ANNUAL

OPERATING

PLAN

Kansas River Projects

1959 Operations

1960 Outlook

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGION 7
DENVER, COLORADO

February 1960

UNITED STATES DEPARTMENT OF THE INTERIOR
Fred A. Seaton, Secretary

BUREAU OF RECLAMATION
Floyd E. Dominy, Commissioner

Region 7 - Denver, Colorado
John N. Spencer, Regional Director

ANNUAL OPERATING PLAN

KANSAS RIVER PROJECTS

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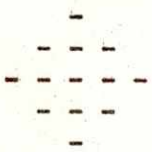


February 1960

SYNOPSIS

Annual Operating Plan - Kansas River Projects
1959 Operations
1960 Outlook

This is the seventh Annual Operating Plan for irrigation units in the Kansas River Projects area. The report is basically concerned with the Federally constructed, or rehabilitated, irrigation facilities in the Republican, Solomon and Smoky Hill River drainage areas. The primary purpose is to describe the irrigation operations and responsibilities of the Bureau of Reclamation. The operational data regarding Harlan County Reservoir, constructed and operated by the Corps of Engineers, has been prepared with the cooperation of the Corps.

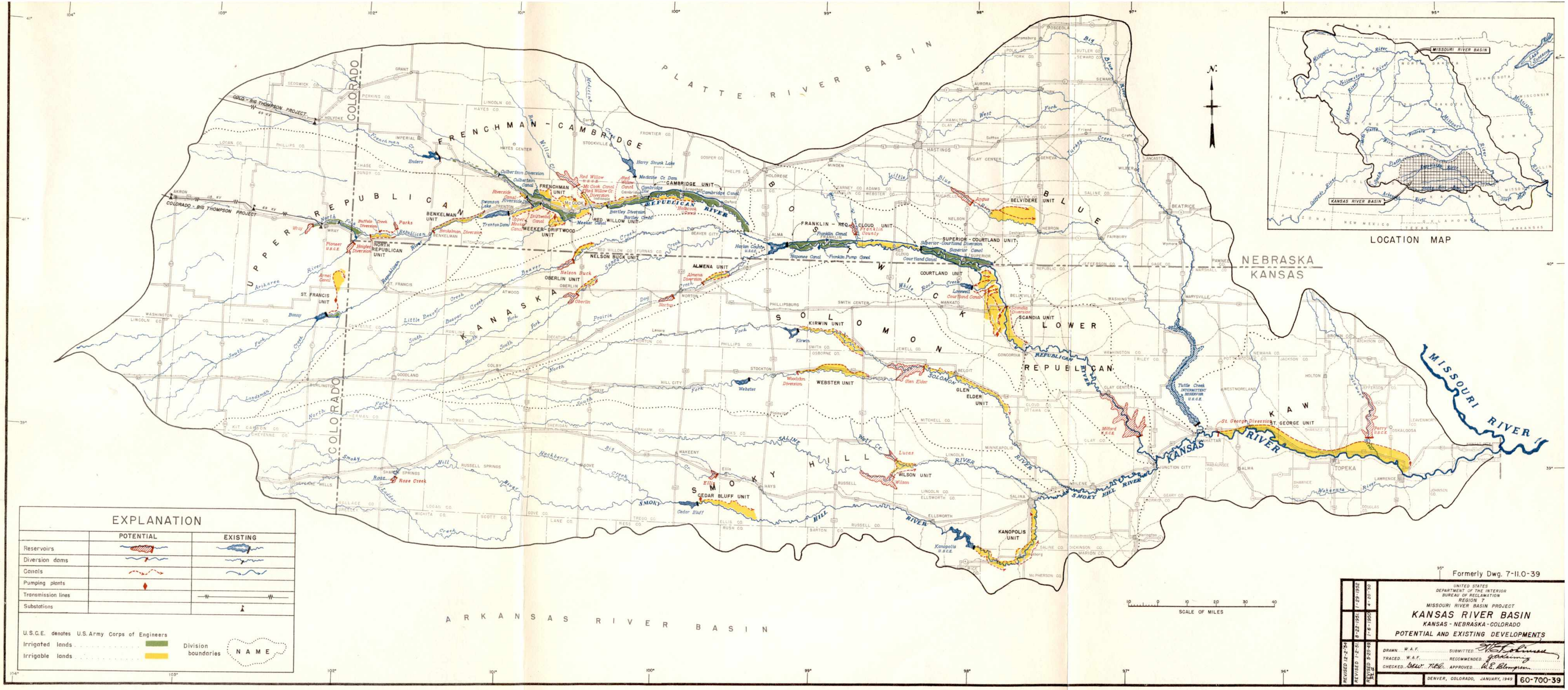
Chapter I, the introduction of the report, gives a brief description of the irrigation units in the Kansas River Projects area. Chapter II summarizes the 1959 operations, and Chapter III presents the plan of operation for 1960.

1959 OPERATIONS

The water supply was more than adequate to meet the 1959 irrigation requirements of 79,900 acres under Kansas River Projects units. Precipitation varied from 80% of normal at Enders Dam to 112% of normal at Webster Dam. Inflows to all reservoirs except Enders was below normal, varying from 29% of normal at Cedar Bluff Reservoir to 101% of normal at Enders Reservoir. Some drawdown was experienced at all reservoirs.

1960 OUTLOOK

The carryover storage at all reservoirs is more than adequate to meet the requirements of the approximately 107,100 acres that could be irrigated in project areas during 1960. Also, supplemental water will be available to approximately 7,500 acres of land under private irrigation systems if dry weather results in a demand for storage water deliveries under Warren Act contracts.



EXPLANATION
POTENTIAL
EXISTING
Reservoirs
Diversion dams
Canals
Pumping plants
Transmission lines
Substations
U.S.C.E. denotes U.S. Army Corps of Engineers
Irrigated lands
Irrigable lands
Division boundaries
NAME
LOCATION MAP
MISSOURI RIVER BASIN
KANSAS RIVER BASIN
PLATTE RIVER BASIN
ARKANSAS RIVER BASIN
NEBRASKA
KANSAS
COLORADO
MISSOURI RIVER
KANSAS RIVER
UPPER REPUBLICAN
FRENCHMAN - CAMBRIDGE
KANASKA
BOSTWICK
SOLOMON
LOWER REPUBLICAN
BLUE
KAW
SMOKY HILL
REPUBLICAN RIVER
SMOKY HILL RIVER
SCALE OF MILES
Formerly Dwg. 7-11.0-39
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
REGION 7
MISSOURI RIVER BASIN PROJECT
KANSAS RIVER BASIN
KANSAS - NEBRASKA - COLORADO
POTENTIAL AND EXISTING DEVELOPMENTS
DRAWN W.A.F. SUBMITTED
TRACED W.A.F. RECOMMENDED
CHECKED APPROVED
DENVER, COLORADO, JANUARY, 1949
60-700-39
REVISED 12-2-'54
REVISED 1-2-51. 8-22-1951. 1-29-1952
REVISED 5-25-49. 1-6-1950 4-20-'50

GPO 835445

KANSAS RIVER PROJECTS
1959 OPERATIONS
1960 OUTLOOK

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CHAPTER I - INTRODUCTION

PURPOSE OF REPORT

The purpose of this Annual Operating Plan is to advise water users, cooperating agencies, and other interests of the results of irrigation operations during 1959 and the plan of irrigation operations for 1960. This report does not include operations for flood control which are the responsibility of the Corps of Engineers.

LOCATION AND MAJOR FEATURES

The Kansas River Projects consist of the irrigation units of the Kansas River Basin, which are a part of the Missouri River Basin Project. This includes multiple-purpose reservoirs which provide storage for irrigation, flood control, municipal water supply, recreational purposes, stream pollution abatement, and other uses. These dams and reservoirs, constructed and operated by the Bureau of Reclamation or Corps of Engineers, serve the irrigation systems for these units. The Canals and diversion dams have been constructed or rehabilitated by the Bureau of Reclamation and, for the most part, are operated by Irrigation Districts.

Ten reservoirs, twelve canal systems, and five diversion dams are in operation. Three canal systems are under construction and one canal system is being rehabilitated. Two of the reservoirs, Harlan County and Kanopolis are operated by the Corps of Engineers. At the present time, Kanopolis is not being used to serve an irrigation unit; therefore, it is not included in this report. Tuttle Creek Dam and Reservoir is under construction by the Corps of Engineers. It also is omitted from discussion in the report because no irrigation from reservoir storage is expected in the near future. Storage allocations for the reservoirs discussed in this report are shown in Table 1 on page 14. The reservoirs and main irrigation canals are schematically shown in Exhibit 1, page 29.

IRRIGATION DISTRICTS

Nine Irrigation Districts in the Kansas River Projects area have contracted with the Bureau of Reclamation for construction of irrigation facilities. These are the Frenchman Valley, H&RW, Frenchman-Cambridge, and Nebraska-Bostwick Irrigation Districts in the State of Nebraska; and Kansas-Bostwick, Kirwin, Webster, Almena and Cedar Bluff Irrigation Districts in the State of Kansas.

The status of each repayment or water service contract is shown in Table 2. This table also lists the development periods now in existence for the various districts.

Frenchman Valley

Enders Reservoir and Culbertson Canal will be used to serve approximately 9,600 acres. The Bureau of Reclamation reconstructed the diversion dam and reconstruction of the main canal will be completed in January 1961. Water was delivered for the first time under the repayment contract in 1958. The canal has been in operation since the 1890's. Enders Reservoir will firm up a previously inadequate water supply.

H&RW (initials for Hitchcock and Red Willow)

The Bureau of Reclamation is presently enlarging and extending the Culbertson Canal to serve 11,500 acres in the H&RW Irrigation District as well as the 9,600 acres now being irrigated in the Frenchman Valley Irrigation District. Present construction schedules provide for completion by January 1962. Very little irrigation of new lands, if any, is expected in 1960.

Frenchman-Cambridge

This irrigation unit is designed to receive storage water from three reservoirs. At the present time, Trenton Dam (Swanson Lake) and Medicine Creek Dam (Harry Strunk Lake) are complete, and are serving this unit. Construction on Red Willow Dam and Reservoir will be initiated in May 1960. Completion of the dam is scheduled for September 1962.

The Cambridge, Bartley, and Meeker-Driftwood Canals are now in operation. The Meeker-Driftwood Canal provides water for the lands that include those formerly irrigated by the Meeker Canal. Construction on the Red Willow Canal will be started November 1961. Completion of the canal is scheduled for January 1964. The Red Willow Diversion Dam is scheduled for construction during the period March 1962 - July 1963. When all facilities in the Frenchman-Cambridge Irrigation District are completed, water will be available for approximately 42,400 acres.

Nebraska-Bostwick

The primary source of storage water for the Nebraska-Bostwick Irrigation District is Harlan County Reservoir. The Franklin, Naponee, Franklin Pump, Superior and Courtland (Nebraska) Canals have been constructed to serve 24,240 acres.

Kansas-Bostwick

Storage water for this district will be provided primarily by Harlan County and Lovewell Reservoirs. The inflow to Lovewell Reservoir from White Rock Creek is insufficient to meet irrigation demands for the lower Courtland Canal. This storage is supplemented

by flows of the Republican River and from Harlan County Reservoir. The additional water is delivered to Lovewell Reservoir by means of the Upper Courtland Canal. Approximately 15,000 acres will be served by that portion of the Courtland Canal in Kansas above Lovewell, and about 34,000 acres by Courtland Canal below Lovewell Reservoir. At the present time, service is available to 31,900 acres of the total 49,300 acres planned above and below Lovewell Reservoir. Most of the canal system is scheduled for completion by February 1961.

Kirwin

Kirwin Reservoir is used to supply water to approximately 11,500 acres under the Kirwin Canal.

Webster

The Woodston Diversion Dam is completed. Construction on the Osborne Canal system is scheduled to be completed in April 1961. This will provide irrigation service to 8,500 acres. Water for this district will be stored in Webster Reservoir. The first year of irrigation is planned for 1960 when it is expected that 2,200 acres will be irrigated.

Almena

The repayment contract between the Bureau of Reclamation and the Almena Irrigation District has been negotiated. Construction funds for the Norton Dam, Almena Diversion Dam, and Almena Canal are budgeted for fiscal year 1961. If funds are appropriated, construction of Norton Dam is scheduled for the period June 1961 - September 1964; the Almena Diversion Dam for the period January 1963 - March 1964; and the Almena Canal system for the period April 1963 - January 1965.

Cedar Bluff

Cedar Bluff Reservoir will supply irrigation water for 6,500 acres under the Cedar Bluff Canal. Some work on the canal system is scheduled for June 1960, but completion of the work is not expected before July 1963.

MUNICIPAL WATER

The City of Russell, Kansas, temporarily contracted for storage water from Cedar Bluff Reservoir in 1959 as they had in the preceding five years. The Bureau of Reclamation and the City of Russell are now negotiating a long-term contract.

A long-term contract has been negotiated with the City of Norton, Kansas for municipal water supply which will be furnished from Norton Reservoir when constructed.

FISH HATCHERY

In July 1959 a fish hatchery operated by the Fish and Wildlife Service of the Department of Interior, was placed in operation below Cedar Bluff Reservoir. The hatchery, which is primarily for warm-water fish is not expected to use more than 4,000 acre-feet of water per year from Cedar Bluff Reservoir.

CHAPTER II - SUMMARY OF 1959 OPERATIONS

PRECIPITATION

Annual precipitation at all dams in the Republican River Basin was below normal in Colorado and Nebraska. The total varied from 80% of normal at Enders Dam to 93% of normal at Harlan County Dam. Total precipitation at the dams in Kansas ranged from 98% of normal at Cedar Bluff Dam to 112% of normal at Webster Dam. See Table 3 on page 16.

INFLOW

Below normal precipitation in the northwestern and western parts of the Kansas River Basin resulted in below normal inflow at all of the reservoirs except Enders. Most of the Enders Reservoir inflow resulted from base flow fed by seepage from ground water. Table 4 on page 17 shows the 1959 inflows compared to normal. The total annual reservoir inflows of 1959 are compared graphically with inflows of previous years of record in exhibits 26 through 34 (pages 54 to 62).

RESERVOIR OPERATIONS - 1959

There were no irrigation shortages in 1959. Controlled spills occurred at all of the reservoirs except Kirwin. Tables 5 through 7 (pages 18 to 20) show the 1959 reservoir operations with monthly inflows, outflows and reservoir contents as compared with 1958. These operations are plotted on Exhibits 2 through 25 (pages 30 to 47) to compare 1959 with the previous years of operation and with estimates for 1960. The enlarged scales for 1959 operations and 1960 estimates show both reservoir elevation and content.

Minimum downstream flow requirements were met by normal return flows and flood spills and no special reservoir operations were necessary except for some storage releases from Harlan County Reservoir during the summer months to satisfy sanitation requirements of the Lower Republican River Basin under terms of a standing agreement between state and federal agencies.

Although the irrigation storage pools in most reservoirs were filled at various times during the year, the flood control pools were used only slightly and ample flood protection was provided at all times. Controlled spills were made under the direction of the Corps of Engineers.

Bonny Reservoir

Controlled spills were made during March, April and May. The reservoir level was maintained between one and two feet below the top of the irrigation pool from May through August. Natural flow

releases were made to Hale Ditch as required. Also, supplemental water under Warren Act contracts was released for 590 acres served by the Hale Ditch.

Swanson Lake

Controlled spills were made from January through May. Releases for irrigation were made to the Meeker-Driftwood Canal. Also, irrigation releases were made to the river for diversions by the Bartley Canal. Supplemental water was supplied to 625 acres under Warren Act contracts. A drawdown below the top of the irrigation pool of 12 feet (53,000 acre-feet) was experienced during the irrigation season.

Enders Reservoir

The reservoir level was maintained at approximately the top of the irrigation pool from January through May. Controlled spills were made in February through May. Natural flows were released to the Culbertson Canal and for senior water rights during May, June, July, August, and September. Releases were made during July, August, and September for Warren Act contractors irrigating a total of 2,682 acres.

Harry Strunk Lake

Storage in Harry Strunk Lake was more than adequate to meet the requirements of the Cambridge Canal and of 1,192 acres served under Warren Act contracts. The reservoir spilled from January through May.

Harlan County Reservoir

The irrigation pool at Harlan County Reservoir was full during most of April and May. However, a drawdown of 7 feet (87,000 acre-feet) below the top of the irrigation pool occurred during the irrigation season. The storage was more than adequate to fulfill all demands of the Naponee, Franklin, Franklin Pump, Superior and Courtland Canals and Lovewell Reservoir.

Lovewell Reservoir

No early diversions from the Republican River through the Upper Courtland Canal were required to fill the irrigation pool. Inflows from White Rock Creek raised the reservoir level to a maximum of $1\frac{1}{2}$ feet above the top of the irrigation pool during May. Releases were made to Courtland Canal below Lovewell during the irrigation season. This resulted in a drawdown of about 9 feet (21,000 acre-feet) below the top of the irrigation pool in September.

Kirwin Reservoir

Although Kirwin Reservoir did not spill in 1959, the storage was more than adequate to meet the demands of the Kirwin Canal. The carry-over storage for 1960 is excellent.

Webster Reservoir

There were no irrigation demands below Webster Reservoir except for some minor releases requested by state officials administering senior water rights. Releases were controlled to assist the Kansas State Board of Water Resources, the Geological Survey, and the Corps of Engineers in conducting studies on pickup of stream flow below Webster Dam. The irrigation pool remained almost full, or more than full, throughout the year, and most of the natural inflow was passed through the reservoir.

Cedar Bluff Reservoir

Controlled spills occurred from March through July. Those flood releases were more than adequate to meet most of the municipal water supply requirements of the City of Russell, Kansas. However, the lack of natural inflow and the discontinuance of releases from the flood control pool in August and September made it necessary to make special releases, totaling 430 acre-feet for the city in August and September.

The fish hatchery operated by the Fish and Wildlife Service of the Department of Interior was placed in operation below Cedar Bluff Reservoir in July 1959. Only 398 acre-feet were diverted to the hatchery. Much of this amount was passed through the hatchery and released back into the river below the dam.

CANAL OPERATIONS

A total of 219,000 acre-feet of water was diverted into twelve Bureau of Reclamation constructed, rehabilitated or operated canals. This was used on a total of 79,900 acres of land of which 57,200 acres were in Nebraska and 22,700 acres were in Kansas.

Supplemental storage water amounting to 1,040 acre-feet was used on 4,500 acres under pump irrigation in Nebraska. In Colorado, the Hale Ditch received 2,570 acre-feet of natural flow and supplemental storage water for 590 acres.

Table 8 (page 21) shows the monthly diversions and acres irrigated for each canal. Table 9 (page 22 to 25) is a tabulation comparing 1959 operations with previous year's records and estimates for 1960. Most of the canals are now operated by the irrigation

districts, although the Bureau of Reclamation usually operates a system during the first 1 to 3 years of operation. Table 10 (page 26) shows this information and also gives a tabulation of acres planned, irrigated in 1959, and estimated acres for which service has been built for the various canal systems. Exhibits 20 through 25 (page 48 to 53) give a graphic comparison of irrigation in the different irrigation districts in 1959, with past years of operation, and with 1960 estimates.

OTHER USES

During 1959 the water levels at a majority of the reservoirs had a drawdown of only a few feet. This made them very attractive for fish, waterfowl, and public recreation use. Some of the reservoirs, such as Swanson Lake, Harry Strunk Lake, and Lovewell Reservoir experienced a drawdown of several feet during the irrigation season because of the heavy demand for irrigation water. This resulted in some complaints from recreation interests; however, it is a condition that can develop at any of the multipurpose reservoirs of the Kansas River Projects during a dry irrigation season. Insofar as possible, the operation of the reservoirs is planned to protect the interests of recreation, provided these interests do not have a direct conflict with the primary interests of irrigation and flood control.

There has been a marked increase in public visitation at the reservoirs during the past few years. The number of watercraft and the number of people participating in water sports have, in most instances, shown a steady increase. Many sportsmen have been attracted by the excellent fishing and hunting in the reservoir areas. The annual visitation and some of the more prominent uses of the various reservoirs are shown in Table 11 (page 28).

CHAPTER III - ANNUAL OPERATING PLAN FOR 1960

WATER SUPPLY - 1960

The water supply outlook for 1960 is excellent. The irrigation pools in all reservoirs will be full or almost full by the start of the 1960 irrigation season. Even under extremely dry conditions, no shortages are expected.

The total water supply of each reservoir available to meet any demands is equal to the carry-over storage from the previous year plus the inflow of the current year. While the carry-over storage is readily known, the forecast of reservoir inflows in an area where the major source of water is flood runoff is nearly impossible. For forecasting purposes, values of annual inflows that will be statistically equaled or exceeded 10, 50, and 90 percent of the time were selected from the probability curve to be "Reasonable Maximum," "Most Probable," and "Reasonable Minimum" inflow conditions. The estimates of the annual inflow for 1960 selected by the above procedure are shown in Table 4 on page 17 and are compared graphically with historical inflow records on Exhibits 26 through 34 (pages 54 to 62).

RESERVOIR OPERATIONS - 1960

The normal storage limitations at all of the reservoirs for irrigation and municipal purposes will be the top of the irrigation storage pool, as shown in Table 1 on page 14. State laws regulating the use of water will also affect the amount and time of storing streamflows.

Each fall after the demand period, the storage in all reservoirs is evaluated and when it is apparent that a reservoir will spill before the start of the next irrigation season, controlled releases will be made and only that portion of the inflow required to fill the irrigation storage pool by the first of May will be stored. This method is not used for Bonny Reservoir as it is undesirable to make releases during winter months.

Exhibits 2,4,6,8,10,12,14,16 and 18 (page 30,32,34,36,38, 40,42,44 and 46) show the probable effects on each reservoir for 1960 under "Most Probable," "Reasonable Minimum," and "Reasonable Maximum" inflow conditions.

Bonny Reservoir

The carry-over storage will more than meet any requirements of Hale Ditch for supplemental storage during 1960. Controlled spills will occur under any inflow condition. Releases to lower the reservoir

level in advance of anticipated inflows which will more than fill the irrigation storage pool are also considered as controlled spills. As the Hale Ditch outlet pipe is exposed, it is not desirable to make continuous releases during freezing weather. This makes it necessary to have the reservoir level three to four feet below the top of the irrigation pool each fall. To reduce the large drawdown required each September, the reservoir level will be lowered to two feet below the top of the irrigation pool during April, and maintained there throughout the summer months. This will make only a one or two-foot drawdown necessary in September. This plan of operation will be revised as required for flood inflow or extremely dry weather.

Swanson Lake

Irrigation releases from this reservoir will be used primarily for lands under Meeker-Driftwood and Bartley Canals.

The carry-over storage and available inflow will be more than adequate to meet the irrigation demands for 1960. Surplus storage will be available as supplemental water for Warren Act contract sales. Swanson Lake will spill under all expected inflow conditions except reasonably minimum inflow.

Enders Reservoir

The storage in Enders Reservoir will be more than adequate to meet any irrigation requirements. Surplus storage will be available for Warren Act contractors on Frenchman or Stinking Water Creeks. Spills will occur under all inflow conditions.

Harry Strunk Lake

Harry Strunk Lake will be spilling at the start of the 1960 irrigation season. Irrigation releases will be made for Cambridge Canal. Surplus storage will again be available for sale to private irrigators in the Medicine Creek watershed.

Harlan County Reservoir

This reservoir will spill or be close to spilling this spring under any expected inflow conditions. Irrigation releases will be made for Franklin, Naponee, Franklin Pump, Superior and Courtland Canals in Nebraska and Courtland Canal and Lovewell Reservoir, as required, in Kansas. The carry-over storage in Lovewell Reservoir is such that no releases will be required from Harlan County Reservoir before the start of the 1960 irrigation season. Under dry conditions, the demand of Lovewell Reservoir upon Harlan County Reservoir may exceed 39,400 acre-feet; however,

this includes irrigation requirements of areas served below Lovewell Reservoir.

If conditions permit, the transfers of storage from Harlan County Reservoir to Lovewell Reservoir will normally be made during the first and last month of the irrigation season, but unusual conditions may occasionally require transfer operations during the non-irrigation season. The transfers of storage will be held to a minimum during winter months as the maintenance costs are higher and the irrigation districts are normally preparing their canals for the next year's operation while the canals are dry.

Lovewell Reservoir

Lovewell Reservoir was planned for regulation of Courtland Canal as well as the storage of natural flows on White Rock Creek. The demands on Courtland Canal below Lovewell Reservoir will be met with water stored from White Rock Creek flows and with water diverted from the Republican River through the Upper Courtland Canal. When the flows in the Republican River and White Rock Creek are inadequate to meet the demand, special releases from Harlan County Reservoir will be made to transfer storage to Lovewell Reservoir. During periods of low water supply in Harlan County and Lovewell Reservoirs, all flow not needed by Superior and Courtland Canals or downstream water rights will be diverted into Lovewell Reservoir. Under severe drouth conditions, diversions could continue through all of the non-irrigation season months except January and February.

During the winter months, it is desirable that the water level in Lovewell Reservoir be at an elevation of approximately 1577 feet or above to reduce the possibilities of erosion to the upstream face of the dam. If conditions permit, any drawdown of Harlan County required for this purpose will be done in September. If water is available either as pickup in the Republican River or as surplus storage in Harlan County Reservoir, the irrigation pool of Lovewell Reservoir will be filled during the first month of irrigation operations. This usually will be in May.

Kirwin Reservoir

Kirwin will not spill except under "Reasonable Maximum" inflow conditions. The project area in the Kirwin Irrigation District is large for the expected available water supply and successful operation of the unit may at times be dependent upon several years of carry-over reservoir storage. The present carry-over storage is more than adequate to meet the demands for 1960 under the Kirwin Canal. No plans have been made to make supplemental water available to non-project lands.

Webster Reservoir

Webster Reservoir will be spilling before the start of the 1960 irrigation season. The water supply will be more than adequate to meet the irrigation requirements of the Osborne Canal in 1960. Surplus storage water will be available as supplemental water under Warren Act contracts.

Cedar Bluff Reservoir

Cedar Bluff Reservoir will spill under all but the "Reasonable Minimum" inflow conditions in 1960. The carry-over storage is more than sufficient to meet the municipal requirements of the City of Russell, Kansas, and the Fish Hatchery demands. Surplus storage will be available to supplement natural flow water rights.

CANAL OPERATIONS

As many as 107,100 acres under the Kansas River Projects irrigation units could be irrigated in 1960. Of this, 70,700 acres are in Nebraska and 36,400 are in Kansas. The irrigable acres and probable canal diversions for 1960 under "Most Probable," "Reasonable Driest Year," and "Reasonable Wettest Year" are shown graphically in Exhibits 20 through 25 (pages 48 to 53). The canal requirements are based on probability curves that were used for water supply studies. The acres estimated to be irrigated in 1960 are listed in Table 9 (page 22 to 25).

The canal operations for 1960 are discussed in the following paragraphs under the Irrigation District in which they will be operated. Table 10 (page 26) lists the canal system in each Irrigation District and shows the systems operated by the Bureau of Reclamation and the Irrigation Districts.

Frenchman Valley Irrigation District

The Irrigation District will operate the diversion dam and Culbertson Canal but these facilities will be maintained by the Bureau of Reclamation. The Irrigation District will irrigate approximately 9,600 acres.

H&RW Irrigation District

There will be no irrigation in this District during 1960. The present construction schedule indicates January 1962 for completion of the canal system.

Frenchman-Cambridge Irrigation District

The Irrigation District will operate and maintain the Bartley, Cambridge and Meeker-Driftwood Canal systems. As many as 38,500 acres could be irrigated under the three canals during 1960. This will be the first year of operation of the Meeker-Driftwood system by the District. Service is available to 16,300 acres under the recently completed Meeker-Driftwood Canal; however, the actual acres irrigated in 1960 may be less than this figure.

Nebraska-Bostwick Irrigation District

Franklin, Naponee, Franklin Pump, Superior Canals will be operated and maintained by the Irrigation District. The Kansas-Bostwick Irrigation District will operate and maintain the Courtland Canal and the Nebraska-Bostwick Irrigation District will operate and maintain the Courtland Lateral system in Nebraska. The Kansas-Bostwick Irrigation District also will operate and maintain the Superior-Courtland Diversion Dam. This will be the first year of operation and maintenance of this diversion dam by an Irrigation District.

An estimated total of 22,600 acres may be irrigated during the 1960 irrigation season.

Kansas-Bostwick Irrigation District

This District will operate and maintain the Courtland Canal system above Lovewell Reservoir and most of the system below Lovewell Reservoir. The Bureau of Reclamation will maintain some of the lateral systems recently completed but the District will perform most of the operating work on the recently constructed pumps and laterals.

Service has been completed to serve 31,900 acres of which 22,800 acres are expected to be irrigated.

Kirwin Irrigation District

The Irrigation District will operate and maintain the Kirwin Canal systems for the first time in 1960. This system was transferred to the Irrigation District January 1, 1960. Service has been completed to serve the entire District of 11,500 irrigable acres.

Webster Irrigation District

The Osborne Canal is under construction and will not be completed until April 1961. An estimated 2,200 acres will be irrigated for the first time in 1960. The Bureau of Reclamation will operate and maintain that part of the system to be operated in 1960.

Almena Irrigation District

No construction has been started in the Almena system.

Cedar Bluff Irrigation District

Construction of the Cedar Bluff Canal system will be started during 1960; however, no irrigation is planned for the year.

TABLE 1
RESERVOIR DATA - KANSAS RIVER PROJECTS

RESERVOIR	STORAGE ALLOCATIONS			CONDITIONS EXPECTED BY MAY 1, 1960
	DEAD AND INACTIVE 1/	IRRIGATION 1/	FLOOD CONTROL	
Bonny				
Elevation (Ft.)	3635.5	3672.0	3710.0	3670.0
Total Acre Feet	1,420	41,340	170,160	37,390
Net Acre Feet	1,420	39,920	128,820	35,970
Swanson Lake				
Elevation (Ft.)	2710.0	2752.0	2773.0	2752.0
Total Acre Feet	4,100	120,160	253,950	120,160
Net Acre Feet	4,100	116,060	133,790	116,060
Enders				
Elevation (Ft.)	3080.0	3112.3	3127.0	3112.3
Total Acre Feet	8,470	44,480	74,520	44,480
Net Acre Feet	8,470	36,010	30,040	36,010
Harry Strunk				
Elevation (Ft.)	2335.0	2366.1	2386.2	2366.1
Total Acre Feet	5,370	39,230	90,920	39,230
Net Acre Feet	5,370	33,860	51,690	33,860
Harlan County				
Elevation (Ft.)	1920.0 2/	1946.0	1973.5	1945.7
Total Acre Feet	97,200 3/	350,120	850,000	346,400
Net Acre Feet	97,200 3/	252,920	499,880	249,200
Lovewell				
Elevation (Ft.)	1562.07 4/	1582.6	1595.3	1577.9
Total Acre Feet	5,050 5/	41,690	92,150	29,300
Net Acre Feet	5,050 5/	36,640	50,460	24,940
Kirwin				
Elevation (Ft.)	1693.0	1728.4	1757.3	1726.1
Total Acre Feet	6,380	95,180	314,550	85,200
Net Acre Feet	6,380	88,800	219,370	78,820
Webster				
Elevation (Ft.)	1855.5	1889.6	1923.7	1889.6
Total Acre Feet	2,180	67,100	260,740	67,100
Net Acre Feet	2,180	64,920	193,640	64,920
Cedar Bluff				
Elevation (Ft.)	2100.4 4/	2144.0	2166.0	2144.0
Total Acre Feet	21,580 6/	185,090	376,950	185,090
Net Acre Feet	21,580 6/	163,510	191,860	176,830
Total Storage (A.F.)	151,750	984,390	2,483,940	954,350
Total Net Acre Feet	151,750	832,640	1,499,550	816,610

1/ Includes space for sediment storage.
2/ Controlling elevation to Franklin Canal.
3/ Could release 95,900 A.F. to river
4/ Controlling elevation to canal.
5/ Could release 690 A.F. to river.
6/ Could release 13,320 A.F. to river and fish hatchery.

Note: Reservoir storage data based on latest reservoir surveys.

TABLE 2

STATUS OF REPAYMENT / WATER SERVICE CONTRACTS
KANSAS RIVER PROJECTS

Contracting Organization	Contract Number	Date of Contract	Date Contract Approved by Court	Development Period Start	Development Period End
Frenchman-Cambridge Irrigation District	I 1r-1500	May 29,1947	July 19,1950 (Rej.)	Jan.1,1957(Blk I)	Dec.31,1961 (Blk I)
	Amendatory No.1	July 19,1951	Feb. 11,1956 (Appr.)	Jan.1,1960(Blk II)	Dec.31,1964 (Blk II)
	Amendatory No.2	Jan.4,1956			
	Amendatory No.3	Nov.1,1957			
Frenchman Valley Irrigation District	14-06-700-1241	Nov.7,1956	Oct.20,1958	No development period Pay only water service charges	
H.& R.W. Irrigation District	14-06-700-1242	Nov.7,1956	July 19,1957		
	Amendment No.1	Aug.12,1958			
Nebraska-Bostwick Irrigation District	I 1r-1079	Feb.21,1949		Jan.1,1957	Dec.31,1961
	Amended	Nov.10,1954	Feb.28,1955		
Kansas-Bostwick Irrig.Dist.No.2	I 1r-1584	Apr.20,1951	Mar. 9,1953	Jan.1,1957(Blk I)	Dec.31,1961 (Blk I)
	Amendment No.2	Apr.24,1957	Dec. 20,1957	Jan.1,1960(Blk II)	Dec.31,1964 (Blk II)
Almena Irrigation District No.5	14-06-700-1579	Mar.7,1958	Nov. 20, 1958		
Kirwin Irrigation District No. 1	14-06-W55	June 9 ,1953	May 26,1954	Jan.1,1960	Dec.31,1964
	Amendatory	Oct.18,1955			
	Amendatory No.2	Feb.12,1959			
Webster Irrigation District No. 4	14-06-700-1375	Apr.24,1957	Oct.22,1957		
Cedar Bluff Irrigation District No.6	14-06-700-2118	Sept.3,1959			
City of Norton, Kansas	14-06-700-1573	Mar.7,1958			

1-18-60

Table 3

PRECIPITATION DATA

Month	BONNY DAM				TRENTON DAM				ENDERS DAM				McCOOK, NEBR.				MEDICINE CREEK DAM				HARLAN CO. DAM			
	Norm.	1957	1958	1959	Norm.	1957	1958	1959	Norm.	1957	1958	1959	Norm	1957	1958	1959	Norm.	1957	1958	1959	Norm.	1957	1958	1959
Jan.	0.35	0.07	0.13	0.49	0.44	0.08	0.17	0.61	0.42	0.08	0.14	0.69	0.50	0.24	0.11	0.96	0.40	0.21	0.06	0.51	0.41	0.10	0.22	0.40
Feb.	0.41	T	0.48	0.22	0.52	0.15	0.77	0.14	0.46	0.26	0.47	0.54	0.59	0.20	1.32	0.29	0.64	0.19	1.50	0.26	0.58	0.15	1.46	0.29
Mar.	0.91	1.37	1.55	0.87	1.21	0.64	1.41	1.14	1.06	0.88	1.76	1.34	1.35	2.10	2.14	2.32	0.99	1.05	1.43	1.70	0.95	1.30	1.82	1.67
Apr.	1.59	2.82	1.41	0.76	1.94	1.72	1.94	0.85	1.94	2.80	2.13	0.50	2.06	3.01	2.05	1.65	2.31	2.08	1.87	1.61	2.27	3.22	2.76	2.49
May	2.40	5.07	5.90	2.61	3.20	5.40	4.94	2.31	3.38	6.29	2.65	3.62	3.12	6.92	3.09	2.28	3.22	7.23	3.27	2.79	3.21	5.78	3.04	3.76
June	2.57	3.69	3.79	0.82	3.19	3.67	2.21	2.38	3.36	3.66	3.63	1.73	3.17	4.71	2.49	4.21	3.52	4.32	3.17	2.12	3.66	7.91	1.29	3.33
July	2.32	2.64	3.70	2.61	2.61	2.71	2.75	2.45	2.19	3.93	9.08	0.88	2.80	2.10	4.90	2.36	2.79	2.27	3.29	1.34	2.86	0.77	5.76	1.10
Aug.	2.27	2.66	2.58	1.06	2.50	2.28	2.47	2.23	2.23	1.39	2.20	0.76	2.30	1.22	2.31	3.32	2.61	1.22	0.85	2.94	2.48	2.92	4.29	1.83
Sept.	1.28	0.23	0.89	1.30	1.68	0.49	1.77	1.64	1.79	0.49	1.35	1.68	1.70	2.04	0.98	2.17	2.02	3.07	0.66	1.76	2.19	1.68	1.47	2.46
Oct.	0.74	1.35	0.66	1.75	0.87	1.23	0.30	2.67	0.80	2.04	0.48	2.78	0.87	2.68	0.42	2.63	1.12	3.32	0.17	2.87	1.03	1.63	0.03	2.15
Nov.	0.41	0.26	0.23	0.01	0.68	0.52	0.16	0.08	0.54	0.49	0.07	0.21	0.76	0.53	0.63	0.12	0.84	0.31	0.76	T	0.77	0.40	0.65	T
Dec.	0.39	0.24	0.44	0.36	0.45	0.10	0.58	0.93	0.45	0.42	0.88	0.10	0.53	0.19	0.56	0.54	0.57	0.14	0.14	0.09	0.49	0.22	0.03	0.03
Total	15.64	20.40	21.76	12.86	19.29	18.99	19.47	17.43	18.62	22.73	24.84	14.83	19.75	25.94	21.00	22.85	21.03	25.10	17.17	17.99	20.90	26.08	22.82	19.51

Month	LOVEWELL DAM				KIRWIN DAM				WEBSTER DAM				CEDAR BLUFF DAM				KANOPOLIS DAM			
	Norm.	1957	1958	1959	Norm.	1957	1958	1959	Norm.	1957	1958	1959	Norm.	1957	1958	1959	Norm.	1957	1958	1959
Jan.	0.60	0.20	0.21	0.46	0.47	0.18	0.25	0.36	0.40	0.16	0.49	0.51	0.48	0.04	0.07	0.19	0.77	T	0.28	0.21
Feb.	0.85	0.24	1.47	0.38	0.70	0.13	1.16	0.19	0.78	0.16	1.12	0.38	0.62	0.04	0.26	0.05	1.08	0.90	0.89	0.39
Mar.	1.26	3.12	2.68	2.27	1.18	2.21	2.97	1.41	1.00	2.43	3.72	1.62	1.26	2.82	3.28	0.86	1.71	3.08	3.02	2.21
Apr.	2.21	2.93	2.08	1.56	2.40	3.57	1.12	1.15	2.20	2.80	1.00	1.67	2.11	2.23	2.06	0.52	2.65	3.60	1.33	1.29
May	3.60	4.65	2.95	8.11	2.90	6.26	2.27	5.25	2.90	5.47	3.77	4.23	3.62	4.25	4.29	4.43	4.02	8.78	3.23	6.45
June	4.82	5.51	3.50	2.59	3.75	6.41	1.87	2.48	3.70	11.74	1.48	2.75	3.92	7.11	1.84	3.07	4.01	6.87	3.38	3.55
July	2.81	0.77	7.99	1.15	2.87	2.76	5.68	3.45	2.70	4.90	7.26	4.16	2.33	2.16	8.51	2.97	3.31	1.52	4.88	4.39
Aug.	2.68	3.56	3.20	1.07	2.85	2.23	3.56	1.04	2.75	2.65	3.41	1.88	2.43	2.18	3.70	1.39	3.45	1.17	2.04	3.06
Sept.	2.69	1.40	8.02	3.10	2.27	1.38	1.35	4.48	2.50	1.81	1.63	3.24	2.06	5.07	2.14	4.38	3.02	4.13	4.71	4.55
Oct.	1.45	1.50	0.54	5.66	1.26	3.10	0.11	4.53	1.40	1.33	0.67	4.24	1.16	1.41	0.09	3.17	2.29	3.40	0.09	4.19
Nov.	1.03	0.65	0.68	0.03	0.84	0.67	0.47	T	0.99	0.81	0.56	T	0.86	1.08	0.43	T	1.30	1.17	0.79	0.01
Dec.	0.77	0.55	0.10	0.18	0.56	0.07	0.13	T	0.70	0.10	0.46	0.09	0.55	T	0.10	T	0.90	0.82	0.17	0.37
Total	24.77	25.08	33.42	26.56	22.06	28.97	20.94	24.34	22.02	34.36	25.57	24.77	21.40	28.39	26.77	21.03	28.51	35.44	24.81	30.67

NOTE: U.S. Weather Bureau Records

TABLE 4

INFLOW INTO RESERVOIRS - 1959 RECORDS, 1960 ESTIMATES

1	2	3	4	5	6	7	8
	1,000 Acre-Feet (Except Column 4)						
	1959 Records			Average	1960 Estimates 1/		
Reservoir	Actual	Adjusted	Percent of Average	for Period of Record	Reasonable Minimum	Most Probable	Reasonable Maximum
Bonny	21.3		65%	32.8	18.5	26.2	42.0
Swanson Lake	85.6	91.4 2/	66% 2/	138.0 2/	68.0	119.0	205.0
Enders	50.2		101%	49.9	42.8	49.3	57.2
Harry Strunk Lake	39.6		72%	54.8	33.0	51.7	82.0
Harlan County	240.9	301.1 2/	63% 2/	481.6 2/	260.0	455.6	780.0
Lovewell	24.2 3/	16.5 4/	58% 4/	28.3 4/	3.4	17.9	64.0
Kirwin	24.3		44%	55.1	17.0	38.1	115.0
Webster	24.7		47%	52.3	12.5	33.9	98.0
Cedar Bluff	19.1		29%	65.2	12.4	36.9	138.0

1/ Values determined from inflow frequency curves. A value of 90% on curve = reasonable minimum conditions, 50% = most probable conditions, and 10% = reasonable maximum conditions.

2/ Actual records plus upstream depletions caused by reservoirs and canals in Missouri Basin Projects.

3/ Includes total of White Rock Creek and inflow from Courtland Canal.

4/ Natural inflow from White Rock Creek.

RESERVOIR OPERATIONS
KANSAS RIVER PROJECTS
(Units in 1,000 Acre-Feet)

MONTH	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1958	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1959	1959 OUTFLOW	INFLOW 1959	INFLOW AVERAGE	DAM AND RESERVOIR INFORMATION
Jan.	40.5	41.2	0.4	2.1	2.2	
Feb.	42.0	42.9	0.4	1.9	2.3	DAM: BONNY
Mar.	44.5	43.9	1.6	2.7	2.8	
Apr.	40.1	39.4	6.6	2.7	2.5	RESERVOIR: BONNY
May	39.1	37.7	3.9	2.0	6.2	
June	38.4	36.2	1.4	1.1	4.6	
July	38.6	36.4	1.0	2.8	2.8	STORAGE CAPACITY
Aug.	37.7	34.8	0.7	0.1	2.2	
Sept.	35.3	33.6	0.7	0.1	1.6	DEAD 1.4
Oct.	37.4	33.9	1.0*	1.9*	1.6	IRRIGATION 39.9
Nov.	37.4	35.4	0.4*	1.9*	1.9	SUB-TOTAL 41.3
Dec.	39.1	37.0	0.4*	2.0*	2.1	FLOOD 128.8
Total			18.5	21.3	32.8	TOTAL 170.1

Average inflow based on CY 1929-58

Jan.	125.2	116.6	9.5	7.7	9.4	9.7	
Feb.	121.4	119.3	8.6	11.8	13.3	11.7	DAM: TRENTON
Mar.	120.4	122.1	11.1	15.5	16.6	14.7	
Apr.	119.5	119.4	19.5	19.6	15.7	12.2	RESERVOIR: SWANSON LAKE
May	131.0	121.9	9.8	13.8	11.9	21.0	
June	118.1	116.3	6.7	3.8	4.4	20.7	
July	121.7	95.2	19.1	0.3	2.7	11.5	STORAGE CAPACITY
Aug.	125.7	75.1	18.4	0	0.1	9.5	
Sept.	117.3	67.3	6.5	0	0	6.7	DEAD 4.1
Oct.	118.3	68.4	0.8*	2.9*	4.0*	4.8	IRRIGATION 116.1
Nov.	119.6	72.4	0.1*	4.1*	5.6*	7.3	SUB-TOTAL 120.2
Dec.	118.3	78.4	0.1*	6.1*	7.7*	8.2	FLOOD 133.8
Total			110.2	85.6 a/	91.4 b/	138.0	TOTAL 254.0

Average inflow based on CY 1922, 1924-58 with records adjusted to correct for effect of operation of Bonny Reservoir
a/ Recorded inflow
b/ Recorded inflow adjusted to correct for effect of operation of Bonny Reservoir

Jan.	44.3	43.3	4.0	5.0	4.7	
Feb.	44.0	44.1	3.7	4.6	4.2	DAM: ENDERS
Mar.	44.5	45.9	2.3	4.6	4.4	
Apr.	44.0	46.0	4.0	4.2	4.1	RESERVOIR: ENDERS
May	45.4	44.6	6.6	4.7	4.4	
June	43.6	42.7	4.4	3.4	4.6	
July	46.9	38.5	6.8	3.1	3.7	STORAGE CAPACITY
Aug.	43.5	33.5	8.4	3.4	3.6	
Sept.	41.1	33.1	3.4	3.1	3.8	DEAD 8.5
Oct.	40.5	34.9	2.0**	5.1**	3.9	IRRIGATION 36.0
Nov.	41.2	37.5	2.0**	4.5**	4.1	SUB-TOTAL 44.5
Dec.	42.1	39.9	2.1**	4.5**	4.4	FLOOD 30.0
Total			49.7	50.2	49.9	TOTAL 74.5

Average inflow based on CY 1924-58

* Not U.S.G.S. record. Computed from reservoir operation data.

RESERVOIR OPERATIONS
KANSAS RIVER PROJECTS
(Units in 1,000 Acre-Feet)

MONTH	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1958	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1959	1959 OUTFLOW	INFLOW 1959	INFLOW AVERAGE	DAM AND RESERVOIR INFORMATION
Jan.	38.6	39.1	3.0	3.4	3.4	
Feb.	38.0	40.3	4.0	3.4	3.6	DAM: MEDICINE CREEK
Mar.	39.0	41.1	3.6	4.4	4.5	
Apr.	39.2	39.8	5.3	3.8	5.1	RESERVOIR:
May	39.7	39.2	6.6	6.4	6.3	HARRY STRUNK LAKE
June	39.6	38.2	3.3	3.1	9.7	
July	41.2	28.9	11.0	2.2	5.4	STORAGE CAPACITY
Aug.	35.3	22.8	7.8	1.8	3.6	
Sept.	35.8	23.2	1.0	2.2	3.5	DEAD 5.4
Oct.	36.0	25.7	0.3**	3.2**	3.4	IRRIGATION 33.8
Nov.	37.4	28.2	0.3**	2.8**	3.1	SUB-TOTAL 39.2
Dec.	38.8	30.9	0.3**	2.9**	3.2	FLOOD 51.7
Total			46.5	39.6	54.8	TOTAL 90.9

Average inflow based on CY 1925-58

Jan.	354.1	317.1	22.5	20.3	22.2	21.1	
Feb.	368.5	325.3	27.6	30.9	36.4	28.9	DAM: HARLAN COUNTY
Mar.	371.2	345.4	21.5	42.6	51.8	38.7	
Apr.	350.9	352.2	35.6	44.5	39.9	39.3	RESERVOIR: HARLAN COUNTY
May	363.4	361.9	32.0	38.8	42.6	58.9	
June	347.8	345.3	32.2	20.0	24.7	115.4	
July	366.7	313.6	34.3	8.3	13.4	51.2	STORAGE CAPACITY
Aug.	333.4	274.3	36.8	3.3	2.5	32.2	DEAD 1.3
Sept.	325.8	262.8	10.6	3.6	6.1	30.5	INACTIVE 95.9
Oct.	312.4	268.5	0.7**	8.7*	18.5*	24.1	IRRIGATION 252.9
Nov.	316.8	273.5	0.8**	7.2*	17.7*	20.1	SUB-TOTAL 350.1
Dec.	318.1	281.8	1.1**	12.7*	25.3*	21.2	FLOOD 499.9
Total			255.7	240.9 a/	301.1 b/	481.6	TOTAL 850.0

Average inflow based on CY 1929-58 with records adjusted to correct for effect of upstream reservoirs and canals.
a/ Recorded inflow
b/ Recorded inflow adjusted to correct for effect of upstream reservoirs and canals.

Jan.	27.9	39.8	0	0.	0.	0.2	
Feb.	28.1	39.9	0	0.9	0.9	1.1	DAM: LOVEWELL
Mar.	28.4	40.6	0	0.3	0.3	1.0	
Apr.	29.6	41.1	0.1	0.1	0.1	1.3	RESERVOIR: LOVEWELL
May	41.9	44.5	10.0	6.2	6.2	4.1	
June	41.3	40.6	4.5	0.9	0.7	8.5	
July	47.2	33.3	9.9	3.2	0.9	5.3	STORAGE CAPACITY
Aug.	45.9	20.5	13.0	2.1	0.	1.6	DEAD 4.4
Sept.	41.5	21.7	1.6	3.5	0.9	2.2	INACTIVE 0.7
Oct.	40.7	28.1	0	6.9*	6.4*	1.6	IRRIGATION 36.6
Nov.	40.3	27.6	0	0 *	0 *	0.5	SUB-TOTAL 41.7
Dec.	39.0	27.7	0	0.1*	0.1*	0.3	FLOOD 50.5
Total			39.1	24.2 a/	16.5 b/	27.7	TOTAL 92.2

Average inflow based on CY 1929-58 (excluding deliveries from Upper Courtland Canal).
(a) Total inflow from White Rock Creek and deliveries from Upper Courtland Canal.
(b) Natural flow from White Rock Creek

* Not U. S. G. S. record. Computed from reservoir operation data.

RESERVOIR OPERATIONS
KANSAS RIVER PROJECTS
(Units in 1,000 Acre-Feet)

MONTH	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1958	TOTAL STORAGE END OF MONTH CALENDAR YEAR 1959	1959 OUTFLOW	INFLOW 1959	INFLOW AVERAGE	DAM AND RESERVOIR INFORMATION
Jan.	83.7	86.4	0	0.4	0.9	
Feb.	84.9	88.8	0	1.6	1.6	DAM: KIRWIN
Mar.	87.9	90.7	0	2.0	1.7	
Apr.	90.7	91.4	0	1.5	3.1	RESERVOIR: KIRWIN
May	93.4	92.2	0.9	1.9	5.8	
June	89.0	88.6	4.7	3.6	15.2	
July	91.4	86.6	7.5	7.3	10.1	STORAGE CAPACITY
Aug.	90.4	77.9	6.4	0.3	7.0	
Sept.	88.3	76.0	1.5	0.6	4.5	DEAD 6.4
Oct.	86.5	79.9	0 *	4.7*	2.8	IRRIGATION 88.8
Nov.	85.6	79.2	0 *	0 *	1.4	SUB-TOTAL 95.2
Dec.	85.9	79.6	0 *	0.4*	1.0	FLOOD 219.4
Total			21.0	24.3	55.1	TOTAL 314.6
Average inflow based on CY 1920-58						
Jan.	71.7	82.8	1.0	1.1	0.9	
Feb.	63.7	85.3	1.1	2.7	1.5	DAM: WEBSTER
Mar.	56.8	72.8	16.5	3.0	1.8	
Apr.	58.5	66.6	7.4	2.8	3.0	RESERVOIR: WEBSTER
May	61.7	69.2	0	2.3	6.2	
June	62.4	66.1	0.6	3.2	13.8	
July	75.7	66.6	0	0.6	10.0	STORAGE CAPACITY
Aug.	87.3	63.9	0.5	0.7	6.0	
Sept.	87.5	62.5	0.4	0.5	4.3	DEAD 2.2
Oct.	83.7	67.3	0.1*	5.7*	2.6	IRRIGATION 64.9
Nov.	82.2	67.1	1.2*	1.1*	1.2	SUB-TOTAL 67.1
Dec.	81.6	66.2	1.9*	1.0*	1.0	FLOOD 193.6
Total			30.7	24.7	52.3	TOTAL 260.7
Average inflow based on CY 1920-58						
Jan.	188.9	182.7	0	0.6	0.9	
Feb.	188.9	184.4	0	1.4	1.3	DAM: CEDAR BLUFF
Mar.	193.8	185.4	0	1.8	1.3	
Apr.	193.1	185.4	0.1	1.4	3.5	RESERVOIR: CEDAR BLUFF
May	202.0	189.6	0.3	1.1	8.8	
June	188.5	187.5	1.2	1.2	20.1	STORAGE CAPACITY
July	202.7	185.4	0.2	0.3	10.1	
Aug.	192.0	182.4	0.4	2.7	8.5	DEAD 8.3
Sept.	186.8	180.0	0.6	0.1	4.8	INACTIVE 13.3
Oct.	184.4	184.4	0.1*	7.0	3.6	IRRIGATION 163.5
Nov.	183.0	182.0	0.3*	0.8	1.3	SUB-TOTAL 185.1
Dec.	182.7	181.3	0.1*	0.7	1.0	FLOOD 191.9
Total			3.3	19.1	65.2	TOTAL 377.0
Average inflow based on CY 1919-58						

* Not U.S.G.S. records. Computed from reservoir operation data.

TABLE 8

ACRES IRRIGATED AND CANAL DIVERSIONS - 1959

KANSAS RIVER PROJECTS

State and Canal System	Acres Irrigated	Acre-Feet Diverted							
		Apr.	May	June	July	Aug.	Sept.	Oct.	Total
COLORADO									
Hale Ditch (Non-Project)	590	0	178	604	643	329	257	560	2,571
NEBRASKA									
Warren Act (Non-Project) 1/	4,499	0	0	5	402	943	28	0	1,378
Culbertson (Frenchman Valley I.D.)	9,400	0	1,611	5,219	6,948	7,396	902	0	22,076
Meeker-Driftwood	9,670	0	2,035	2,862	9,108	10,429	5,003	704	30,141
Bartley	4,815	0	533	861	4,582	3,757	595	129	10,457
Cambridge	13,485	0	1,525	3,297	14,463	10,173	1,208	141	30,807
Total (Frenchman-Cambridge I.D.)	27,970	0	4,093	7,020	28,153	24,359	6,806	974	71,405
Franklin	9,687	0	966	2,943	9,013	10,352	2,573	0	25,847
Naponee	1,474	0	0	254	1,612	1,307	50	0	3,223
Franklin Pump	1,930	0	0	54	1,557	1,192	307	0	3,110
Superior	5,080	212	1,496	1,636	5,911	6,907	1,287	0	17,449
Courtland (Nebraska) 2/	1,664	0	1,079	591	1,158	2,384	-26	-53	5,133
Total (Nebraska-Bostwick I.D.)	19,835	212	3,541	5,478	19,251	22,142	4,191	-53	54,762
KANSAS									
Courtland (Above Lovewell Res.) 3/	7,159	0	613	2,240	9,217	9,911	1,809	-447	23,343
Courtland (Below Lovewell Res.)	9,081	0	865	1,228	9,721	13,005	1,569	0	26,388
Total (Kansas-Bostwick I.D.)	16,240	0	1,478	3,468	18,938	22,916	3,378	-447	49,731
Kirwin (Kirwin I.D.)	6,470	0	928	4,711	7,515	6,355	1,496	0	21,005
TOTAL OF PROJECTS	79,915	212	11,651	25,896	80,805	83,168	16,773	474	218,979

1/ Storage water supplied to non-project lands. No record of natural flow use.
2/ Headgate records less state line records.
3/ State line records less records at deliveries to Lovewell Reservoir.

TABLE 9

IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

1	2	3	4	5	6	7	8	9	10	11	12
	COLORADO	NEBRASKA									
Water Use During Year	Hale Ditch 1/ (Non-Proj)	Warren Act 2/ (Non-Proj)	Fr. Valley Irrig.Dist Culbertson	Frenchman-Cambridge Irrigation Dist. Meeker Driftwood	Meeker	Bartley	Cambridge	Total Fr.Cambr.	Nebr.-Bostwick Irrig. Dist. Franklin	Naponee	Franklin Pump
1960(Est)											
Acres	590	5,000	9,600	16,278	4/	6,592	15,626	38,496	11,285	1,533	2,123
AF(Dry Yr)	5,200	3,100	27,600	44,000		17,100	39,400	100,500	37,900	5,200	7,100
AF(Med Yr)	3,800	900	19,200	30,900		11,900	26,600	69,400	25,200	3,400	4,700
AF(Wet Yr)	2,600	100	12,000	18,200		6,900	15,600	40,700	12,800	1,700	2,400
1959											
Acres	590	4,499	9,400 5/	9,670	4/	4,815	13,485	27,970	9,687	1,474	1,930
AF Div.	2,571	1,039	22,076	30,141		10,457	30,807	71,405	25,847	3,223	3,110
AF/Ac.	4.36	0.23	2.35	3.12		2.17	2.29	2.55	2.67	2.19	1.61
1958											
Acres	575	3,350	9,400 5/	1,895	2,855	5,300	12,800	22,850	8,359	930	1,391
AF Div.	2,066	226	26,330 5/	8,710	9,558	8,550	20,380	47,198	13,810	407	858
AF/Ac.	3.59	0.07	2.80	4.60	3.35	1.61	1.59	2.07	1.65	0.44	0.62
1957											
Acres	880	4,187		739 5/	2,908	5,050	11,855	20,552	6,887	1,220	1,628
AF Div.	2,677	388		3,480	8,906	8,560	21,430	42,376	13,150	1,940	1,800
AF/Ac.	3.04	0.09		4.71	3.06	1.70	1.81	2.06	1.91	1.59	1.11
1956											
Acres	1,643	6,310			2,975	4,430	9,860	17,265	5,834	1,057	1,596
AF Div.	4,729	1,040			13,830	9,490	33,890	57,210	21,250	2,040	3,710
AF/Ac.	2.88	0.16			4.65	2.14	3.44	3.31	3.64	1.93	2.32
1955											
Acres	982	14,214 7/			3,048	3,502	9,104	15,654	2,743	548	1,516
AF Div.	5,267	2,574			11,626	11,430	32,540	55,596	11,490	1,700	3,830
AF/Ac.	5.36	0.18			3.81	3.26	3.57	3.55	4.19	3.10	2.53
1954											
Acres	1,541	14,573 7/			2,950	450 5/	5,938	9,338	1,165		1,460
AF Div.	5,493	2,572			11,330	1,520	22,860	35,710	7,930		2,540
AF/Ac.	3.56	0.18			3.84	3.38	3.85	3.82	6.81		1.74

Note: Acres shown are based upon crop census unless indicated otherwise.

TABLE 9 (cont'd)
IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

13	14	15	16	17	18	19	20	21	22	23	24
	NEBRASKA (Contd.)				KANSAS						TOTAL
Water Use During Year	Superior	Nebr.-Courtland	N-B Dist. Total Nebr-Bost	Total Projects In Nebr.	Kans-Bostwick Irrig Dist. Courtland Canal Upper	Lower	Total	Kirwin Irrig Dist Kirwin	Webster Irrig Dist Osborne	Total Projects in Kans.	FOR PROJECT SYSTEMS 3/
1960 (Est)											
Acres	5,834	1,840	22,615	70,711	9,801	13,000	22,801	11,374	2,200	36,375	107,086
AF(Dry Yr)	17,300	4,700	72,700	200,800	25,300	41,900	67,200	30,400	8,500	106,100	306,900
AF(Med Yr)	12,500	3,400	49,200	137,800	18,200	30,200	48,400	20,500	5,900	74,800	212,600
AF(Wet Yr)	6,100	1,700	24,700	77,400	8,800	14,600	23,400	12,700	3,600	39,700	117,100
1959											
Acres	5,080	1,664	19,835	57,205	7,159	9,081	16,240	6,470		22,710	79,915
A.F. Div.	17,449	5,133	54,762	148,243	23,343	26,388	49,731	21,005		70,736	218,979
AF/Yr	3.43	3.08	2.76	2.59	3.26	2.91	3.06	3.25		3.11	2.74
1958											
Acres	3,978	489	15,147	47,397	5,829	2,878	8,707	4,127		12,834	60,230
A.F. Div.	8,420	1,620	25,115	98,643	13,727	5,690	19,417	15,150		34,567	133,210
AF/Yr	2.12	3.31	1.66	2.08	2.35	1.98	2.23	3.67		2.69	2.21
1957											
Acres	4,685	1,396	15,816	36,368	7,272		7,272	1,336		8,608	44,976
A.F. Div.	10,490	2,180	29,560	71,936	18,240		18,240	5,530		23,770	95,706
AF/Yr	2.24	1.56	1.87	1.98	2.51		2.51	4.14		2.76	2.13
1956											
Acres	4,681	1,399	14,567	31,832	5,347		5,347			5,347	37,179
A.F. Div.	13,190	6,140	25,080	82,290	20,860		20,860			20,860	103,150
AF/Yr	2.82	4.39	1.72	2.59	3.90		3.90			3.90	2.77
1955											
Acres	4,316	1,383	10,506	26,160	2,385		2,385			2,385	28,545
A.F. Div.	15,100	6,600	38,720	94,316	14,370		14,370			14,370	108,686
AF/Yr	3.50	4.77	3.69	3.61	6.03		5.07			5.07	3.81
1954											
Acres	3,812	1,079	7,516	16,854	30 5/		30			30	16,854
A.F. Div.	9,610	9,690	29,770	65,480	3,910		3,910			3,910	69,390
AF/Yr	2.52	8.98	3.96	3.89	13.03		13.03			13.03	4.12

TABLE 9 (cont'd) Sheet 3 of 4

IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

1	2	3	4	5	6	7	8	9	10	11	12
	COLORADO	NEBRASKA									
Water Use	Hale	Warren	Fr. Valley	Frenchman-Cambridge Irrigation Dist.					Nebr.-Bostwick Irrig. Dist.		
During	Ditch 1/	Act 2/	Irrig.Dist	Meeker				Total			Franklin
Year	(Non-Proj)	(Non-Proj)	Culbertson	Driftwood	Meeker	Bartley	Cambridge	Fr.Cambr.	Franklin	Naponee	Pump
1953											
Acres	700	730			2,800		4,390	7,190			994
AF Div	3,870	469			9,980		16,340	26,320			2,290
AF/Ac.	5.53	0.64			3.56		3.72	3.66			2.30
1952											
Acres	700	330			2,887		1,419	4,306			
AF Div	3,463	84			10,460		6,510	16,970			
AF/Ac.	4.95	0.25			3.62		4.59	3.94			
1951											
Acres	700				2,816		1,450	4,266			
AF Div	2,821				7,390		8,900	16,290			
AF/Ac.	4.03				2.62		6.14	3.82			
1950											
Acres					2,791			2,791			
AF Div					7,660			7,660			
AF/Ac.					2.74			2.74			
1949											
Acres					2,906			2,906			
AF Div					5,290			5,290			
AF/Ac.					1.82			1.82			
1948											
Acres					2,675			2,675			
AF Div					5,180			5,180			
AF/Ac.					1.94			1.94			

TABLE 9 (cont'd)
IRRIGATION UNDER CANAL SYSTEMS IN KANSAS RIVER PROJECTS

13	14	15	16	17	18	19	20	21	22	23	24
	NEBRASKA (Contd.)				KANSAS						TOTAL
Water Use During Year	Superior	Nebr.-Courtland	N-B Dist Total Nebr-Bost	Total Projects In Nebr.	Kans-Bostwick Irrig Dist. Courtland Canal Upper	Lower	Total	Kirwin Irrig Dist Kirwin	Webster Irrig Dist Osborne	Total Projects in Kans.	FOR PROJECT 3/ SYSTEMS
1953											
Acres	3,093	282	4,376	11,566							11,566
AF Div	10,170	1,470	13,930	40,250							40,250
AF/Ac.	3.29	5.21	3.18	3.48							3.48
1952											
Acres	1,900	338	2,238	6,544							6,544
AF Div	6,280	7,340	13,620	30,590							30,590
AF/Ac.	3.31	21.72	6.09	4.67							4.67
1951											
Acres	193		193	4,459							4,459
AF Div	1,940		1,940	18,230							18,230
AF/Ac.	10.05		10.05	4.09							4.09
1950											
Acres				2,791							2,791
AF Div				7,660							7,660
AF/Ac.				2.74							2.74
1949											
Acres				2,906							2,906
AF Div				5,290							5,290
AF/Ac.				1.82							1.82
1948											
Acres				2,675							2,675
AF Div				5,180							5,180
AF/Ac.				1.94							1.94

1/ Hale Ditch is not a Bureau constructed or operated system. Acre feet diverted includes both natural flow and supplemental water delivered under Warren Act Contracts.
2/ Includes private pumps and irrigation systems not constructed or operated by Bureau of Reclamation. Storage use only.
3/ Totals for project systems only. Excludes Hale Ditch and deliveries under Warren Act contracts.
4/ Old Meeker lands now included under Meeker-Driftwood Canal System.
5/ Acreage based on water rental or acreage assessment data.
6/ First year operated as a project of the Bureau of Reclamation.
7/ Includes Culbertson Canal before it became a project area.

TABLE 10

IRRIGATION DEVELOPMENT AND OPERATION OF PROJECT CANAL SYSTEMS

State and Canal System	Acres: Planned in Definite Plan Reports	Acres: 1959 Irrigation Season: Service Available 1/	Acres: 1959 Irrigation Season: Actually Irrigated 2/	Acres: Available for Service Jan. 1, 1960 3/	Years (Inclusive) Canal was Operated: By Bureau of Reclamation	Years (Inclusive) Canal was Operated: By Irrigation District
NEBRASKA						
Culbertson (Fr.-Val. I.D.)	9,600	9,400 4/	9,400 4/	9,600	None	1958 - Present 5/
Meeker-Driftwood	16,440	14,978	9,670	16,278	1957-59 6/	Dist. in 1960
Bartley	7,000	7,000	4,815	6,592	1954-56	1957 - Present
Cambridge	15,600	15,600	13,485	15,626	1951-56	1957 - Present
Total (Fr.-Cam. I.D.)	39,040	37,578	27,970	38,496		
Franklin	11,510	11,510	9,687	11,285	1954-56	1957 - Present
Naponee	1,640	1,535	1,474	1,533	1955-56	1957 - Present
Franklin Pump	2,120	2,120	1,930	2,123	1953-56	1957 - Present
Superior	6,320	5,927	5,080	5,834	1951-56	1957 - Present
Courtland (Nebraska)	2,650	2,018	1,664	1,840	1952-58 7/	1959 - Present
Total (Nebr.-Bost. I.D.)	24,240	23,110	19,835	22,615		
KANSAS						
Courtland(Above Lov.Res.)	15,270	9,782	7,159	9,801	1954-58 8/	1959 - Present
Courtland(Below Lov.Res.)	31,030	21,784	9,081	22,138	1958	1959 - Present
Total (Kans.-Bost. I.D.)	46,300	31,566	16,240	31,939		
Kirwin (Kirwin I.D.)	11,500	11,500	6,470	11,374	1957-58	Dist. in 1960
Webster (Webster I.D.)	8,500	0	0	0 9/	1960	
TOTAL OF PROJECTS	139,180	113,154	79,915	114,024		

(See attached sheet for footnotes.)

Footnotes for Table 10:

1/ Acres used in crop census reports and official program documents.

2/ Determined by crop census.

3/ Based upon land classification reports.

4/ Acres paying water charges. No crop census. Includes 1,030 acres under reconstructed canal.

5/ District operated since 1890, but 1958 was first year operated as part of Kansas River Projects.

6/ In 1948 Bureau took over operation of 2,912 acres of old Meeker Canal now included in Meeker-Driftwood system.

7/ Nebraska-Bostwick District took over lateral operation in 1957. Kansas-Bostwick District took over main canal operation in 1959. Kansas-Bostwick District will take over operation of Superior-Courtland Diversion Dam in 1960.

8/ Kansas-Bostwick District operated lateral systems in 1957.

9/ Estimate 4,772 acres will have service available by July 1, 1960, but expect only about 2,200 acres to be irrigated in 1960.

TABLE 11

RECREATION USES OF BUREAU OF RECLAMATION RESERVOIRS IN KANSAS RIVER PROJECTS

(Annual Totals)

Reservoirs	Visitors - 1/				Water Craft - 2/				Fish Caught - 3/			
	1956	1957	1958	1959	1956	1957	1958	1959	1956	1957	1958	1959
COLORADO												
Bonny	81,000	45,000	46,000	37,300	7,642	4,241	1,680	1,844	23,080	12,820	27,500	25,000
NEBRASKA												
Swanson Lake	160,500	180,000	200,000	254,820	1,500	836	3,150	3,750	125,000	93,050	75,000	138,000
Enders	116,500	101,000	81,000	75,000	1,391	1,059	1,470	1,200	27,782	23,688	18,750	79,500
Harry Strunk Lake	70,000	70,000	101,000	130,075	1,889	2,068	2,100	1,575	65,675	53,065	62,500	140,000
KANSAS												
Lovewell	4/		278,980	232,106	4/	4/	11,400	6,336	4/	4/	195,000	131,500
Kirwin	11,300	57,160	147,766	211,558	4/	4/	270	280	3,250	59,450	250,000	325,000
Webster	4/	125,700	126,652	247,217	4/	3,460	2,860	4,281	4/	16,652	76,296	277,700
Cedar Bluff	88,746	209,569	267,840	394,366	11,305	16,900	18,200	15,674	48,790	102,250	219,840	177,500
TOTAL		758,429	1,249,238	1,582,442			41,130	34,940			924,886	1,294,200

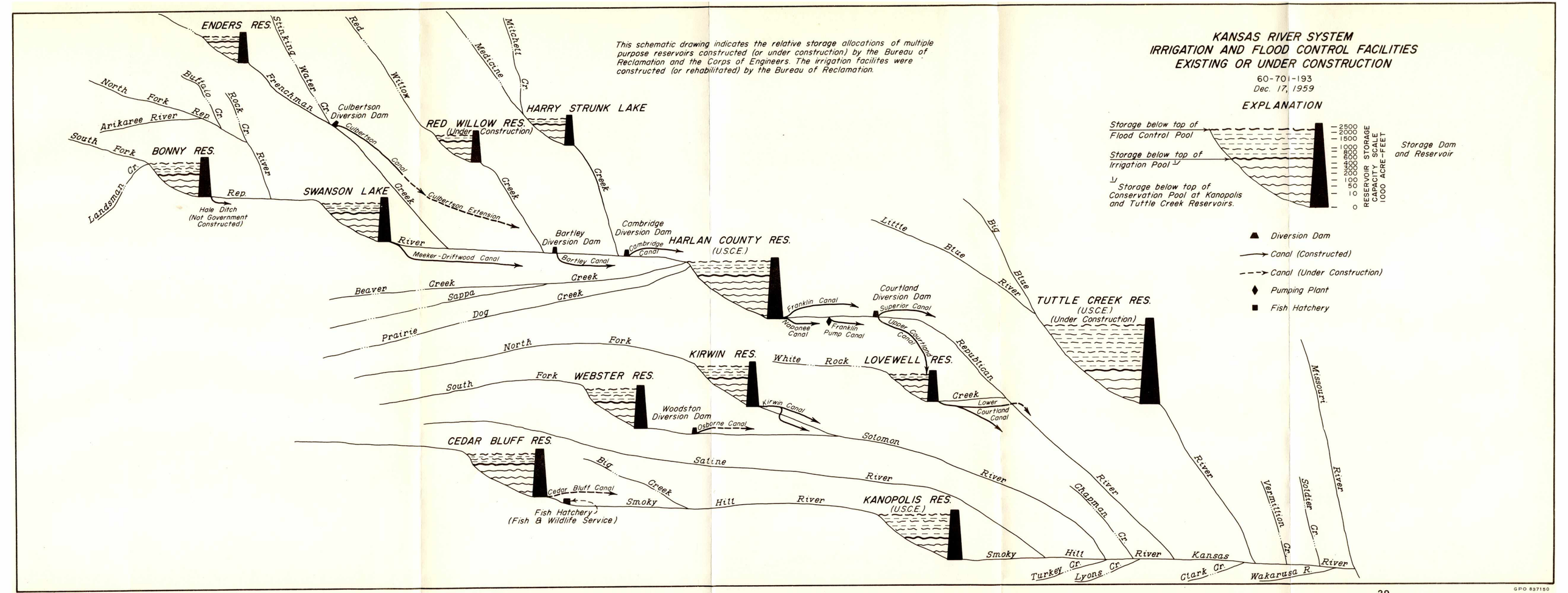
1/ Total number during the year on a visitors per day basis. (Sightseers, Picknickers, Campers, Boaters, Fishermen and Hunters.)

2/ Total number used on the reservoir on a water craft per day basis. (Rowboats, Sailboats, Inboards and Outboards.)

3/ Total number of Sport Fish caught during the year.

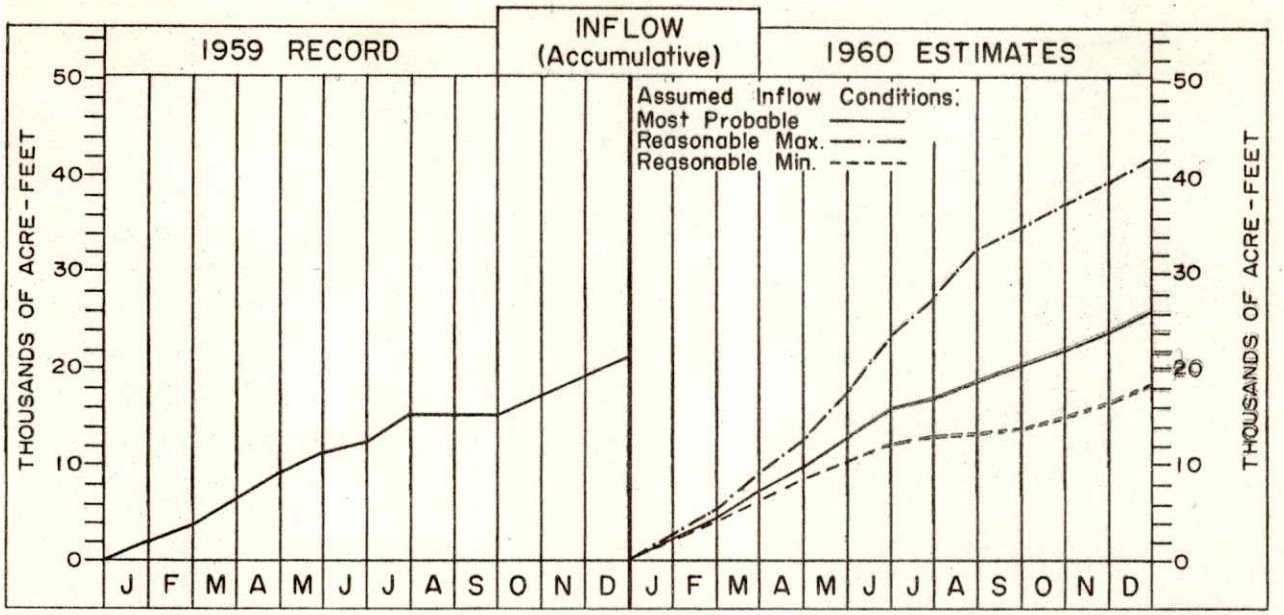
4/ No data available.

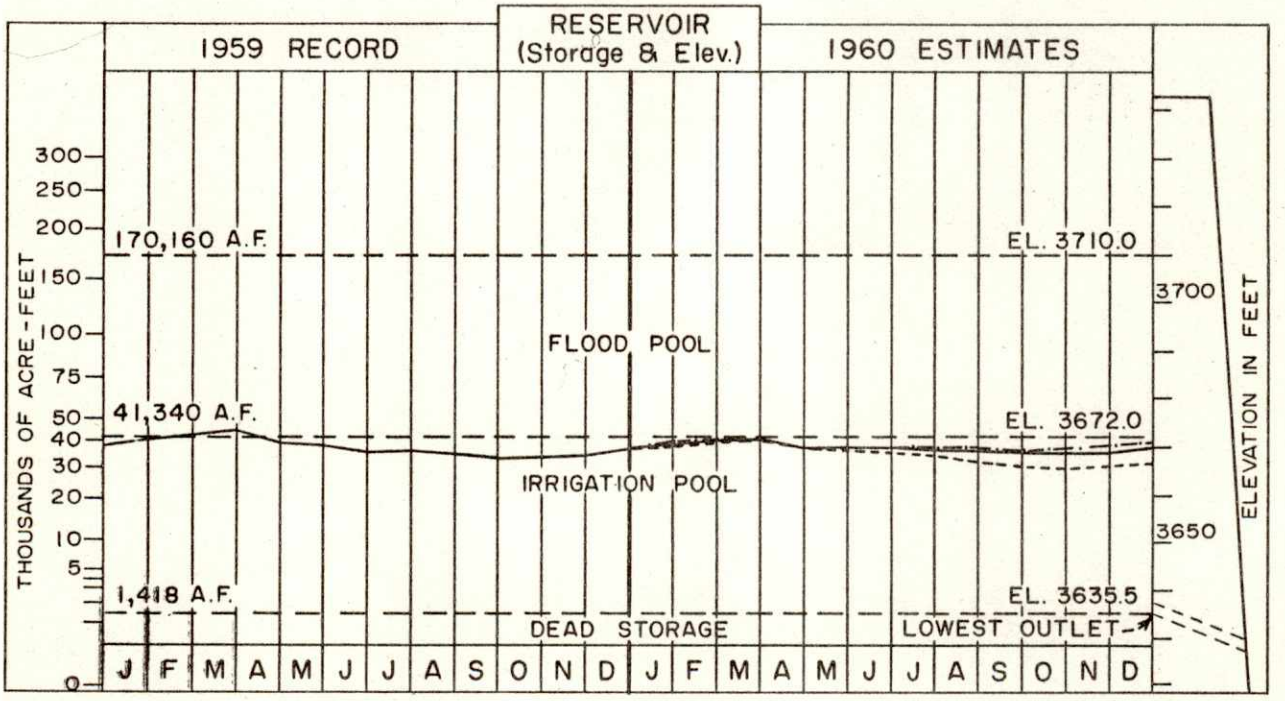
Note: Does not include Harlan County and Kanopolis Reservoirs which are operated by the Corps of Engineers.

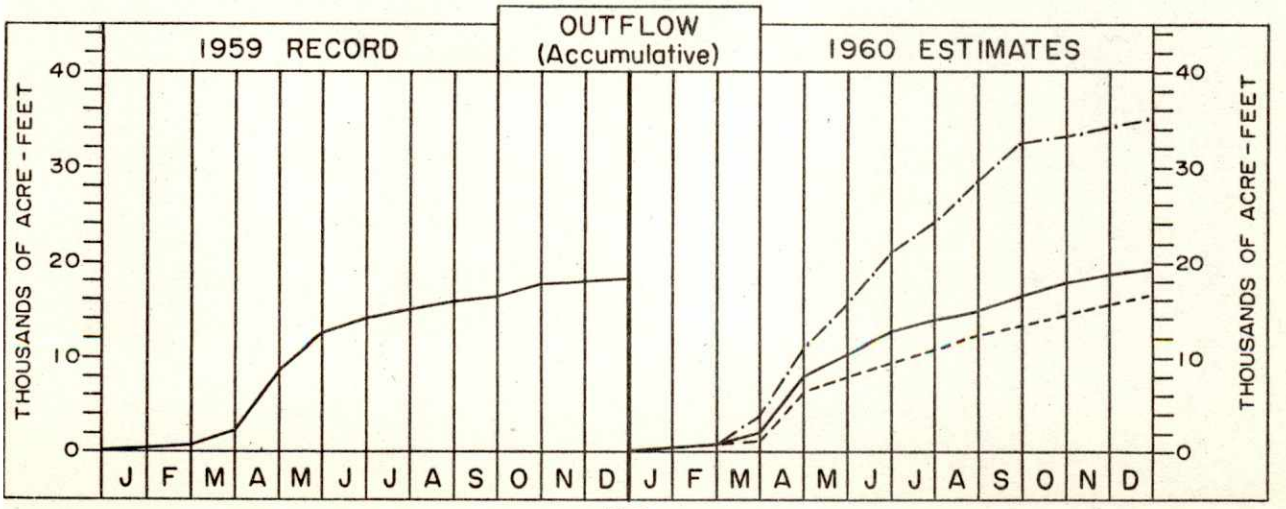

KANSAS RIVER SYSTEM
IRRIGATION AND FLOOD CONTROL FACILITIES
EXISTING OR UNDER CONSTRUCTION
60-701-193
Dec. 17, 1959
This schematic drawing indicates the relative storage allocations of multiple purpose reservoirs constructed (or under construction) by the Bureau of Reclamation and the Corps of Engineers. The irrigation facilites were constructed (or rehabilitated) by the Bureau of Reclamation.
EXPLANATION
Storage below top of Flood Control Pool
Storage below top of Irrigation Pool 1/
1/ Storage below top of Conservation Pool at Kanopolis and Tuttle Creek Reservoirs.
RESERVOIR STORAGE CAPACITY SCALE 1000 ACRE-FEET
2500
2000
1500
1000
800
600
400
300
200
100
50
0
Storage Dam and Reservoir
Diversion Dam
Canal (Constructed)
Canal (Under Construction)
Pumping Plant
Fish Hatchery
ENDERS RES.
Frenchman
Stinking Water Cr.
Culbertson Diversion Dam
Culbertson Canal
Culbertson Extension
Red Willow Creek
RED WILLOW RES. (Under Construction)
Medicine Creek
Mitchell Cr.
HARRY STRUNK LAKE
North Fork Arikaree River
Buffalo Rep
Rock Cr.
South Fork Landsman Cr.
BONNY RES.
Rep River
Hale Ditch (Not Government Constructed)
SWANSON LAKE
Republican River
Meeker-Driftwood Canal
Bartley Diversion Dam
Bartley Canal
Cambridge Diversion Dam
Cambridge Canal
HARLAN COUNTY RES. (U.S.C.E.)
Beaver Creek
Sappa Creek
Prairie Dog Creek
Franklin Canal
Naponee Canal
Franklin Pump Canal
Courtland Diversion Dam
Superior Canal
Upper Courtland Canal
Little Blue River
Big Blue River
TUTTLE CREEK RES. (U.S.C.E.) (Under Construction)
North Fork
KIRWIN RES.
White Rock Creek
LOVEWELL RES.
South Fork
WEBSTER RES.
Woodston Diversion Dam
Osborne Canal
Kirwin Canal
Lower Courtland Canal
CEDAR BLUFF RES.
Big Creek
Saline River
Solomon River
Cedar Bluff Canal
Fish Hatchery (Fish & Wildlife Service)
Smoky Hill River
KANOPOLIS RES. (U.S.C.E.)
Chapman Cr.
Republican River
Missouri River
Vermillion Cr.
Soldier Cr.
Turkey Cr.
Lyons Cr.
Clark Cr.
Kansas River
Wakarusa R

GPO 837150

BONNY RESERVOIR OPERATION







BONNY RESERVOIR
OPERATION HYDROGRAPHS

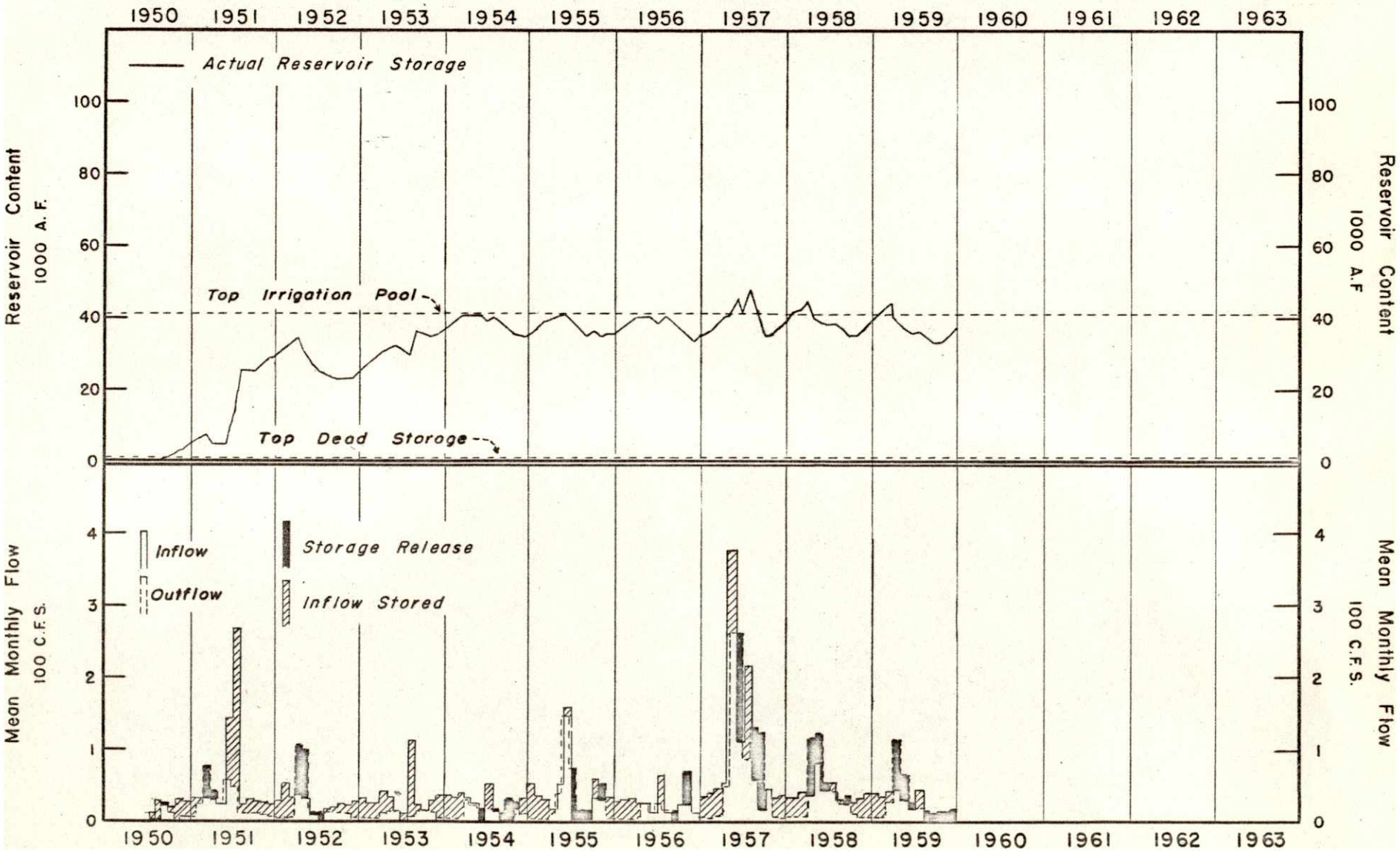
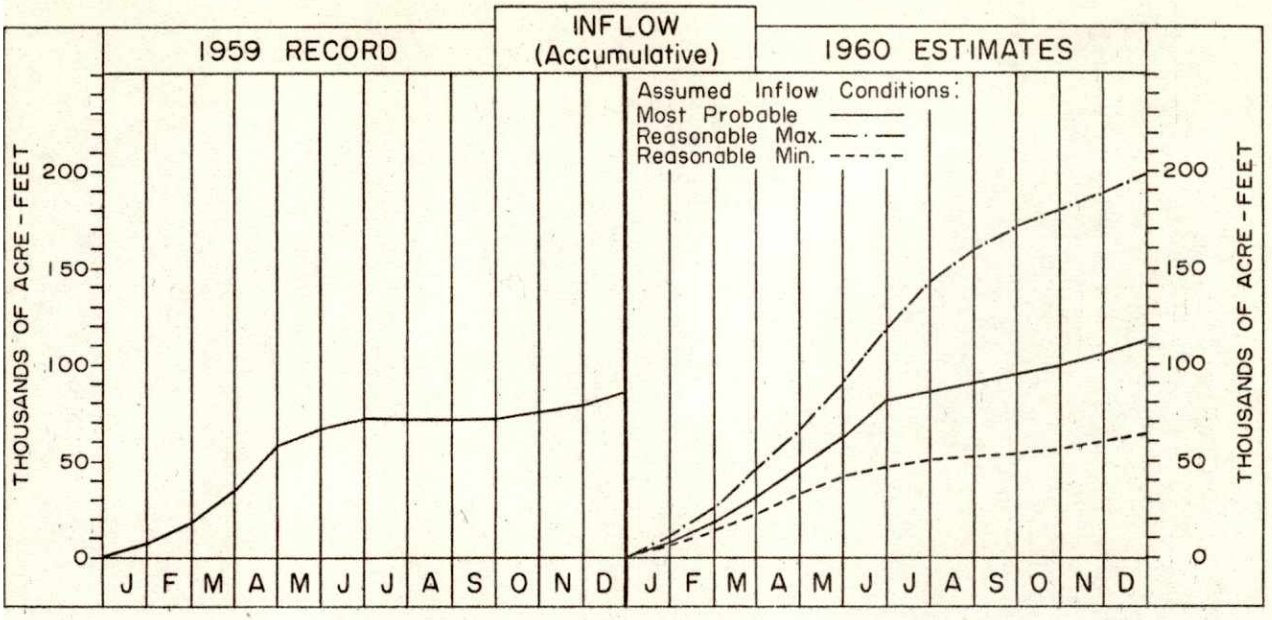
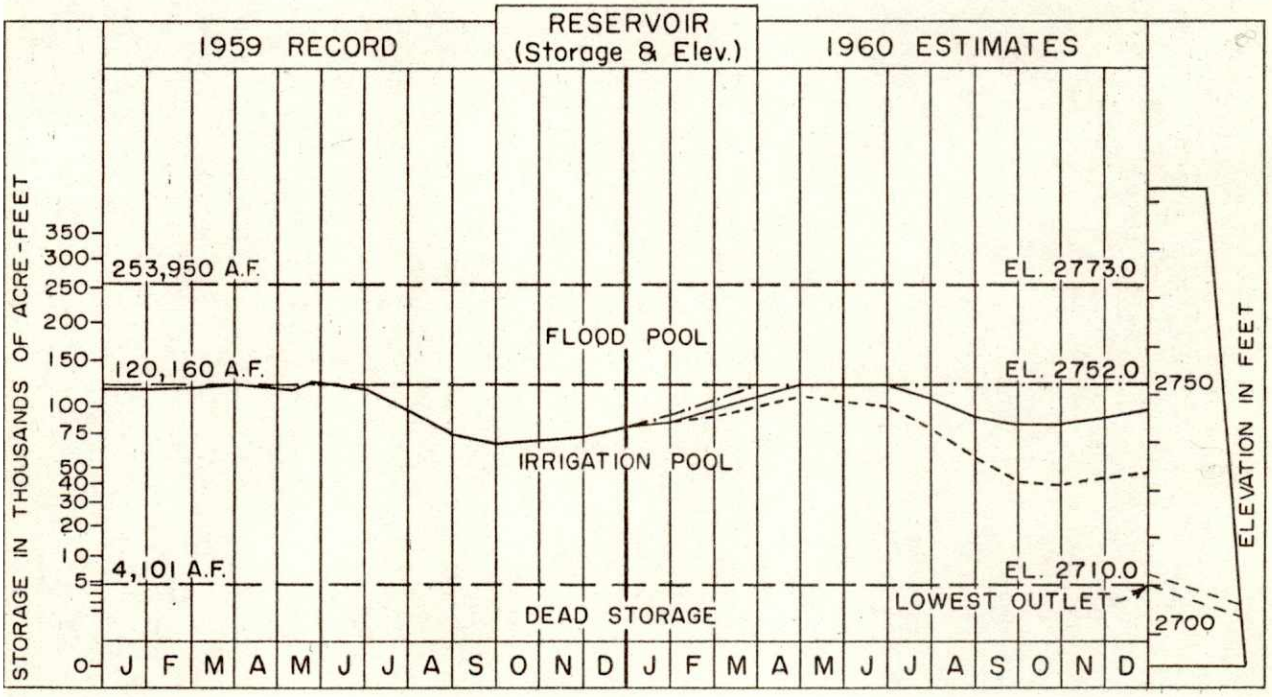
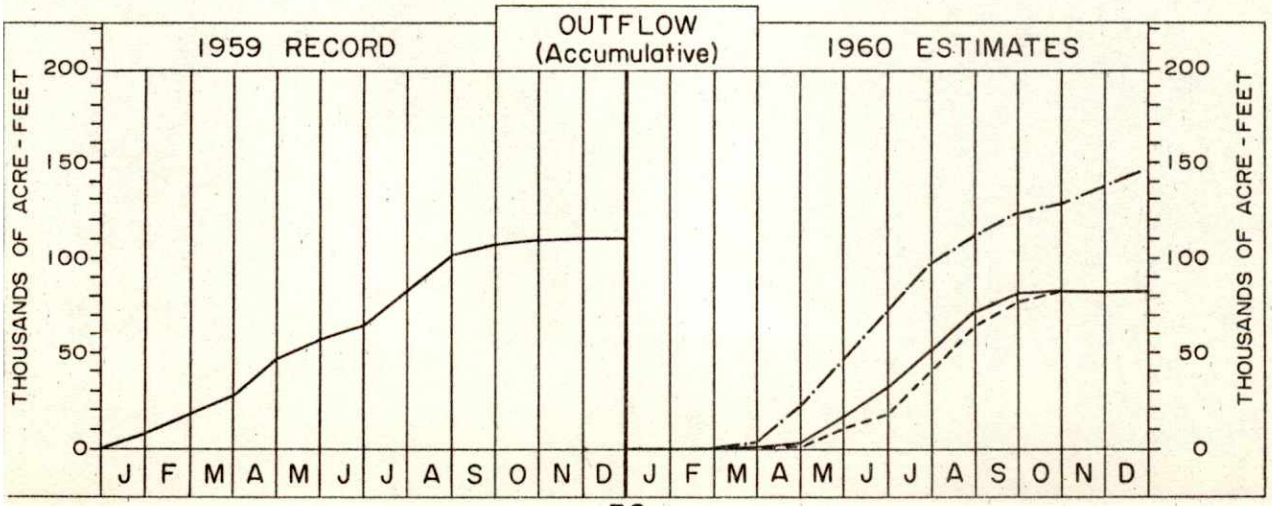


Exhibit 4

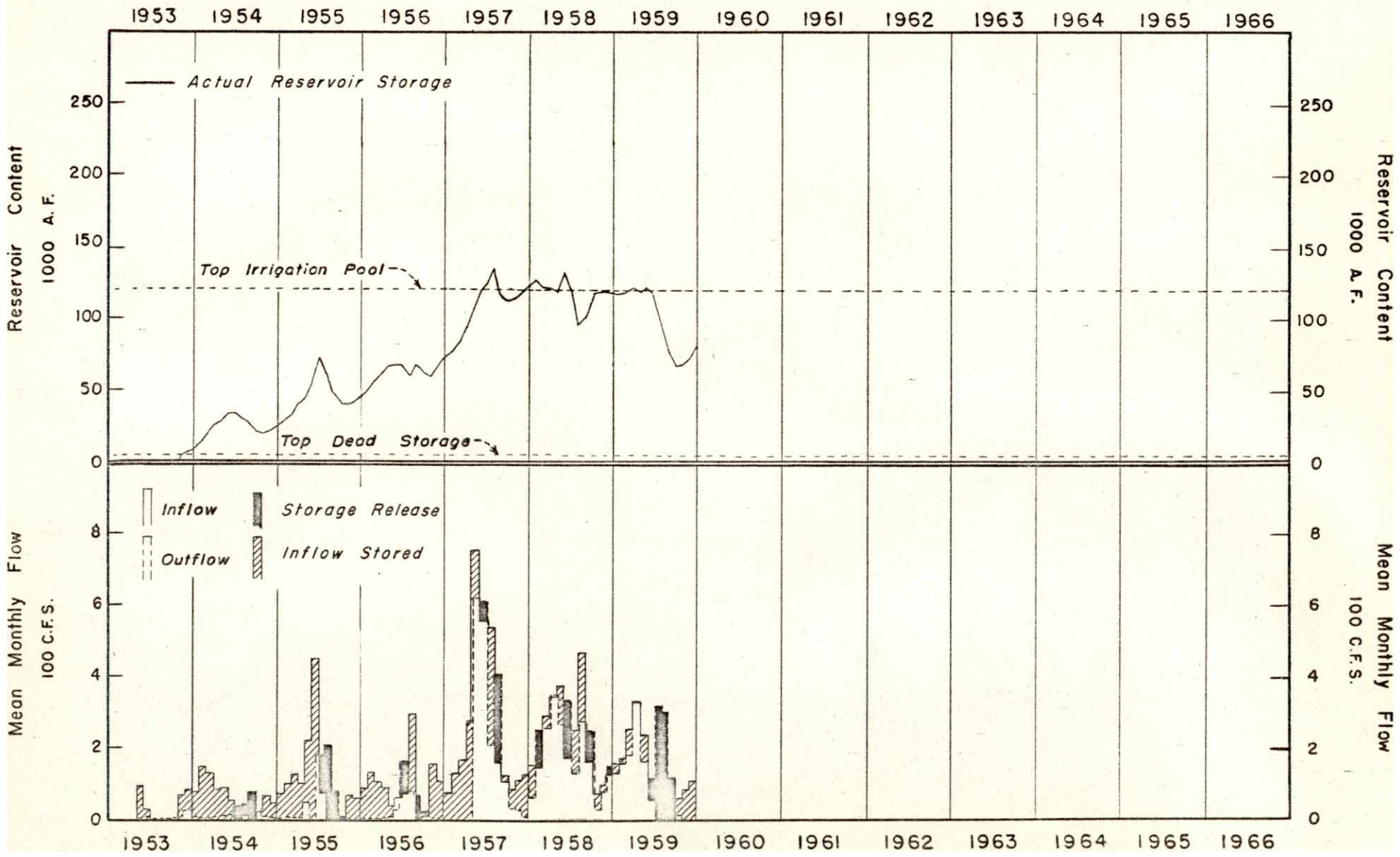
SWANSON LAKE OPERATION



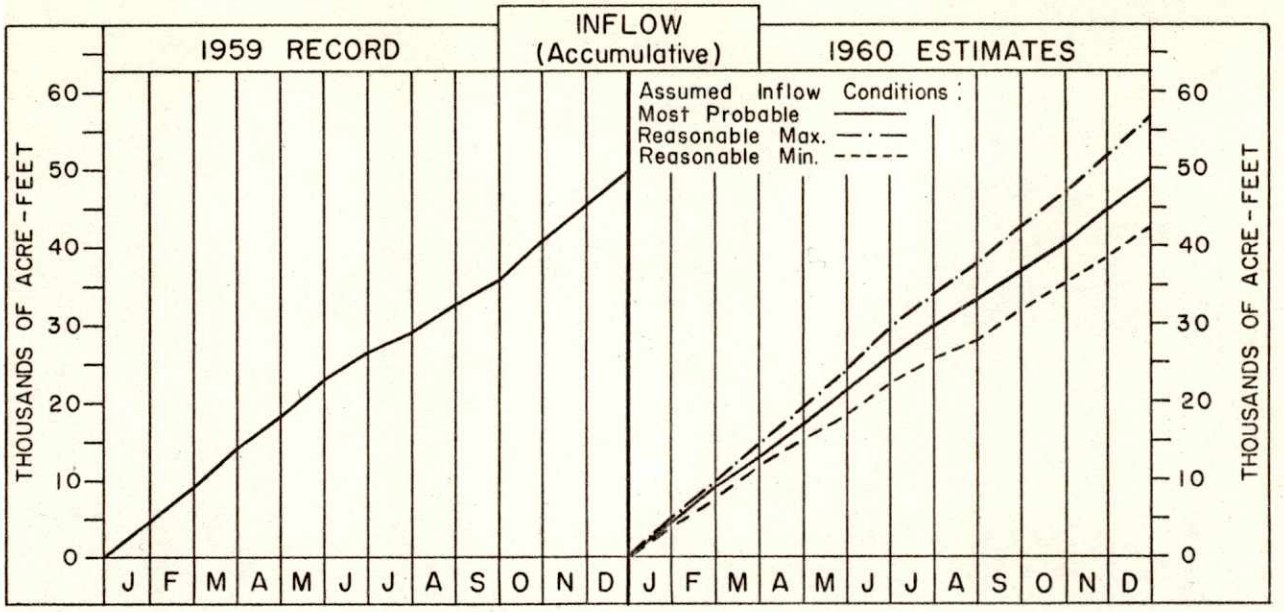


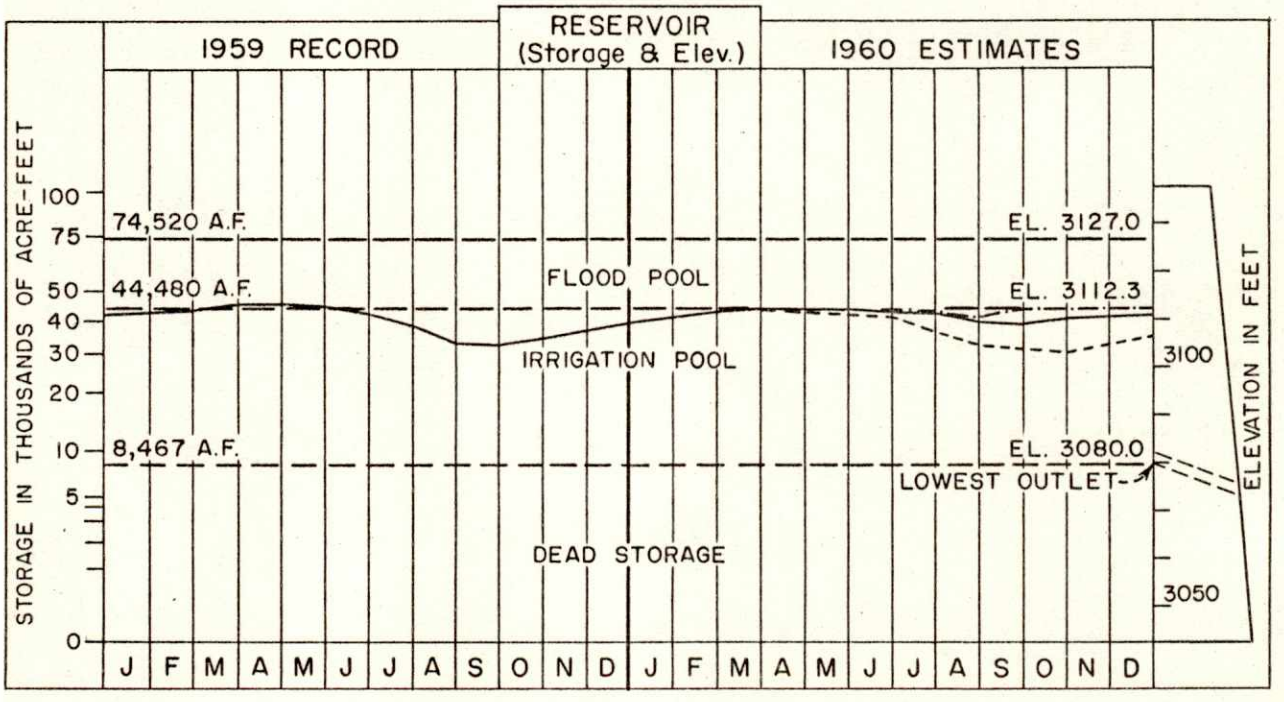


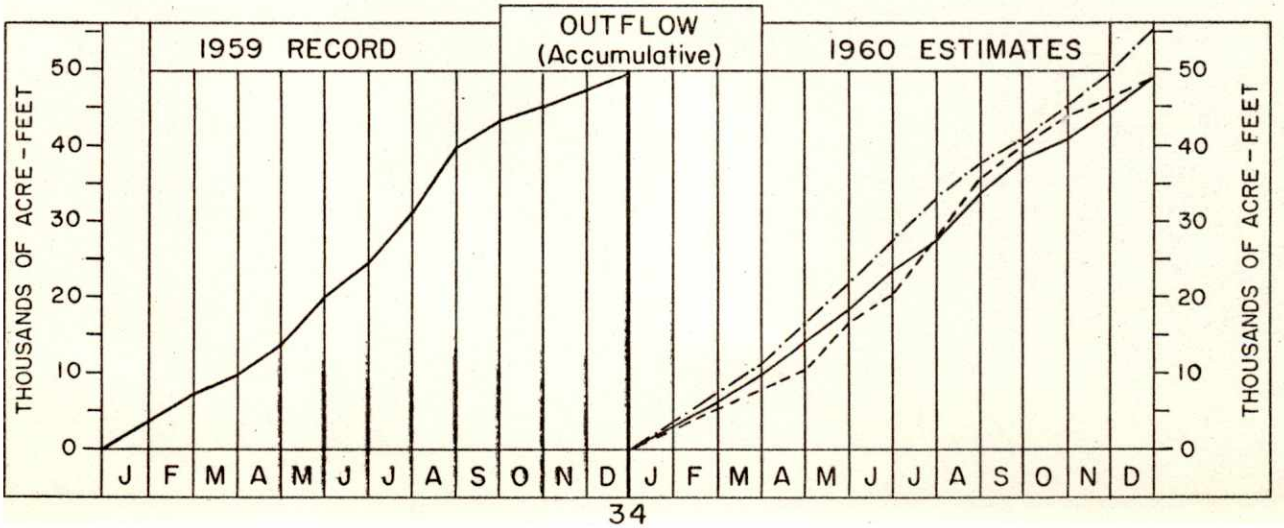
SWANSON LAKE
OPERATION HYDROGRAPHS



ENDERS RESERVOIR OPERATION







ENDERS RESERVOIR
OPERATION HYDROGRAPHS

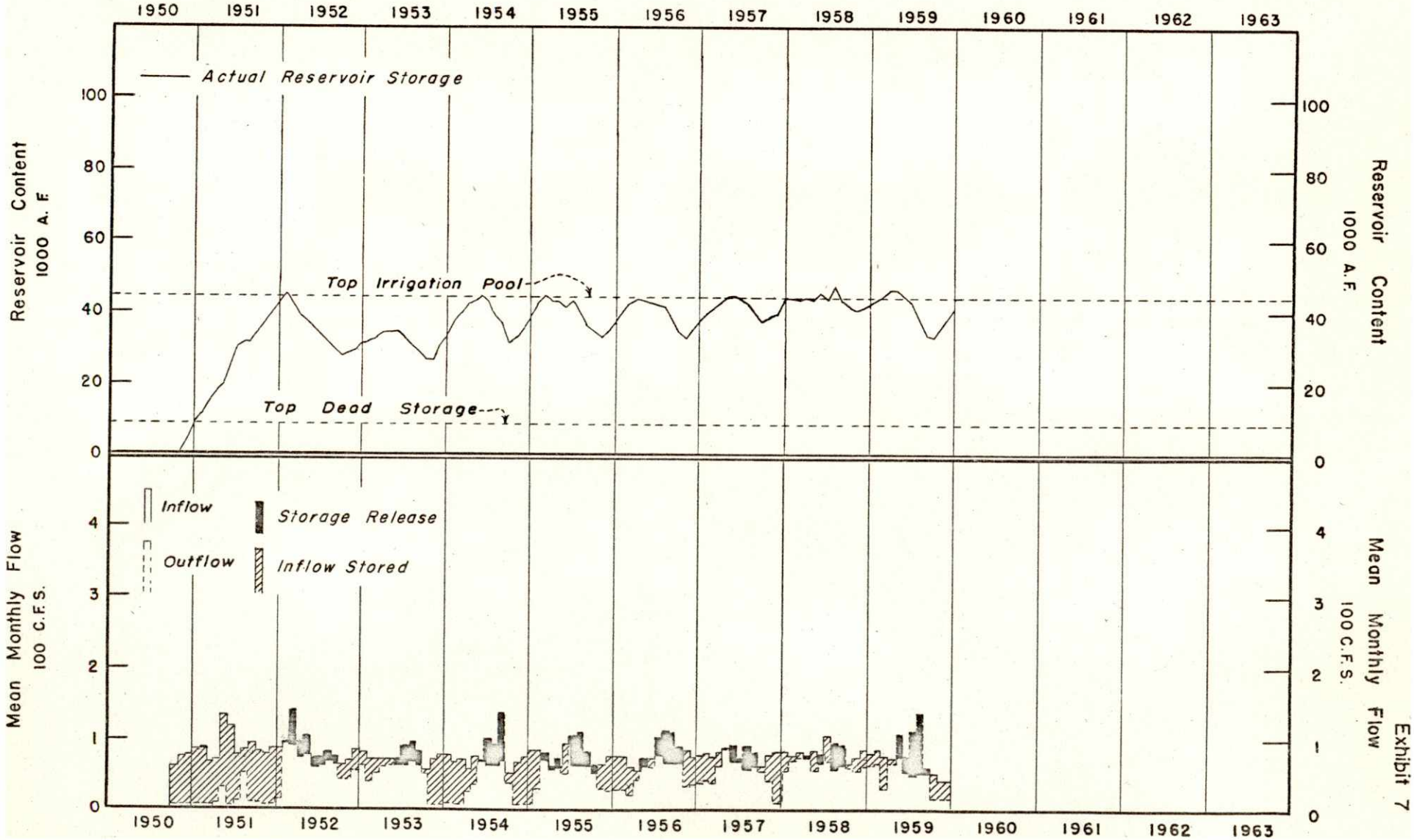
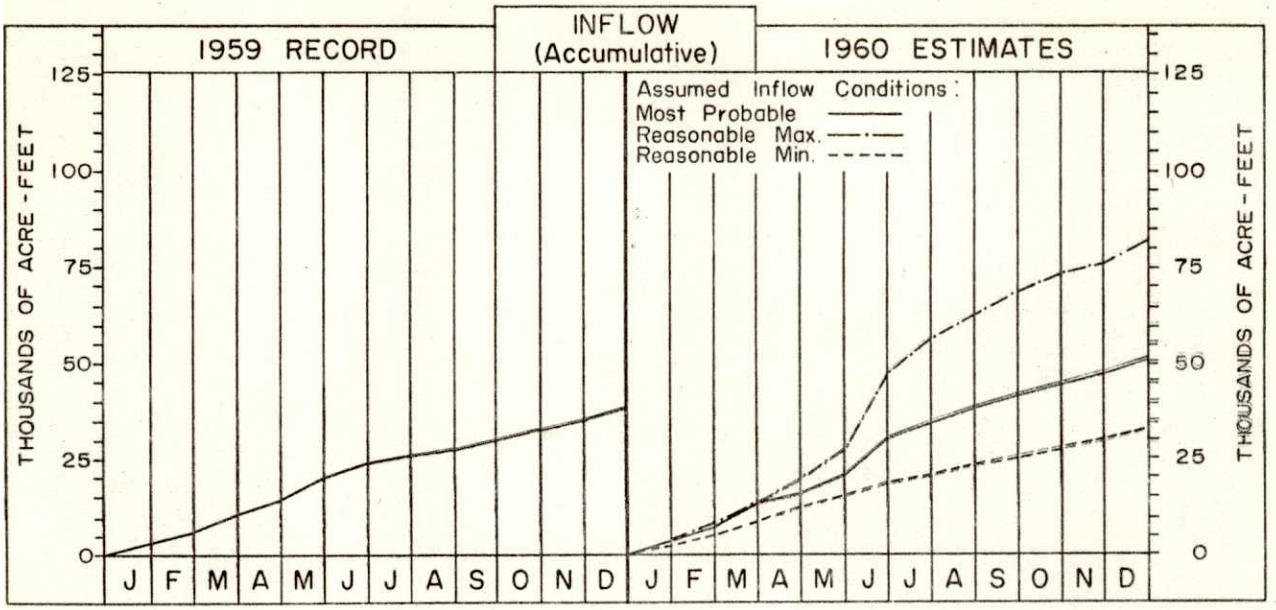
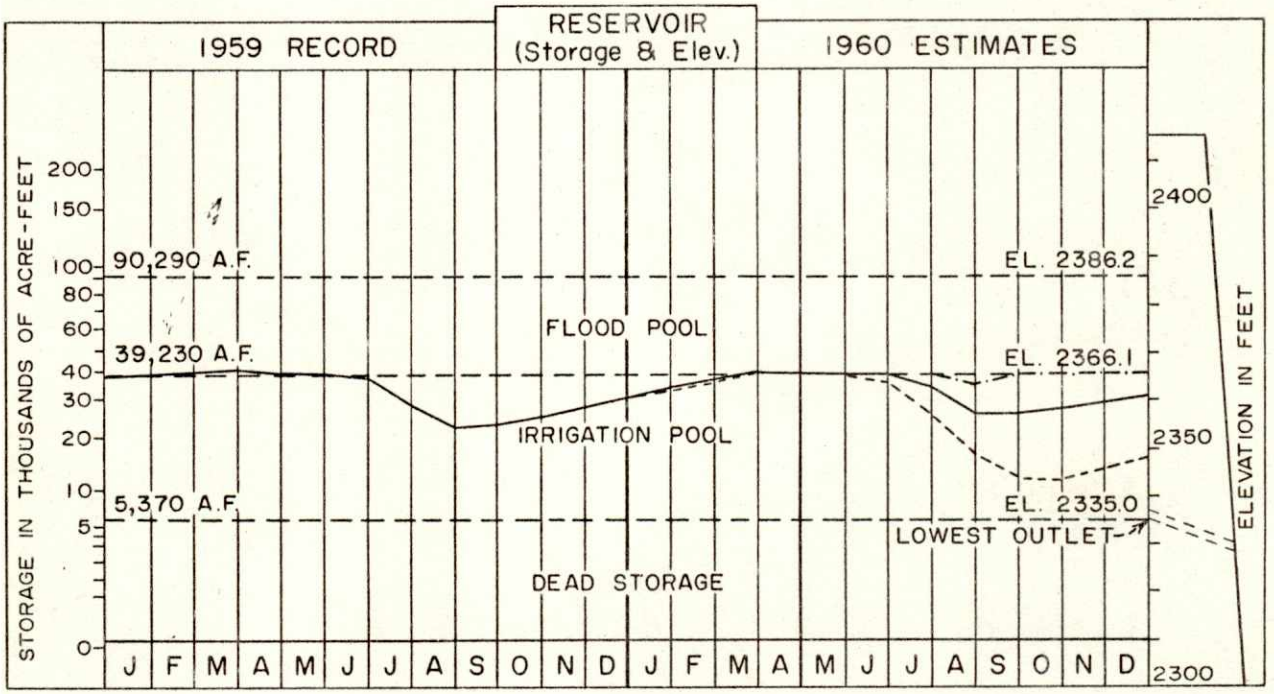


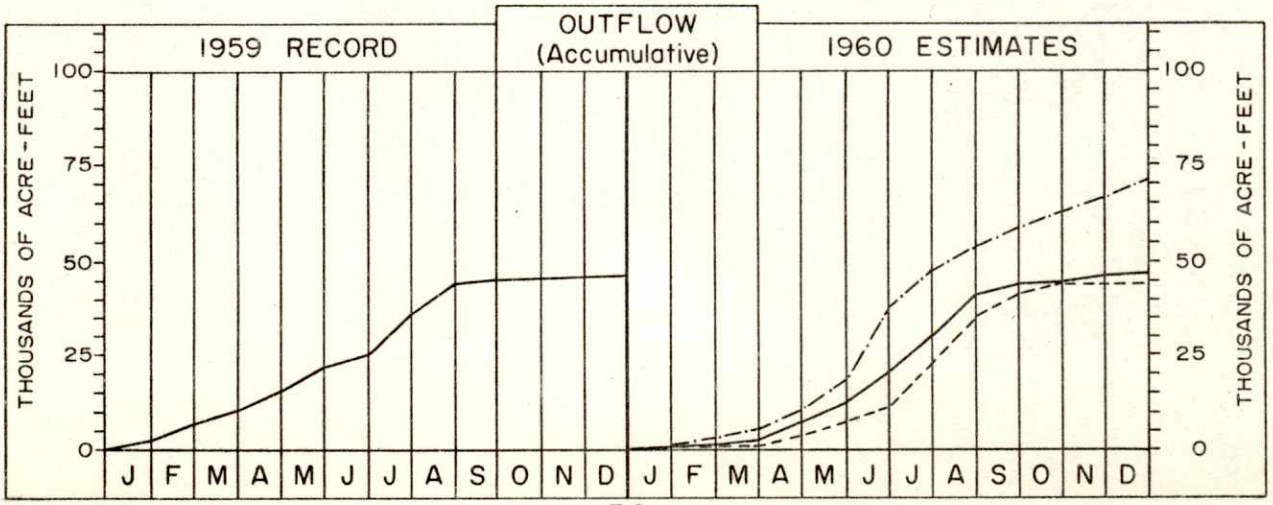
Exhibit 7

Exhibit 8

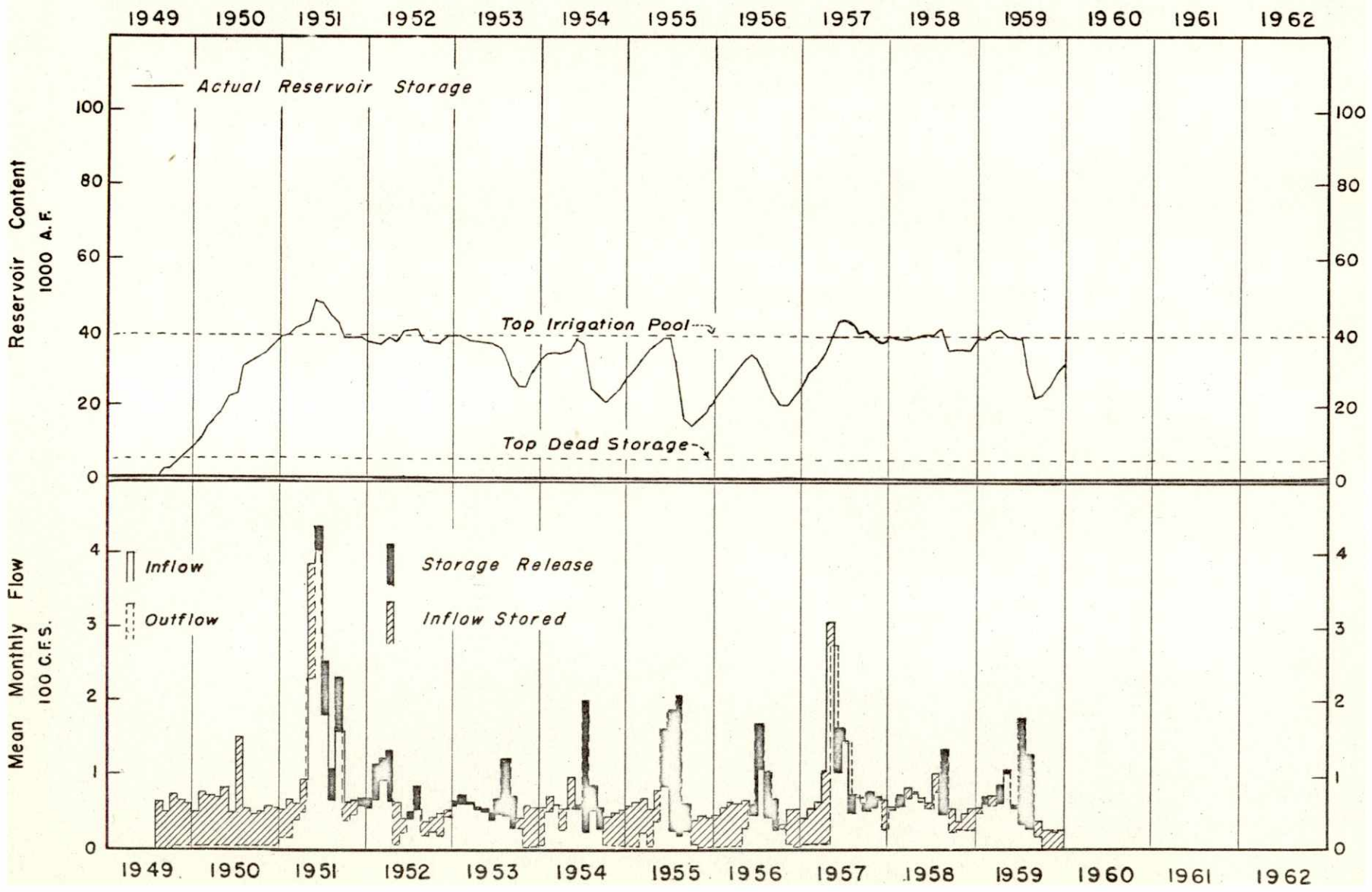
HARRY STRUNK RESERVOIR OPERATION



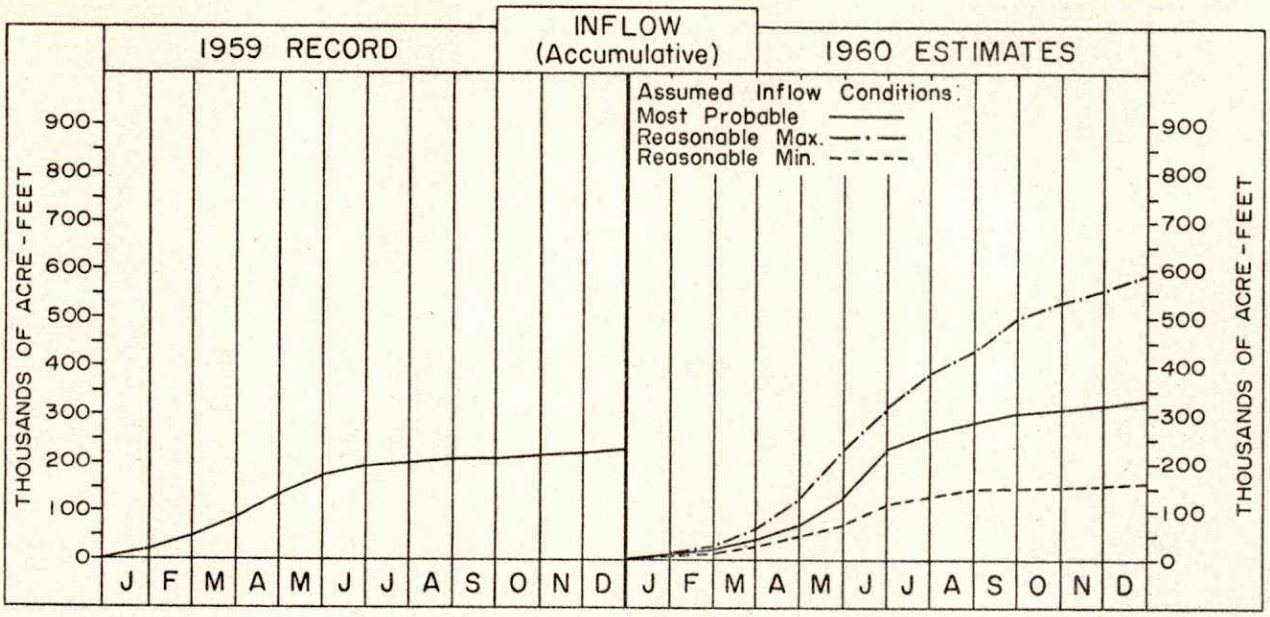


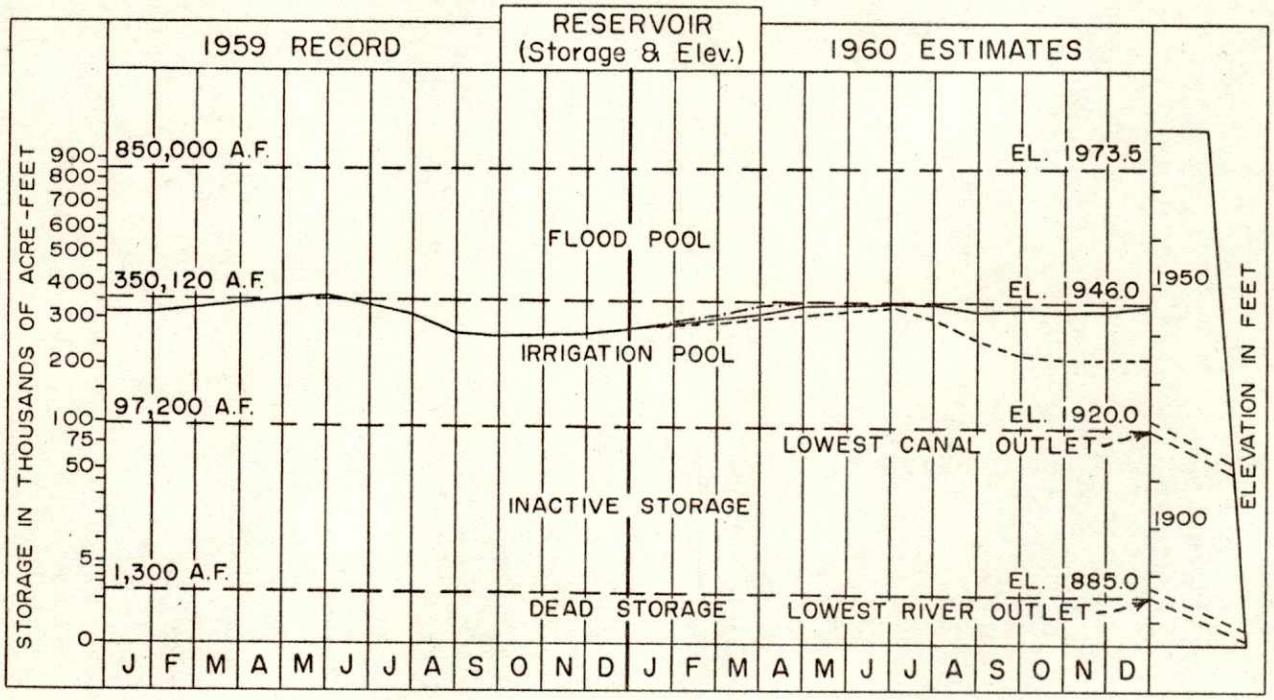


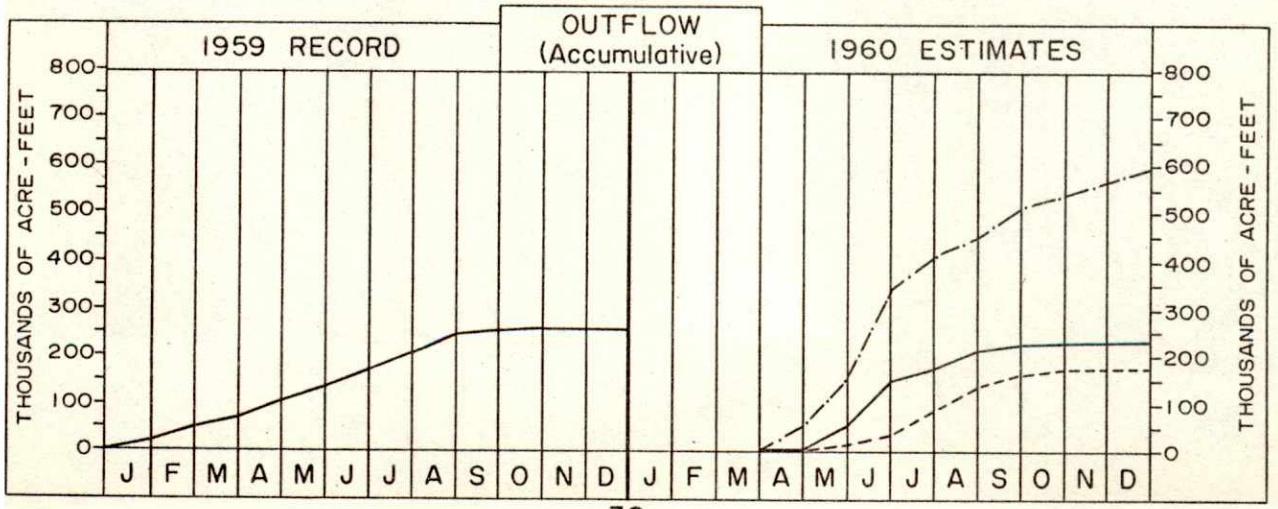
HARRY STRUNK LAKE
OPERATION HYDROGRAPHS



HARLAN COUNTY RESERVOIR OPERATION







HARLAN COUNTY RESERVOIR
OPERATION HYDROGRAPHS

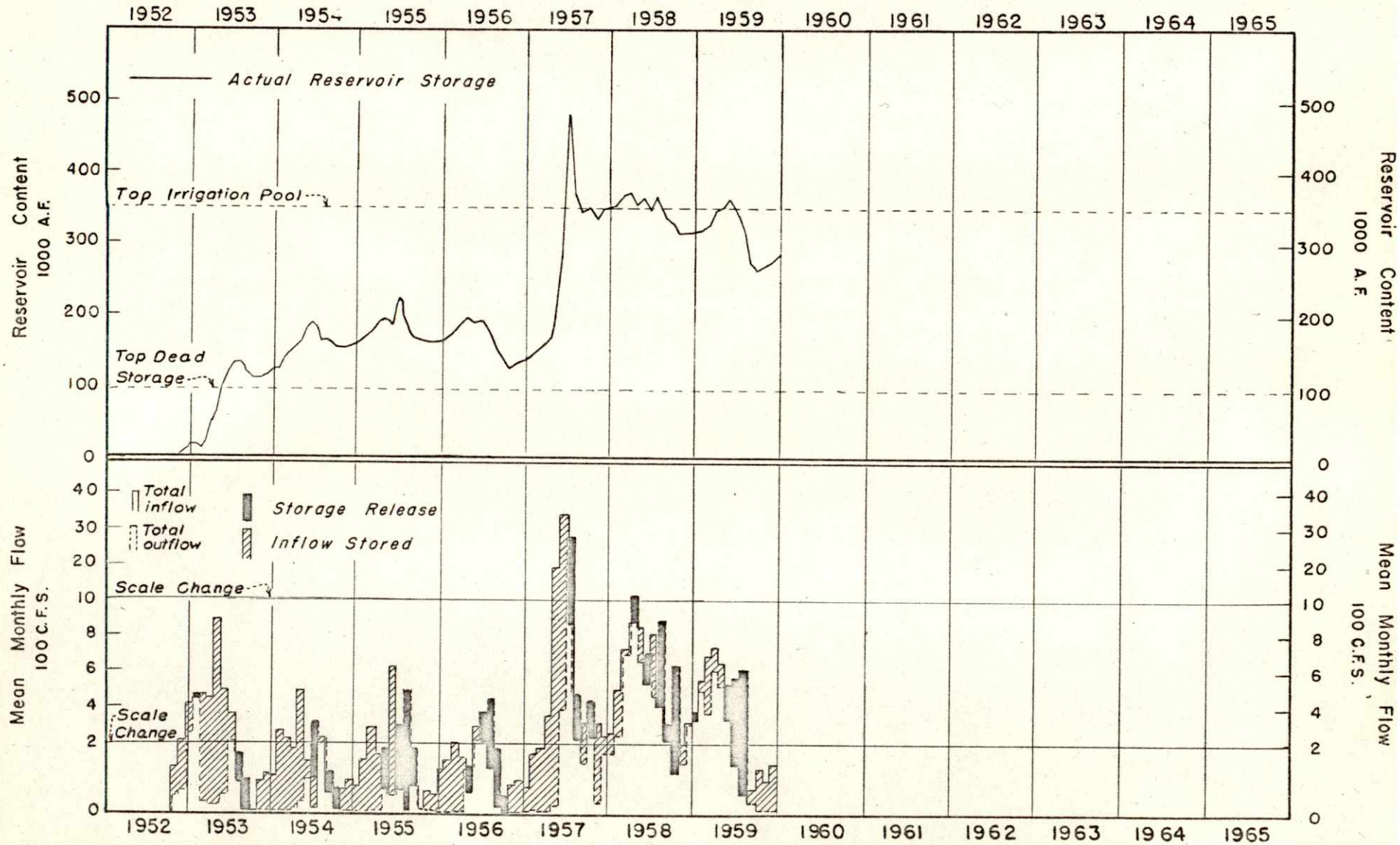
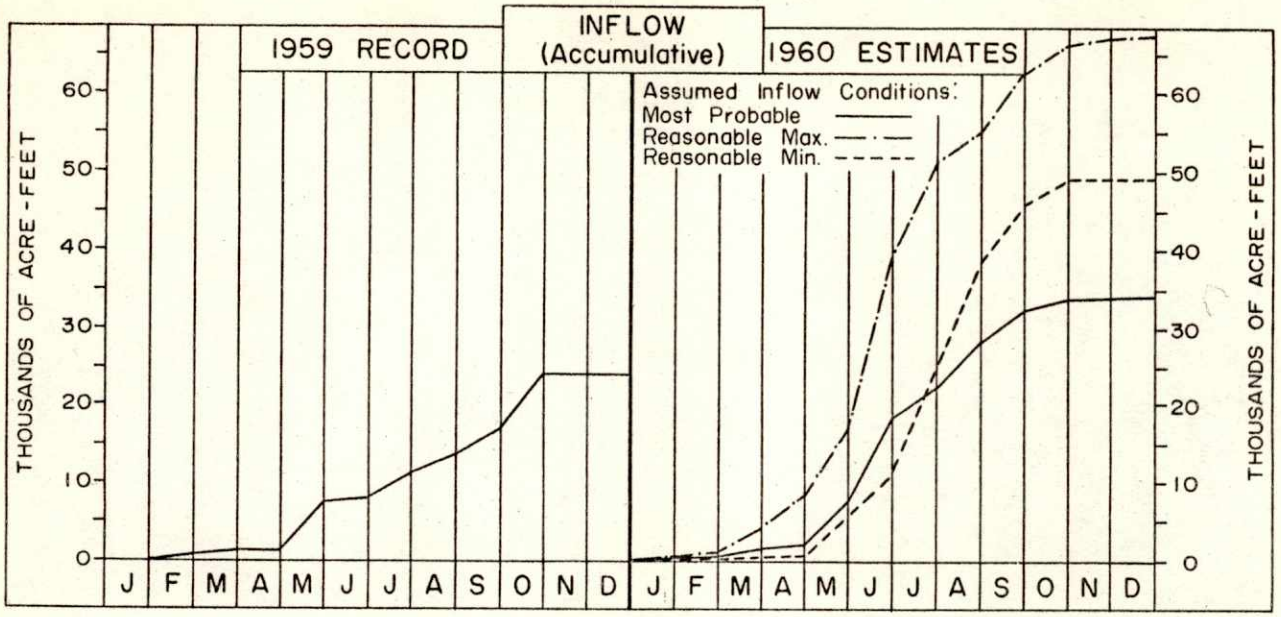
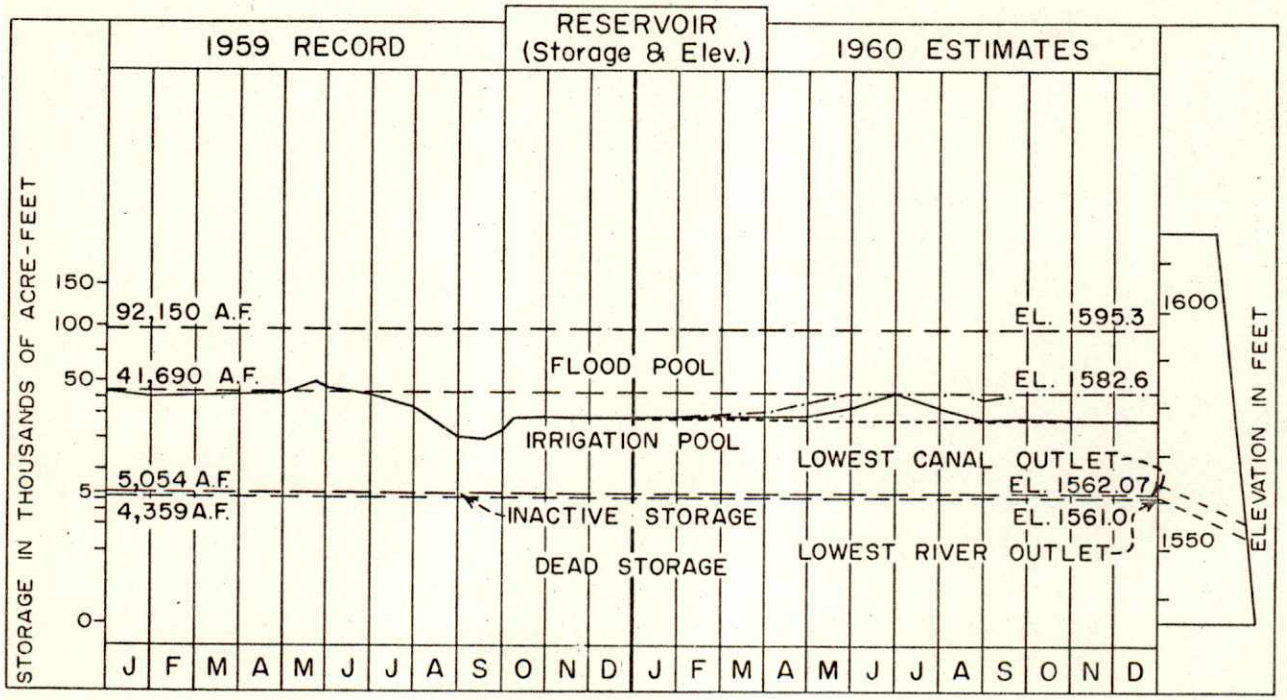
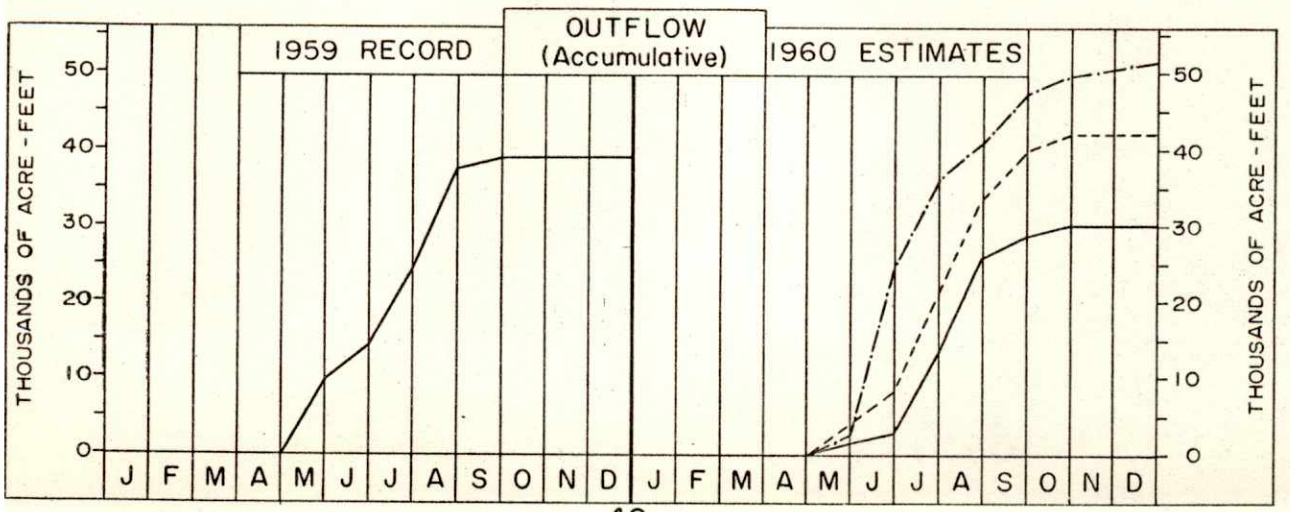


Exhibit 12

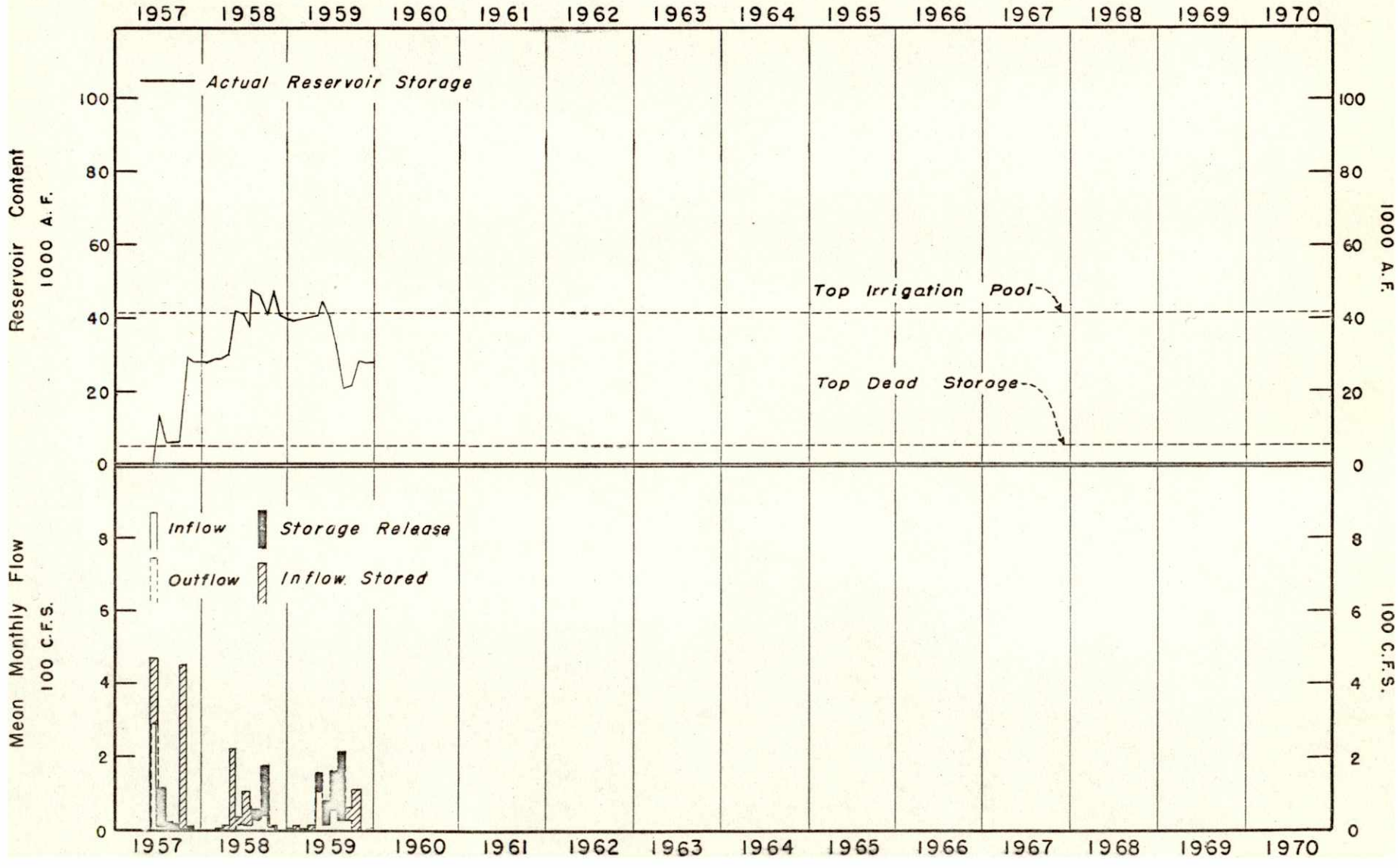
LOVEWELL RESERVOIR OPERATION



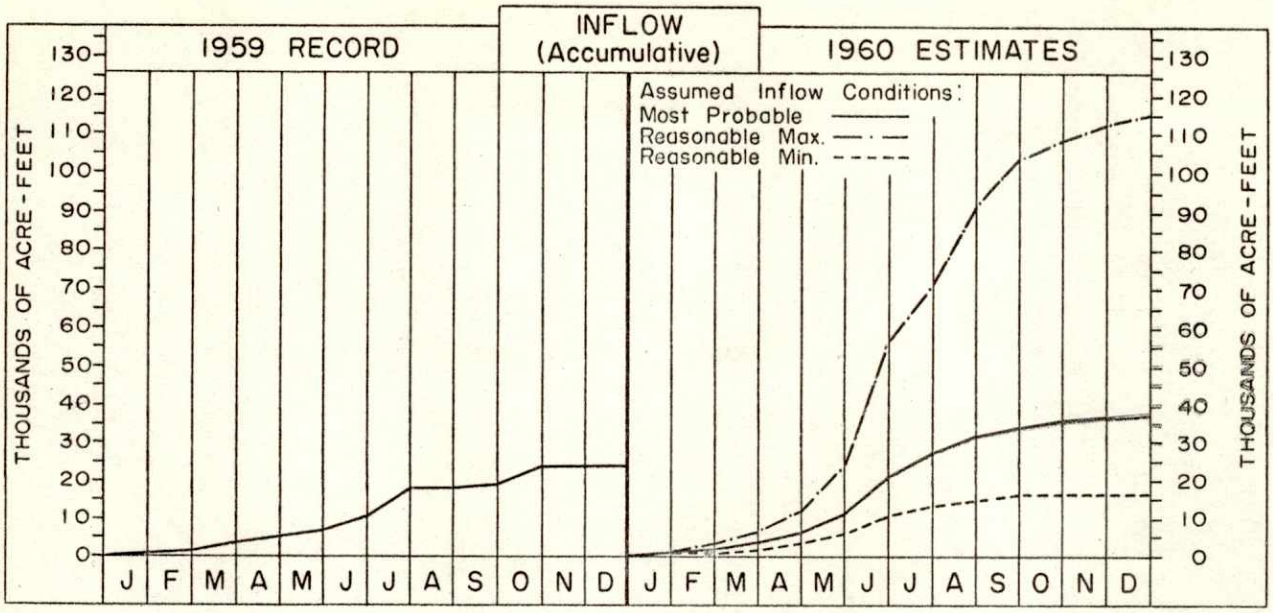


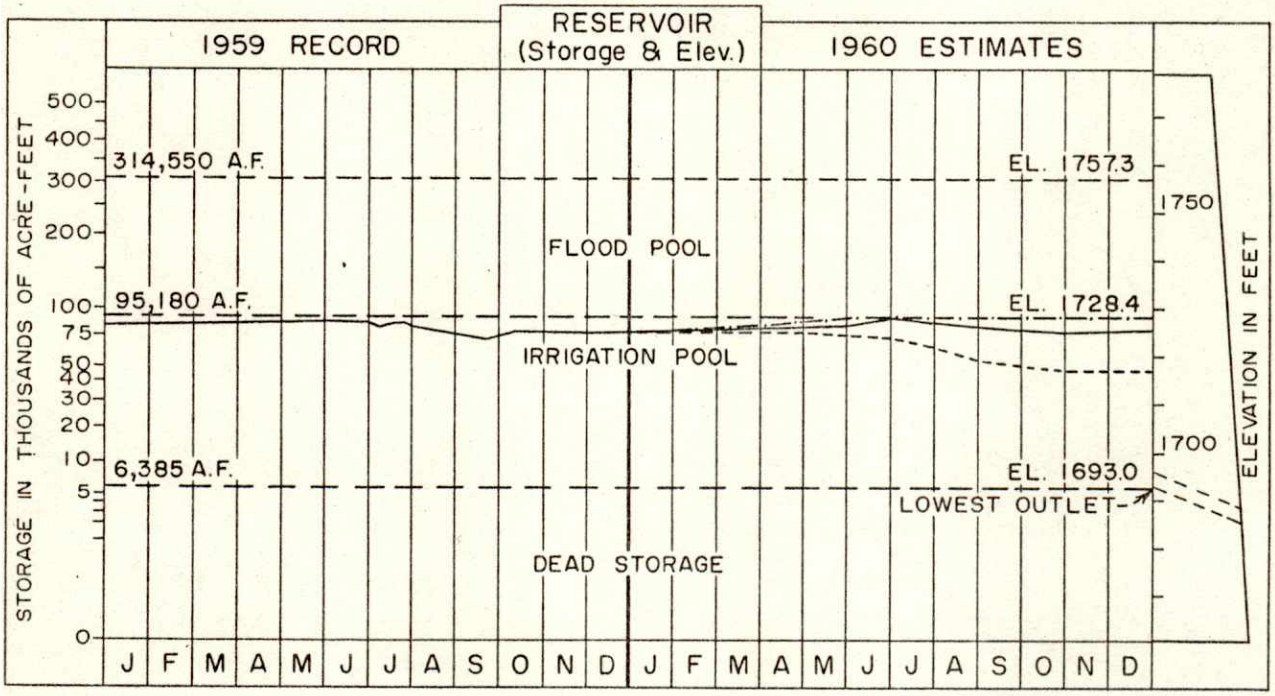


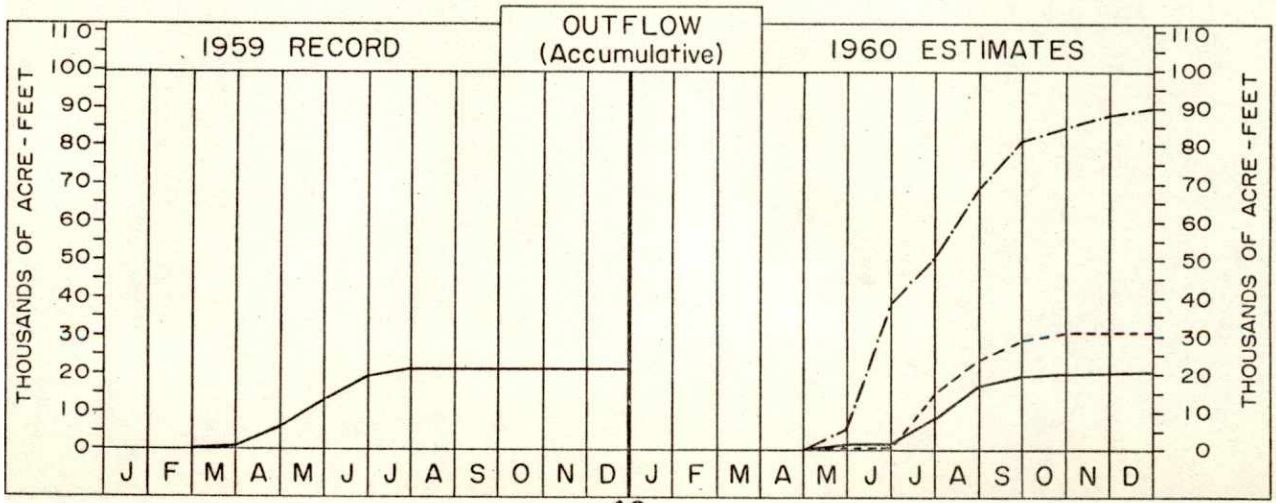
LOVEWELL RESERVOIR
OPERATION HYDROGRAPHS



KIRWIN RESERVOIR OPERATION







KIRWIN RESERVOIR
OPERATION HYDROGRAPHS

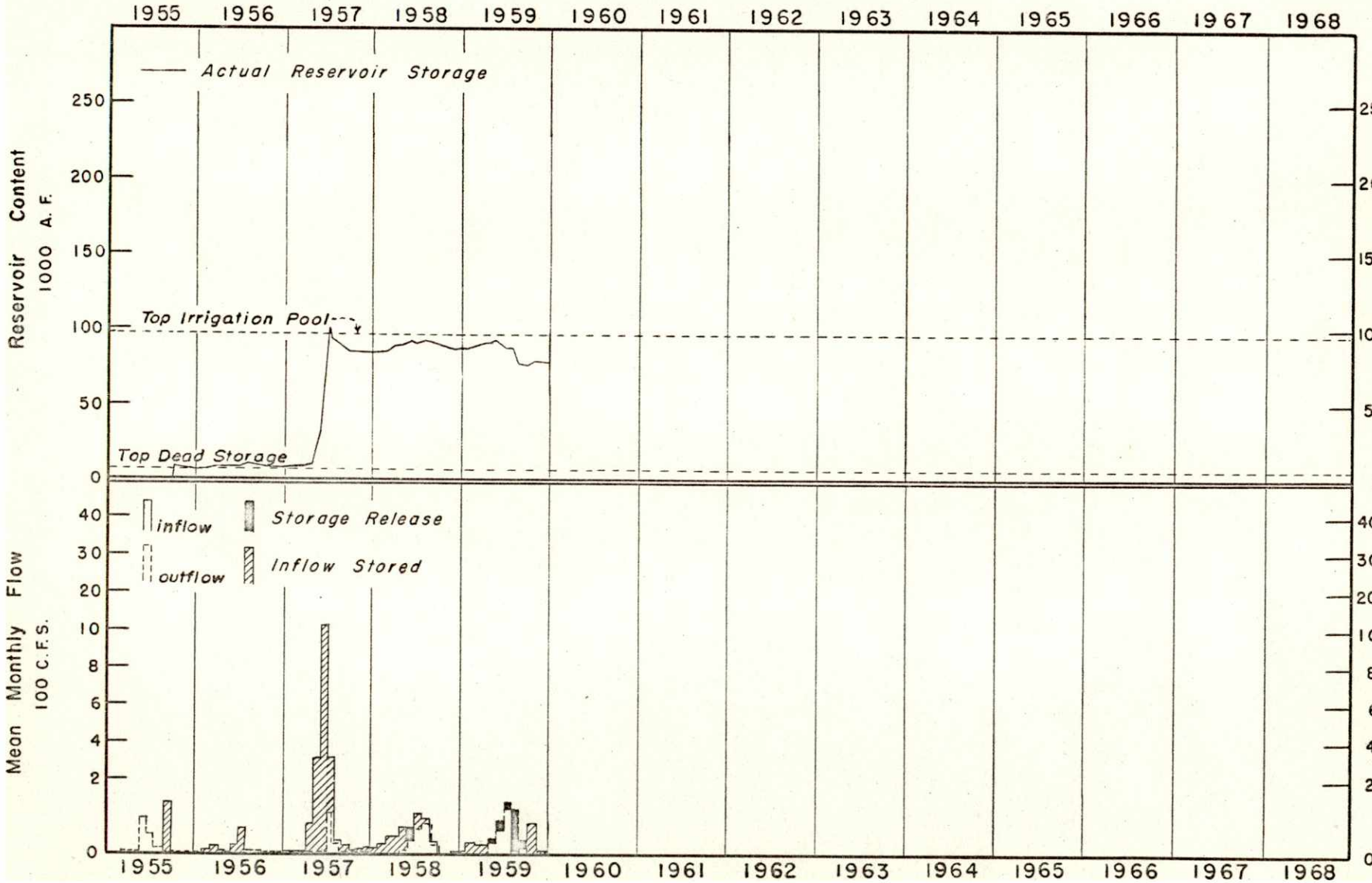
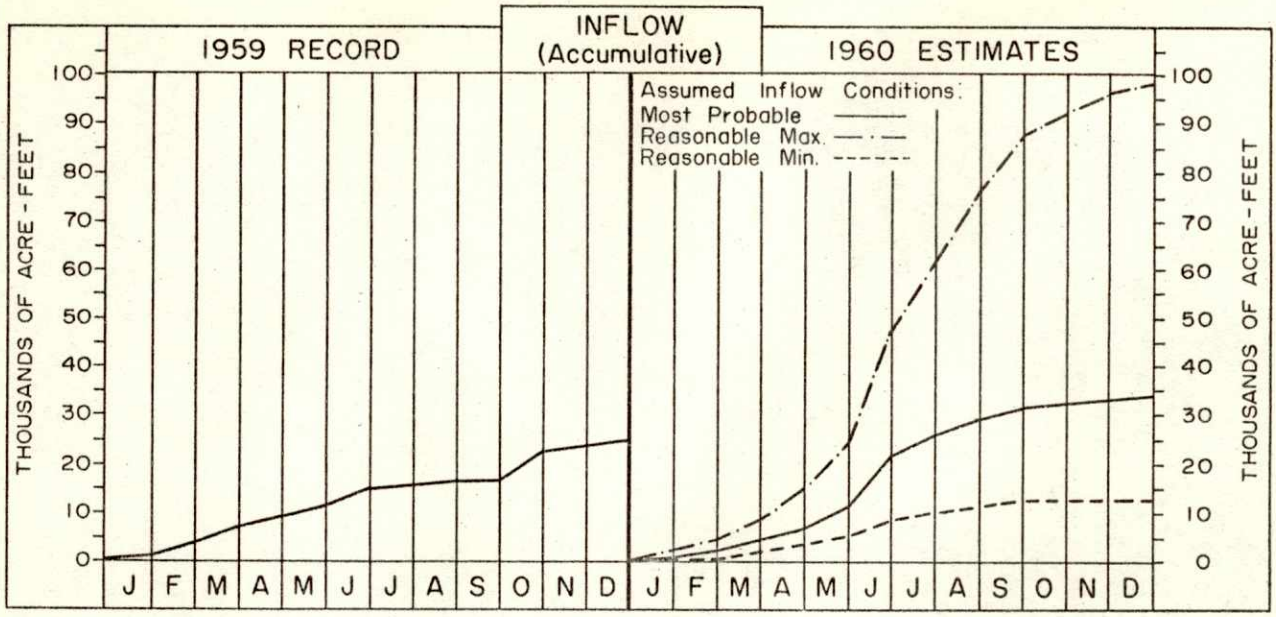
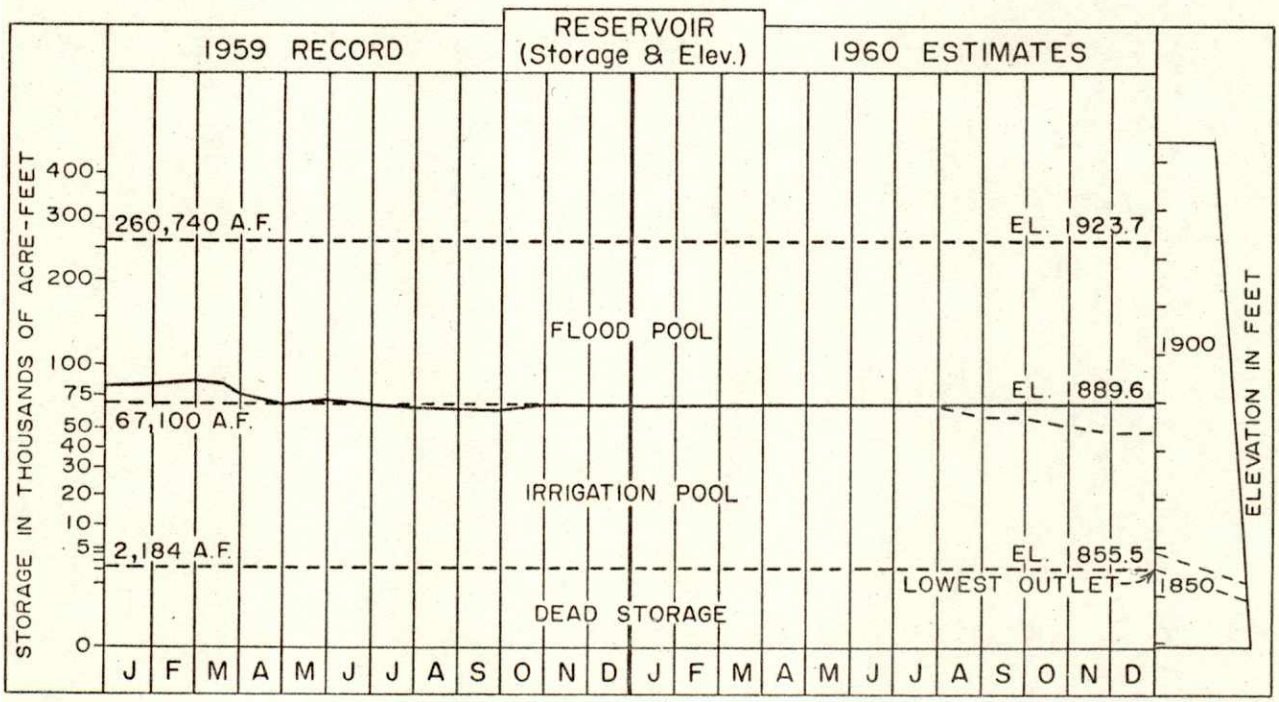
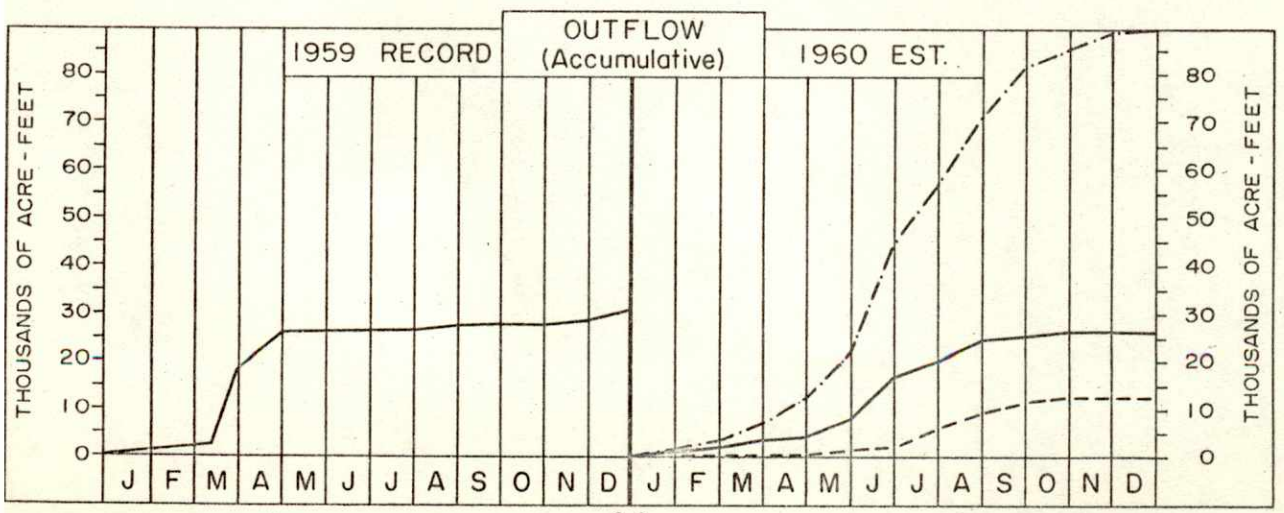


Exhibit 15

WEBSTER RESERVOIR OPERATION







WEBSTER RESERVOIR
OPERATION HYDROGRAPHS

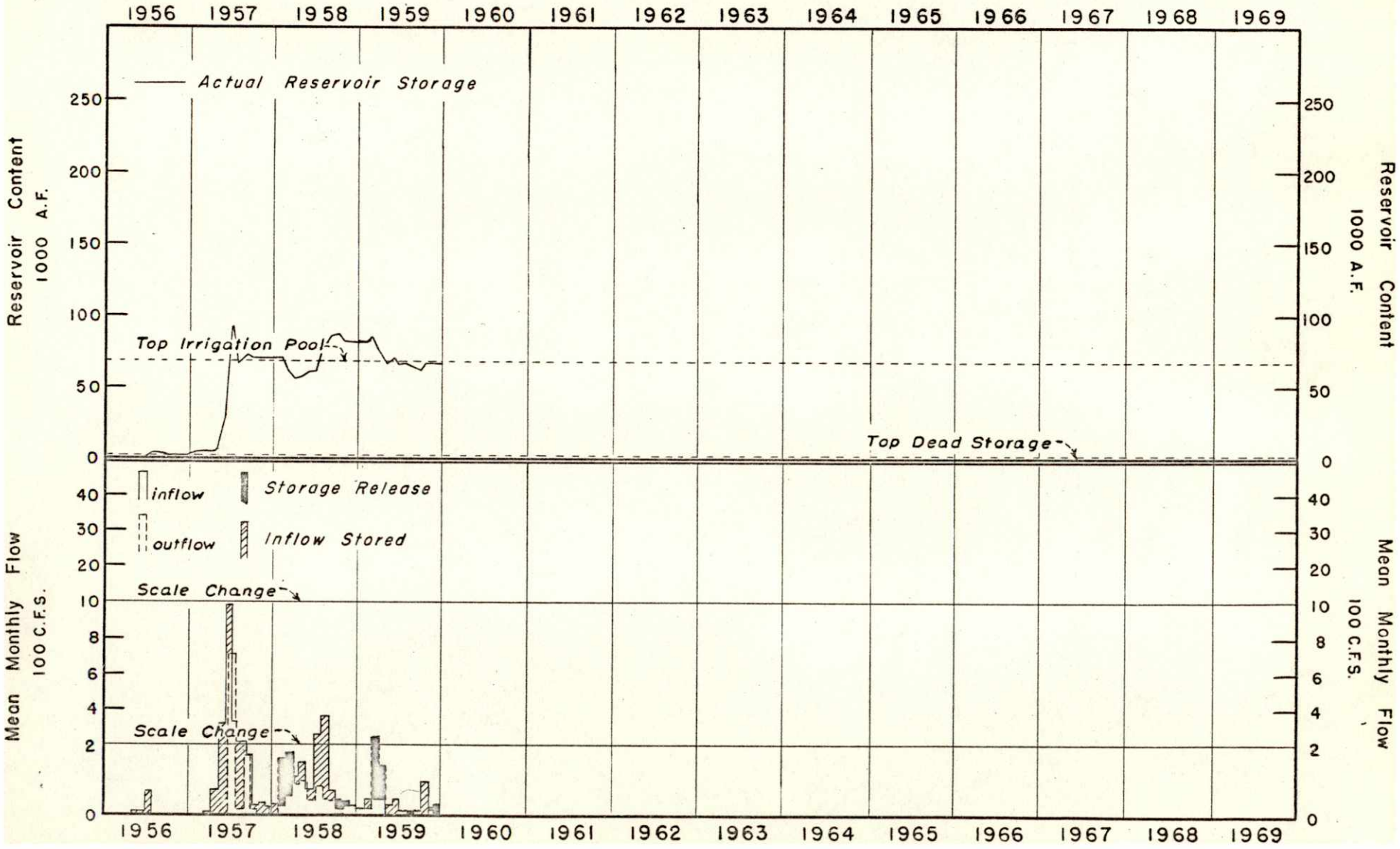
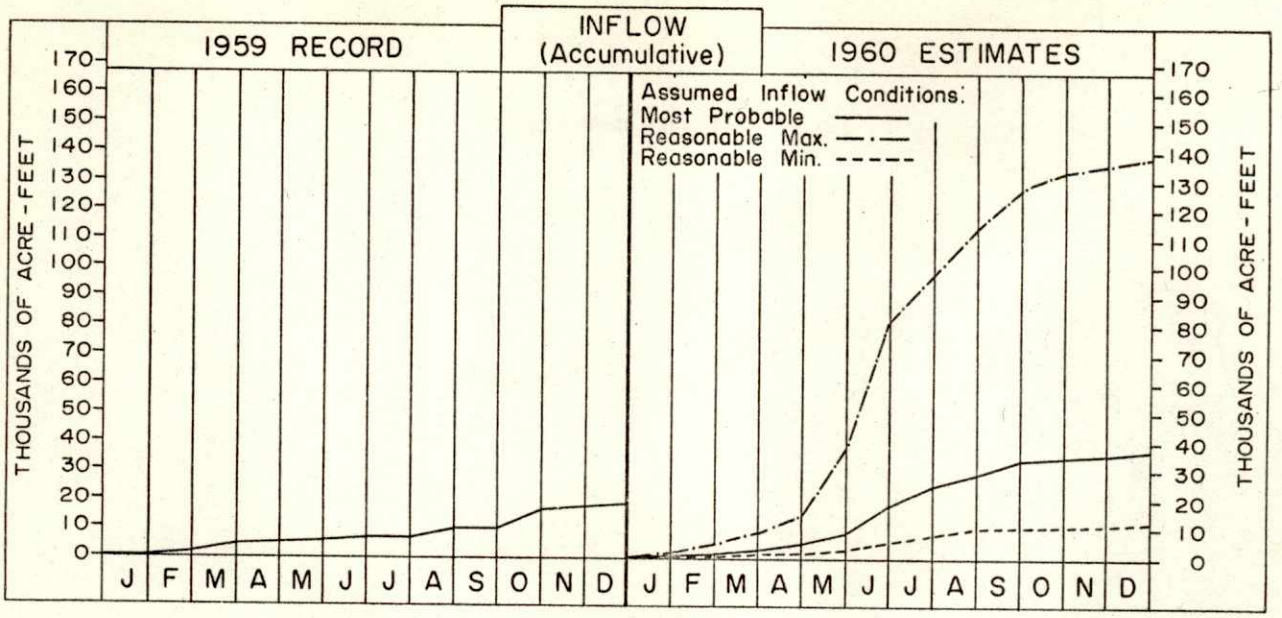
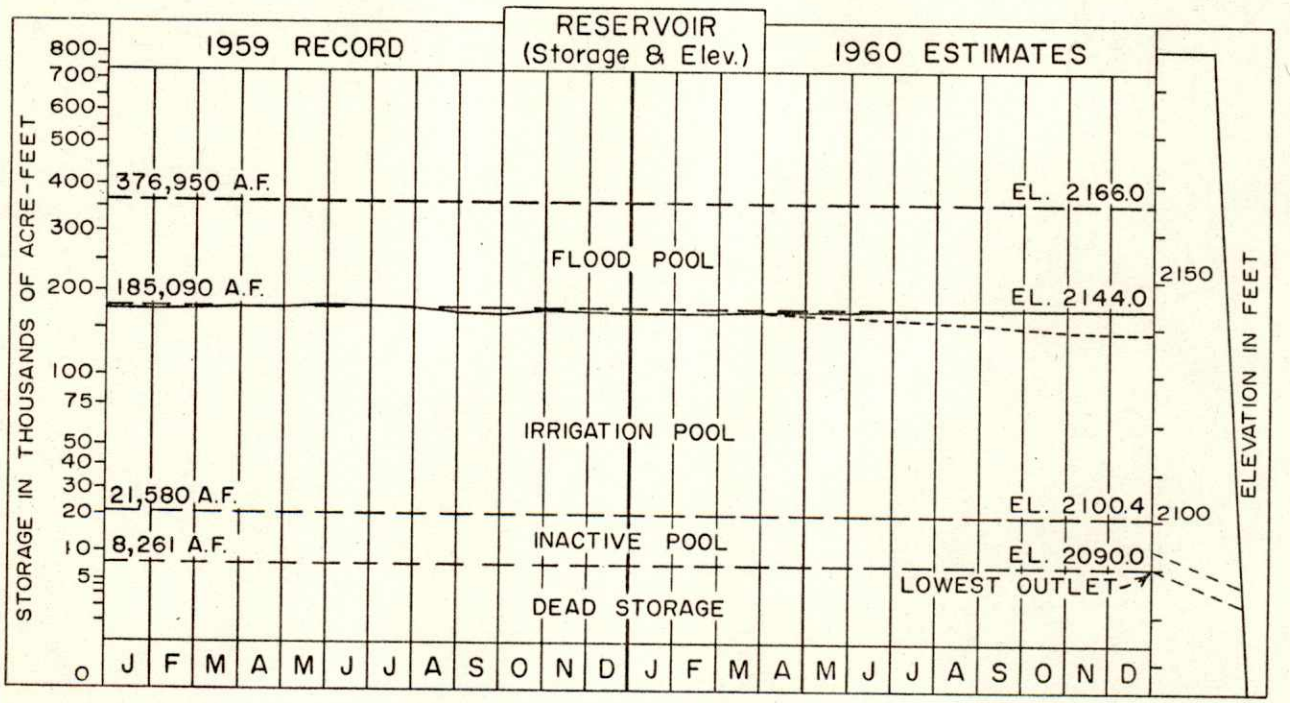
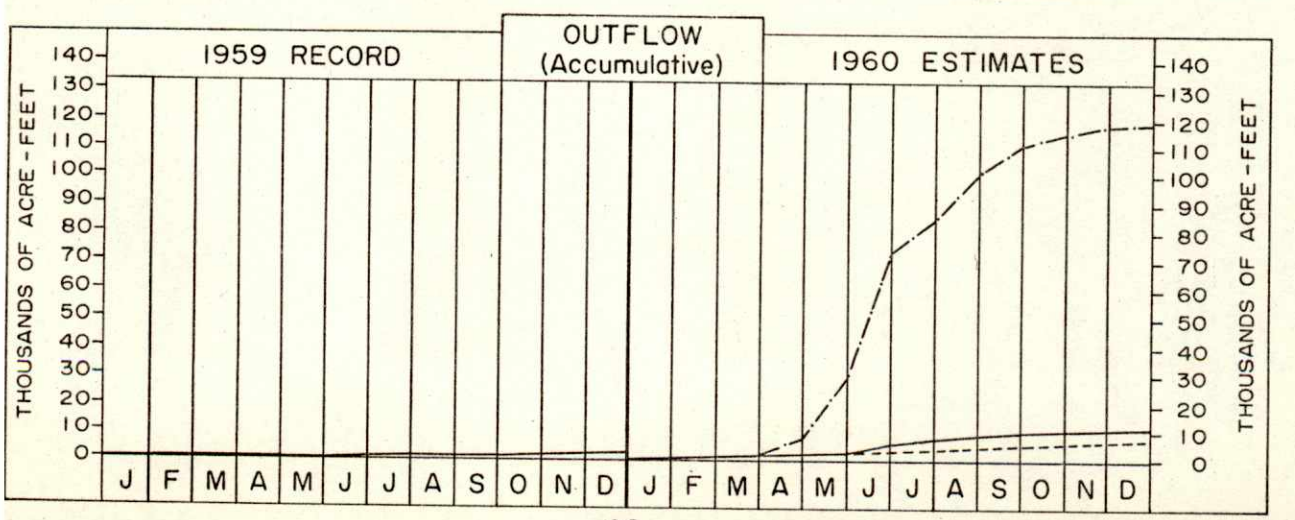


Exhibit 18

CEDAR BLUFF RESERVOIR OPERATION







CEDAR BLUFF RESERVOIR
OPERATION HYDROGRAPHS

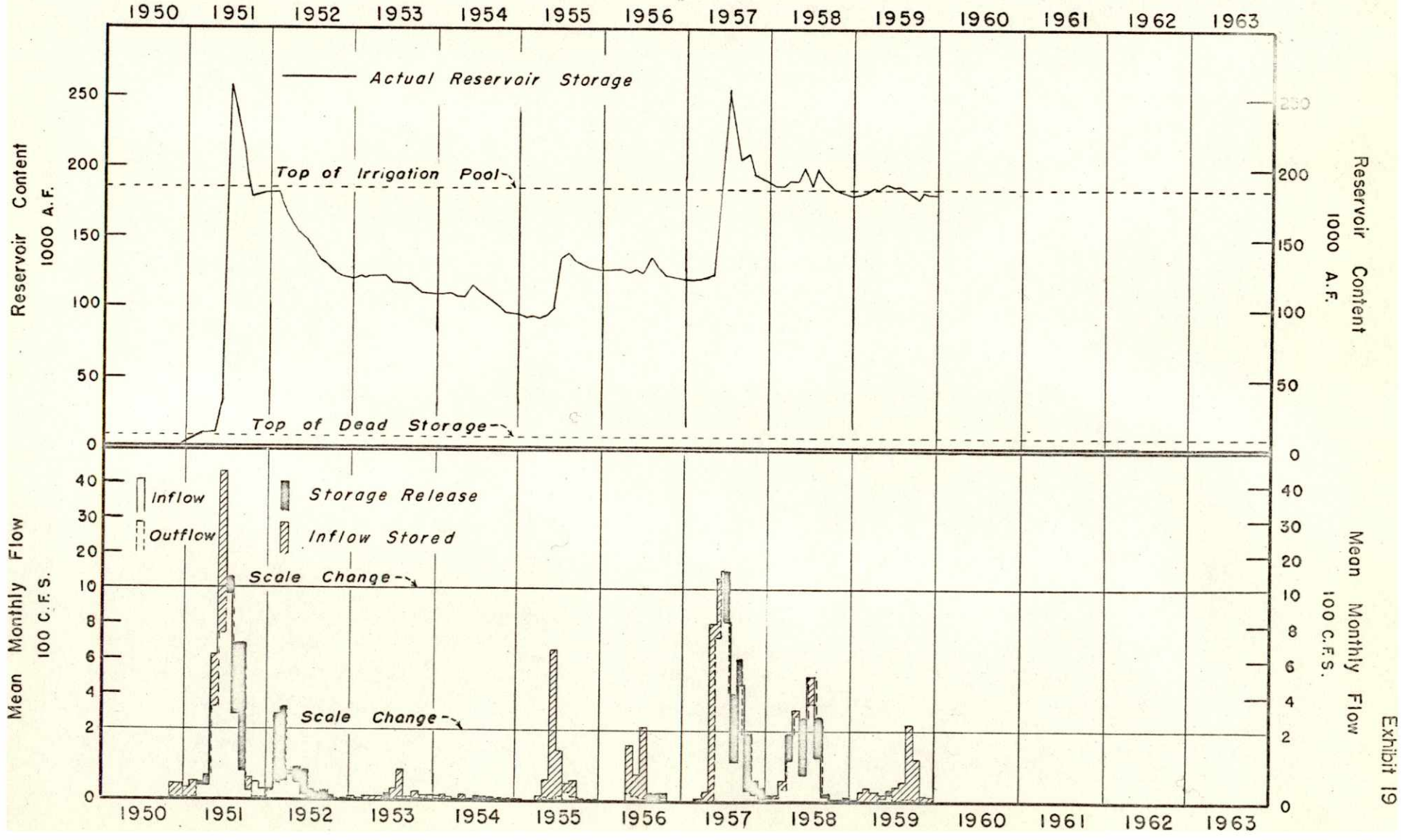
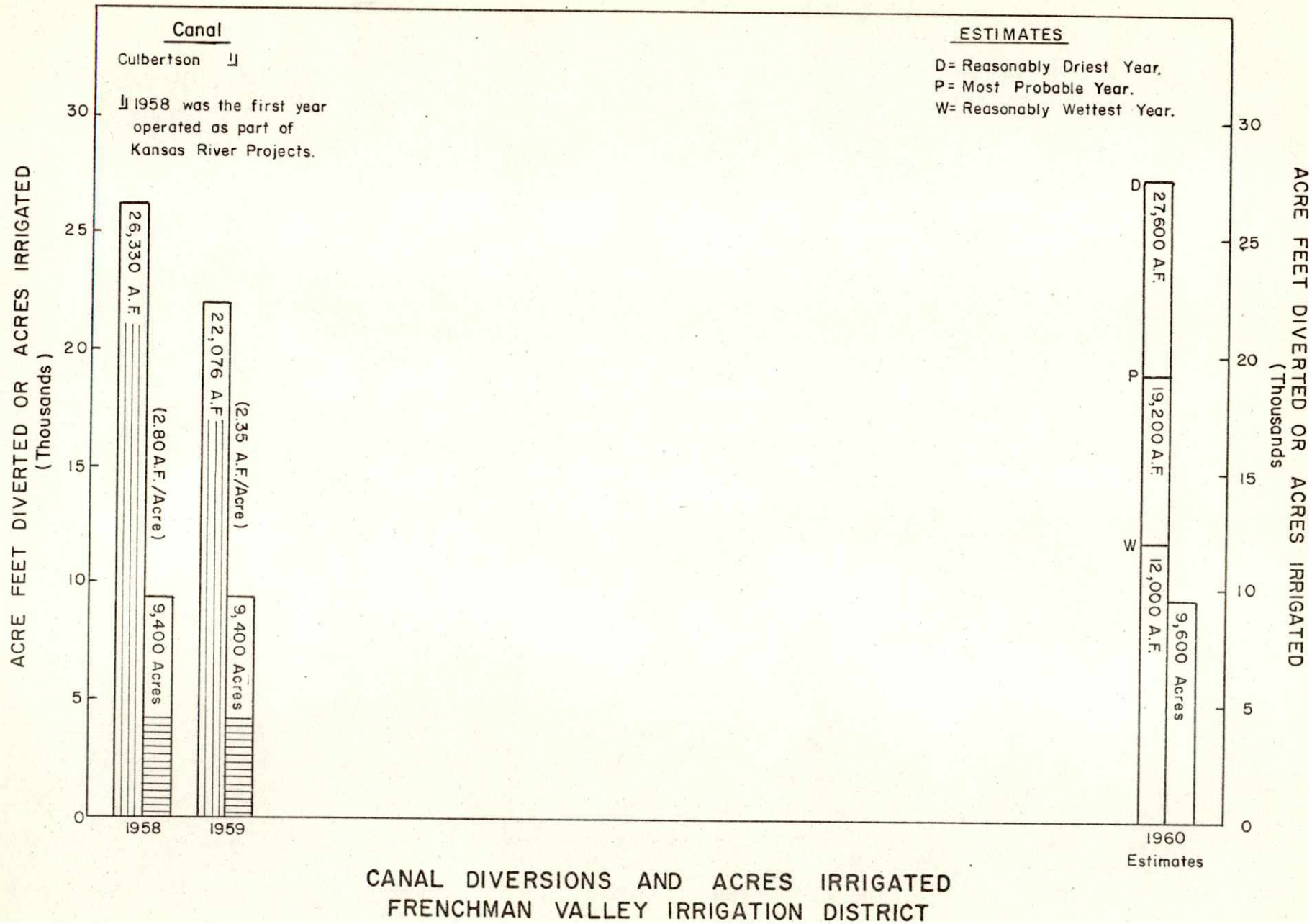


Exhibit 19

CANAL DIVERSIONS AND ACRES IRRIGATED
KANSAS RIVER PROJECTS

Exhibit 20



CANAL DIVERSIONS AND ACRES IRRIGATED
FRENCHMAN VALLEY IRRIGATION DISTRICT

Canal	First Year Operated
Meeker [1]	1948 [2]
Cambridge	1951
Bartley	1954
Meeker-Driftwood	1957

[1] Operated as a lateral of Meeker-Driftwood System after 1958

[2] First year operated as part of Kansas River Projects.

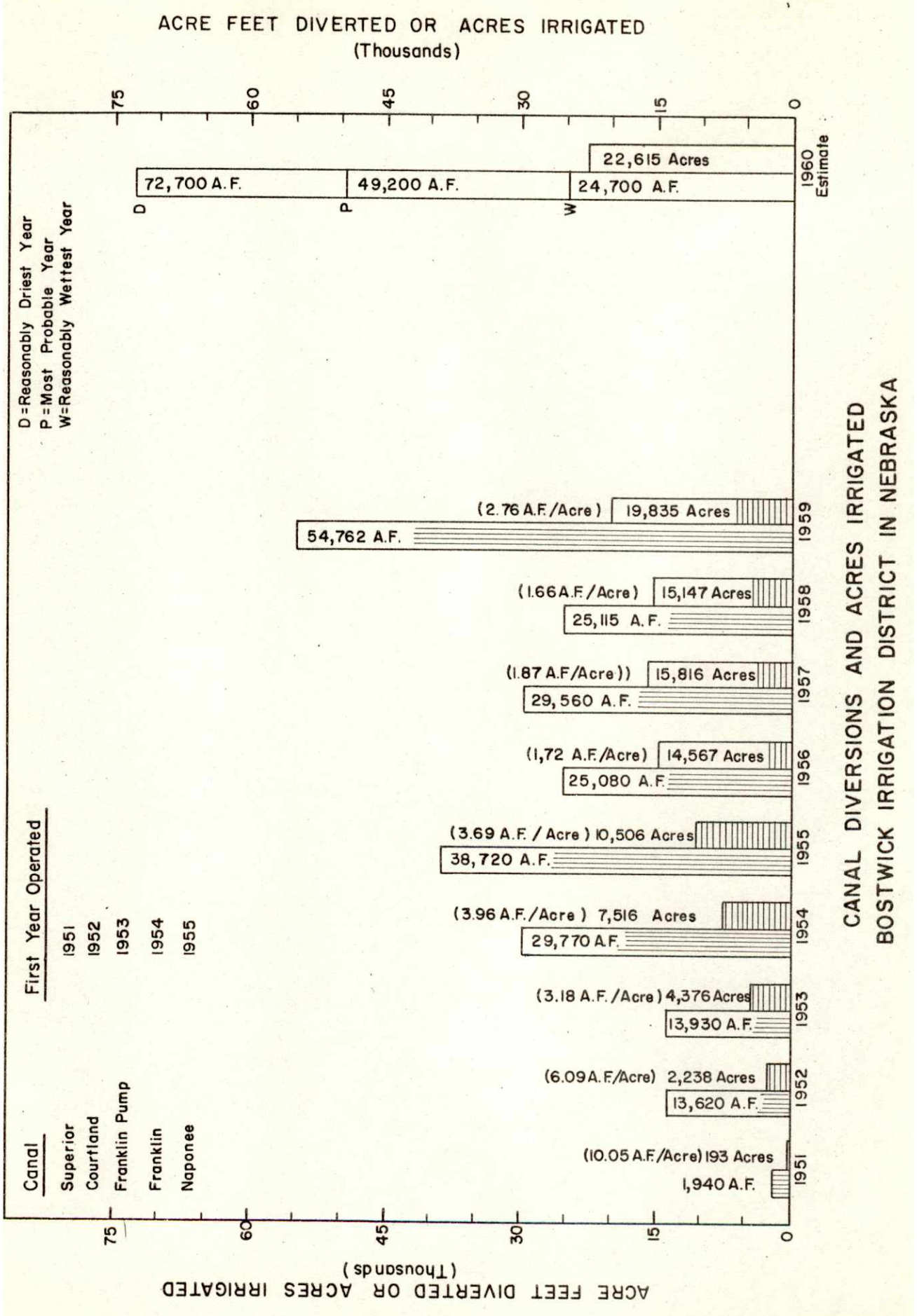
D = Reasonably Driest Year
P = Most Probable Year
W = Reasonably Wettest Year

ACRE FEET DIVERTED OR ACRES IRRIGATED (Thousands)

1948: 5,180 A.F. (1.94 A.F./Acres) 2,675 Acres
1949: 5,290 A.F. (1.82 A.F./Acres) 2,906 Acres
1950: 7,660 A.F. (2.74 A.F./Acre) 2,791 Acres
1951: 16,290 A.F. (3.82 A.F/Acre) 4,266 Acres
1952: 16,970 A.F. (3.94 A.F./Acre) 4,306 Acres
1953: 26,320 A.F. (3.66 A.F/Acre) 7,190 Acres
1954: 35,710 A.F. (3.82 A.F./Acre) 9,338 Acres
1955: 55,596 A.F. (3.55 A.F./Acre) 15,654 Acres
1956: 57,210 A.F. (3.31 A.F./Acre) 17,265 Acres
1957: 42,376 A.F. (2.06 A.F./Acre) 20,552 Acres
1958: 47,198 A.F. (2.07 A.F./Acre) 22,850 Acres
1959: 71,405 A.F. (2.55 A.F./Acre) 27,970 Acres
1960 Estimates:
D: 100,500 A.F.
P: 69,400 A.F.
W: 40,700 A.F.
38,496 Acres

CANAL DIVERSIONS AND ACRES IRRIGATED
FRENCHMAN-CAMBRIDGE IRRIGATION DISTRICT

Exhibit 22



CANAL DIVERSIONS AND ACRES IRRIGATED
BOSTWICK IRRIGATION DISTRICT IN NEBRASKA

CANAL DIVERSIONS AND ACRES IRRIGATED
KANSAS-BOSTWICK IRRIGATION DISTRICT

Exhibit 24

Canal

Kirwin

ESTIMATES

D = Reasonably Driest Year.

P = Most Probable Year.

W = Reasonably Wettest Year.

ACRE FEET DIVERTED OR ACRES IRRIGATED (Thousands)

0 5 10 15 20 25 30 35

1957: 5,530 A.F. (3.84 A.F./Acre) 1,440 Acres

1958: 15,150 A.F. (3.67 A.F./Acre) 4,127 Acres

1959: 21,005 A.F. (3.25 A.F./Acre) 6,470 Acres

1960 Estimates

D: 30,400 A.F.

P: 20,500 A.F.

W: 12,700 A.F. 11,374 Acres

CANAL DIVERSIONS AND ACRES IRRIGATED
KIRWIN IRRIGATION DISTRICT

ACRE FEET DIVERTED OR ACRES IRRIGATED (Thousands)

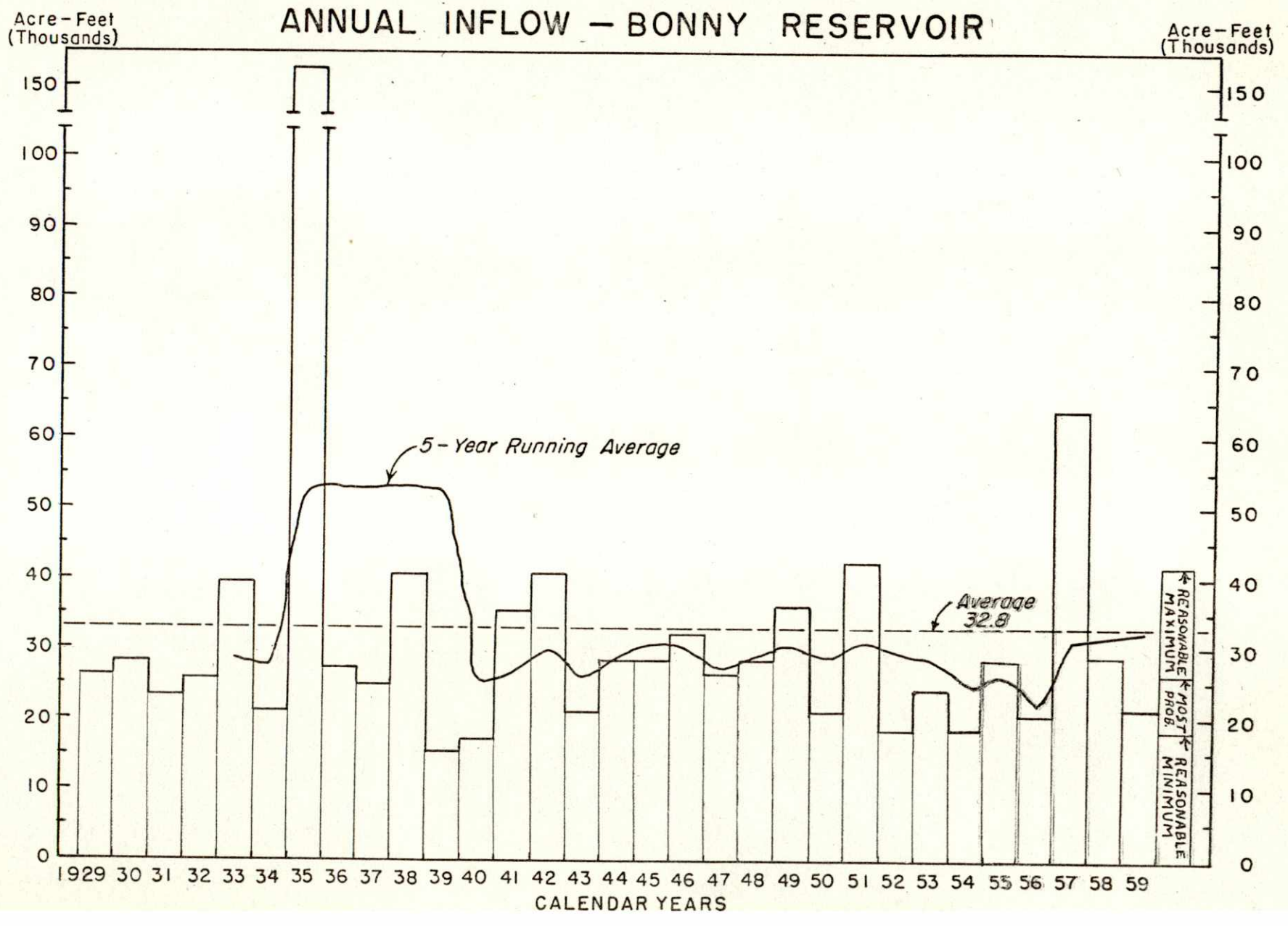
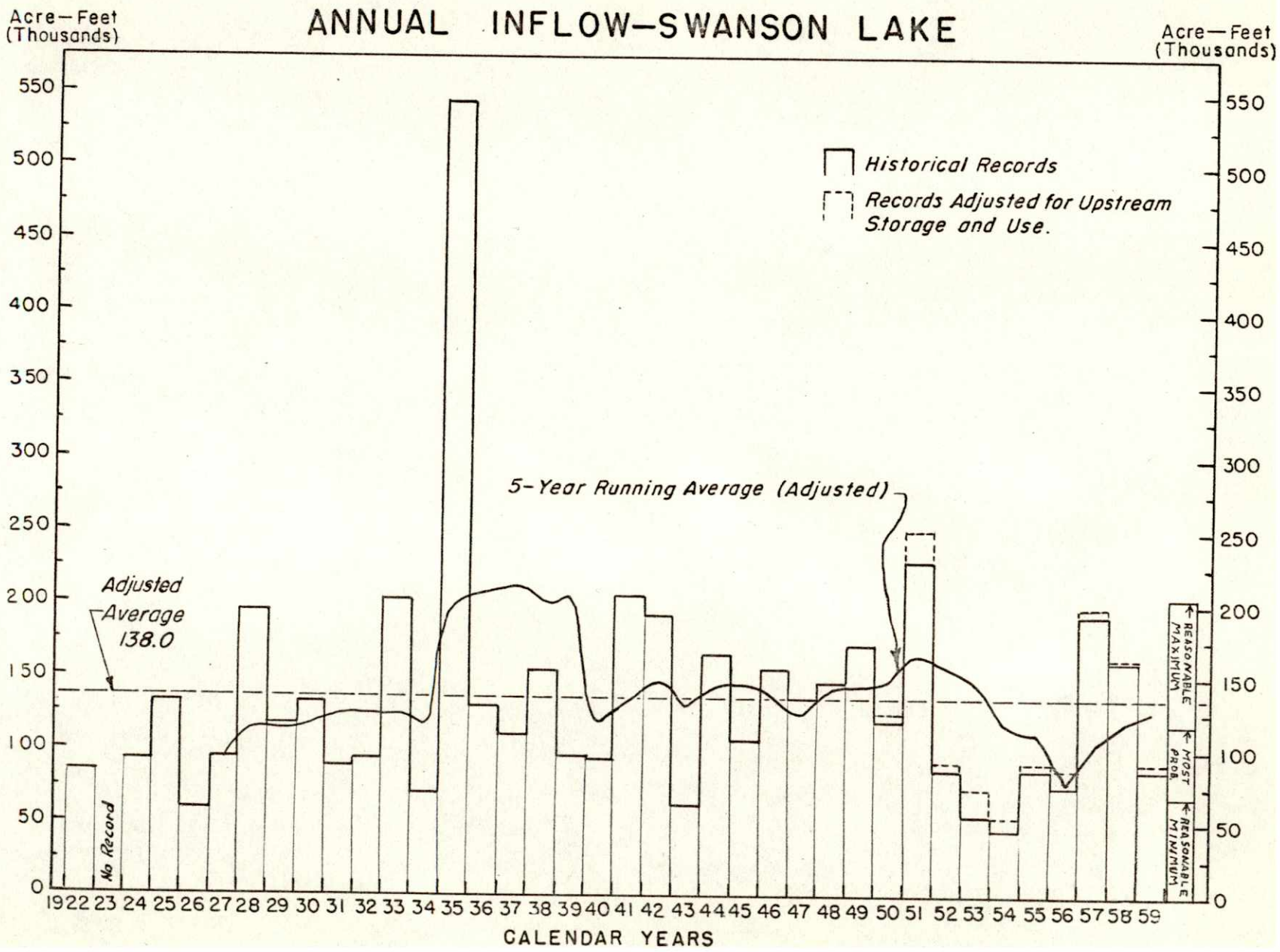
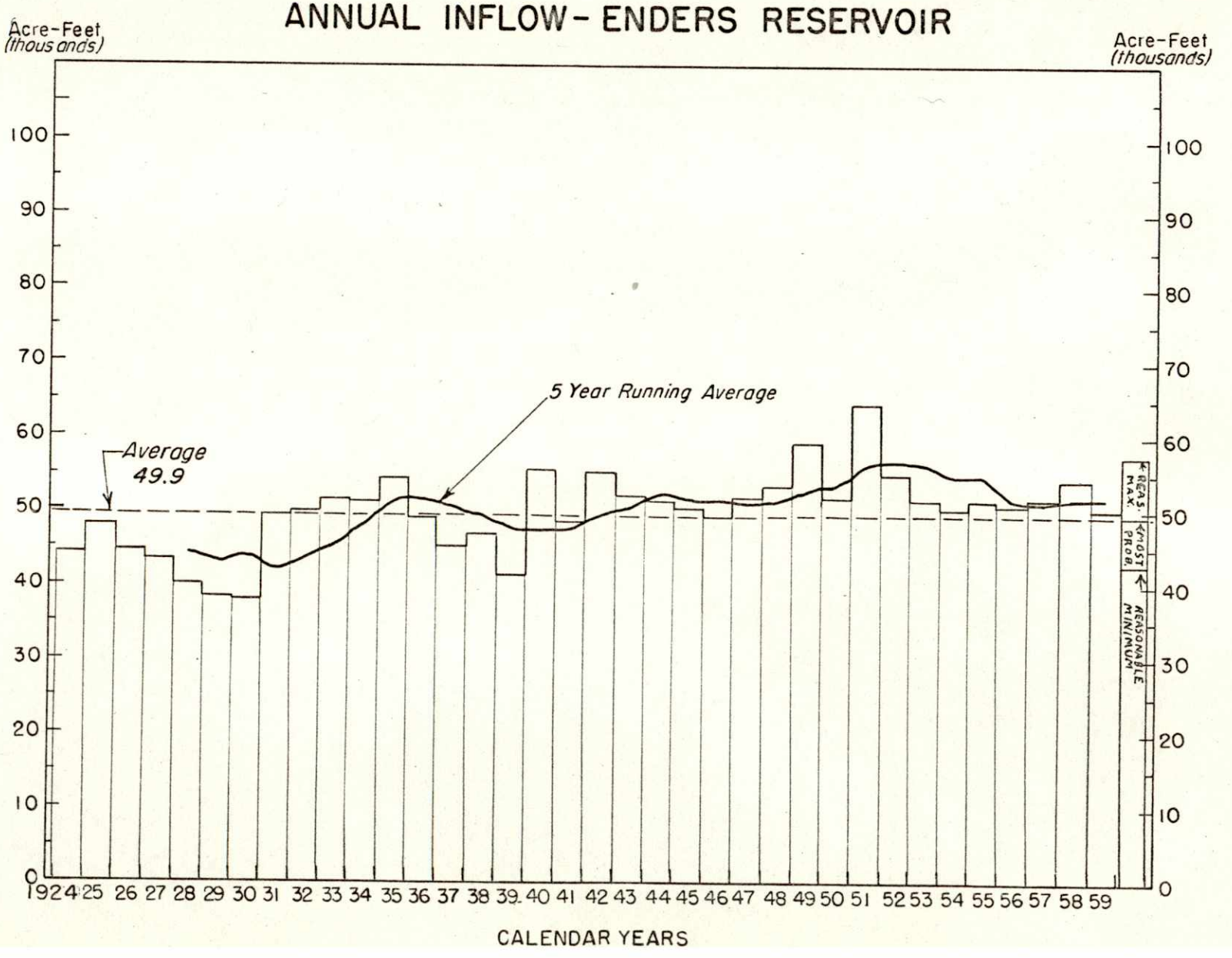
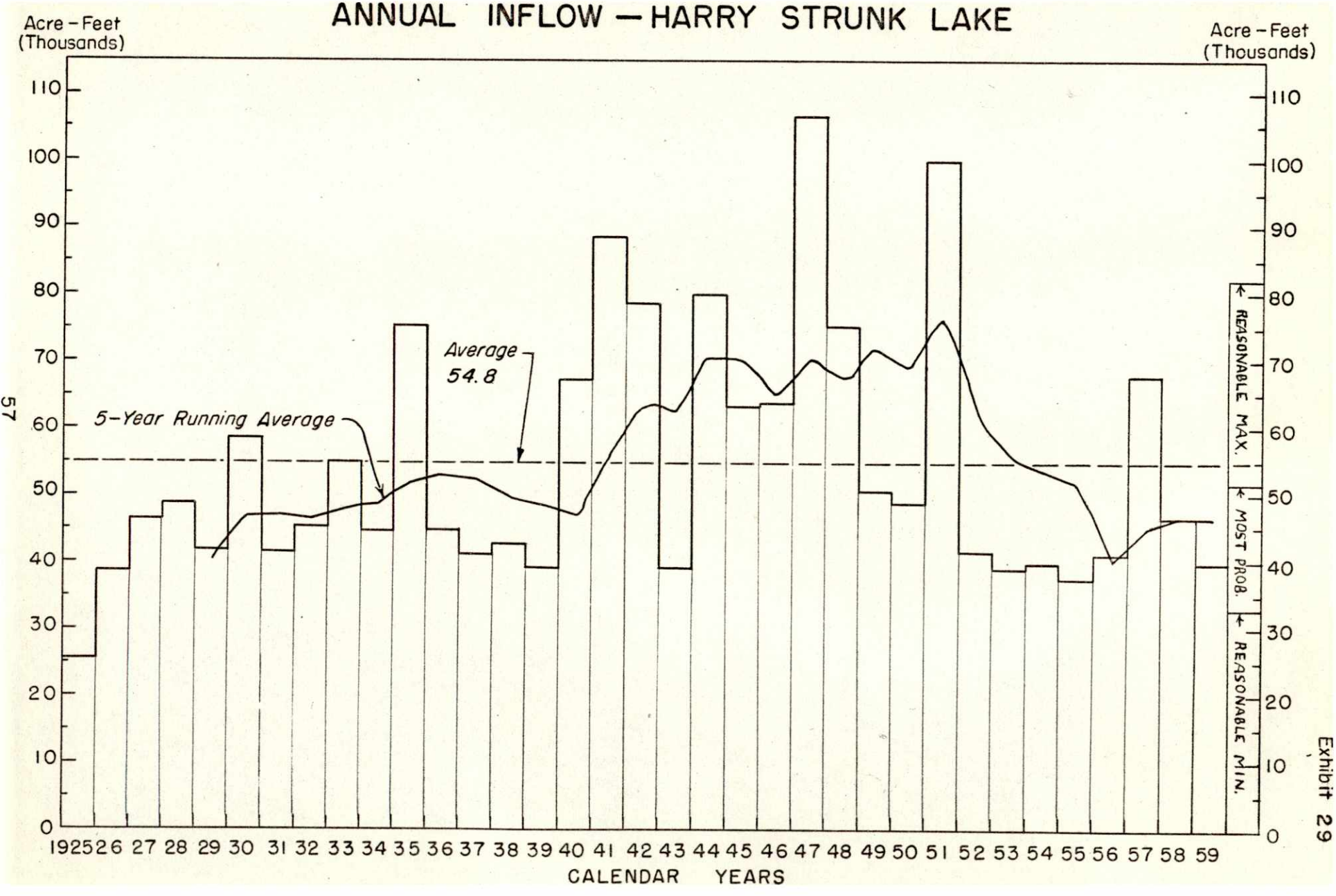

ANNUAL INFLOW — BONNY RESERVOIR
Acre-Feet (Thousands)
Acre-Feet (Thousands)
150
100
90
80
70
60
50
40
30
20
10
0
5-Year Running Average
Average 32.8
REASONABLE MAXIMUM
MOST PROB.
REASONABLE MINIMUM
1929 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS

Exhibit 26


ANNUAL INFLOW—SWANSON LAKE
Acre—Feet (Thousands)
Acre—Feet (Thousands)
550
500
450
400
350
300
250
200
150
100
50
0
Historical Records
Records Adjusted for Upstream Storage and Use.
5-Year Running Average (Adjusted)
Adjusted Average 138.0
No Record
REASONABLE MAXIMUM
MOST PROB.
REASONABLE MINIMUM
19 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS


ANNUAL INFLOW - ENDERS RESERVOIR
Acre-Feet (thousands)
Acre-Feet (thousands)
100
90
80
70
60
50
40
30
20
10
0
Average 49.9
5 Year Running Average
REAS. MAX.
FROST PROB.
REASONABLE MINIMUM
1924 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS



57

Exhibit 29

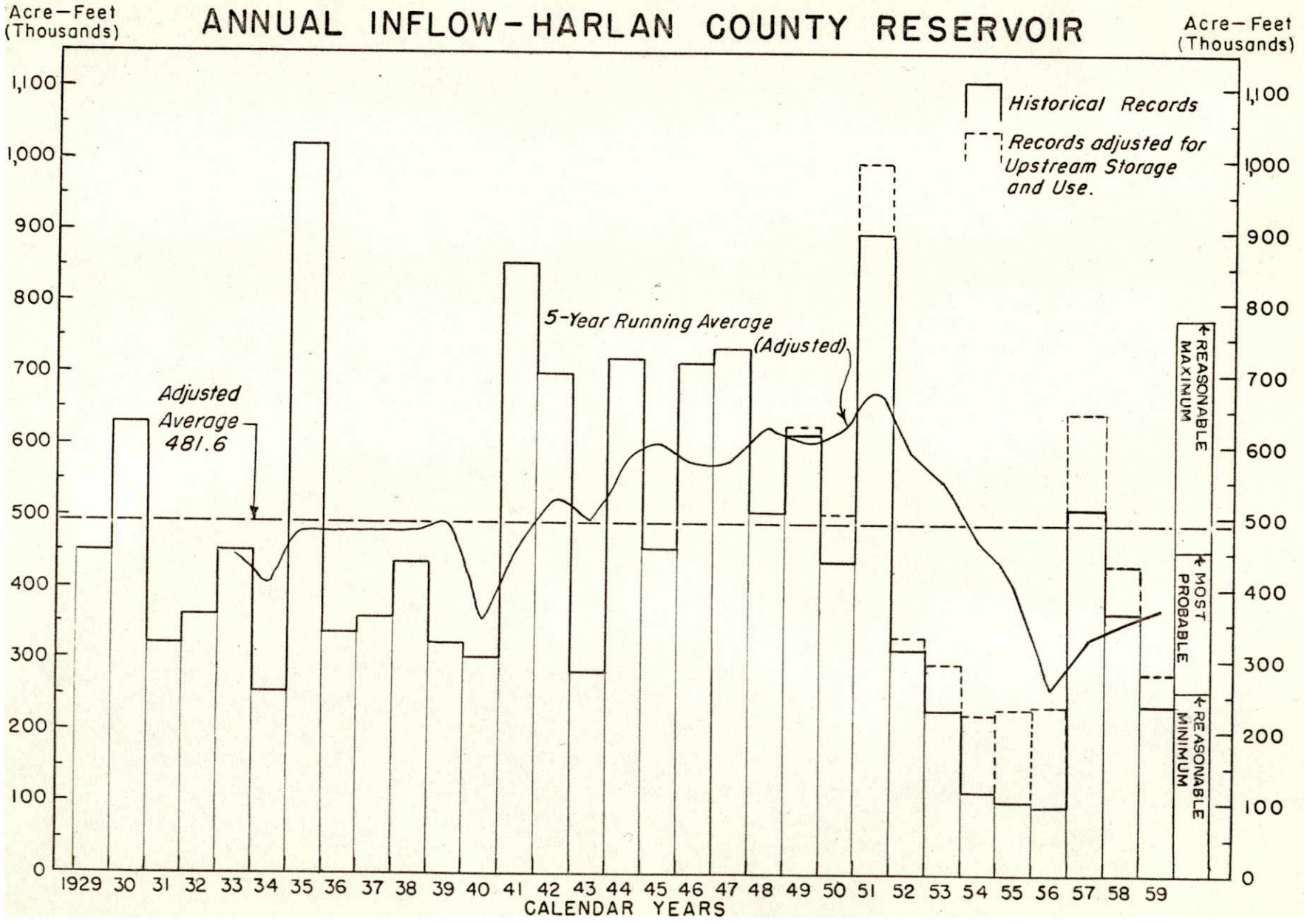

ANNUAL INFLOW - HARLAN COUNTY RESERVOIR
Acre-Feet (Thousands)
Acre-Feet (Thousands)
Historical Records
Records adjusted for Upstream Storage and Use.
5-Year Running Average (Adjusted)
Adjusted Average 481.6
REASONABLE MAXIMUM
MOST PROBABLE
REASONABLE MINIMUM
1,100
1,000
900
800
700
600
500
400
300
200
100
0
1929 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS

Exhibit 30

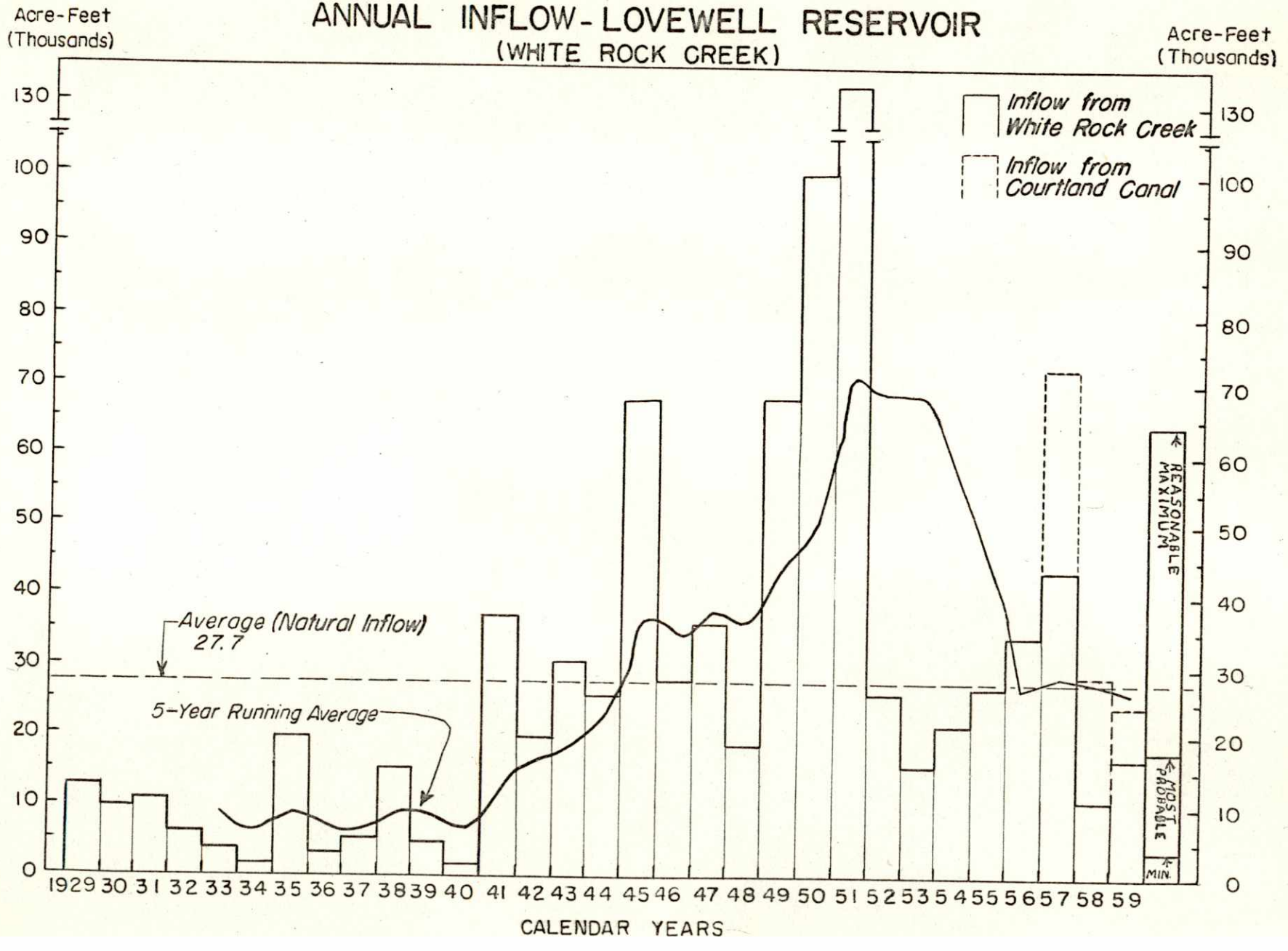
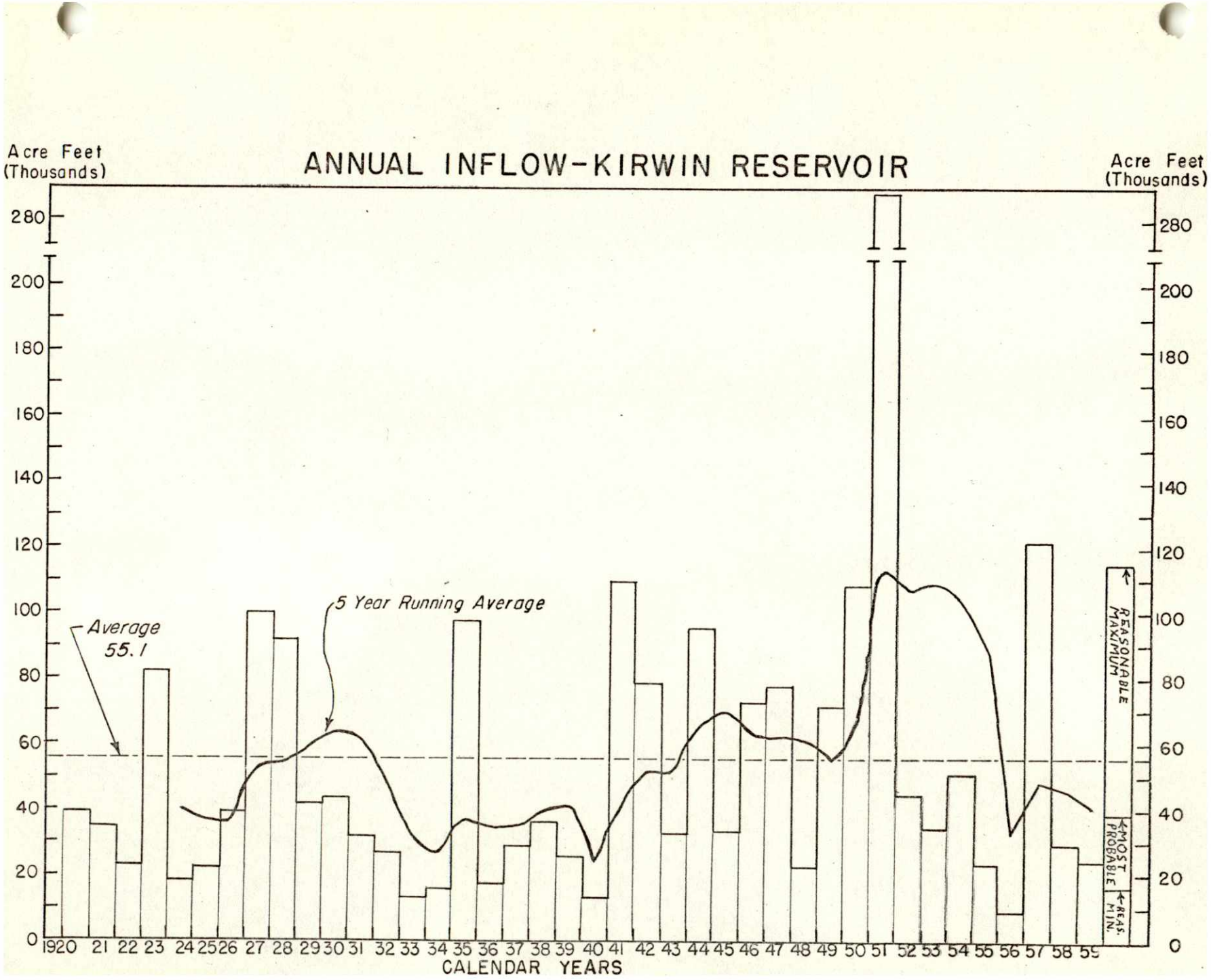

ANNUAL INFLOW - LOVEWELL RESERVOIR
(WHITE ROCK CREEK)
Acre-Feet
(Thousands)
Acre-Feet
(Thousands)
Inflow from
White Rock Creek
Inflow from
Courtland Canal
Average (Natural Inflow)
27.7
5-Year Running Average
REASONABLE
MAXIMUM
MOST
PROBABLE
MIN.
130
100
90
80
70
60
50
40
30
20
10
0
1929 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS

Exhibit 31


ANNUAL INFLOW-KIRWIN RESERVOIR
Acre Feet (Thousands)
Acre Feet (Thousands)
280
200
180
160
140
120
100
80
60
40
20
0
Average 55.1
5 Year Running Average
REASONABLE MAXIMUM
MOST PROBABLE
REAS. MIN.
1920 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS

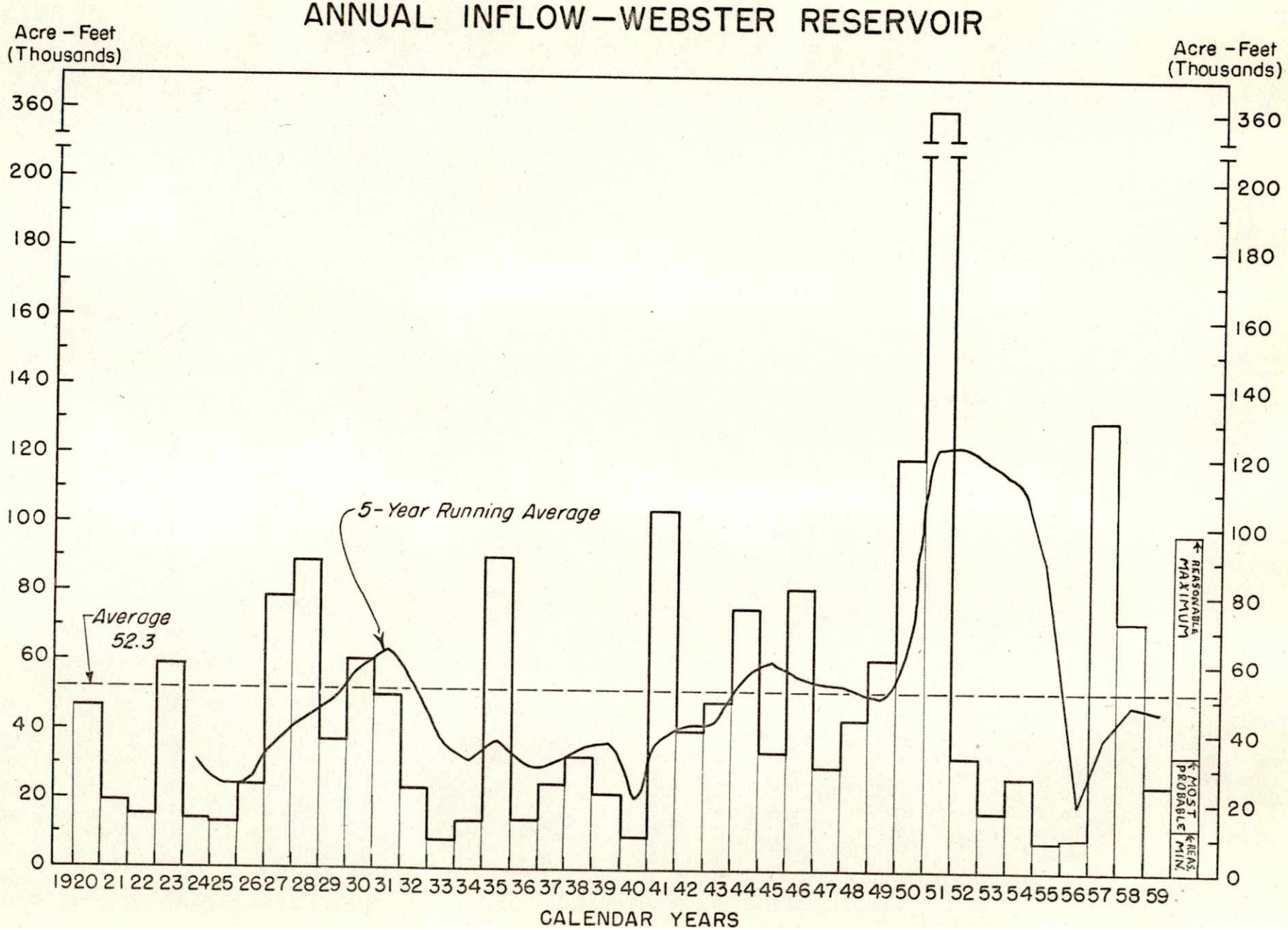

ANNUAL INFLOW—WEBSTER RESERVOIR
Acre - Feet (Thousands)
Acre - Feet (Thousands)
360
200
180
160
140
120
100
80
60
40
20
0
5-Year Running Average
Average 52.3
REASONABLE MAXIMUM
MOST PROBABLE
REAS. MIN.
1920 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
CALENDAR YEARS

Exhibit 33

ANNUAL INFLOW–CEDAR BLUFF RESERVOIR

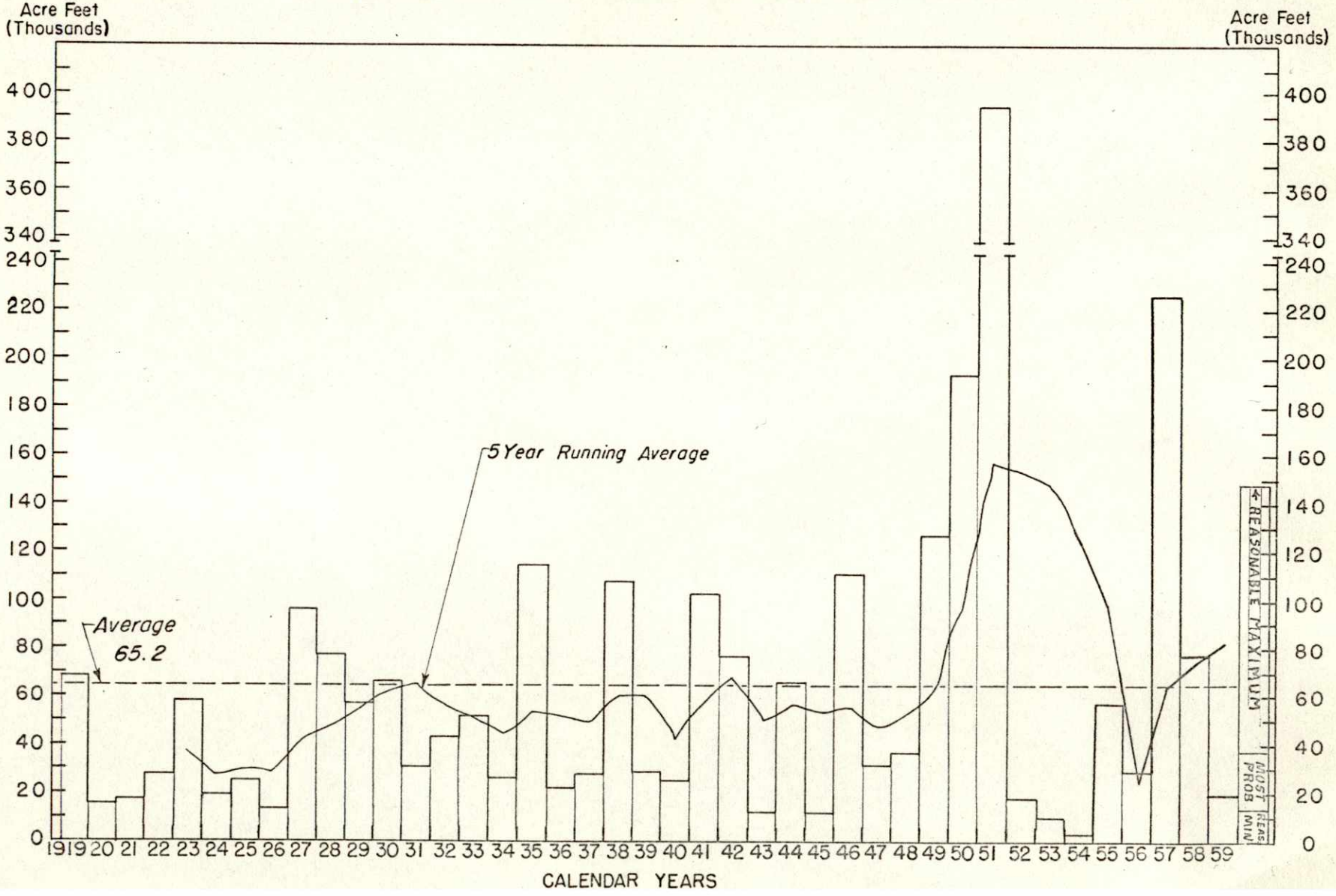


Exhibit 34