below Army Weir, Crescent Weir, and Crescent Bypass.

23. DOWNSTREAM DIVISION OF FLOWS

a. The numerous Kings River diversion structures are shown on Chart A-6.



c. Since the late 1800's Kings River flows have divided in the Delta between Kings River North and Kings River South. Flow from Kings River North enters the San Joaquin River and the flow going south ends up in Tulare Lakebed. Since Tulare Lakebed has no outlet to the ocean, flows in excess of irrigation and spreading demand are damaging, and over the years provisions have been made to divert flood water north. Normally, under present conditions, Kings River flood water is diverted north up to the capacity of the Kings River North channels. When Kings River North capacity is reached, flood water is then sent south. During large floods it may be necessary to consider the capacity of the San Joaquin River when determining the rate of flow to be sent north.

d. Prior to construction at Pine Flat Dam, an agreement, dated 15 December 1947, was signed by three local entities (Tulare Lake Water Storage District, Kings River Water Association, and Lower Kings River Association) to establish the division of flow between Kings River North and Kings River South. The agreement provides that flood water may be sent north up to the Kings River North channel capacity but that the total flow at Mendota Pool should not be permitted to exceed flows that would occur naturally. The agreement also provides that flows at Lemoore Wier of 10,000 c.f.s. or more will be split, fifty percent going north and fifty percent going south. The Lower Kings River Association is now defunct, the Tulare Lake Water Storage District has joined the Kings River Water Association, and physical conditions have changed considerably. Should the Kings River flow above Army Wier exceed the combined north and south channel capacities, the operation of the diversion structures will be determined by the conditions prevailing at the time.

24. FLOOD DAMAGES UNDER PROJECT CONDITIONS

a. Since completion of Pine Flat Lake, the largest rainflood of record (1896-1978) occurred in December 1955 and the largest snowmelt flood of record occurred in 1969. Releases from Pine Flat Lake during the 1955 flood were nominal and caused no damage downstream. In 1969, about 185,000 acre-feet of water from Kings River reached Tulare Lake during April through July and flows in Kings River below Pine Flat Lake exceeded design channel capacity. However, channel improvements constructed under operation foresight and a well coordinated program for levee patrol and flood fighting enabled the releases to be continued through the critical period.

b. In December 1955, it is estimated that Pine Flat Lake prevented about \$5,000,000 in flood damage to the Kings River area and Tulare Lake. The 1969 snowmelt flood was preceded by a rainflood and during the entire 1969 flood season Pine Flat Lake prevented approximately \$7,600,000 in flood damage in the Kings River area and Tulare Lake.

25. FLOOD CONTROL OPERATION

The schedule for flood control operation of Pine Flat Lake under the multiple-purpose operation is given on chart A-8.

26. CONSERVATION OPERATION

Operation for conservation in accordance with the contract with local interests, dated 23 December 1963, is essentially as follows:

a. All inflow in excess of the release requested by the Kings River Watermaster will be stored to the extent that conservation space in the reservoir is available.

b. Water stored for irrigation will be released in accordance with the requests of the Kings River Watermaster.

c. Requests by the Kings River Watermaster for irrigation or fish and wildlife releases will normally be made directly to the reservoir operator and will be coordinated with downstream interests by the watermaster.

27. SEDIMENTATION AND WATER QUALITY MEASUREMENT

a. A system of 35 sedimentation ranges shown on chart 18 was established in 1951 before any significant water had been stored in the reservoir. Of these, two ranges cross the river channel below the dam, and one is above the gross pool elevation on the river above the reservoir. The remaining ranges are so spaced that no range will represent more than 10 percent of the potential sediment accumulation in the reservoir. Each range is straight and is marked by a permanent monument above gross pool level at each end. Each profile is recorded on a permanent drawing to a horizontal scale of 1 inch to 400 feet and a vertical scale of 1 inch to 20 feet with an attached table showing the coordinates of all survey points.

b. Surveys made in November 1956 and June 1973 indicate that the annual rate of sediment inflow is 243 acre-feet per year or about 216 tons per square mile per year. Future sediment surveys will probably not be made unless a major flood event has occurred. However, outflow sediment concentration is checked at frequent intervals.

c. Water quality at Pine Flat Lake is measured twice a year. Inflow and outflow samples are checked for dissolved oxygen and temperature and a chemical analysis of the samples is then made in a laboratory. In addition, a water quality profile of the lake is made for dissolved oxygen, temperature, ph and electrical conductivity. The quality of water in Pine Flat Lake is generally excellent.

28. RELATION TO OTHER PROJECTS

a. Pine Flat Lake operates in conjunction with four other Federal storage projects (Millerton Lake, Lake Kaweah, Success Lake, and Isabella Lake) to minimize floodflows into Tulare Lakebed. The operation of these projects is coordinated for maximum realization of their common goal.

b. As a prerequisite for construction of Wishon and Courtright Reservoirs, Pacific Gas and Electric Company contracted with Kings River irrigation interests to store 251,800 acre-feet of Kings River water for power generation. They also contracted (Contract No. DA-04-167-eng-1328) with the United States to store all or a portion of that water in Pine Flat Lake when it was not stored in their projects. Under that contract they are permitted to store up to 230,000 acre-feet of water within space reserved for flood control provided: (1) no water is stored in space required to control rainfloods, (2) no water is stored in the uppermost 30,000 acre-feet of flood control reservation and (3) in time of emergency, the Government may place additional restrictions on the transfer of flood control space. The charge for storing water in Pine Flat is 13.75 cents per acre-foot per month based on the maximum storage space occupied during the month. In 1972, Pacific Gas and Electric Company and the Kings River irrigation interests ammended their contracts so that Pacific Gas and Electric is required to store no more than 60,000 acre-feet of water. Now, except for rare exceptions, this power water is stored in Wishon and Courtright and payments to the Government are not necessary.

■ [REDACTED]

■ [REDACTED]

CHAPTER VI - FLOOD CONTROL DESIGN REQUIREMENTS

30. HYDROLOGIC BASIS FOR DESIGN

Selection of the capacity of Pine Flat Lake was based primarily on flood control. Snowmelt-season runoff governed the capacity, since the space required for the control of potential snowmelt floods is at all times greater than the space required to control rain floods.

31. FLOOD CONTROL SPACE REQUIREMENTS

Prior to authorization it was determined that 1,000,000 acre-feet of flood control reservation would be required to control the 1906 flood to objective flows with only minor damaging flows to Tulare Lake. It was also found that in evacuating the reservoir by the start of the snowmelt season, sufficient space (475,000 acre-feet) would normally be available to control all but extremely rare rainfloods. For operational purposes, a minimum rainflood reservation of 260,000 acre-feet was adopted based on a hypothetical flood developed at that time.

32. MULTIPLE USE OF RESERVOIR SPACE

a. The space in Pine Flat Lake required to control snowmelt floods may be adjusted for available space upstream in Wishon and Courtright Reservoirs less 20,000 acre-feet. There is a minor amount of storage capacity in Black Rock Reservoir and Balch afterbay but since they are usually full, they are not considered in flood operations.

b. From 1 December to 1 February, 475,000 acre-feet, minus the adjustments for upstream storage, must be available to control anticipated snowmelt. After 1 February, when snowmelt forecasts are available, the required flood control space is based on forecasted snowmelt-runoff and is also adjusted for upstream storage.

c. A contract between the Federal Government and the Pacific Gas and Electric Company that permits storage of power water in Pine Flat Lake is discussed in paragraph 28c. However, due to a 1972 agreement between the electric company and Kings River irrigation interests, except for rare situations, it is doubtful that water for the Kings River Project will be stored in Pine Flat Lake again.

33. FLOOD CONTROL DIAGRAM

The flood control diagram for Pine Flat Lake is shown on chart A-8. It is based on 83 years of hydrologic data for the basin, 25 years of operational experience with the project, and current irrigation demands. The diagram gives the required flood control release for a given storage at any particular time of year.

CHAPTER VII - OPERATIONAL CONTROLS

34. DIVISION OF RESPONSIBILITY FOR OPERATION

a. The primary responsibilities of operating Pine Flat Reservoir are delegated to units of the Engineering Division and Construction-Operations Division of the Sacramento District, Corps of Engineers as outlined herein. Names, addresses, and telephone numbers for those individuals whose responsibilities are outlined in the following paragraphs are given on the personnel chart at the front of this report.

b. The Reservoir Control Section (Engineering Division), will be responsible for:

(1) Analyzing current reservoir and hydrologic data, determining the condition under which the reservoir shall be operated, and issuing appropriate operation instructions to the reservoir operator.

(2) Preparing monthly operation and other special reports relative to operation of the reservoir as required by the Office, Chief of Engineers, and as needed for operational purposes.

(3) Advising the District Engineer whenever there has been an unavoidable departure from these regulations, or when there is a need for making a temporary modification of these regulations.

(4) Keeping advised at all times of downstream channel conditions by making periodic field inspections.

(5) Arranging with local interests for collection of current flow and diversion data.

(6) Obtaining from local interests each month a summary of recorded Kings River flows and diversions; maintaining a record of instructions issued, data transmitted to other agencies, and requests received from other agencies.

c. The responsibilities of the Reservoir Operator (Construction-Operations Division) are outlined in Appendix A.

d. The Hydrology Section (Engineering Division) will be responsible for:

(1) Obtaining current hydrometeorological data and weather forecast for the region as required for use by the Chief, Reservoir Control Section.

(2) Maintaining hydrologic equipment and supervising its operation.

(3) Supervising a program of water quality and sediment measurement.

35. HYDROLOGIC FACILITIES

36. FLOOD RUNOFF FORECASTS

a. Normally the reservation maintained in Pine Flat Lake through the winter is greater than that required to control major rainfloods. Therefore, the probability of spills from Pine Flat Lake due to a rainflood is small. However, local flows downstream may be substantial and releases should be curtailed at the onset of an impending flood. Rainflood forecast criteria for flows into Pine Flat Lake and an area elevation curve are shown on charts 19 and 20.

b. During the snowmelt season, the release schedule for Pine Flat Lake is based on runoff forecasts. Forecasts of snowmelt made by the Department of Water Resources of the State of California will be utilized in the operation of Pine Flat Lake. The department publishes forecasts of runoff through July into Pine Flat Lake as of 1 February, 1 March, 1 April, and 1 May of each year. Preliminary forecast values are furnished the District Office by the 10th of each of these months. The forecasts are published in "Water Conditions in California". A forecast summary is shown on chart 21.

37. COORDINATION WITH OTHER AGENCIES

In order to assure that the flood control operation of Pine Flat Lake is effective, it is essential the Corps of Engineers be aware at all times of possible flood hazards, weather conditions, inflow to Millerton and Pine Flat Lakes, and the flows in the San Joaquin and Kings River. This requires close liaison with other agencies including the National Weather Service, the State of California Department of Water Resources, the Bureau of Reclamation, the Kings River Water Association, the Kings River Conservation District, and other downstream interests.

CHAPTER VIII - WATER RIGHTS

38. WATER RIGHTS FOR IRRIGATION

With the exception of water used by a few riparian owners who pump water from the river, virtually all use of Kings River water between Piedra and Mendota is being administered by the Kings River Water Association.

39. WATER RIGHTS FOR POWER

Pacific Gas and Electric Company has no water rights in the Kings River Basin but has contracted with irrigation interests for use of Kings River water for power. The agreement is dated 20 December 1954 and was amended 18 January 1972.

CHAPTER IX - PROJECT ACCOMPLISHMENTS

40. EXAMPLES OF OPERATION

Hypothetical operation during the standard project and the December 1955 rainflood is illustrated on charts 13 and 15. Hypothetical operation of Pine Flat Lake during the spillway design flood is shown on chart 16. Hypothetical routings of historic snowmelt floods are shown on chart 14. Stage duration curves are presented on chart 22, a stage frequency curve on chart 23, and a seasonal variation of reservoir storage on chart 24.

41. OPERATION RECORD

The official operation record of Pine Flat Lake is included in a monthly report submitted to the Chief of Engineers. Daily storage and daily outflow are published annually in the U.S. Geological Survey Water Supply Papers. Historical operation of Pine Flat is shown graphically on chart 25.

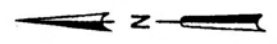
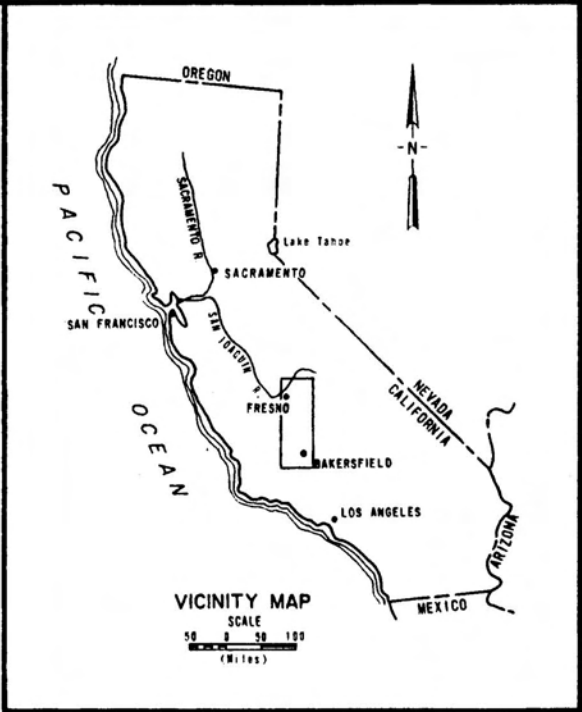
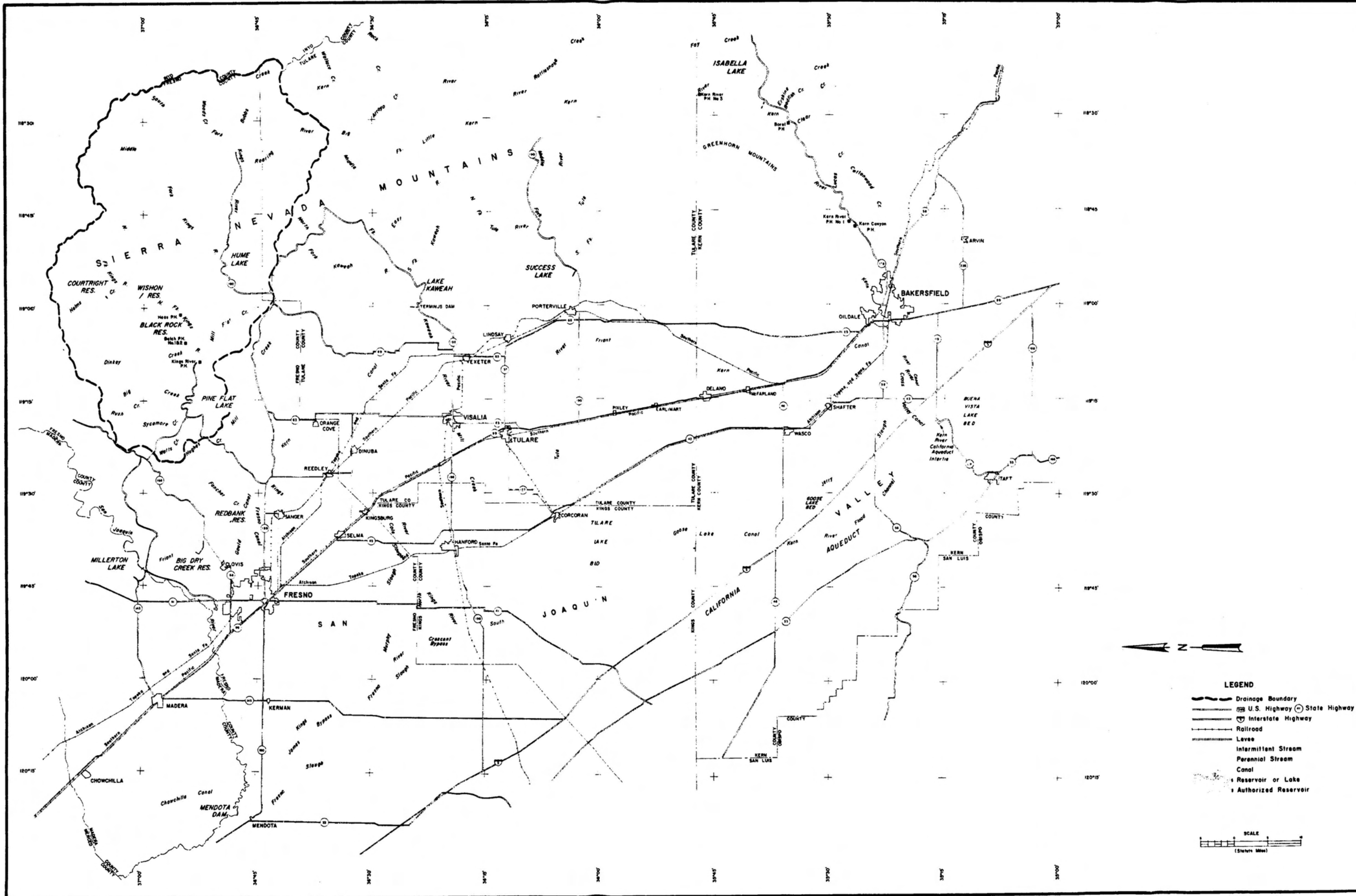
CHAPTER X - FUTURE DEVELOPMENT

42. PROJECTS UNDER CONSTRUCTION

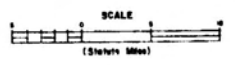
Pacific Gas and Electric Company is presently constructing the Helms Pumped Storage Project between Courtright and Wishon Reservoirs. The project is scheduled to be operational by 1981.

43. POTENTIAL DEVELOPMENT

In December 1974 the International Engineering Company, under contract to the Kings River Conservation District, completed a "Master Plan Study for Kings River Service Area". As a result of the study, the Kings River Conservation District applied to the Federal Power Commission for a preliminary permit covering hydroelectric sites at Pine Flat, Piedra, Mill Creek, Rodgers Crossing and Dinkey Creek. The permit was granted and the Kings River Conservation District is presently applying for licenses to construct the first two units of their proposed development: a hydroelectric power plant at Pine Flat Dam, and power development on Dinkey Creek.



- LEGEND**
- Drainage Boundary
 - U.S. Highway
 - State Highway
 - Interstate Highway
 - Railroad
 - Levee
 - Intermittent Stream
 - Perennial Stream
 - Canal
 - Reservoir or Lake
 - Authorized Reservoir



PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

GENERAL MAP

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: T.G.K. Date: NOVEMBER 1978
 Drawn: C.A.P.



CHART 2

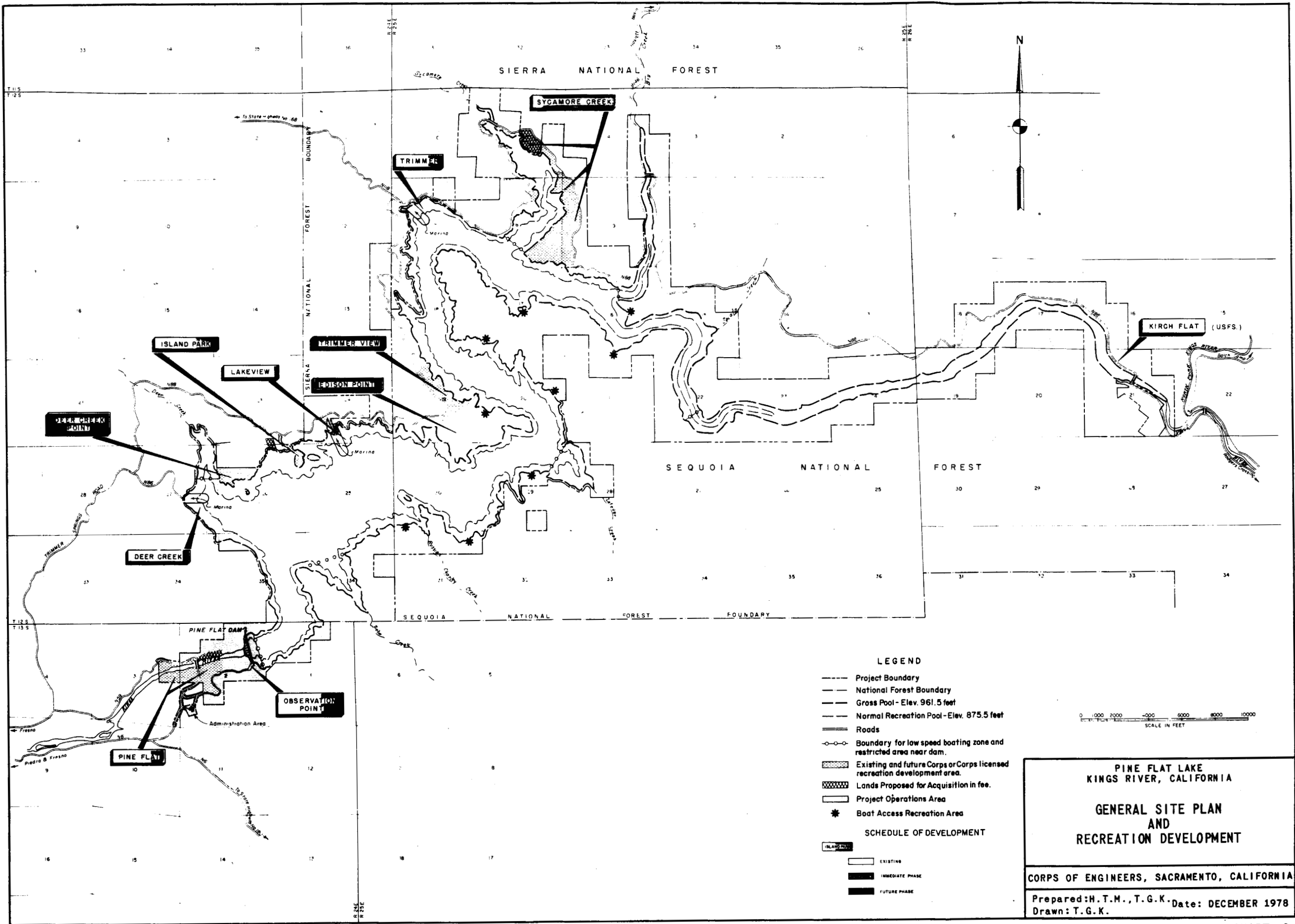


HISTORICAL UNIMPAIRED INFLOWS TO PINE FLAT LAKE

Runoff in 1,000 acre-feet

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL
1955	8.7	18.0	26.9	39.1	50.3	62.0	122.3	329.4	330.8	77.7	31.0	11.2	1107.4
1956	8.7	13.2	379.7	204.5	98.6	127.5	239.6	519.2	565.9	266.8	67.8	26.8	2518.3
1957	24.2	18.2	16.6	21.5	50.0	66.7	122.4	318.2	467.1	100.7	28.6	11.2	1245.4
1958	16.2	24.7	44.0	39.3	87.5	154.9	321.4	751.2	647.3	271.0	92.2	31.4	2481.1
1959	16.7	14.2	13.7	26.9	70.0	92.3	182.8	191.9	122.7	30.3	15.0	25.4	801.9
1960	12.7	8.3	8.3	14.0	45.7	62.8	166.6	227.1	122.3	25.3	10.5	7.8	711.4
1961	10.3	20.4	24.1	14.6	20.9	37.9	116.7	161.9	104.6	20.2	25.5	10.6	567.7
1962	7.8	11.3	20.5	22.9	153.2	92.0	373.0	423.7	510.3	188.4	47.5	17.7	1868.3
1963	17.3	12.0	9.7	76.8	186.1	85.9	176.2	469.7	505.7	271.5	74.6	31.3	1916.8
1964	26.9	58.4	37.6	28.5	26.6	47.3	129.1	266.6	192.5	53.8	24.8	12.0	904.1
1965	9.6	33.8	148.2	149.3	82.0	94.9	222.1	411.3	458.7	231.0	110.8	29.8	1981.5
1966	17.1	68.7	59.7	53.3	43.4	101.2	274.2	368.8	143.5	46.4	23.5	9.7	1209.5
1967	8.5	28.3	295.3	99.1	99.7	208.0	217.4	607.0	847.6	649.2	161.2	66.7	3288.0
1968	25.4	24.8	36.0	33.4	53.2	70.2	140.0	246.1	137.1	41.4	18.6	7.0	833.2
1969	16.0	31.9	42.0	393.5	201.0	185.2	396.6	1117.1	1014.8	587.5	171.5	50.1	4207.2
1970	35.4	30.2	35.4	116.5	60.9	101.7	132.4	397.3	254.9	99.4	29.9	13.8	1307.8
1971	11.6	28.5	58.9	60.4	56.5	81.0	152.5	272.2	298.6	96.9	30.8	15.0	1162.9
1972	12.8	24.1	40.9	35.7	38.1	115.2	114.5	235.3	159.2	39.0	11.4	29.2	855.4
1973	17.5	28.6	39.2	76.8	87.5	112.0	211.6	748.3	550.7	154.7	50.0	15.4	2092.3
1974	21.3	56.1	59.9	109.1	53.8	161.3	233.9	619.6	515.3	154.6	56.8	14.9	2056.6
1975	15.1	18.5	26.4	30.6	53.1	101.4	97.9	522.2	512.1	125.5	32.1	15.0	1549.9
1976	38.0	26.0	21.0	14.9	24.9	45.7	73.7	160.0	47.3	21.9	16.7	42.6	532.7
1977	29.2	13.2	9.0	13.7	13.7	19.0	70.9	83.2	105.0	15.2	6.7	6.5	385.3
1978	8.2	10.1	68.8	131.2	174.8	254.9	275.1	687.6	899.9	519.1	167.1	166.8	3363.6
24-YEAR TOTAL	415.2	621.5	1521.8	1805.6	1831.5	2481.0	4562.9	10134.9	9513.9	4087.5	1304.6	667.9	38948.3
MEAN	17.3	25.9	63.4	75.2	76.3	103.4	190.1	422.3	396.4	170.3	54.4	27.8	1622.8





LEGEND

- Project Boundary
- - - National Forest Boundary
- Gross Pool - Elev. 961.5 feet
- Normal Recreation Pool - Elev. 875.5 feet
- == Roads
- Boundary for low speed boating zone and restricted area near dam.
- ▨ Existing and future Corps or Corps licensed recreation development area.
- ▩ Lands Proposed for Acquisition in fee.
- Project Operations Area
- * Boat Access Recreation Area

SCHEDULE OF DEVELOPMENT

- ▭ EXISTING
- ▨ IMMEDIATE PHASE
- ▩ FUTURE PHASE



**PINE FLAT LAKE
KINGS RIVER, CALIFORNIA**

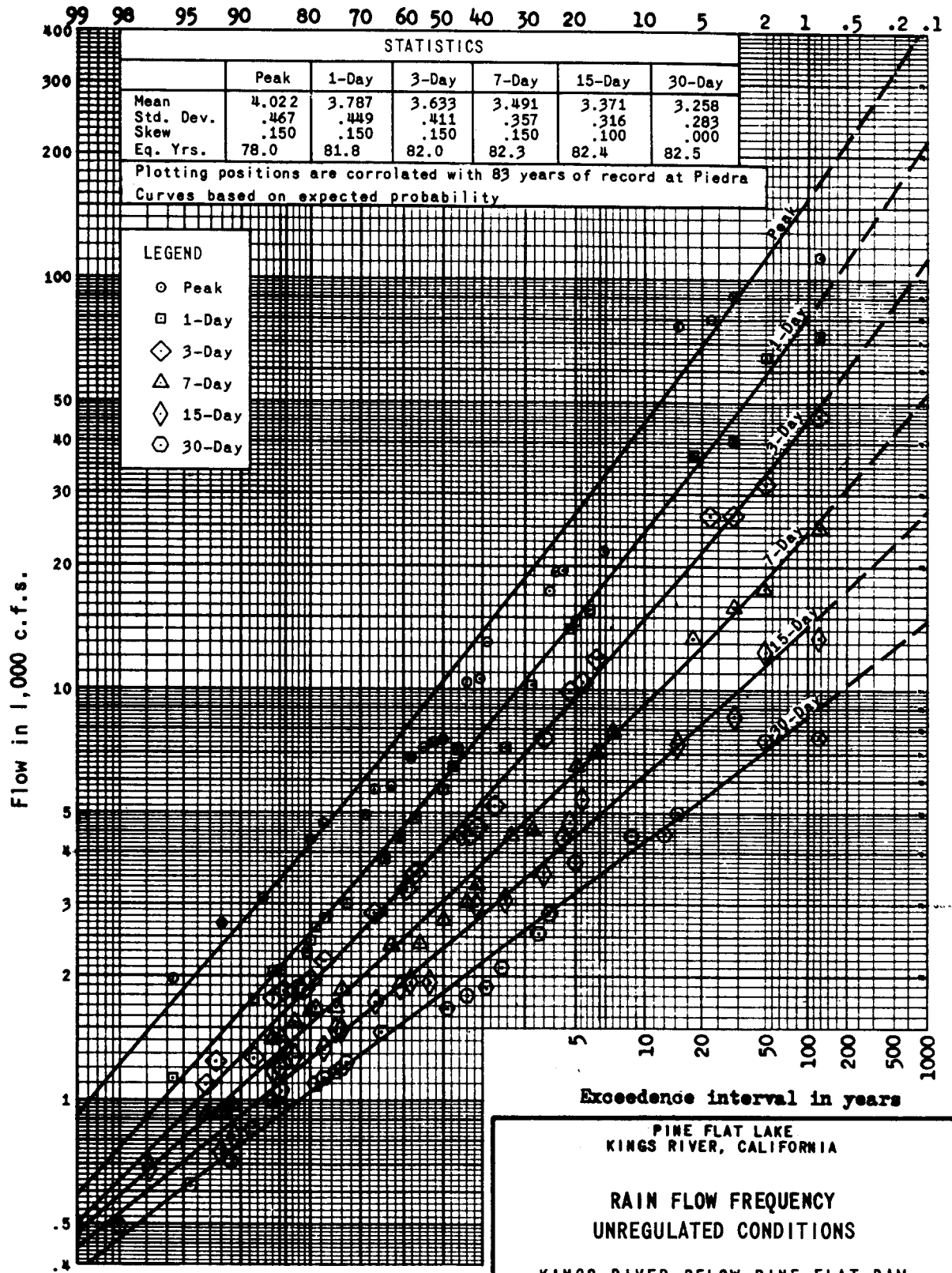
**GENERAL SITE PLAN
AND
RECREATION DEVELOPMENT**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M., T.G.K. Date: DECEMBER 1978
Drawn: T.G.K.



Exceedence frequency per hundred years



Drainage Area = 1545 sq. mi.

Period of Record
1955 - 1978

Exceedence interval in years

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

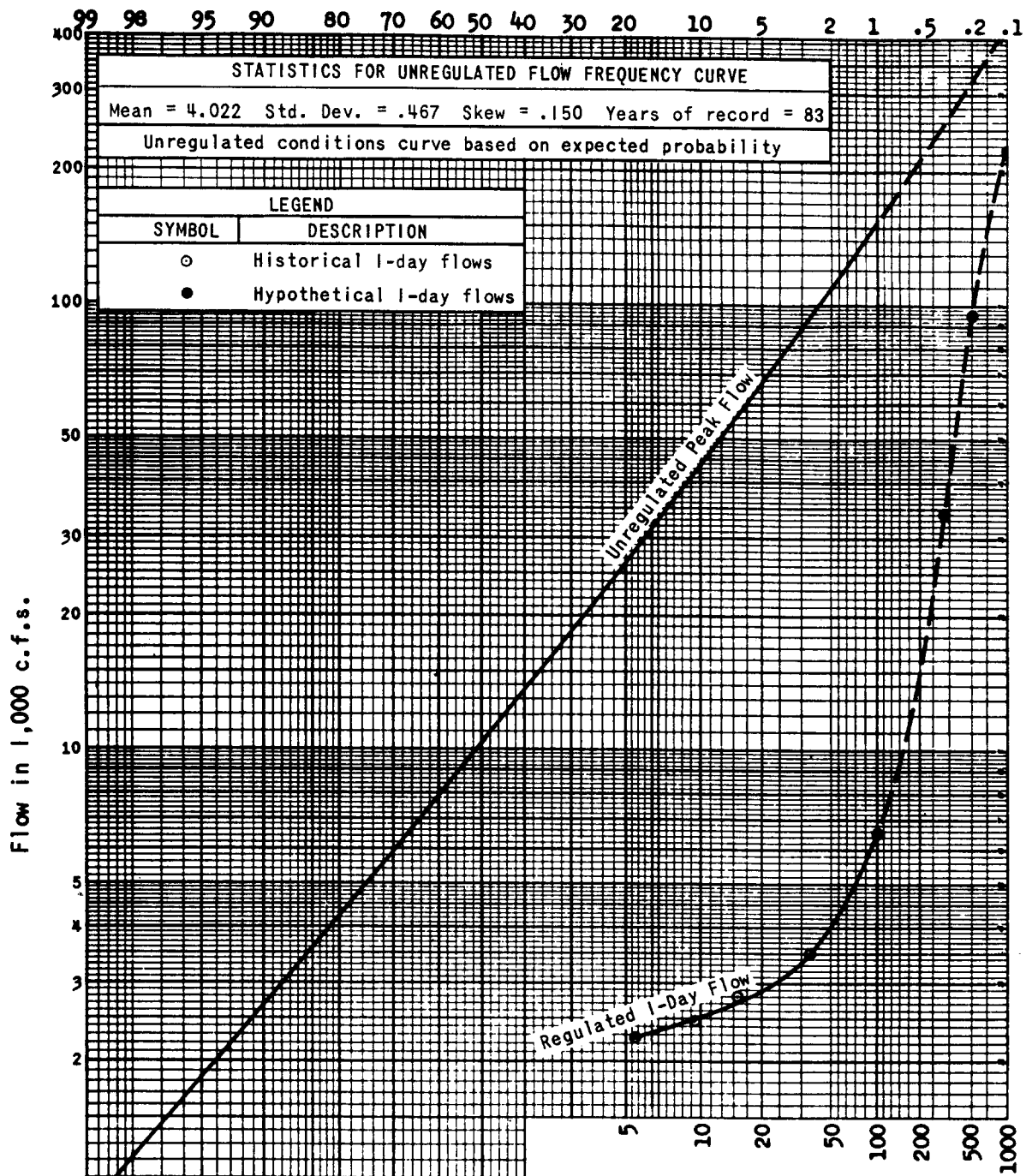
RAIN FLOW FREQUENCY
UNREGULATED CONDITIONS

KINGS RIVER BELOW PINE FLAT DAM

Corps of Engineers, Sacramento, Calif.

Prepared: H.T.M., L.H.C. Date: FEBRUARY 1979

Exceedence frequency per hundred years



STATISTICS FOR UNREGULATED FLOW FREQUENCY CURVE
 Mean = 4.022 Std. Dev. = .467 Skew = .150 Years of record = 83
 Unregulated conditions curve based on expected probability

LEGEND	
SYMBOL	DESCRIPTION
○	Historical 1-day flows
●	Hypothetical 1-day flows

Drainage Area = 1545 sq. mi.

PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA

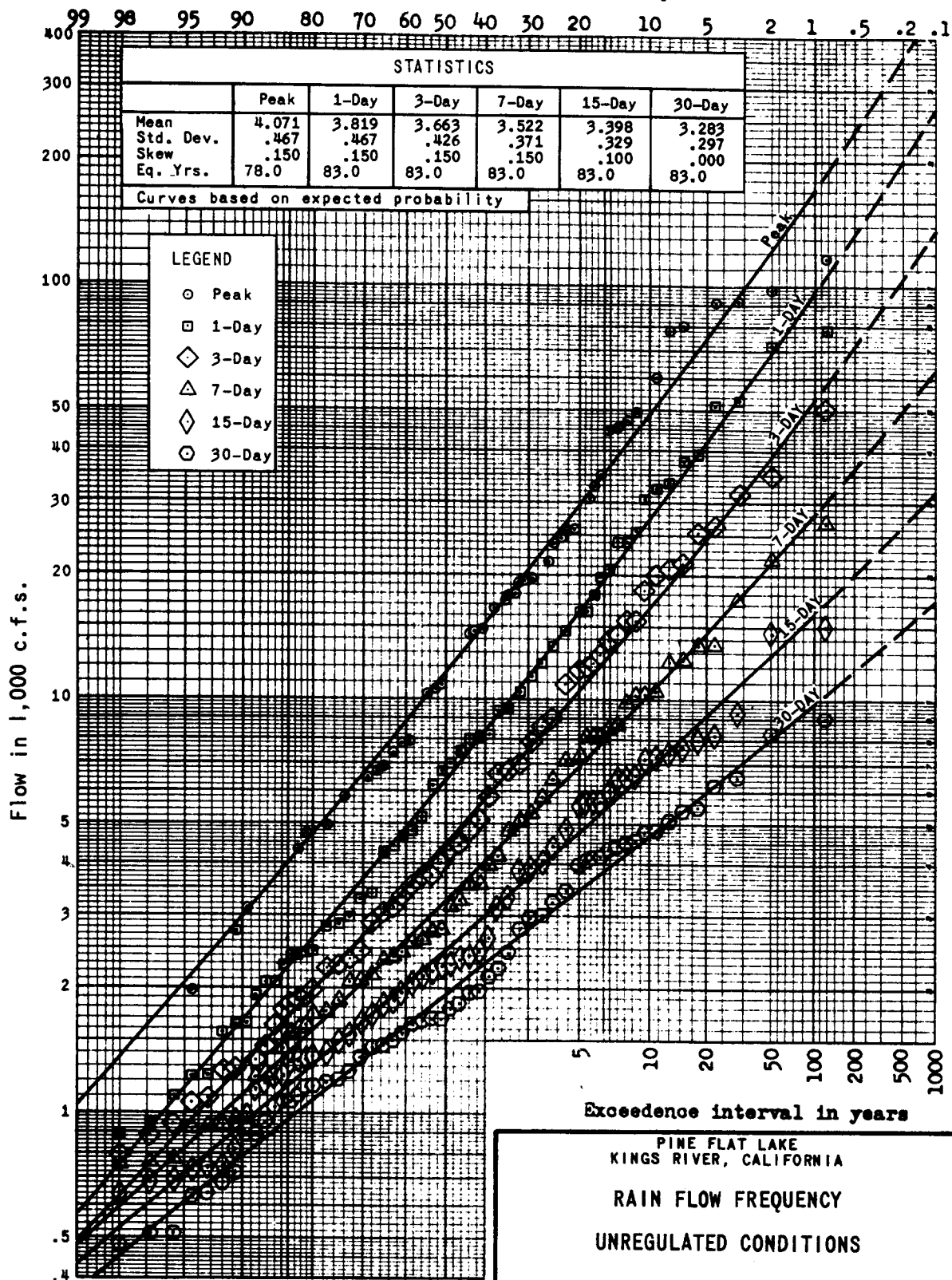
**RAIN FLOW FREQUENCY
 REGULATED CONDITIONS**

KINGS RIVER BELOW PINE FLAT DAM

Corps of Engineers, Sacramento, Calif.

Prepared: H.T.M. Date: FEBRUARY 1979

Exceedence frequency per hundred years



STATISTICS						
	Peak	1-Day	3-Day	7-Day	15-Day	30-Day
Mean	4.071	3.819	3.663	3.522	3.398	3.283
Std. Dev.	.467	.467	.426	.371	.329	.297
Skew	.150	.150	.150	.150	.100	.000
Eq. Yrs.	78.0	83.0	83.0	83.0	83.0	83.0

Curves based on expected probability

- LEGEND**
- Peak
 - 1-Day
 - ◇ 3-Day
 - △ 7-Day
 - ◇ 15-Day
 - 30-Day

Period of Record
1896 - 1978

Drainage Area: 1694 sq. mi.

Exceedence interval in years

**PINE FLAT LAKE
KINGS RIVER, CALIFORNIA**

RAIN FLOW FREQUENCY

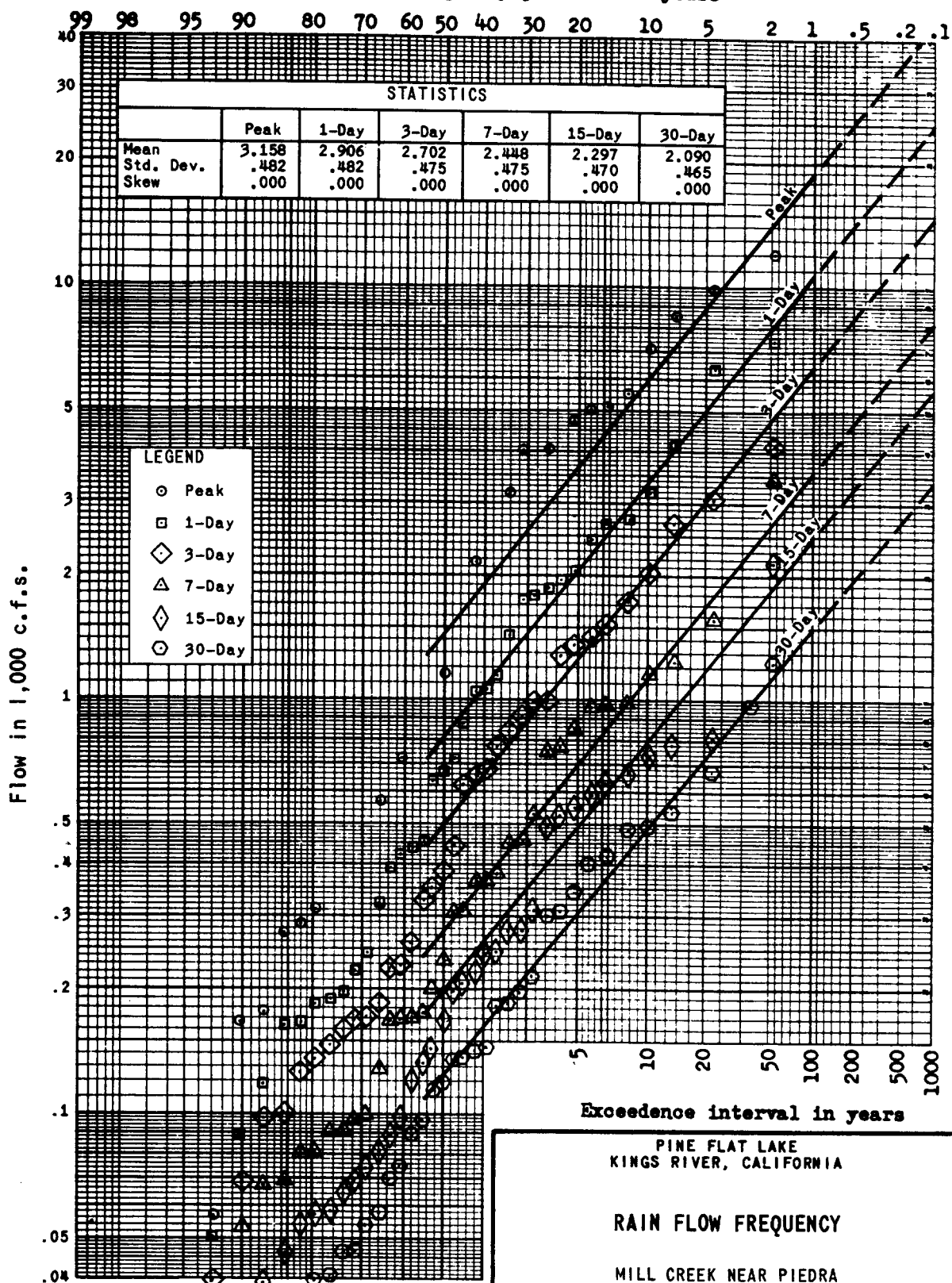
UNREGULATED CONDITIONS

KINGS RIVER AT PIEDRA

Corps of Engineers, Sacramento, Calif.

Prepared H.T.M., L.H.C. Date: FEBRUARY 1979

Exceedence frequency per hundred years



STATISTICS						
	Peak	1-Day	3-Day	7-Day	15-Day	30-Day
Mean	3.158	2.906	2.702	2.448	2.297	2.090
Std. Dev.	.482	.482	.475	.475	.470	.465
Skew	.000	.000	.000	.000	.000	.000

LEGEND	
○	Peak
□	1-Day
◇	3-Day
△	7-Day
◇	15-Day
○	30-Day

Drainage Area: 127 sq. mi.
 Period of Record
 1940 - 1976

PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA

RAIN FLOW FREQUENCY

MILL CREEK NEAR PIEDRA

Corps of Engineers, Sacramento, Calif.
 Prepared: R.F.C. Date: JULY 1978

Exceedence frequency per hundred years

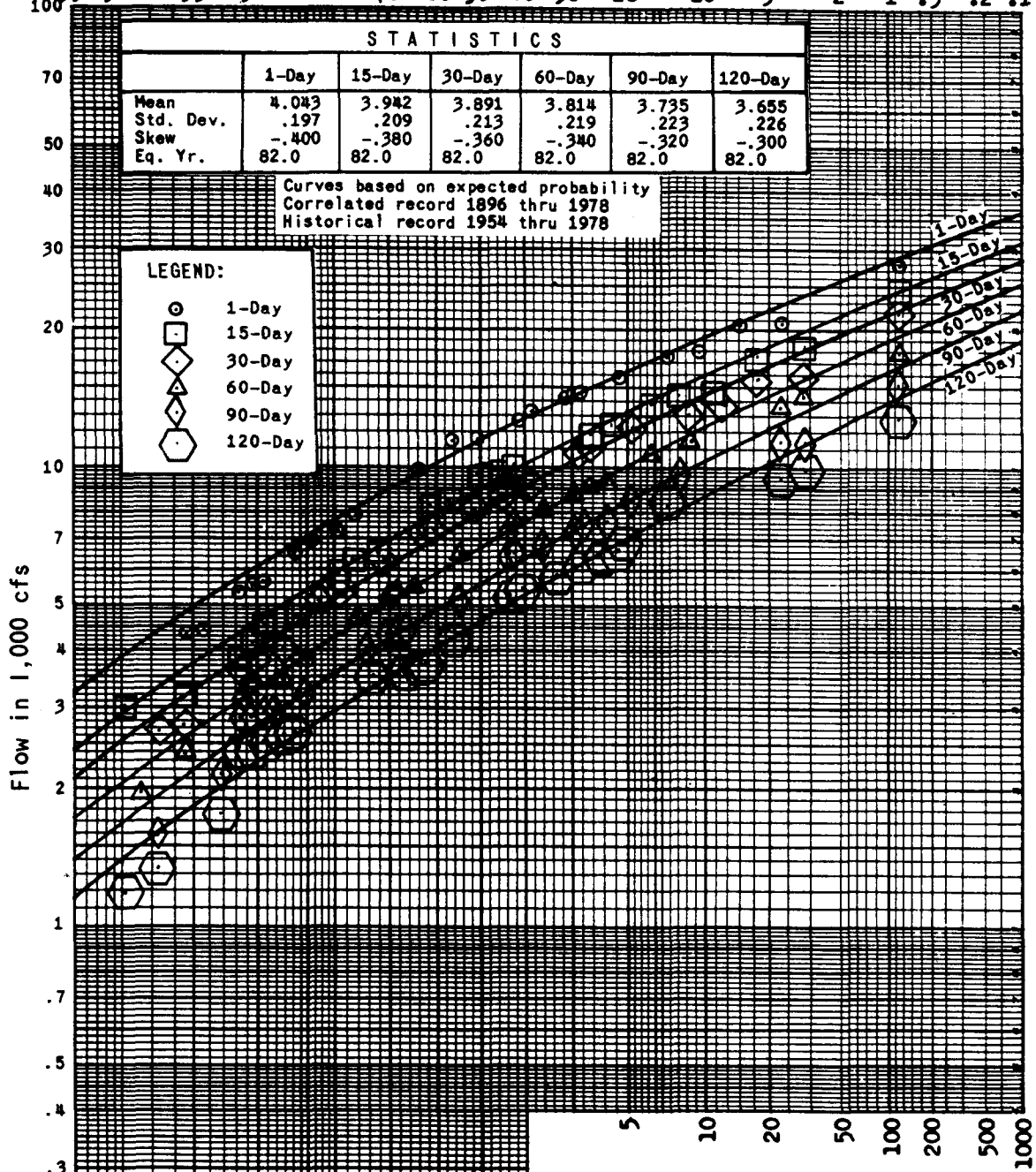
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1

STATISTICS						
	1-Day	15-Day	30-Day	60-Day	90-Day	120-Day
Mean	4.043	3.942	3.891	3.814	3.735	3.655
Std. Dev.	.197	.209	.213	.219	.223	.226
Skew	-.400	-.380	-.360	-.340	-.320	-.300
Eq. Yr.	82.0	82.0	82.0	82.0	82.0	82.0

Curves based on expected probability
 Correlated record 1896 thru 1978
 Historical record 1954 thru 1978

LEGEND:

- 1-Day
- 15-Day
- ◇ 30-Day
- △ 60-Day
- ◇ 90-Day
- ⬡ 120-Day



Drainage Area = 1545 sq. mi.

Exceedence interval in years

PINE FLAT DAM
 KINGS RIVER, CALIFORNIA

SNOWMELT FLOW FREQUENCY
 UNREGULATED CONDITIONS

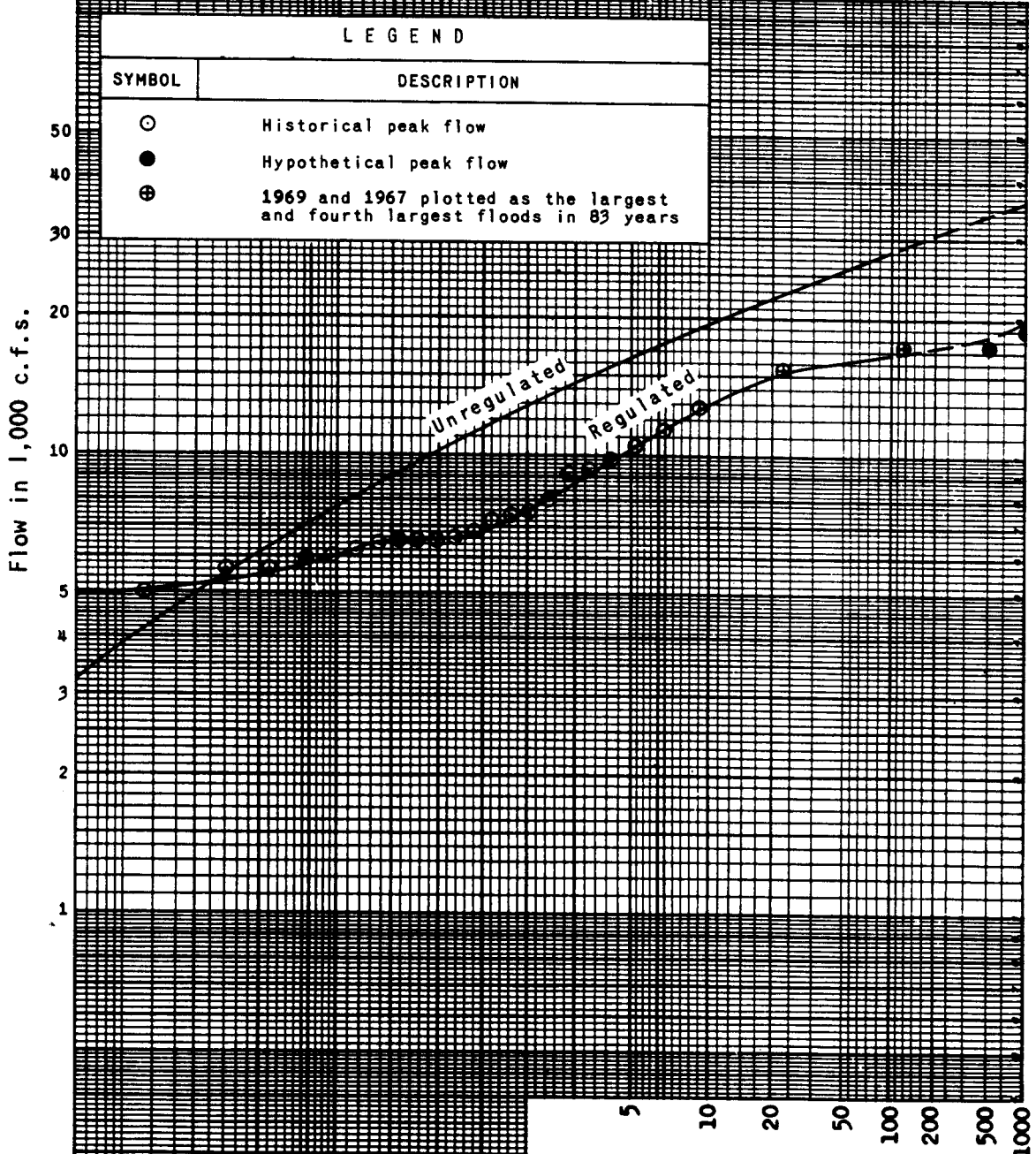
KINGS RIVER BELOW PINE FLAT DAM

Corps of Engineers, Sacramento, Calif.

Prepared: H.T.M., T.G.K. Date: DECEMBER 1978

Exceedence frequency per hundred years

99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1



Drainage Area = 1545 sq. mi.
 Period of Record
 1955-1978

Exceedence interval in years

PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA

SNOWMELT FLOW FREQUENCY
 REGULATED CONDITIONS

KINGS RIVER BELOW PINE FLAT DAM

Corps of Engineers, Sacramento, Calif.
 Prepared: H.T.M. Date: FEBRUARY 1979

Exceedence frequency per hundred years

99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1

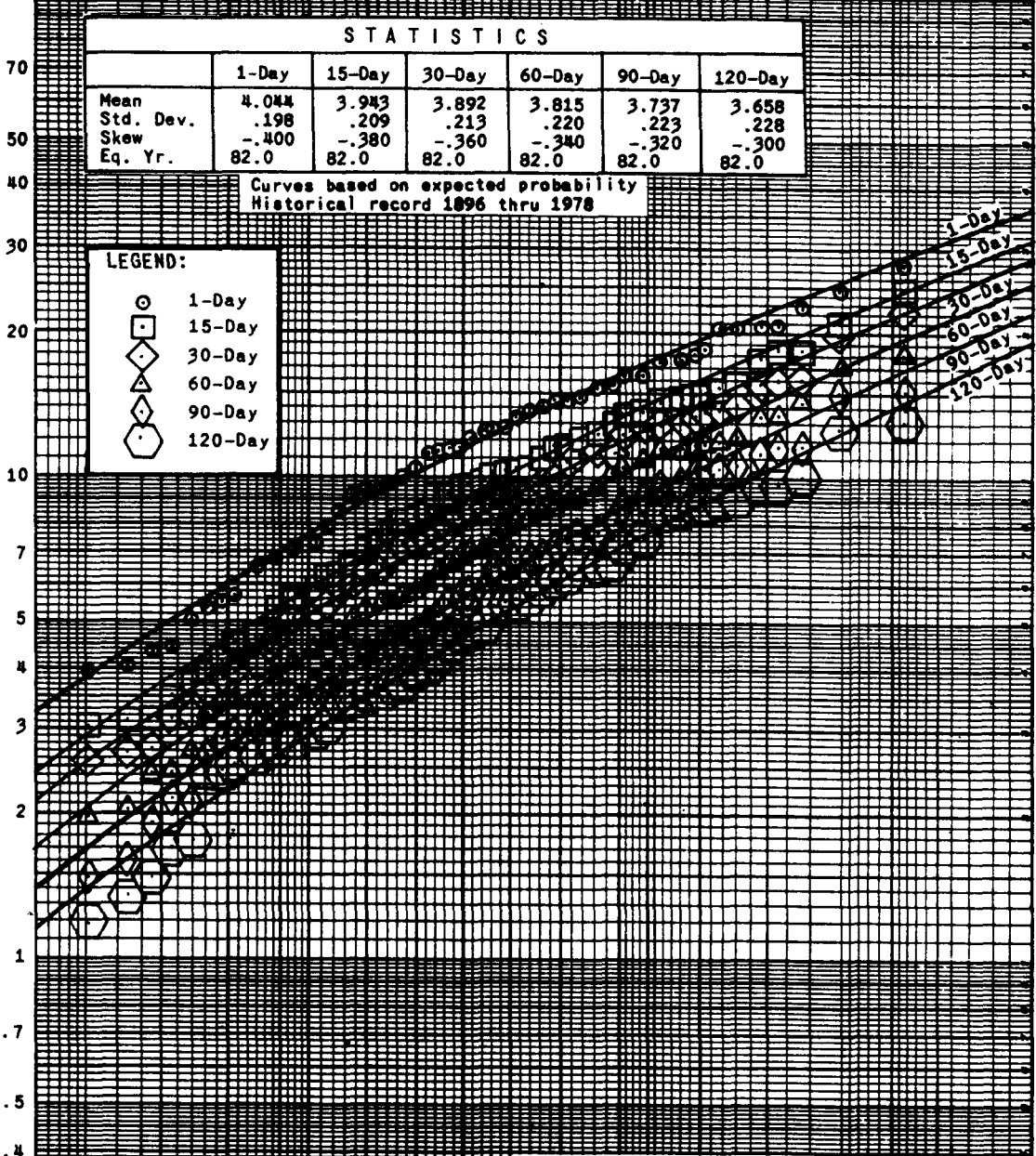
STATISTICS						
	1-Day	15-Day	30-Day	60-Day	90-Day	120-Day
Mean	4.044	3.943	3.892	3.815	3.737	3.658
Std. Dev.	.198	.209	.213	.220	.223	.228
Skew	-.400	-.380	-.360	-.340	-.320	-.300
Eq. Yr.	82.0	82.0	82.0	82.0	82.0	82.0

Curves based on expected probability
Historical record 1896 thru 1978

LEGEND:

○	1-Day
□	15-Day
◇	30-Day
△	60-Day
◇	90-Day
⬡	120-Day

Flow in 1,000 c.f.s.



5 10 20 50 100 200 500 1000

Exceedence interval in years

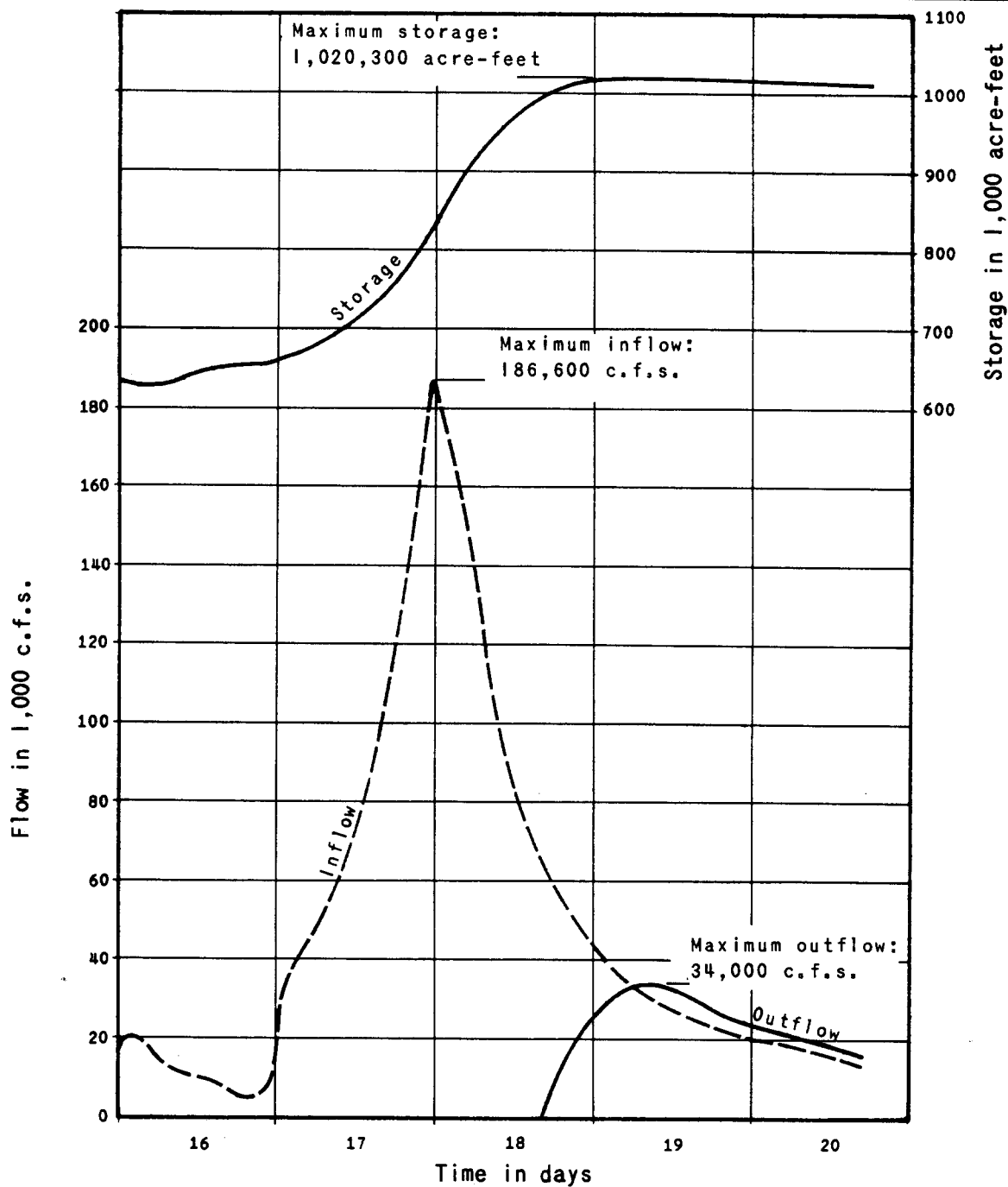
Drainage Area = 1694 sq. mi.

PINE FLAT DAM
KINGS RIVER, CALIFORNIA

SNOWMELT FLOW FREQUENCY
UNREGULATED CONDITIONS
KINGS RIVER AT PIEDRA

Corps of Engineers, Sacramento, Calif.

Prepared: H.T.M., T.G.K. Date: AUG 1978



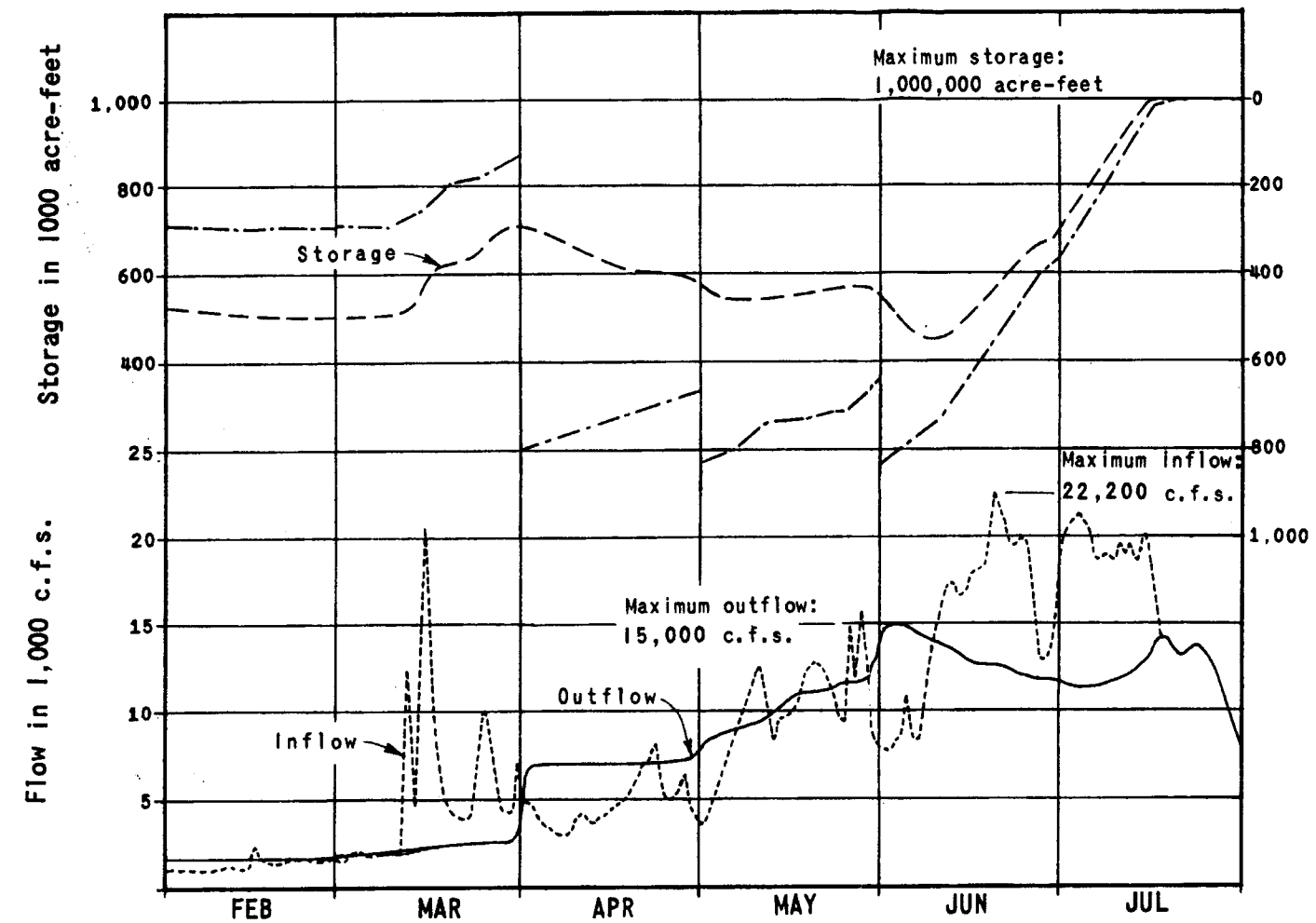
MAIN WAVE OF STANDARD PROJECT 30-DAY FLOOD SERIES

PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA

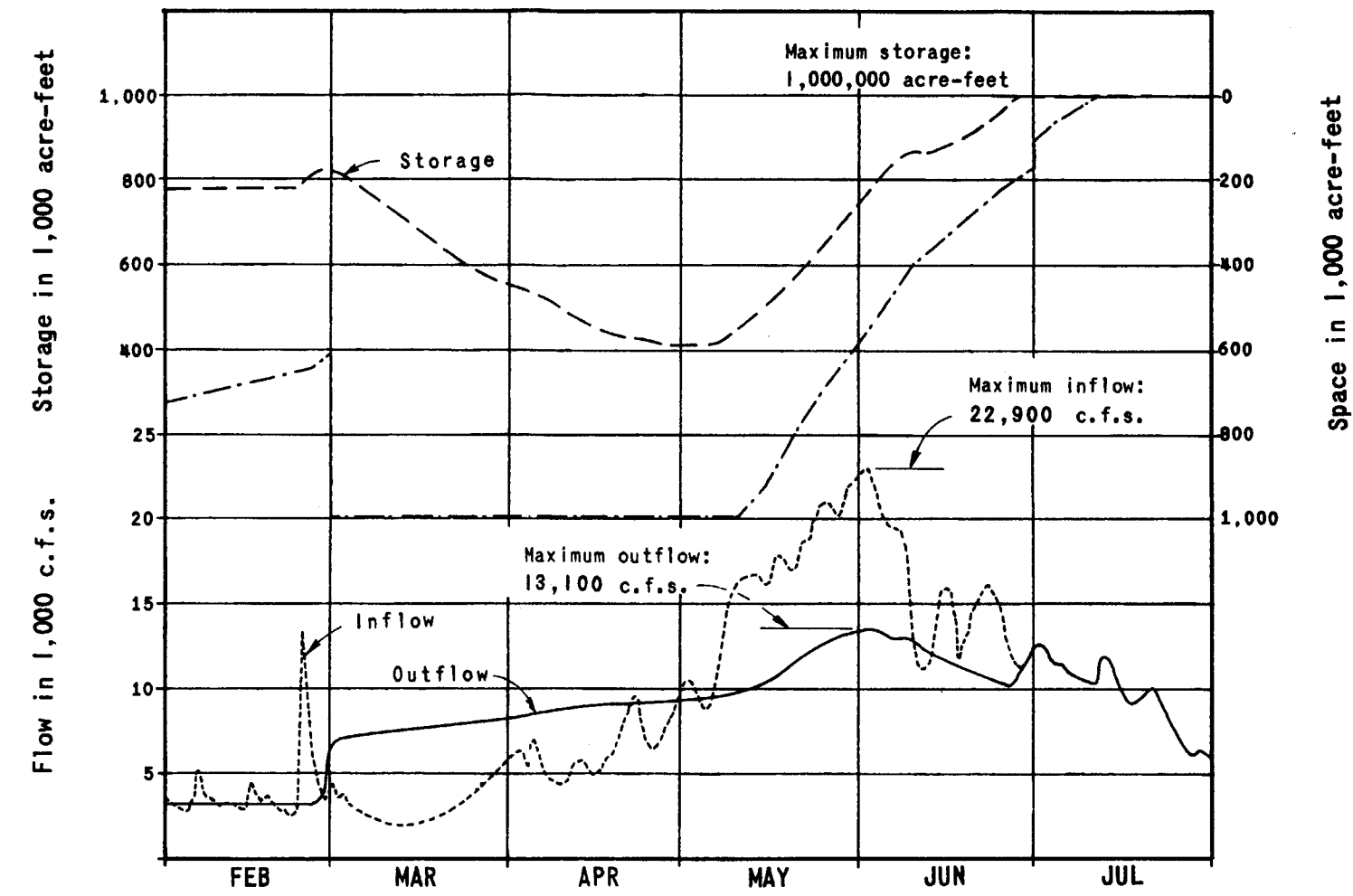
STANDARD PROJECT
 FLOOD ROUTING

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H. T. M. Date: DECEMBER 1978
 Drawn: L. H. C.



1906



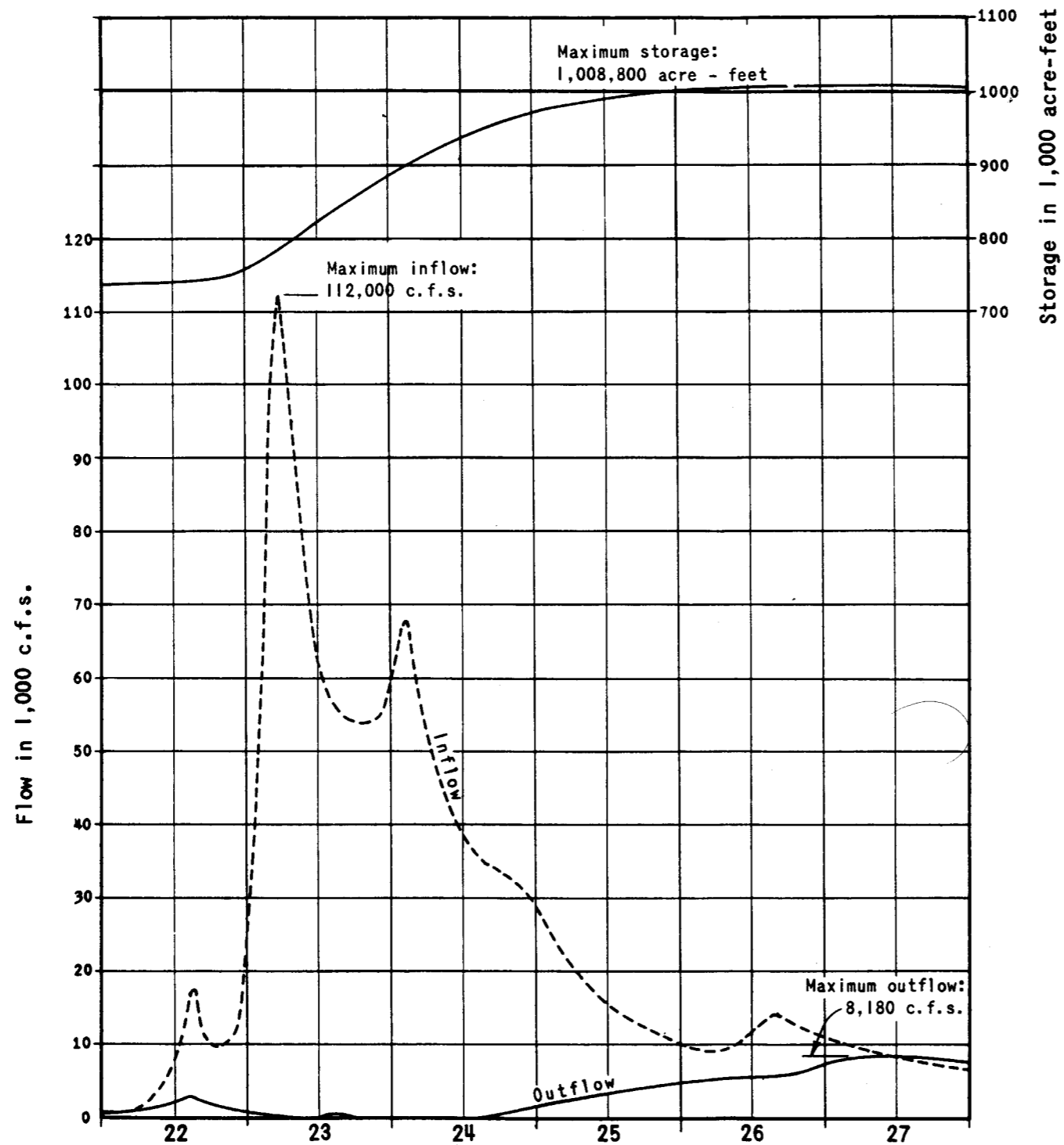
1969

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

HYPOTHETICAL ROUTINGS
OF HISTORIC
SNOWMELT FLOODS

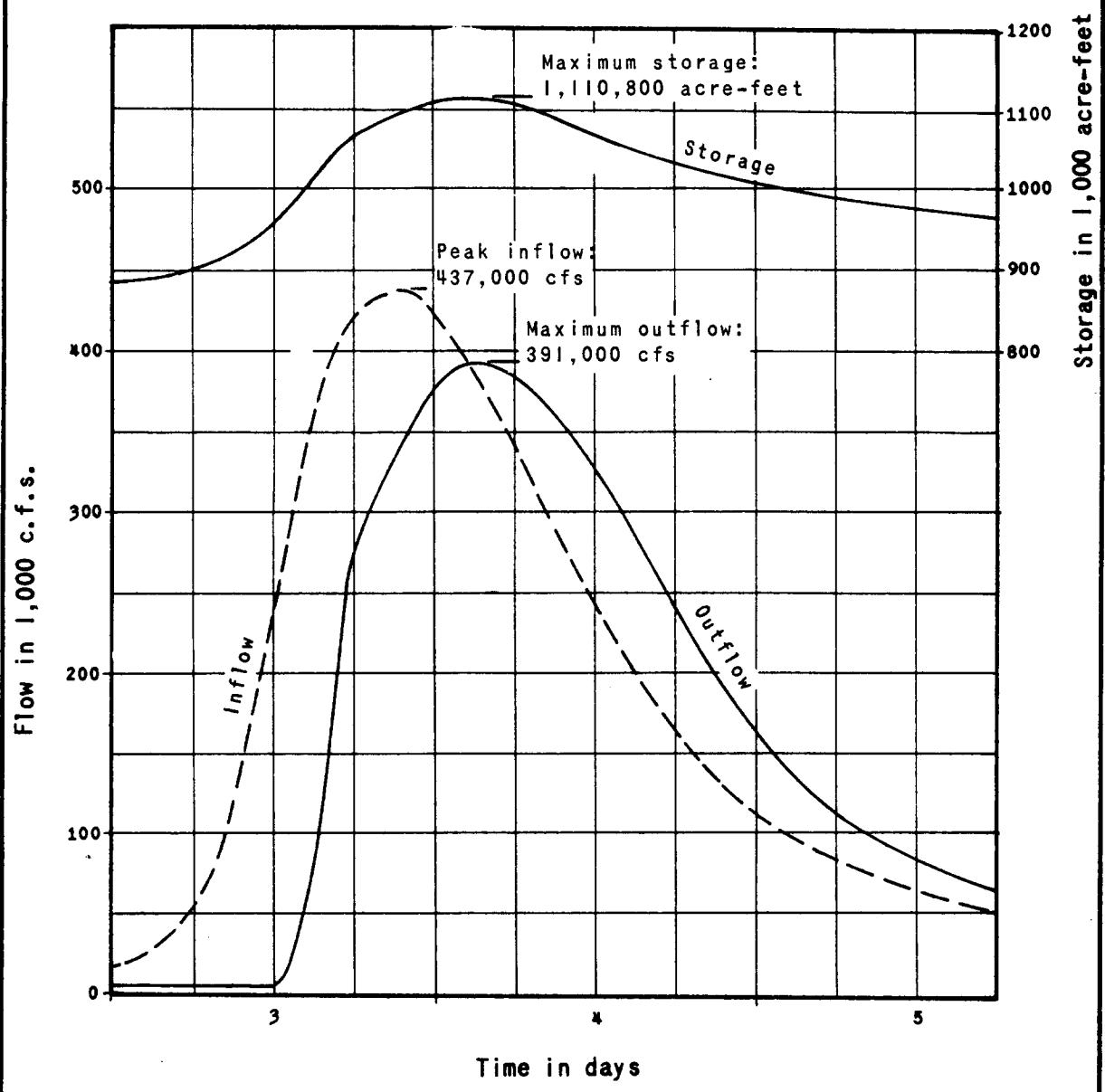
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M. Date: MARCH 1979
Drawn: L.H.C.



DECEMBER 1955

PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA
 HYPOTHETICAL ROUTING
 OF DECEMBER 1955 RAINFLOOD
 CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA
 Prepared: H.T.M. Date: MARCH 1979
 Drawn: L.H.C.



Drainage Area = 1545 sq. mi.

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

**SPILLWAY DESIGN
FLOOD ROUTING**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: L.R.B. Date: SEPTEMBER 1954
 Drawn: L.R.B.

FISH AND WILDLIFE RELEASES ON KINGS RIVER

The data in this table is based on an agreement between Kings River Water Association and the State of California, dated 11 September 1964.

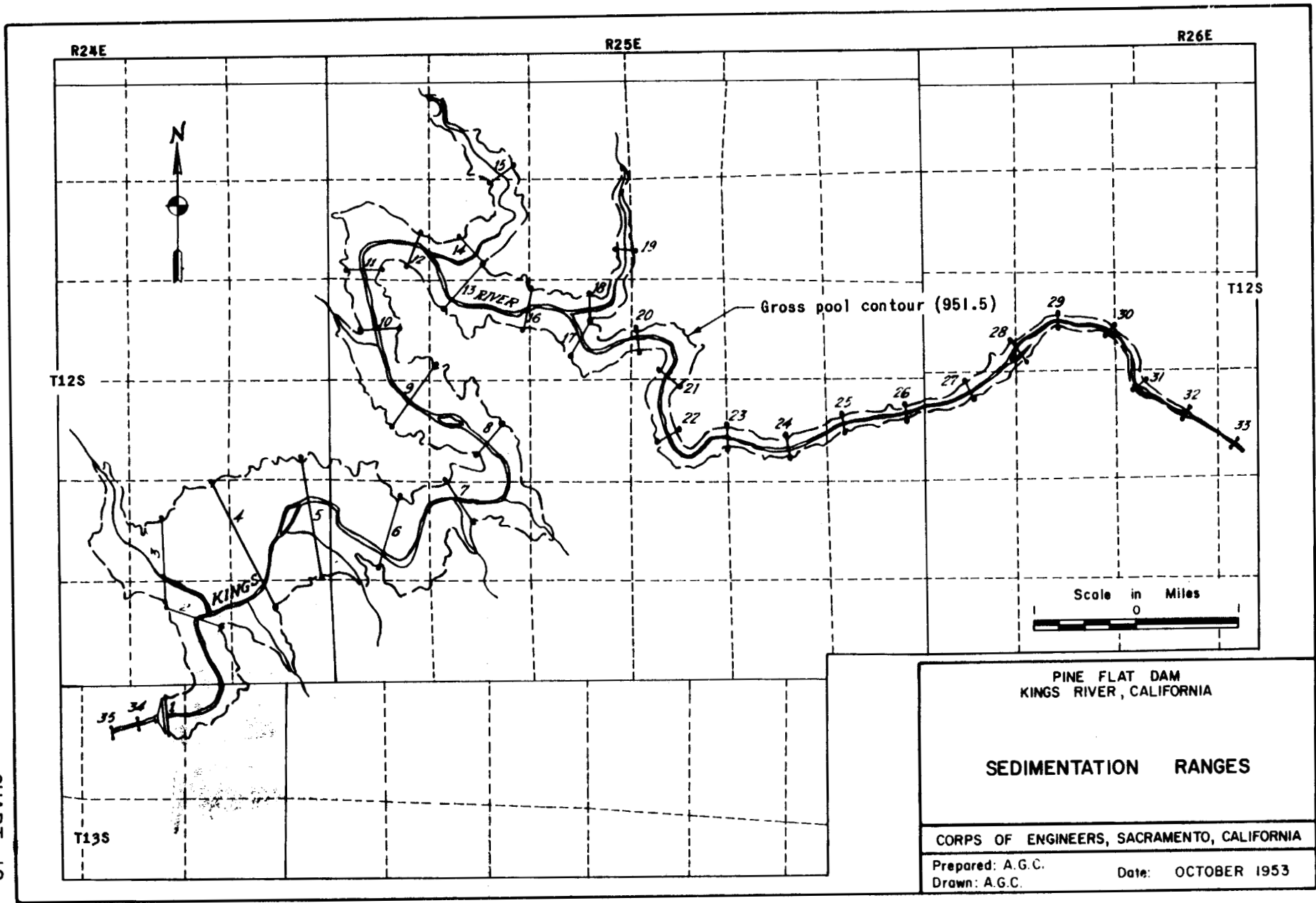
Minimum release from Pine Flat Dam: 25 c.f.s.

Minimum release at the head of Centerville Bottoms:

UNIMPAIRED RUNOFF OF KINGS RIVER AT PIEDRA FOR WATER YEAR (acre-feet)	MINIMUM FLOWS FOR PERIOD (c.f.s.)		
	1 OCTOBER THROUGH 15 NOVEMBER	16 NOVEMBER THROUGH 31 MARCH	1 APRIL THROUGH 30 SEPTEMBER
1,000,000 or less	50	50	50
1,100,000	60	50	60
1,200,000	70	50	70
1,250,000	75	50	75
1,300,000	75	50	80
1,400,000	75	50	90
1,500,000 or more	75	50	100

NOTES:

1. The flow at the head of Centerville Bottoms is defined as the sum of the actual flow of Kings River at Piedra and the discharge from the Friant-Kern Canal into Kings River, decreased by diversions to Gould, Fresno, Alta and Consolidated Canals (exclusive of diversion through canal for China Slough Ditch).
2. The minimum flow requirements shown above increase or decrease proportionally to the nearest cubic foot per second between each stage of unimpaired runoff.
3. The minimum release requirements for the period 1 April through 30 September shall be based on actual flows to date of release plus the forecasted subsequent runoff as determined by California Department of Water Resources, assuming median subsequent hydrologic conditions.
4. The minimum release requirements for the period 1 October through 15 November shall be based on the unimpaired runoff of Kings River at Piedra for the immediately preceding water year.
5. No minimum releases shall be made in excess of the calculated daily unimpaired runoff of Kings River at Piedra.



PINE FLAT DAM
KINGS RIVER, CALIFORNIA

SEDIMENTATION RANGES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: A.G.C. Date: OCTOBER 1953
Drawn: A.G.C.

**TWO HOUR UNIT GRAPH
FOR 750 SQUARE MILES**

TIME IN HOURS	AVERAGE FLOW IN C.F.S.
0	0
2	13,976
4	45,431
6	57,921
8	41,245
10	23,693
12	14,956
14	10,361
16	7,600
18	5,808
20	4,479
22	3,492
24	2,769
26	2,206
28	1,768
30	1,404
32	1,090
34	870
36	722
38	564
40	397
42	286
44	215
46	158
48	110
50	67
52	47
54	33
56	14
58	2
60	0

CHART 19

HISTORIC FLOOD DATA

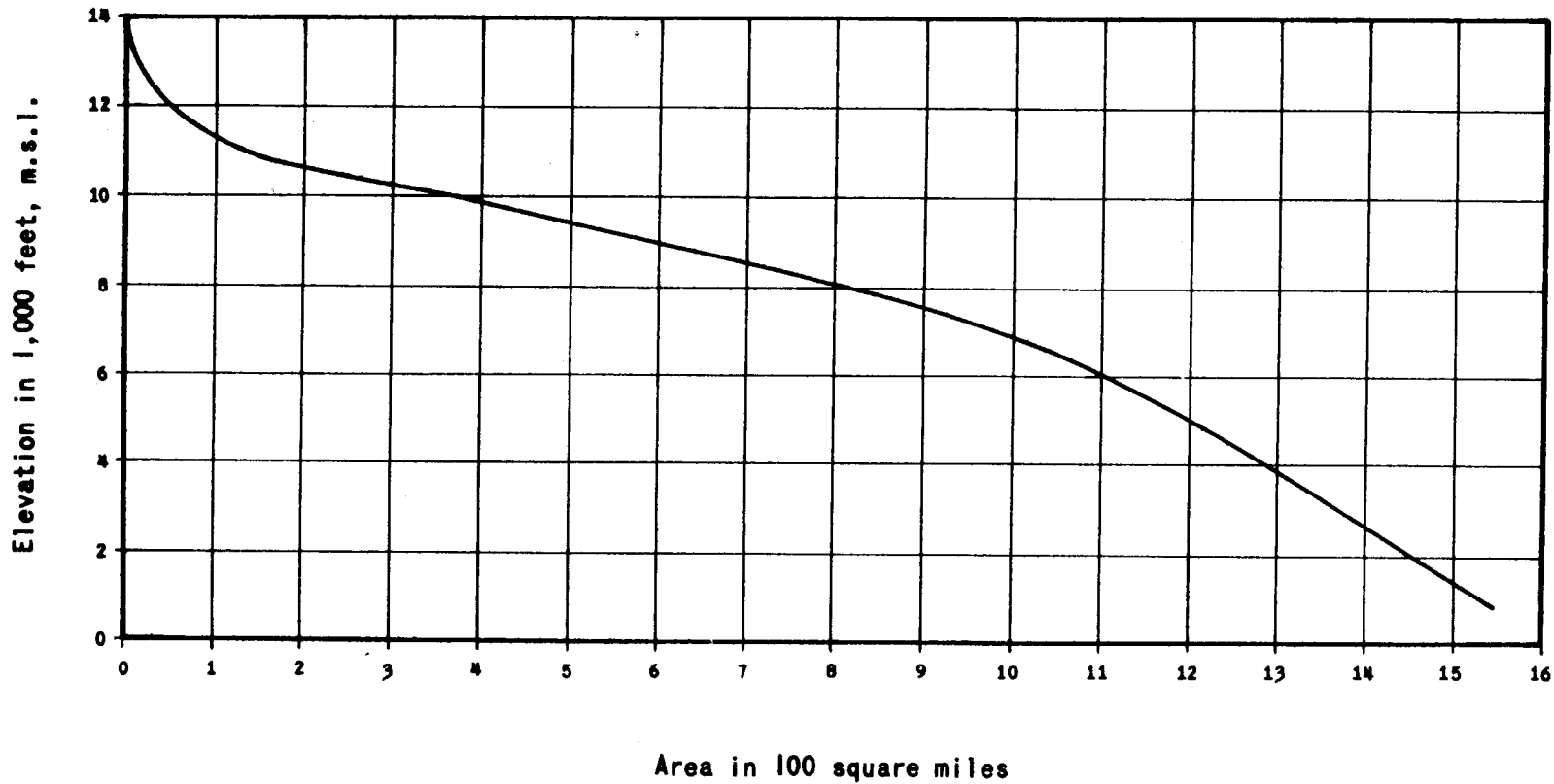
DATE	TOTAL PRECIPITATION (Inches)	34° ELEVATION (Feet MSL)	INITIAL LOSS (Inches)	CONSTANT LOSS RATE (Inches per 2 hours)	FLOW VOLUME AT PIEDRA (Ac-ft)	LOCAL RUNOFF VOLUME AT PIEDRA (Ac-ft)
18-26 Jan 69	24.7	5700	5.8	.4	369000	69500
1- 7 Dec 66	15.7	8000	7.0	.4	224000	18500
18-25 Dec 55	17.1	8100	2.1	.4	30900	21900

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

PINE FLAT LAKE
RAINFLOOD
FORECAST CRITERIA

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M. Date: JUNE 1979
Drawn: M.L.W.



Drainage Area = 1545 sq. mi.

PINE FLAT LAKE KINGS RIVER, CALIFORNIA AREA-ELEVATION CURVE	
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA	
Prepared: L.H.C.	Date: DECEMBER 1978
Drawn: L.H.C.	

SUMMARY OF FORECASTED AND ACTUAL SNOWMELT RUNOFF INTO PINE FLAT LAKE

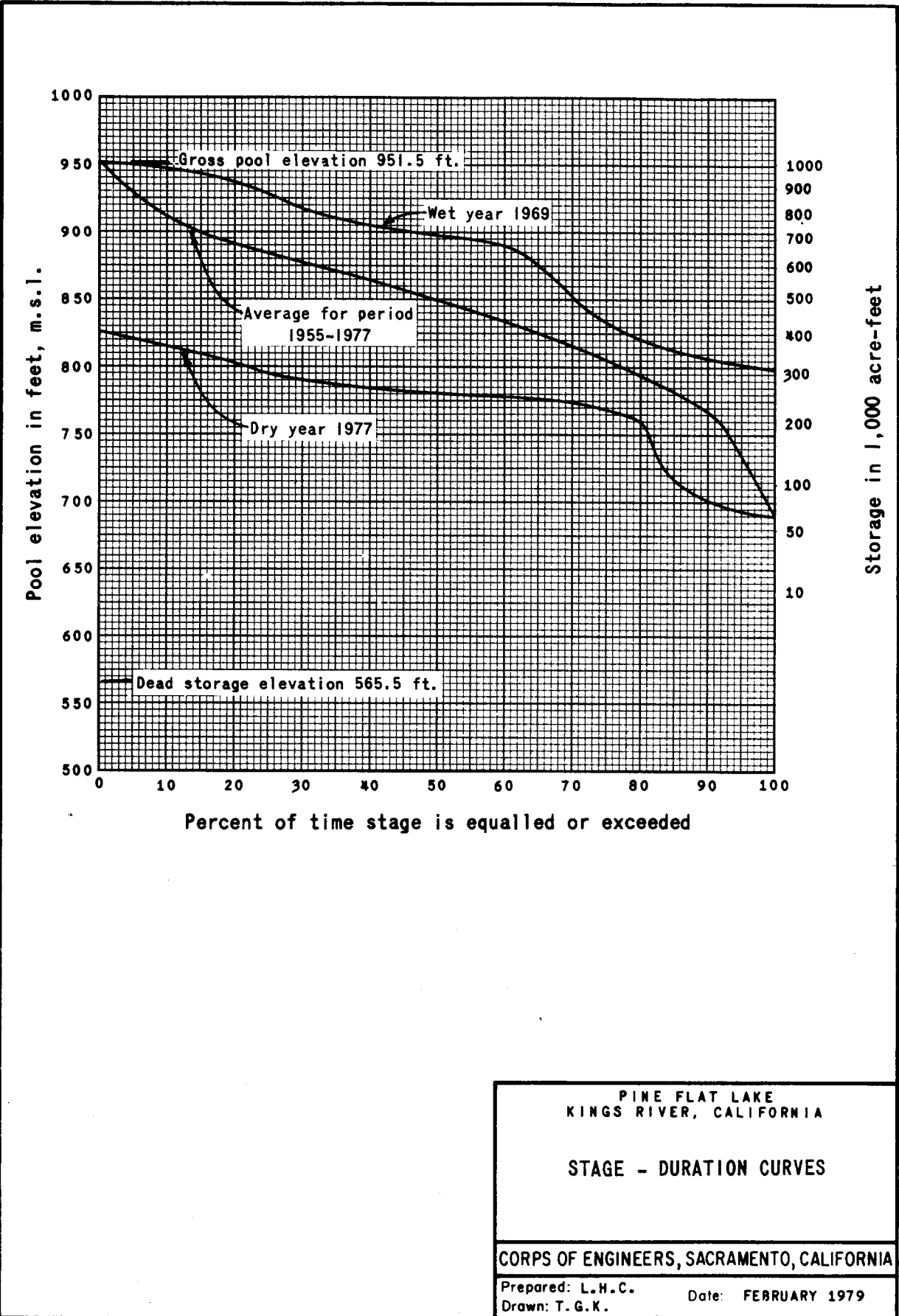
(Flow in 1,000 acre-feet)

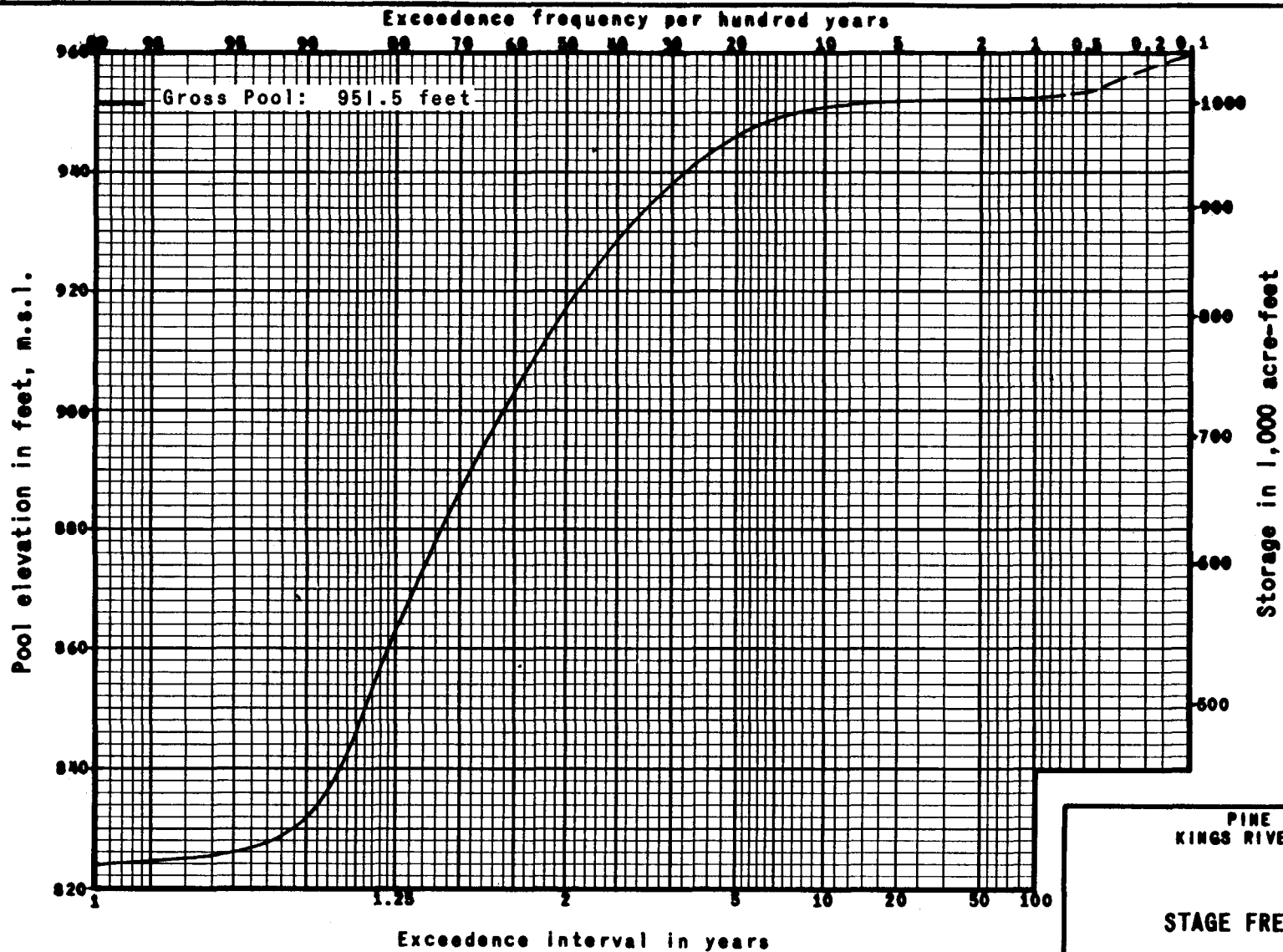
WATER YEAR	ACTUAL	I APRIL - 31 JULY RUNOFF								
		I FEBRUARY			I MARCH			I APRIL		
		FORECAST	ERROR	% ERROR	FORECAST	ERROR	% ERROR	FORECAST	ERROR	% ERROR
1955	860	1,196	+ 336	+ 28	1,148	+ 288	+ 25	739	- 121	- 16
1956	1,591	2,194	+ 603	+ 27	1,847	+ 256	+ 14	1,597	+ 6	0
1957	1,008	849	- 159	- 18	839	- 169	- 20	730	- 278	- 38
1958	1,991	1,150	- 841	- 73	1,260	- 731	- 58	2,150	+ 159	+ 7
1959	528	760	+ 232	+ 30	980	+ 452	+ 46	670	+ 142	+ 21
1960	541	550	+ 9	+ 1	680	+ 139	+ 20	560	+ 19	+ 3
1961	403	770	+ 367	+ 47	500	+ 97	+ 19	420	+ 17	+ 4
1962	1,495	840	- 655	- 77	1,440	- 55	- 3	1,520	+ 25	+ 1
1963	1,423	760	- 663	- 87	770	- 653	- 85	800	- 623	- 78
1964	642	850	+ 208	+ 24	510	- 132	- 26	560	- 82	- 15
1965	1,323	1,500	+ 177	+ 11	1,175	- 148	- 13	1,100	- 223	- 20
1966	833	1,280	+ 447	+ 34	1,090	+ 257	+ 24	780	- 53	- 7
1967	2,321	1,600	- 721	- 45	1,270	- 1,051	- 83	1,650	- 671	- 41
1968	565	930	+ 365	+ 39	720	+ 155	+ 22	620	+ 55	+ 9
1969	3,116	2,200	- 916	- 41	2,900	- 216	- 7	2,950	- 166	- 6
1970	884	1,200	+ 316	+ 26	1,020	+ 136	+ 13	1,000	+ 116	+ 12
1971	820	1,220	+ 400	+ 33	950	+ 130	+ 14	840	+ 20	+ 2
1972	548	1,090	+ 542	+ 49	830	+ 282	+ 34	500	- 48	- 10
1973	1,665	1,320	- 345	- 26	1,610	- 55	- 3	1,840	+ 175	+ 9
1974	1,523	1,380	- 143	- 10	1,130	- 393	- 35	1,450	- 73	- 5
1975	1,266	820	- 446	- 54	980	- 286	- 29	1,350	+ 84	+ 6
1976	303	540	+ 237	+ 43	480	+ 177	+ 36	400	+ 97	+ 24
1977	274	465	+ 191	+ 41	230	- 44	- 19	200	- 74	- 37
1978	2,382	1,600	- 782	- 48	1,945	- 437	- 22	2,350	- 32	- 1
Mean(+)	1,179	1,128	+ 316	+ 31	1,096	+ 215	+ 24	1,116	+ 76	+ 9
Mean(-)	-	-	- 567	- 48	-	- 336	- 31	-	- 204	- 23
Extreme(+)	3,116	2,200	+ 603	+ 48	2,900	+ 452	+ 46	2,950	+ 175	+ 24
Extreme(-)	274	465	- 916	- 87	230	- 1,051	- 85	200	- 671	- 78

GIVEN DATE THROUGH 31 JULY RUNOFF							
I MAY				I JUNE			
ACTUAL	FORECAST	ERROR	% ERROR	ACTUAL	FORECAST	ERROR	% ERROR
738	653	- 85	- 13	408	NA	NA	NA
1,352	1,356	+ 4	0	833	NA	NA	NA
886	636	- 250	- 39	568	NA	NA	NA
1,669	1,721	+ 52	+ 3	918	965	+ 47	+ 4
345	397	+ 52	+ 13	153	NA	NA	NA
375	390	+ 15	+ 4	148	NA	NA	NA
287	243	- 44	- 18	125	NA	NA	NA
1,122	1,057	- 65	- 6	699	NA	NA	NA
1,247	844	- 403	- 48	777	NA	NA	NA
513	401	- 112	- 28	246	NA	NA	NA
1,101	1,080	- 21	- 2	690	NA	NA	NA
559	466	- 93	- 20	190	NA	NA	NA
2,104	2,030	- 74	- 4	1,497	1,290	- 207	- 16
425	410	- 15	- 4	178	NA	NA	NA
2,719	2,600	- 119	- 5	1,602	1,585	- 17	- 1
752	818	+ 66	+ 8	354	NA	NA	NA
668	618	- 50	- 8	395	NA	NA	NA
443	330	- 103	- 31	198	NA	NA	NA
1,454	1,550	+ 96	+ 6	705	NA	NA	NA
1,289	1,296	+ 7	+ 1	670	NA	NA	NA
1,160	1,380	+ 220	+ 16	638	NA	NA	NA
229	302	+ 73	+ 24	69	NA	NA	NA
203	125	- 78	- 62	120	NA	NA	NA
2,107	2,325	+ 218	+ 9	1,419	NA	NA	NA
989	959	+ 80	+ 9	567	1,280	+ 47	+ 4
-	-	- 108	- 21	-	-	- 112	- 8
2,719	2,600	+ 220	+ 24	1,602	1,585	+ 47	+ 4
203	125	- 403	- 62	69	965	- 207	- 16

NOTES:

1. NA = Not Available.
2. Forecasts prepared and published by State of California.
3. Computed error based on past performance is not necessarily indicative of the accuracy that may be achieved in the future.





PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

STAGE FREQUENCY CURVE

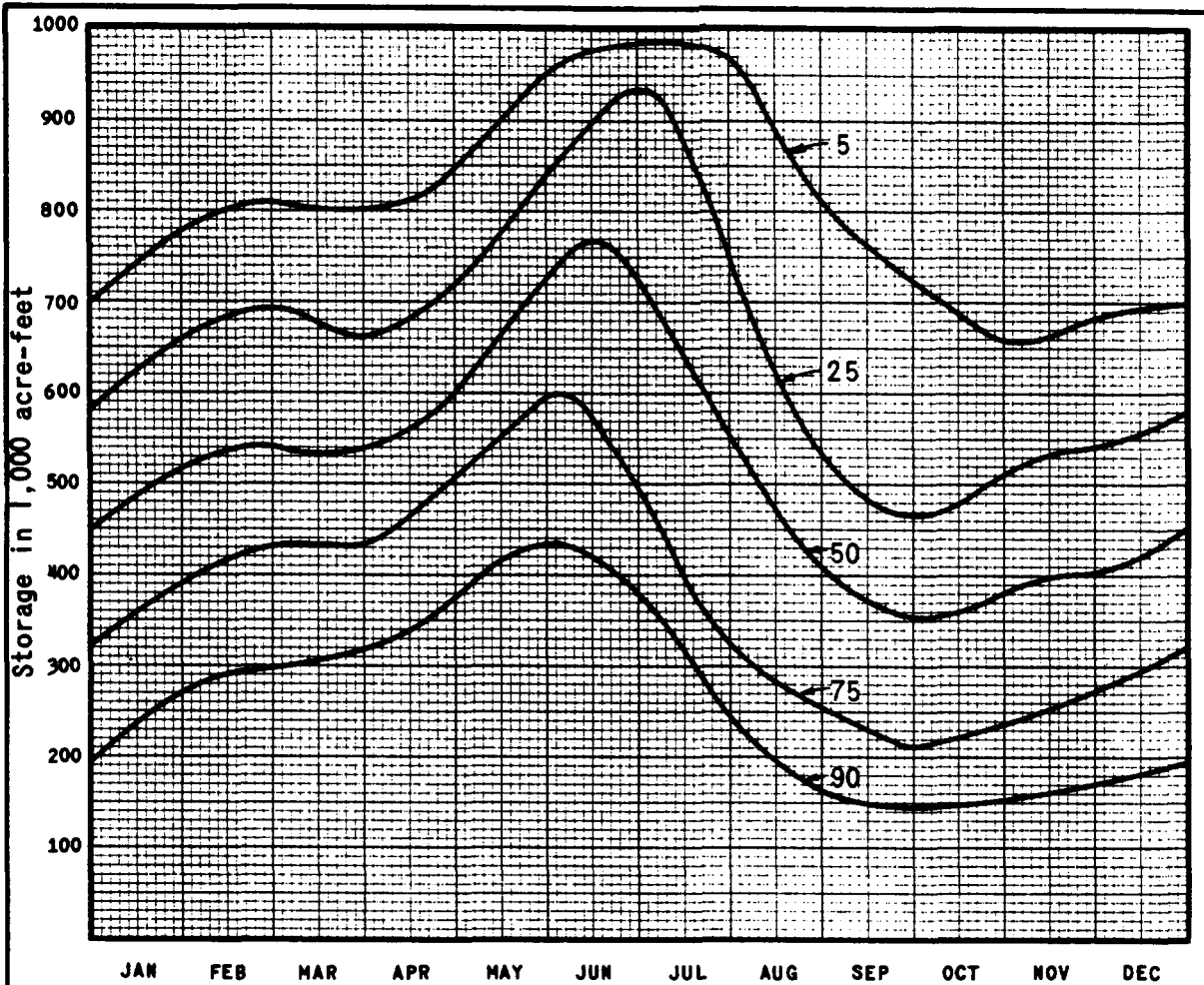
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Drainage Area = 1545 sq. mi.

Prepared: L.H.C.

Date: FEBRUARY 1979

Drawn: L.H.C.



NOTE:

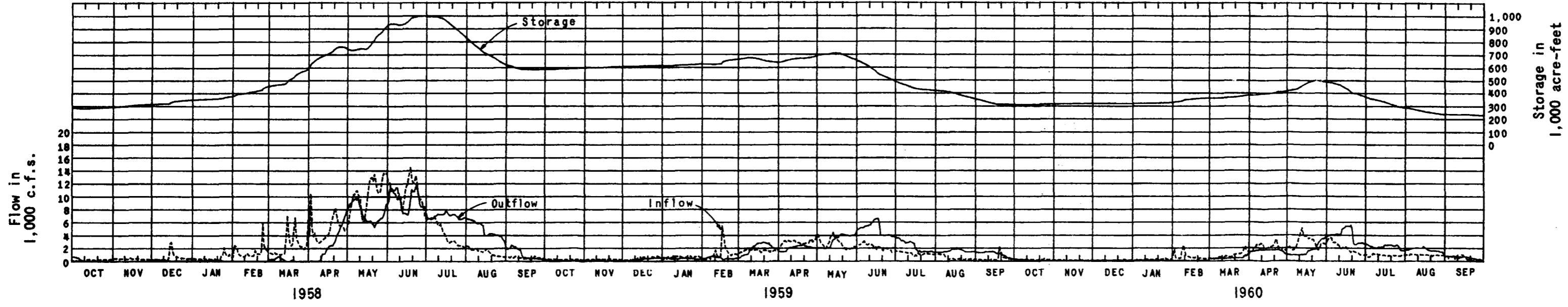
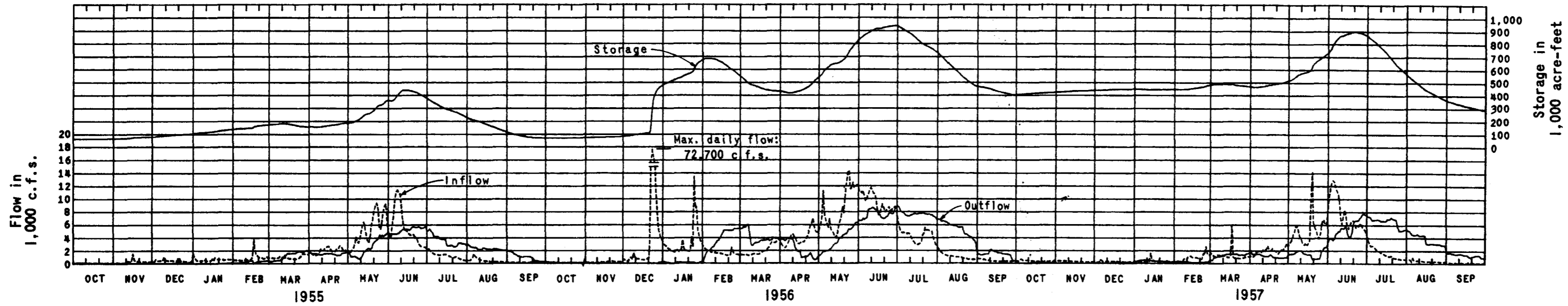
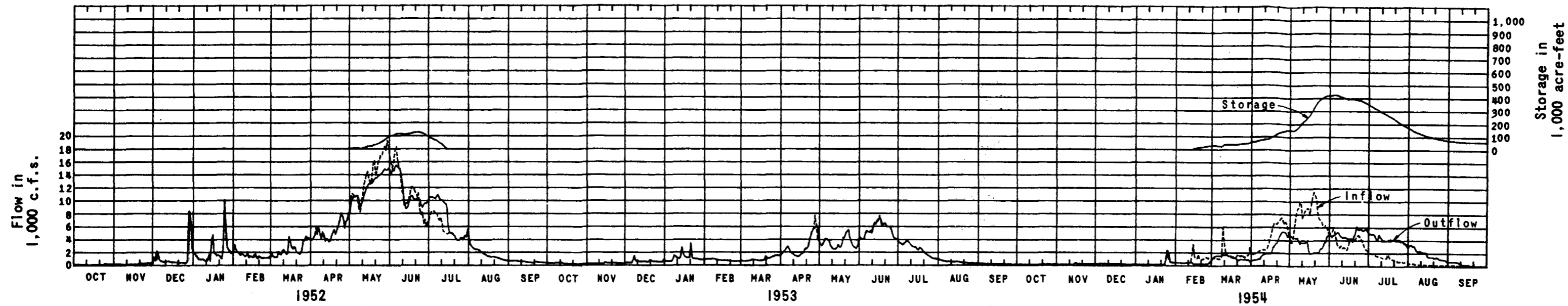
Indicated value is percentage of years that storage is exceeded on a given date based on total end of month storage for the years 1955-1978. Data extracted from U.S.G.S. water supply papers.

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

**SEASONAL VARIATION
OF RESERVOIR STORAGE**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: L.H.C. Date: DECEMBER 1978
 Drawn: L.H.C.

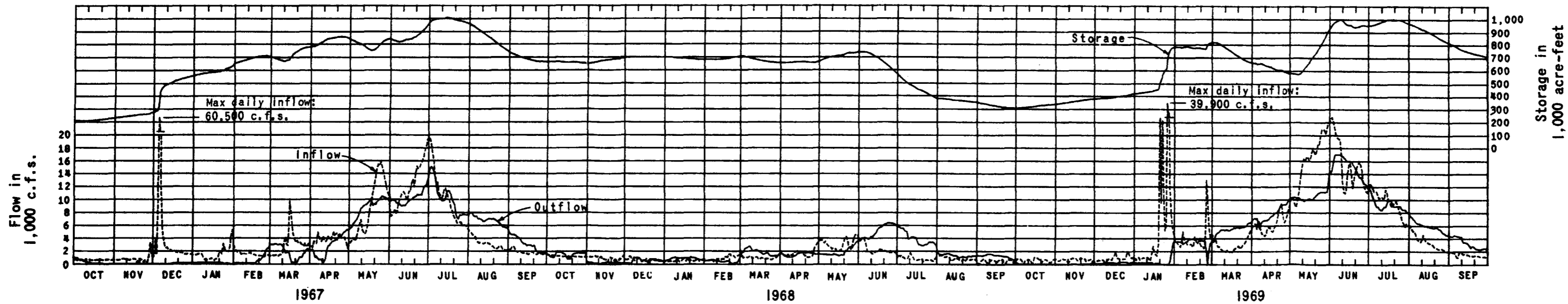
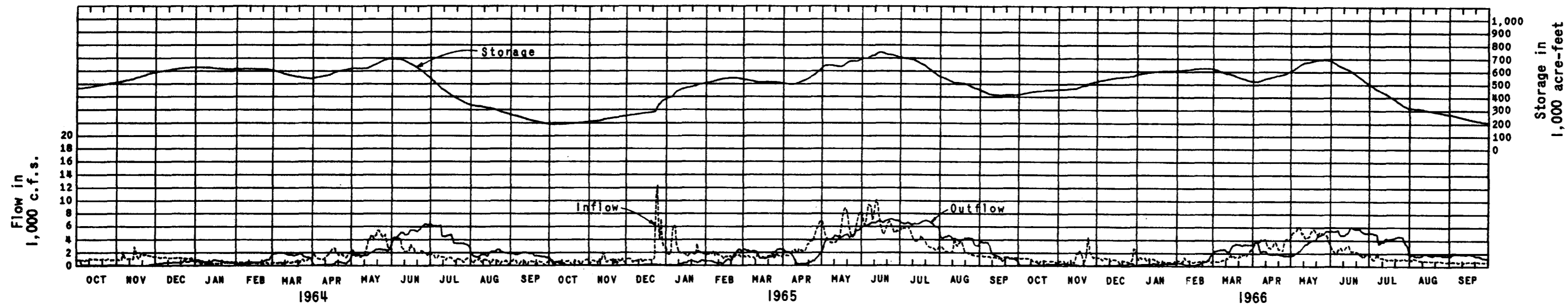
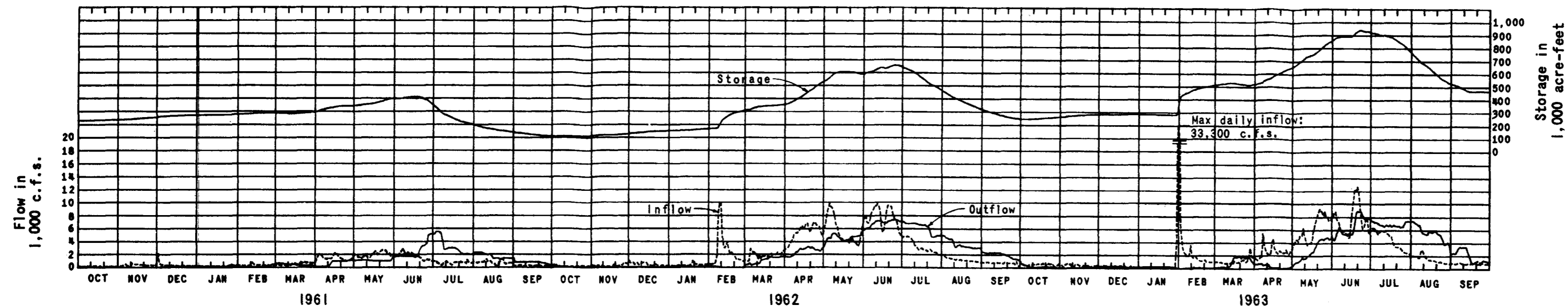


PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

**HISTORICAL OPERATION
PINE FLAT LAKE**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

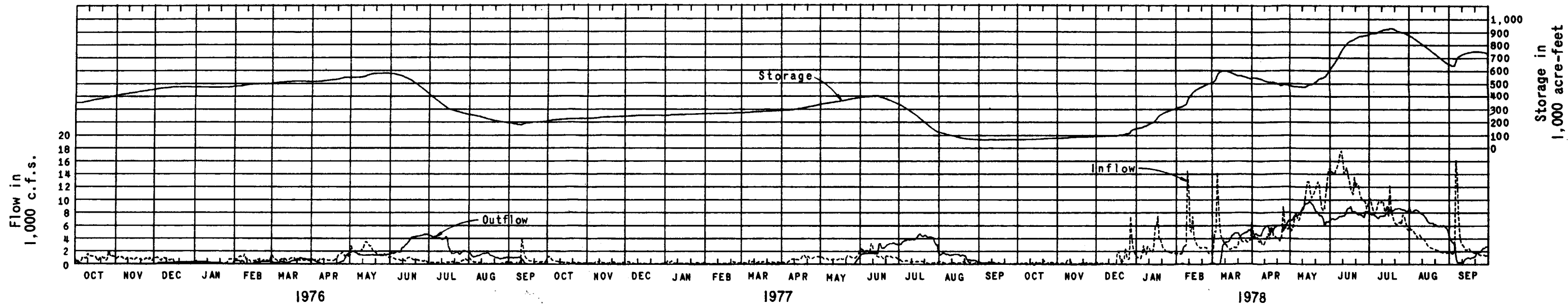
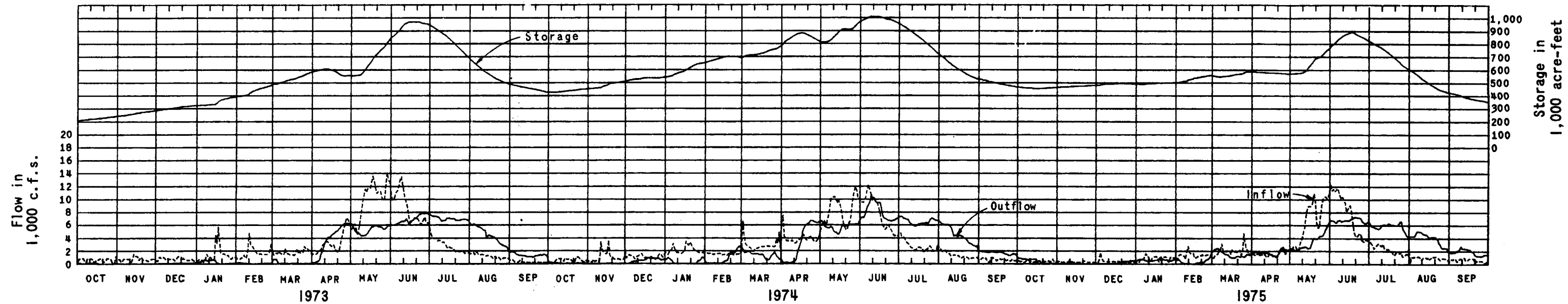
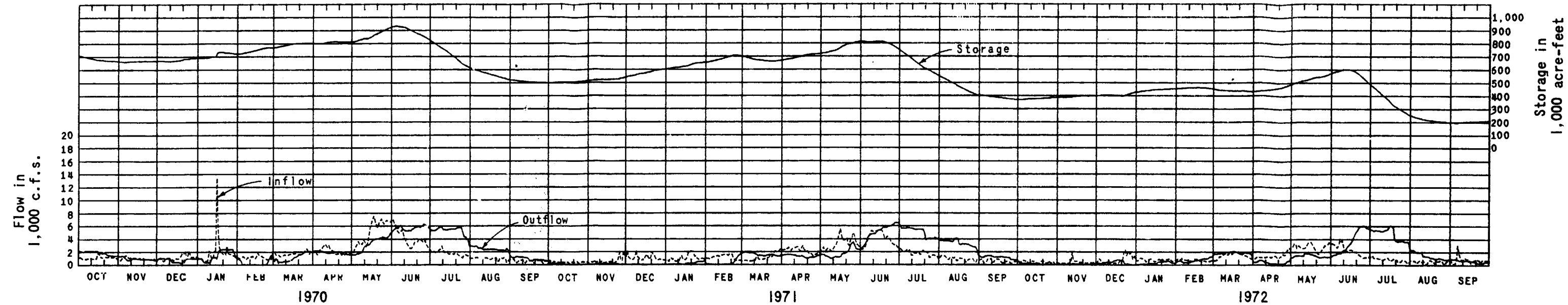
Prepared: H.T.M. Date: JUNE 1979
Drawn: L.H.C.



PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

HISTORICAL OPERATION
PINE FLAT LAKE

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA
Prepared: H.T.M. Date: JUNE 1979
Drawn: L.H.C.



PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

HISTORICAL OPERATION
PINE FLAT LAKE

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

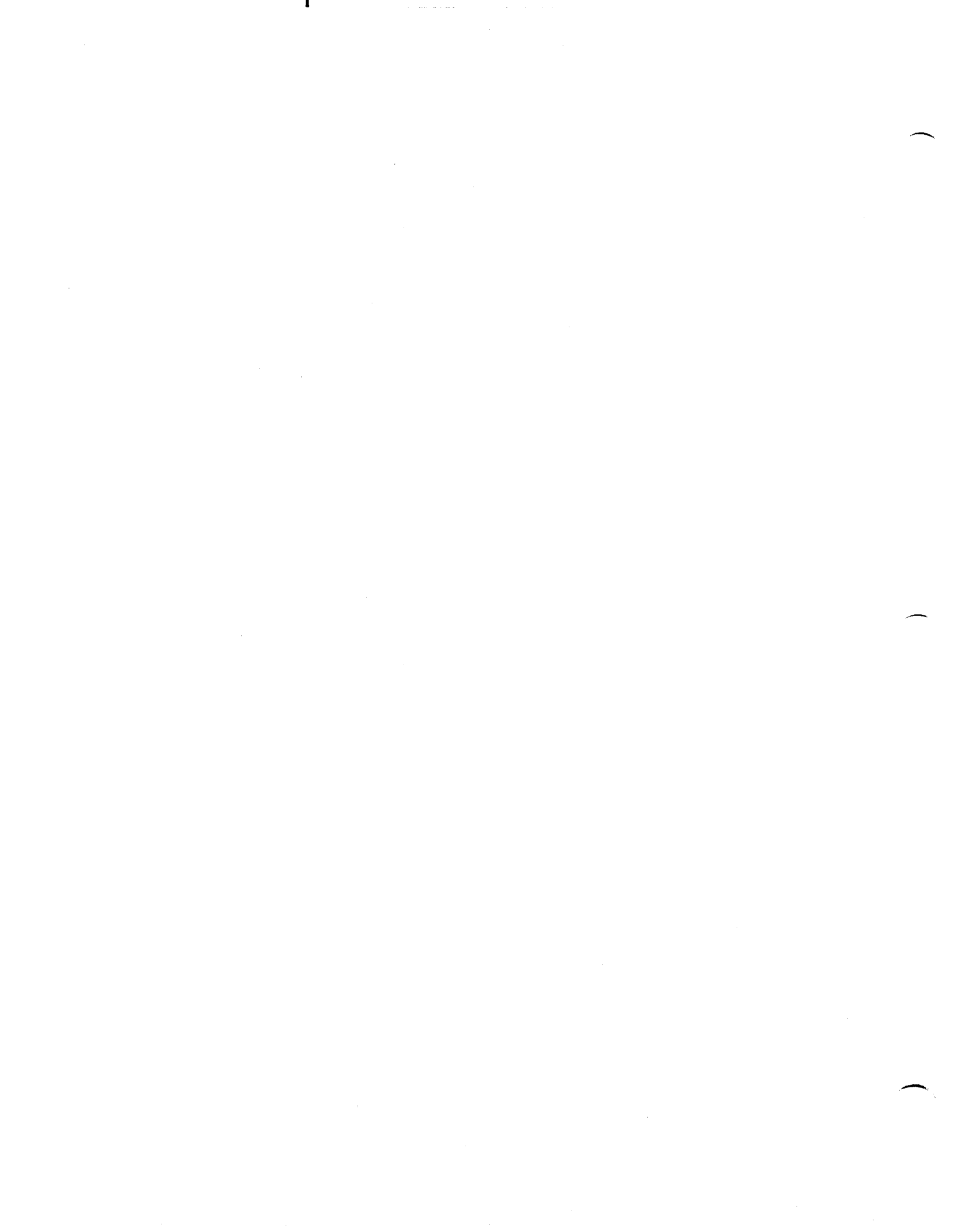
Prepared: H.T.M. Date: JUNE 1979
Drawn: L.H.C.

RESERVOIR REGULATION MANUAL
FOR
PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

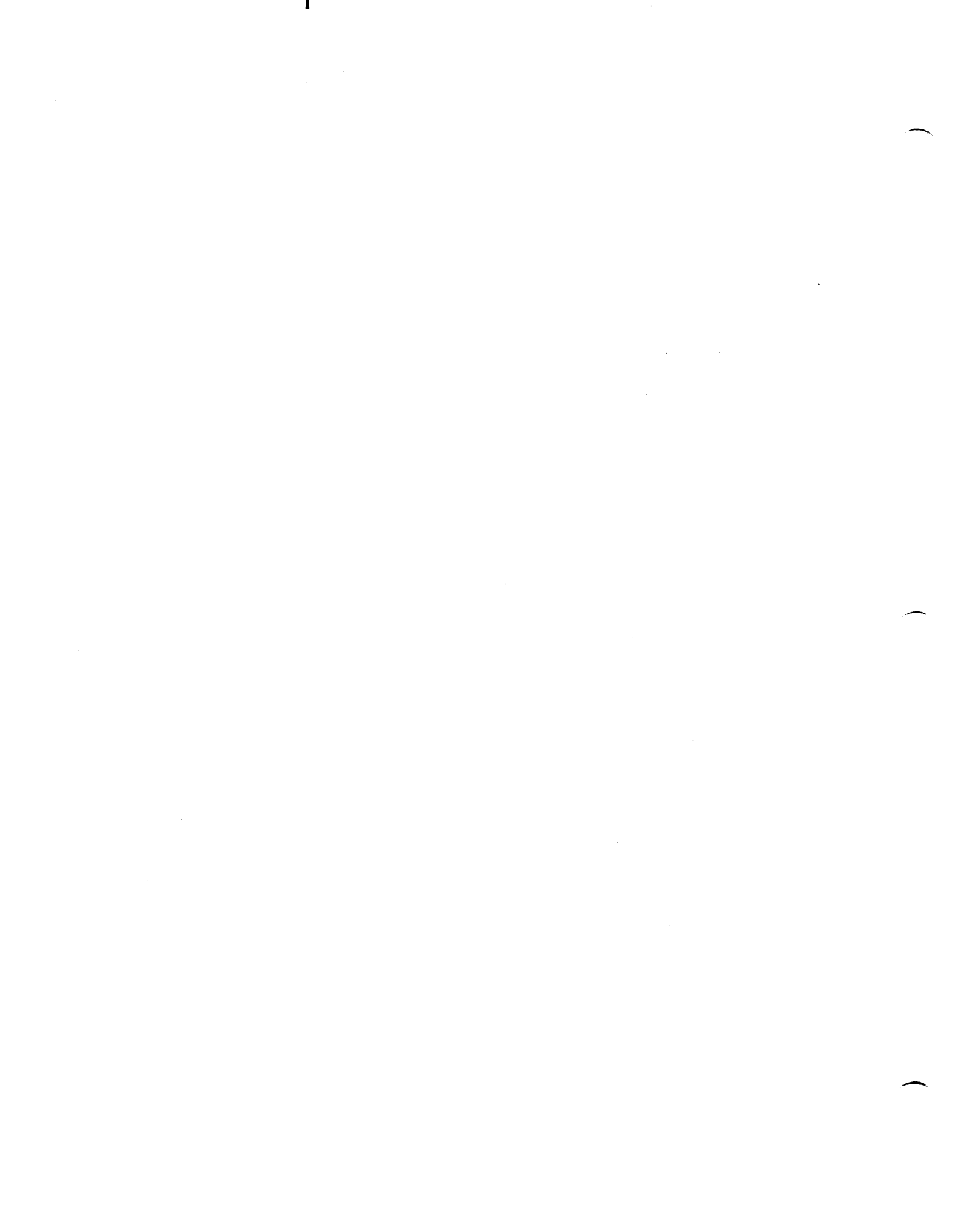
APPENDIX A
STANDING OPERATING INSTRUCTIONS

November 1953
Rev. September 1979

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA







RESERVOIR REGULATION MANUAL
FOR
PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

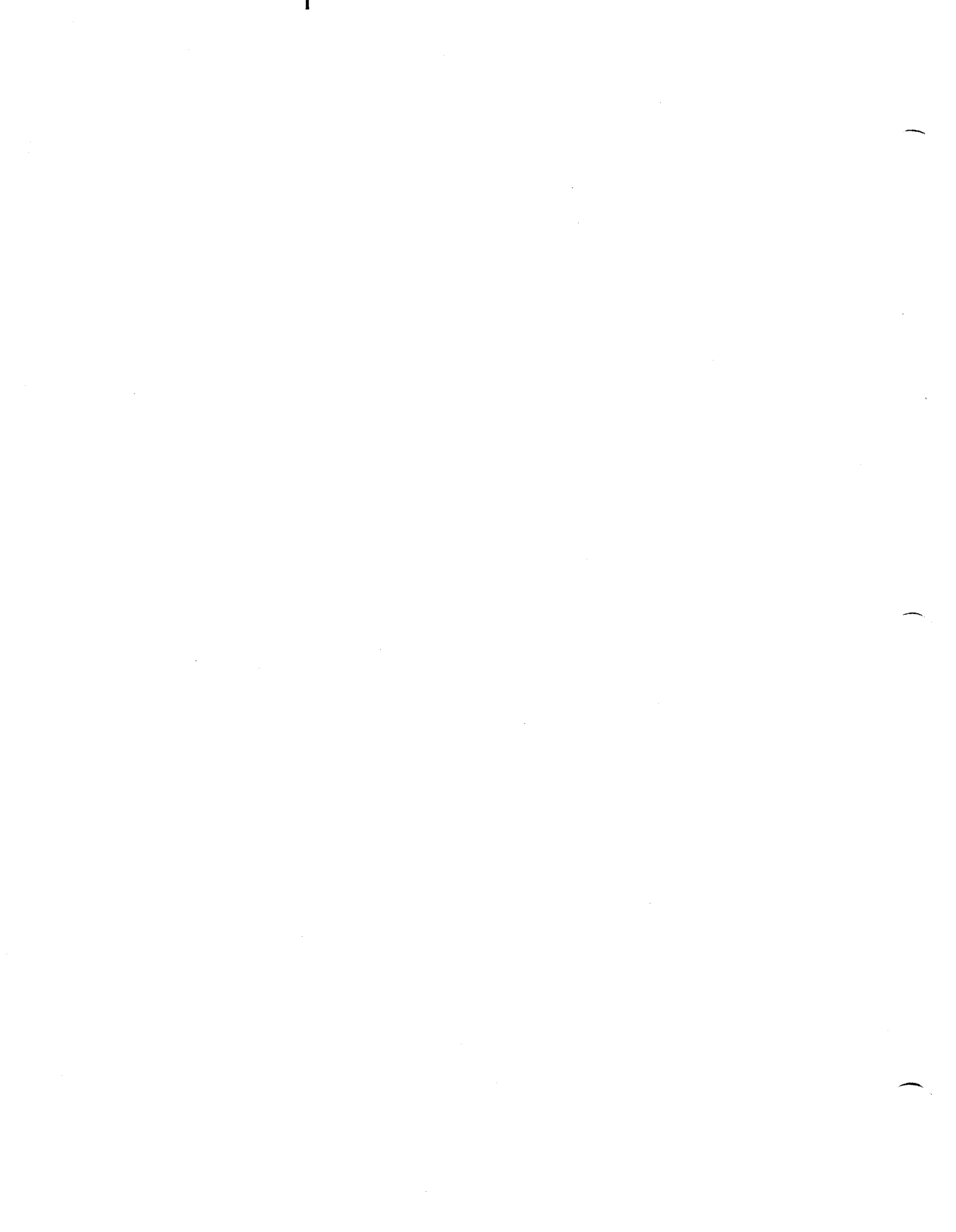
APPENDIX A
STANDING OPERATING INSTRUCTIONS

TABLE OF CONTENTS

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3	Limitations on Storage	A-2
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5	Outlet Works	A-2
6	Flood Control Operation	A-4
7	Conservation Operation	A-4
8	Operation Reports	A-4
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10	Computation of Hydrologic Data	A-6
11	Standing Instruction During Flood Emergency	A-8
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LIST OF CHARTS

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A-2	Area and Capacity Table - Pine Flat Lake
A-3	Evaporation Coefficients
A-4	Spillway and Outlet Rating Curves
A-5	Discharge Rating Curves
A-6	Downstream Channel Capacities
A-7	Emergency Spillway Release Diagram
A-8	Flood Control Diagram



1. GENERAL

a. This appendix to the "Reservoir Regulation Manual, Pine Flat Lake, Kings River, California" is prepared in accordance with instructions contained in EM 1110-2-3600, paragraph 4-07 (Standing Instructions to Dam Operators) and pertains to duties and responsibilities of the Dam Operator in connection with the functional operation of Pine Flat Lake for flood control, and the reporting of required hydrologic data.

b. Operational instructions to the Dam Operator are briefly outlined with specific emphasis on the Dam Operator's duties and responsibilities during extreme flood emergencies when communication facilities between the dam and Sacramento District Office are disrupted. It is designed for optional separation from the manual, and used as an emergency flood control regulation guide, or as published in conjunction with the "Reservoir Regulation Manual, Pine Flat Lake." To facilitate independent use of this appendix, charts required for emergency flood control operation of Pine Flat Lake are included.

2. OPERATION REQUIREMENTS

Operation of Pine Flat Lake is accomplished by Corps of Engineers personnel under supervision of the Construction-Operations Division of the Sacramento District Office, with instructions on all matters covering flood control operation received directly from the Reservoir Control Section of the Engineering Division. The Park Manager is responsible for:

a. Accomplishing the physical operation of the reservoir in accordance with instructions contained in this manual or issued by the Reservoir Control Section. During storms, this will often require 24-hour attendance at the dam.

b. Calculating and maintaining a continuous provisional record of inflows, outflows, storage, weather data, upstream reservoir storages, and other data specified by the Reservoir Control Section. This information should be recorded on forms designed for that purpose.

c. Reporting by radio (or telephone) to the Reservoir Control Section such data as outlined in paragraphs 8 and 9, and other data that may be requested from time to time.

d. Keeping local interests continuously advised of the operation of the reservoir.

e. Reporting to the Reservoir Control Section any unusual condition in the reservoir or along the downstream channels which might interfere with the planned operation of the reservoir.

f. Maintaining all trash racks clear of trash in order that the outlet gates can be operated systematically and effectively.

g. Maintaining a log of gate operation on the appropriate form furnished, containing (1) change in position of gates, (2) date and time, (3) reservoir water level, and (4) the initials of the individual accomplishing the change.

h. Immediately after the end of each month, dispatching the data specified in paragraph b to the Reservoir Control Section.

i. Making emergency operation changes when contact with the District Office is broken and a clearly defined change occurs that warrants immediate action. Charts A-1 through A-8 are included for use in accomplishing the various operational requirements specified above, and in preparing the required operation reports listed in paragraph 8.

3. LIMITATIONS ON STORAGE

Operational limitations on storage in Pine Flat Lake are specified in paragraphs 6 and 7. There are no legal limitations on storage, as the taking line elevation (961 feet) is above any normal operation level.

4. LIMITATIONS ON RELEASES

Unless flood releases are required, outflows will depend on irrigation and fish requirements. These requirements will be determined by the Kings River Watermaster. Also, any necessary releases in excess of irrigation demands should be restricted as long as possible to channel capacities as listed on chart A-6, or as otherwise determined by the Corps of Engineers. Releases of flood water to Tulare Lake will be delayed as long as possible in order to permit harvesting of crops. Flows in Kings River North should be restricted when they would cause San Joaquin River flows to exceed preproject quantities.

5. OUTLET WORKS





6. FLOOD CONTROL OPERATION

a. The release schedule for flood control operation of Pine Flat Reservoir, until emergency spillway releases are required, is given on chart A-8. This diagram is designed to reserve the necessary flood control space during the winter season to control rain floods and to prepare for possible spring snowmelt floods. After February when snowmelt forecasts become available, the diagram indicates the space required to control snowmelt runoff based on the forecast. If the space available is less than that required, the diagram indicates the release in excess of irrigation demand (supplemental release) that must be made to provide protection from snowmelt floods while filling the reservoir at the end of the season. Runoff forecasts shall be provided by the State of California, and releases shall be determined by the Reservoir Control Section of the Corps of Engineers.

b. When the reservoir water surface is near spillway crest elevation (916.5 feet) and the pool is rising rapidly, the reservoir operator shall make frequent checks on the pool elevation and rate of rise and shall keep the Reservoir Control Section informed. The Reservoir Control Section shall then determine whether greater releases are required by the emergency spillway release diagram, chart A-7.

7. CONSERVATION OPERATION

Irrigation releases, including water desired in the Tulare Lake area, should be requested on a day-to-day basis by the Kings River Watermaster. Operation for conservation in accordance with the interim contract with local interests is as follows:

a. All inflow in excess of the release requested by the Kings River Watermaster is stored to the extent that conservation space in the reservoir is available.

b. Water stored for irrigation is released in accordance with the requests of the Kings River Watermaster, which are normally made directly to the reservoir operator.

8. OPERATION REPORTS

a. The reservoir operator shall report the following data by radio or telephone to the Reservoir Control Section each work day between 7:30 a.m. and 9:00 a.m.:

- (1) Reservoir stage and storage as of midnight.
- (2) Reservoir storage increment (ending at midnight).
- (3) Pan evaporation.
- (4) Lake evaporation.

- (5) Mean daily flows (ending at midnight) of:
 - (a) Kings River below Pine Flat Dam.
 - (b) Kings River below North Fork.
 - (c) Mill Creek near Piedra.
 - (d) Total inflow.
- (6) Storages in upstream reservoirs.
- (7) Preproject flow.
- (8) Daily precipitation at the dam as measured at 7:00 a.m. and seasonal total to date.
- (9) Inches (total and change) of snow at 7:00 a.m., reported by radio reporting hydraulic gages.

When conditions do not warrant weekend or holiday reports, complete reports for each day shall be made on the first day following the non-reporting period. More frequent reports of the above information and reports of other Kings River data will be made in the same manner when requested by the Reservoir Control Section. Forms furnished to the operators are to be used in computing the above information.

b. Immediately after the end of each month, the reservoir operator will dispatch to the Reservoir Control Section all original forms used for observations and computations as specified in paragraphs 2b, 2g and 8a above. The charts and punch tapes for that month from the following instruments will be included.

- (1) Recording precipitation gage chart.
- (2) Reservoir level recorder punch tape.
- (3) Remote recording gages punch tapes.

9. SPECIAL WEATHER AND FLOOD REPORTS

a. During the rainflood season, 1 October to 1 May, the reservoir operator shall call the Reservoir Control Section immediately whenever one of the following occurs:

- (1) One inch or more of rainfall occurs at the project during any 6-hour period or 1.5 inches of rainfall during any 24-hour period.
- (2) An increase in flow of 2,000 c.f.s. or more at the Kings River inflow station during any 8-hour period.

b. Any special report based on one of the foregoing criteria should include the latest available data concerning the other. On non-working days or at night, these special reports should be telephoned directly to the the Chief of the Reservoir Control Section or his designated alternate.

10. COMPUTATION OF HYDROLOGIC DATA

a. The required hydrologic data to be reported, as specified in paragraph 8 above, for the use in operation of Pine Flat Lake and for official record purposes may be obtained or computed as follows:

(1) Reservoir stage is obtained from the recording pool gage at the dam and storage is obtained from the Pine Flat Lake area-capacity table.

(2) Reservoir storage increment is the algebraic difference between the previous day's recorded midnight storage and the most recent midnight storage.

(3) Pan evaporation is obtained from the class A evaporation land pan located at Pine Flat Dam.

(4) Lake evaporation in inches is equal to the pan evaporation in inches multiplied by the evaporation coefficient shown on chart A-3. For this computation, pan evaporation as measured at 7:00 a.m. is used to compute lake evaporation for the previous day.

(a) Pan evaporation (inches):

x Gross Evaporation Coefficient

12

x Average Lake Area (acres) = Acre-Feet
(Round to nearest acre-foot for next
computation)

Acre-Feet x 0.50417* = s.f.d. = mean c.f.s.
for 24-hours.

*Coefficient shown is for 24-hour day. When changing to daylight savings time or from daylight savings time the coefficients are as follows: for 23-hour day (change to D.S.T.) use 0.52609; for 25-hour day (change from D.S.T.) use 0.48400.

(b) Lake area used when computing evaporation will be the average area for the day; obtained by averaging the midnight areas at the beginning and ending of the period being computed.

(5) Procedures used to compute mean daily flows are detailed in subparagraph 10b below. The gage heights to compute flows required in sub-paragraph 8a (5) should be obtained as follows:

- (a) Kings River below Pine Flat Dam from gage reading.
- (b) Kings River below North Fork from gage reading.
- (c) Mill Creek near Piedra from gage reading.

(d) Computed mean inflow to the lake will be taken as the algebraic sum of the mean outflow, change in lake storage, and evaporation for the lake water surface and will represent mean inflow to the lake from all sources including rainfall on the lake surface.

$$\begin{aligned} &\text{Mean Daily Outflow (c.f.s.) +} \\ &\text{Change in Lake Storage (s.f.d.) +} \\ &\text{Evaporation (s.f.d.) =} \\ &\text{Mean Inflow (c.f.s.)} \end{aligned}$$

(6) Computed preproject flow at the lake will be the mean daily inflow plus evaporation losses from the upstream power reservoirs, (Wishon, Courtright), plus the gain (or minus the loss) in total storage in the four upstream reservoirs (Wishon, Courtright, Balch FB, and Balch AB). When important, an allowance for 12 hours travel time from Wishon and Courtright reservoirs to Pine Flat will be made.

(7) Computed preproject flow at Piedra will be the mean daily preproject flow as computed in subparagraph 10a(6) above, plus Mill and Hughes Creek mean daily flows.

(8) Obtain Kings River below North Fork from radio telemark streamgage.

(9) Precipitation at the dam is measured at the weather station.

b. Mean Daily Flow Computations

(1) Check punch tape for errors in gage height and for time. Time is corrected to the current 15 minutes; gage height to the nearest .01 foot.

(2) Tabulate correct gage height readings at odd hours, starting with 0100 hours. Punch tape correction, if any, should be noted.

(3) Enter current rating table, using shifts as applicable, determine and list flow at each odd hour, using the procedure as indicated for mean daily flow in paragraph 10b (5) below.

(4) Total the 12 flow readings so obtained and divide by 12. This is the mean daily flow.

(5) Mean daily flow will be listed to nearest 0.1 c.f.s. for flows up to 10 c.f.s., and to the nearest 1 c.f.s. for flows above 10 c.f.s. Such values will later be rounded to 3 significant figures by the USGS prior to publication.

(6) When calculating discharge from gage height with a (-) shift correction, enter rating table below the actual height, i.e., if actual gage height is 4.86 and shift is -.02, enter rating table at 4.84 to obtain discharge. For (+) shift, enter rating table above actual gage height.

(7) In order to calculate the gage height for a desired flow under a (-) shift condition, add amount of (-) shift to gage height obtained from table for desired discharge, i.e., if shift is -.03, desired discharge is 5,000 c.f.s., and rating table shows gage height of 10.20 = 5,000 c.f.s., required gage height for 5,000 c.f.s. is $10.20 + .03 = 10.23$. For (+) shift, subtract amount of shift from gage height obtained from table for desired discharge.

11. STANDING INSTRUCTIONS DURING FLOOD EMERGENCY

a. Flood Control operation shall be in accordance with instructions from the Reservoir Control Section. During flood periods, close contact will be maintained between project and District personnel on a 24-hour per day basis or as otherwise required.

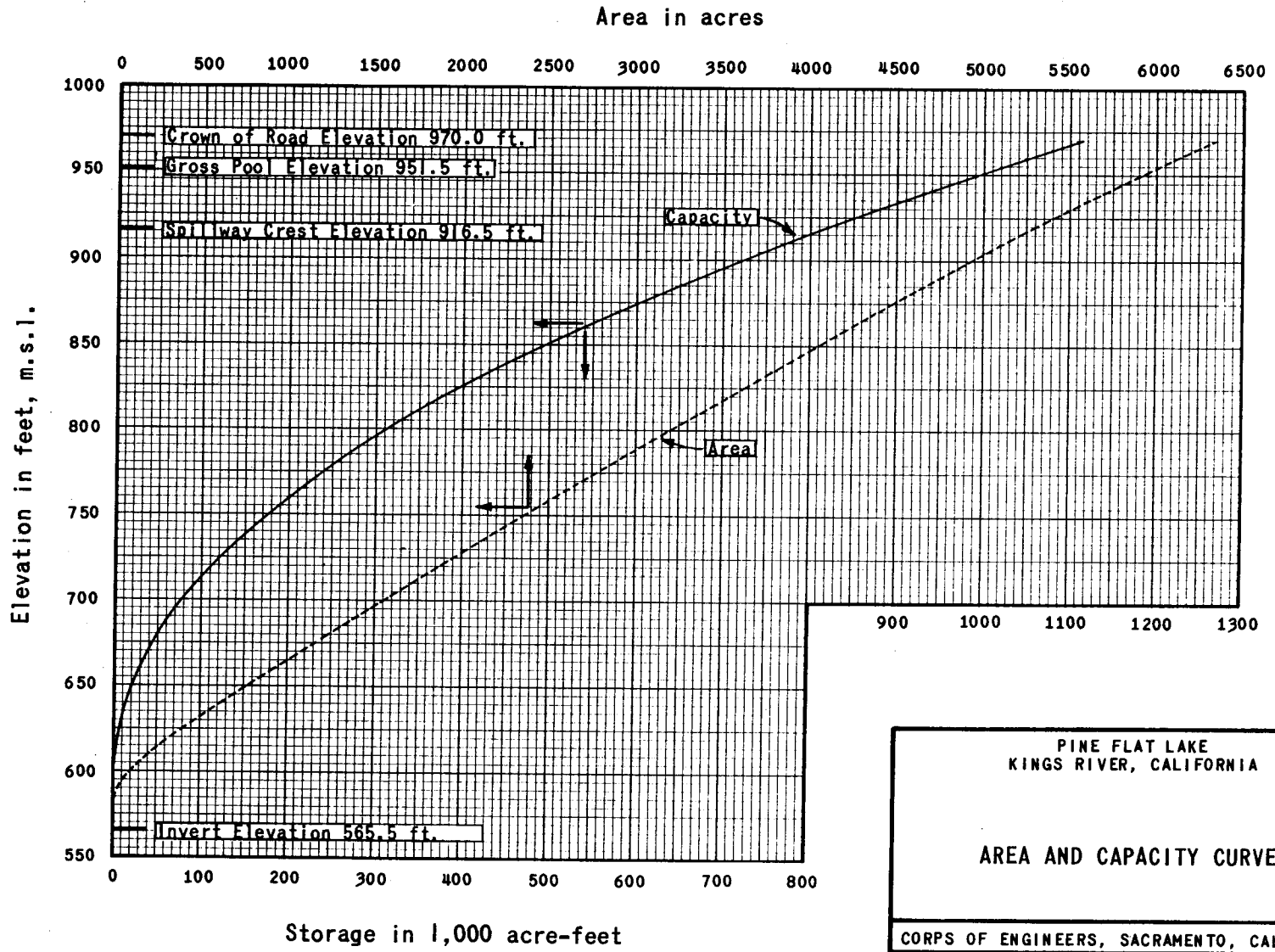
b. If communication is broken between the operating personnel and the Sacramento District Office during a flood emergency, the following procedure is recommended:

(1) Continue releases in accordance with the last instructions received from the Sacramento District and make every attempt to re-establish communication.

(2) If communications cannot be re-established and larger releases are required by the emergency spillway release diagram (chart A-7), release should be increased in accordance with the diagram.

12. MODIFICATION OF INSTRUCTIONS

The operating rules contained herein are subject to temporary modification by the District Engineer during flood or other emergencies. Major changes in the operating rules are subject to prior approval by the Chief of Engineers.



PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

AREA AND CAPACITY CURVES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M., T.G.K. Date: _____

Drawn: T.G.K.

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
600.0	423 101	433 102	443 103	454 104	464 105	475 106	485 107	496 108	507 109	518 110
601.0	529 111	540 112	551 113	563 114	574 115	586 116	597 117	609 118	621 119	633 120
602.0	645 121	657 122	669 123	682 124	694 125	707 126	720 127	732 128	745 129	758 130
603.0	771 131	784 132	798 133	811 134	825 136	838 137	852 138	866 139	880 140	894 141
604.0	908 142	922 143	936 144	951 145	965 146	980 147	995 148	1010 149	1025 150	1040 151
605.0	1055 153	1070 154	1086 155	1101 156	1117 157	1133 158	1148 159	1164 160	1181 161	1197 162
606.0	1213 164	1229 165	1246 166	1263 167	1279 168	1296 169	1313 170	1330 171	1347 172	1365 174
607.0	1382 175	1400 176	1417 177	1435 178	1453 179	1471 180	1489 182	1507 183	1526 184	1544 185
608.0	1563 186	1581 187	1600 188	1619 190	1638 191	1657 192	1676 193	1696 194	1715 195	1735 197
609.0	1755 198	1774 199	1794 200	1814 201	1835 202	1855 204	1875 205	1896 206	1916 207	1937 208
610.0	1958 210	1979 211	2000 212	2022 213	2043 214	2064 216	2086 217	2108 218	2130 219	2152 220
611.0	2174 222	2196 223	2218 224	2241 225	2263 226	2286 228	2309 229	2332 230	2355 231	2378 233
612.0	2401 234	2425 235	2448 236	2472 237	2496 239	2520 240	2544 241	2568 242	2592 244	2617 245
613.0	2641 246	2666 247	2691 249	2716 250	2741 251	2766 252	2791 254	2817 255	2842 256	2869 257
614.0	2894 259	2920 260	2946 261	2972 262	2998 264	3025 265	3051 266	3078 267	3105 269	3132 270
615.0	3159 271	3186 273	3213 274	3241 275	3268 276	3296 278	3324 279	3352 280	3380 282	3408 283
616.0	3436 284	3465 285	3493 287	3522 288	3551 289	3580 291	3609 292	3638 293	3668 294	3697 296
617.0	3727 297	3757 298	3787 300	3817 301	3847 302	3877 304	3907 305	3938 306	3969 308	4000 309
618.0	4031 310	4062 312	4093 313	4124 314	4156 315	4187 317	4219 318	4251 319	4283 321	4315 322
619.0	4347 323	4380 325	4412 326	4445 327	4478 329	4511 330	4544 331	4577 333	4610 334	4644 335

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
620.0	4677 337	4711 338	4745 340	4779 341	4813 342	4848 344	4882 345	4917 346	4951 348	4986 349
621.0	5021 350	5056 352	5091 353	5127 354	5162 356	5198 357	5234 358	5270 360	5306 361	5342 363
622.0	5378 364	5415 365	5451 367	5488 368	5525 369	5562 371	5599 372	5636 374	5674 375	5711 376
623.0	5749 378	5787 379	5825 380	5863 382	5901 383	5939 385	5978 386	6017 387	6055 389	6094 390
624.0	6133 391	6173 393	6212 394	6251 396	6291 397	6331 398	6371 400	6411 401	6451 403	6491 404
625.0	6532 405	6572 407	6613 408	6654 410	6695 411	6736 412	6778 414	6819 415	6861 417	6902 418
626.0	6944 419	6986 421	7028 422	7071 424	7113 425	7156 426	7198 428	7241 429	7284 431	7327 432
627.0	7371 433	7414 435	7458 436	7501 438	7545 439	7589 441	7633 442	7678 443	7722 445	7767 446
628.0	7811 448	7856 449	7901 451	7946 452	7991 453	8037 455	8082 456	8128 458	8174 459	8220 461
629.0	8266 462	8312 463	8359 465	8405 466	8452 468	8499 469	8546 471	8593 472	8640 473	8688 475
630.0	8735 476	8783 478	8831 479	8879 481	8927 482	8975 484	9024 485	9072 486	9121 488	9170 489
631.0	9219 491	9268 492	9317 494	9367 495	9416 497	9466 498	9516 499	9566 501	9616 502	9666 504
632.0	9717 505	9767 507	9818 508	9869 510	9920 511	9971 512	10022 514	10074 515	10125 517	10177 518
633.0	10229 520	10281 521	10333 523	10386 524	10438 526	10491 527	10544 529	10597 530	10650 531	10703 533
634.0	10754 534	10810 536	10863 537	10917 539	10971 540	11025 542	11079 543	11134 545	11188 546	11243 548
635.0	11298 549	11353 551	11408 552	11463 553	11519 555	11574 556	11630 558	11686 559	11742 561	11798 562
636.0	11854 564	11911 565	11967 567	12024 568	12081 570	12138 571	12195 573	12253 574	12310 576	12368 577
637.0	12426 579	12484 580	12542 582	12600 583	12658 585	12717 586	12775 587	12834 589	12893 590	12952 592
638.0	13012 593	13071 595	13131 596	13190 598	13250 599	13310 601	13370 602	13431 604	13491 605	13552 607
639.0	13612 608	13673 610	13734 611	13796 613	13857 614	13918 616	13980 617	14042 619	14104 620	14166 622

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
640.0	14228 623	14291 625	14353 626	14416 628	14479 629	14542 631	14605 632	14668 634	14732 635	14795 637
641.0	14859 638	14923 640	14987 641	15051 643	15115 644	15180 646	15245 647	15309 649	15374 650	15439 652
642.0	15505 653	15570 655	15636 656	15701 658	15767 659	15833 661	15899 662	15966 664	16032 665	16099 667
643.0	16165 668	16232 670	16299 671	16366 673	16434 674	16501 676	16569 677	16637 679	16705 680	16773 682
644.0	16841 683	16910 685	16978 686	17047 688	17116 689	17185 691	17254 692	17323 694	17393 695	17462 697
645.0	17532 698	17602 700	17672 701	17742 703	17813 704	17883 706	17954 708	18025 709	18096 711	18167 712
646.0	18238 714	18309 715	18381 717	18453 718	18525 720	18597 721	18669 723	18741 724	18814 726	18886 727
647.0	18959 729	19032 730	19105 732	19178 733	19252 735	19325 736	19399 738	19473 739	19547 741	19621 742
648.0	19695 744	19770 745	19845 747	19919 748	19994 750	20069 752	20145 753	20220 755	20295 756	20371 758
649.0	20447 759	20523 761	20599 762	20675 764	20752 765	20828 767	20905 768	20982 770	21059 771	21136 773
650.0	21214 774	21291 776	21369 777	21447 779	21525 780	21603 782	21681 784	21760 785	21838 787	21917 788
651.0	21996 790	22075 791	22154 793	22233 794	22313 796	22393 797	22472 799	22552 800	22632 802	22713 803
652.0	22793 805	22874 806	22954 808	23035 810	23116 811	23197 813	23279 814	23360 816	23442 817	23524 819
653.0	23606 820	23688 822	23770 823	23852 825	23935 826	24018 828	24101 829	24184 831	24267 832	24350 834
654.0	24434 836	24517 837	24601 839	24685 840	24769 842	24853 843	24938 845	25022 846	25107 848	25192 849
655.0	25277 851	25362 852	25447 854	25533 855	25618 857	25704 859	25790 860	25876 862	25962 863	26049 865
656.0	26135 866	26222 868	26309 869	26396 871	26483 872	26570 874	26658 875	26745 877	26833 879	26921 880
657.0	27009 882	27098 883	27186 885	27274 886	27363 888	27452 889	27541 891	27630 892	27719 894	27809 895
658.0	27899 897	27988 899	28078 900	28168 902	28259 903	28349 905	28440 906	28530 908	28621 909	28712 911
659.0	28803 912	28895 914	28986 915	29078 917	29169 919	29261 920	29353 922	29446 923	29538 925	29631 926

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
660.0	29723 928	29816 929	29909 931	30002 932	30096 934	30189 935	30283 937	30377 939	30471 940	30565 942
661.0	30659 943	30753 945	30848 946	30943 948	31037 949	31132 951	31228 952	31323 954	31418 956	31514 957
662.0	31610 959	31706 960	31802 962	31898 963	31994 965	32091 966	32188 968	32285 969	32382 971	32479 973
663.0	32576 974	32674 976	32771 977	32869 979	32967 980	33065 982	33163 983	33262 985	33360 986	33459 988
664.0	33558 990	33657 991	33756 993	33855 994	33955 996	34055 997	34154 999	34254 1000	34354 1002	34455 1003
665.0	34555 1005	34656 1007	34756 1008	34857 1010	34958 1011	35060 1013	35161 1014	35262 1016	35364 1017	35466 1019
666.0	35568 1020	35670 1022	35772 1024	35875 1025	35977 1027	36080 1028	36183 1030	36286 1031	36389 1033	36493 1034
667.0	36596 1036	36700 1037	36804 1039	36907 1041	37012 1042	37116 1044	37220 1045	37325 1047	37430 1048	37535 1050
668.0	37640 1051	37745 1053	37850 1054	37956 1056	38061 1058	38167 1059	38273 1061	38379 1062	38486 1064	38592 1065
669.0	38699 1067	38806 1068	38912 1070	39020 1072	39127 1073	39234 1075	39342 1076	39449 1078	39557 1079	39665 1081
670.0	39773 1082	39882 1084	39990 1085	40099 1087	40208 1089	40317 1090	40426 1092	40535 1093	40644 1095	40754 1096
671.0	40863 1098	40973 1099	41083 1101	41194 1103	41304 1104	41414 1106	41525 1107	41636 1109	41747 1110	41858 1112
672.0	41969 1113	42081 1115	42192 1116	42304 1118	42416 1120	42528 1121	42640 1123	42752 1124	42865 1126	42977 1127
673.0	43090 1129	43203 1130	43316 1132	43430 1134	43543 1135	43657 1137	43770 1138	43884 1140	43998 1141	44112 1143
674.0	44227 1144	44341 1146	44456 1147	44571 1149	44686 1151	44801 1152	44916 1154	45032 1155	45147 1157	45263 1158
675.0	45379 1160	45495 1161	45611 1163	45728 1165	45844 1166	45961 1168	46078 1169	46195 1171	46312 1172	46429 1174
676.0	46547 1175	46664 1177	46782 1179	46900 1180	47018 1182	47136 1183	47255 1185	47373 1186	47492 1188	47611 1189
677.0	47730 1191	47849 1193	47968 1194	48088 1196	48208 1197	48327 1199	48447 1200	48567 1202	48688 1203	48808 1205
678.0	48929 1207	49049 1208	49170 1210	49291 1211	49412 1213	49534 1214	49655 1216	49777 1217	49899 1219	50021 1221
679.0	50143 1222	50265 1224	50388 1225	50510 1227	50633 1228	50756 1230	50879 1231	51002 1233	51126 1235	51249 1236

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
680.0	51373 1238	51497 1239	51621 1241	51745 1242	51869 1244	51994 1245	52118 1247	52243 1249	52368 1250	52493 1252
681.0	52618 1253	52744 1255	52869 1256	52995 1258	53121 1259	53247 1261	53373 1263	53499 1264	53626 1266	53752 1267
682.0	53879 1269	54006 1270	54133 1272	54261 1273	54388 1275	54516 1277	54643 1278	54771 1280	54899 1281	55027 1283
683.0	55156 1284	55284 1286	55413 1287	55542 1289	55671 1291	55800 1292	55929 1294	56059 1295	56188 1297	56318 1298
684.0	56448 1300	56578 1301	56708 1303	56839 1305	56969 1306	57100 1308	57231 1309	57362 1311	57493 1312	57624 1314
685.0	57756 1316	57887 1317	58019 1319	58151 1320	58283 1322	58415 1323	58548 1325	58680 1326	58813 1328	58946 1330
686.0	59079 1331	59212 1333	59345 1334	59479 1336	59613 1337	59746 1339	59880 1340	60015 1342	60149 1344	60283 1345
687.0	60418 1347	60553 1348	60687 1350	60823 1351	60958 1353	61093 1355	61229 1356	61364 1358	61500 1359	61634 1361
688.0	61772 1362	61909 1364	62045 1365	62182 1367	62319 1369	62455 1370	62591 1372	62730 1373	62867 1375	63005 1376
689.0	63143 1378	63280 1380	63418 1381	63557 1383	63695 1384	63833 1386	63972 1387	64111 1389	64250 1390	64389 1392
690.0	64528 1394	64668 1395	64807 1397	64947 1398	65087 1400	65227 1401	65367 1403	65508 1405	65648 1406	65789 1408
691.0	65930 1409	66071 1411	66212 1412	66353 1414	66495 1415	66636 1417	66778 1419	66920 1420	67062 1422	67204 1423
692.0	67347 1425	67489 1426	67632 1428	67775 1430	67918 1431	68061 1433	68205 1434	68348 1436	68492 1437	68635 1439
693.0	68779 1441	68924 1442	69068 1444	69212 1445	69357 1447	69502 1448	69647 1450	69792 1452	69937 1453	70082 1455
694.0	70228 1456	70374 1458	70519 1459	70665 1461	70812 1462	70958 1464	71104 1466	71251 1467	71398 1469	71545 1470
695.0	71692 1472	71839 1473	71987 1475	72134 1477	72282 1478	72430 1480	72576 1481	72726 1483	72874 1484	73023 1486
696.0	73172 1488	73320 1489	73469 1491	73619 1492	73768 1494	73917 1495	74067 1497	74217 1499	74367 1500	74517 1502
697.0	74667 1503	74817 1505	74968 1506	75119 1508	75270 1510	75421 1511	75572 1513	75723 1514	75875 1516	76026 1517
698.0	76178 1519	76330 1521	76482 1522	76635 1524	76787 1525	76940 1527	77092 1528	77245 1530	77398 1532	77552 1533
699.0	77705 1535	77859 1536	78012 1538	78166 1539	78320 1541	78474 1543	78629 1544	78783 1546	78938 1547	79093 1549

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
700.0	79248 1550	79403 1552	79558 1554	79714 1555	79869 1557	80025 1558	80181 1560	80337 1561	80493 1563	80649 1565
701.0	80806 1566	80963 1568	81120 1569	81277 1571	81434 1573	81591 1574	81749 1576	81906 1577	82064 1579	82222 1580
702.0	82380 1582	82538 1584	82697 1585	82855 1587	83014 1588	83173 1590	83332 1591	83491 1593	83651 1595	83810 1596
703.0	83970 1598	84130 1599	84290 1601	84450 1602	84610 1604	84771 1606	84931 1607	85092 1609	85253 1610	85414 1612
704.0	85576 1614	85737 1615	85899 1617	86060 1618	86222 1620	86384 1621	86547 1623	86709 1625	86871 1626	87034 1628
705.0	87197 1629	87360 1631	87523 1632	87687 1634	87850 1636	88014 1637	88177 1639	88341 1640	88506 1642	88670 1644
706.0	88834 1645	88999 1647	89164 1648	89328 1650	89494 1651	89659 1653	89824 1655	89990 1656	90155 1658	90321 1659
707.0	90487 1661	90653 1663	90820 1664	90986 1666	91153 1667	91320 1669	91487 1670	91654 1672	91821 1674	91989 1675
708.0	92156 1677	92324 1678	92492 1680	92660 1682	92828 1683	92997 1685	93165 1686	93334 1688	93503 1689	93672 1691
709.0	93841 1693	94010 1694	94180 1696	94349 1697	94519 1699	94689 1701	94859 1702	95030 1704	95200 1705	95371 1707
710.0	95542 1709	95712 1710	95884 1712	96055 1713	96226 1715	96398 1716	96570 1718	96741 1720	96913 1721	97086 1723
711.0	97258 1724	97431 1726	97603 1728	97776 1729	97949 1731	98122 1732	98296 1734	98469 1736	98643 1737	98816 1739
712.0	98990 1740	99164 1742	99339 1744	99513 1745	99688 1747	99863 1748	100037 1750	100213 1751	100388 1753	100563 1755
713.0	100739 1756	100914 1758	101090 1759	101266 1761	101442 1763	101619 1764	101795 1766	101972 1767	102149 1769	102326 1771
714.0	102503 1772	102680 1774	102858 1775	103035 1777	103213 1779	103391 1780	103569 1782	103747 1783	103926 1785	104104 1787
715.0	104283 1788	104462 1790	104641 1791	104820 1793	105000 1795	105179 1796	105359 1798	105539 1799	105719 1801	105899 1803
716.0	106079 1804	106260 1806	106440 1807	106621 1809	106802 1810	106983 1812	107165 1814	107346 1815	107528 1817	107709 1818
717.0	107891 1820	108073 1822	108256 1823	108438 1825	108621 1826	108803 1828	108986 1830	109169 1831	109352 1833	109536 1834
718.0	109719 1836	109903 1838	110087 1839	110271 1841	110455 1842	110639 1844	110824 1846	111009 1847	111193 1849	111378 1851
719.0	111563 1852	111749 1854	111934 1855	112120 1857	112306 1859	112492 1860	112678 1862	112864 1863	113050 1865	113237 1867

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA ,0	CAP AREA ,1	CAP AREA ,2	CAP AREA ,3	CAP AREA ,4	CAP AREA ,5	CAP AREA ,6	CAP AREA ,7	CAP AREA ,8	CAP AREA ,9
720.0	113424 1868	113610 1870	113798 1871	113985 1873	114172 1875	114360 1876	114547 1878	114735 1879	114923 1881	115111 1883
721.0	115300 1884	115488 1886	115677 1887	115866 1889	116055 1891	116244 1892	116433 1894	116623 1895	116812 1897	117002 1899
722.0	117192 1900	117382 1902	117572 1903	117763 1905	117953 1907	118144 1908	118335 1910	118526 1912	118717 1913	118909 1915
723.0	119100 1916	119292 1918	119484 1920	119676 1921	119868 1923	120061 1924	120253 1926	120446 1928	120639 1929	120832 1931
724.0	121025 1932	121218 1934	121412 1936	121605 1937	121799 1939	121993 1941	122187 1942	122381 1944	122576 1945	122771 1947
725.0	122965 1949	123160 1950	123355 1952	123551 1953	123746 1955	123942 1957	124137 1958	124333 1960	124529 1962	124726 1963
726.0	124922 1965	125119 1966	125315 1968	125512 1970	125709 1971	125906 1973	126104 1974	126301 1976	126499 1978	126697 1979
727.0	126895 1981	127093 1983	127291 1984	127490 1986	127688 1987	127887 1989	128086 1991	128285 1992	128485 1994	128684 1995
728.0	128884 1997	129084 1999	129284 2000	129484 2002	129684 2004	129884 2005	130085 2007	130286 2008	130487 2010	130688 2012
729.0	130889 2013	131090 2015	131292 2017	131494 2018	131696 2020	131898 2021	132100 2023	132302 2025	132505 2026	132708 2028
730.0	132910 2030	133114 2031	133317 2033	133520 2034	133724 2036	133927 2038	134131 2039	134335 2041	134539 2043	134744 2044
731.0	134968 2046	135153 2047	135358 2049	135563 2051	135768 2052	135973 2054	136179 2056	136384 2057	136590 2059	136796 2060
732.0	137002 2062	137208 2064	137415 2065	137621 2067	137828 2069	138035 2070	138242 2072	138449 2073	138657 2075	138864 2077
733.0	139072 2078	139280 2080	139488 2082	139696 2083	139905 2085	140113 2086	140322 2088	140531 2090	140740 2091	140949 2093
734.0	141159 2095	141368 2096	141578 2098	141788 2100	141998 2101	142208 2103	142418 2104	142629 2106	142840 2108	143050 2109
735.0	143261 2111	143473 2113	143684 2114	143895 2116	144107 2117	144319 2119	144531 2121	144743 2122	144955 2124	145168 2126
736.0	145381 2127	145593 2129	145806 2131	146019 2132	146233 2134	146446 2135	146660 2137	146874 2139	147088 2140	147302 2142
737.0	147516 2144	147730 2145	147945 2147	148160 2149	148375 2150	148590 2152	148805 2153	149021 2155	149236 2157	149452 2158
738.0	149668 2160	149884 2162	150100 2163	150317 2165	150533 2167	150750 2168	150967 2170	151184 2171	151401 2173	151618 2175
739.0	151836 2176	152054 2178	152272 2180	152490 2181	152708 2183	152926 2185	153145 2186	153364 2188	153582 2190	153801 2191

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
740.0	154021 2193	154240 2194	154460 2196	154679 2198	154899 2199	155119 2201	155339 2203	155560 2204	155780 2206	156001 2208
741.0	156222 2209	156443 2211	156664 2213	156885 2214	157107 2216	157328 2217	157550 2219	157772 2221	157994 2222	158217 2224
742.0	158439 2226	158662 2227	158885 2229	159108 2231	159331 2232	159554 2234	159778 2236	160001 2237	160225 2239	160449 2241
743.0	160673 2242	160897 2244	161122 2245	161346 2247	161571 2249	161796 2250	162021 2252	162247 2254	162472 2255	162698 2257
744.0	162924 2259	163149 2260	163376 2262	163602 2264	163828 2265	164055 2267	164282 2269	164509 2270	164736 2272	164963 2274
745.0	165190 2275	165418 2277	165646 2278	165874 2280	166102 2282	166330 2283	166559 2285	166787 2287	167016 2288	167245 2290
746.0	167474 2292	167703 2293	167933 2295	168162 2297	168392 2298	168622 2300	168852 2302	169082 2303	169312 2305	169543 2307
747.0	169774 2308	170005 2310	170236 2312	170467 2313	170698 2315	170930 2317	171162 2318	171394 2320	171626 2321	171858 2323
748.0	172090 2325	172323 2326	172556 2328	172789 2330	173022 2331	173255 2333	173488 2335	173722 2336	173955 2338	174189 2340
749.0	174423 2341	174658 2343	174892 2345	175127 2346	175361 2348	175596 2350	175831 2351	176066 2353	176302 2355	176537 2356
750.0	176773 2358	177009 2360	177245 2361	177481 2363	177718 2365	177954 2366	178191 2368	178428 2370	178665 2371	178902 2373
751.0	179139 2375	179377 2376	179615 2378	179853 2380	180091 2381	180329 2383	180567 2385	180806 2386	181044 2388	181283 2390
752.0	181522 2391	181762 2393	182001 2395	182240 2396	182480 2398	182720 2400	182960 2401	183200 2403	183441 2405	183681 2406
753.0	183922 2408	184163 2410	184404 2411	184645 2413	184886 2415	185128 2416	185370 2418	185611 2420	185854 2421	186096 2423
754.0	186338 2425	186581 2426	186823 2428	187066 2430	187309 2431	187552 2433	187796 2435	188039 2436	188283 2438	188527 2440
755.0	188771 2441	189015 2443	189260 2445	189504 2446	189749 2448	189994 2450	190239 2451	190484 2453	190729 2455	190975 2456
756.0	191221 2458	191466 2460	191712 2461	191959 2463	192205 2465	192452 2466	192698 2468	192945 2470	193192 2471	193439 2473
757.0	193687 2475	193934 2476	194182 2478	194430 2480	194678 2481	194926 2483	195175 2485	195423 2486	195672 2488	195921 2490
758.0	196170 2491	196419 2493	196668 2495	196918 2496	197168 2498	197418 2500	197668 2501	197918 2503	198168 2505	198419 2506
759.0	198670 2508	198921 2510	199172 2511	199423 2513	199674 2515	199926 2517	200178 2518	200429 2520	200682 2522	200934 2523

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
760.0	201186 2525	201439 2527	201691 2528	201944 2530	202197 2532	202451 2533	202704 2535	202958 2537	203211 2538	203465 2540
761.0	203719 2542	203974 2543	204228 2545	204483 2547	204737 2548	204992 2550	205247 2552	205503 2553	205758 2555	206014 2557
762.0	206269 2558	206525 2560	206782 2562	207038 2563	207294 2565	207551 2567	207808 2569	208065 2570	208322 2572	208579 2574
763.0	208836 2575	209094 2577	209352 2579	209610 2580	209868 2582	210126 2584	210385 2585	210643 2587	210902 2589	211161 2590
764.0	211420 2592	211679 2594	211939 2595	212198 2597	212458 2599	212718 2600	212978 2602	213239 2604	213499 2606	213760 2607
765.0	214021 2609	214281 2611	214543 2612	214804 2614	215065 2616	215327 2617	215589 2619	215851 2621	216113 2622	216375 2624
766.0	216638 2626	216901 2627	217163 2629	217426 2631	217689 2633	217953 2634	218216 2636	218480 2638	218744 2639	219008 2641
767.0	219272 2643	219536 2644	219801 2646	220066 2648	220330 2649	220595 2651	220861 2653	221126 2654	221391 2656	221657 2658
768.0	221923 2659	222189 2661	222455 2663	222722 2665	222988 2666	223255 2668	223522 2670	223789 2671	224056 2673	224323 2675
769.0	224591 2676	224859 2678	225127 2680	225395 2681	225663 2683	225931 2685	226200 2687	226469 2688	226737 2690	227007 2692
770.0	227276 2693	227545 2695	227815 2697	228085 2698	228354 2700	228625 2702	228895 2703	229165 2705	229436 2707	229707 2708
771.0	229978 2710	230249 2712	230520 2714	230791 2715	231063 2717	231335 2719	231607 2720	231879 2722	232151 2724	232424 2725
772.0	232696 2727	232969 2729	233242 2730	233515 2732	233788 2734	234062 2736	234335 2737	234609 2739	234883 2741	235157 2742
773.0	235432 2744	235706 2746	235981 2747	236256 2749	236531 2751	236806 2752	237081 2754	237357 2756	237632 2758	237908 2759
774.0	238184 2761	238460 2763	238737 2764	239013 2766	239290 2768	239567 2769	239844 2771	240121 2773	240398 2775	240676 2776
775.0	240954 2778	241232 2780	241510 2781	241788 2783	242066 2785	242345 2786	242623 2788	242902 2790	243181 2791	243461 2793
776.0	243740 2795	244020 2797	244299 2798	244579 2800	244859 2802	245140 2803	245420 2805	245701 2807	245981 2808	246262 2810
777.0	246543 2812	246825 2814	247106 2815	247388 2817	247669 2819	247951 2820	248233 2822	248516 2824	248798 2825	249081 2827
778.0	249364 2829	249647 2830	249930 2832	250213 2834	250497 2836	250780 2837	251064 2839	251348 2841	251632 2842	251916 2844
779.0	252201 2846	252486 2847	252770 2849	253055 2851	253341 2853	253626 2854	253911 2856	254197 2858	254483 2859	254769 2861

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ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
780.0	255055 2863	255342 2864	255628 2866	255915 2868	256202 2870	256489 2871	256776 2873	257063 2875	257351 2876	257639 2878
781.0	257926 2880	258215 2881	258503 2883	258791 2885	259080 2887	259368 2888	259657 2890	259946 2892	260236 2893	260525 2895
782.0	260815 2897	261104 2898	261394 2900	261684 2902	261975 2904	262265 2905	262556 2907	262847 2909	263138 2910	263429 2912
783.0	263720 2914	264011 2915	264303 2917	264595 2919	264887 2921	265179 2922	265471 2924	265764 2926	266056 2927	266349 2929
784.0	266642 2931	266935 2932	267229 2934	267522 2936	267816 2938	268110 2939	268404 2941	268698 2943	268992 2944	269287 2946
785.0	269582 2948	269876 2950	270171 2951	270467 2953	270762 2955	271058 2956	271353 2958	271649 2960	271945 2961	272241 2963
786.0	272538 2965	272834 2967	273131 2968	273428 2970	273725 2972	274022 2973	274320 2975	274617 2977	274915 2978	275213 2980
787.0	275511 2982	275809 2984	276108 2985	276407 2987	276705 2989	277004 2990	277303 2992	277603 2994	277902 2995	278202 2997
788.0	278502 2999	278802 3001	279102 3002	279402 3004	279702 3006	280003 3007	280304 3009	280605 3011	280906 3013	281207 3014
789.0	281509 3016	281811 3018	282113 3019	282415 3021	282717 3023	283019 3024	283322 3026	283624 3028	283927 3030	284230 3031
790.0	284533 3033	284837 3035	285140 3036	285444 3038	285748 3040	286052 3041	286356 3043	286661 3045	286965 3047	287270 3048
791.0	287575 3050	287880 3052	288185 3053	288491 3055	288796 3057	289102 3059	289408 3060	289714 3062	290020 3064	290327 3065
792.0	290633 3067	290940 3069	291247 3070	291554 3072	291862 3074	292169 3076	292477 3077	292785 3079	293093 3081	293401 3082
793.0	293709 3084	294018 3086	294326 3088	294635 3089	294944 3091	295253 3093	295563 3094	295872 3096	296182 3098	296492 3099
794.0	296802 3101	297112 3103	297422 3105	297733 3106	298044 3108	298354 3110	298665 3111	298977 3113	299288 3115	299600 3117
795.0	299911 3118	300223 3120	300535 3122	300848 3123	301160 3125	301473 3127	301785 3128	302098 3130	302411 3132	302725 3134
796.0	303038 3135	303352 3137	303666 3139	303980 3140	304294 3142	304608 3144	304922 3146	305237 3147	305552 3149	305867 3151
797.0	306182 3152	306497 3154	306813 3156	307128 3157	307444 3159	307760 3161	308076 3163	308393 3164	308709 3166	309026 3168
798.0	309343 3169	309660 3171	309977 3173	310294 3175	310612 3176	310930 3178	311248 3180	311566 3181	311884 3183	312202 3185
799.0	312521 3186	312839 3188	313158 3190	313478 3192	313797 3193	314116 3195	314436 3197	314756 3198	315075 3200	315396 3202

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ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
800.0	315716 3204	316036 3205	316357 3207	316678 3209	316999 3210	317320 3212	317641 3214	317962 3215	318284 3217	318606 3219
801.0	318928 3221	319250 3222	319572 3224	319895 3226	320217 3227	320540 3229	320863 3231	321186 3233	321510 3234	321833 3236
802.0	322157 3238	322481 3239	322805 3241	323129 3243	323453 3244	323778 3246	324103 3248	324427 3250	324753 3251	325078 3253
803.0	325403 3255	325729 3256	326054 3258	326380 3260	326706 3262	327033 3263	327359 3265	327686 3267	328012 3268	328339 3270
804.0	328666 3272	328994 3273	329321 3275	329649 3277	329976 3279	330304 3280	330632 3282	330961 3284	331289 3285	331618 3287
805.0	331947 3289	332276 3291	332605 3292	332934 3294	333263 3296	333593 3297	333923 3299	334253 3301	334583 3302	334913 3304
806.0	335244 3306	335575 3308	335905 3309	336236 3311	336568 3313	336899 3314	337231 3316	337562 3318	337894 3320	338226 3321
807.0	338558 3323	338891 3325	339223 3326	339556 3328	339889 3330	340222 3331	340555 3333	340888 3335	341222 3337	341556 3338
808.0	341890 3340	342224 3342	342558 3343	342893 3345	343227 3347	343562 3348	343897 3350	344232 3352	344567 3354	344903 3355
809.0	345238 3357	345574 3359	345910 3360	346246 3362	346582 3364	346919 3366	347256 3367	347592 3369	347929 3371	348267 3372
810.0	348604 3374	348941 3376	349279 3377	349617 3379	349955 3381	350293 3383	350631 3384	350970 3386	351308 3388	351647 3389
811.0	351986 3391	352326 3393	352665 3395	353004 3396	353344 3398	353684 3400	354024 3401	354364 3403	354705 3405	355045 3406
812.0	355386 3408	355727 3410	356068 3412	356409 3413	356751 3415	357092 3417	357434 3418	357776 3420	358118 3422	358460 3423
813.0	358803 3425	359145 3427	359488 3429	359831 3430	360174 3432	360517 3434	360861 3435	361204 3437	361548 3439	361892 3441
814.0	362236 3442	362581 3444	362925 3446	363270 3447	363615 3449	363960 3451	364305 3452	364650 3454	364996 3456	365341 3458
815.0	365687 3459	366033 3461	366379 3463	366726 3464	367072 3466	367419 3468	367766 3469	368113 3471	368460 3473	368807 3475
816.0	369155 3476	369503 3478	369850 3480	370198 3481	370547 3483	370895 3485	371244 3486	371592 3488	371941 3490	372290 3492
817.0	372640 3493	372989 3495	373339 3497	373688 3498	374038 3500	374388 3502	374739 3504	375089 3505	375440 3507	375790 3509
818.0	376141 3510	376493 3512	376844 3514	377195 3515	377547 3517	377899 3519	378251 3521	378603 3522	378955 3524	379308 3526
819.0	379660 3527	380013 3529	380366 3531	380719 3532	381072 3534	381426 3536	381780 3538	382134 3539	382488 3541	382842 3543

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
820.0	383196 3544	383551 3546	383905 3548	384260 3549	384615 3551	384970 3553	385326 3555	385681 3556	386037 3558	386393 3560
821.0	386749 3561	387105 3563	387462 3565	387818 3566	388175 3568	388532 3570	388889 3572	389246 3573	389603 3575	389961 3577
822.0	390319 3578	390677 3580	391035 3582	391393 3583	391752 3585	392110 3587	392469 3589	392828 3590	393187 3592	393546 3594
823.0	393906 3595	394265 3597	394623 3599	394985 3600	395345 3602	395705 3604	396066 3606	396427 3607	396787 3609	397148 3611
824.0	397509 3612	397871 3614	398232 3616	398594 3617	398956 3619	399318 3621	399680 3623	400042 3624	400405 3626	400768 3628
825.0	401130 3629	401493 3631	401857 3633	402220 3634	402583 3636	402947 3638	403311 3640	403675 3641	404039 3643	404404 3645
826.0	404768 3646	405133 3648	405498 3650	405863 3651	406228 3653	406594 3655	406959 3657	407325 3658	407691 3660	408057 3662
827.0	408423 3663	408790 3665	409156 3667	409523 3668	409890 3670	410257 3672	410624 3674	410992 3675	411359 3677	411727 3679
828.0	412095 3680	412463 3682	412831 3684	413200 3685	413568 3687	413937 3689	414306 3691	414675 3692	415045 3694	415414 3696
829.0	415784 3697	416154 3699	416523 3701	416894 3702	417264 3704	417634 3706	418005 3708	418376 3709	418747 3711	419118 3713
830.0	419490 3714	419861 3716	420233 3718	420605 3719	420977 3721	421349 3723	421721 3724	422094 3726	422466 3728	422839 3730
831.0	423212 3731	423585 3733	423959 3735	424332 3736	424706 3738	425080 3740	425454 3741	425828 3743	426203 3745	426577 3747
832.0	426952 3748	427327 3750	427702 3752	428077 3753	428453 3755	428828 3757	429204 3758	429580 3760	429956 3762	430332 3764
833.0	430709 3765	431085 3767	431462 3769	431839 3770	432216 3772	432593 3774	432971 3775	433349 3777	433726 3779	434104 3780
834.0	434482 3782	434861 3784	435239 3786	435618 3787	435997 3789	436376 3791	436755 3792	437134 3794	437514 3796	437893 3797
835.0	438273 3799	438653 3801	439033 3803	439414 3804	439794 3806	440175 3808	440556 3809	440937 3811	441318 3813	441699 3814
836.0	442081 3816	442463 3818	442844 3820	443226 3821	443609 3823	443991 3825	444373 3826	444756 3828	445139 3830	445522 3831
837.0	445905 3833	446289 3835	446672 3836	447056 3838	447440 3840	447824 3842	448208 3843	448593 3845	448977 3847	449362 3848
838.0	449747 3850	450132 3852	450517 3853	450903 3855	451288 3857	451674 3859	452060 3860	452446 3862	452832 3864	453219 3865
839.0	453606 3867	453992 3869	454379 3870	454767 3872	455154 3874	455541 3876	455929 3877	456317 3879	456705 3881	457093 3882

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
840.0	457481 3884	457870 3886	458258 3887	458647 3889	459036 3891	459425 3892	459815 3894	460204 3896	460594 3898	460984 3899
841.0	461374 3901	461764 3903	462154 3904	462545 3906	462935 3908	463326 3909	463717 3911	464108 3913	464500 3915	464891 3916
842.0	465283 3918	465675 3920	466067 3921	466459 3923	466852 3925	467244 3926	467637 3928	468030 3930	468423 3932	468816 3933
843.0	469209 3935	469603 3937	469997 3938	470391 3940	470785 3942	471179 3943	471574 3945	471968 3947	472363 3948	472758 3950
844.0	473153 3952	473548 3954	473944 3955	474339 3957	474735 3959	475131 3960	475527 3962	475923 3964	476320 3965	476716 3967
845.0	477113 3969	477510 3971	477907 3972	478305 3974	478702 3976	479100 3977	479498 3979	479895 3981	480294 3982	480692 3984
846.0	481091 3986	481489 3988	481888 3989	482287 3991	482686 3993	483086 3994	483485 3996	483885 3998	484285 3999	484685 4001
847.0	485085 4003	485485 4005	485886 4006	486286 4008	486687 4010	487088 4011	487490 4013	487891 4015	488292 4016	488694 4018
848.0	489096 4020	489496 4022	489900 4023	490303 4025	490705 4027	491108 4028	491511 4030	491914 4032	492317 4033	492721 4035
849.0	493124 4037	493526 4038	493932 4040	494336 4042	494741 4044	495145 4045	495550 4047	495954 4049	496359 4050	496765 4052
850.0	497170 4054	497575 4055	497981 4057	498387 4059	498793 4061	499199 4062	499605 4064	500012 4066	500418 4067	500825 4069
851.0	501232 4071	501639 4072	502047 4074	502454 4076	502862 4078	503270 4079	503678 4081	504086 4083	504494 4084	504903 4086
852.0	505311 4088	505720 4089	506129 4091	506538 4093	506948 4095	507357 4096	507767 4098	508177 4100	508587 4101	508997 4103
853.0	509408 4105	509818 4107	510229 4108	510640 4110	511051 4112	511462 4113	511874 4115	512285 4117	512697 4118	513109 4120
854.0	513521 4122	513933 4124	514346 4125	514758 4127	515171 4129	515584 4130	515997 4132	516411 4134	516824 4135	517237 4137
855.0	517651 4139	518065 4141	518479 4142	518894 4144	519308 4146	519723 4147	520138 4149	520553 4151	520968 4152	521383 4154
856.0	521799 4156	522214 4158	522630 4159	523046 4161	523462 4163	523879 4164	524295 4166	524712 4168	525129 4170	525546 4171
857.0	525963 4173	526380 4175	526798 4176	527216 4178	527634 4180	528052 4181	528470 4183	528888 4185	529307 4187	529726 4188
858.0	530144 4190	530564 4192	530983 4193	531402 4195	531822 4197	532242 4199	532662 4200	533082 4202	533502 4204	533923 4205
859.0	534343 4207	534764 4209	535185 4210	535606 4212	536027 4214	536449 4216	536870 4217	537292 4219	537714 4221	538136 4222

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
860.0	538559 4224	538981 4226	539404 4228	539827 4229	540250 4231	540673 4233	541096 4234	541520 4236	541944 4238	542367 4240
861.0	542791 4241	543216 4243	543640 4245	544065 4246	544489 4248	544914 4250	545339 4252	545764 4253	546190 4255	546615 4257
862.0	547041 4258	547467 4260	547893 4262	548320 4264	548746 4265	549173 4267	549600 4269	550026 4270	550453 4272	550881 4274
863.0	551308 4275	551736 4277	552164 4279	552592 4281	553020 4282	553448 4284	553877 4286	554305 4287	554734 4289	555163 4291
864.0	555592 4293	556022 4294	556451 4296	556881 4298	557311 4300	557741 4301	558171 4303	558601 4305	559032 4306	559463 4308
865.0	559893 4310	560325 4312	560756 4313	561187 4315	561619 4317	562051 4318	562483 4320	562915 4322	563347 4324	563779 4325
866.0	564212 4327	564645 4329	565078 4330	565511 4332	565944 4334	566377 4336	566811 4337	567245 4339	567679 4341	568113 4342
867.0	568547 4344	568982 4346	569416 4348	569851 4349	570286 4351	570722 4353	571157 4354	571593 4356	572028 4358	572464 4360
868.0	572900 4361	573336 4363	573773 4365	574209 4367	574646 4368	575083 4370	575520 4372	575957 4373	576395 4375	576833 4377
869.0	577270 4379	577708 4380	578146 4382	578585 4384	579023 4386	579462 4387	579900 4389	580339 4391	580779 4392	581218 4394
870.0	581657 4396	582097 4398	582537 4399	582977 4401	583417 4403	583858 4405	584298 4406	584739 4408	585180 4410	585621 4411
871.0	586062 4413	586503 4415	586945 4417	587387 4418	587829 4420	588271 4422	588713 4424	589156 4425	589598 4427	590041 4429
872.0	590484 4430	590927 4432	591370 4434	591814 4436	592257 4437	592701 4439	593145 4441	593589 4443	594034 4444	594478 4446
873.0	594923 4448	595368 4450	595813 4451	596258 4453	596703 4455	597149 4456	597595 4458	598041 4460	598487 4462	598933 4463
874.0	599379 4465	599826 4467	600273 4469	600720 4470	601167 4472	601614 4474	602062 4476	602509 4477	602957 4479	603405 4481
875.0	603853 4483	604302 4484	604750 4486	605199 4488	605648 4489	606097 4491	606546 4493	606995 4495	607445 4496	607895 4498
876.0	608345 4500	608794 4502	609245 4503	609695 4505	610146 4507	610597 4509	611048 4510	611499 4512	611950 4514	612402 4516
877.0	612853 4517	613305 4519	613757 4521	614209 4523	614662 4524	615114 4526	615567 4528	616020 4530	616473 4531	616926 4533
878.0	617379 4535	617833 4537	618287 4538	618740 4540	619195 4542	619649 4544	620103 4545	620558 4547	621013 4549	621467 4551
879.0	621923 4552	622378 4554	622833 4556	623289 4558	623745 4559	624201 4561	624657 4563	625114 4565	625570 4566	626027 4568

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
880.0	626484 4570	626941 4572	627398 4573	627856 4575	628313 4577	628771 4579	629229 4580	629687 4582	630145 4584	630604 4586
881.0	631062 4587	631521 4589	631980 4591	632439 4593	632899 4596	633358 4596	633818 4598	634278 4600	634738 4601	635198 4603
882.0	635659 4605	636119 4607	636580 4609	637041 4610	637502 4612	637963 4614	638425 4616	638886 4617	639348 4619	639810 4621
883.0	640272 4623	640735 4624	641197 4626	641660 4628	642123 4630	642586 4631	643049 4633	643513 4635	643976 4637	644440 4639
884.0	644904 4640	645368 4642	645832 4644	646297 4646	646761 4647	647226 4649	647691 4651	648157 4653	648622 4654	649087 4656
885.0	649553 4658	650019 4660	650485 4662	650951 4663	651418 4665	651884 4667	652351 4669	652818 4670	653285 4672	653752 4674
886.0	654220 4676	654688 4678	655155 4679	655623 4681	656091 4683	656560 4685	657029 4686	657497 4688	657966 4690	658435 4692
887.0	658905 4694	659374 4695	659843 4697	660313 4699	660783 4701	661253 4702	661724 4704	662194 4706	662665 4708	663136 4710
888.0	663607 4711	664078 4713	664550 4715	665021 4717	665493 4718	665965 4720	666437 4722	666909 4724	667382 4726	667854 4727
889.0	668327 4729	668800 4731	669274 4733	669747 4735	670220 4736	670694 4738	671168 4740	671642 4742	672116 4744	672591 4745
890.0	673065 4747	673540 4749	674015 4751	674490 4752	674966 4754	675441 4756	675917 4758	676393 4760	676869 4761	677345 4763
891.0	677822 4765	678298 4767	678775 4769	679252 4770	679729 4772	680206 4774	680684 4776	681161 4778	681639 4779	682117 4781
892.0	682595 4783	683074 4785	683552 4787	684031 4788	684510 4790	684989 4792	685469 4794	685948 4796	686428 4797	686908 4799
893.0	687387 4801	687868 4803	688348 4805	688829 4807	689309 4808	689790 4810	690272 4812	690753 4814	691234 4816	691716 4817
894.0	692197 4819	692680 4821	693162 4823	693644 4825	694127 4826	694610 4828	695093 4830	695576 4832	696059 4834	696542 4835
895.0	697026 4837	697510 4839	697994 4841	698478 4843	698962 4845	699447 4846	699932 4848	700417 4850	700902 4852	701387 4854
896.0	701872 4855	702358 4857	702844 4859	703330 4861	703816 4863	704302 4865	704789 4866	705276 4868	705763 4870	706250 4872
897.0	706737 4874	707224 4876	707712 4877	708200 4879	708688 4881	709176 4883	709664 4885	710153 4887	710642 4888	711131 4890
898.0	711620 4892	712109 4894	712599 4896	713088 4898	713578 4899	714068 4901	714558 4903	715049 4905	715539 4907	716030 4909
899.0	716521 4910	717012 4912	717503 4914	717995 4916	718487 4918	718979 4920	719471 4921	719963 4923	720455 4925	720948 4927

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

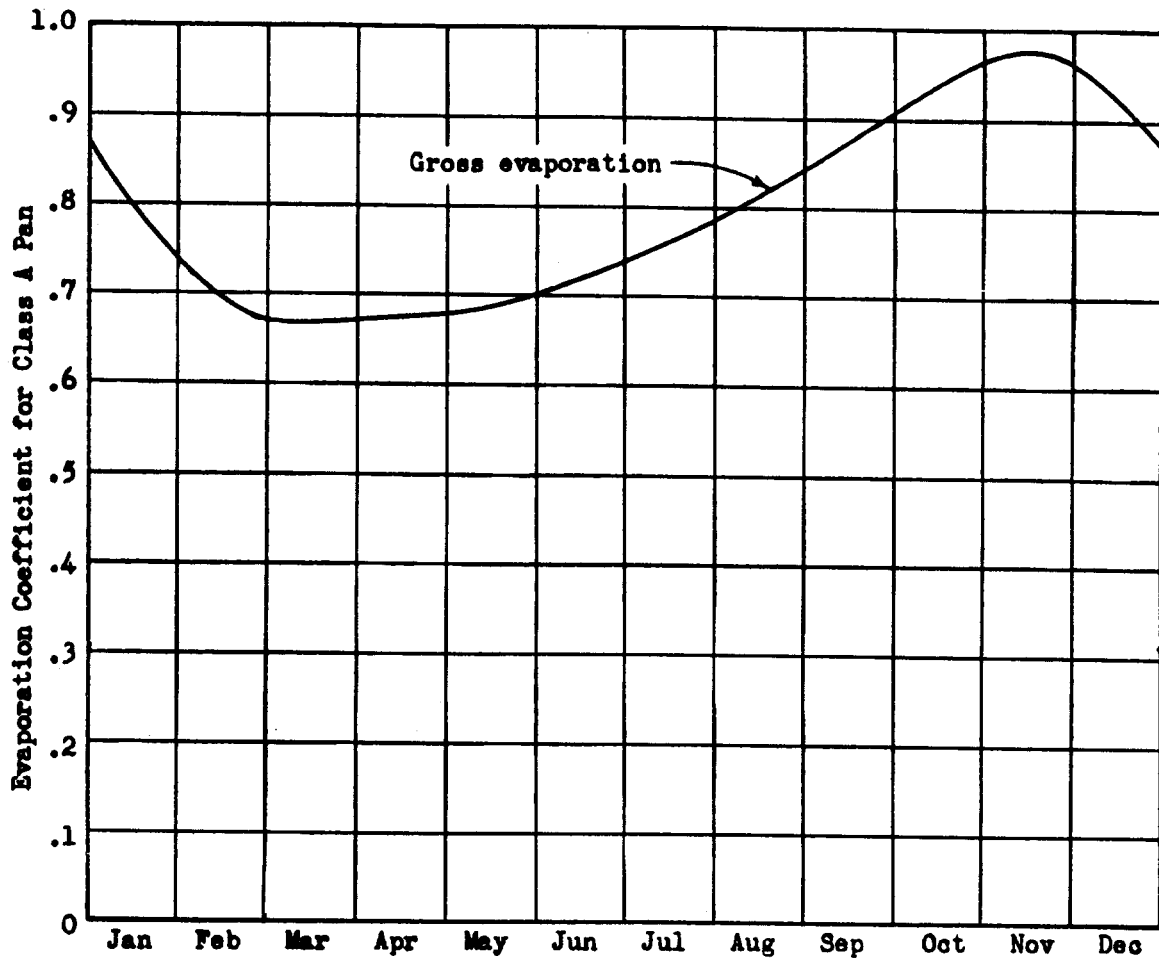
ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
900.0	721441 4929	721934 4931	722427 4932	722920 4934	723414 4936	723907 4938	724401 4940	724895 4942	725389 4943	725884 4945
901.0	726379 4947	726873 4949	727368 4951	727864 4953	728359 4955	728854 4956	729350 4958	729846 4960	730342 4962	730839 4964
902.0	731335 4966	731832 4968	732328 4969	732826 4971	733323 4973	733820 4975	734318 4977	734816 4979	735313 4981	735811 4982
903.0	736310 4984	736809 4986	737307 4988	737806 4990	738305 4992	738804 4994	739304 4995	739804 4997	740303 4999	740803 5001
904.0	741303 5003	741804 5005	742305 5007	742805 5008	743306 5010	743807 5012	744309 5014	744810 5016	745312 5018	745814 5020
905.0	746316 5022	746818 5023	747321 5025	747823 5027	748326 5029	748829 5031	749332 5033	749835 5035	750339 5036	750842 5038
906.0	751346 5040	751851 5042	752355 5044	752859 5046	753364 5048	753869 5050	754374 5051	754879 5053	755385 5055	755890 5057
907.0	756396 5059	756902 5061	757408 5063	757915 5065	758421 5067	758928 5068	759435 5070	759942 5072	760450 5074	760957 5076
908.0	761464 5078	761972 5080	762480 5082	762989 5084	763497 5085	764006 5087	764514 5089	765024 5091	765533 5093	766042 5095
909.0	766552 5097	767062 5099	767571 5101	768082 5102	768592 5104	769103 5106	769613 5108	770124 5110	770635 5112	771147 5114
910.0	771658 5116	772170 5118	772682 5120	773193 5121	773706 5123	774218 5125	774731 5127	775244 5129	775757 5131	776270 5133
911.0	776783 5135	777297 5137	777810 5139	778325 5140	778839 5142	779353 5144	779868 5146	780382 5148	780897 5150	781412 5152
912.0	781927 5154	782443 5156	782958 5158	783475 5160	783991 5161	784507 5163	785023 5165	785540 5167	786057 5169	786574 5171
913.0	787091 5173	787608 5175	788126 5177	788643 5179	789162 5181	789680 5183	790199 5184	790717 5186	791236 5188	791754 5190
914.0	792274 5192	792793 5194	793312 5196	793832 5198	794352 5200	794872 5202	795392 5204	795913 5206	796433 5208	796954 5210
915.0	797475 5211	797997 5213	798518 5215	799040 5217	799561 5219	800084 5221	800606 5223	801128 5225	801651 5227	802173 5229
916.0	802696 5231	803220 5233	803743 5235	804266 5237	804790 5239	805315 5241	805838 5242	806363 5244	806888 5246	807413 5248
917.0	807936 5250	808462 5252	808987 5254	809513 5256	810039 5258	810565 5260	811090 5262	811617 5264	812144 5266	812670 5268
918.0	813197 5270	813724 5272	814252 5274	814779 5276	815306 5277	815834 5279	816362 5281	816891 5283	817419 5285	817947 5287
919.0	818476 5289	819005 5291	819535 5293	820064 5295	820594 5297	821124 5299	821653 5301	822183 5303	822714 5305	823245 5307

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
920.0	823775 5309	824306 5311	824838 5313	825369 5315	825900 5317	826432 5319	826964 5321	827496 5323	828029 5325	828561 5326
921.0	829094 5328	829627 5330	830160 5332	830693 5334	831227 5336	831760 5338	832295 5340	832829 5342	833363 5344	833897 5346
922.0	834432 5348	834967 5350	835502 5352	836037 5354	836573 5356	837108 5358	837645 5360	838181 5362	838717 5364	839254 5366
923.0	839790 5368	840327 5370	840864 5372	841401 5374	841939 5376	842477 5378	843015 5380	843553 5382	844091 5384	844629 5386
924.0	845168 5388	845707 5390	846246 5392	846785 5394	847325 5396	847864 5398	848404 5400	848944 5402	849485 5404	850025 5406
925.0	850566 5408	851107 5410	851648 5412	852189 5414	852731 5416	853272 5418	853815 5420	854356 5422	854899 5424	855441 5426
926.0	855984 5428	856527 5430	857069 5432	857613 5434	858157 5436	858700 5438	859244 5440	859788 5442	860332 5444	860877 5446
927.0	861421 5448	861966 5450	862511 5452	863057 5454	863602 5456	864148 5458	864693 5460	865240 5462	865786 5464	866333 5466
928.0	866879 5468	867426 5470	867973 5472	868520 5474	869068 5476	869616 5478	870164 5480	870712 5482	871260 5484	871809 5486
929.0	872357 5488	872906 5490	873455 5492	874004 5494	874554 5496	875104 5498	875654 5500	876204 5502	876754 5504	877305 5506
930.0	877855 5508	878406 5510	878958 5512	879509 5514	880061 5516	880612 5518	881164 5520	881716 5522	882268 5524	882821 5527
931.0	883373 5529	883927 5531	884480 5533	885033 5535	885587 5537	886141 5539	886695 5541	887249 5543	887803 5545	888358 5547
932.0	888913 5549	889467 5551	890023 5553	890578 5555	891134 5557	891689 5559	892246 5561	892802 5563	893358 5565	893915 5567
933.0	894471 5569	895029 5571	895586 5573	896144 5575	896701 5577	897259 5580	897817 5582	898375 5584	898934 5586	899492 5588
934.0	900051 5590	900610 5592	901170 5594	901729 5596	902289 5598	902849 5600	903409 5602	903969 5604	904530 5606	905090 5608
935.0	905651 5610	906212 5612	906774 5614	907335 5616	907897 5619	908459 5621	909021 5623	909583 5625	910146 5627	910708 5629
936.0	911271 5631	911835 5633	912398 5635	912962 5637	913526 5639	914090 5641	914654 5643	915218 5645	915783 5647	916348 5649
937.0	916913 5652	917478 5654	918044 5656	918610 5658	919176 5660	919741 5662	920308 5664	920874 5666	921441 5668	922008 5670
938.0	922575 5672	923142 5674	923710 5676	924278 5678	924845 5680	925414 5683	925982 5685	926550 5687	927119 5689	927689 5691
939.0	928257 5693	928827 5695	929396 5697	929966 5699	930536 5701	931106 5703	931677 5705	932248 5707	932819 5710	933389 5712

PINE FLAT RESERVOIR, KINGS RIVER, CALIFORNIA - AREA AND CAPACITY TABLE SEPTEMBER 1975

ELEV FEET	CAP AREA .0	CAP AREA .1	CAP AREA .2	CAP AREA .3	CAP AREA .4	CAP AREA .5	CAP AREA .6	CAP AREA .7	CAP AREA .8	CAP AREA .9
940.0	933961 5716	934532 5716	935103 5718	935676 5720	936248 5722	936820 5724	937392 5726	937965 5728	938539 5730	939111 5732
941.0	939685 5735	940259 5737	940832 5739	941406 5741	941980 5743	942555 5745	943130 5747	943704 5749	944279 5751	944855 5753
942.0	945430 5755	946005 5758	946582 5760	947157 5762	947734 5764	948310 5766	948887 5768	949464 5770	950041 5772	950618 5774
943.0	951196 5776	951773 5778	952351 5781	952930 5783	953508 5785	954087 5787	954665 5789	955244 5791	955823 5793	956403 5795
944.0	956983 5797	957563 5799	958143 5802	958723 5804	959304 5806	959884 5808	960465 5810	961046 5812	961627 5814	962209 5816
945.0	962790 5818	963372 5820	963955 5823	964537 5825	965120 5827	965702 5829	966285 5831	966868 5833	967452 5835	968035 5837
946.0	968619 5839	969203 5841	969788 5844	970372 5846	970956 5848	971542 5850	972127 5852	972713 5854	973298 5856	973883 5858
947.0	974469 5860	975055 5863	975642 5865	976228 5867	976815 5869	977402 5871	977989 5873	978577 5875	979164 5877	979752 5879
948.0	980340 5882	980928 5884	981517 5886	982105 5888	982695 5890	983284 5892	983873 5894	984463 5896	985052 5898	985642 5901
949.0	986232 5903	986822 5905	987413 5907	988004 5909	988596 5911	989186 5913	989778 5915	990369 5917	990961 5920	991554 5922
950.0	992146 5924	992739 5926	993331 5928	993924 5930	994517 5932	995110 5934	995704 5937	996298 5939	996892 5941	997486 5943
951.0	998080 5945	998675 5947	999270 5949	999865 5951	1000460 5953	1001055 5956	1001651 5958	1002246 5960	1002844 5962	1003440 5964
952.0	1004035 5966	1004632 5968	1005229 5970	1005826 5973	1006424 5975	1007022 5977	1007619 5979	1008218 5981	1008816 5983	1009414 5985
953.0	1010012 5987	1010611 5990	1011210 5992	1011810 5994	1012409 5996	1013009 5998	1013609 6000	1014209 6002	1014809 6004	1015410 6007
954.0	1016011 6009	1016612 6011	1017213 6013	1017813 6015	1018416 6017	1019018 6019	1019619 6021	1020223 6023	1020824 6026	1021427 6028
955.0	1022030 6030	1022633 6032	1023236 6034	1023839 6036	1024443 6038	1025047 6040	1025651 6043	1026256 6045	1026860 6047	1027465 6049
956.0	1028070 6051	1028676 6053	1029280 6055	1029886 6057	1030492 6060	1031099 6062	1031704 6064	1032311 6066	1032918 6068	1033526 6070
957.0	1034132 6072	1034739 6074	1035347 6077	1035955 6079	1036563 6081	1037170 6083	1037779 6085	1038388 6087	1038996 6089	1039606 6091
958.0	1040215 6094	1040824 6096	1041434 6098	1042044 6100	1042654 6102	1043264 6104	1043874 6106	1044486 6108	1045096 6110	1045707 6113



AVERAGE MONTHLY
EVAPORATION COEFFICIENTS

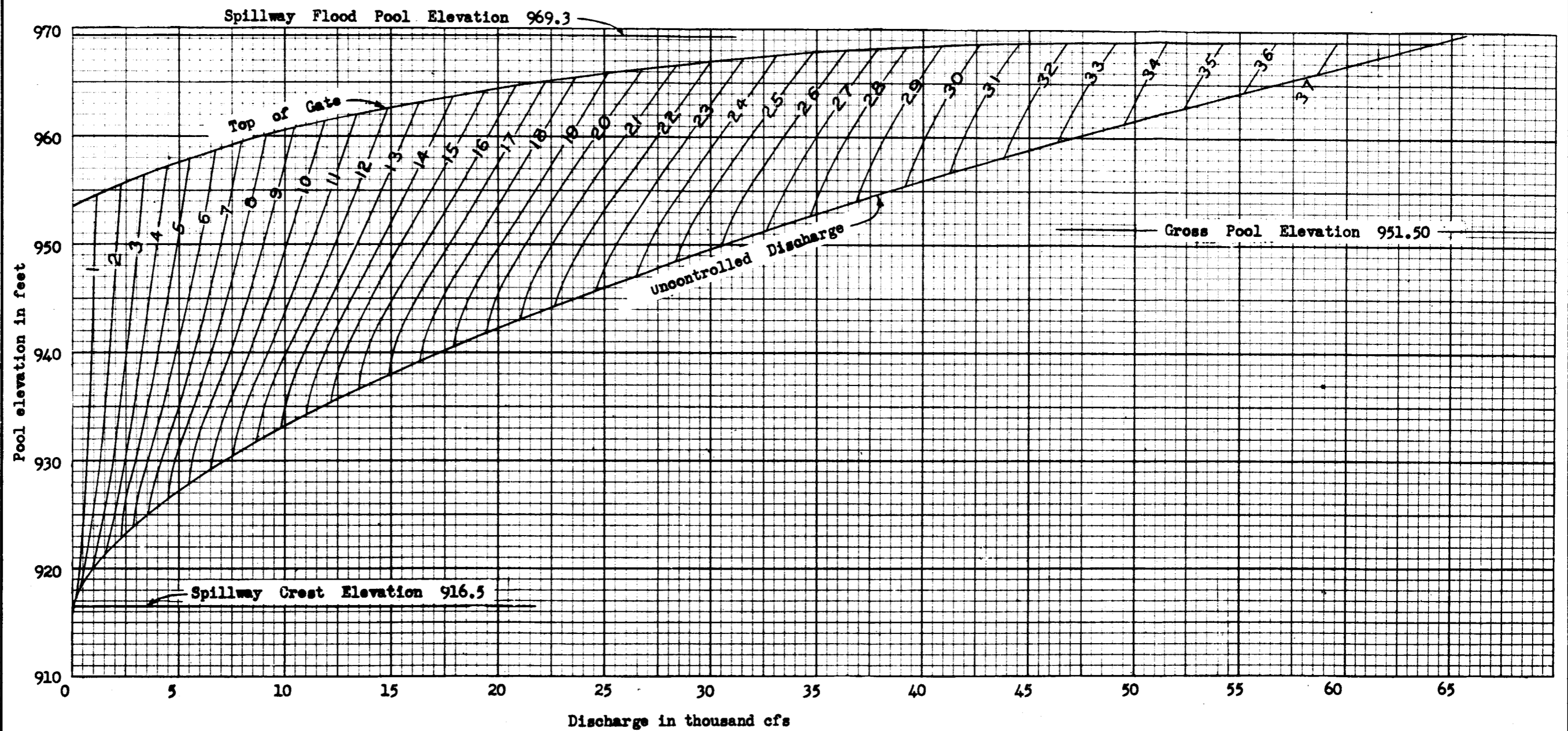
Jan	0.804	Jul	0.768
Feb	0.696	Aug	0.816
Mar	0.672	Sep	0.876
Apr	0.672	Oct	0.936
May	0.684	Nov	0.960
Jun	0.720	Dec	0.860

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

EVAPORATION COEFFICIENTS

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: L.R.B. Date: SEPTEMBER 1955



NOTES

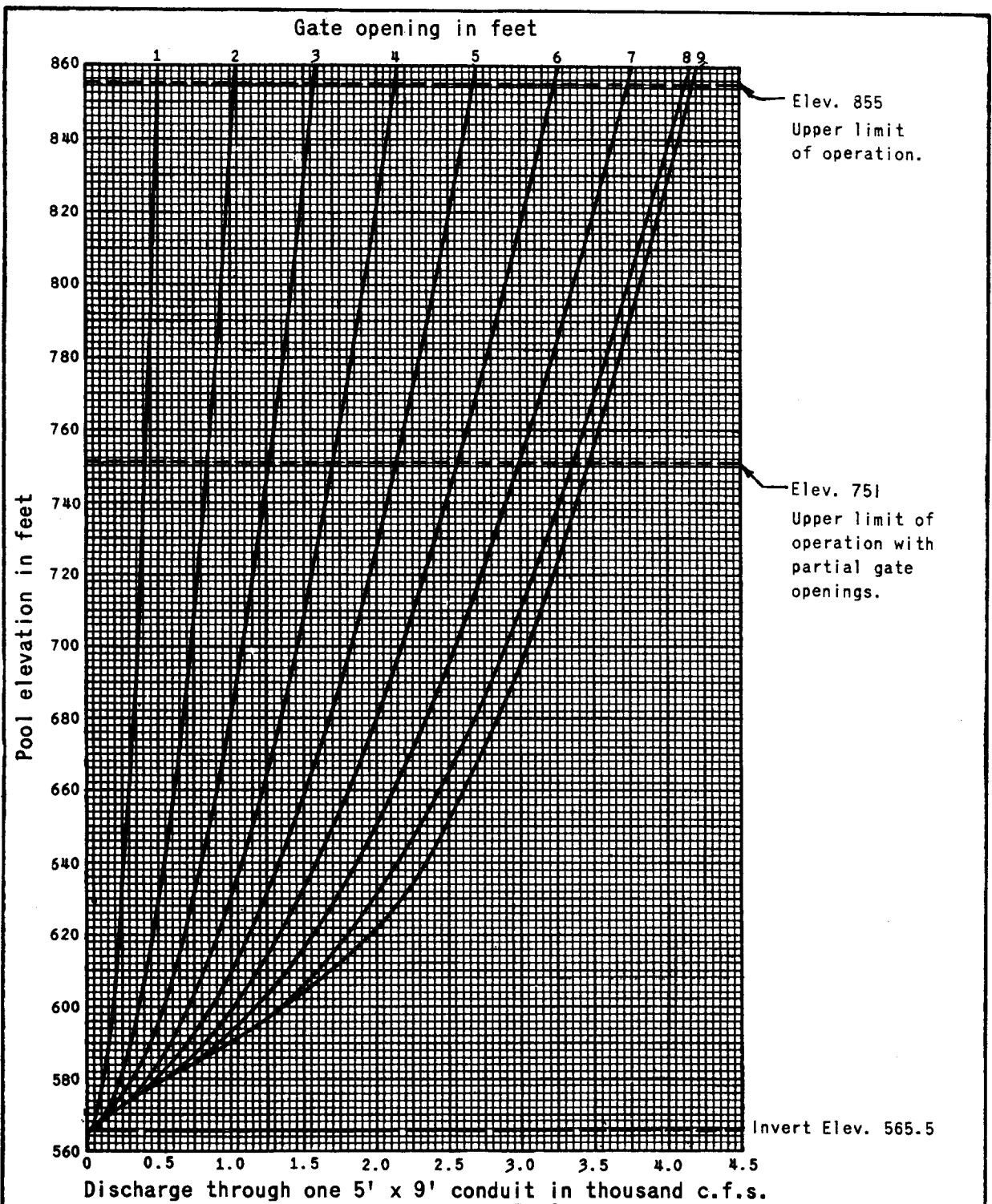
- 1 Ratings are for one of six radial gates with adjacent gates operating.
- 2 Parameter is gate opening (hoist chain travel) in feet.
- 3 Gate seat elevation 915.46 feet.
- 4 At such times as the water flows free (below bottom of spillway gate), discharge is indicated by "uncontrolled discharge" curve regardless of gate opening.

PINE FLAT DAM
KINGS RIVER, CALIFORNIA

SPILLWAY DISCHARGE CURVES
ONE OF SIX SPILLWAY GATES

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M., T.G.K. Date: DECEMBER 1978
Drawn: T.G.K.



NOTES:

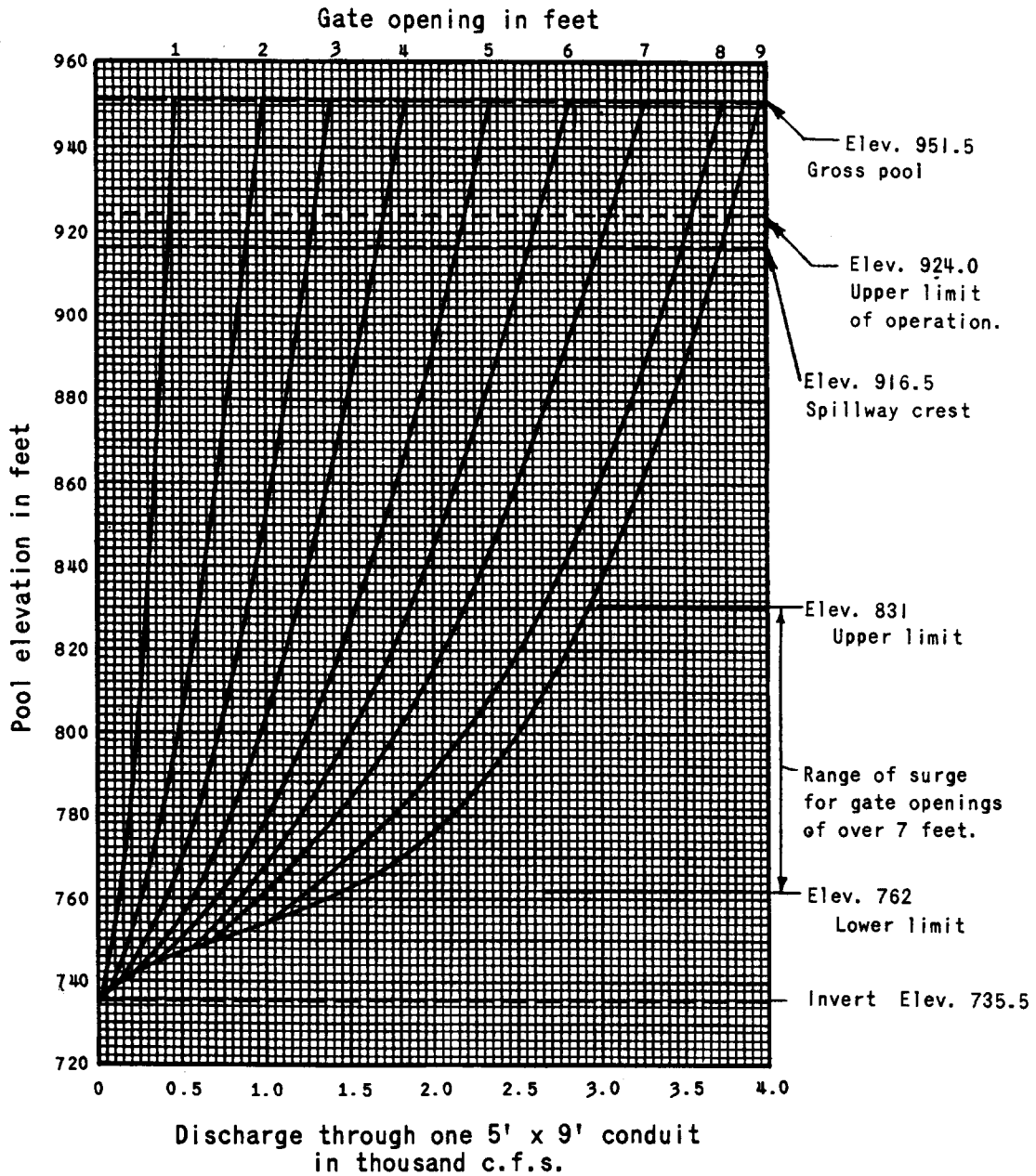
1. Rating for full gate opening is derived from current meter measurements in May and June, 1952, with flows from 8,000 to 15,000 c.f.s.
2. Ratings for partial gate openings are theoretical.

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

**OUTLET DISCHARGE CURVES
ONE OF FIVE LOWER TIER OUTLETS**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: A.G.C. Date: OCTOBER 1953



NOTE:

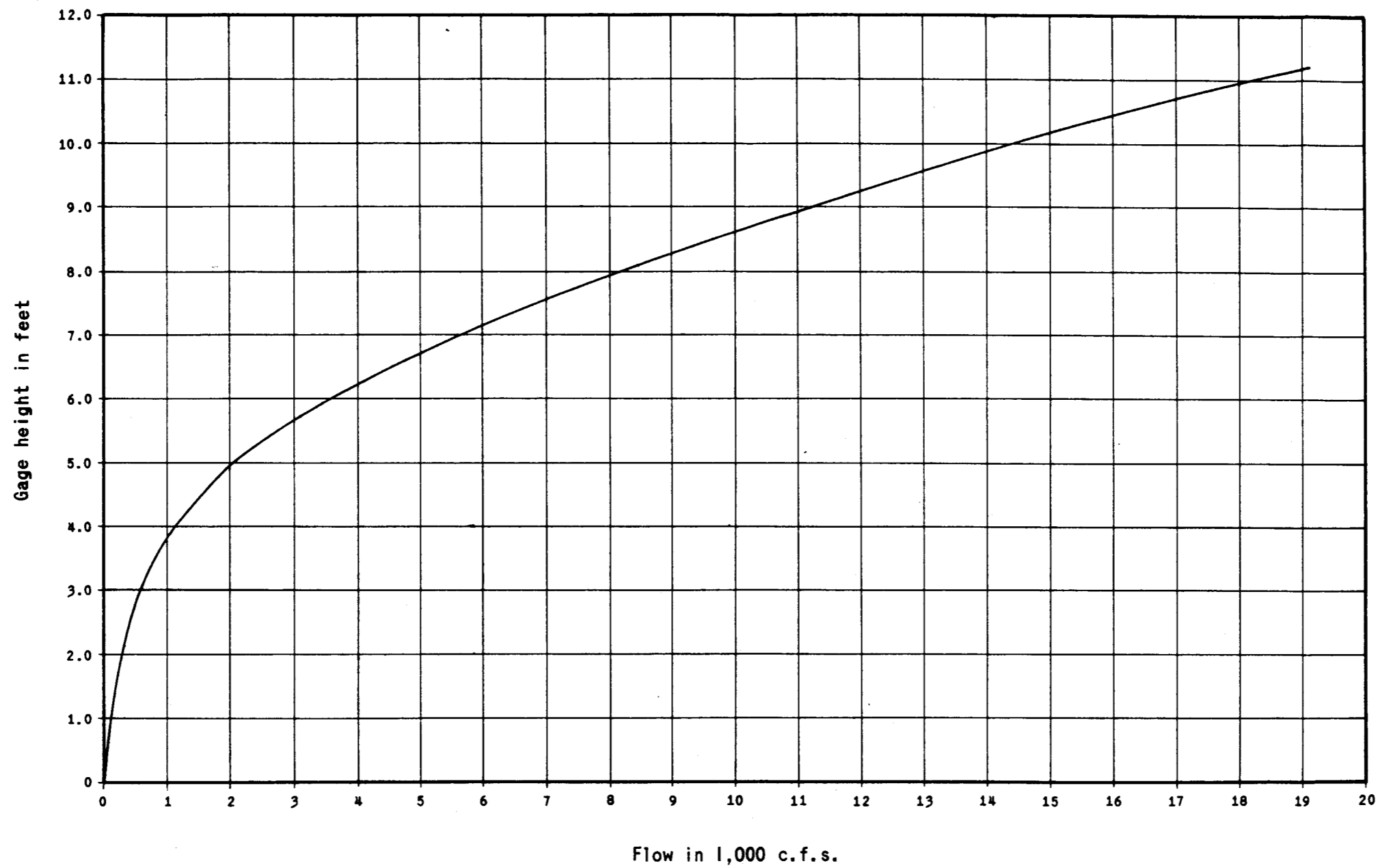
Ratings for all gate openings are theoretical.

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

**OUTLET DISCHARGE CURVES
ONE OF FIVE UPPER TIER OUTLETS**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: A.G.C. Date: OCTOBER 1953



NOTE:
 Data extracted from U.S.G.S. Rating Table
 No. 11 dated 8 April 1976.

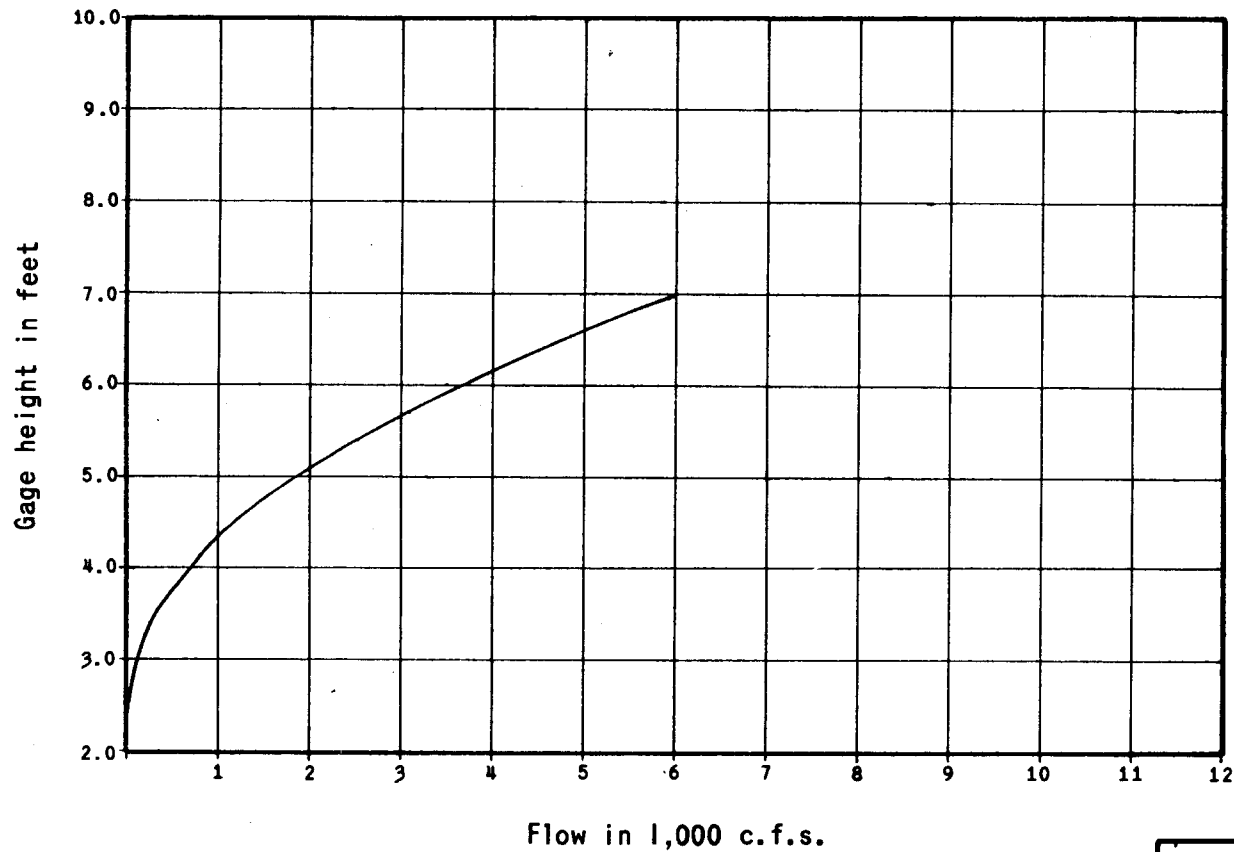
PINE FLAT LAKE
 KINGS RIVER, CALIFORNIA

DISCHARGE RATING CURVE

KINGS RIVER BELOW PINE FLAT DAM

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

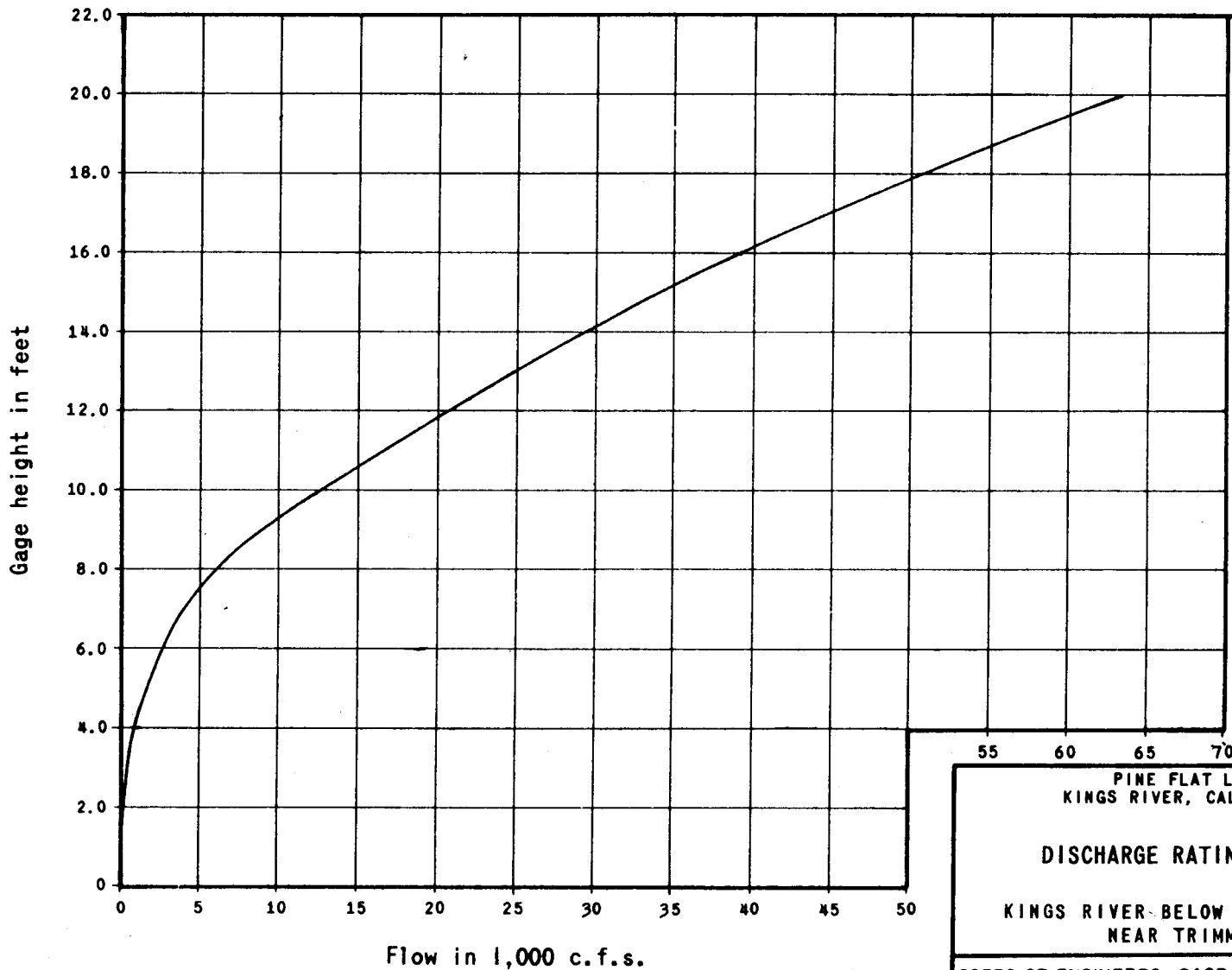
Prepared: L.H.C. Date: FEBRUARY 1979
 Drawn: L.H.C.



NOTE:

Data extracted from U.S.G.S. Rating Table No. 23 dated 1 March 1975.

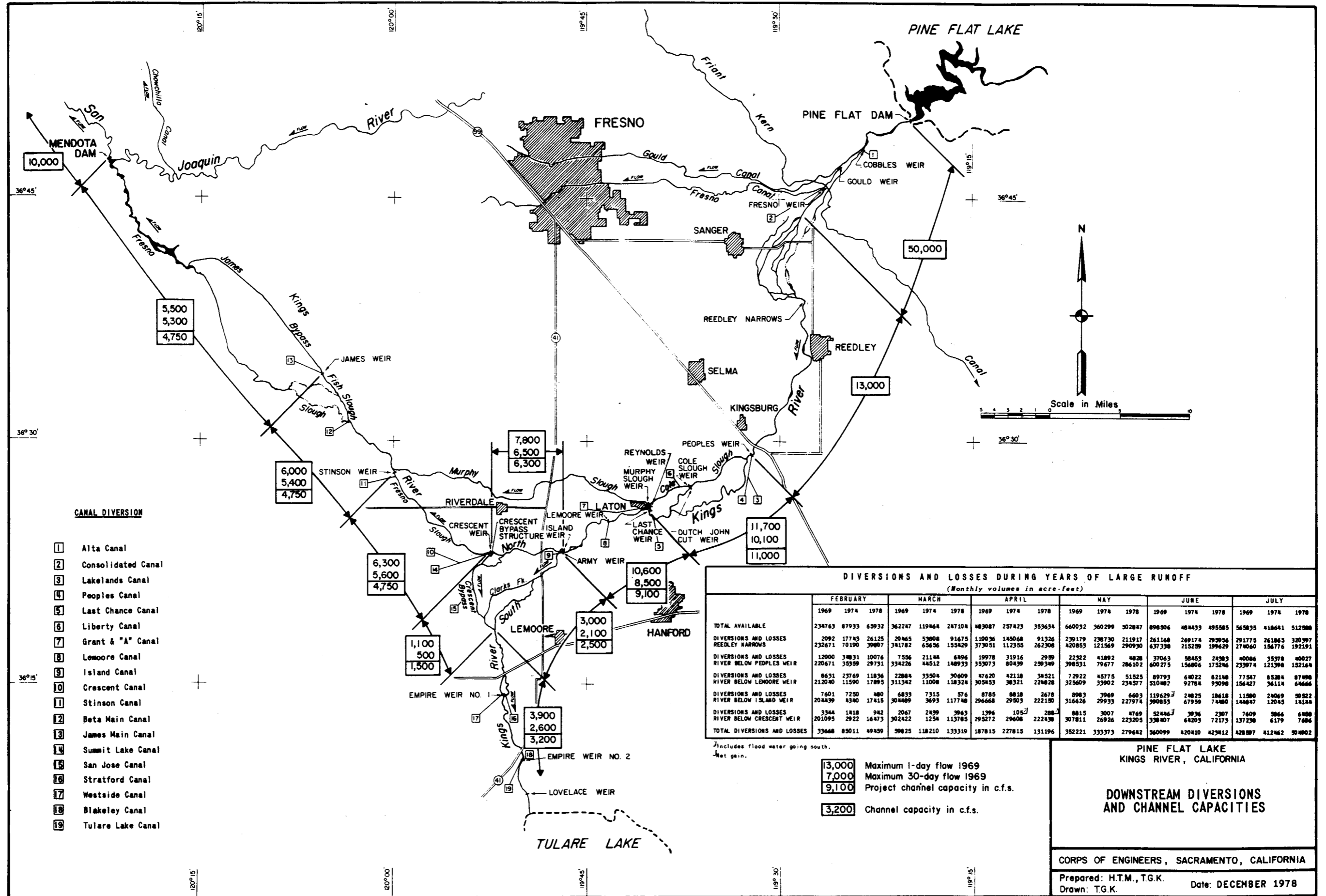
PINE FLAT LAKE KINGS RIVER, CALIFORNIA	
DISCHARGE RATING CURVE	
MILL CREEK NEAR PIEDRA	
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA	
Prepared: L.H.C.	Date: FEBRUARY 1979
Drawn: L.H.C.	



NOTE:

Date extracted from U.S.G.S. Rating Table
No. 19

PINE FLAT LAKE KINGS RIVER, CALIFORNIA	
DISCHARGE RATING CURVE	
KINGS RIVER-BELOW NORTH FORK NEAR TRIMMER	
CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA	
Prepared: L.H.C.	Date: FEBRUARY 1979
Drawn: L.H.C.	



CANAL DIVERSION

- 1 Alta Canal
- 2 Consolidated Canal
- 3 Lakelands Canal
- 4 Peoples Canal
- 5 Last Chance Canal
- 6 Liberty Canal
- 7 Grant & "A" Canal
- 8 Lemoore Canal
- 9 Island Canal
- 10 Crescent Canal
- 11 Stinson Canal
- 12 Beta Main Canal
- 13 James Main Canal
- 14 Summit Lake Canal
- 15 San Jose Canal
- 16 Stratford Canal
- 17 Westside Canal
- 18 Blakeley Canal
- 19 Tulare Lake Canal

DIVERSIONS AND LOSSES DURING YEARS OF LARGE RUNOFF
(Monthly volumes in acre-feet)

	FEBRUARY			MARCH			APRIL			MAY			JUNE			JULY		
	1969	1974	1978	1969	1974	1978	1969	1974	1978	1969	1974	1978	1969	1974	1978	1969	1974	1978
TOTAL AVAILABLE	234765	87933	69932	362247	119464	247104	483087	237423	353634	660032	360299	502847	898506	484433	493585	563935	418641	512988
DIVERSIONS AND LOSSES REEDLEY NARROWS	2092	17743	26125	20465	53808	91675	110036	148068	91326	239179	238730	211917	261168	269174	293956	291775	261865	320397
DIVERSIONS AND LOSSES RIVER BELOW PEOPLES WEIR	12000	34831	10076	7556	21144	6496	19978	31916	2939	22322	41892	4828	37063	58453	24393	40086	35378	40027
DIVERSIONS AND LOSSES RIVER BELOW LEMOORE WEIR	8631	23769	11836	22884	33304	30609	47620	42118	34521	72922	45775	51525	89793	64022	82148	77547	85284	87988
DIVERSIONS AND LOSSES RIVER BELOW ISLAND WEIR	7601	7250	480	6833	7315	576	8785	8818	2678	316626	29933	227974	119629	24825	18618	11580	24069	50822
DIVERSIONS AND LOSSES RIVER BELOW CRESCENT WEIR	3344	1418	942	2067	2439	3963	1396	105	288	307811	26926	223205	338407	64203	72173	137230	6179	7686
TOTAL DIVERSIONS AND LOSSES	33668	85011	49459	59825	118210	133319	187815	227815	131196	352221	333373	279642	560099	420410	423412	428397	412462	504802

J includes flood water going south.
Net gain.

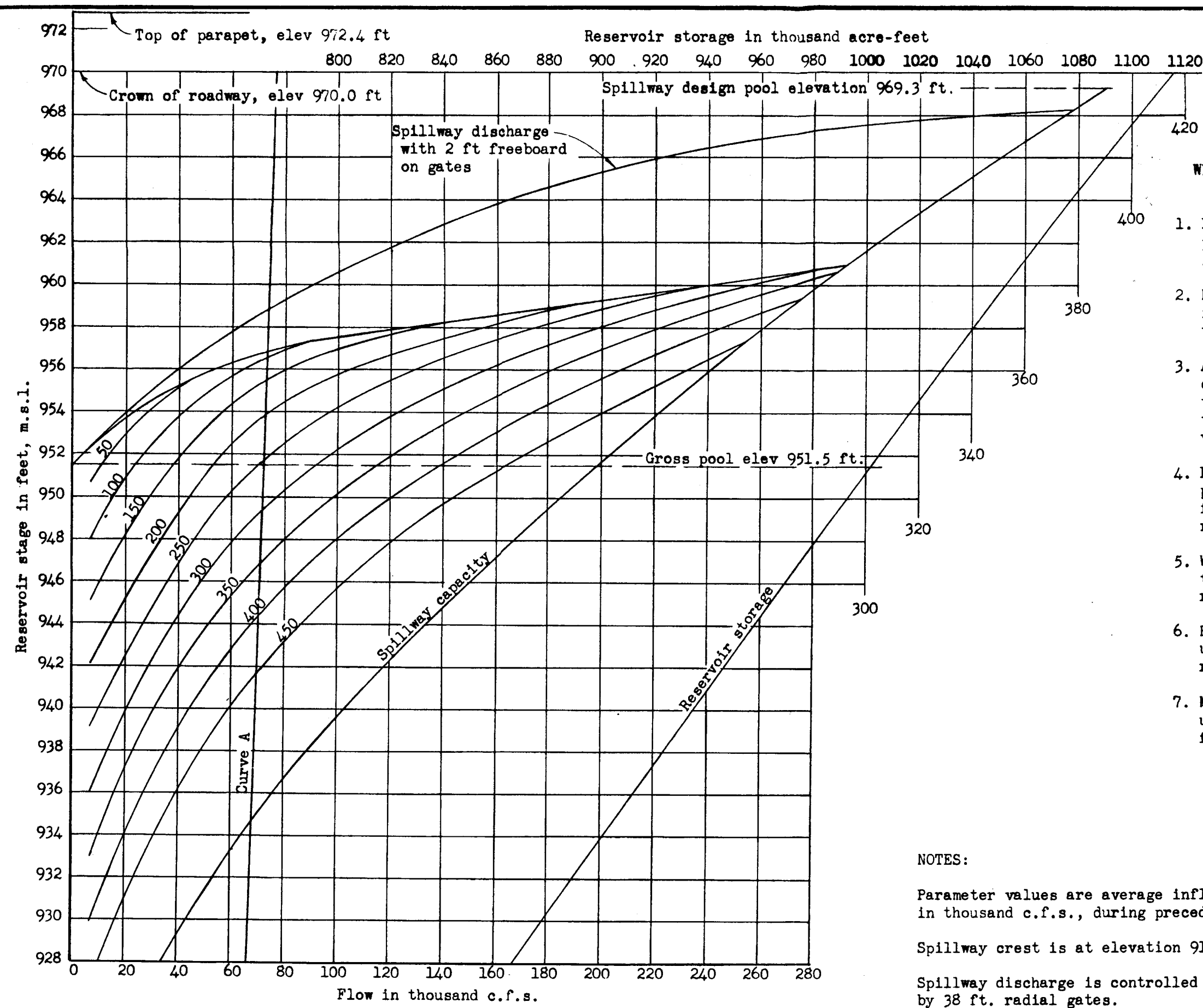
- 13,000** Maximum 1-day flow 1969
- 7,000** Maximum 30-day flow 1969
- 9,100** Project channel capacity in c.f.s.
- 3,200** Channel capacity in c.f.s.

**PINE FLAT LAKE
KINGS RIVER, CALIFORNIA**

**DOWNSTREAM DIVERSIONS
AND CHANNEL CAPACITIES**

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M., T.G.K. Date: DECEMBER 1978
 Drawn: T.G.K.



USE OF DIAGRAM

When reservoir stage is rising:

1. Read from curve A the flow corresponding to the average reservoir stage during the preceding hour.
2. Multiply this value by the rise in reservoir stage, in feet, during the preceding hour.
3. Add this product to the average outflow from the reservoir during the preceding hour. This sum is the average inflow to the reservoir during the preceding hour.
4. From the parameter line corresponding to this inflow, read the flow corresponding to the current reservoir stage.
5. When this value of flow exceeds the current release, increase the release to this value.
6. Repeat steps 1 through 5 each hour until maximum gate opening has been reached.
7. Maintain this maximum gate opening until reservoir stage begins to fall and is below elevation 961.

When reservoir stage is falling and is below elevation 961:

8. Read from curve A the flow corresponding to the average reservoir stage during the preceding hour.
9. Multiply this value by the fall in reservoir stage, in feet, during the preceding hour.
10. Decrease the release by .2 of the product obtained in step 9.
11. Repeat steps 8 through 10 each hour, as long as the reservoir is receding, until the release has been reduced to that required by chart A-8.

Once operation in accordance with the emergency release diagram is initiated, gate changes shall be made only at such times as criteria under steps 1 through 6 require increased gate openings or criteria under steps 8 through 11 require decreased gate openings, until the release has been reduced to that required by chart A-8.

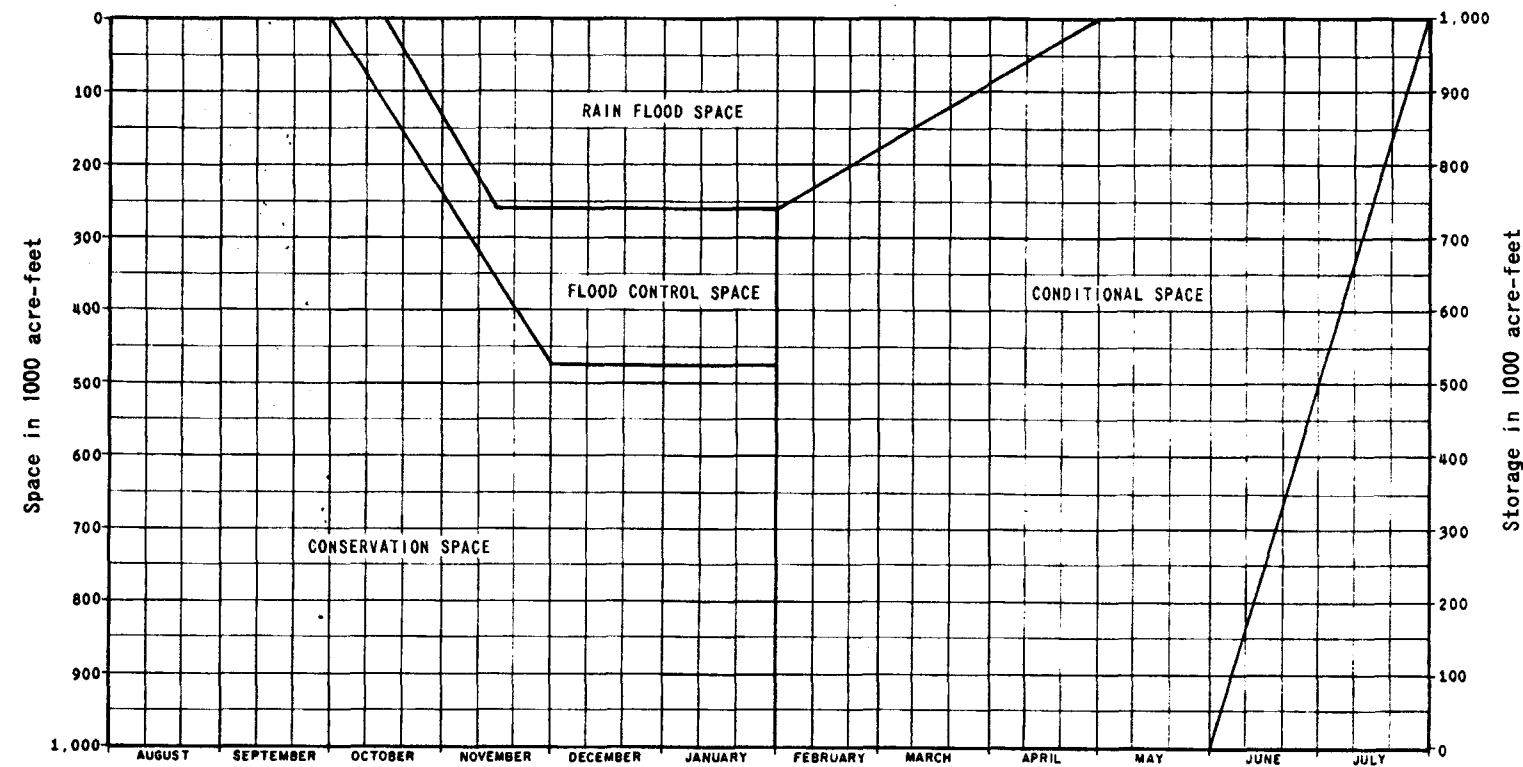
NOTES:

Parameter values are average inflow to reservoir, in thousand c.f.s., during preceding hour.

Spillway crest is at elevation 916.5 ft.

Spillway discharge is controlled by six 42 ft. by 38 ft. radial gates.

PINE FLAT LAKE KINGS RIVER, CALIFORNIA	
EMERGENCY SPILLWAY RELEASE DIAGRAM	
CORPS OF ENGINEERS,	SACRAMENTO, CALIFORNIA
Prepared: H.A.K.	Date: MAY 1955



USE OF DIAGRAM

- When the storage level is in the range of Conservation Space, flood releases are not required.
- Water stored in Flood Control Space shall be released as rapidly as possible without exceeding 4,750 c.f.s. below Crescent Weir or causing flood flows to Kings River South. The Flood Control Space shall be decreased by the space available in Wishon and Courtright Reservoirs less 20,000 acre-feet.
- When water is stored in Rain Flood Space, releases shall be increased to maximum channel capacity to Kings River North and up to maximum channel capacity to Kings River South as necessary to evacuate the Rain Flood Space within 10 days. The Rain Flood Space shall not be reduced by space in upstream reservoirs.
- When water is stored in the portion of the Conditional Space required for flood control, a supplemental release in addition to irrigation demand must be made. The amount of Conditional Space required for flood control, on a given date, is determined from the forecasted full natural runoff into Pine Flat Lake and the forecasted irrigation demand from that date to 10 June (after 26 May use the Forecasted Irrigation Demand for the next 15 days or until 31 July, whichever is less) using the adjacent diagram. The adjacent diagram is also used to compute the supplemental release.

ADDITIONAL CONSIDERATIONS

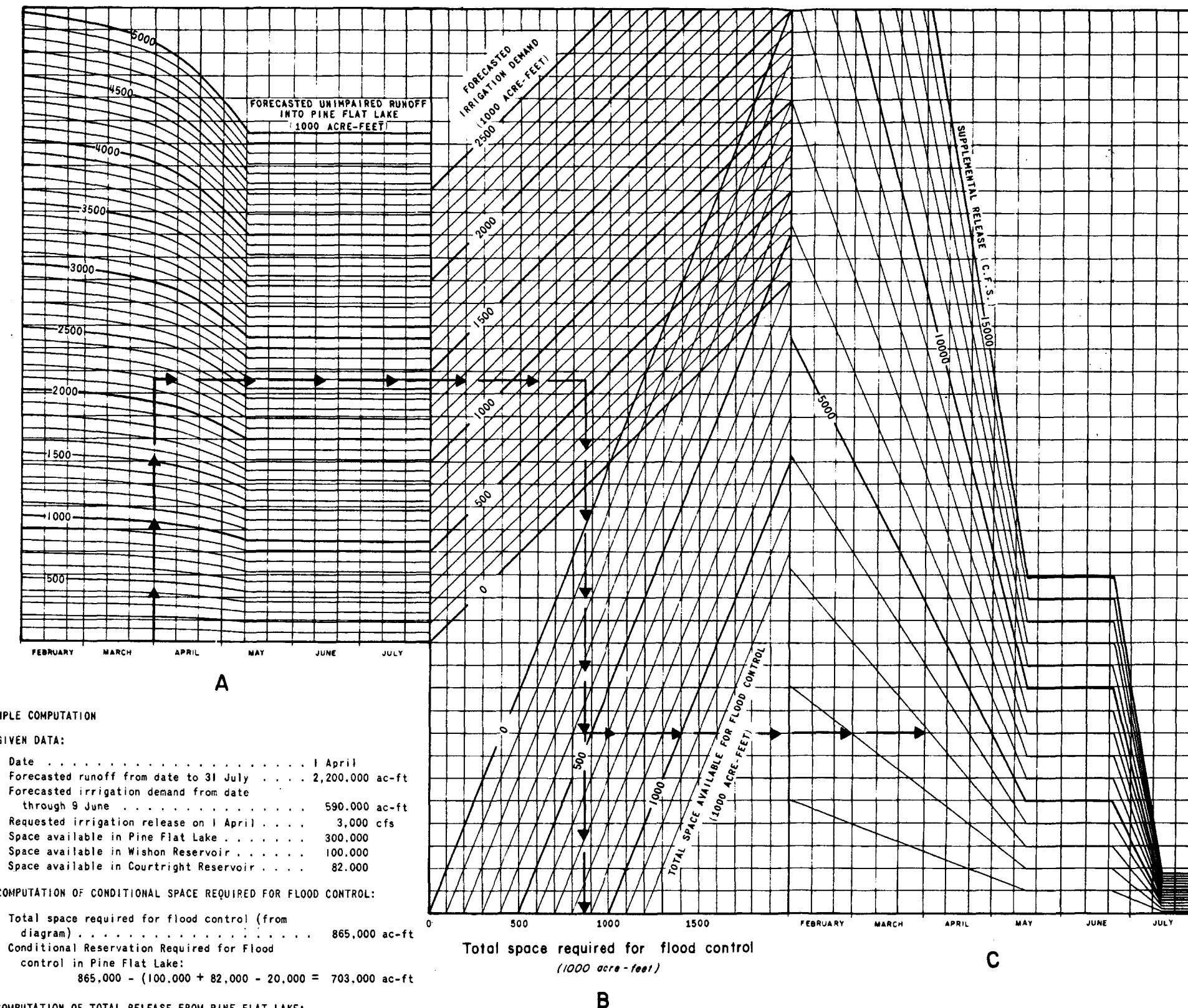
- Reservoir releases will be determined by the instructions hereon unless larger releases are required by the Emergency Spillway Release Diagram (Chart A-7).
- The Corps of Engineers may direct flood releases to be increased or decreased when deviation from the computed release is warranted by existing conditions.
- Insofar as possible, the release from Pine Flat shall not cause the flow in any reach of Kings River or Kings River distributaries to exceed the safe channel capacity as determined by the Corps of Engineers at the time of occurrence.
- The Corps of Engineers may increase or decrease the 20,000 acre-foot adjustment to space transfers from Wishon and Courtright reservoirs based on forecasted runoff and reservoir operation.
- When the San Joaquin River below Mendota is at flood stage the releases to Kings River North shall not be greater than pre-project flow.

CONDITIONAL SPACE REQUIRED FOR FLOOD CONTROL COMPUTATION

- Enter margin "A" for the date the required space is being computed, and move upward vertically to the Forecasted Unimpaired Runoff into Pine Flat Lake parameter, which indicates the runoff from that date through 31 July.
- Move horizontally from the forecasted unimpaired runoff into Pine Flat Lake to the Forecasted Irrigation Demand from that given date to 10 June* (after 26 May use the Forecasted Irrigation Demand for the next 15 days or until 31 July, whichever is less).
- Move vertically downward from the Forecasted Irrigation Demand to margin "B" to obtain Total Space Required for Flood Control. Decrease this volume by the space available in Wishon and Courtright Reservoirs (less 20,000 acre-feet) to obtain the Conditional Space required for flood control in Pine Flat Lake.
*Irrigation Demands shall be the amount of water determined by the Kings River Watermaster to satisfy diversion requirements, channel losses, spreading, sinking, and other uses.

SUPPLEMENTAL RELEASE COMPUTATION

- Perform Steps 1 and 2 above using the date for which the release is being computed.
- Move vertically downward from the Forecasted Irrigation Demand to the Total Space Available for Flood Control on the given date which is the total space available in Pine Flat Lake and Courtright and Wishon Reservoirs (less 20,000 acre-feet).
- Move horizontally from the Total Space Available for Flood Control to the point directly above the given date on margin "C" to obtain the Supplemental Release (interpolate as required). The Supplemental release must be added to the irrigation demand to obtain the total release.



SAMPLE COMPUTATION

GIVEN DATA:

Date 1 April
 Forecasted runoff from date to 31 July 2,200,000 ac-ft
 Forecasted irrigation demand from date through 9 June 590,000 ac-ft
 Requested irrigation release on 1 April 3,000 cfs
 Space available in Pine Flat Lake 300,000
 Space available in Wishon Reservoir 100,000
 Space available in Courtright Reservoir 82,000

COMPUTATION OF CONDITIONAL SPACE REQUIRED FOR FLOOD CONTROL:

Total space required for flood control (from diagram) 865,000 ac-ft
 Conditional Reservation Required for Flood control in Pine Flat Lake:
 $865,000 - (100,000 + 82,000 - 20,000) = 703,000$ ac-ft

COMPUTATION OF TOTAL RELEASE FROM PINE FLAT LAKE:

Total space available for flood control 462,000
 $300,000 + 100,000 + 82,000 - 20,000 = 462,000$
 Supplemental release (from diagram) 2,900 cfs
 Total release $3,000 + 2,900 = 5,900$ cfs

	NORMAL IRRIGATION DEMAND	
	(1000 A.F.)	(MEAN C.F.S.)
JANUARY	23	374
FEBRUARY	78	1360
MARCH	122	1990
APRIL	170	2860
MAY	257	4190
1-9 JUNE	104	5830
10 JUNE-31 JULY	665	6450
AUGUST	188	3060
SEPTEMBER	133	2240
OCTOBER	18	293
NOVEMBER	5	84
DECEMBER	19	309

PINE FLAT LAKE
KINGS RIVER, CALIFORNIA

FLOOD CONTROL DIAGRAM

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: H.T.M. Date: MARCH 1979
 Drawn: L.H.C.