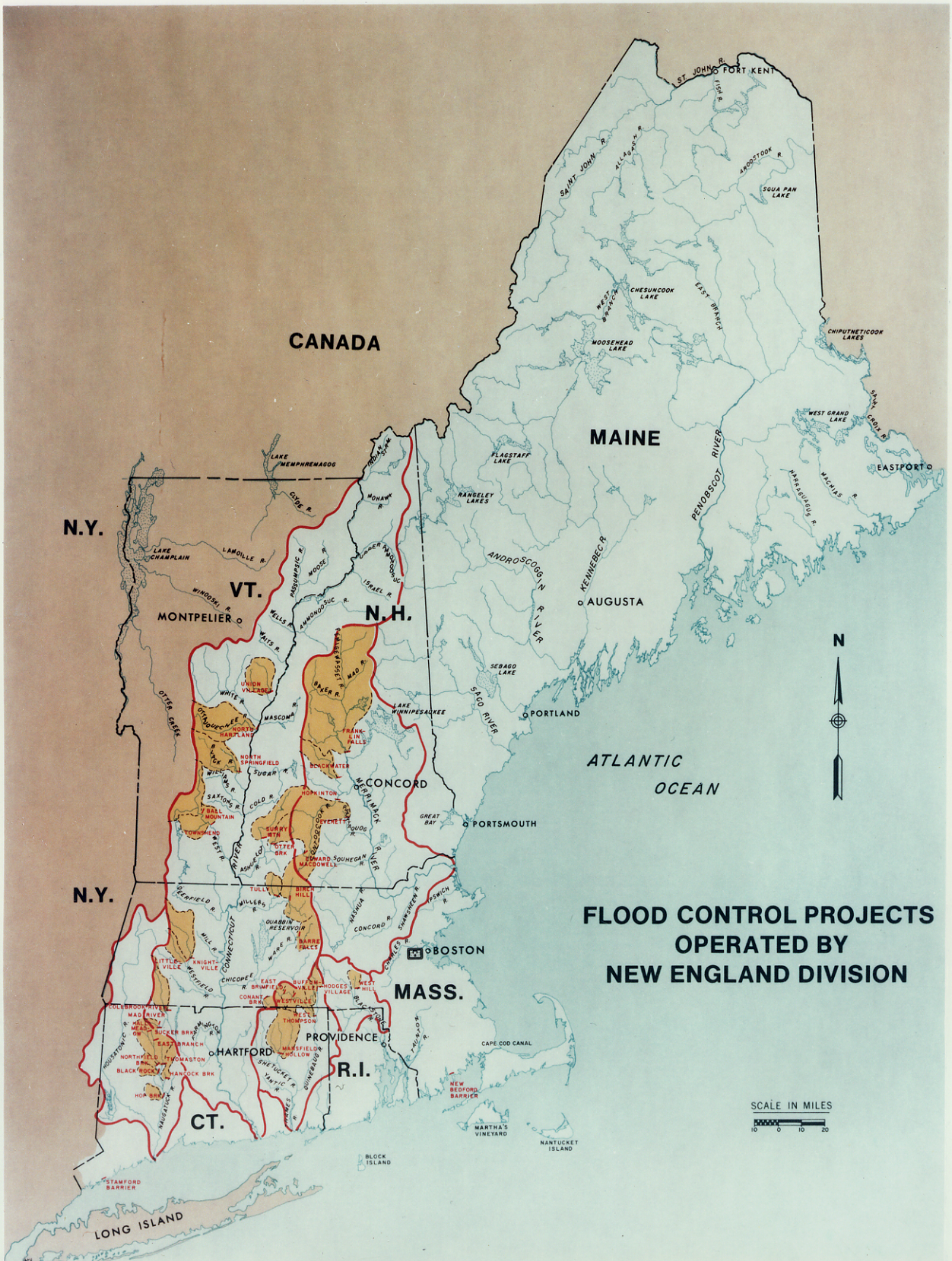
US Army Corps of Engineers
New England Division

Annual Report FY 86
Reservoir Control Center
November 1986



DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASSACHUSETTS

RESERVOIR CONTROL CENTER

ANNUAL REPORT

FISCAL YEAR 1986

NOVEMBER 1986

FOREWORD

This publication was prepared in accordance with OCE guidelines and summarizes the FY86 reservoir regulation activities within the New England Division. The report also describes the accomplishments of Reservoir Control Center personnel, reviews the status of the Water Control Branch Data Collection System and discusses the involvement of RCC personnel in other Corps activities. These Annual Reports have been prepared since 1972 and duplication of previous information has been kept to a minimum.

JOSEPH W. FINEGAN
Chief, Reservoir Control Center

ACKNOWLEDGMENTS

The following were involved in the completion of the Annual Report:

Timothy Buckelew, Nicholas Forbes, Robert Mirick - Preparation of text, tables and summaries

Margery Cotter - Editing and final typing

Joseph Finegan - Review of report for completeness and continuity

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A. ORGANIZATION AND PURPOSE

The New England Division Reservoir Control Center (RCC) was approved by the Chief of Engineers in October 1968 and is a section of the Water Control Branch within the Engineering Division. Responsibilities of RCC encompass regulation activities at all flood control projects, collection of hydrometeorological data associated with regulation needs, coordination of information, and special studies. Specific responsibilities include the following:

1. Directing the regulation of reservoirs and hurricane barriers within NED.

2. Collecting, analyzing, and interpreting hydrologic and meteorologic data for regulation purposes.

3. Preparing and revising regulation plans and manuals for individual reservoirs and systems of reservoirs, hurricane barriers and local protection projects.

4. Training of office and field personnel responsible for regulation activities.

Other elements of the Water Control Branch, namely, the Hydrologic Engineering Section, and the Hydraulics and Water Quality Section, are available to provide technical assistance and manpower for special studies and reservoir regulation activities during flood periods. The organizational structure of the Branch and major duties of each Section are summarized in plate 1. The organizational chart for reservoir regulation is shown on plate 2.

B. GENERAL BACKGROUND

The Corps has completed 35 dams, 5 hurricane barriers, and 80 local protection projects within the New England Division; 8 local protection projects are currently under construction; in addition, the Corps has acquired flowage rights on more than 8,000 acres of floodprone lands within the Charles River Natural Valley Storage area. Thirty-one of the 35 reservoir projects and 2 of the 5 hurricane barriers are operated and maintained by the Corps, while the remaining projects are operated and maintained by local interests. Most construction prior to 1955 was authorized for flood control purposes only; however, approval has been given for other uses at many of our older reservoirs due to development of new water resource needs in the basins. Most of the newer projects have been designed for more than flood control storage, e.g., recreation, conservation and low flow augmentation; furthermore, two have significant water supply storage.

At present NED reservoirs are not operated for irrigation or navigation purposes; however, non-Federal hydropower facilities have recently been installed at 5 sites on Corps-owned lands.

C. ACCOMPLISHMENTS DURING FISCAL YEAR 1986

1. Regulation Manuals -

a. Completed the revised regulation manual for the Ottauquechee River (North Hartland Lake).

b. Work was initiated in revising the regulation manual for the Black River, Vermont (North Springfield Lake), dated October 1968. This manual is scheduled for completion by December 1987.

c. Work has also been initiated on revising the manual for the Farmington River, Connecticut (Colebrook River Lake, Mad River and Sucker Brook Dams), dated June 1970. Scheduled completion date is also December 1987.

2. Studies -

a. Flood Emergency Plans - During the past several years, NED has been preparing flood emergency plans for each dam/reservoir project. The program is nearing completion, and during FY86 an additional nine more reports were prepared, resulting in a total of 29 completed plans. The remaining six are scheduled for completion in FY87. Last year's Annual report includes a content description of these plans. RCC has been actively involved in the preparation of the reports and continually reviews and comments on all emergency plans. RCC participated in five training sessions for the reservoir project managers and other field personnel held during FY86. Additional training for field and office personnel will be undertaken in FY87.

b. Drought Contingency Storage Plans - In recent years, NED has also been involved in preparing drought contingency storage plans at the 28 Corps flood control reservoirs which have gated outlet facilities. RCC personnel are part of a project team evaluating each project and establishing limits of flexibility under existing authority to modify regulation and use existing storage during drought emergency conditions. By the end of FY86, reports had been prepared for 23 reservoirs. The last five projects are tentatively scheduled for completion in FY87, pending receipt of requested funding.

c. Contingency Plans for Toxic Spills - We had mentioned in last year's Annual Report that work would be started in the preparation of emergency type plans for toxic spills into selected Corps reservoirs. However, other Corps programs had higher priority and no work in this area has yet been initiated. When these studies are started, RCC personnel will be actively involved in their preparation.

3. Data Collection -

a. General - NED's Water Control Data System (plate 6) consists of a satellite ground receive station and a set of 46 data collection platforms (DCP's) installed at key river gages and flood control dams. This system has now operated successfully for more than four years.

In FY86 there were no new installations of DCP's, but preparations were made for three new ones: Millers River at Athol, Massachusetts, Ware River at Barre Plains, Massachuchusetts, and the Stamford hurricane barrier. For Athol and Barre Plains, RCC has received permits for installing DCP's on State-owned bridges. We have applied for permits for placing power poles on State-owned rights-of-way, and a contractor has started work on two instrument enclosures. Acoustic sensors have been received for those two sites. These sensors are identical to the ones already in place on the Naugatuck River at Waterbury, Connecticut and on the Contoocook River at River Hill, New Hampshire. For the Stamford hurricane barrier, we have obtained a special DCP that is capable of controlling complex meteorologic devices for sensing windspeed, wind direction, barometric pressure, and air temperature; and we have ordered an electronic sensor package. Delivery of the sensors is expected during the first quarter of FY87.

As planned we also obtained a MacIntosh microcomputer that not only serves as a backup to RCC's Charles River Data Systems' UV68/35 but also produces excellent graphics. Every week during scheduled maintenance of the UV68/35, the MacIntosh continues to take in GOES data, thus eliminating gaps in a DCP's record. Now that the microcomputer is in place, all components in the ground station are backed-up.

b. Operation and Maintenance Manual - To document the many facts and figures connected with RCC's satellite Water Control Data System, a comprehensive Operation and Maintenance Manual was completed in FY86. This computer-based manual (called "OPMAN") is intended to serve as the source of both information and reference on all aspects of the WCDS. OPMAN is composed and arranged in a format that

was suggested by the way information is stored and accessed in the WCDS microcomputer -- as a branching directory. The advantages of this arrangement are rapid access to information and easy rewrites when changes are made to the WCDS. Information is retrieved at all of our six desk-top terminals by means of simple commands and user-selected keywords. A detailed description of OPMAN was given in RCC's FY85 Annual Report, but here is an outline of the manual's major purposes:

- A user's manual and training aid for RCC personnel.
- A guide for the procurement and installation of WCDS equipment.
- A troubleshooting and maintenance guide.
- A reference manual for answering inquiries or preparing informative material.

c. Maintenance of Data Collection Platforms - Routine calibration and adjustment of our DCP's is now provided by the U.S. Geological Survey staff from their Boston, Massachusetts, Hartford, Connecticut, Bow, New Hampshire and Montpelier, Vermont offices. Under a work order from the Corps they have agreed to perform minor maintenance and recalibration to the DCP's on their normal rounds every 4 to 6 weeks. The arrangement is working out very well and has signifcantly improved DCP accuracy.

RCC has written specifications and started the requisition process for a contract with private industry for installation and maintenance in the WCDS not included in the USGS contract. This contract, to be awarded in FY87, will apply both to data collection platforms and telephonic equipment.

d. Talkamarks. Another method of data collection used by RCC is retrieval of water level by dial-up telephone lines to "Telemarks" and "Talkamarks". These devices -- now numbering about ten -- are located at Corps dams, tailwater gages of Corps dams, and at key river gages. In FY85 we purchased four new Synergetics' talkamarks as labor-saving devices for obtaining tailwater readings or as replacements for obsolete equipment. Several of the talkamarks we received contained manufacturing defects, which we expect to be corrected by the manufacturer sometime in FY87. In FY86 we planned to install six talkamarks -- at Everett Lake, Tully Lake, Merrimack River gage at Concord, New Hampshire, Blackstone River gage at Northbridge, Massachusetts, and the gage

at West Branch of the Westfield River at Huntington, Massachusetts; but due to the malfunctions, at year-end only the Hopkinton talkamark was operating. The others are being repaired and will be installed in the near future.

e. Data Sharing With Other Agencies - In FY86 RCC continued with a policy of getting more usage out of the data from our WCDS, by sharing it via telephone with agencies or organizations who have a valid need for it. Inclusion of these outsiders has not adversely affected either our computer or our data collection activities. A password system allows only authorized callers to gain entry to our computer. From four outsiders at the end of FY85, the usership has now expanded to include:

National Weather Service
U.S. Geological Survey (several offices)
Massachusetts Institute of Technology
Massachusestts Metropolitan District Commission
Massachusetts Water Resources Authority

New Hampshire Water Resources Board
Lawrence Hydro
New England Power Exchange
Appalachian Mountain Club
Massachusetts Water Supply Citizens Advisory Council

4. RCC Meetings With Others -

1985
October

Attended a meeting at the Water Resources Support Center in Fort Belvoir, Virginia concerning the proposed standard format for binary self-timed GOES messages.

Met With members of the Merrimack River Watershed Council in Lowell, Massachusetts to discuss river levels and flows at the Pawtucket Dam in Lowell.

November

Met with Corps personnel of the Upper Connecticut River basin at North Springfield Lake, Vermont to present a reservoir training session on Flood Emergency Plans.

Attended meetings of the GOES Direct Readout Ground Station Users and the GOES Technical Working Group at Camp Springs, Maryland.

December

Travelled to USGS offices in Bow, New Hampshire and Hartford, Connecticut to train USGS personnel in providing routine maintenance and calibration on GOES DCP's.

Met with USGS personnel in Boston to discuss the FY 1987 Cooperative Stream Gaging Program.

Visited the Northfield Mountain pumped storage hydropower facility on the Connecticut River in Northfield, Massachusetts.

1986
January

Attended a meeting of the Springfield, Massachusetts Riverfront Development Commission concerning possible development on lands along the Connecticut River located outside of the Springfield local protection project.

Attended the annual 2-day Project Managers' Conference in Sturbridge, Massachusetts.

February

Travelled to Jamaica, Vermont, Peterboro and Keene, New Hampshire and Athol, Massachusetts to observe river conditions and critical ice jam problems in those areas.

Met with officials of the town of Springfield, Vermont and the Central Vermont Power Company in Springfield to discuss hydropower dams on the Black River downstream of North Springfield Lake.

Attended meeting of the GOES Technical Working Group in Reston, Virginia for a demonstration of equipment and services by GOES vendors.

Met with Corps field personnel of the Lower Connecticut River basin at Tully Lake for presentation of a Flood Emergency Plan training session.

March

Met with officials from the State of Massachusetts in Athol, MA to discuss the proposed installation of

GOES data collection sites on two State-owned bridges located on the Millers River in Athol and Ware River at Barre, Massachusetts.

Made a presentation in the Visitors' Center to a group of students and faculty of the Fenn school in Concord, Massachusetts regarding the Corps flood control activities.

Travelled to Warwick, Rhode Island to meet with city officials and USGS personnel to discuss and tour the city's automatic flood reporting system.

Travelled to Franklin Falls Dam to present a training session on Flood Emergency Plans to Corps field personnel within the Merrimack River basin.

April

Attended an electrical safety presentation given by Ed Egan of the Occupational Safety and Health Administration (OSHA) at the USGS office in Hartford, Connecticut.

Met with personnel of the National Weather Service at Logan Airport in Boston to discuss forecasts and hydrologic information they continually provide the Corps and also to view their facilities.

Spoke with a private consultant via conference telephone call regarding possible replacement of Corps present land-based radio network with a system using commercial satellites.

Visited the Vermont Agency of Environmental Conservation in Montpelier, Vermont to discuss issues related to Corps reservoir flood control activities.

Met with representatives of the Vermont Electric Generating and Transmission Cooperative to discuss the recently completed Ottauquechee River Water Control Manual and to view the non-Federal hydropower facilities at North Hartland Lake.

Conducted a Flood Emergency training session at Buffumville Lake for Corps field personnel in the Thames River basin.

May

Travelled to Stamford, Connecticut to discuss design features and regulation procedures of the Stamford hurricane barrier with city personnel.

Attended a GOES Technical Working Group users meeting in Portland, Oregon.

Travelled to Davenport, Iowa to attend the annual Water Control Data System Workshop.

June

Conducted a Flood Emergency Plan training session at Black Rock Lake for Corps field personnel within Naugatuck River basin.

Met with electrical contractors regarding the installation of GOES data collection stations at two sites at Barre and Athol, Massachusetts.

Made a reconnaissance along the Fitchburg local protection project to inspect the lack of local maintenance activities.

Toured three hydroelectric plants on the Connecticut River in Vermont and New Hampshire with a representative of the New England Power Company.

July

Met with personnel of the Farmington River Watershed Association in Simsbury, Connecticut to discuss Corps activities in the watershed and to conduct a reconnaissance of the lower watershed for possible flood problems.

Briefed Assistant Director Civil Works, Atlantic, on NED's satellite data collection system.

Gave a presentation and tour of NED's satellite data collection facilities to members of OCE's Command Inspection Team.

August

Visited by contractors seeking information on using GOES data collection techniques and equipment for hydropower applications.

Travelled to Ohio River Division in Cincinnati, Ohio to attend a Corps workshop on non-Federal hydropower development at Corps projects. While there RCC personnel gave a presentation on the non-Federal hydropower development at North Hartland Lake.

September

Attended a two-day working meeting at the Hydrologic Engineering Center in Davis, California to help in the preparation of EM 1110-2-3600, "Management of Water Control Systems".

Visited the proposed Proctor Hill hydropower site within the Hopkinton Reservoir, accompanied by developer's consultant, and inspected the area for potential impacts on flood control, environmental and recreational activities.

Participated in an inspection of the North Hartland non-Federal hydropower facility.

5. Training Personnel -

a. Field Personnel - RCC personnel visited the following Corps-built projects to discuss regulation procedures with field personnel or to make reconnaissance of the watershed areas.

Connecticut River

Union Village
North Hartland
North Springfield
Ball Mountain
Townshend
Surry Mountain
Otter Brook
Birch Hill
Tully Lake
Barre Falls
Colebrook
Mad River
Sucker Brook

Merrimack River

Franklin Falls
Blackwater
Edward MacDowell
Hopkinton
Everett

Blackstone River

West Hill

Thames River

Buffumville
Hodges Village

Naugatuck River

Thomaston
Black Rock
Hop Brook
Hancock Brook
Northfield Brook

Hurricane Barriers

New Bedford
Stamford

b. RCC Personnel - In addition to continued on-the-job training, the following courses were attended by RCC personnel:

Office of Personnel Management

Computer Literacy for Managers and Supervisors
Introduction to Computer Telecommunications
Towards Excellence
Workshop for Middle Managers

c. Non-Federal Personnel - RCC staff visited the Stamford hurricane barrier and the Warwick local protection project to discuss flood control activities with local officials.

6. Regulation of Reservoirs

a. General - Flood control is the primary function at all 35 dams, and most regulation activities are related to this purpose. Other limited reservoir uses include water supply, low flow augmentation, conservation and recreation. Winter pools are maintained at many projects to submerge the flood control gates and keep them from freezing.

There is no flood-free season in New England. During the spring snowmelt period, which usually occurs in March and April, several weeks of regulation within a watershed are an annual occurrence. Hurricanes pose a potential threat each year during the summer and autumn months. Coastal storms occur frequently during the autumn, winter and spring months.

b. Flood Control - During FY 1986 there were three storm events in the New England area that caused small amounts of reservoir flood control storage to be utilized. The first occurred on 26-27 January when 2 to 4 inches of rain fell and caused ice jam conditions on many tributaries. Estimated benefits of $615,000 were attributed to reservoir regulated activities.

The second occurrence, during the middle of March, was caused by 2 to 3 inches of rainfall with appreciable snowmelt. Rivers rose to near bankfull capacities and all Corps reservoirs used small amounts of flood control storage; however, no benefits were claimed.

During the first week of June, a large and slow moving storm system produced 3 to 6 inches of rainfall in southern New England, with an unusual 9.2 inches at Colebrook Lake, Connecticut, causing our southern reservoirs to be

regulated and store small amounts of runoff. There were no significant problems, however, because antecedent conditions were dry and flood conditions did not occur downstream of our reservoirs.

A tabulation of monthly precipitation at the 28 manned Corps reservoirs is included for reference on plate 3. In addition, a summary of maximum reservoir levels and storages utilized during FY86 is shown on plate 4. This tabulation also provides information on the two highest pool levels since the completion of each project. Graphical records of annual reservoir data for the 28 staffed dams, including water levels, outflows and precipitation, are shown on plates 7 through 34.

c. Other Regulation Activities -

(1) Ball Mountain Lake - Controlled releases of about 1,500 cfs were made from Ball Mountain for white water canoeing on 5-6 October 1985. The pool was raised to about 98 feet in late April of 1986, so releases of about 1,700 cfs on 2-4 May and 1,500 cfs on 10-11 May could be made for canoe races and recreational canoeing sponsored by the West River White Water Association.

(2) Birch Hill Dam and Tully Lake - The pools at Birch Hill and Tully were built-up so that releases from both would provide adequate downstream flows in Athol, MA for the annual "River Rat" race on 5 April.

(3) Knightville Dam - The pool was raised to about a 48-foot level to provide flows of about 1,000 cfs on 29-30 March, 5-6 and 13 April for the annual Westfield River Wildwater Canoe Race.

(4) Littleville Lake - Reservoir levels were temporarily raised about 12 feet to provide flows of 700 cfs on 29-30 March, 5-6 and 13 April for the annual Westfield River Wildwater Canoe Races.

(5) Blackwater Dam - A small pool was maintained to provide for a flow of 500 cfs for the New England Slalom championship races on the Blackwater River on 12-13 April.

(6) East Brimfield Lake - On 27 April, a flow of 300 cfs was provided for the Quinebaug River Rat Race sponsored by the Tri-Community Exchange Club of Charlton, Southbridge and Sturbridge.

The American Optical Company of Southbridge, Massachusetts owns 1,140 acre-feet of storage between the stages of 9 and 13 feet at East Brimfield. No releases were required during FY86.

(7) Mansfield Hollow Lake - On 14-15 June, a flow between 900 and 1,200 cfs was provided from a 23-foot deep pool for the annual canoe cruise and race sponsored by the Joshua Tract Conservation and Historic Trust, Columbia Canoe Club and Willimantic Recreational Department. Also on 7 September, a pool level of about 18 feet was maintained for canoeing in the reservoir area (Lake Naubesatuck). This event was called the Mansfield Hollow Marathon Canoe Race and Fun Day. Releases from the pool stored for the 7 September event were held until 14 September, so that releases of about 1,000 cfs could be made for a Canoe-a-thon sponsored by the American Cancer Society on that date.

(8) West Thompson Lake - Reservoir levels were raised to 15 feet on two occasions to provide satisfactory water levels for AKC Retriever Club Trials on 7-8 June and on 12-14 September. A 15-foot pool was also provided for power-boat racing on 19-20 July, sponsored by the Yankee Powerboat Race Association.

(9) Colebrook Lake - A 5,000 acre-foot fishery pool is maintained at Colebrook to maintain a minimum flow regimen for fishlife in the Farmington River. Releases are coordinated with the Connecticut Board of Fisheries and Game; however, no releases were made during FY 1986.

(10) North Hartland Lake - During non-flood periods, reservoir releases made for hydropower generation were under the control of the Vermont Electric Generation and Transmission Cooperative (VEG&TC).

7. Regulation of Hurricane Barriers - During fiscal year 1986 the Stamford barrier was operated on nine occasions and the New Bedford barrier three occasions. Only one event, that of 12-13 December 1985, resulted in "damages prevented" of $25,000 to each project. A summary of operations at the Stamford and New Bedford barriers follows:

HURRICANE BARRIER
OPERATIONS PER CALENDAR YEAR

Year	Number of Operations	
	Stamford	New Bedford
1966	-	4
1967	-	3
1968	6*	3
1969	8	1
1970	9	5
1971	14	12
1972	36	18
1973	13	9
1974	16	5
1975	9	6
1976	7	5
1977	16	10
1978	13	5
1979	17	14
1980	13	8
1981	6	2
1982	4	4
1983	12	7
1984	15	3
1985	10	6
1986**	2	0
TOTAL	226	130

* October - December
** January - September

Estimates of "damages prevented" for each operation are available in Reservoir Control Center files.

The locally-operated Fox Point, Pawcatuck and New London hurricane barriers did not experience damaging tidal flood conditions during the fiscal year.

8. Federal Energy Regulatory Commission (FERC) Activities - RCC reviews and comments on all FERC inquiries to NED concerning the issuance of preliminary permits, exemptions and licenses on applications of hydropower activities at both Federal and non-Federal projects. This review is undertaken to ensure that hydropower projects will have no significant impacts on New England Division flood control activities. During the year written responses by RCC were made on 100 inquiries. Also there have been many meetings and discussions with applicants who have been issued preliminary permits or licenses to develop hydropower at Corps-owned dams (or within reservoir areas). RCC has been actively involved in all reviews and discussions to ensure Corps reservoir regulation procedures are not adversely affected. Licensed hydropower development at Corps sites through September 1986 is briefly summarized in the following tabulation:

Location	Developer	Status	Installed Capacity (kw)
North Hartland	VT Elec. Gen. & Trans. Coop.	Completed	4,000
Dewey's Mills (No. Hartland)	Hydro Energy Corp.	Completed	1,840
Newfound River (Franklin Falls)	Newfound Electric Company	Completed	1,487
Giles Pond (Franklin Falls)	Franklin Falls Hydroelectric Corp.	Completed	200
Hoague-Sprague (Hopkinton Lake)	EHC Hydro Association	Completed	1,000
Colebrook River Lake	Metropolitan District, Hartford	Under Construction	-
Verney Mills (MacDowell Dam)	American Hydro Power Co.	Under Design	-
Littleville Lake	Littleville	Under Design	1,060

In addition, non-Federal license applications have been submitted to FERC to develop hydropower facilities at the following projects:

Union Village Dam (Great Falls)
North Springfield Lake (Tolles Hill Dam)
Ball Mountain Lake
Townshend Lake

D. SUMMARY OF FLOOD CONTROL BENEFITS

1. FY86 Benefits - Estimated "flood damages prevented" from 1 October 1985 through 30 September 1986 follow:

	Damages Prevented		
River Basin	Reservoir	LPP's	Total
Connecticut	$415,000	$0	$415,000
Merrimack	200,000	0	200,000
Thames	0	0	0
Housatonic	0	0	0
Blackstone	0	0	0
Subtotal	$615,000	$0	$615,000
Hurricane Barriers	0	0	50,000
Total	$615,000	$0	$665,000

2. Total Flood Control Benefits - Estimated benefits for all projects through 30 September 1986 are summarized for reference.

Reservoirs	$ 963,222,000
LPP's	801,376,000
Hurricane Barriers	10,980,000
Total	$1,775,578,000

E. STATUS OF REGULATION MANUALS

The status of reservoir regulation manuals for completed projects is shown on plate 5.

F. FUTURE OBJECTIVES

1. Data Collection - All major tasks in NED's Water Control Data System Master Plan have been accomplished for more than two years, and we anticipate only small variations on the same system over the next few years. In FY87 RCC will obtain three items to enhance computer operations: a laser printer for the Charles River data systems computer to produce publication quality documents directly from word-processing files; "R-Office", a desktop management program for the CRDS computer to ease tasks like spread sheet generation, and a 20 Megabyte hard disk for the MacIntosh microcomputer to speedup its operation.

During FY87 we will install several DCP's that were originally scheduled for FY86:

Millers River at Athol, Massachusetts
Ware River at Barre Plains, Massachusetts
Contoocook River at Peterboro, New Hampshire
Stamford, Connecticut Hurricane Barrier

Within two years we are planning to install DCP's at gages on the Concord River at Lowell, Massachusetts and the Contoocook River at Henniker, New Hampshire.

'Talkamark' installations are planned for FY87 at:

Surry Mountain Lake Tailwater
Ashuelot River at Keene, New Hampshire
MacDowell Dam Tailwater
Hodges Village Dam Tailwater
Farmington River at Riverton, Connecticut

2. Revised Regulation Manuals - Construction activities associated with the development of non-Federal hydropower facilities at Colebrook River Lake were initiated during the year. Therefore, RCC has started to prepare a revised regulation manual for Appendix J - Farmington River Watershed and it is scheduled for completion by December 1987. We have also started to prepare a revised regulation manual for North Springfield Lake - Black River Watershed - Appendix C. A review of plate 5 indicates the existing manuals for these projects were prepared more than 15 years ago.

G. FUNDING

The Reservoir Control Center obtains funds from several sources for its varied activities. The annual Operation and Maintenance budget includes salaries for personnel involved

in reservoir control matters, costs for the USGS Cooperative Stream Gaging Program and monies for leasing and amortizing equipment used by the Reservoir Control Center. General Investigations provide limited funding for review of FERC inquiries and planning studies, and funds are also obtained from the Plant Replacement and Improvement Program for purchase of major items such as computers, displays, and hydrologic equipment not associated with any specific project.

ORGANIZATION AND FUNCTIONS CHART

ENGINEERING DIVISION
WATER CONTROL BRANCH

Bergen, L.*	Supv. Hyd. Eng.
Cotter, M.	Secretary

Reservoir Control Center

Finegan, J.*	Supv. Hyd. Eng.
Buckelew, T	Hydrologist
Forbes, N.	Hyd. Eng.
Mirick, R.	Hyd. Eng.
Byrnes, K.	Summer Student

Hydrologic Engineering Section

Manley, P.*	Supv. Hyd. Eng.
Geib, M.	Hyd. Eng.
Marinelli, P.	Hyd. Eng.
Michielutti, R.	Hyd. Eng.
Wilson, D.	Hyd. Eng.
Yen, K. C.	Hyd. Eng.
Doanes, J.	Summer Student

Hydraulics and Water Quality Section

Wener, C.*	Supv. Hyd. Eng.
Barker, T	Hyd. Eng.
Wood, D.	Hyd. Eng.
Strickland, D.	Hyd. Eng.

FUNCTION ASSIGNMENTS

Reservoir Management

Reservoir Regulation
Reservoir Manuals
Hydrologic Equipment
Coordination

Data Collection

Coord. w/USGS, NWS
GOES Random Reporting
Data Analysis

Special Studies

River Forecasting Techniques
Low Flow Studies
Special Reservoir Studies

Planning

River Basin Studies
Reservoir System Studies
Flood Control Investigations
Hydropower Investigations

Design

Multipurpose Reservoirs
Channels and Conduits
Dikes and Walls.

Informational Studies

Flood Plain Information
Hyd. Eng. for Flood Insurance Prog.
River Basin Models
Hyd. Eng. for Periodic Insp. Prog.
Dam Break Flood Analysis

Hydraulic Design and Analysis

Reservoir Water Control Structures
Coastal and Riverine LPP's
Hurricane Barriers
Streambank Erosion Studies

Water Quality Management

Water Quality Data Collection
Reservoir Prediction Studies
Reservoir Management Studies
Special Coastal, Lake, & Stream Studies
Mathematical Modeling

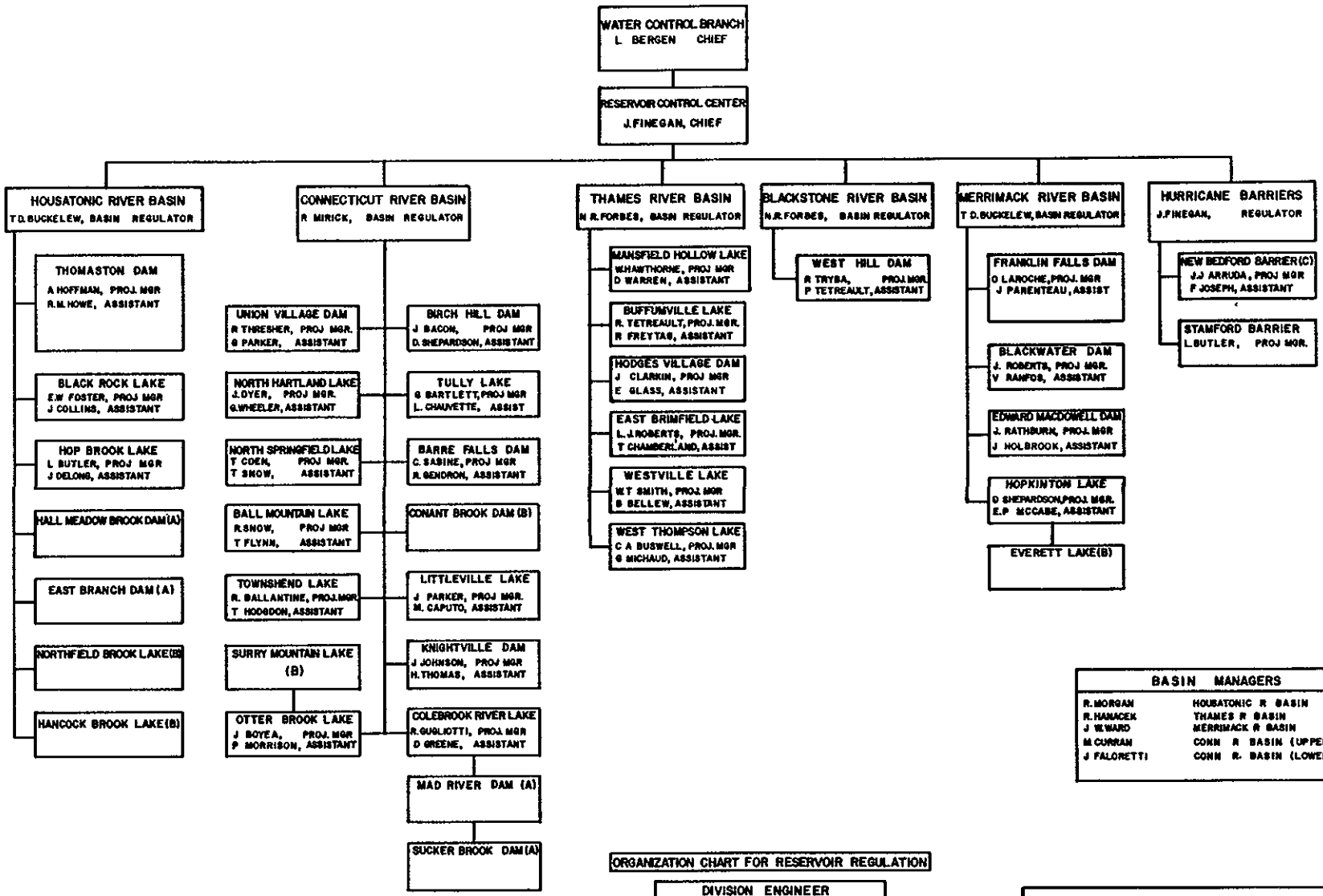
Informational Studies

Coastal Aspects:
- Flood Plain Information
- Flood Insurance

*Chief

September 1986

PLATE I



BASIN MANAGERS	
R. MORGAN	HOUSATONIC R BASIN
R. HANACEK	THAMES R BASIN
J WARD	MERRIMACK R BASIN
M CURRAN	CONN R BASIN (UPPER)
J FALORETTI	CONN R. BASIN (LOWER)

ORGANIZATION CHART FOR RESERVOIR REGULATION

DIVISION ENGINEER
ENGINEERING DIVISION
WATER CONTROL BRANCH
RESERVOIR CONTROL CENTER

(A) Maintained By State Of Connecticut, Department of Environmental Protection, Water and Related Resources Unit

(B) Unstaffed project maintained by Corps Personnel from other projects

(C) Maintained and operated by Cape Cod Canal, Regulation for Hurricanes by R C.C.

ORGANIZATION CHART
RESERVOIR REGULATION

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS
SEPTEMBER 1966

PLATE 2

PRECIPITATION AT CORPS RESERVOIRS - FY 1986

RESERVOIR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	TOTAL
UNION VILLAGE DAM	2.97	4.42	2.04	3.26	2.00	3.07	1.69	2.96	2.94	6.62	2.18	2.85	37.00
NORTH HARTLAND LAKE	3.24	4.81	2.09	4.69	1.90	3.31	1.90	2.51	4.38	5.26	2.02	2.80	38.91
NORTH SPRINGFIELD LAKE	2.32	4.58	2.03	5.18	2.33	4.37	1.66	2.26	5.70	5.36	2.89	2.00	40.68
TOWNSHEND LAKE	1.67	5.52	2.15	4.74	2.68	4.82	1.89	2.01	5.63	8.37	3.25	2.47	45.20
BALL MOUNTAIN LAKE	2.41	6.47	2.56	4.83	2.88	6.06	1.75	2.72	7.68	6.72	4.61	2.89	51.58
SURRY MOUNTAIN LAKE	2.36	5.02	1.54	5.40	2.77	4.44	1.57	3.10	6.55	9.78	3.95	2.37	48.85
OTTER BROOK LAKE	2.71	5.33	1.50	4.47	2.47	4.49	1.17	3.68	6.46	7.08	4.35	2.87	46.58
BIRCH HILL DAM	2.37	5.24	1.41	5.64	2.62	4.39	1.50	1.16	6.57	5.03	3.94	1.37	41.24
TULLY LAKE	2.63	5.89	1.56	5.36	3.26	5.15	1.68	2.07	6.57	7.18	5.50	1.79	48.64
BARRE FALLS DAM	3.27	5.53	1.39	5.12	2.65	3.99	1.78	2.12	7.42	4.02	2.21	1.24	40.74
KNIGHTVILLE DAM	2.75	6.38	2.02	5.27	3.30	3.59	1.25	2.22	5.45	6.59	2.29	1.15	42.26
LITTLEVILLE LAKE	2.62	6.49	2.16	5.35	3.14	3.75	1.35	1.78	5.42	5.50	2.39	1.39	41.34
COLEBROOK RIVER LAKE	3.03	6.32	2.05	5.05	3.52	3.75	1.86	2.58	11.53	5.44	6.61	.96	52.70
FRANKLIN FALLS DAM	3.46	5.93	2.02	7.04	2.64	4.14	2.03	2.44	4.71	6.70	3.13	2.72	46.96
BLACKWATER DAM	2.82	6.30	2.10	6.55	2.68	4.71	1.80	2.38	6.49	6.53	3.69	2.95	49.00
MAC DOWELL DAM	2.45	6.95	1.75	6.00	3.05	5.60	1.70	1.69	5.70	5.20	6.80	3.15	50.04
HOPKINTON LAKE	2.84	6.38	2.12	6.04	2.44	4.09	2.02	2.44	6.53	4.24	2.37	2.76	44.27
EVERETT LAKE	3.08	5.88	1.45	6.25	2.16	4.02	*	*	5.48	4.90	2.21	2.87	----
BUFFUMVILLE LAKE	3.30	6.34	1.71	5.72	3.20	3.63	1.59	1.98	9.93	3.85	5.36	.86	47.47
HODGES VILLAGE DAM	2.61	6.18	1.58	4.92	3.24	3.57	1.66	1.78	8.97	3.92	5.80	.82	45.05
EAST BRIMFIELD LAKE	2.29	5.91	1.57	5.32	2.82	3.02	1.82	1.61	7.61	3.47	3.78	.64	39.86
WESTVILLE LAKE	3.35	6.87	1.26	5.50	3.40	3.40	1.82	1.78	9.04	3.60	4.42	.69	45.13
WEST THOMPSON LAKE	1.86	7.06	1.48	5.00	3.62	3.63	1.61	2.24	7.71	4.25	4.43	.65	43.54
MANSFIELD HOLLOW LAKE	1.92	6.61	1.56	5.18	3.31	3.70	1.72	1.80	3.79	4.68	4.89	1.25	40.41
WEST HILL DAM	2.20	8.28	1.24	4.51	3.67	3.97	1.74	2.53	9.48	4.12	4.00	.77	46.51
THOMASTON DAM	2.02	6.32	1.33	4.80	3.37	2.89	2.01	1.53	4.06	4.50	3.60	.90	37.33
BLACK ROCK LAKE	2.03	5.02	2.15	4.70	4.00	3.27	2.12	1.45	5.69	4.33	3.27	.99	39.02
HOP BROOK LAKE	1.67	6.30	1.90	5.54	3.35	2.95	2.23	.95	4.57	5.70	4.62	1.42	41.20

* No data available because of vandalism to rain gage.

MAXIMUM POOL LEVELS

Reservoir	Fiscal Year 86 Stage	Fiscal Year 86 %Full	Fiscal Year 86 Date	Highest of Record Stage	Highest of Record %Full	Highest of Record Date	Second Highest Stage	Second Highest %Full	Second Highest Date	Placed in Operation
Union Village	59.0	8	Feb 86	114.2	53	Apr 69	103.8	40	Jun 84	1950
North Hartland	60.7	14	Mar 86	128.2	63	Apr 69	118.9	55	Jun 84	1961
North Springfield	37.3	15	Mar 86	78.8	69	Apr 69	77.5	66	Jul 73	1960
Ball Mountain	146.3	33	Mar 86	197.8	82	Apr 69	193.1	75	Jun 84	1961
Townshend	56.9	28	Mar 86	82.0	70	Feb 81	81.8	69	Jun 84	1961
Surry Mountain	37.5	31	Mar 86	61.4	89	Jun 84	57.6	78	Mar 48	1941
Otter Brook	55.2	30	Mar 86	88.7	82	Jun 84	82.6	71	Apr 69	1958
Birch Hill	18.5	20	Jan 86	30.6	64	Jun 84	26.6	46	Mar 79	1941
Tully	23.6	21	Mar 86	35.0	61	Jun 84	32.3	51	Apr 60	1949
Barre Falls*	785.2	14	Jan 86	799.7	64	Jun 84	797.9	55	Apr 60	1958
Conant Brook	14.9	4	Jan 86	27.0	16	Jun 84	24.5	13	Jun 82	1966
Knightville	75.8	25	Mar 86	130.2	100+	Jan 49	129.0	98	Jun 84	1941
Littleville*	533.8	22	Mar 86	568.9	83	Jun 84	551.8	51	Mar 80	1965
Colebrook River*	693.9	0	Nov 85	757.5	90	Jun 84	747.1	68	Apr 83	1969
Mad River	55.3	11	Jun 86	74.6	25	Jun 84	67.3	19	Mar 80	1963
Sucker Brook	16.8	11	Jun 86	25.2	24	Dec 73	23.8	22	Mar 79	1970
Franklin Falls*	344.0	28	Jan 86	375.7	76	Mar 53	373.6	73	Jun 84	1943
Edward MacDowell*	930.6	41	Feb 86	943.2	85	Jun 84	938.0	65	Mar 79	1950
Hopkinton*	398.5	16	Mar 86	407.5	59	Jun 84	405.0	44	Apr 69	1962
Everett*	362.2	16	Mar 86	405.5	59	Jun 84	397.1	44	Apr 69	1961
Blackwater*	547.0	17	Jan 86	561.6	74	Apr 69	560.0	66	Mar 53	1941
Hodges Village	15.8	18	Jun 86	23.4	44	Mar 68	22.5	39	Jan 79	1959
Buffumville	19.6	19	Mar 86	28.4	43	Mar 68	27.2	40	Jan 79	1958
East Brimfield	19.5	18	Jun 86	26.1	47	Jun 84	24.2	37	Jun 82	1960
Westville	38.8	20	Mar 86	50.5	56	Jun 84	49.0	48	Mar 68	1962
West Thompson	24.0	13	Mar 86	38.9	53	Jun 84	37.5	47	Mar 68	1965
Mansfield Hollow	30.2	17	Jan 86	52.6	66	Jun 82	51.8	65	Aug 55	1952
West Hill	16.1	24	Jun 86	24.3	59	Mar 68	24.2	59	Jan 79	1961
East Branch	23.9	10	Jan 86	38.8	29	Jun 84	38.1	28	Sep 75	1964
Hall Meadow	16.1	11	Jun 86	23.5	24	Jun 84	20.6	18	Mar 79	1962
Thomaston	56.4	16	Jan 86	87.2	50	Jun 84	75.4	35	Jun 82	1960
Northfield Brook	43.8	13	Jan 86	67.4	40	Jun 84	59.9	30	Jun 82	1965
Black Rock	63.1	22	Jan 86	93.4	65	Jun 84	84.5	50	Jun 82	1970
Hancock Brook	12.9	13	Dec 85	23.4	58	Jun 82	19.0	36	Mar 80	1966
Hop Brook	41.4	18	Mar 86	57.9	53	Jun 82	55.4	47	Jun 84	1968

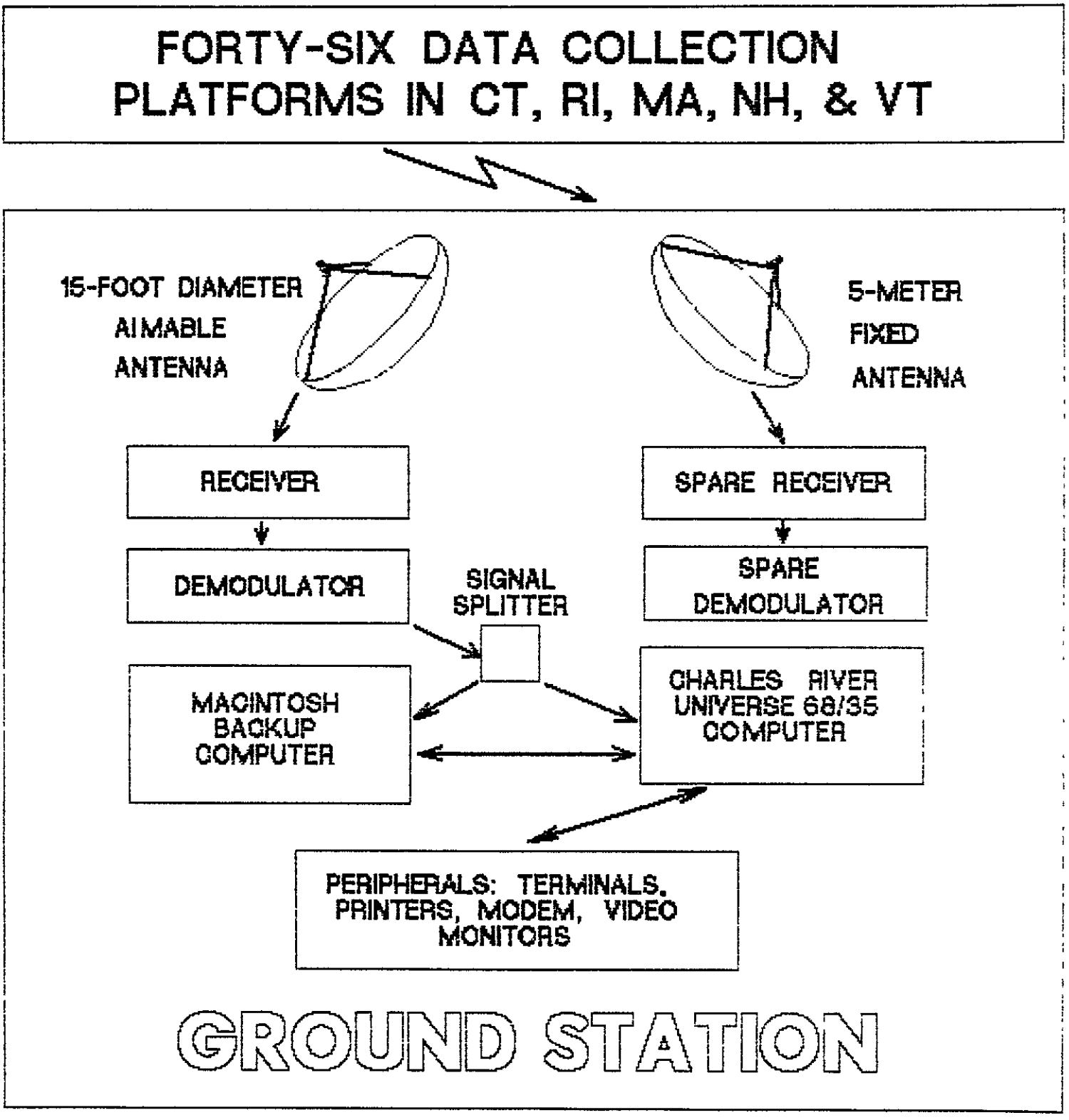
* Elevation of pool in feet ngvd

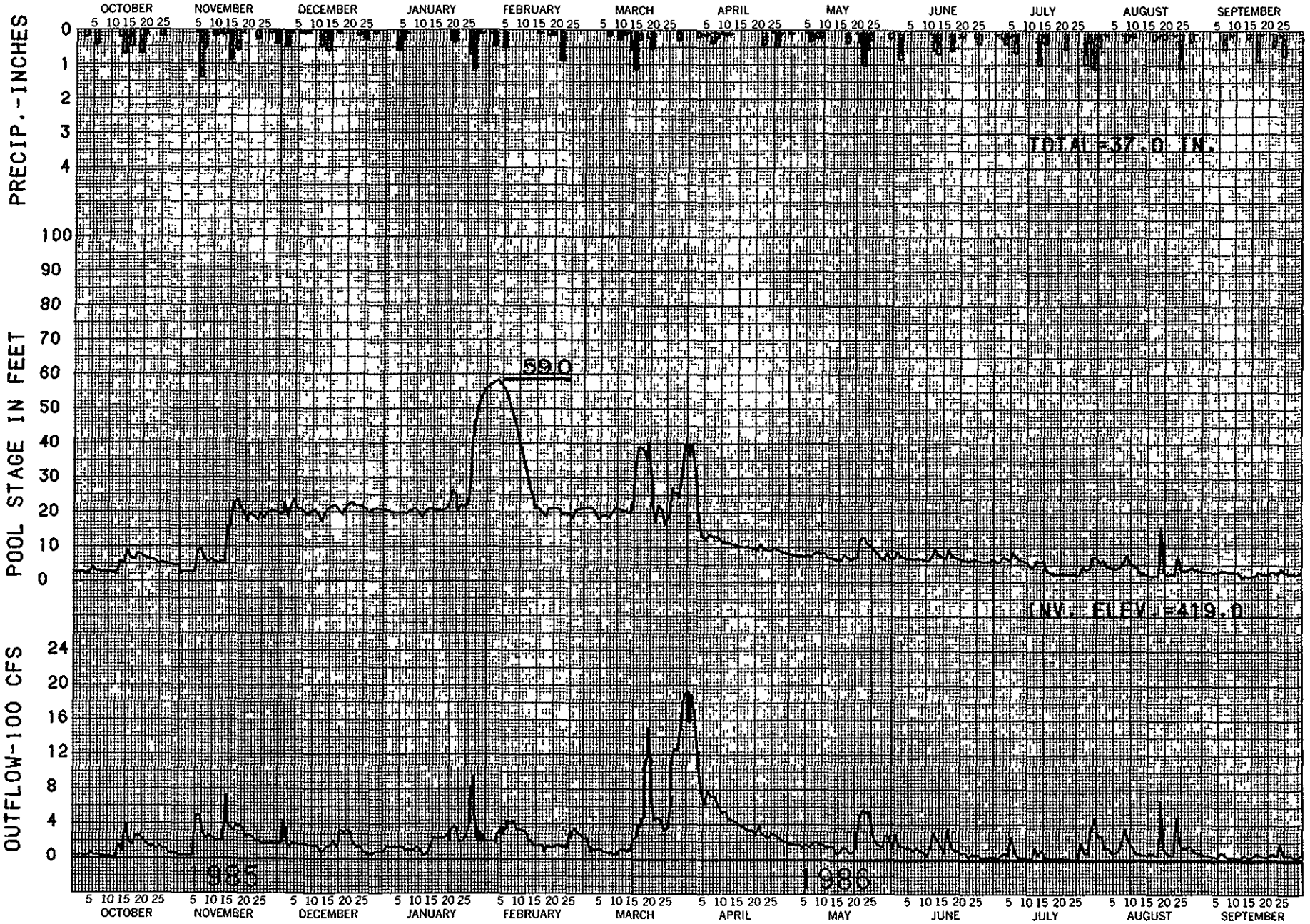
STATUS OF REGULATION MANUALS
NEW ENGLAND DIVISION
SEPTEMBER 1986

	Status of Manuals		Estimated Completion Date	O&M by Local Interests
	Approved	Submitted		
Connecticut River Basin				
Master Manual	X	Jan 84		
Union Village	X	May 71		
North Hartland*	X	Dec 85		
North Springfield	X	Oct 69	Dec 87	
Ball Mountain	X	Sep 73		
Townshend	X	Sep 73		
Surry Mountain	X	Jan 72		
Otter Brook	X	Jan 72		
Birch Hill	X	May 74		
Tully	X	May 74		
Barre Falls	X	Feb 79		
Conant Brook	X	Feb 79		
Knightville	X	Jan 79		
Littleville	X	Jan 79		
Colebrook River	X	Jun 70	Dec 87	
Mad River	X	Jun 70	Dec 87	X
Sucker Brook	X	Jun 70	Dec 87	X
Merrimack River Basin				
Master Manual	X	Sep 77		
Franklin Falls	X	Sep 77		
Blackwater	X	Sep 77		
Edward MacDowell	X	Sep 77		
Hopkinton-Everett	X	Sep 77		
Thames River Basin				
Master Manual	X	Jul 80		
Mansfield Hollow	X	Jul 80		
Buffumville	X	Jul 80		
Hodges Village	X	Jul 80		
East Brimfield	X	Jul 80		
Westville	X	Jul 80		
West Thompson	X	Jul 80		
Blackstone River Basin				
Master Manual	X	Jul 80		
West Hill	X	Jul 80		
Housatonic River Basin				
Master Manual	X	Oct 76		
Hall Meadow Brook	X	Oct 76		X
East Branch	X	Oct 76		X
Thomaston	X	Oct 76		
Northfield Brook	X	Oct 76		
Hancock Brook	X	Oct 76		
Hop Brook	X	Oct 76		
Black Rock	X	Oct 76		
Hurricane Barriers				
New Bedford-Fairhaven	X	Aug 83		X**
Stamford	X	Nov 82		X**

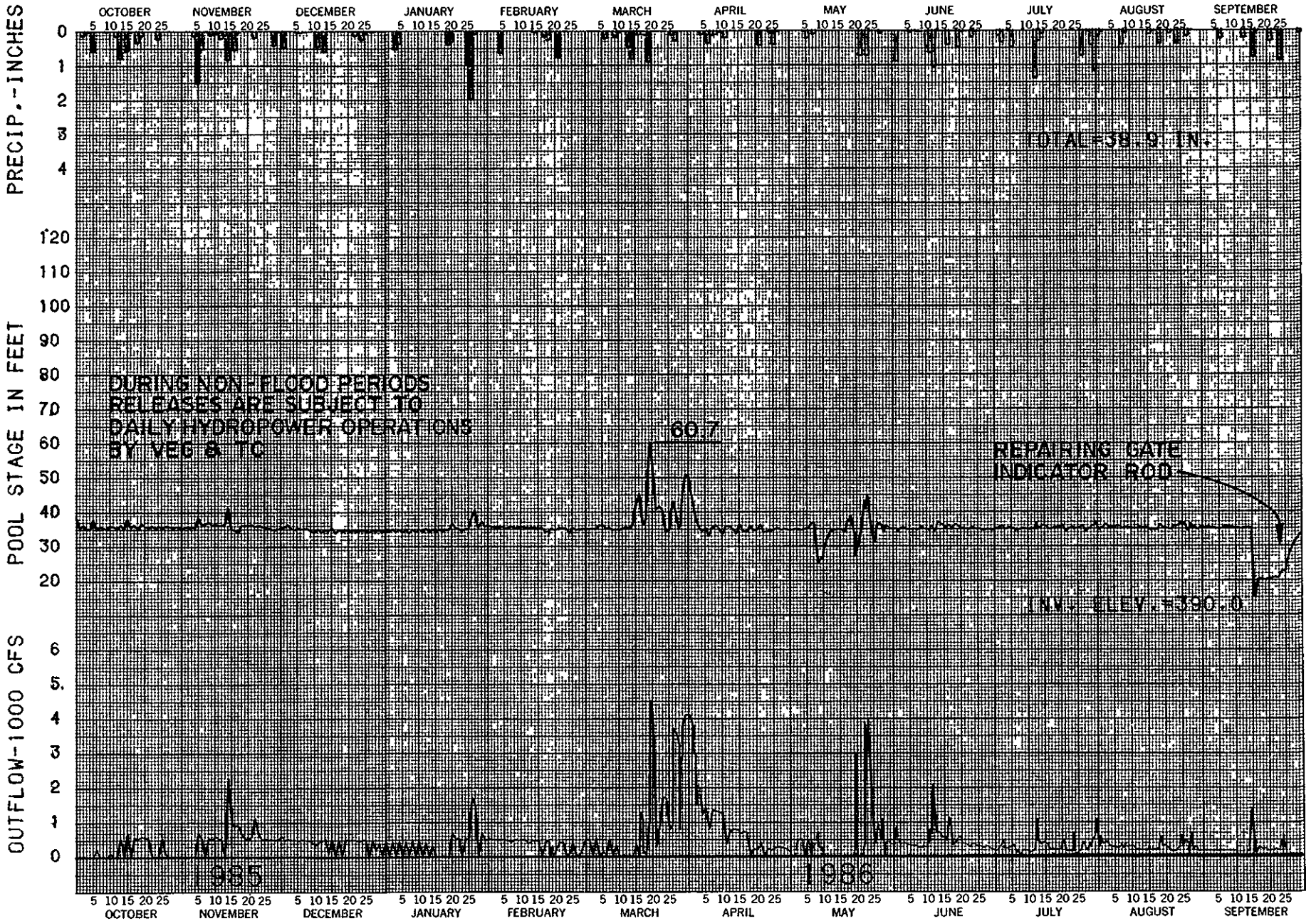
* Revised manual includes VEG&TC hydropower activities
** Navigational gates in project operated by Corps of Engineers

NEW ENGLAND DIVISION
WATER CONTROL DATA SYSTEM
OCTOBER 1986





RESERVOIR REGULATION - UNION VILLAGE DAM

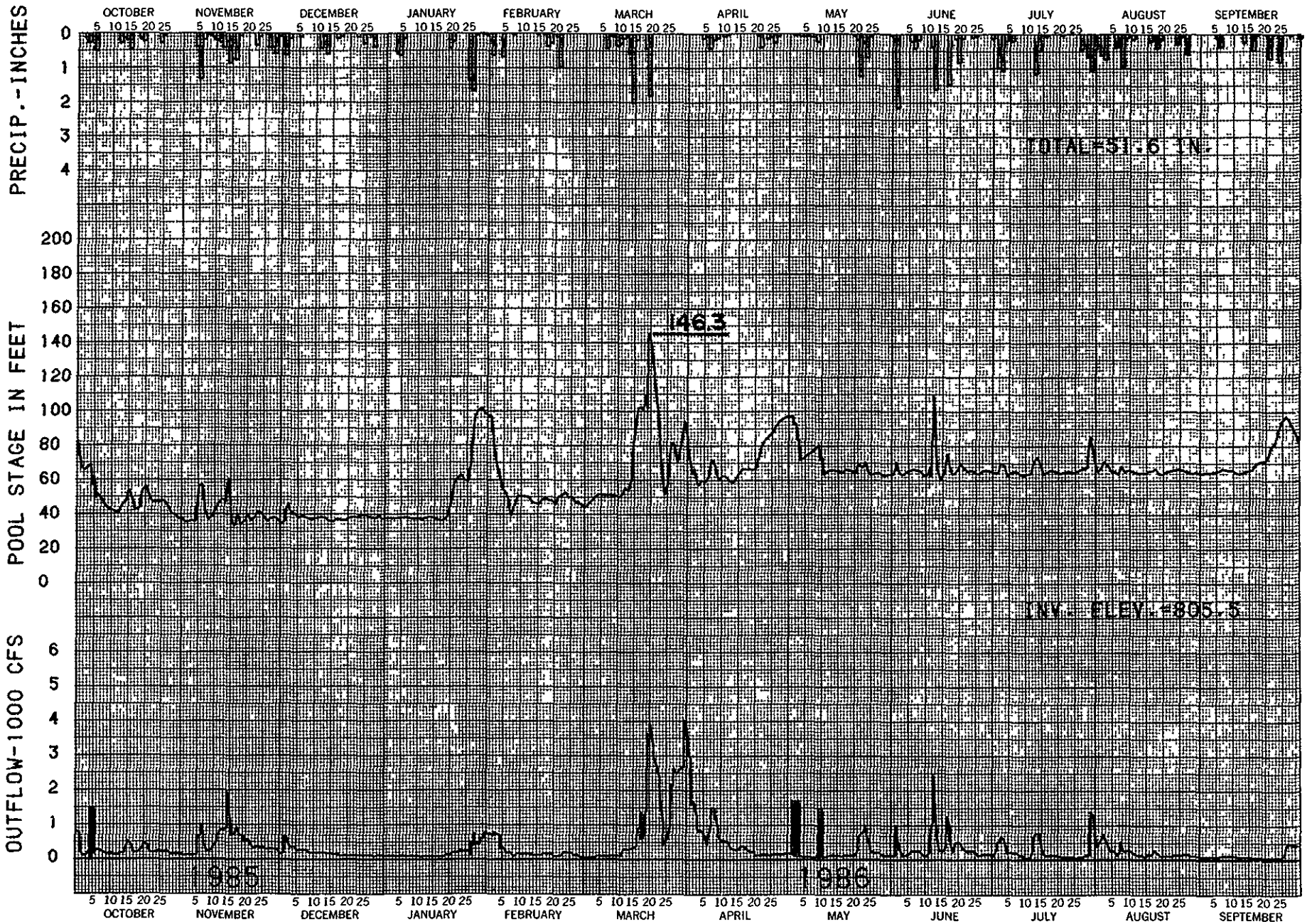


RESERVOIR REGULATION - NORTH HARTLAND LAKE

PLATE 8

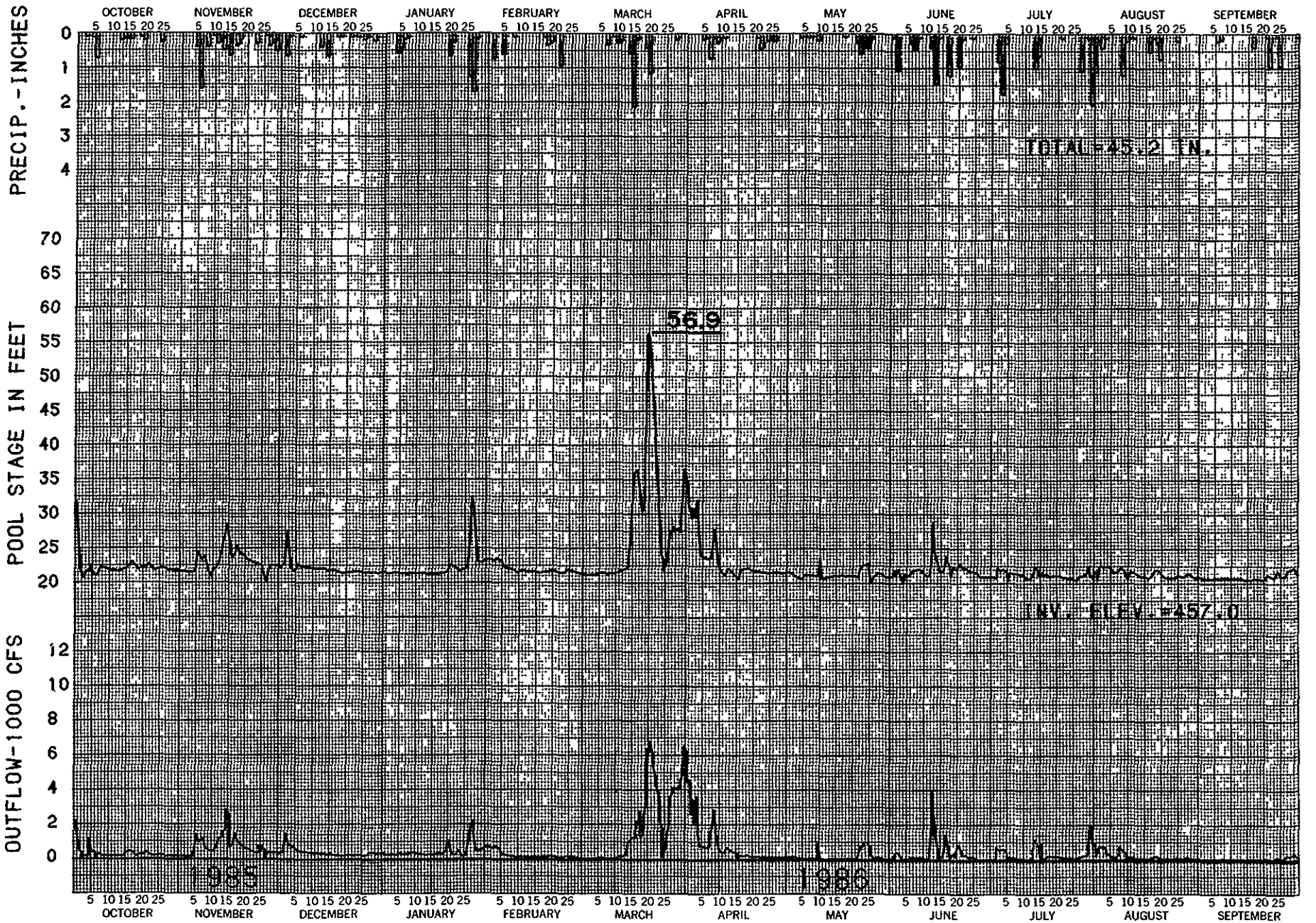
RESERVOIR REGULATION - NORTH SPRINGFIELD LAKE

PLATE 9



RESERVOIR REGULATION - BALL MOUNTAIN LAKE

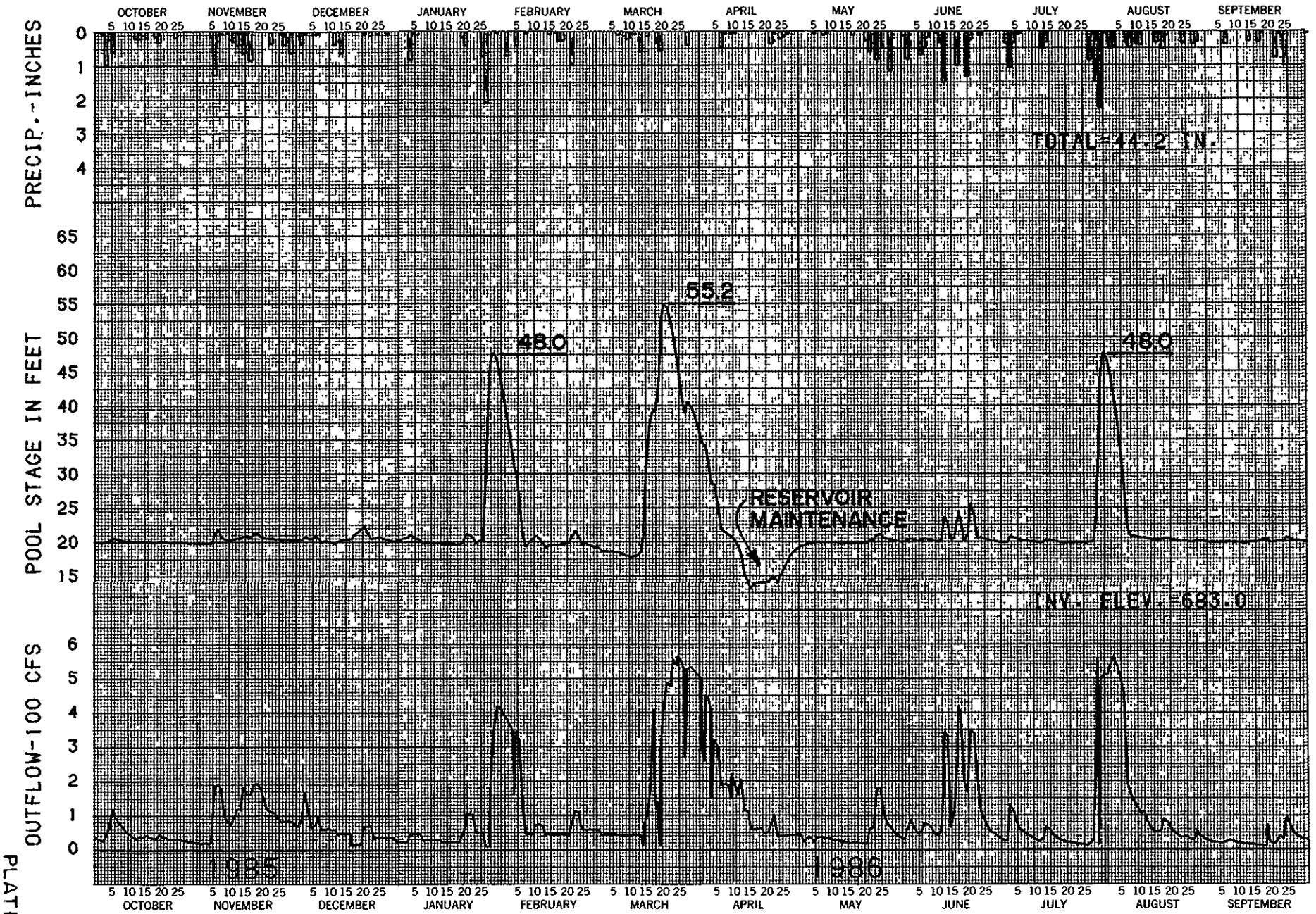
PLATE 10



RESERVOIR REGULATION - TOWNSHEND LAKE

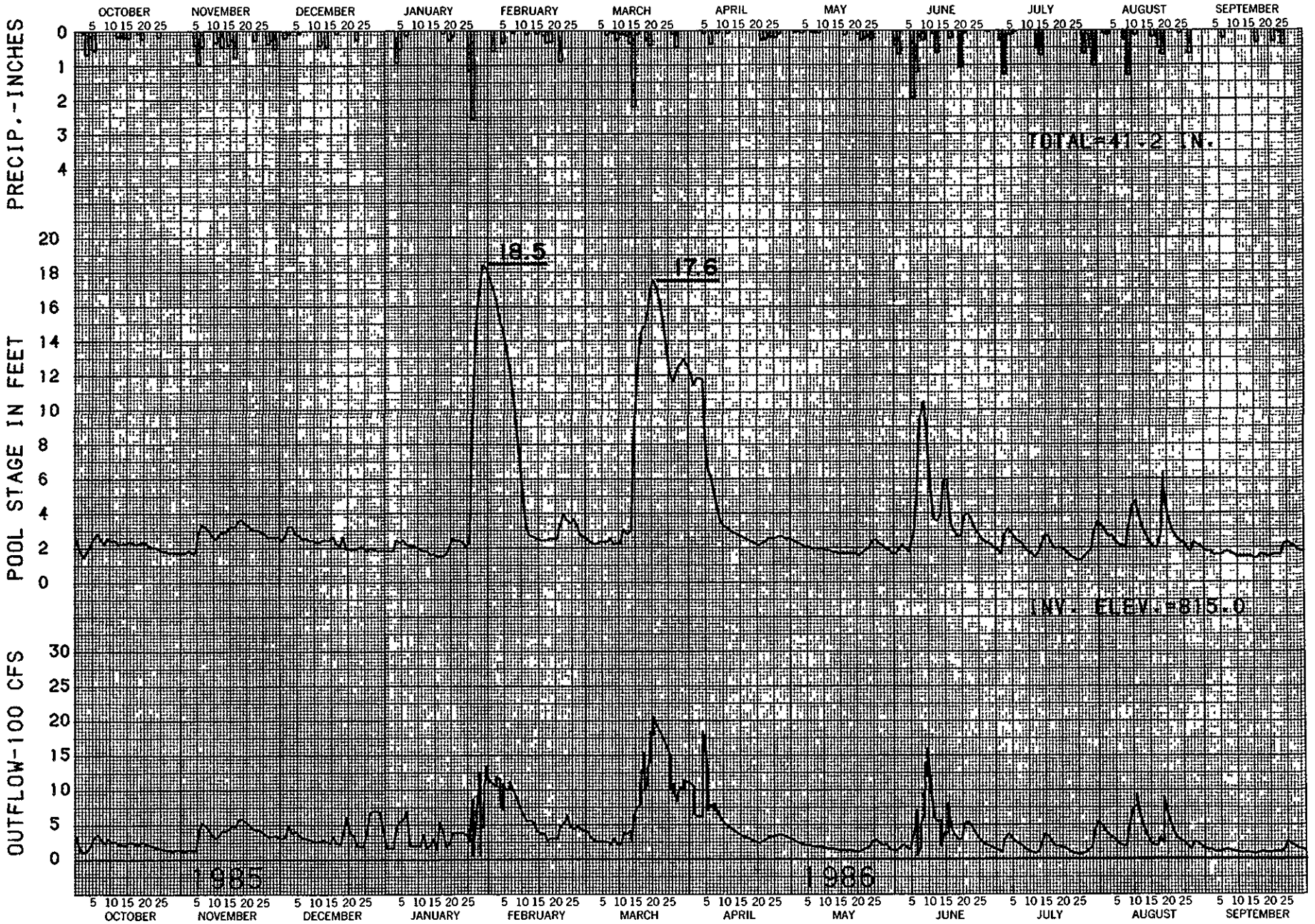
PLATE II

RESERVOIR REGULATION - SURRY MOUNTAIN LAKE



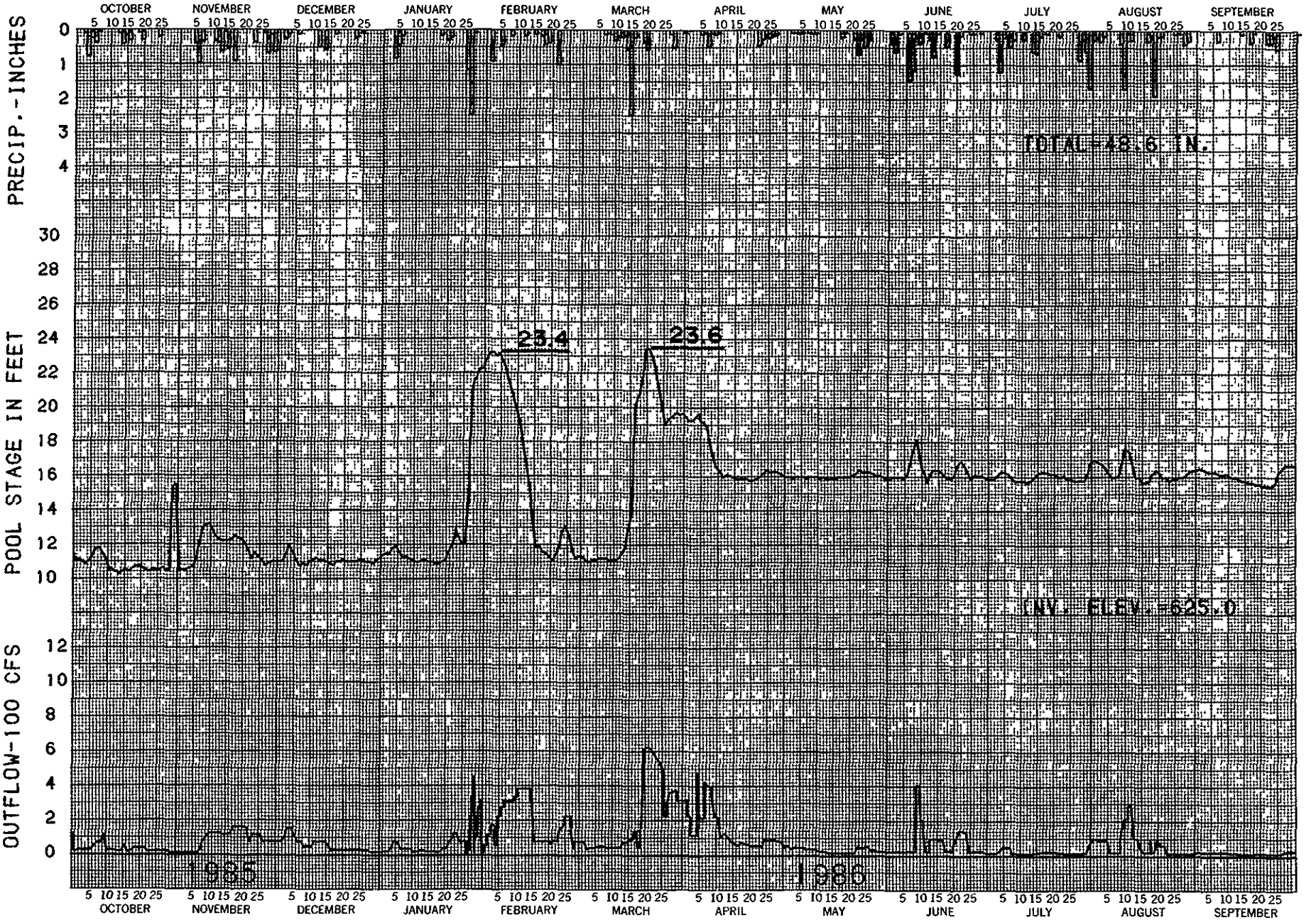
RESERVOIR REGULATION - OTTER BROOK LAKE

PLATE 13



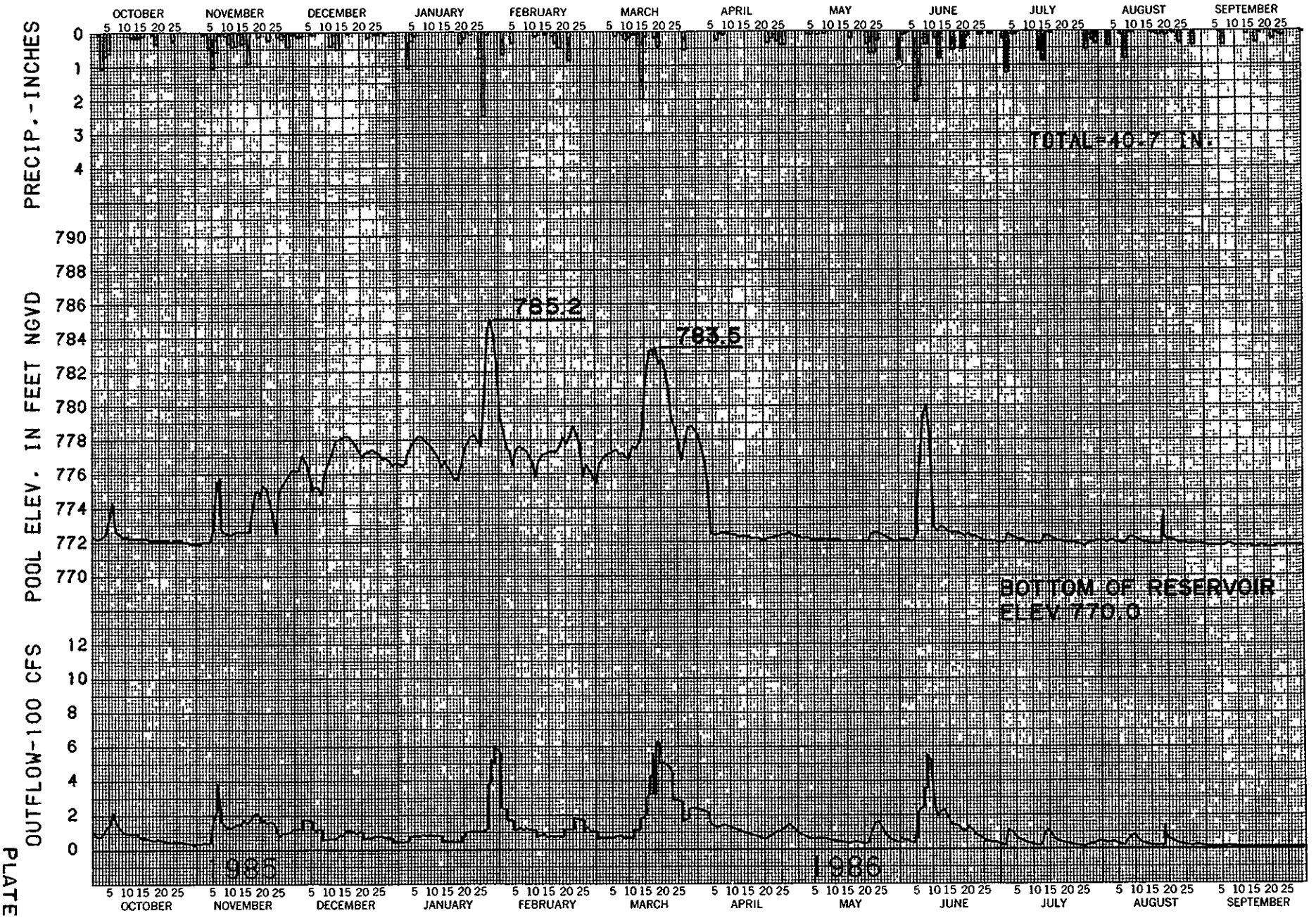
RESERVOIR REGULATION - BIRCH HILL DAM

PLATE 14



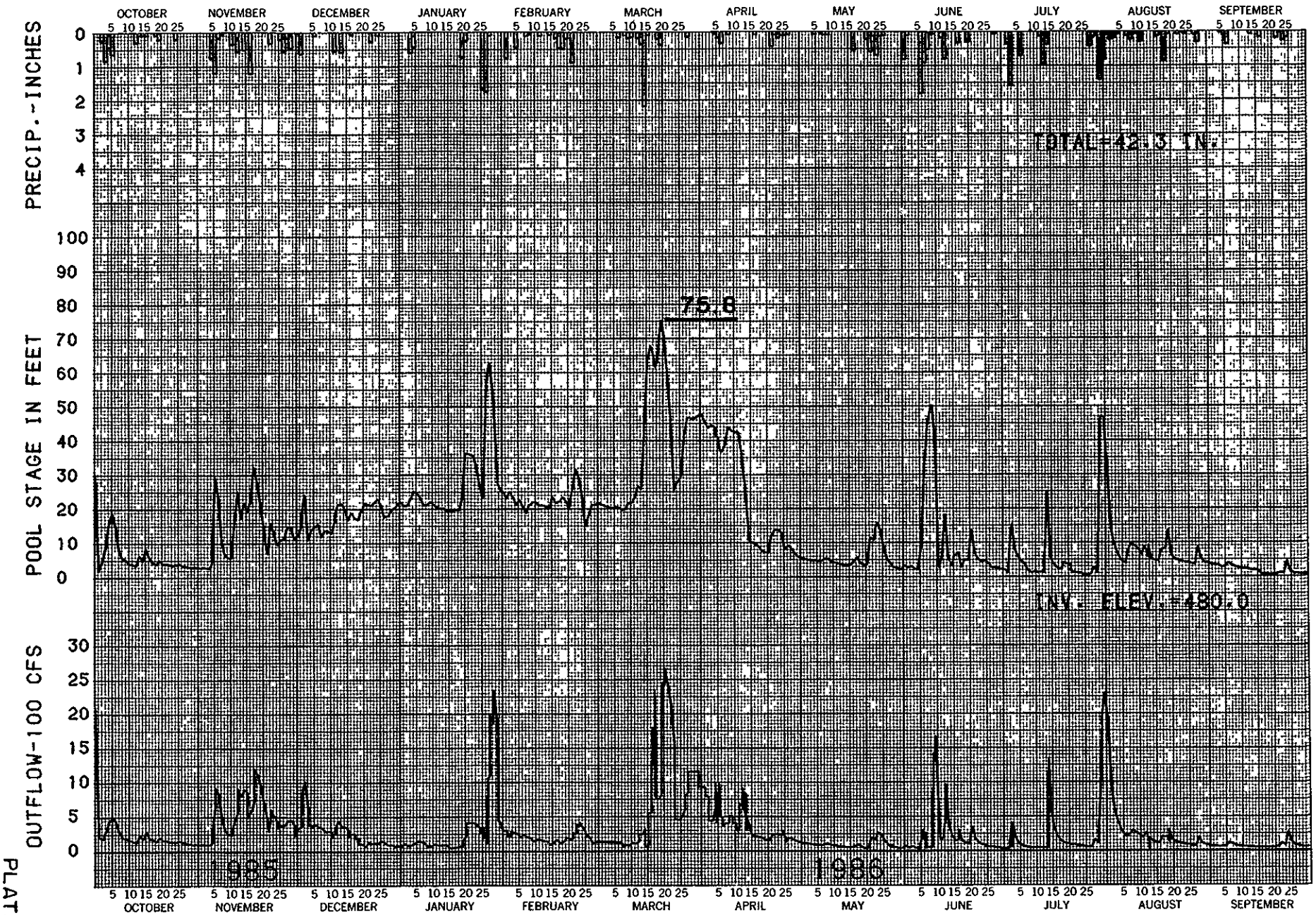
RESERVOIR REGULATION - TULLY LAKE

PLATE 15



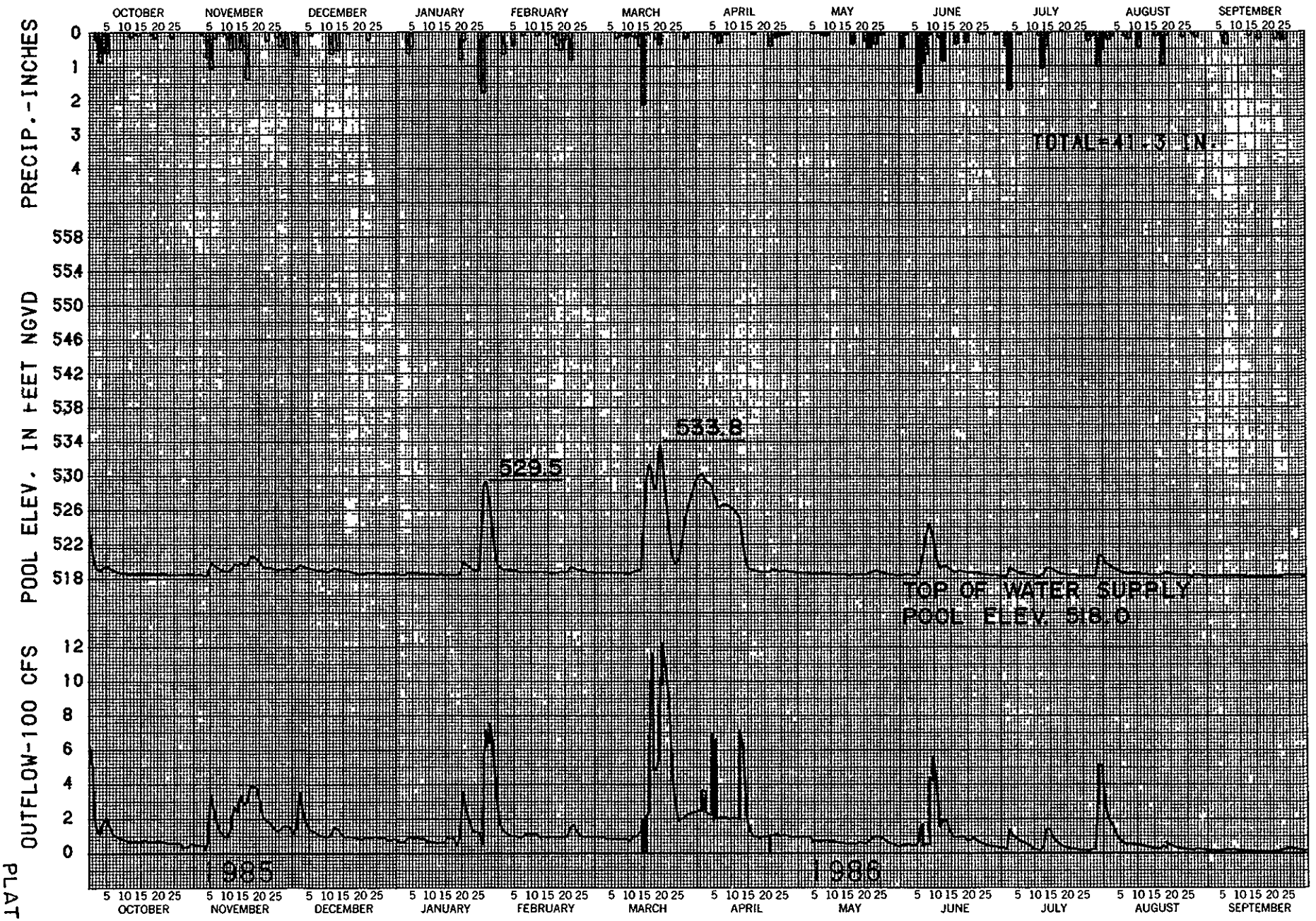
RESERVOIR REGULATION - BARRE FALLS DAM

PLATE 16



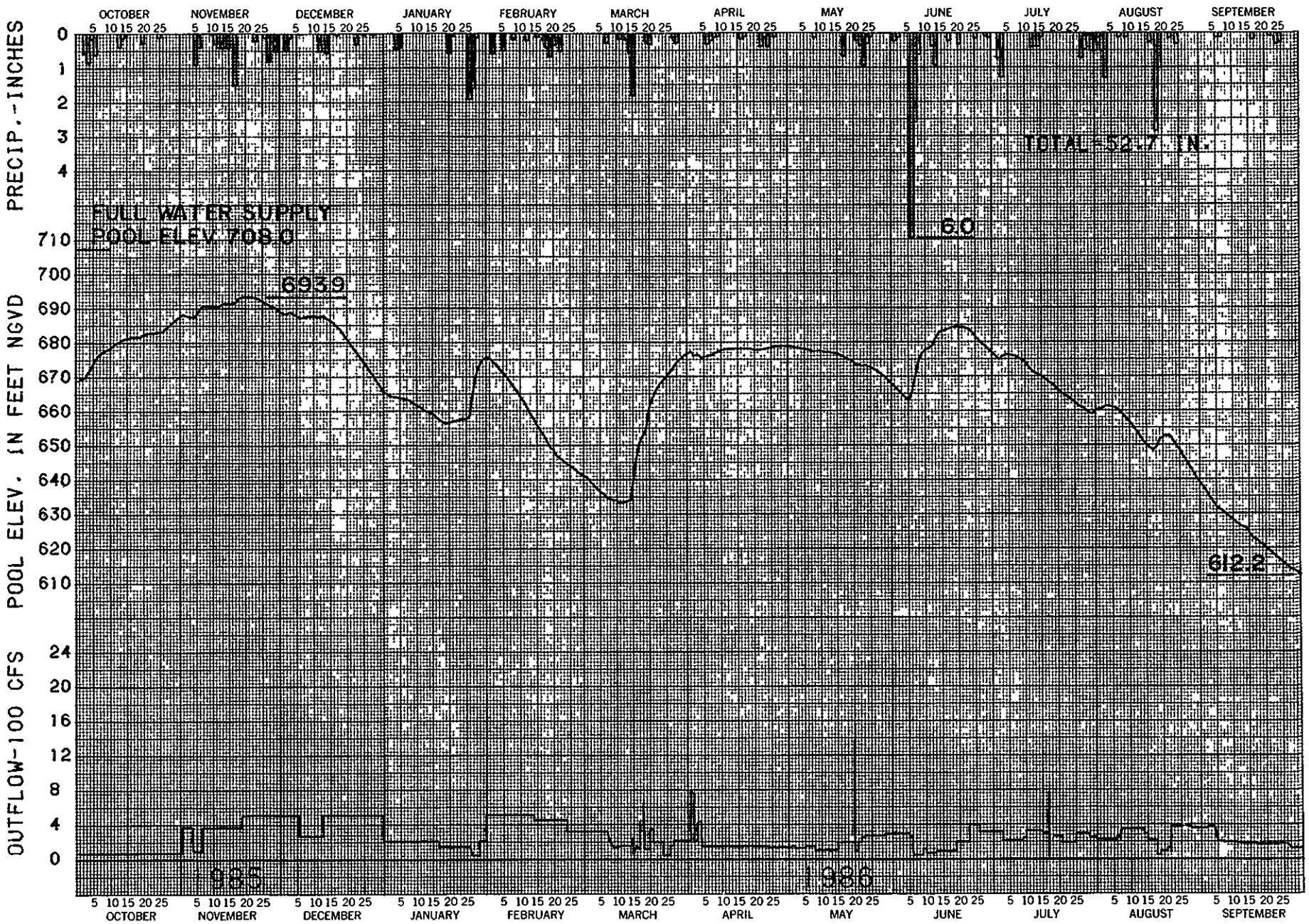
RESERVOIR REGULATION - KNIGHTVILLE DAM

PLATE 17



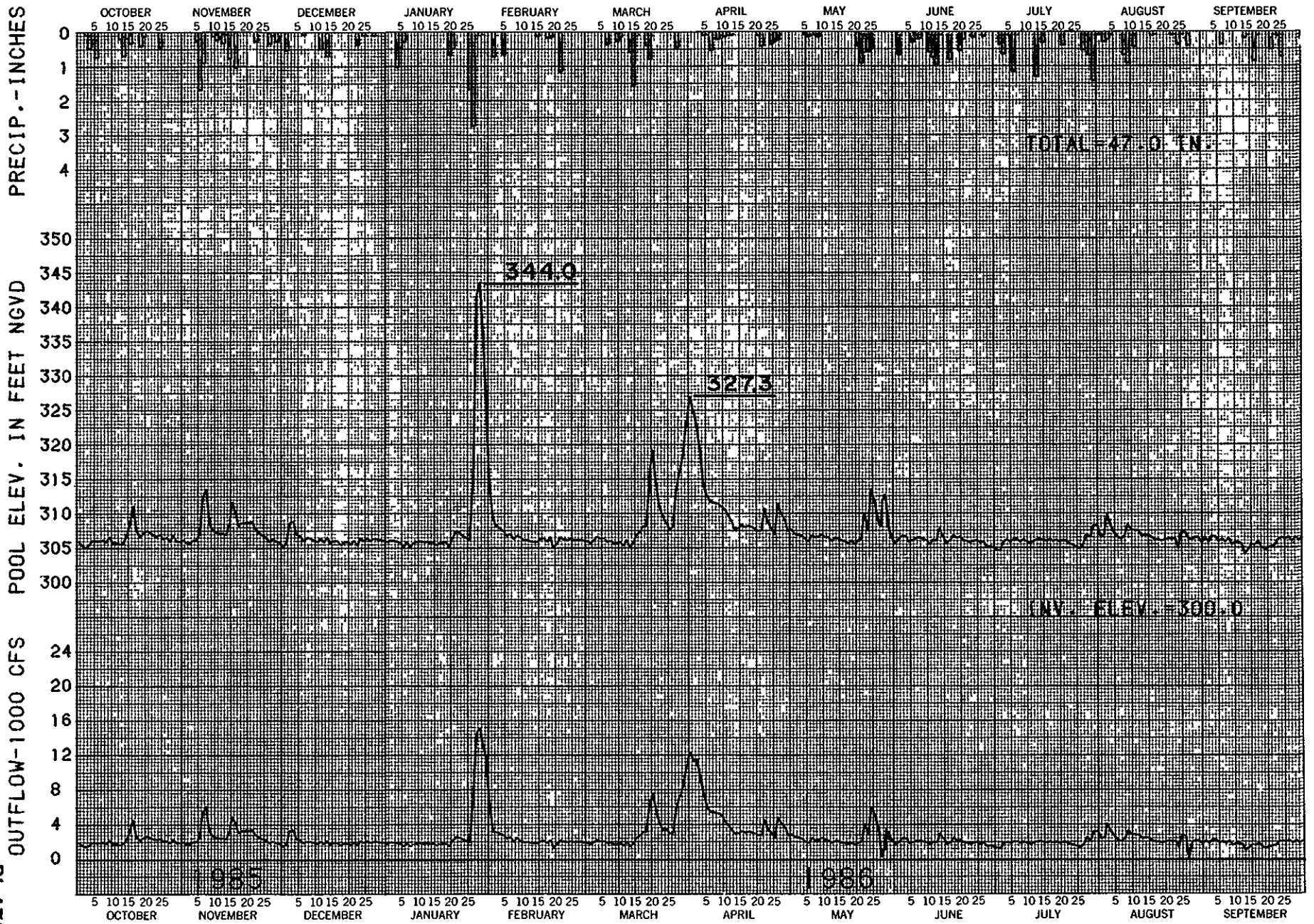
RESERVOIR REGULATION - LITTLEVILLE LAKE

PLATE 18



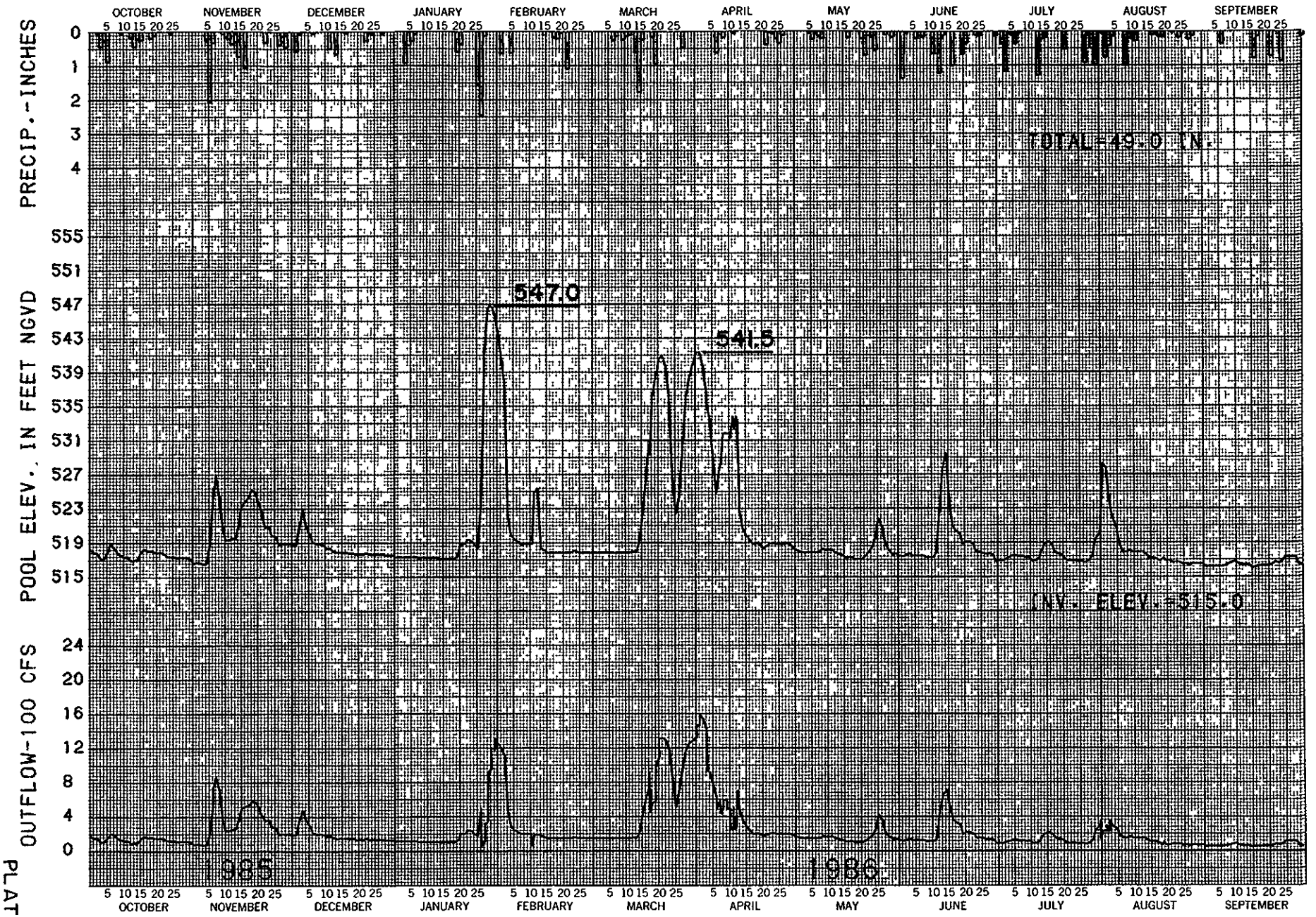
RESERVOIR REGULATION - COLEBROOK RIVER LAKE

PLATE 19



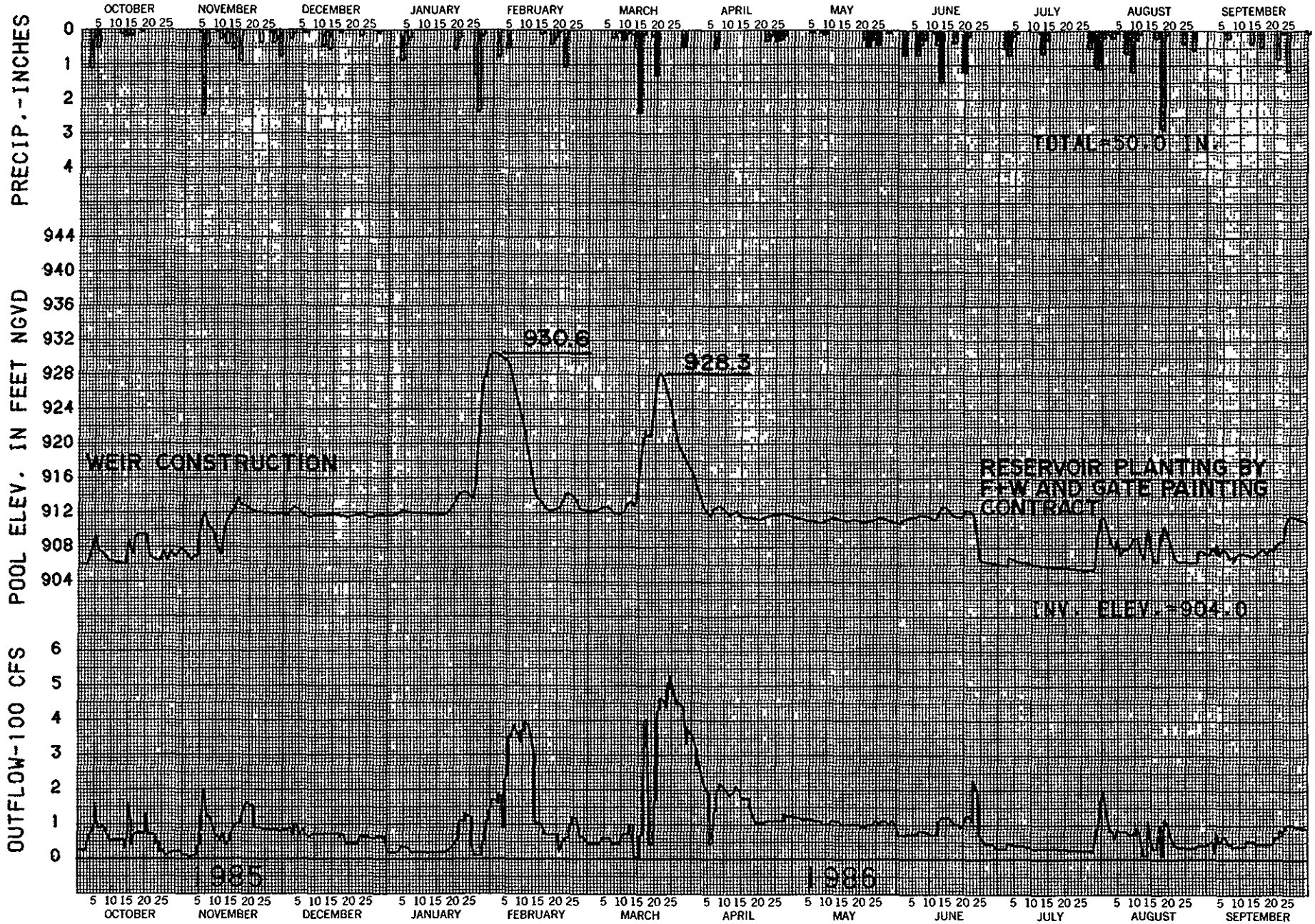
RESERVOIR REGULATION - FRANKLIN FALLS DAM

PLATE 20

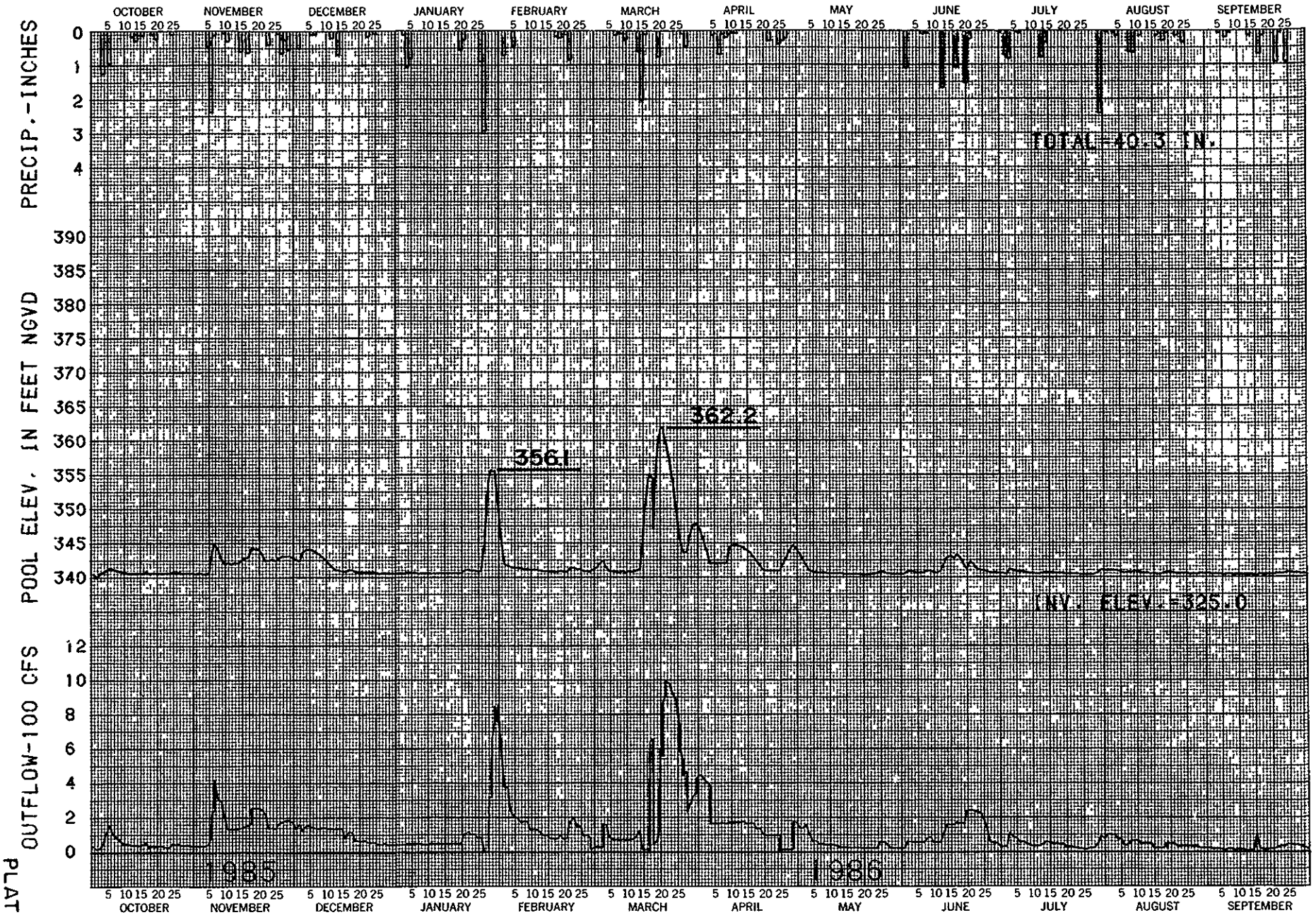


RESERVOIR REGULATION - BLACKWATER DAM

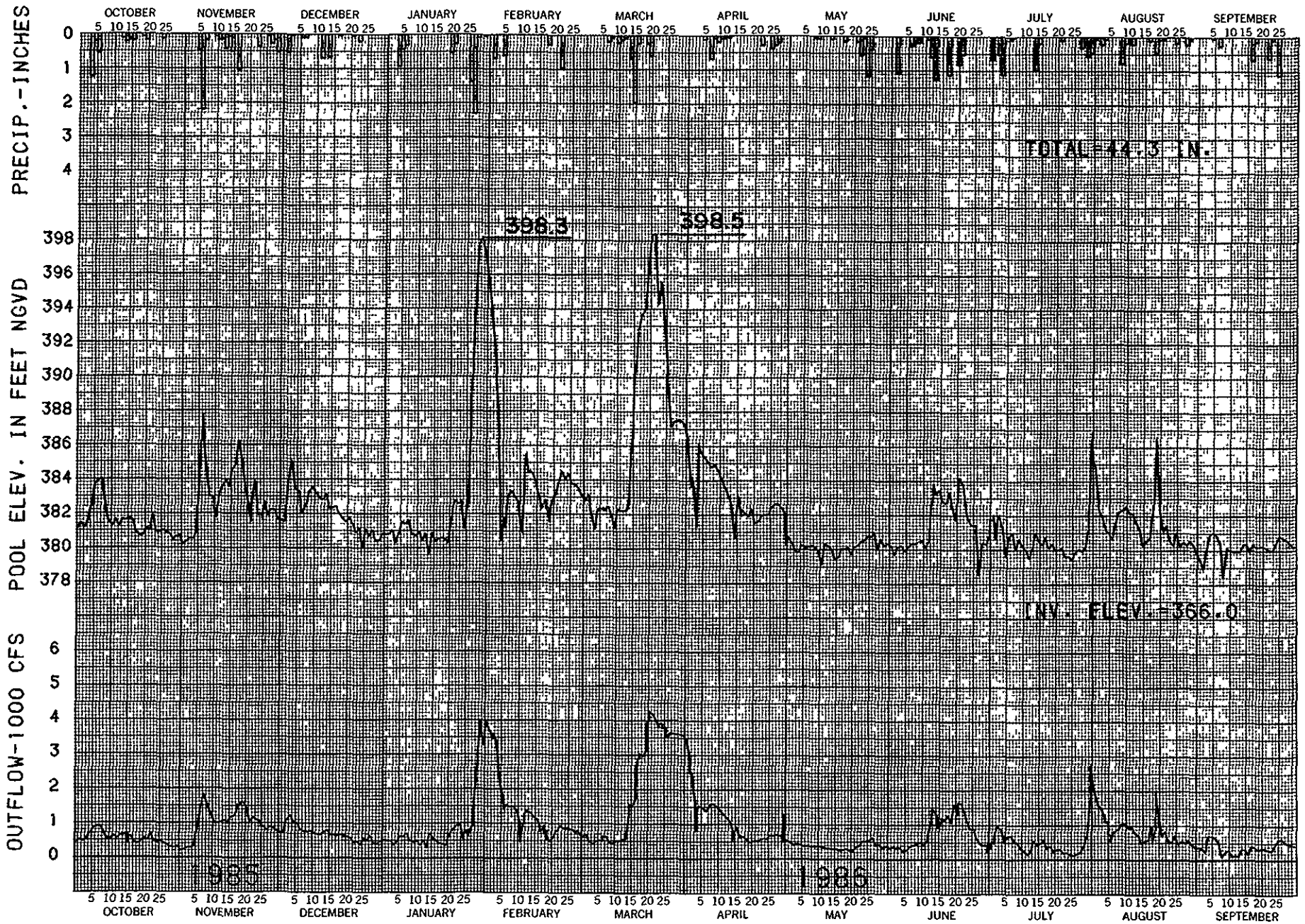
PLATE 21



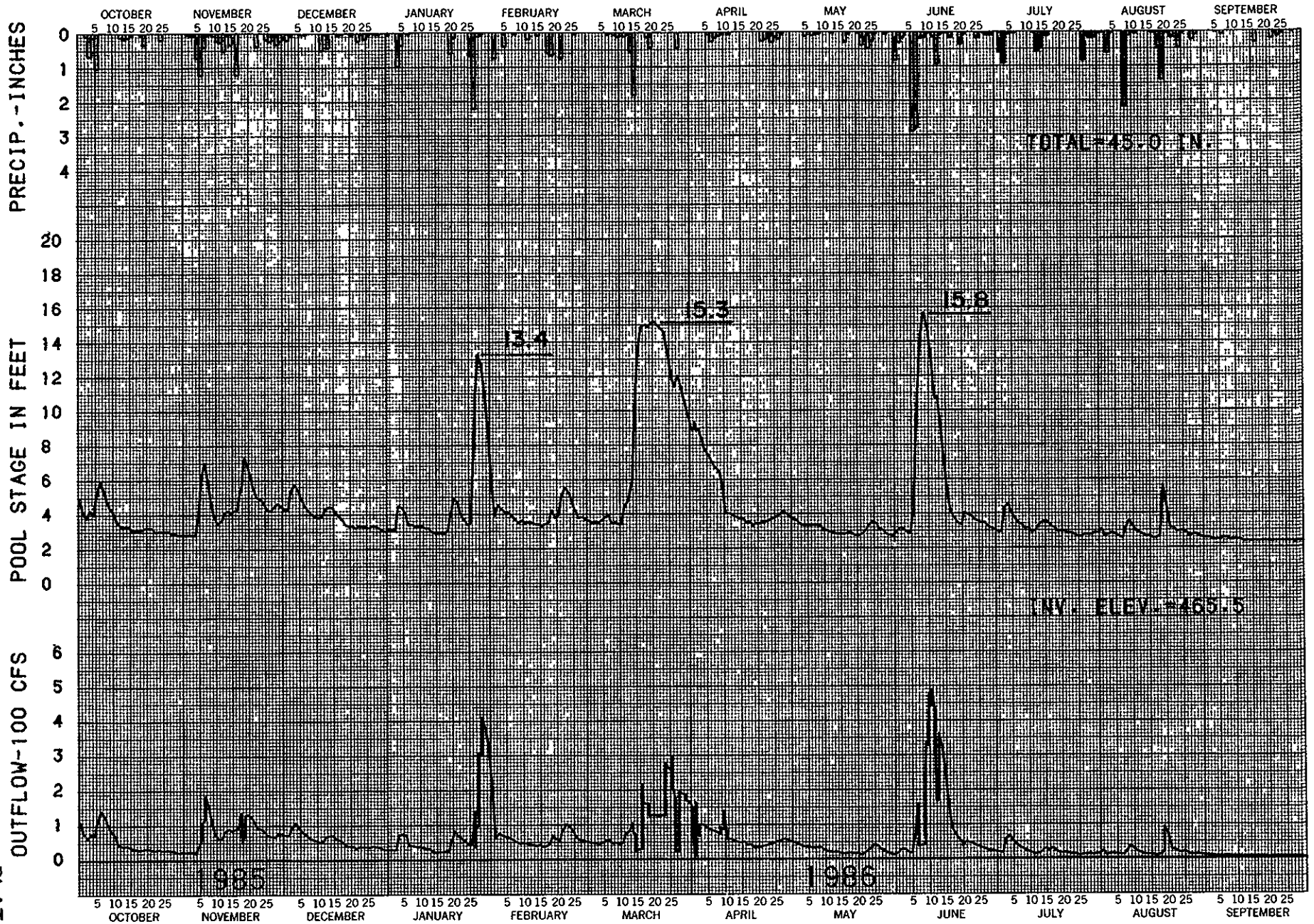
RESERVOIR REGULATION - MAC DOWELL DAM



RESERVOIR REGULATION - EVERETT LAKE

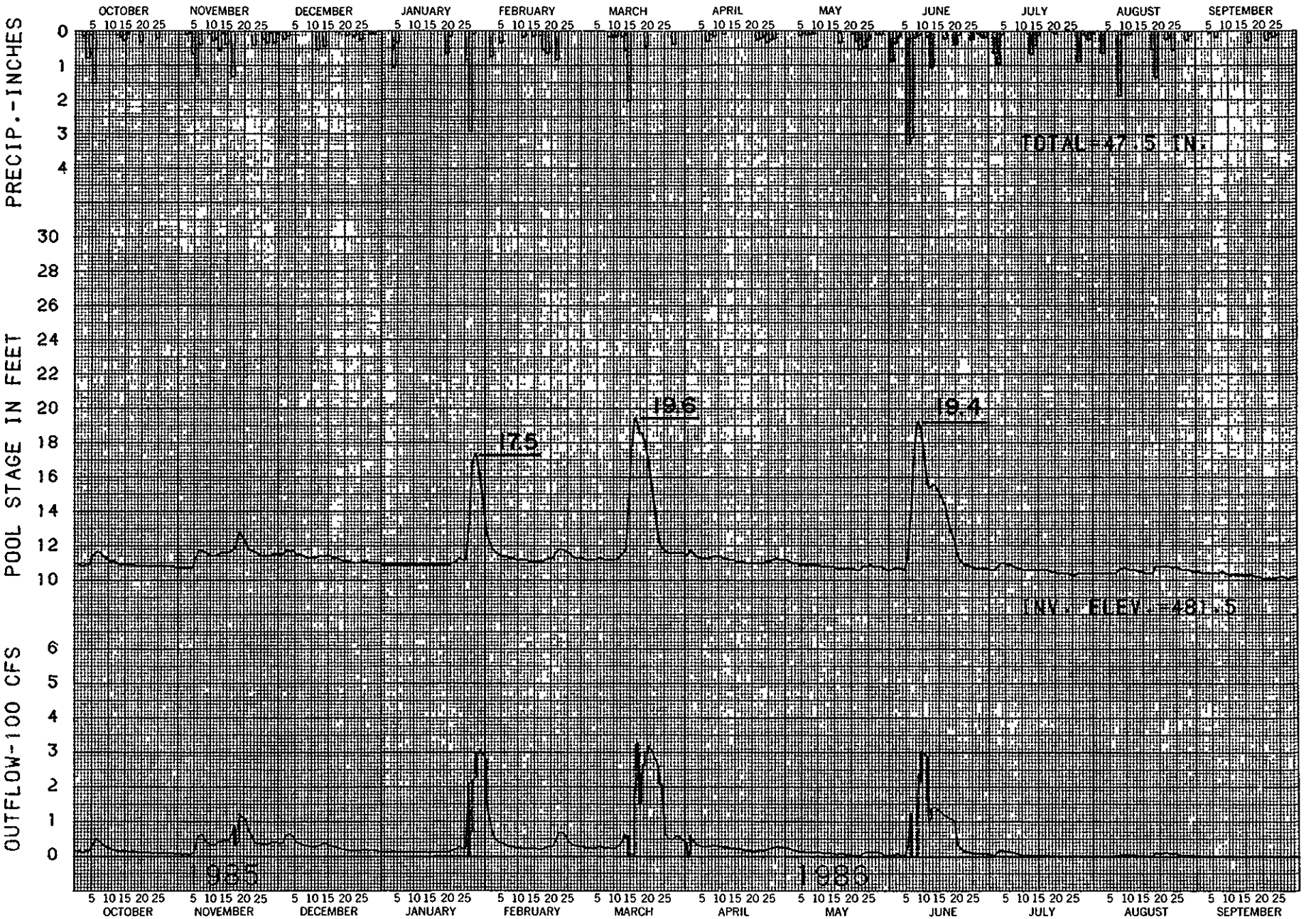


RESERVOIR REGULATION - HOPKINTON LAKE



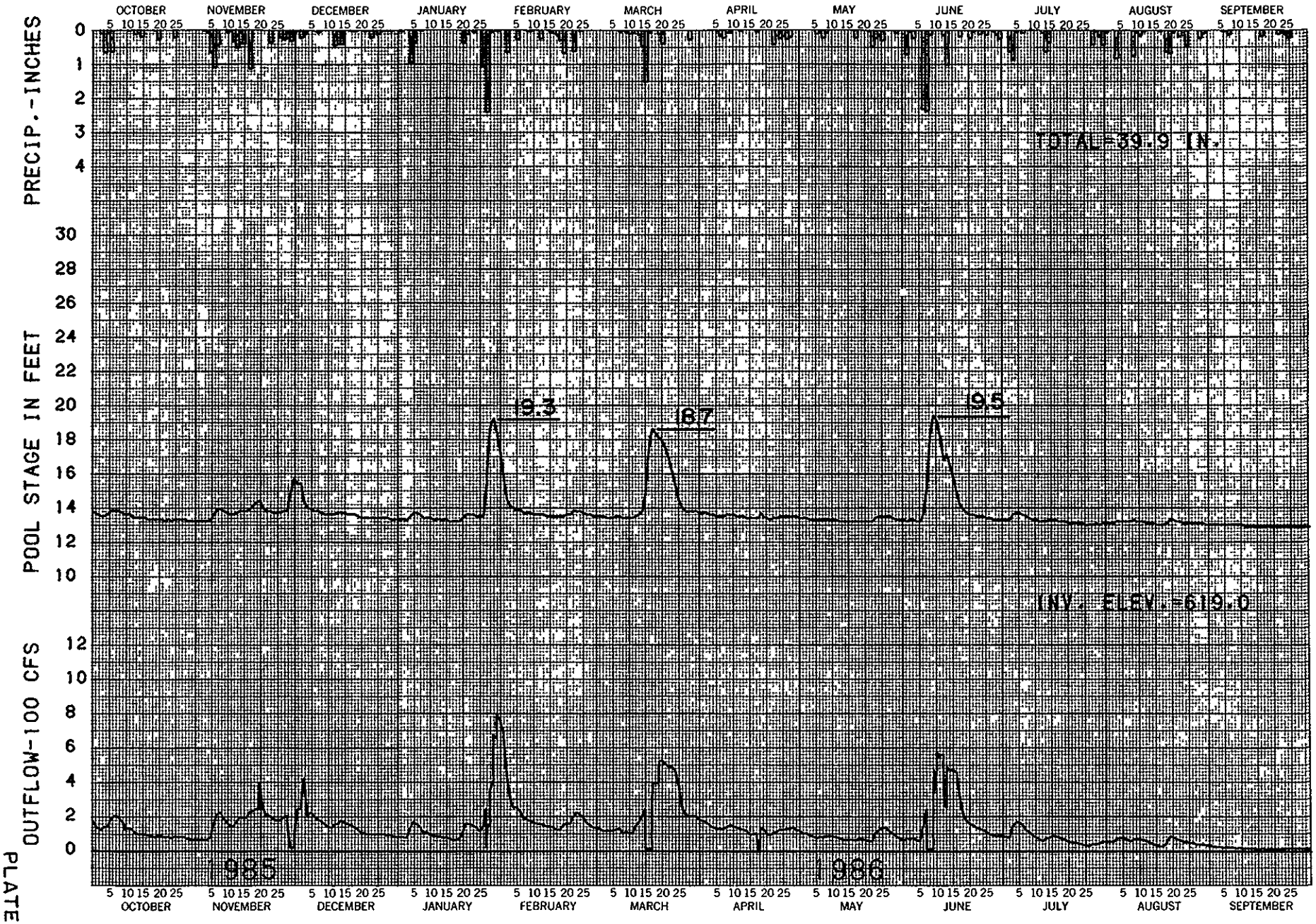
RESERVOIR REGULATION - HODGES VILLAGE DAM

PLATE 25



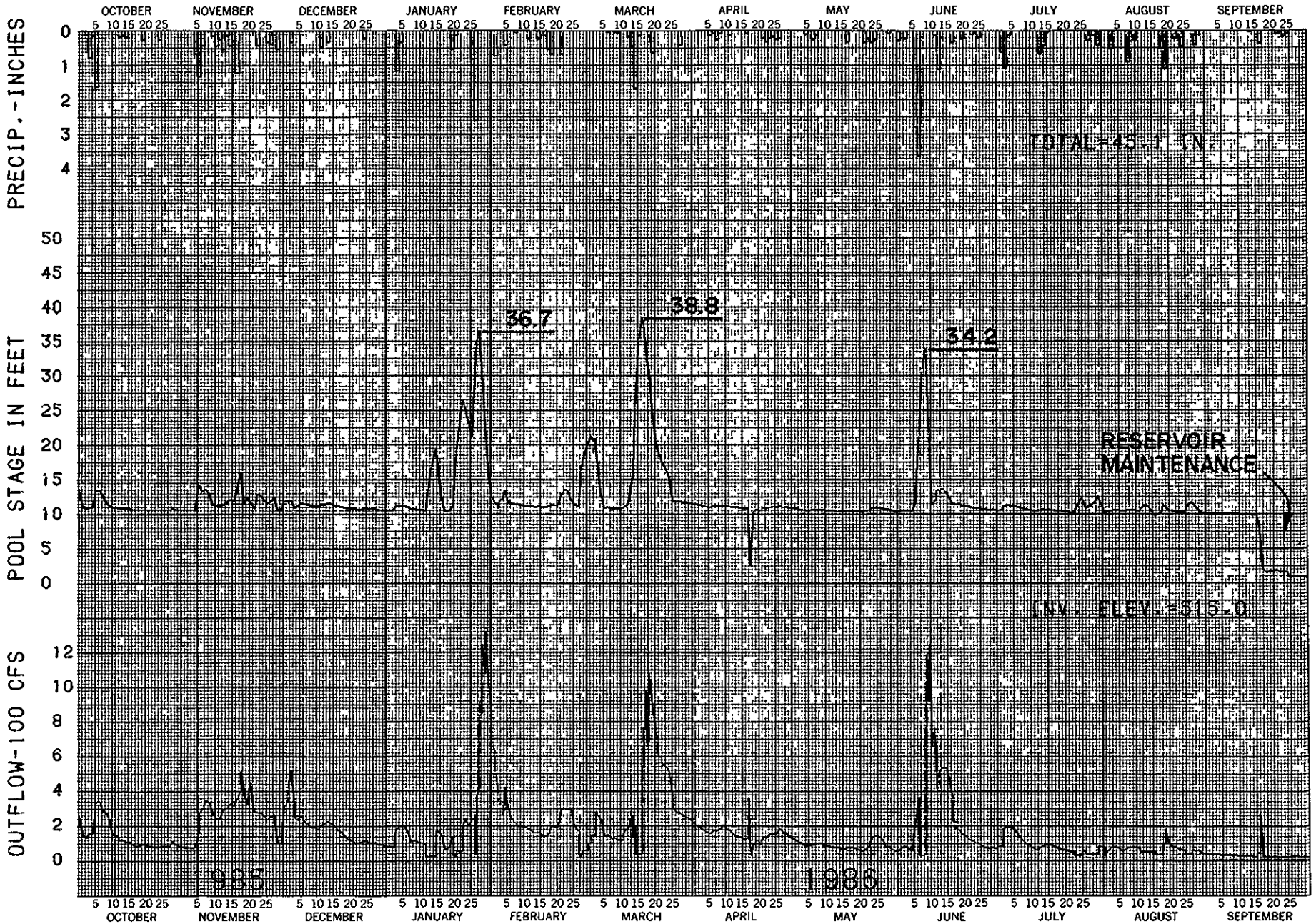
RESERVOIR REGULATION - BUFFUMVILLE LAKE

PLATE 26



RESERVOIR REGULATION - EAST BRIMFIELD LAKE

PLATE 27

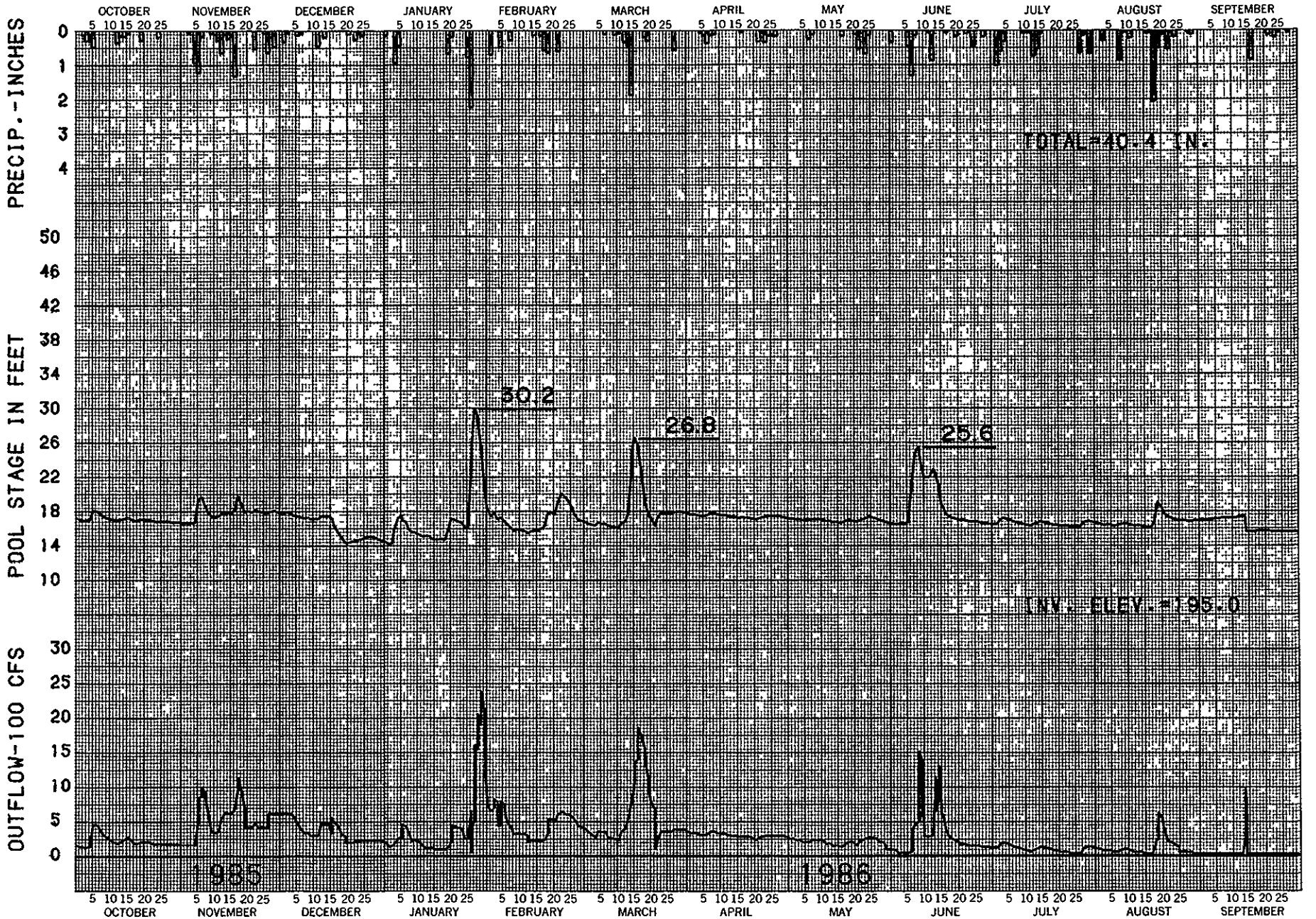


RESERVOIR REGULATION - WESTVILLE LAKE

PLATE 28

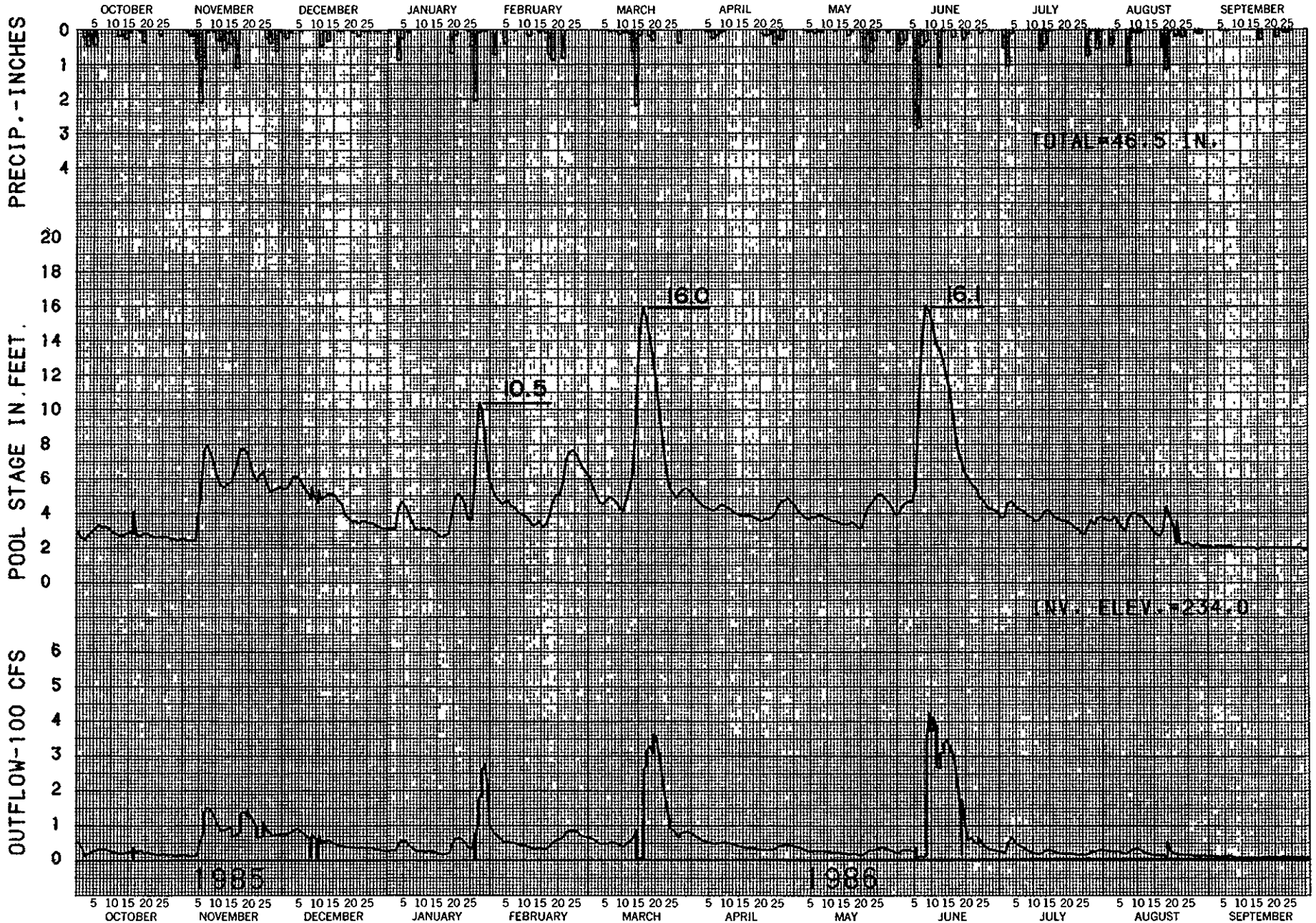
RESERVOIR REGULATION - WEST THOMPSON LAKE

PLATE 29

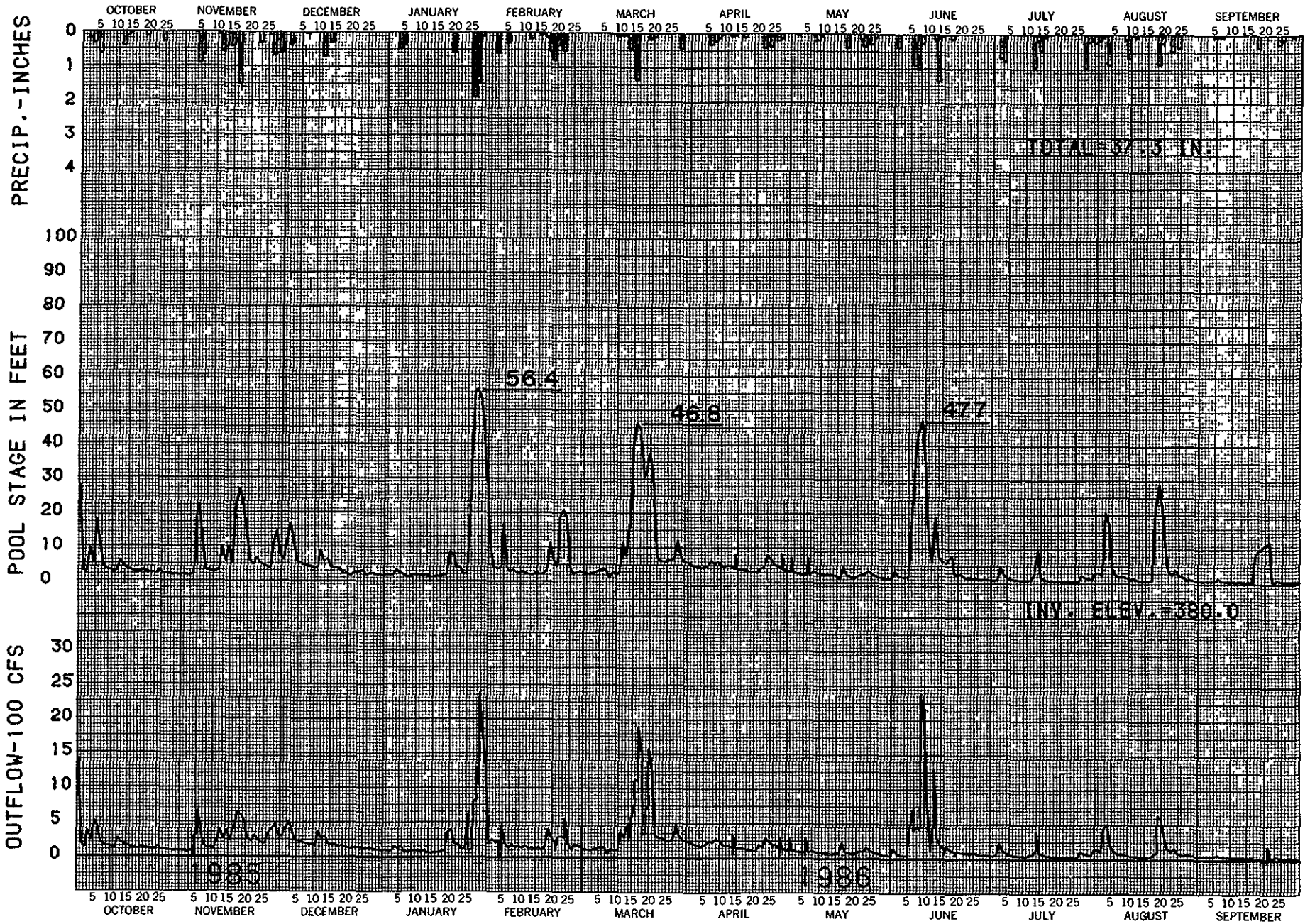


RESERVOIR REGULATION - MANSFIELD HOLLOW LAKE

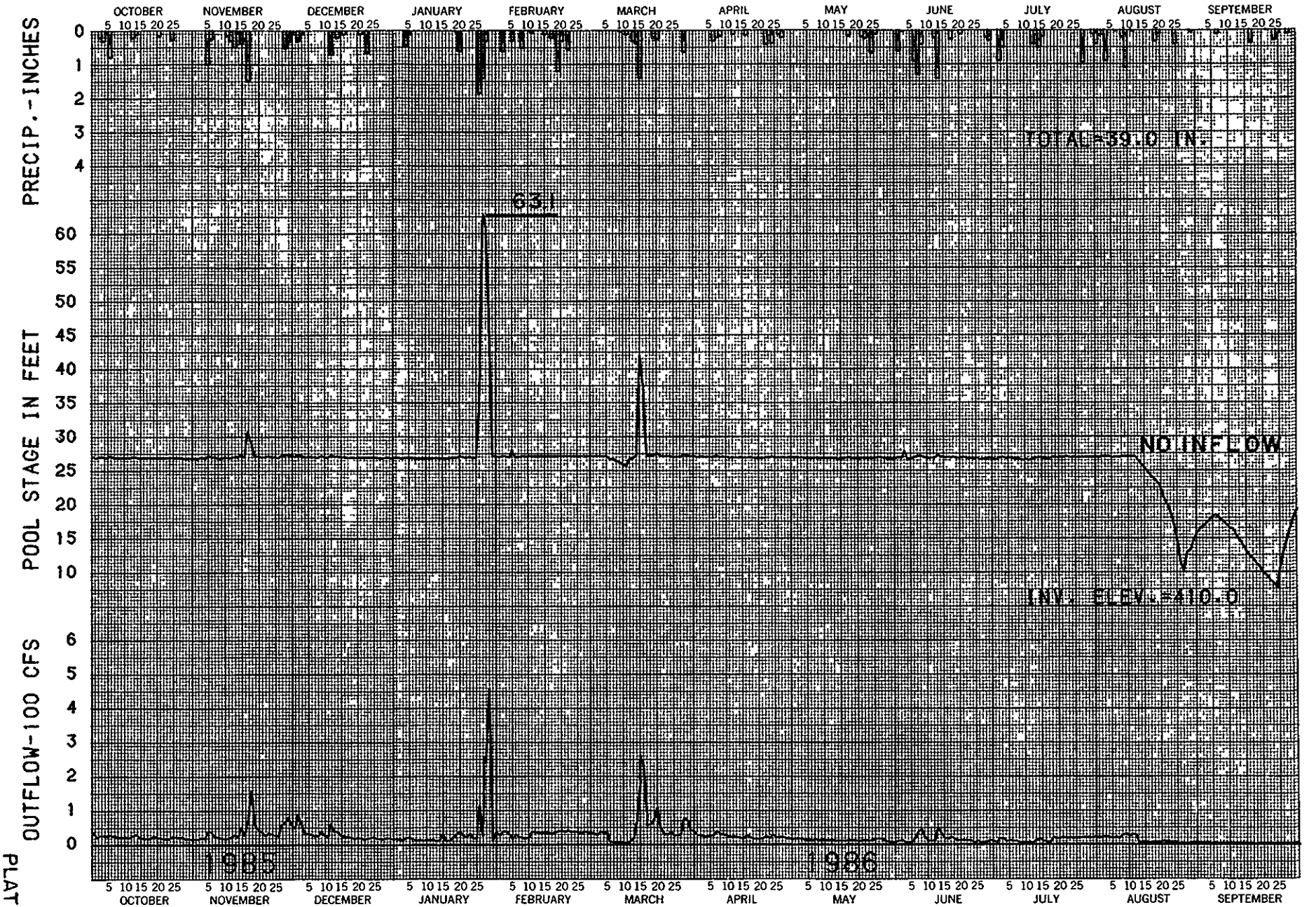
PLATE 30



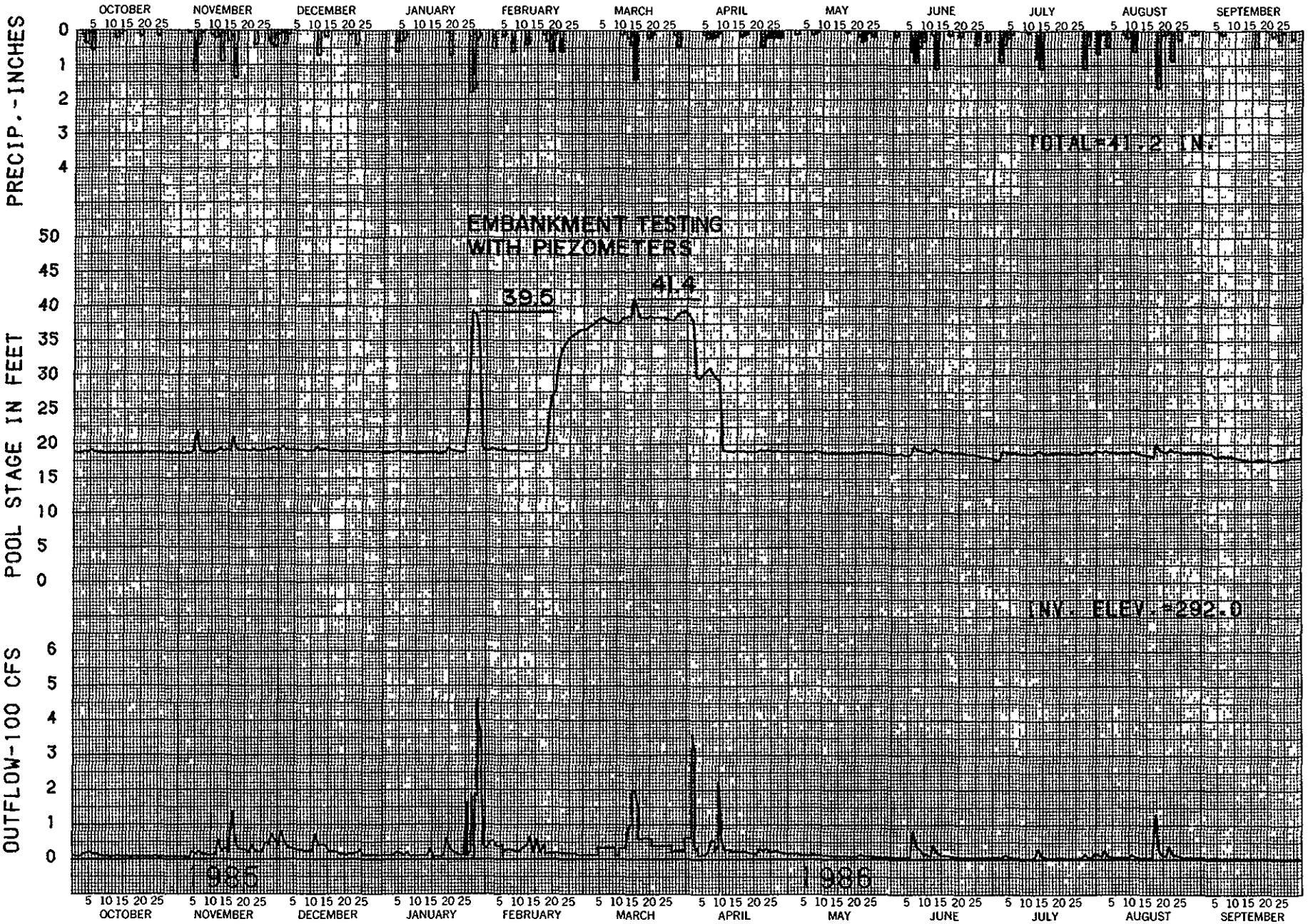
RESERVOIR REGULATION - WEST HILL DAM



RESERVOIR REGULATION - THOMASTON DAM



RESERVOIR REGULATION - BLACK ROCK LAKE



RESERVOIR REGULATION - HOP BROOK LAKE

PLATE 34

FY86 ANNUAL REPORT DISTRIBUTION LIST
(Non-Corps)

District Chief
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New Hampshire Office Chief
US Geological Survey
Water Resources Division
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Connecticut Office Chief
US Geological Survey
Water Resources Division
Abraham A. Ribicoff Federal Bldg.
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Mr. Jerry French (Hydrologist)
National Weather Service
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