

OVERSEAS DEVELOPMENT ADMINISTRATION
MINISTRY OF AGRICULTURE,
GOVERNMENT OF SOMALIA

HYDROMETRY PROJECT - SOMALIA

Annual Flow Hydrographs
Jubba and Shebelle Rivers 1951 - 1989

Sir M MacDonald & Partners Limited
Demeter House, Station Road, Cambridge CB1 2RS
United Kingdom

in association with

Institute of Hydrology
Wallingford, Oxon OX10 8BB
United Kingdom

December 1990

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found

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FOREWORD

This Data Book was compiled during the Somalia Hydrometry Project which was supported by the British Overseas Development Administration between 1983 and 1990. The data may be copied or used for analysis provided that acknowledgement is given to:

*The Director of Irrigation and Land Use
Ministry of Agriculture
Mogadishu
Somalia Democratic Republic*

The Director would also appreciate copies of any published or unpublished papers or reports utilising the data.

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Location map

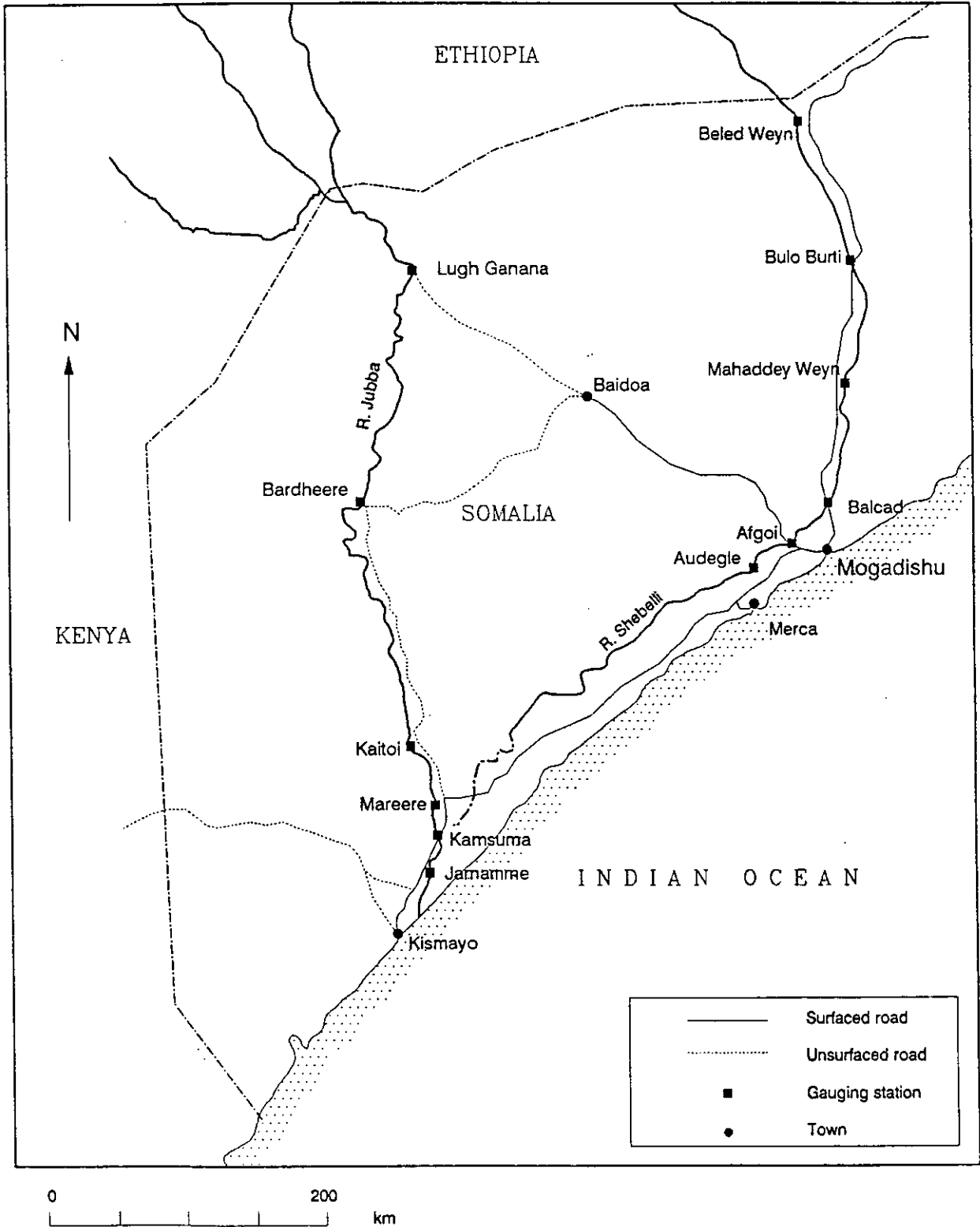


Figure 1

1. INTRODUCTION

This volume contains hydrographs of estimated daily flows (discharges) at selected gauging stations on the Jubba and Shebelle rivers for varying periods between 1951 and 1989. It is intended to be a companion volume to the Hydrometric Data Book⁺, but for completeness and ease of reference much of the Introduction to the Data Book is repeated here. All original data has been checked, with errors corrected and missing values infilled where possible. Figure 1 shows the locations of the gauging stations and Table 1 summarises their main hydrological characteristics.

The data checking and infilling work was carried out as part of the Somalia Hydrometry Project which was instituted and supported by the Overseas Development Administration (ODA), as part of the British Government's programme of Technical Cooperation with Developing Countries. Staff from Sir M. MacDonald and Partners (now part of Mott MacDonald International Limited) and the Institute of Hydrology provided technical assistance and training to the Hydrology Section of the Department of Irrigation and Land Use (DILU) in the Ministry of Agriculture in Mogadishu. This support was on an intermittent basis from late 1983 to mid 1986 and full-time from 1988 to 1990. The continued support of the ODA and of the Director of Irrigation and Land Use is gratefully acknowledged.

Data Availability

1951-1962

Some records are available from 1951 for two stations - Lugh Ganana on the river Jubba and Beled Weyn on the river Shebelle. These stations are the furthest upstream within Somalia and lie within about 50 km of the Ethiopian border. Since virtually all the river flow in Somalia derives from rainfall in Ethiopia (there being no significant tributaries within Somalia) these are very important sites for the evaluation of water resources available in Somalia. However, records from 1951 to 1962 are intermittent and of uncertain accuracy; there are no records from other stations against which the data can be checked and the information about the gauge zeroes is sparse. For this period it was necessary to make two major assumptions: firstly that the staff gauges were at the same zero levels as those in use from 1963 onwards (a few file notes give good reason to support this assumption, particularly for Lugh Ganana), and secondly that the stage-discharge relationship was also the same as in the later period. Consequently, the data presented in this book for 1951 to 1962 is much less reliable than for later years. In general the data for Lugh Ganana appears to be good from 1951 until about 1957, but thereafter is of poor or very poor quality. At Beled Weyn the pattern is similar - data for the early fifties is fairly good but from 1957 the quality deteriorates, though not to the same extent as the record at Lugh Ganana.

⁺ Hydrometric Data Book - Jubba and Shebelle Rivers 1951 - 1989. Issued by the Somalia Hydrometry Project, May 1990

1963-1989

Most of the remaining gauging stations were established in 1963 and the hydrometric network has remained largely unchanged to the present day. The maintenance of these stations over the following 27 years has been irregular so that there are inevitably periods of missing or unreliable stage records. These generally correspond to periods between foreign-funded projects. Measurements of discharge have also been restricted to particular periods so that changes in station controls (and hence rating equations) may not have been properly identified. These matters are covered in detail in other reports by the Hydrometry Project.

Data Checking

From 1963 onwards the data for each station has been cross-checked against the records for other stations upstream and/or downstream. To facilitate this work, computer models were developed for each river. A separate report covers this modelling work in detail. The models allowed periods of doubtful data to be identified, which were then checked against the original records. In many cases it was found that errors had been made in interpretation of the records (eg confusion between staff gauge and bridge dip records) or in entry of the data to the computer; wherever possible, these errors were corrected. For some periods, it was found that data had been fabricated, or that whole months of data had been copied from previous observations. All such doubtful values were deleted. In addition to these corrections it was necessary to delete some further periods of data where the records differed so much from those at other stations that the data is assumed to have been incorrect. Where data was available for three or more stations it was usually easy to identify erroneous values, but where only one or two stations had data, doubtful values often had to be accepted.

The amount of original data retained after this checking procedure varied substantially from station to station. The most complete records are for Beled Weyn and Afgoi on the Shebelli, each having around 90 % original data; Mareere on the Jubba has a similar level from its introduction in 1977. The most complete record for the whole period on the Jubba is for Lugh Ganana with 75 % original data. Figures 2a and 2b show the percentages of original data for each station in each year while Figure 3 presents the average per year for each river. These graphs clearly show the relative completeness of records for different stations, and also indicate the periods for which original data is limited. On the Shebelli the returns in the mid to late seventies were very poor, and this is reflected in the reliability of the hydrographs shown in this book. There was a dramatic improvement in 1980/81 when the network was rehabilitated under FAO funding; this has been largely maintained by the Hydrometry Project. On the Jubba the pattern is a little different, reflecting a slightly different set of projects. There is no data at all for much of 1968 and 1969 (when there was an FAO project restricted to the Shebelli), but records in the early to mid seventies were better as a result of a separate project concentrating on the Jubba valley. The 1980/81 improvement again stands out, but this was followed by two very poor years before the start of the Hydrometry Project. The apparent decline in returns in 1988/89 for the Jubba as a whole is due to the restarting of readings at Kamsuma and Jamamme in mid-year; the returns for the other three stations remained very nearly complete.

Infilling of Missing Data

Where possible, periods of missing or obviously erroneous data were infilled using the computer models; such values are shown as estimates on the hydrographs. Because lateral inflow to the Shebelle in Somalia is very rare in the upper reaches and virtually non-existent in the lower reaches it was generally possible to estimate flows at one station from those at one further downstream, though modelling from an upstream station was preferred. On the Jubba, lateral inflow is also rare, but is relatively more significant, so infilling from a downstream station was treated with additional caution. The over-riding consideration was that estimates were inserted where possible because even slightly inaccurate estimates were considered to be preferable to leaving gaps in the record. On the Shebelle it was possible to produce estimates for all missing periods from the start of 1963, but on the Jubba two periods (most of January 1963 and about two years in 1967-69) remain as missing data because no information was available for any station.

Data Accuracy

It will be noted that at times recorded flows at a downstream station exceed those upstream, even though there has not been any lateral inflow. This is normally due to uncertainties in the rating equations (which have been derived from irregular measurements of discharge). For extensive periods during the Gu and Der flood seasons it is normal for the stations in the lower Shebelle to display a flat-topped hydrograph because of overbank spillage in the upper reaches. The level may vary from year to year because of the state of the bunds or channel scouring/deposition, so apparent changes in peak flows from year to year are unlikely to be significant. There is also a topping-out effect in the lower Jubba, though such periods are usually much shorter than on the Shebelle. The magnitude of low flows is similarly subject to considerable uncertainty; bed levels change substantially from year to year so that the stage-discharge relationship is liable to change (particularly at low levels), but with few measurements of discharge available this cannot be quantified.

The rating equations for the gauging stations have in most cases been established by making many simultaneous measurements of river level and river flow. The main exception is Mareere on the river Jubba, where measurements were only available for very low river levels, and the rating equation was derived by extrapolation and correlations with data from Kaitoi. For all stations, river flows were measured indirectly by making measurements of flow velocity and water depth at several points across the river. Velocities were in all cases measured using a propeller meter (either hand held or suspended from a bridge or cableway). The rating equations, and their accuracy, are discussed in the final report of the Somalia Hydrometry Project.

Acknowledgements

In addition to the support of ODA and DILU, the work of the Hydrometry Project, and in particular the preparation of the Data Book and this companion volume of hydrographs, has benefitted extensively from the work of many previous projects. Of these the two most significant were projects supported by the Food and Agriculture Organisation (FAO) in 1963/64 and 1980/81. The former established the gauging network which has remained largely unaltered to the present day and in the latter the Consultant Hydrologist, B.A.P. Gemmell, undertook a very extensive programme of fieldwork, re-establishing several

stations which had fallen into disrepair, and carrying out numerous discharge measurements so that reliable rating equations could be derived. Finally, none of the work would have been possible without the work over the years of the Ministry of Agriculture's local gauge readers, many of whom have been keeping records for ten years or more.

Lugh Ganana

Uppermost station on the Jubba. Well defined rating. River levels received daily by radio in Mogadishu. Peak recorded flow approximately 1800 cumecs. Altitude 141m AMSL.

Bardheere

Station on mid Jubba. Approximately 2 days lag from Lugh Ganana but possibly slightly longer during flood events. Peak recorded flow approximately 1800 cumecs. River levels received daily by radio in Mogadishu. River valley well defined in reach Lugh Ganana - Bardheere so spillage losses small except during exceptional floods. Little irrigation in reach. Several tributaries flow into reach ; these are normally dry but can contribute considerable local runoff (several hundred cumecs) during local rainfall. Altitude 89m AMSL.

Kaitoi

Station first established in 1963 but only operated for two years. Re-established in 1972. Data generally of good quality but, since 1980, of no value for discharges due to construction of Fanoole barrage a short distance downstream. Approximately 3 days lag from Bardheere. Flow always in-bank ; bank full flow approximately 660 cumecs. Little irrigation in reach Bardheere - Kaitoi. Main spillage in reach occurs shortly upstream of Kaitoi.

Mareere

Station established in 1977 and operated by Jubba Sugar Project. Data of excellent quality but rating uncertain at high flows. Bank full flow approximately 625 cumecs. Much of reach from Kaitoi to Jamamme protected by flood bunds. Approximately 4 days lag from Bardheere. Since early 1980's, flows affected by abstractions by Fanoole irrigation project. Altitude 14m AMSL.

Kamsuma

Station established in 1972 by the Russian Selchozpromexport project and operated for 4 years. Re-established in 1988 by the Somalia Hydrometry Project. Flow always in-bank ; bank full flow approximately 510 cumecs. Data generally of good quality. Affected by pumped abstractions by Jubba sugar project and other smaller schemes.

Jamamme

Lowermost station on the Jubba. Established in 1963 but only operated intermittently since then. Flow always in-bank; bank full flow approximately 480 cumecs. Since mid 1980's, spillages upstream reduced by Mogambo flood relief canal. Low flows affected by pumped abstractions from Mogambo Irrigation scheme. Exceptionally, flows may be affected by drainage from the catchment of the lower Shebelli and by return flows from old river channels of the Jubba. Possibly some tidal influence at the station as it is at sea level.

TABLE 1 - Hydrological characteristics of the Jubba gauging stations

Beled Weyn

Uppermost station on the Shebelli. Well defined, stable rating for in-bank flows. Flood plain several kilometres wide so flood flows passing Beled Weyn can be considerably greater than indicated by rating. Peak recorded flow approximately 500 cumecs from rating, but actual peak flow estimated to be about 1400 cumecs. River levels received daily by radio in Mogadishu. Altitude 176m AMSL.

Bulo Burti

Important station for monitoring progress of floods. Approximately 2 days lag from Beled Weyn whilst flow in-bank, but much longer during flood events. Flood plain in reach Beled Weyn - Bulo Burti bounded by low hills so much of spilled flow returns as flood subsides. Little irrigation in reach. Several minor tributaries flow into reach ; these are normally dry but can contribute considerable runoff (typically less than 100 cumecs) during local rainfall. Altitude 134m AMSL.

Mahaddey Weyn

Important station for operation of Jowhar Offstream reservoir and SNAI sugar estate. Approximately 2 days lag from Bulo Burti but can be longer during flood events. Main spillage upstream of station occurs in region of Duduble flood relief canal. Little irrigation in reach Bulo Burti - Mahaddey Weyn. Flows at station always in-bank. Bank full flow increased from 1980 due (probably) to engineering works associated with construction of Jowhar Offstream reservoir. Bank full flow was approximately 140 cumecs until 1979 and 164 cubic metres per second from 1980. Altitude 105m AMSL.

Balcad

Operated until construction of Balcad barrage (in 1979 approx.). Well defined rating. Data intermittent but of good quality. Approximately 2 days lag from Mahaddey Weyn. Considerable irrigation in region of Balcad. Flow always in-bank ; bank full flow approximately 95 cumecs.

Afgoi

Nearest station to Mogadishu. Data quality generally good. Since 1980, low flows have been affected by releases from Jowhar Offstream Reservoir. Low flows also sometimes show weekly cycle (since 1987 approx.) due to irrigation abstractions upstream. Approximately 3 days lag from Mahaddey Weyn. Flow always in-bank ; bank full flow approximately 95 cumecs. Flood spillages occur mainly in the reach Mahaddey Weyn - Balcad but, since 1980, have been greatly reduced by operation of the supply canal to Jowhar Offstream reservoir. Altitude 77m AMSL.

Audegle

Lowermost station on the Shebelli. Many periods of missing or poor data. Rating affected since mid 1980's by collapse of road bridge and not yet fully re-established. Approximately 1 day lag from Afgoi. Low flows sometimes show same weekly cycle as at Afgoi. Many small scale irrigation schemes in reach Afgoi - Audegle. Flow always in-bank; bank full flow approximately 82 cumecs. Altitude 70m AMSL.

TABLE 1 (cont.) - Hydrological characteristics of the Shebelli gauging stations

River Jubba: Percentages of original data available for each station for the period 1963 - 1989

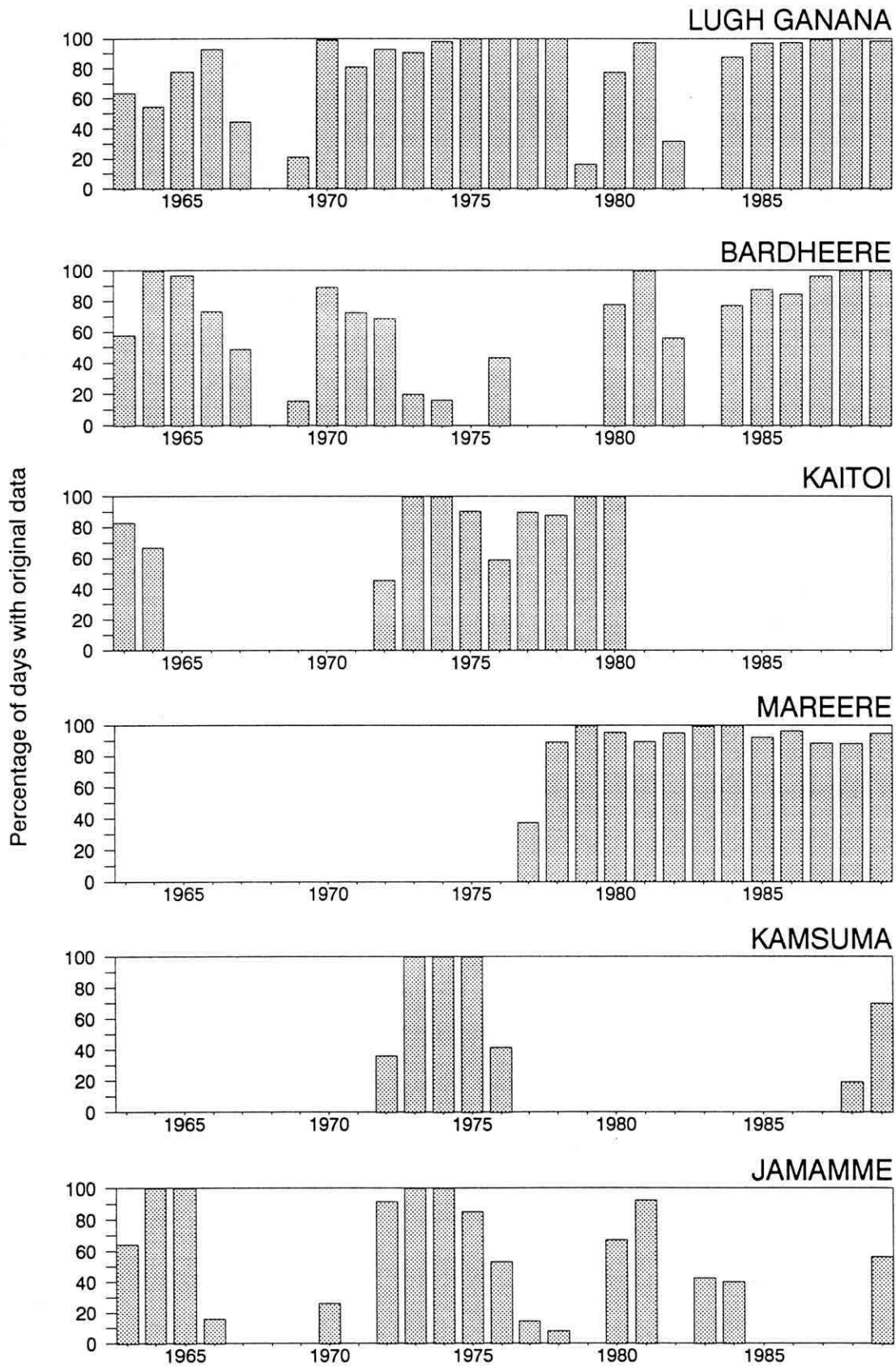
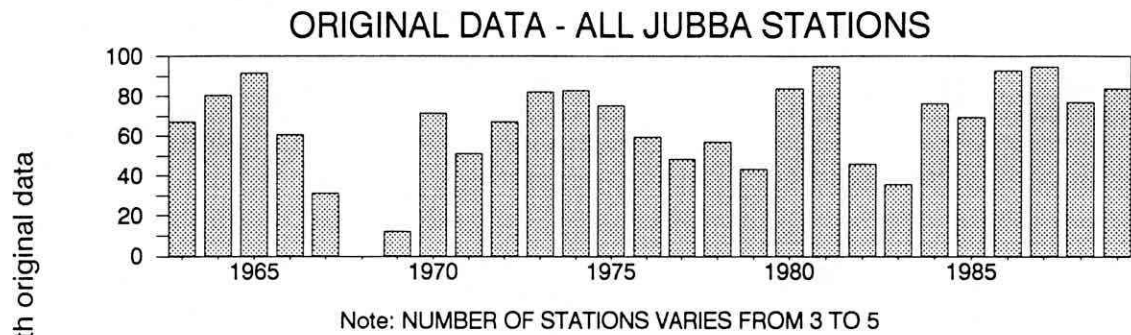
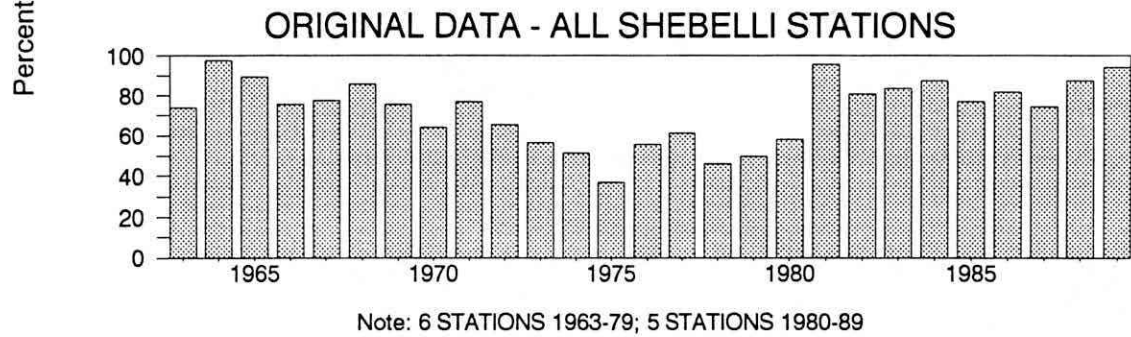


Figure 2a

Average percentages of original data available for all stations for the period 1963 - 1989 (a) River Jubba (b) River Shebelli



(a)



(b)

Figure 3

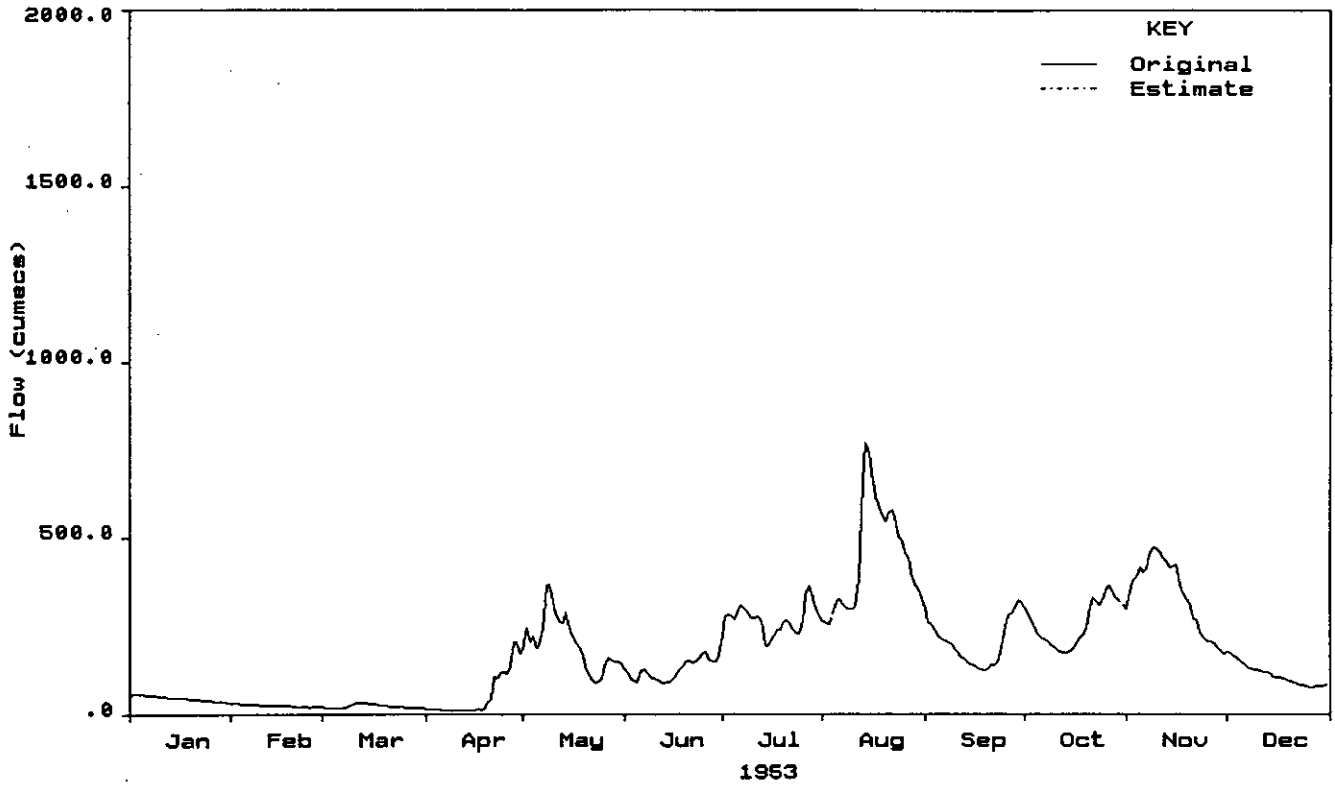
2. DAILY FLOW HYDROGRAPHS

LUGH GANANA

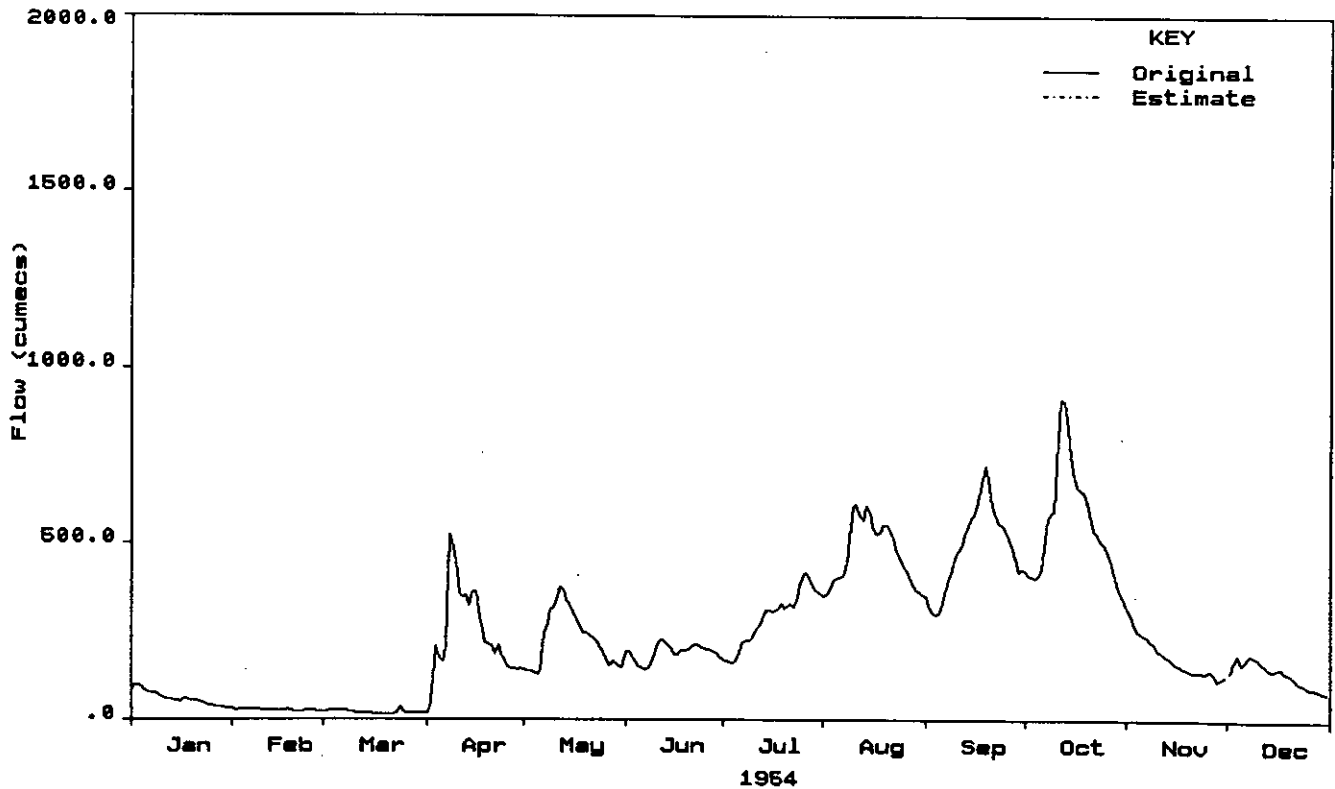
1951 - 1989

River Jubba at Lugh Ganana

1953

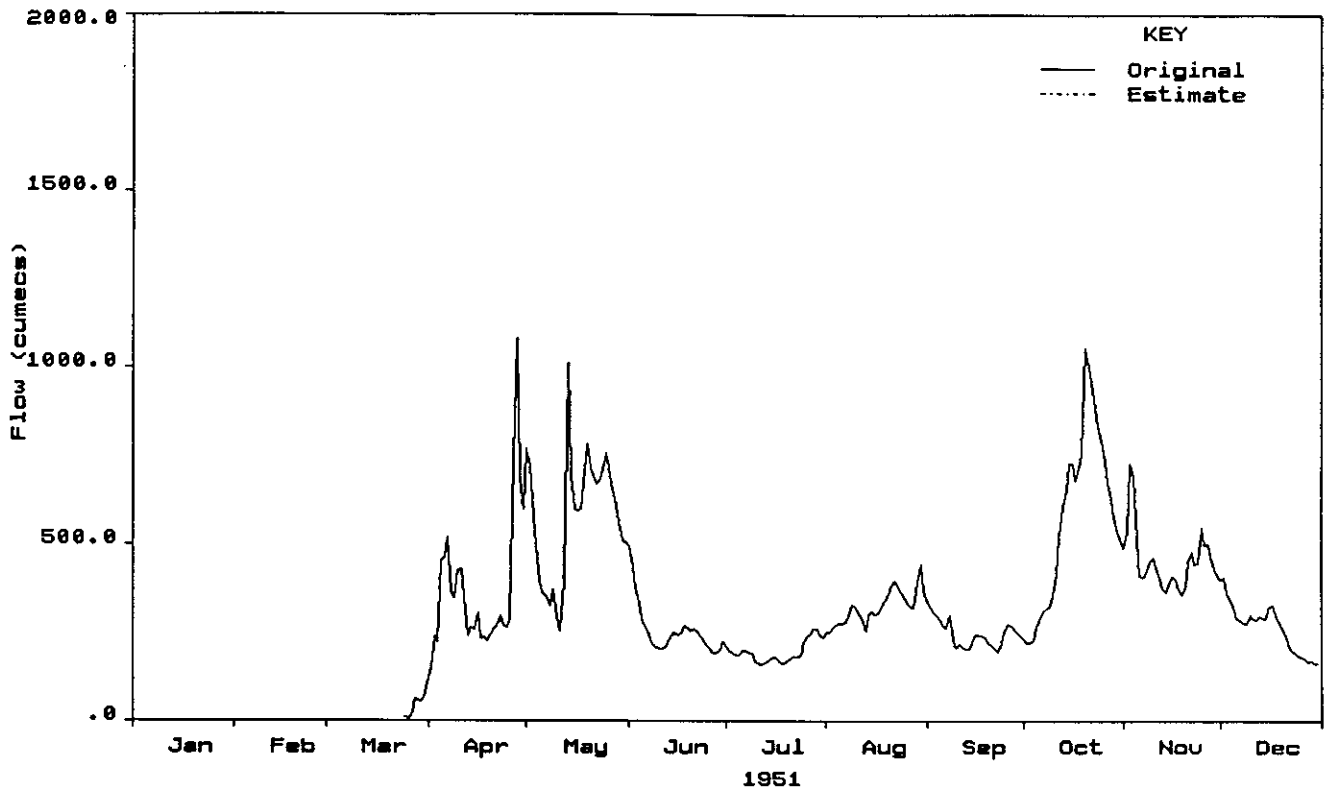


1954

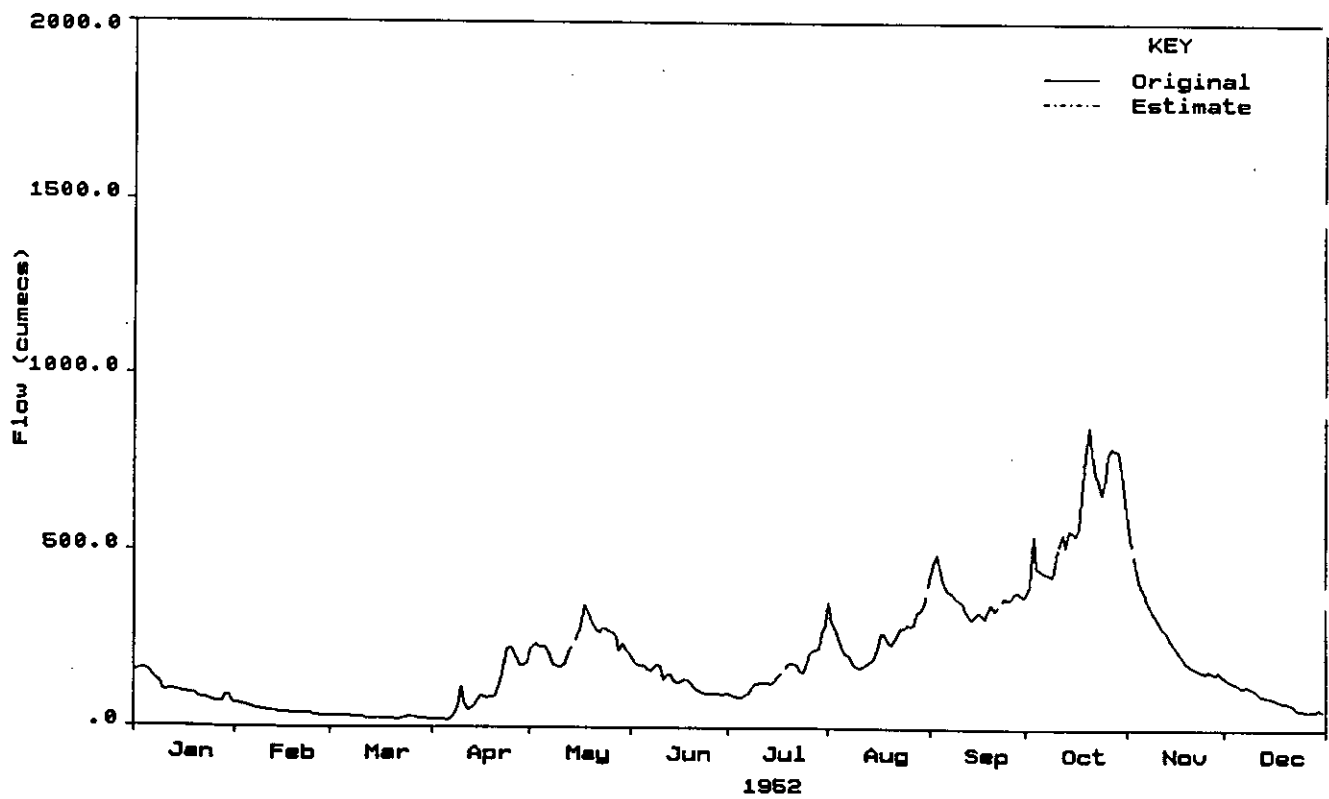


River Jubba at Lugh Ganana

1951

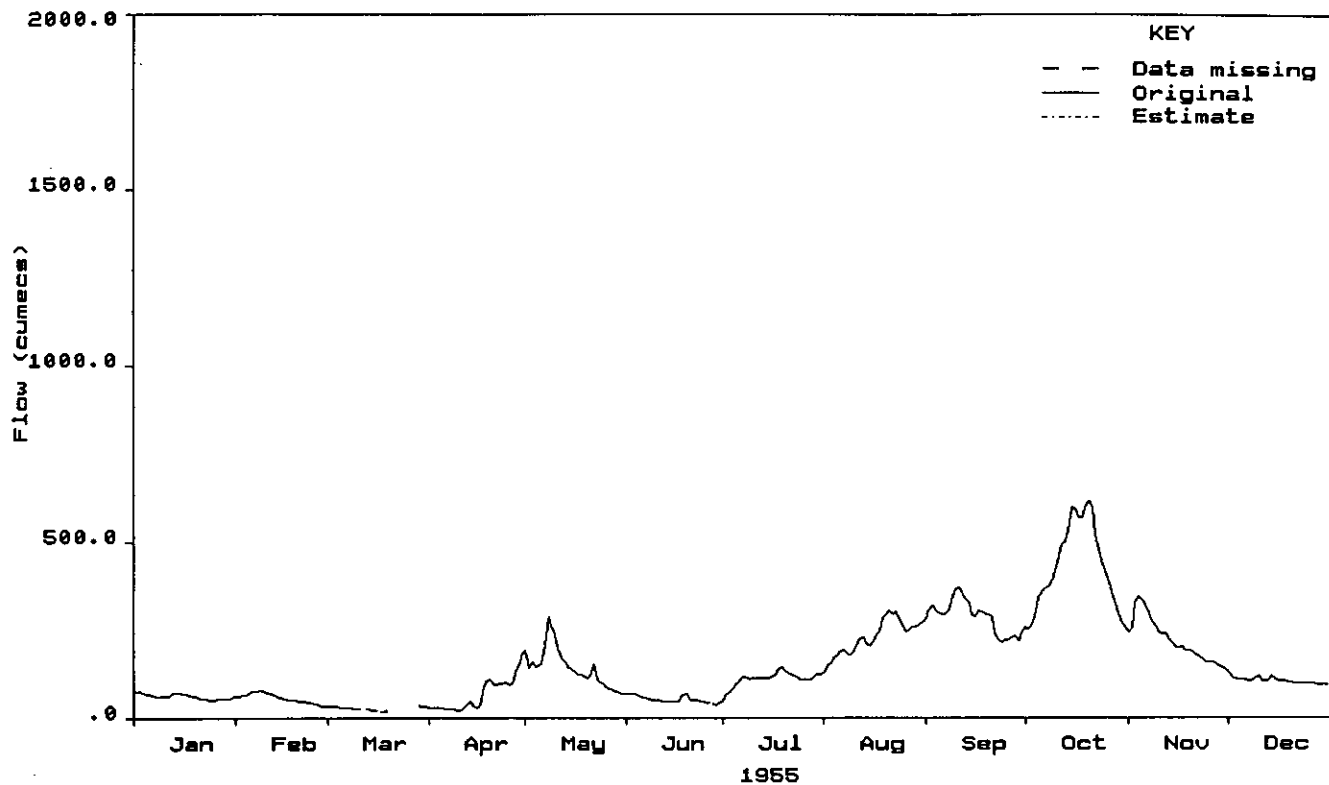


1952

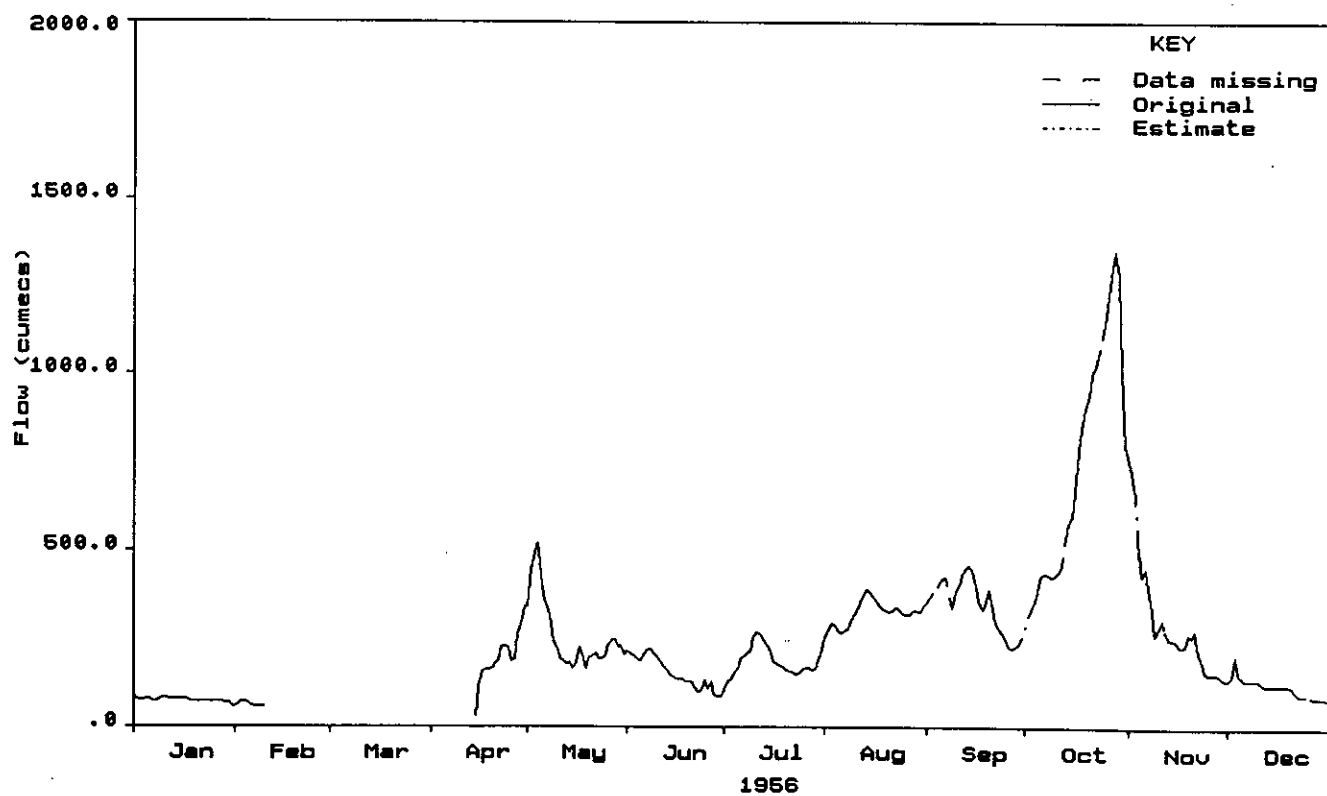


River Jubba at Lugh Ganana

1955

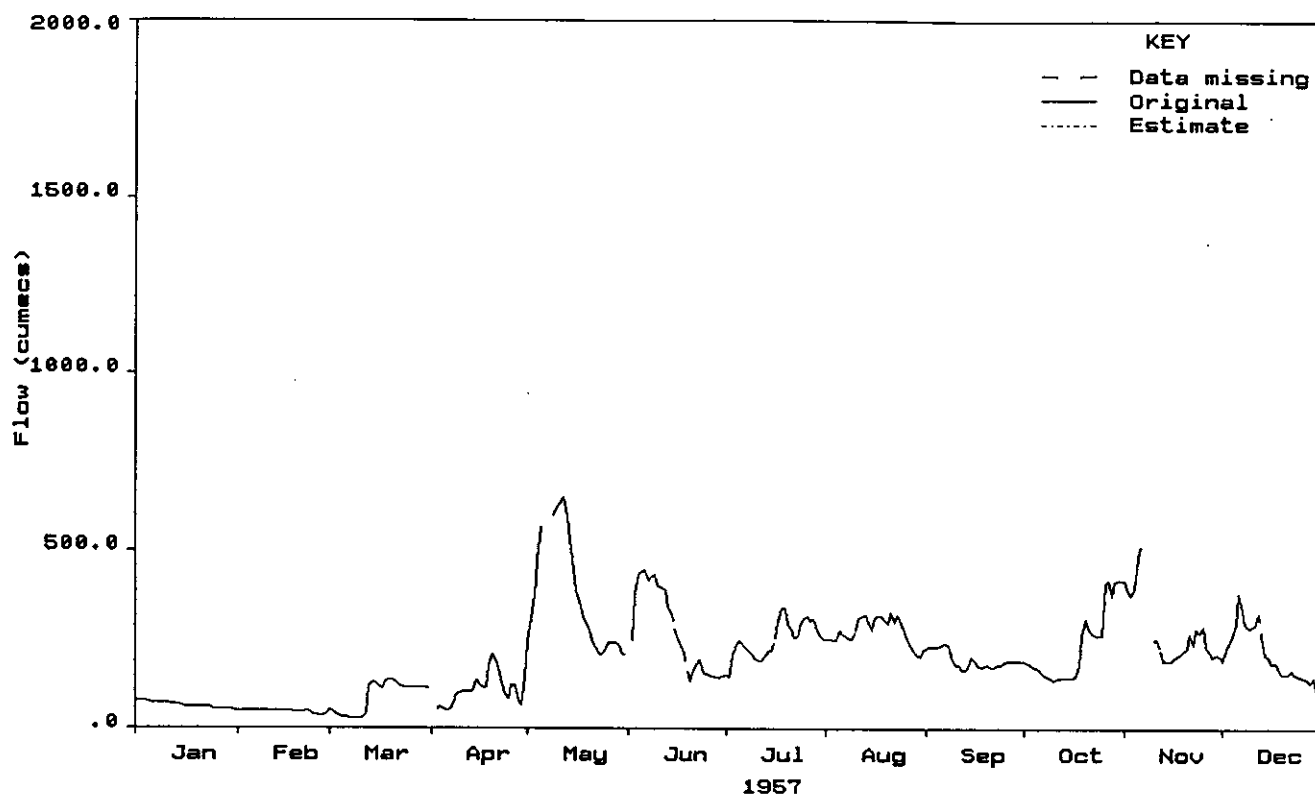


1956

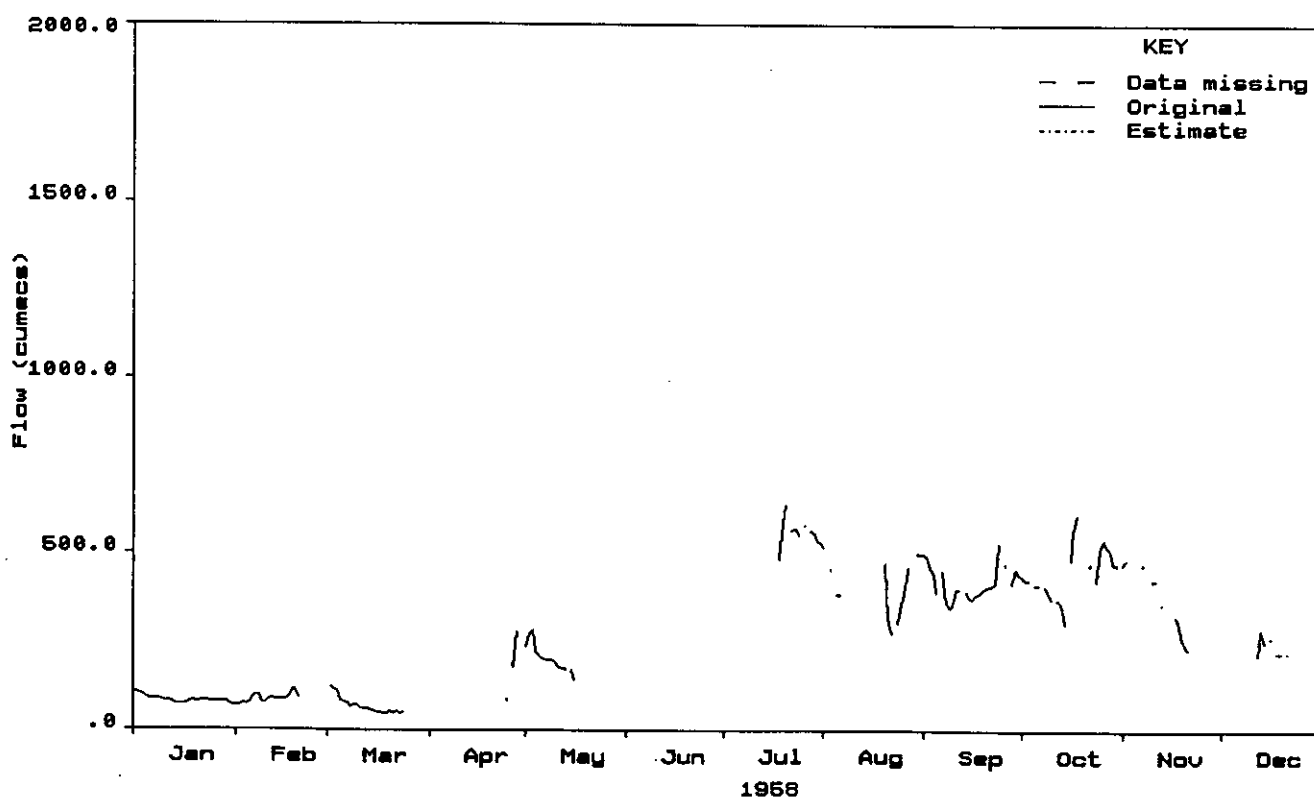


River Jubba at Lugh Ganana

1957

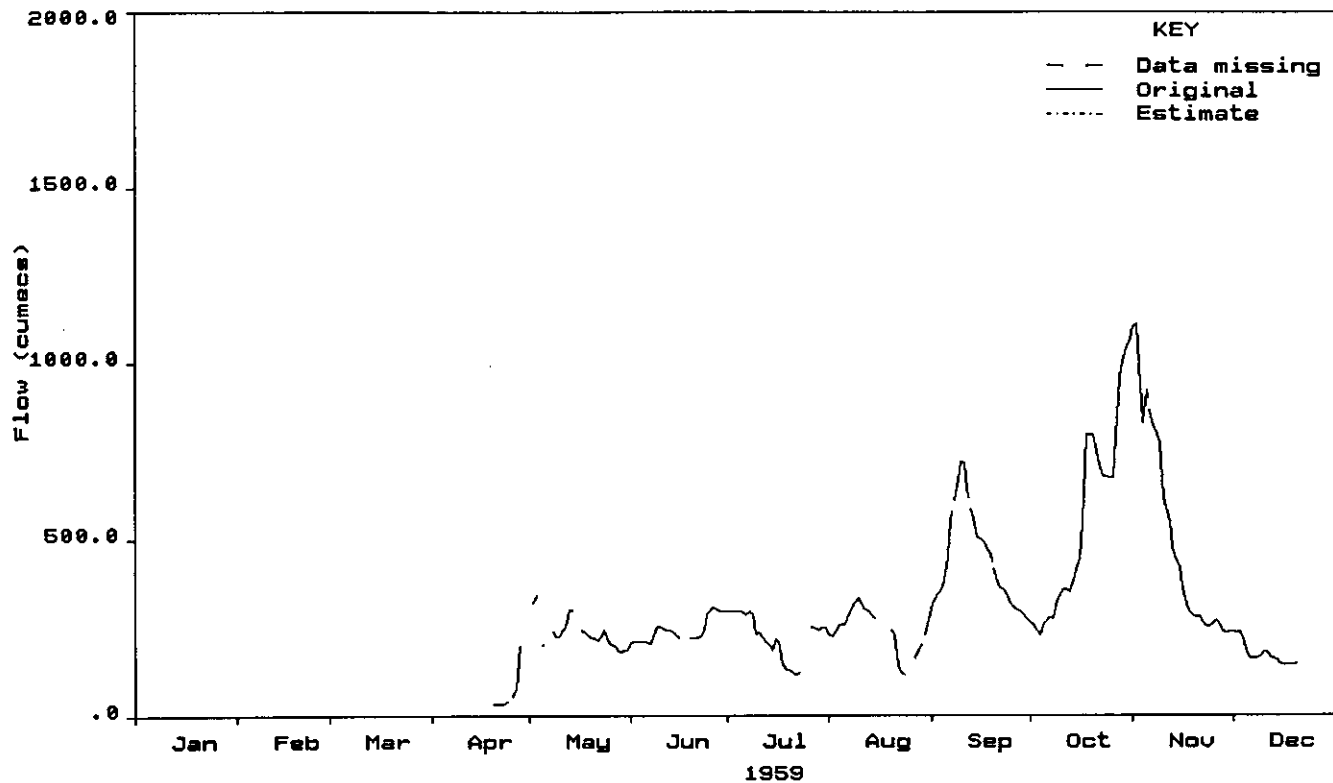


1958

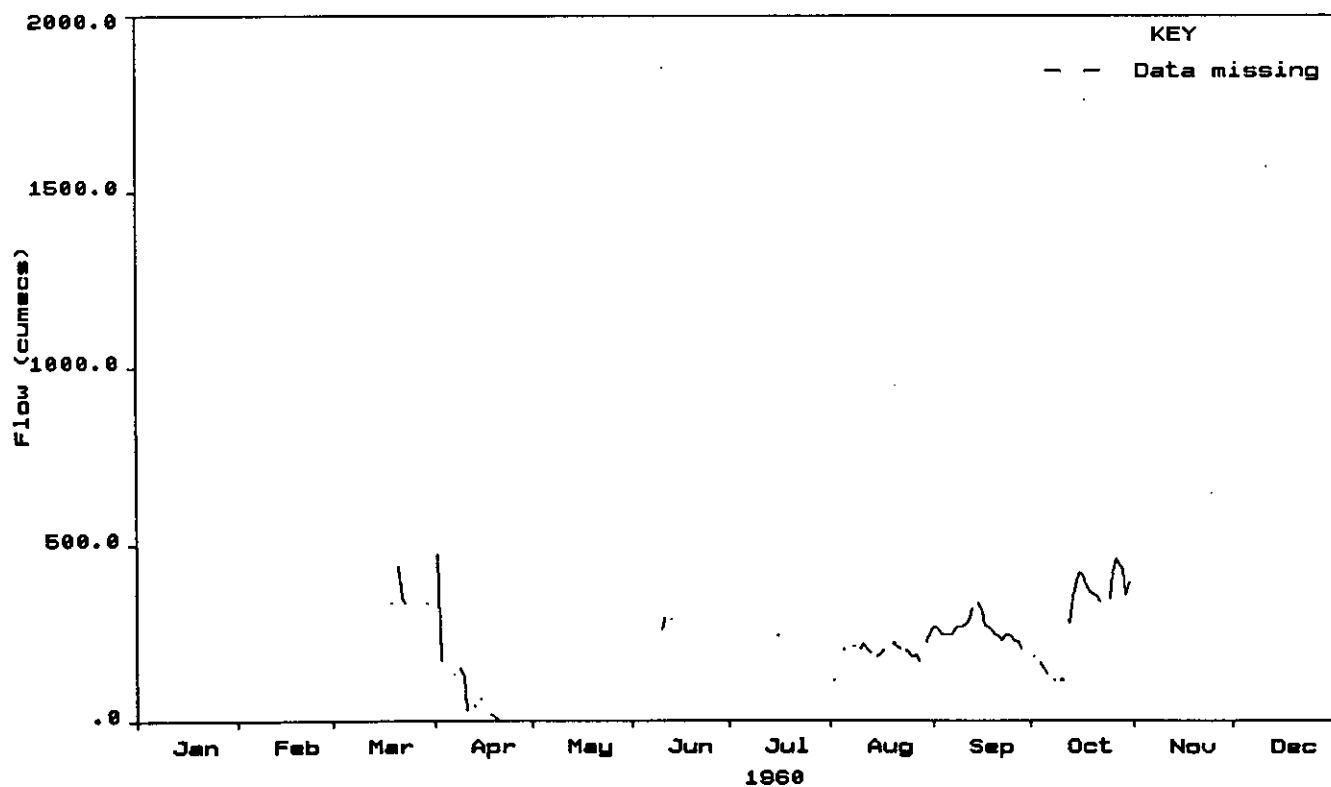


River Jubba at Lugh Ganana

1959

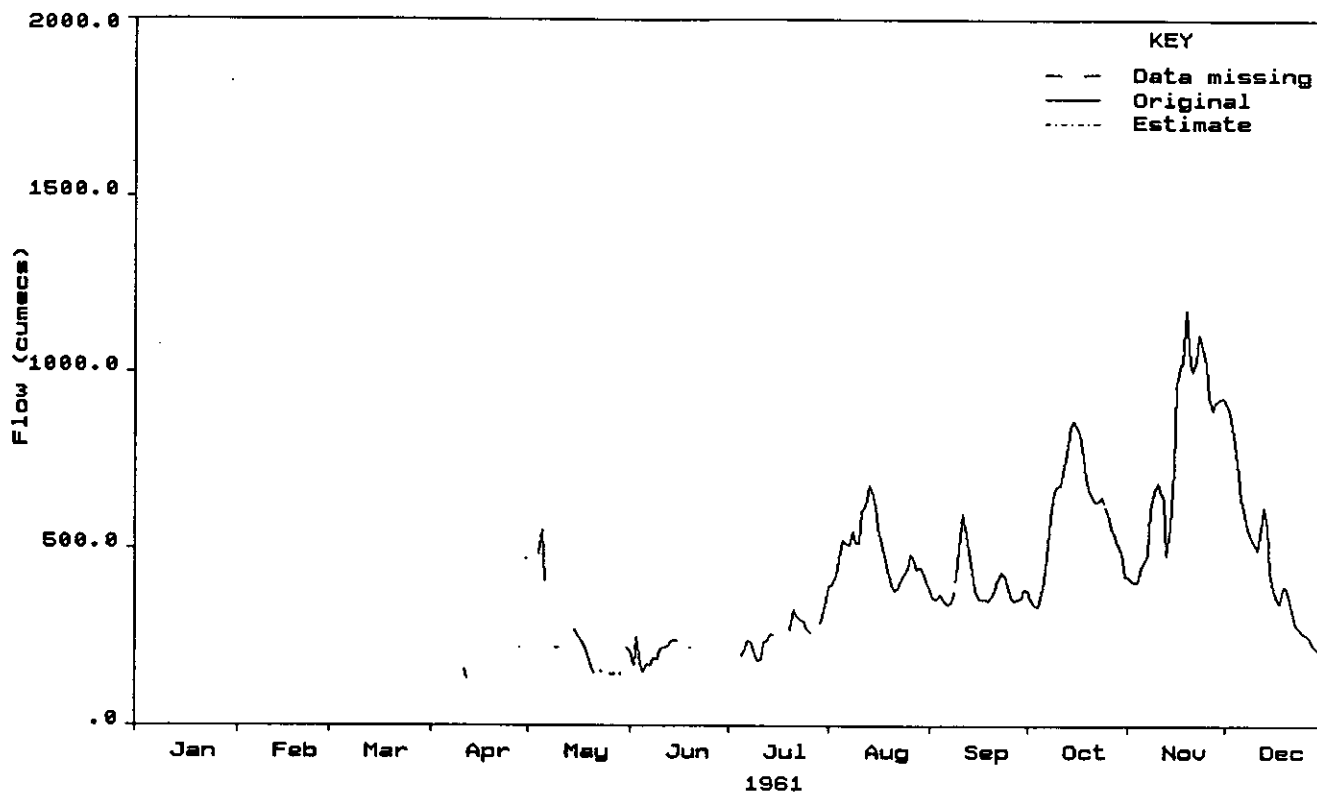


1960

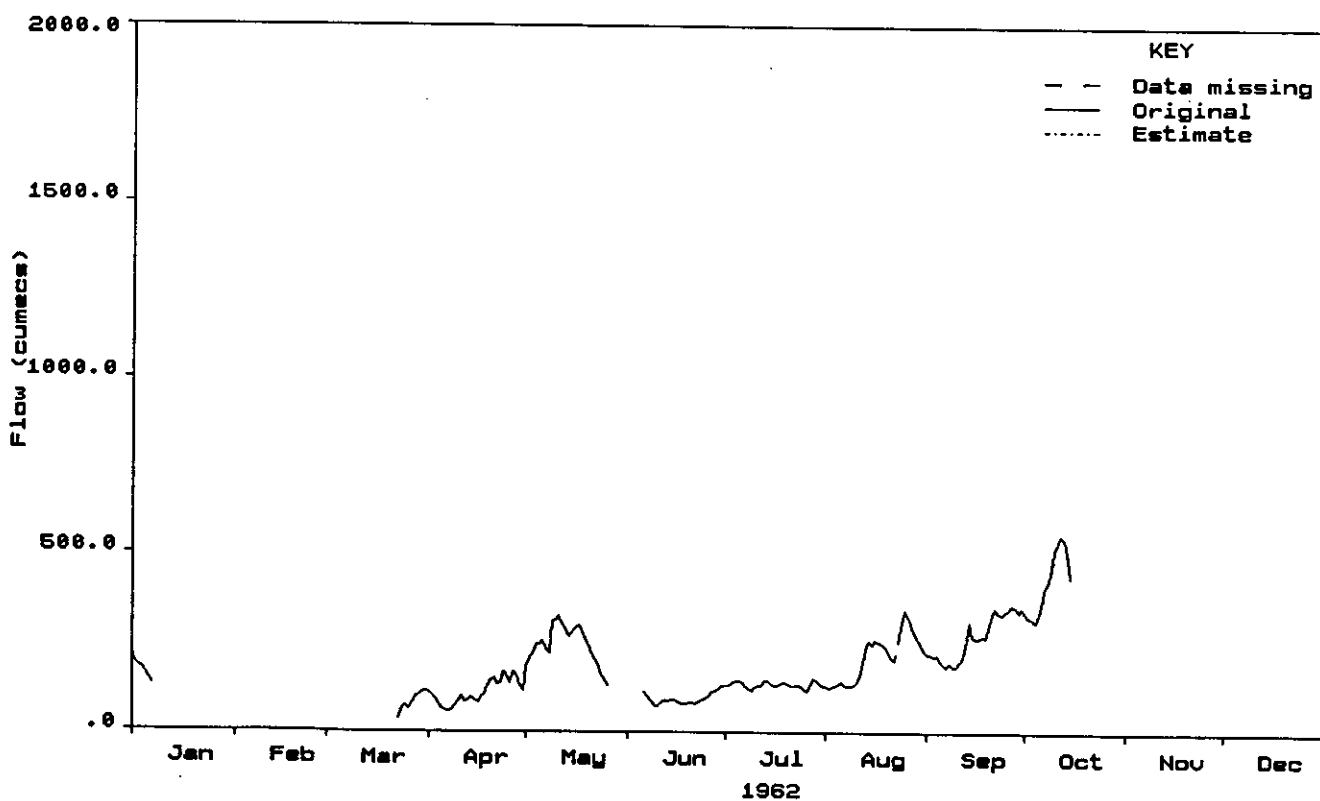


River Jubba at Lugh Ganana

1961

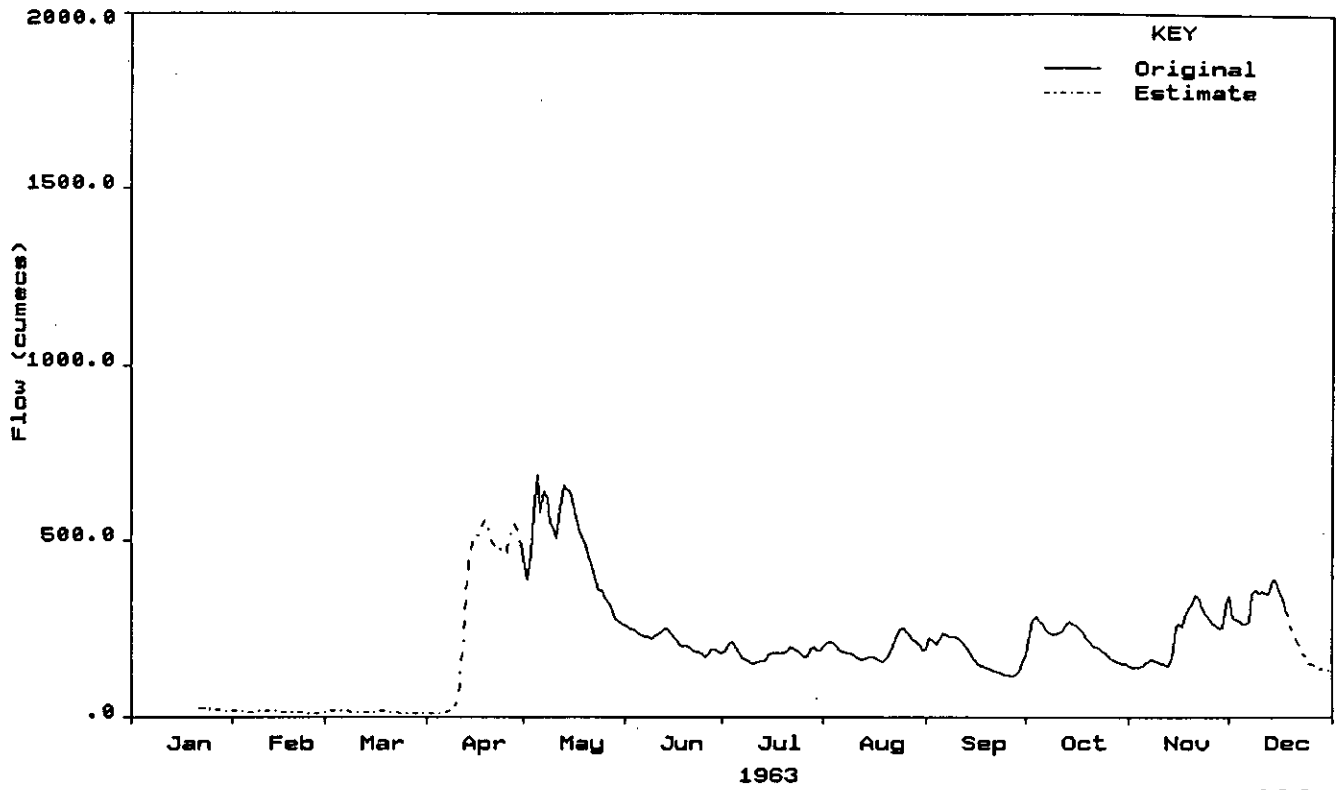


1962

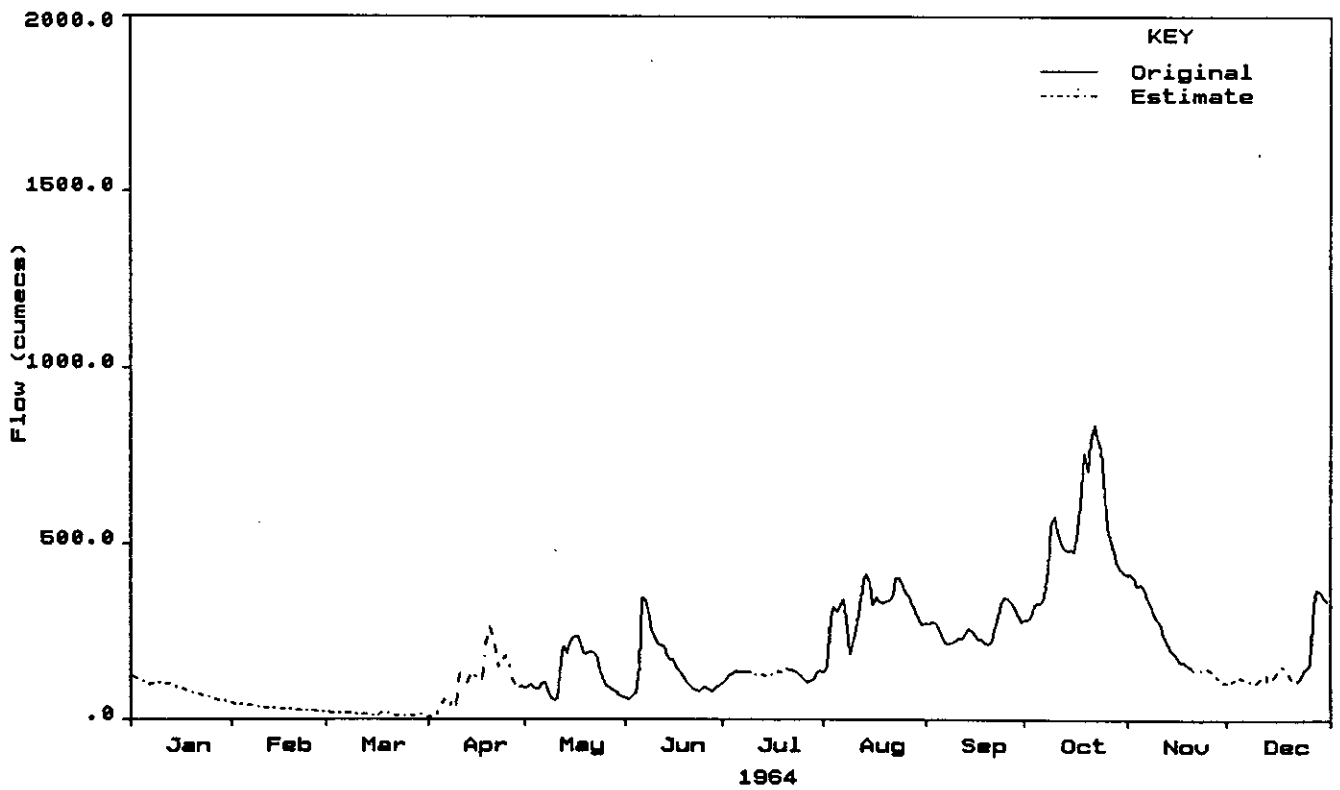


River Jubba at Lugh Ganana

1963

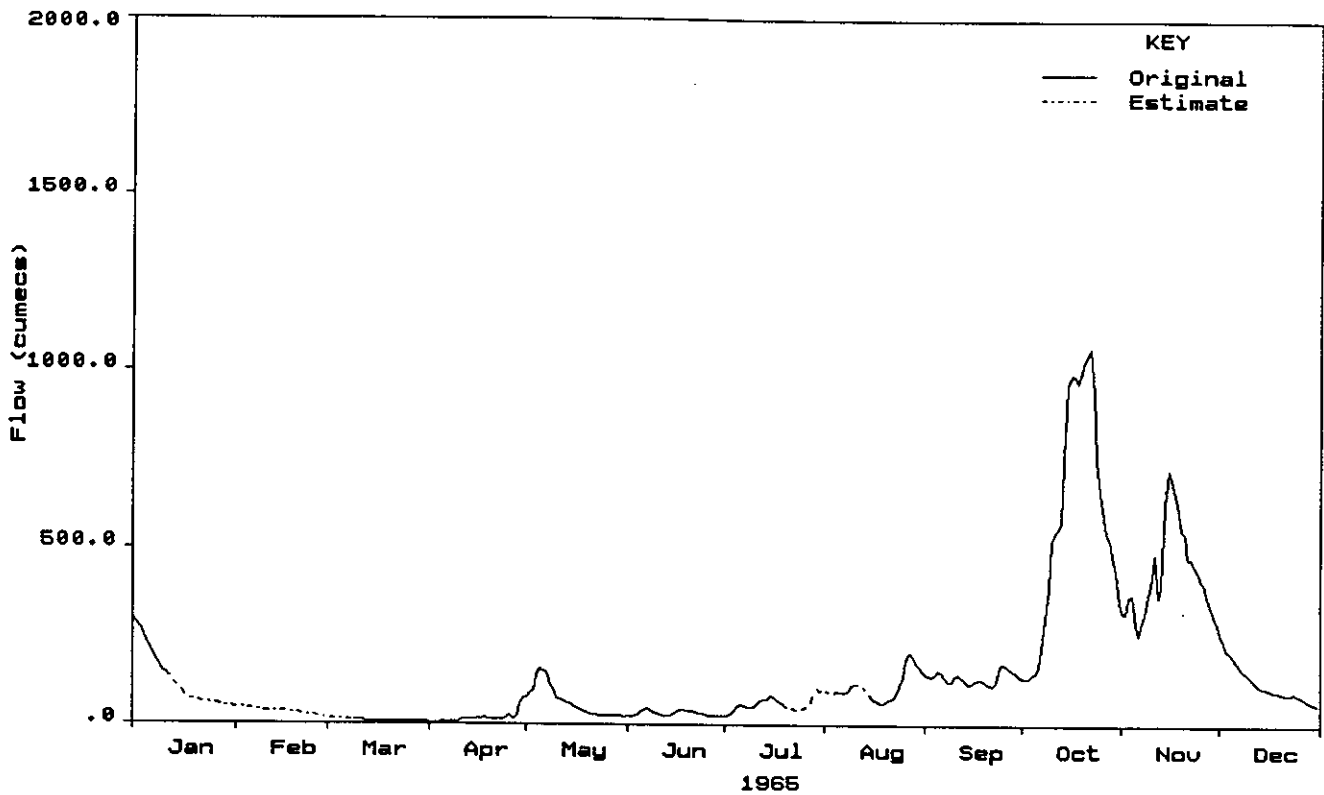


1964

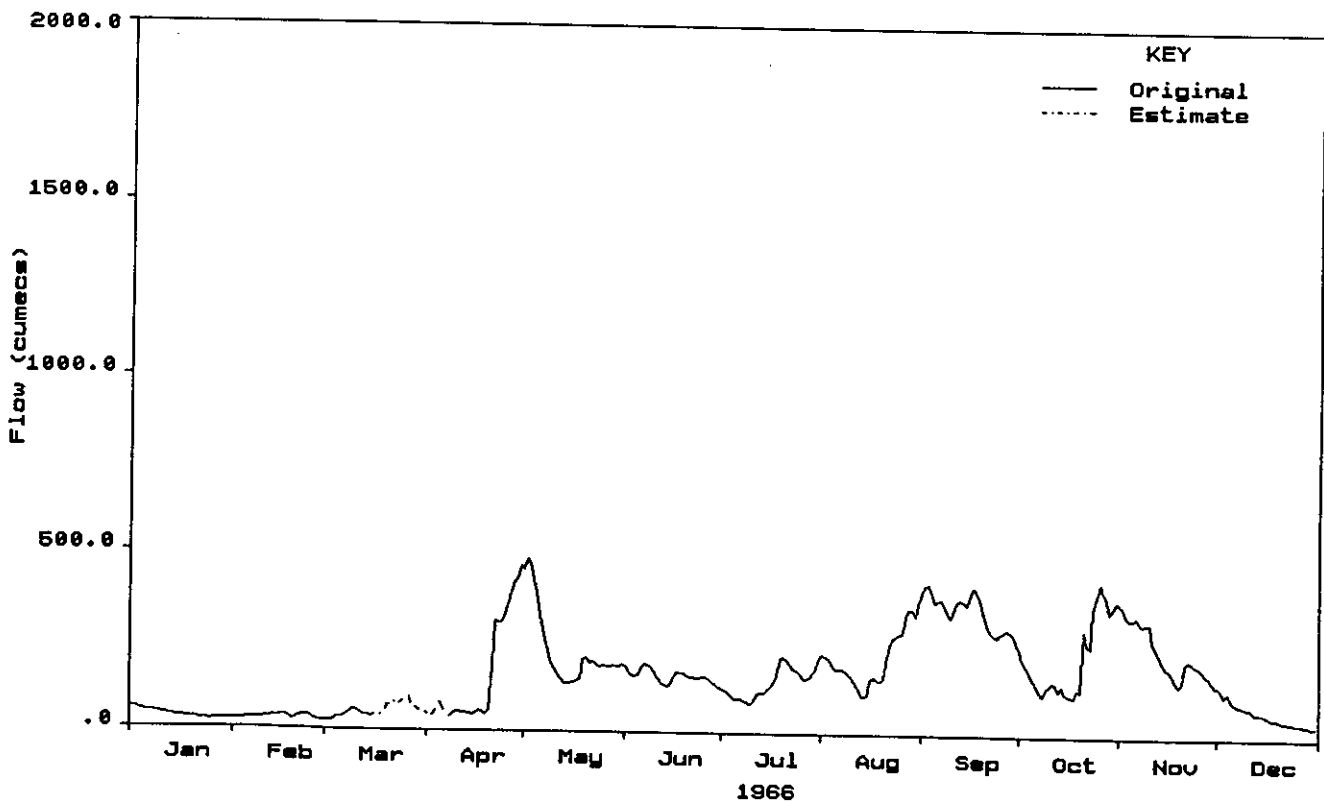


River Jubba at Lugh Ganana

1965

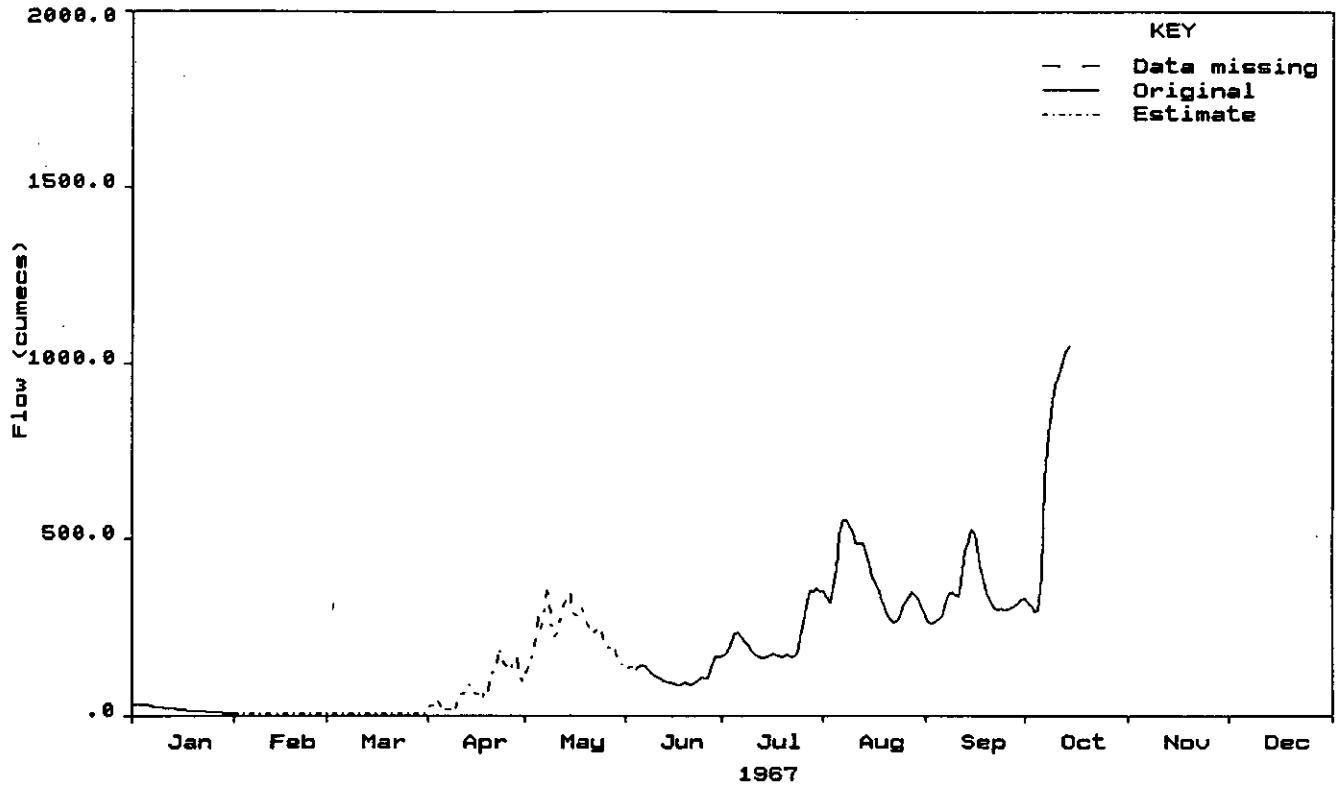


1966

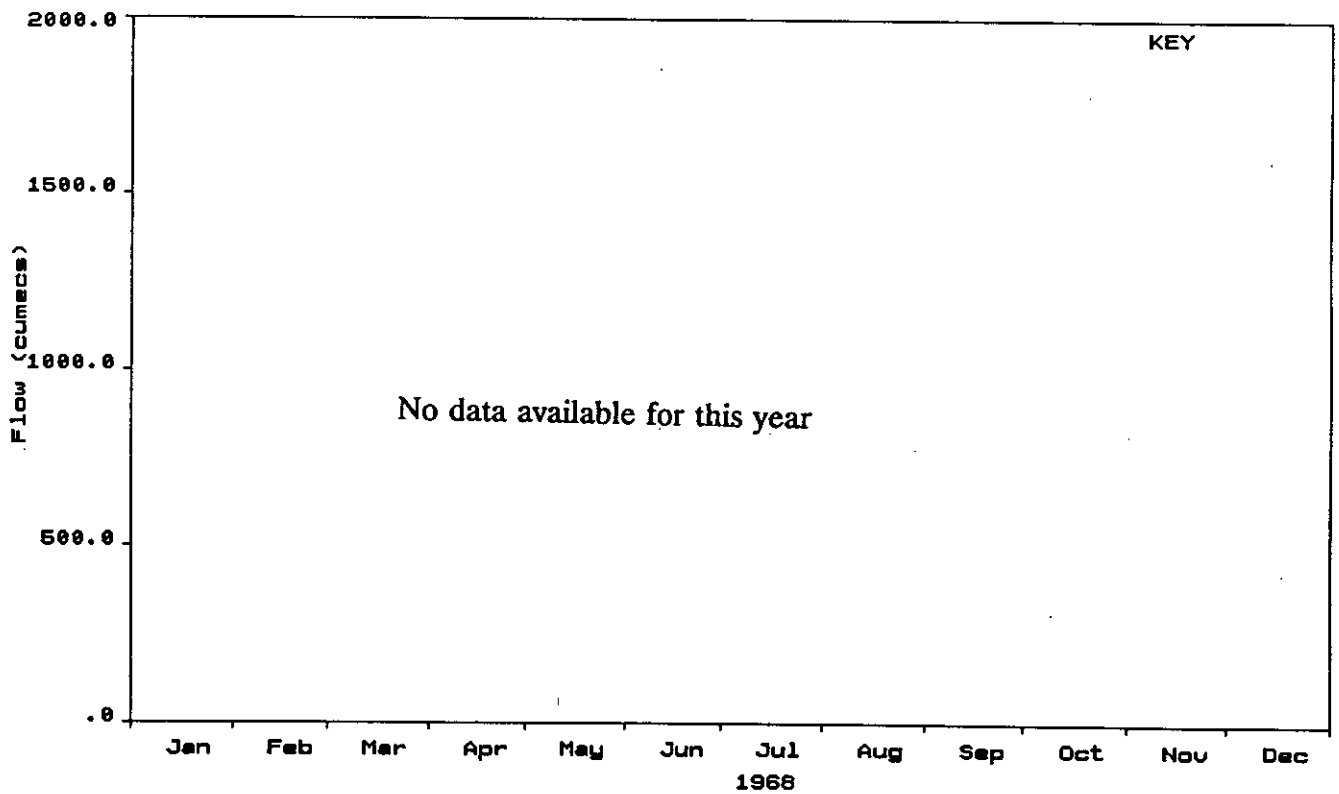


River Jubba at Lugh Ganana

1967

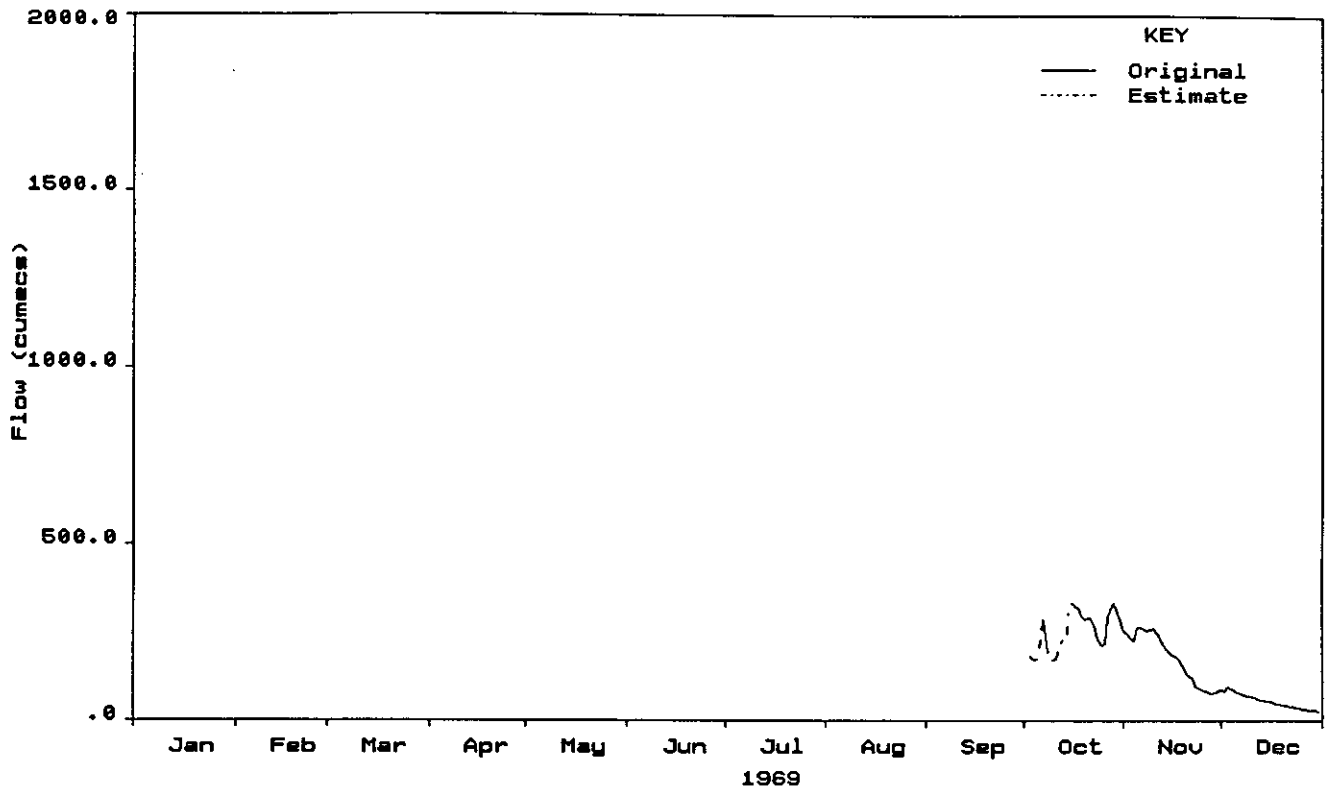


1968

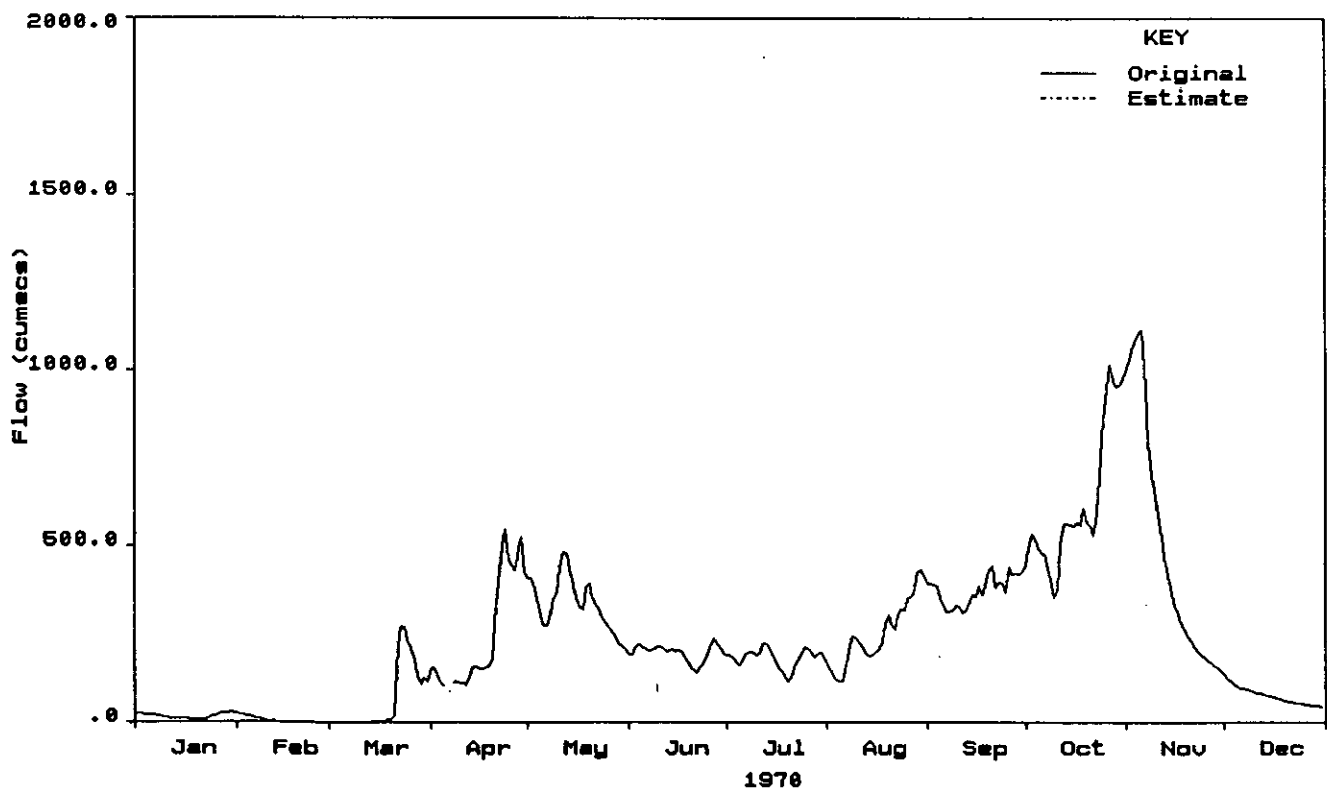


River Jubba at Lugh Ganana

1969

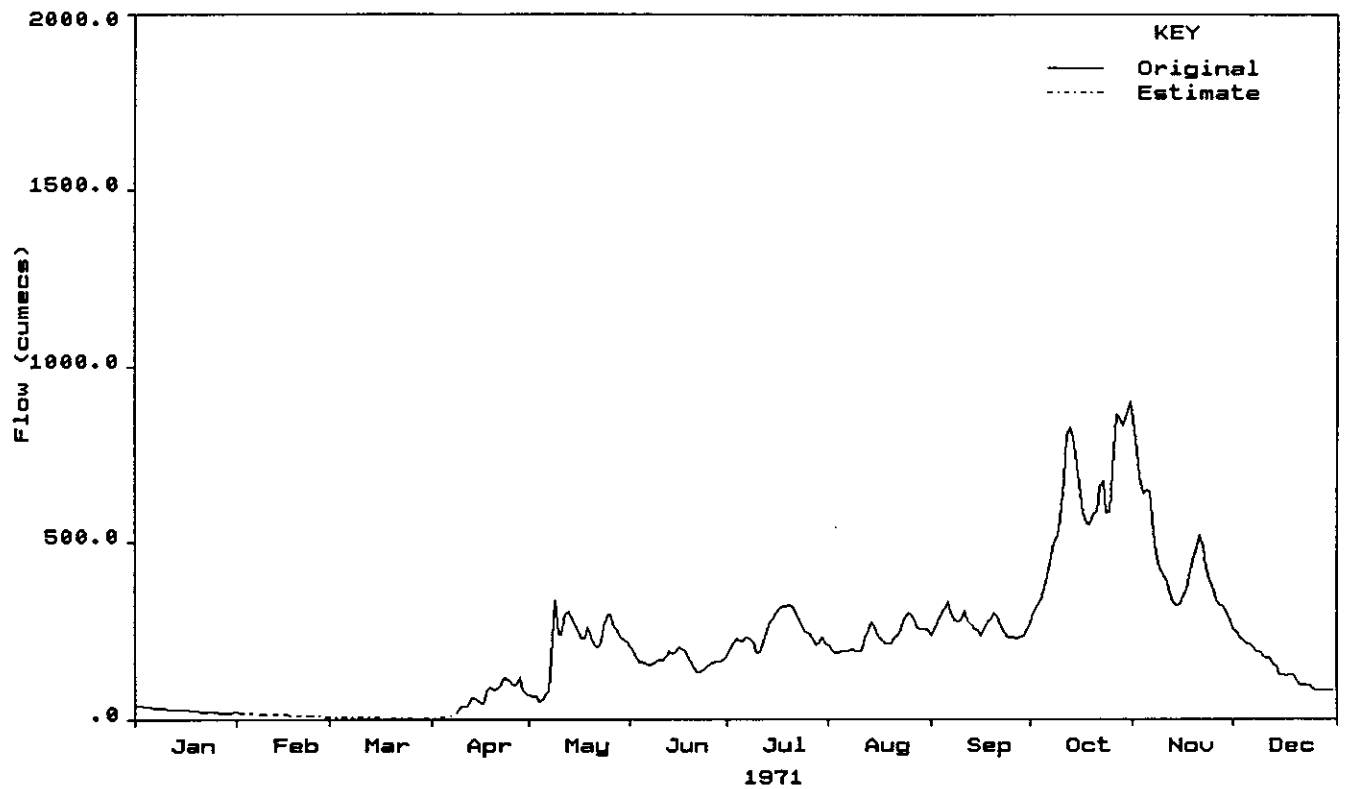


1970

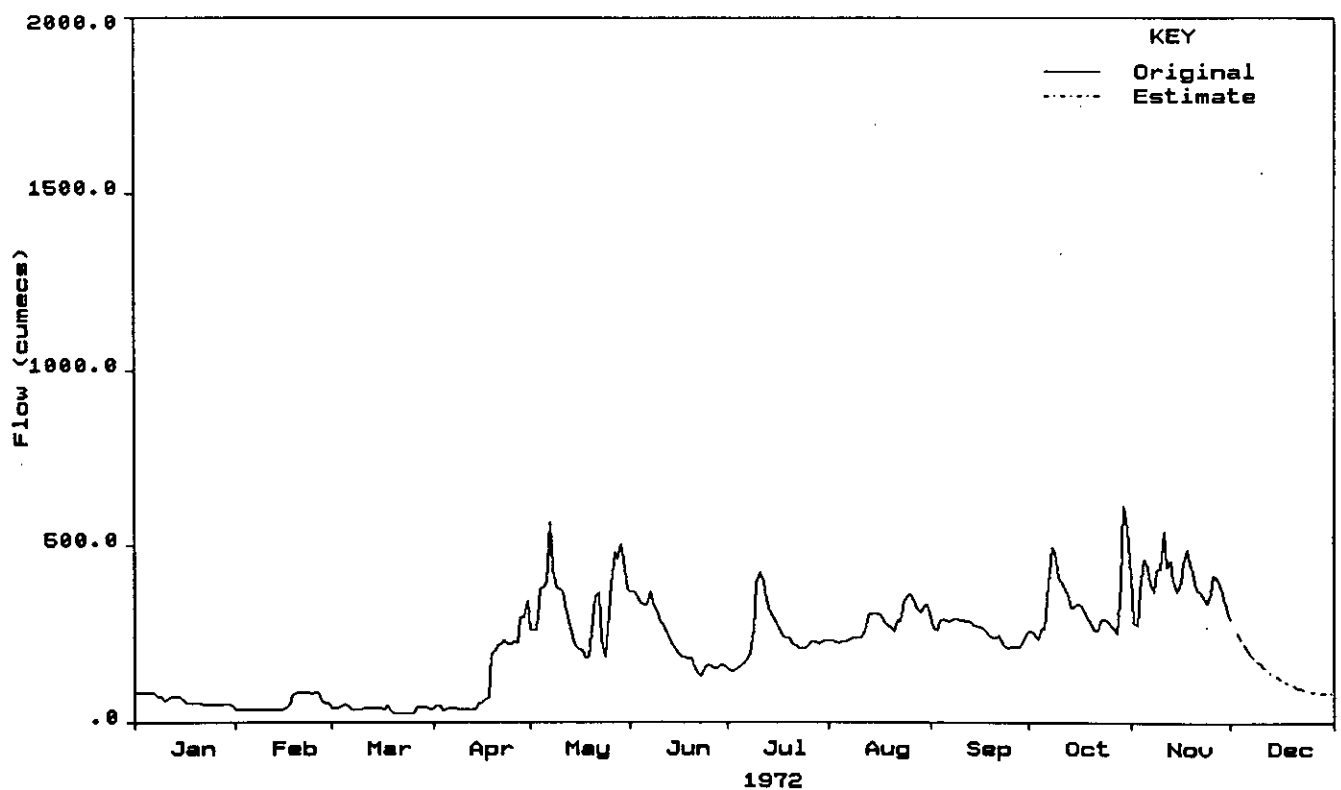


River Jubba at Lugh Ganana

1971

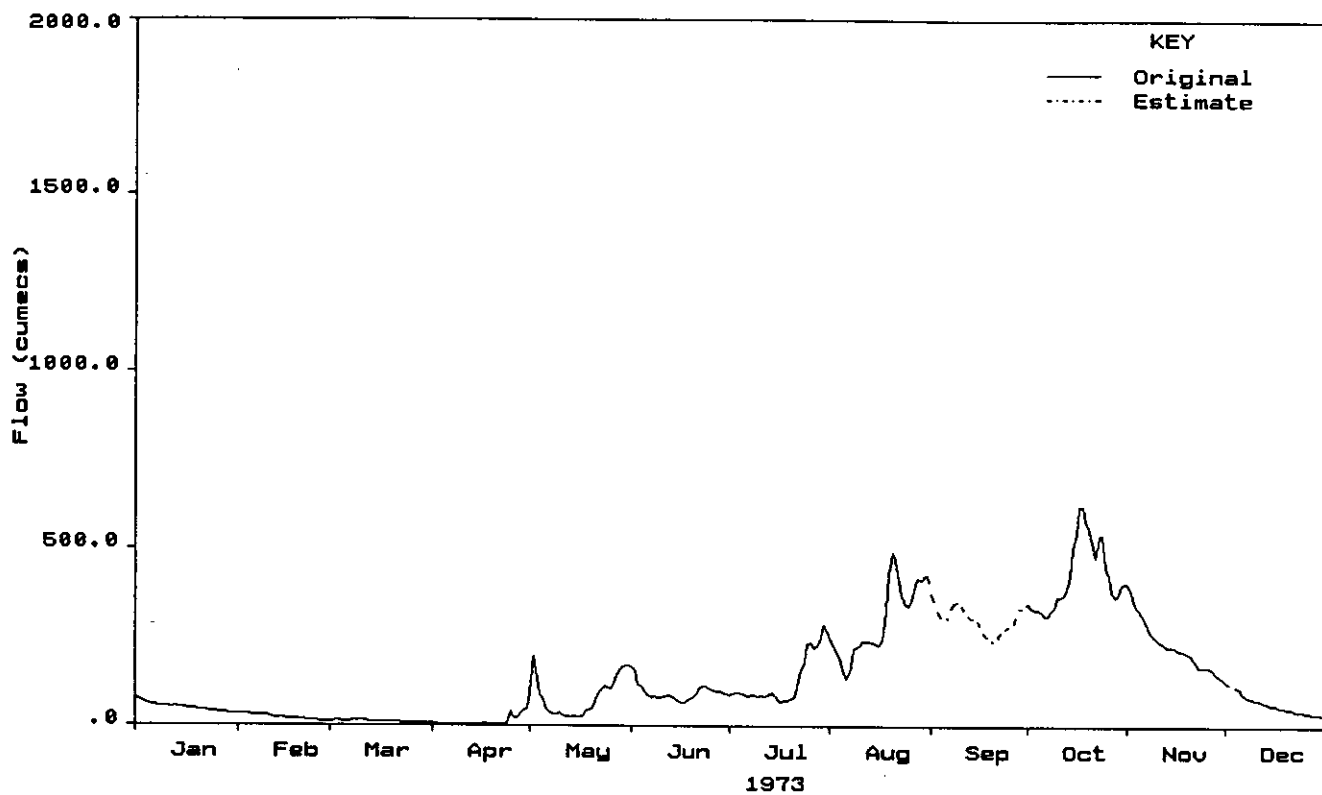


1972

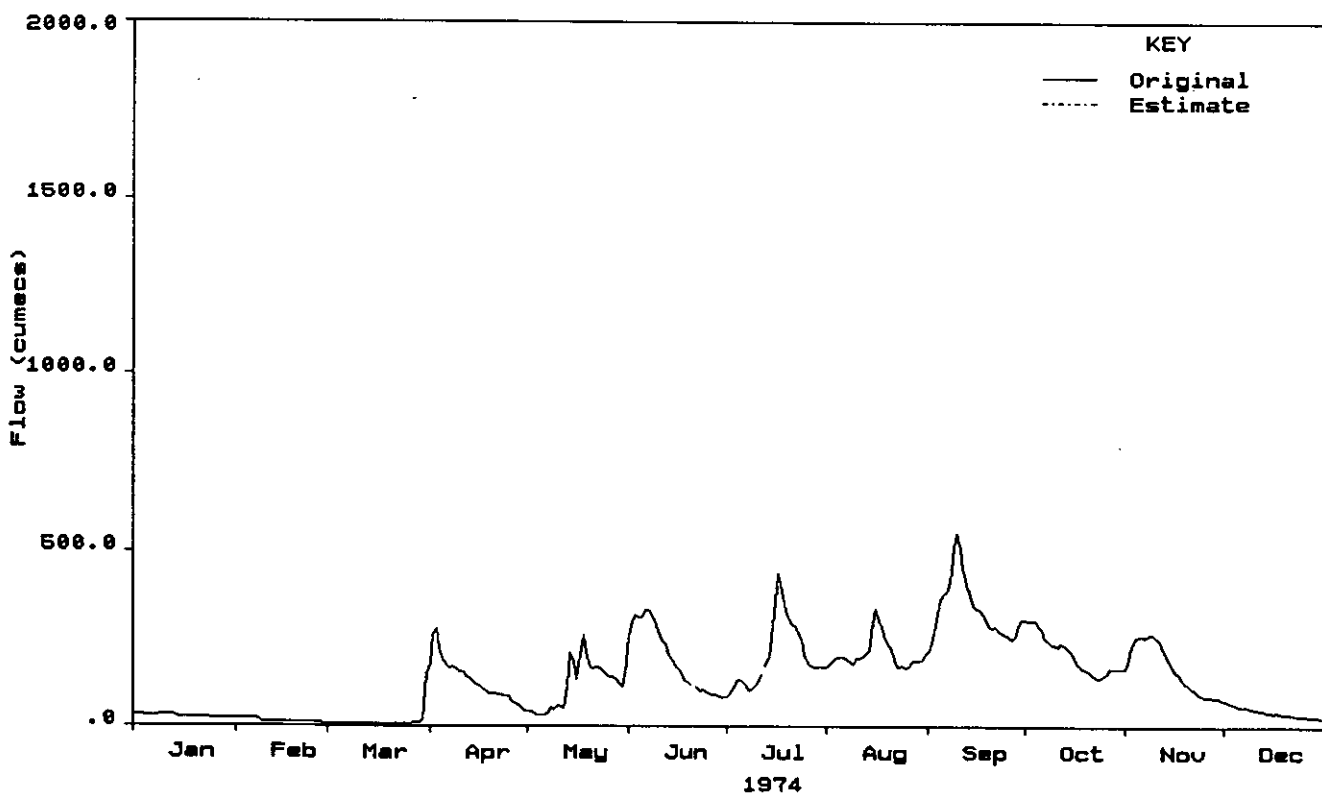


River Jubba at Lugh Ganana

1973

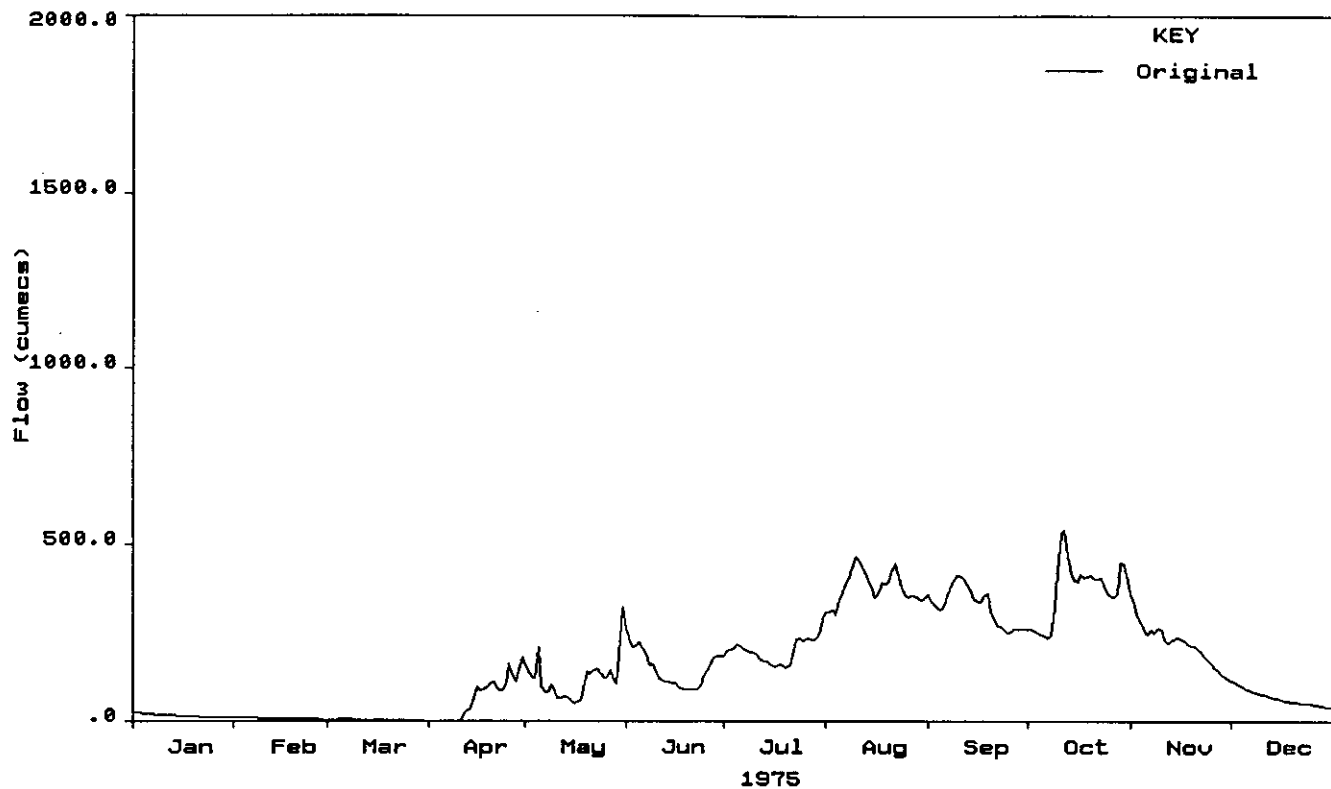


1974

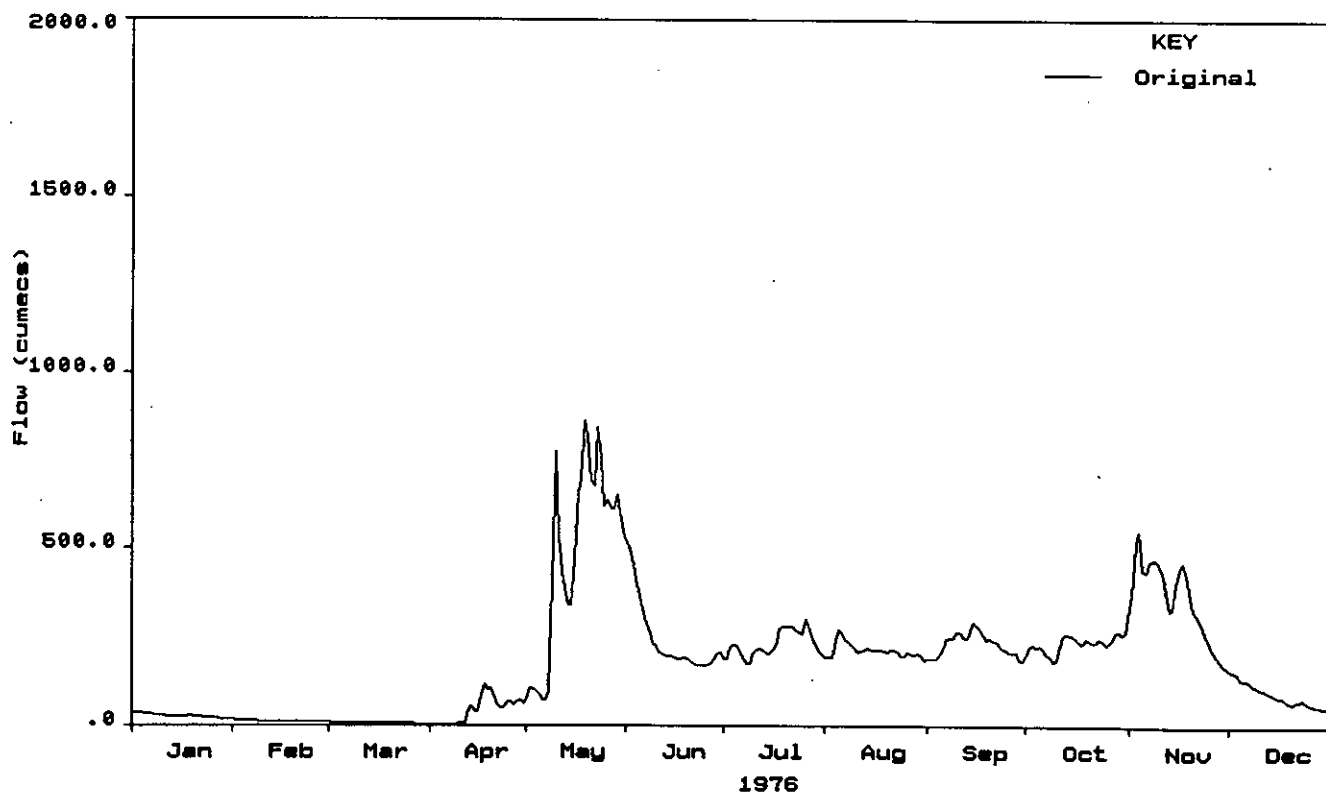


River Jubba at Lugh Ganana

1975

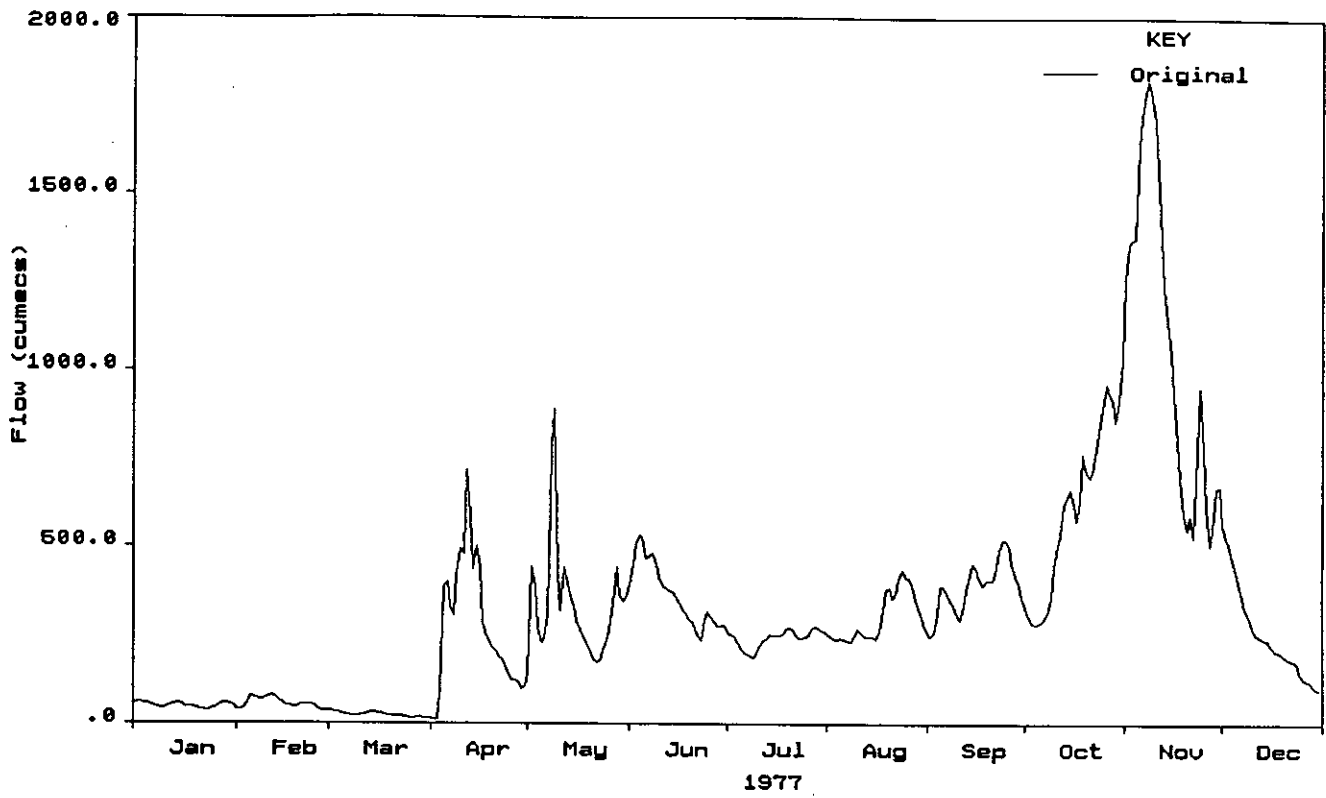


1976

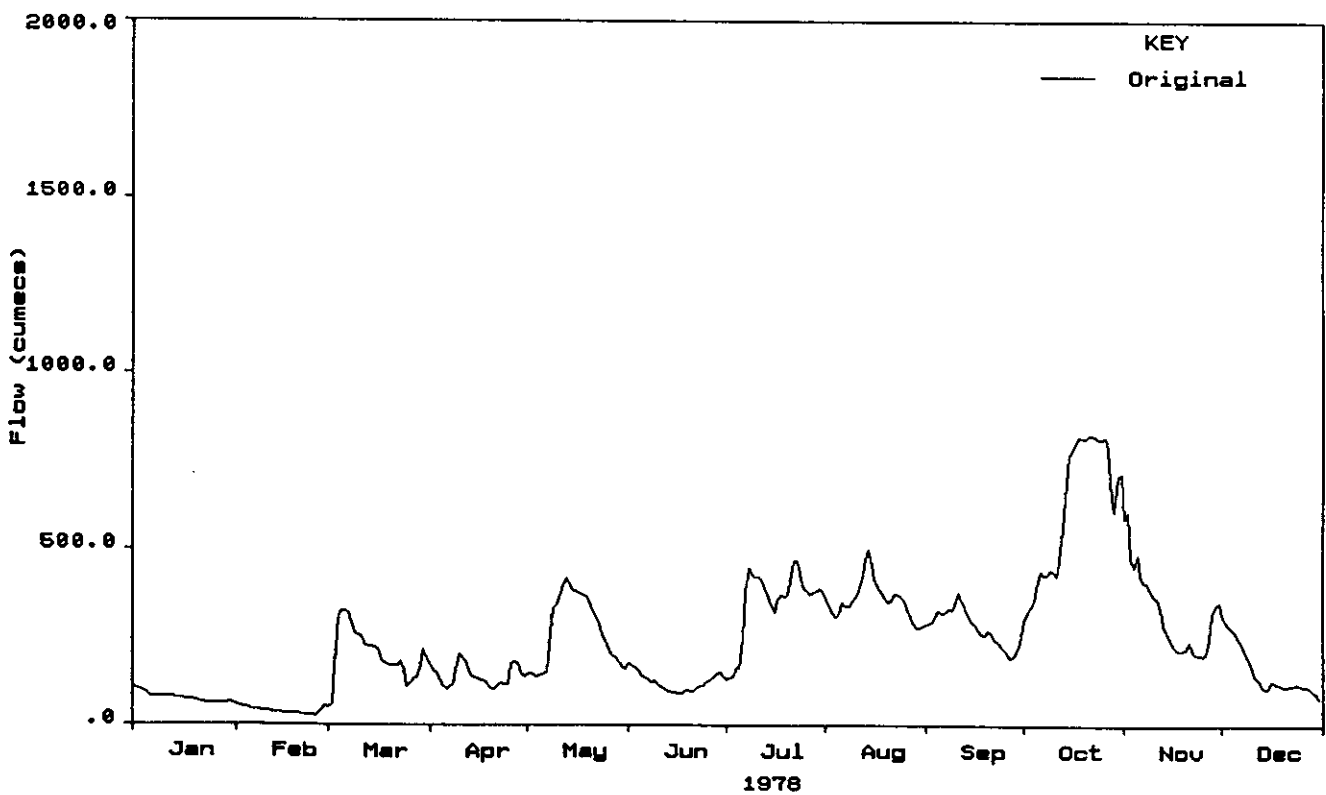


River Jubba at Lugh Ganana

1977

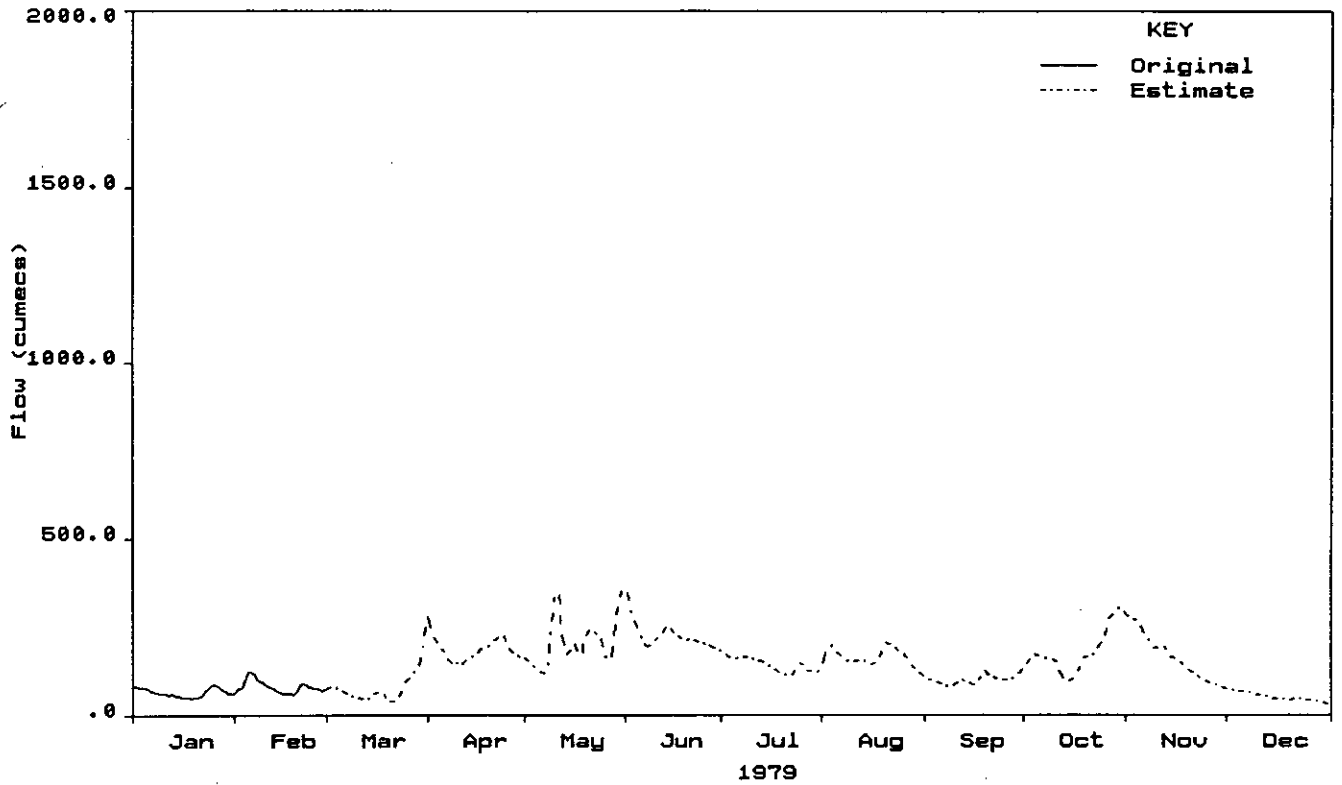


1978

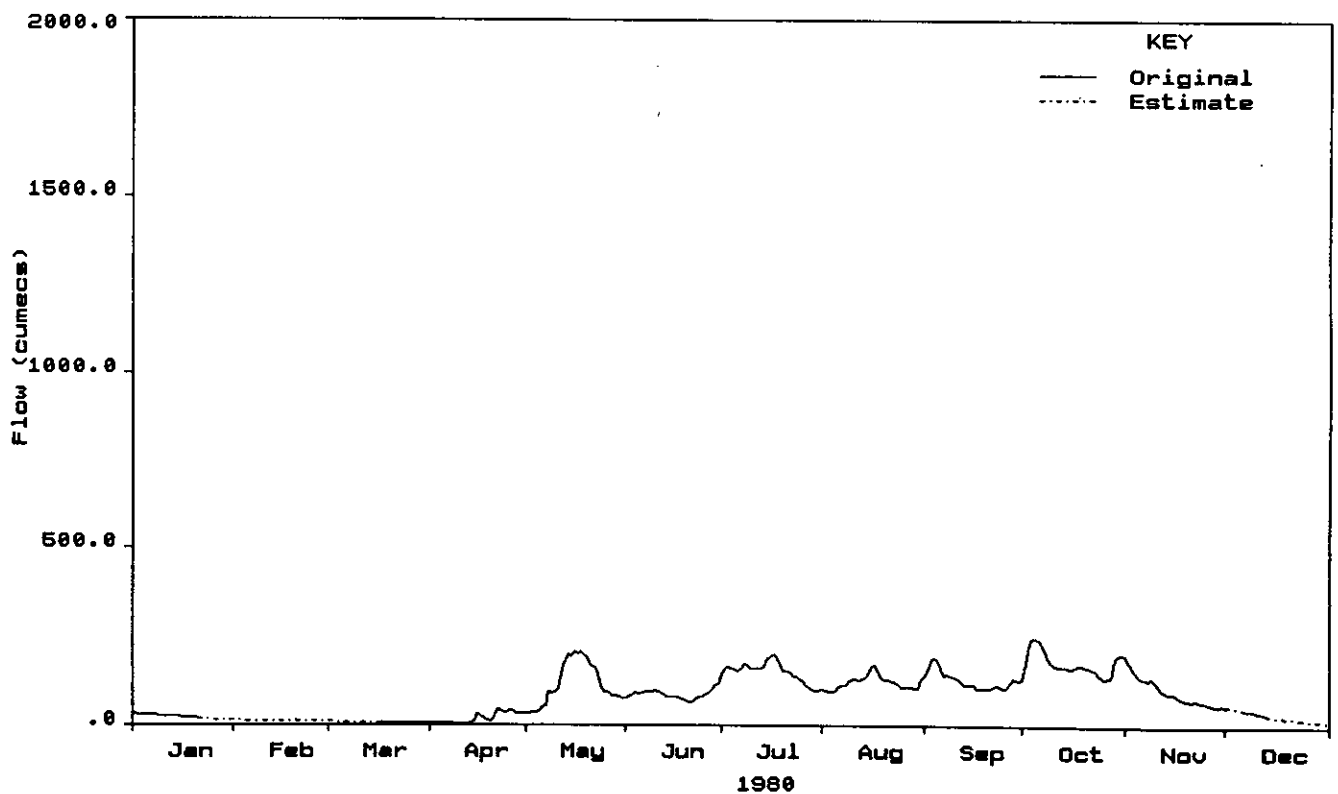


River Jubba at Lugh Ganana

1979

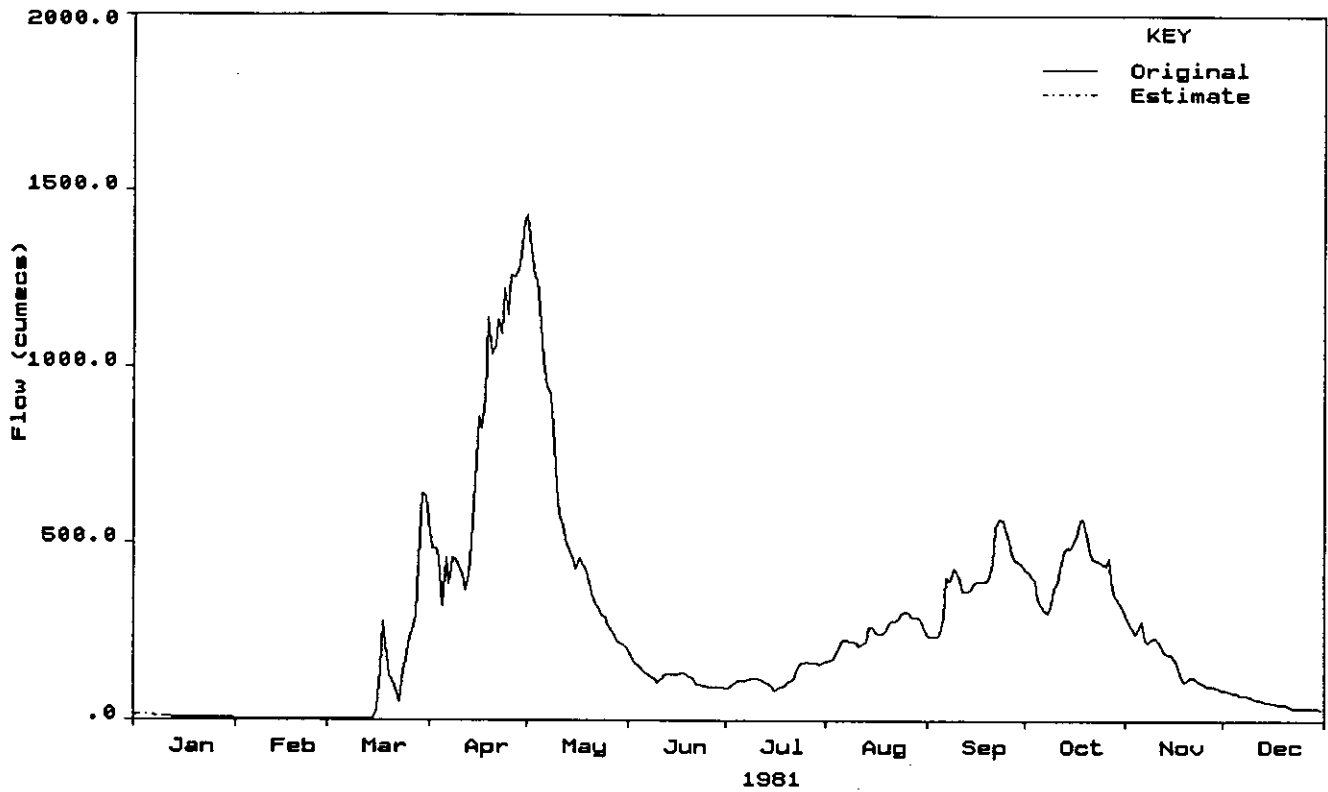


1980

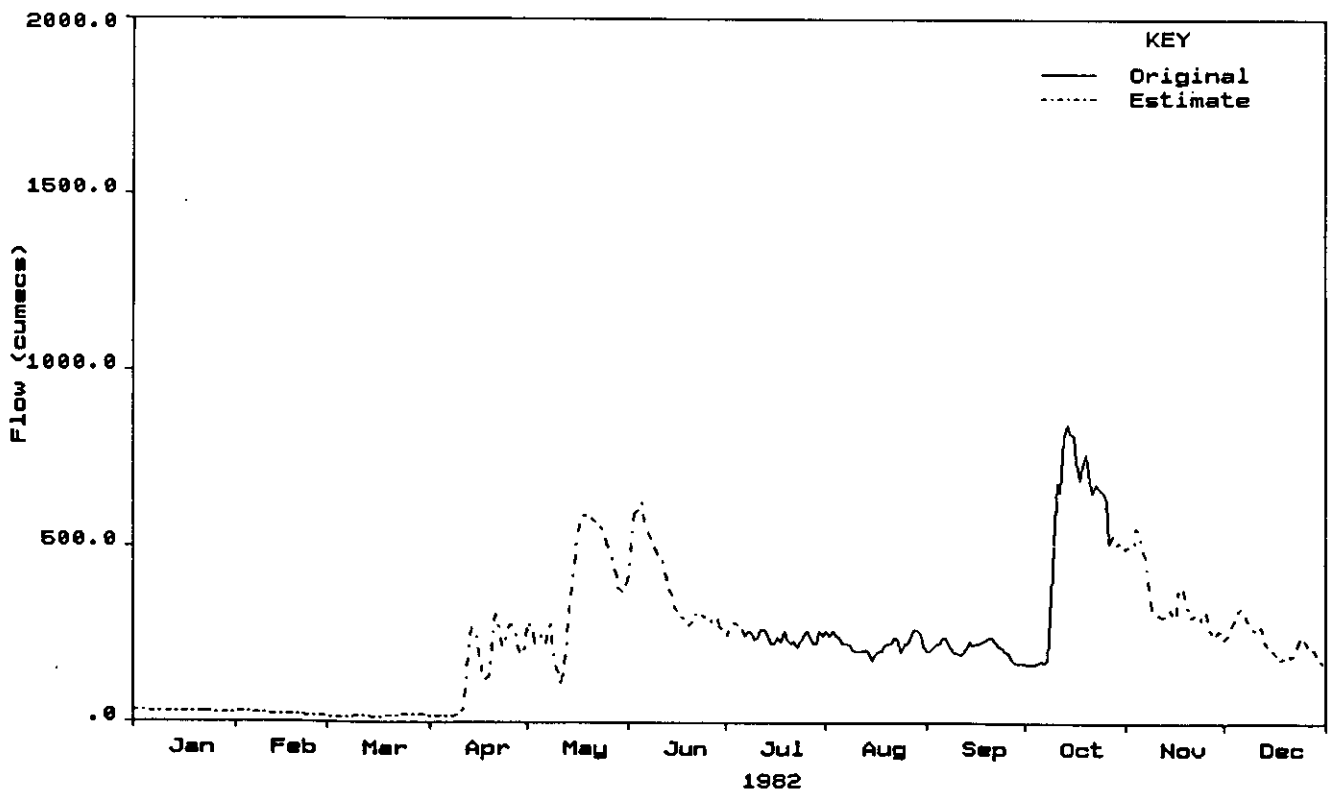


River Jubba at Lugh Ganana

1981

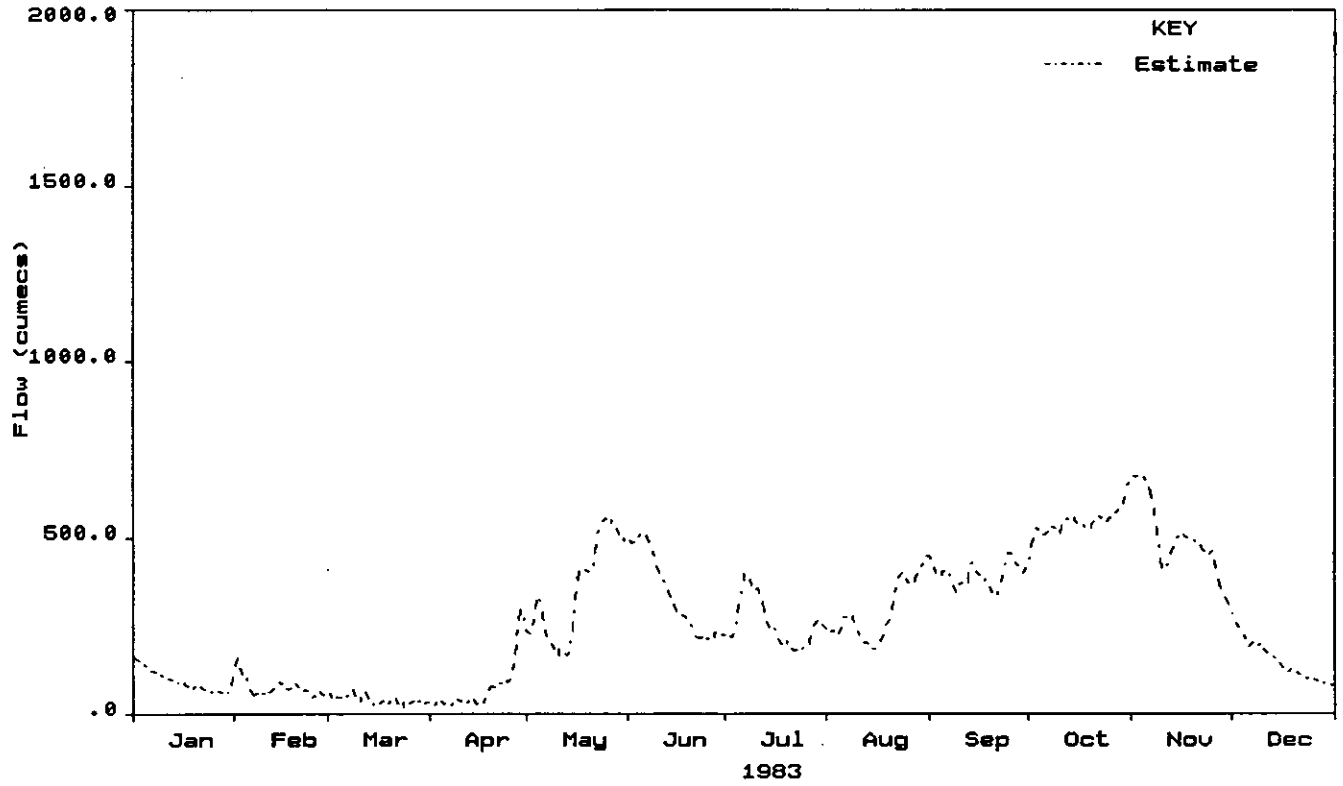


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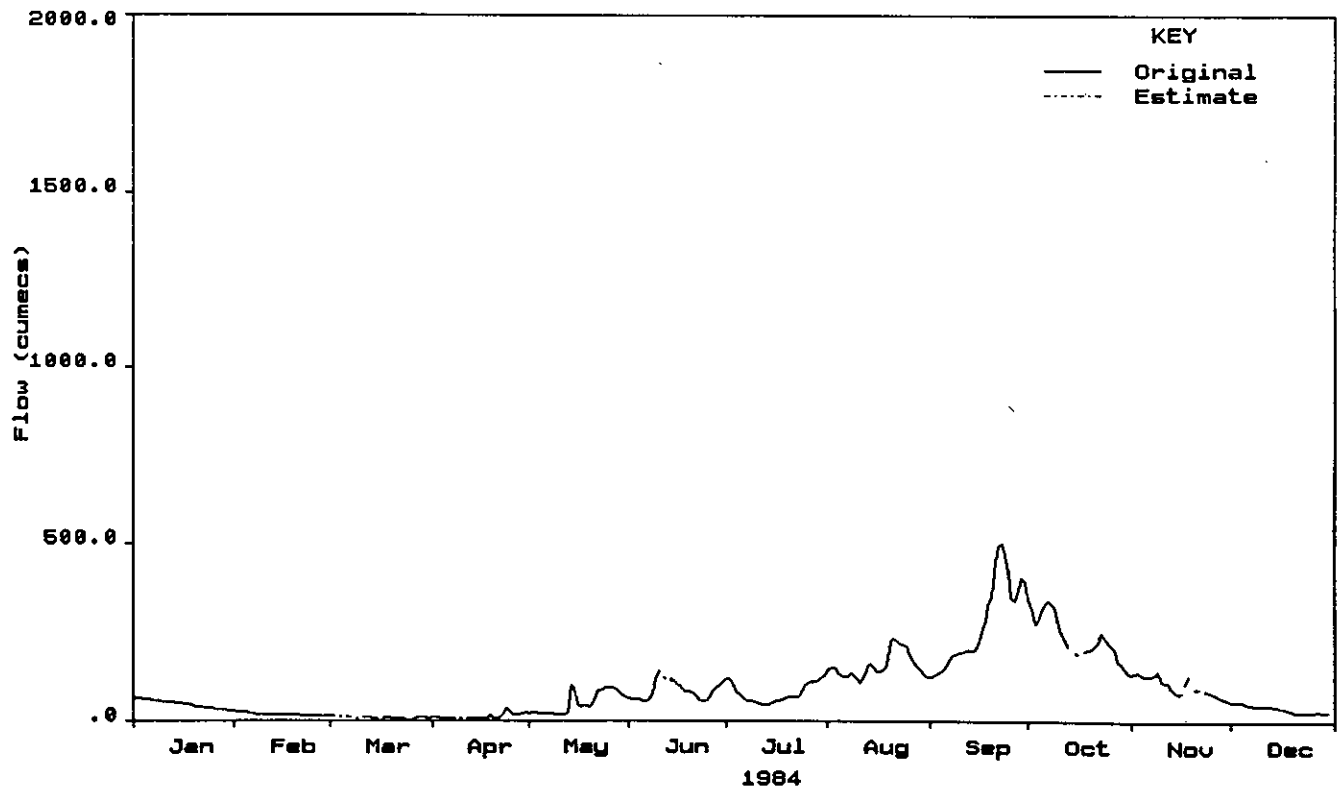


River Jubba at Lugh Ganana

1983

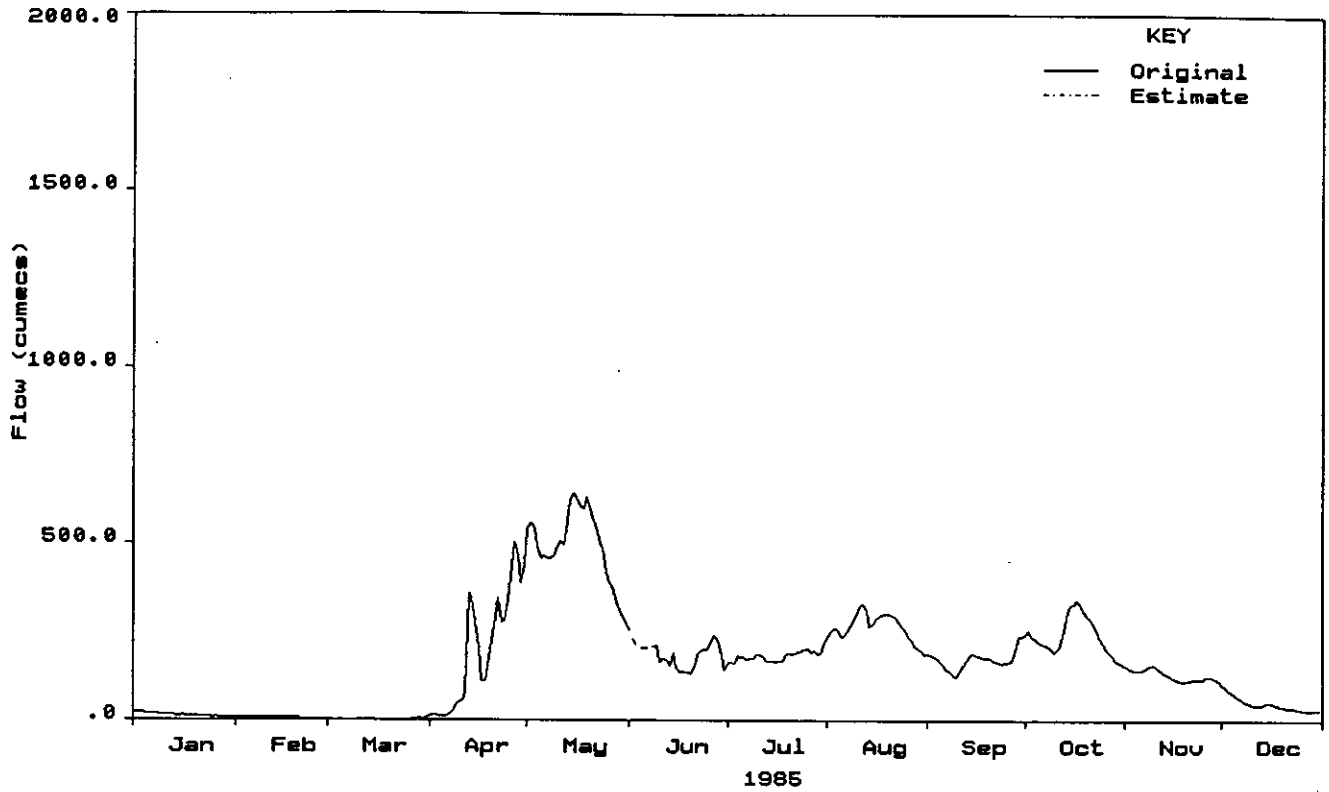


1984

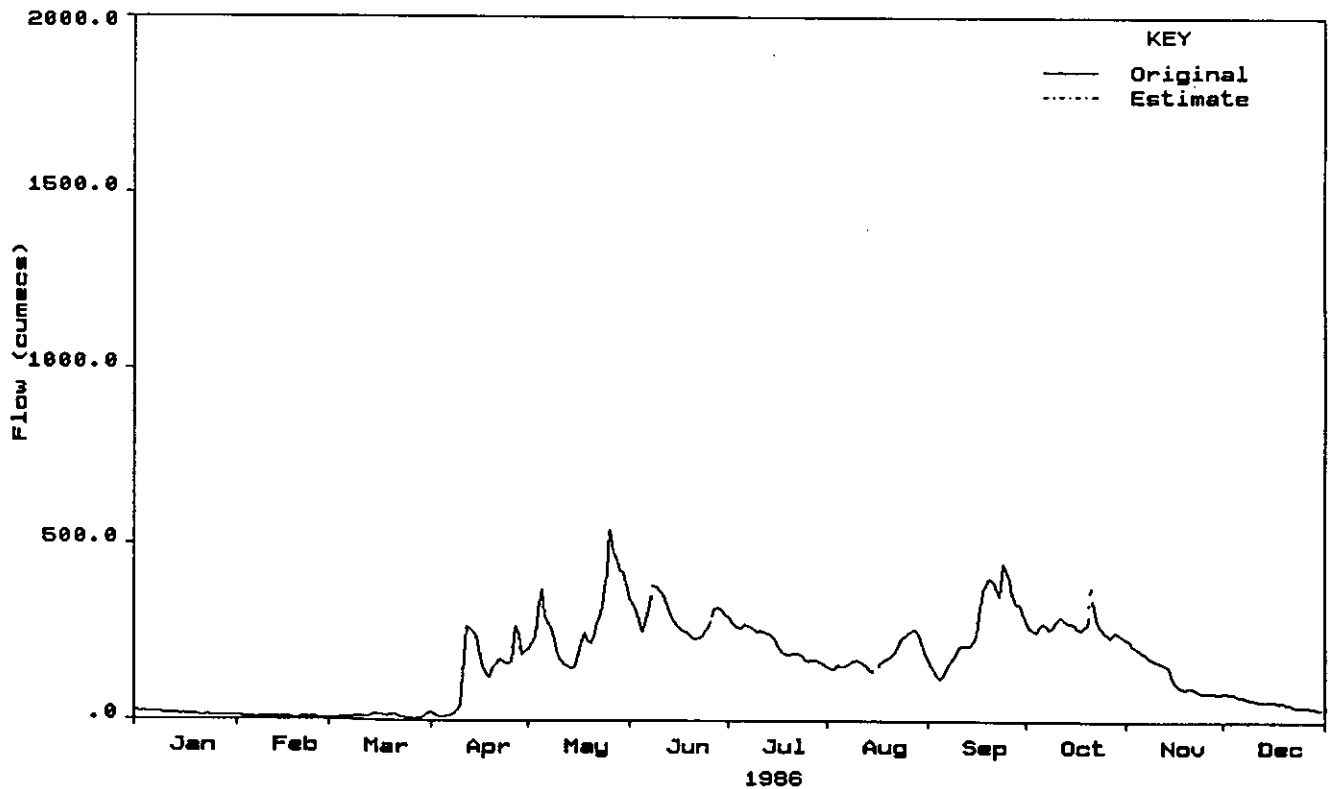


River Jubba at Lugh Ganana

1985

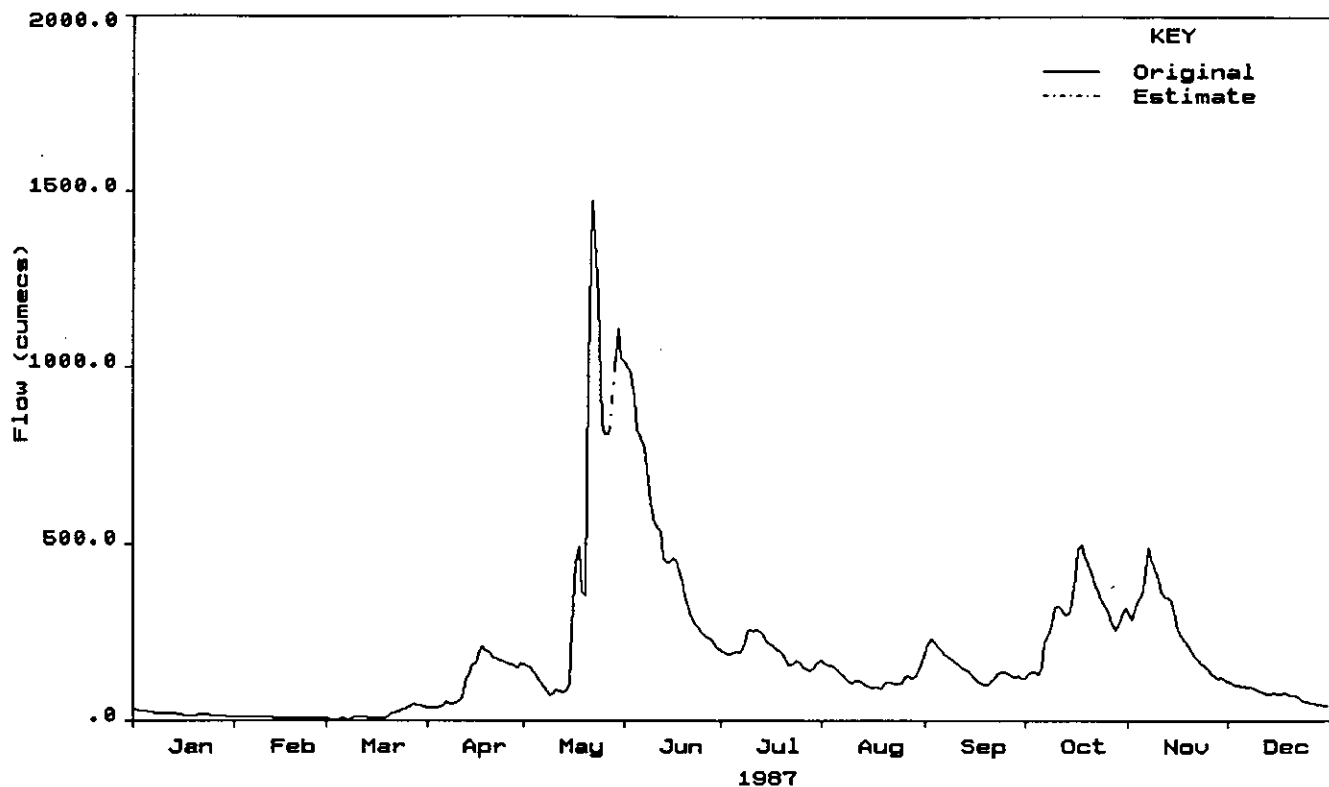


1986

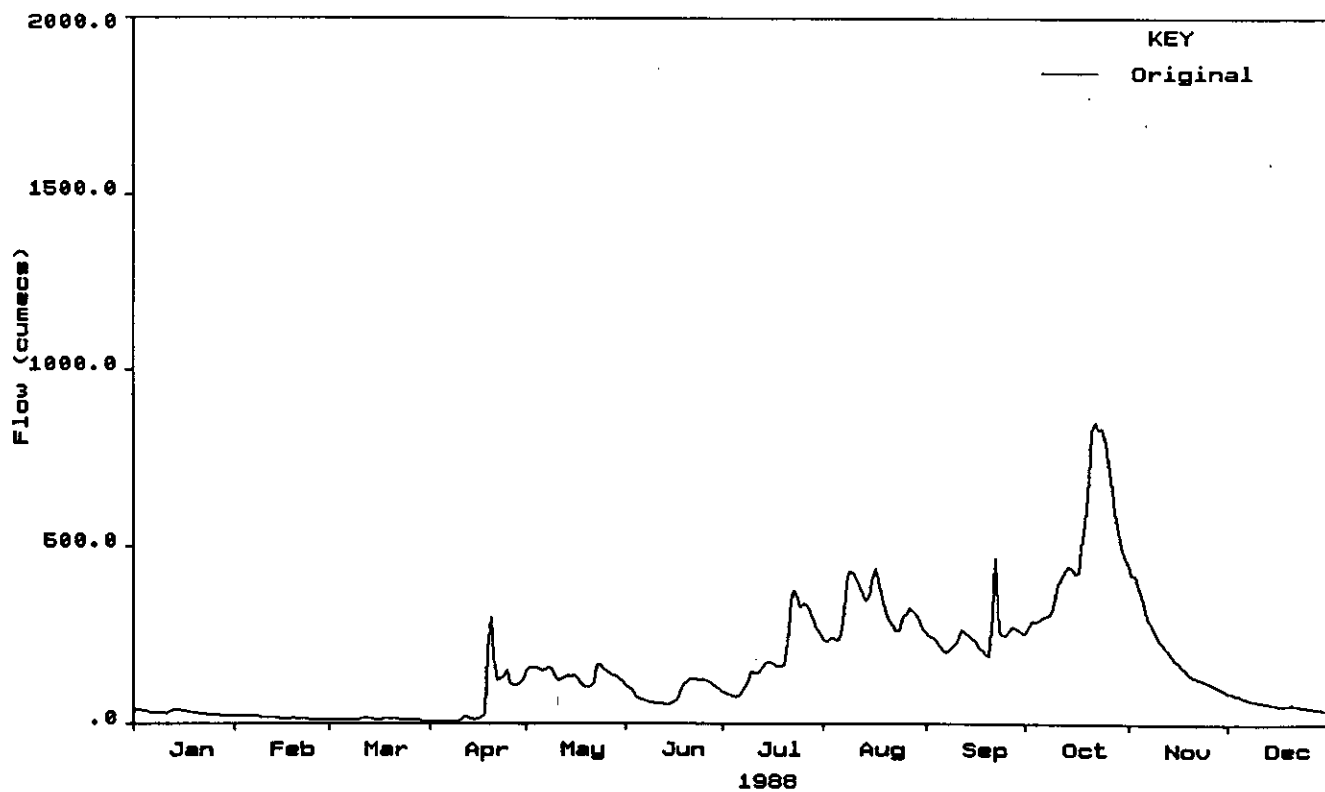


River Jubba at Lugh Ganana

1987

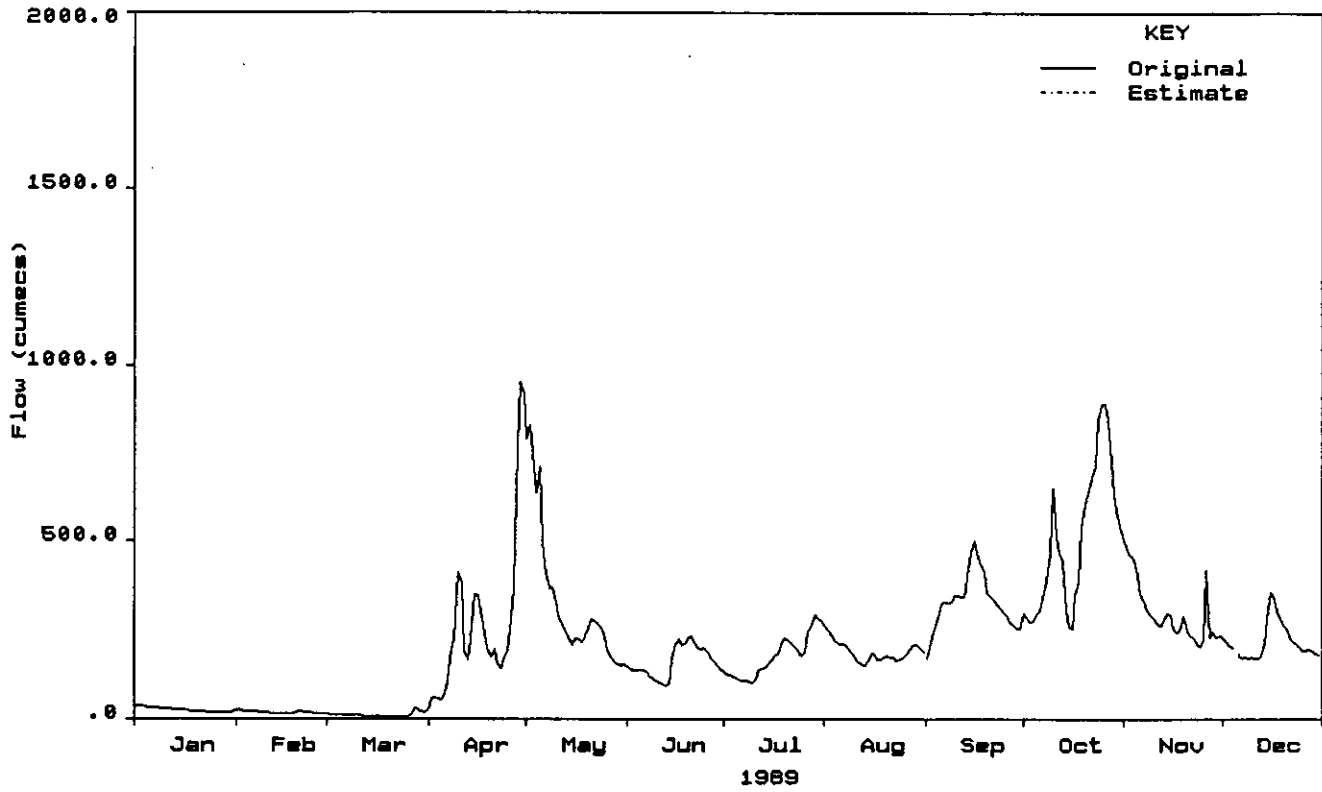


1988

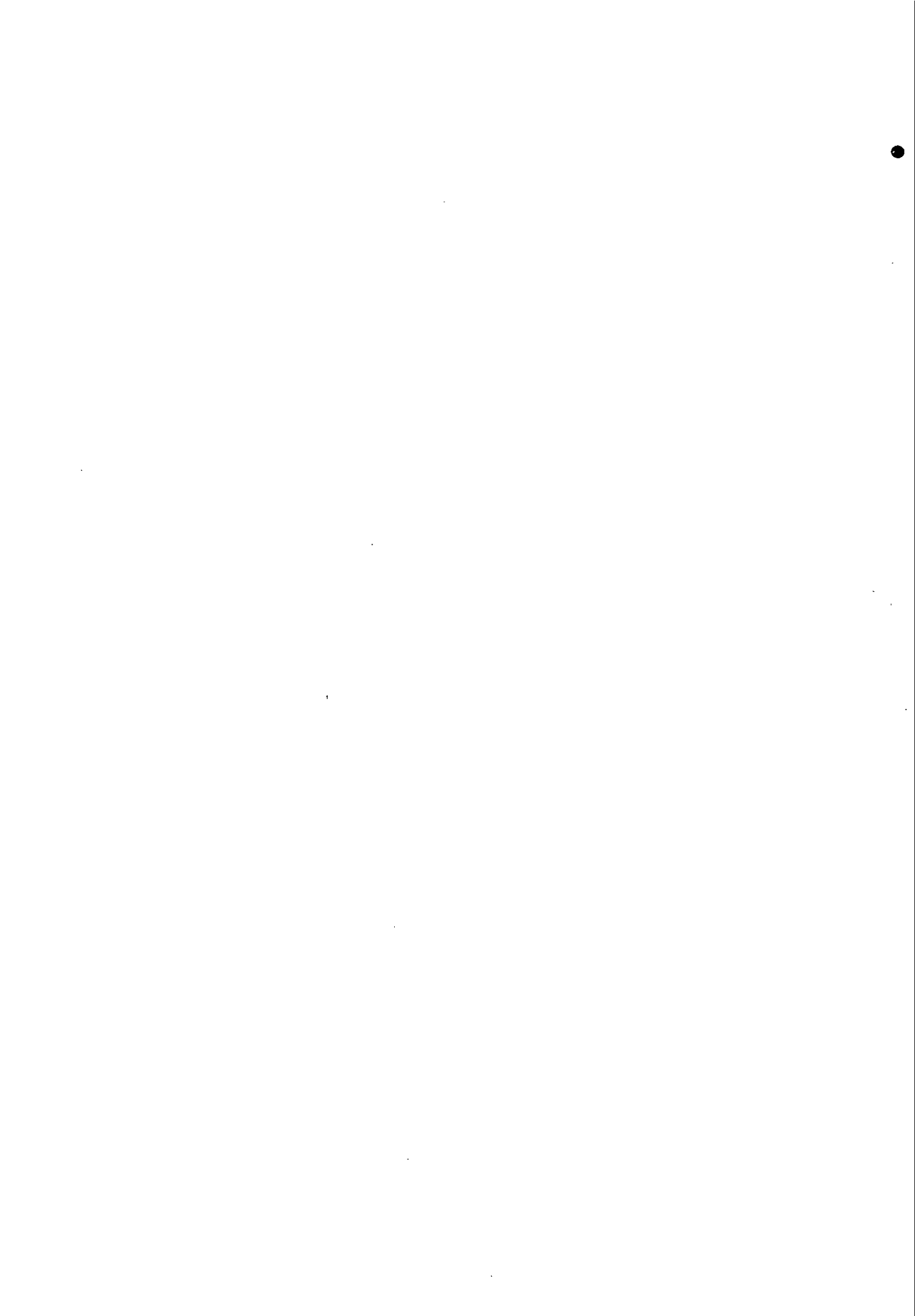


River Jubba at Lugh Ganana

1989

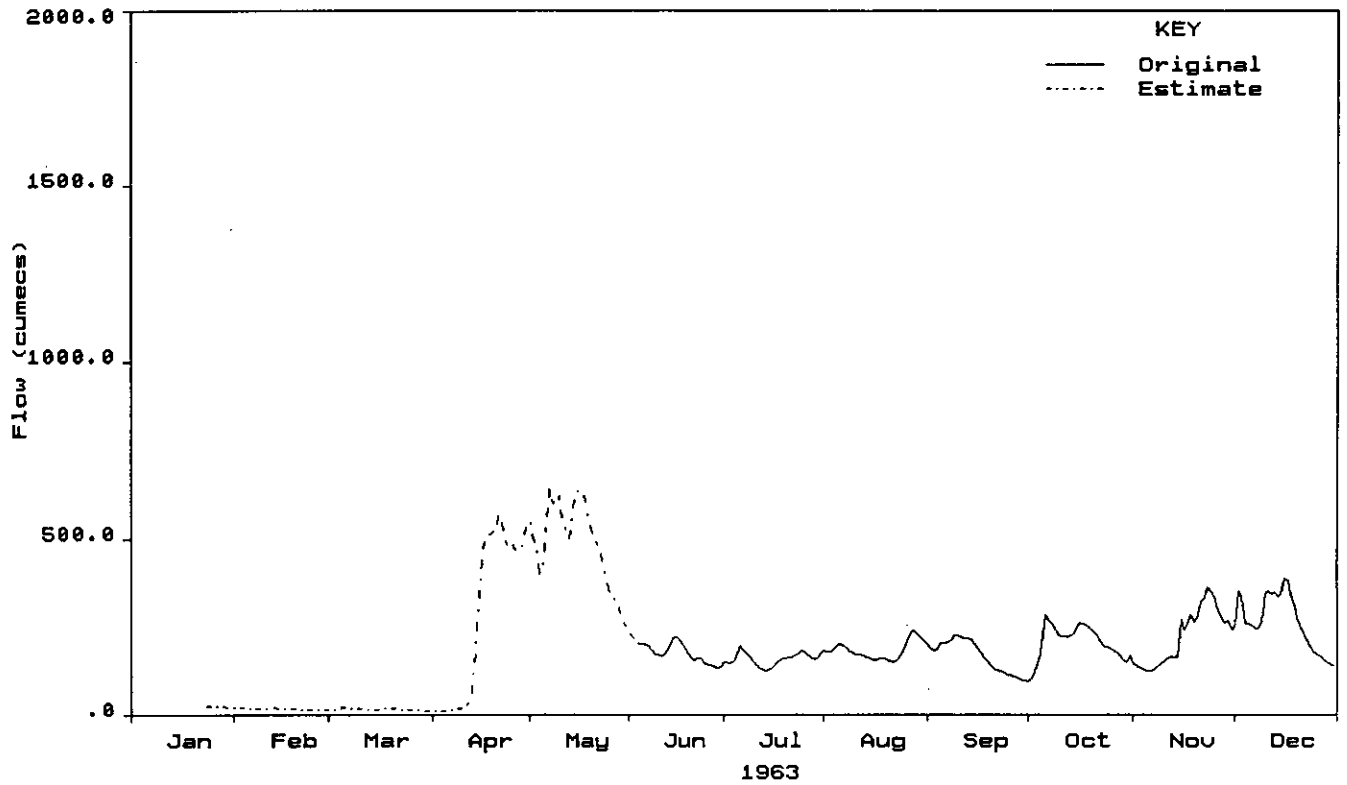


BARDHEERE
1963 - 1989

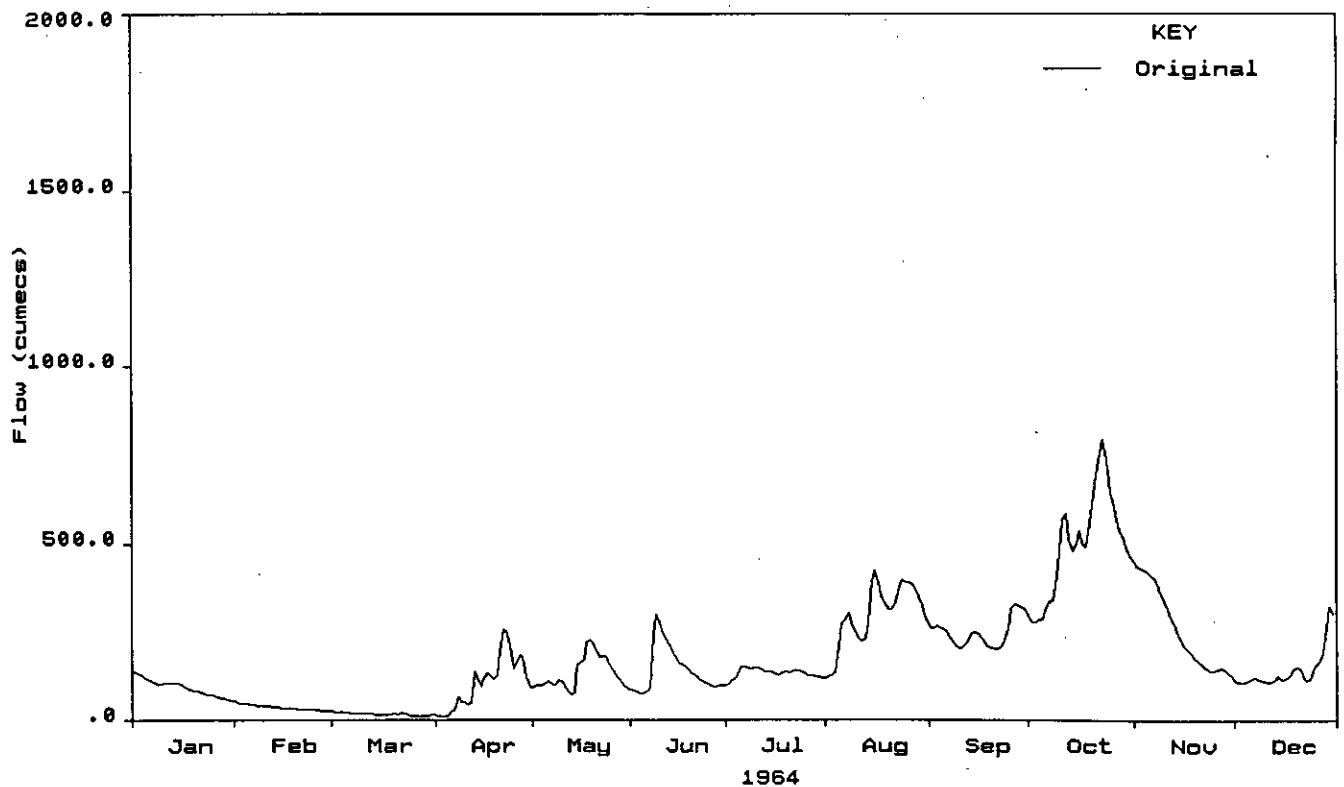


River Jubba at Bardheere

1963

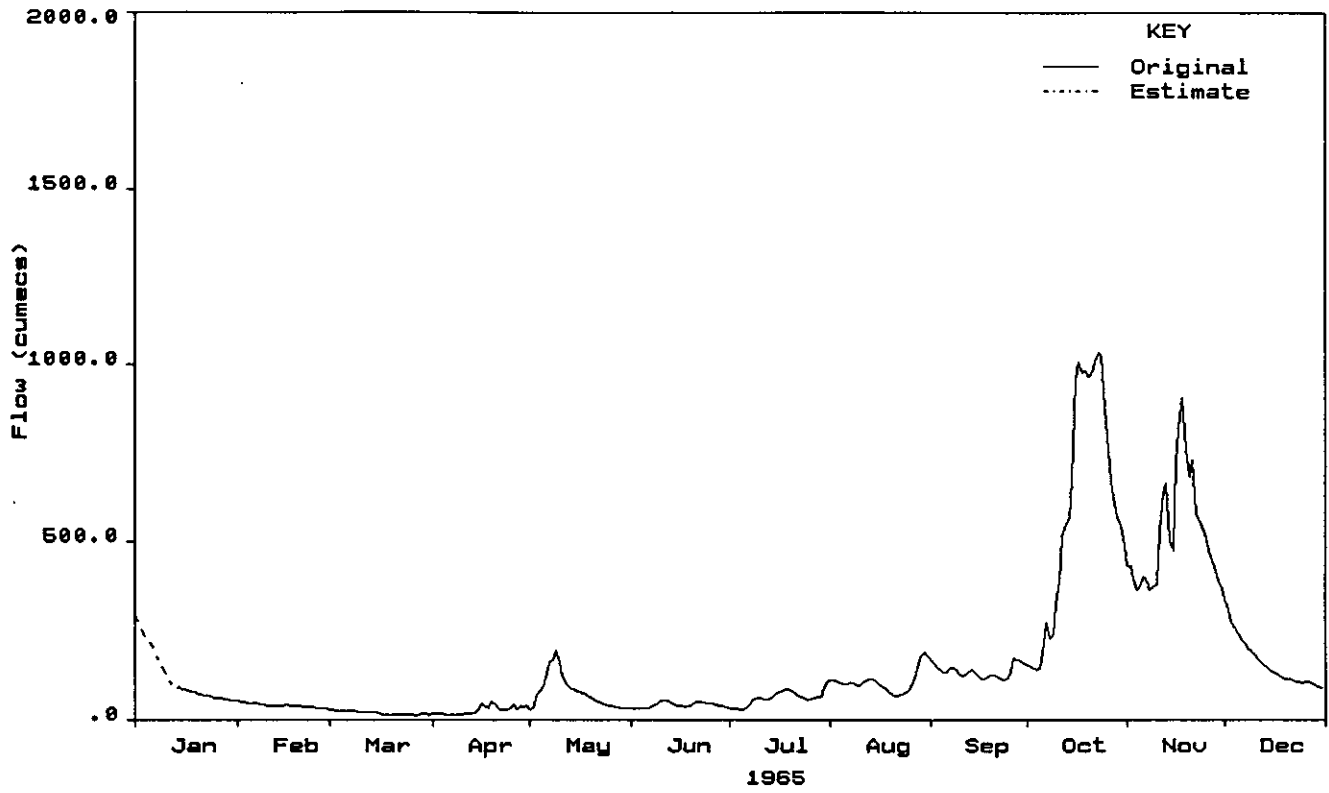


1964

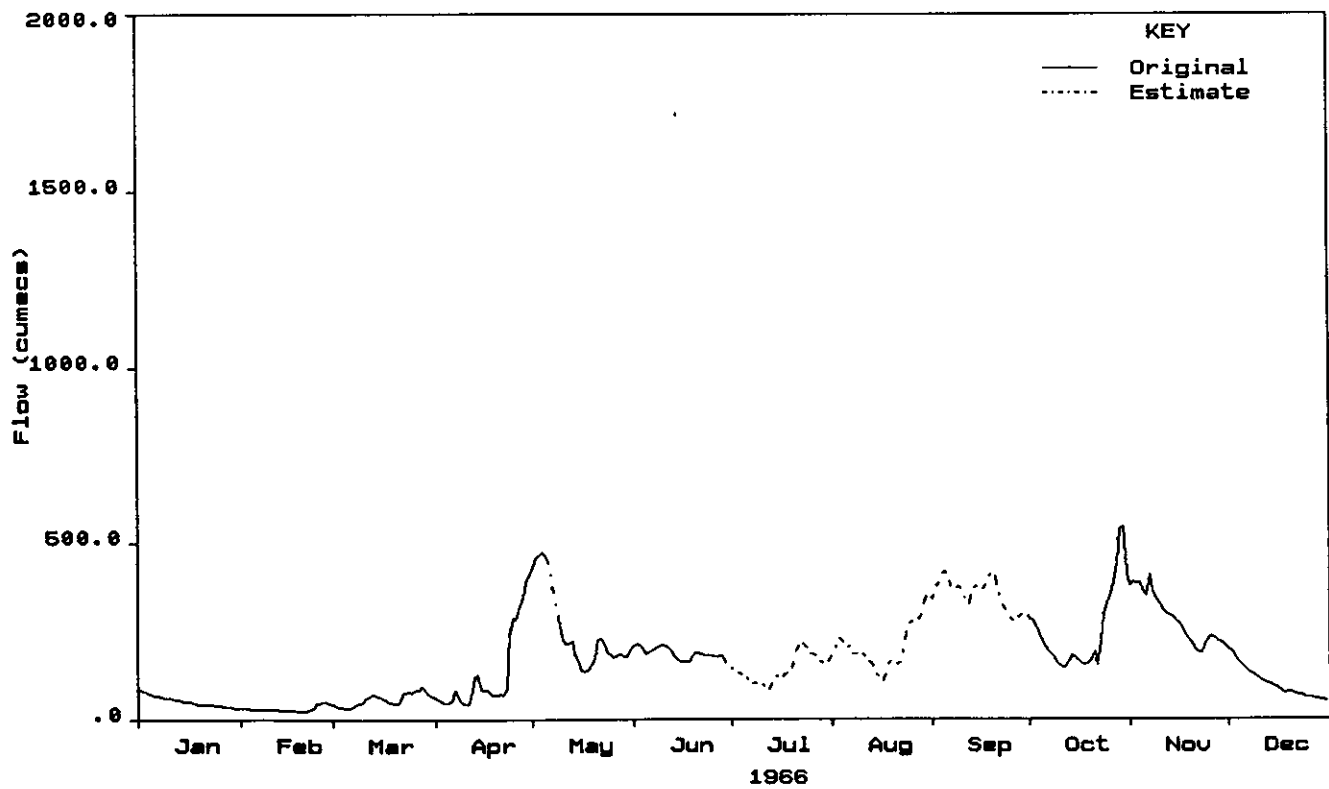


River Jubba at Bardheere

1965

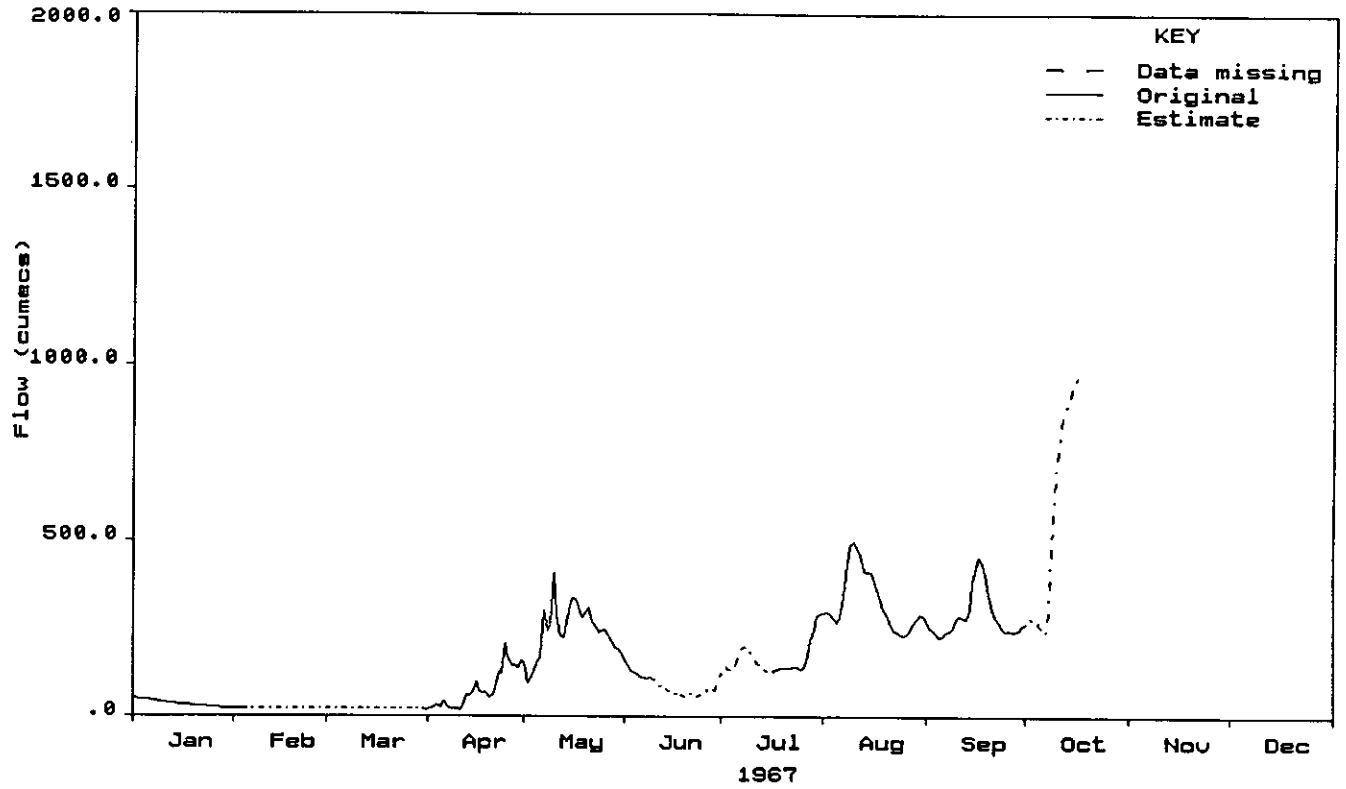


1966

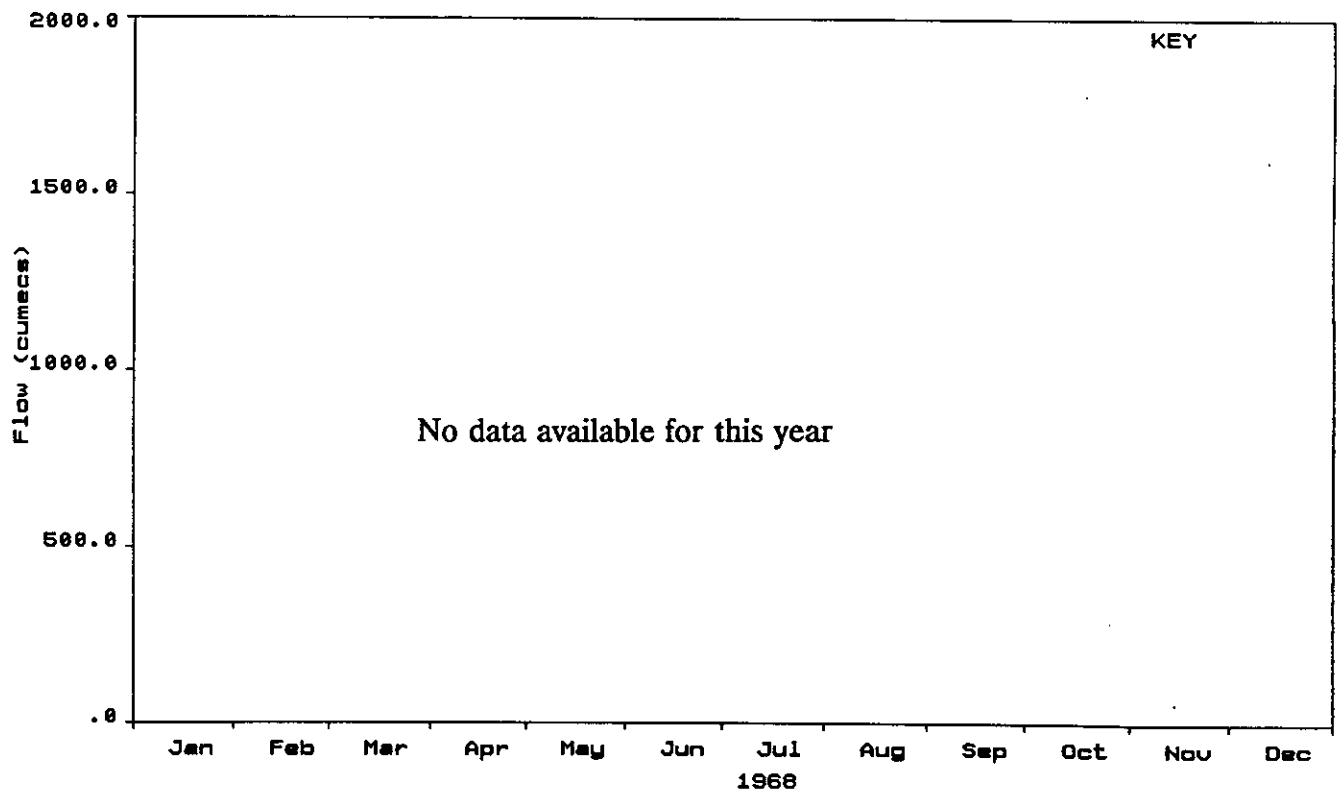


River Jubba at Bardheere

1967

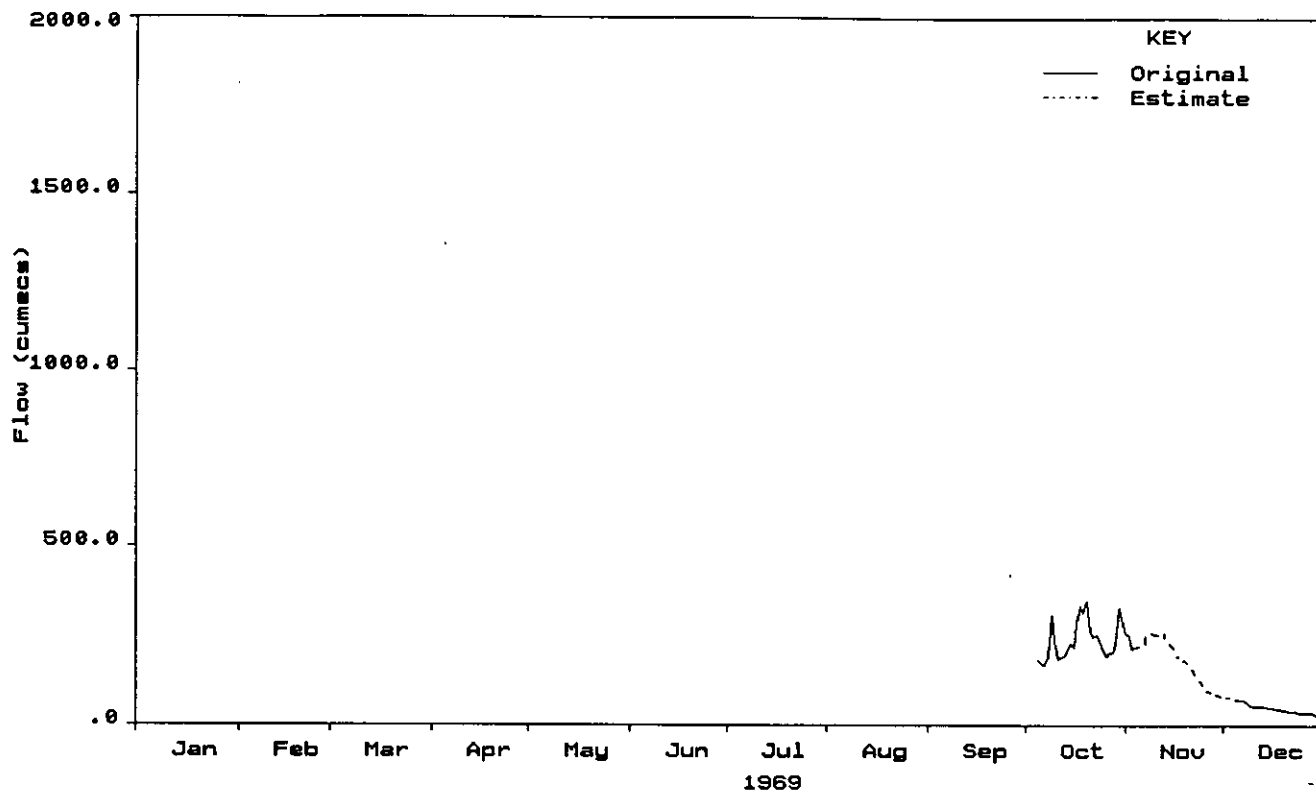


1968

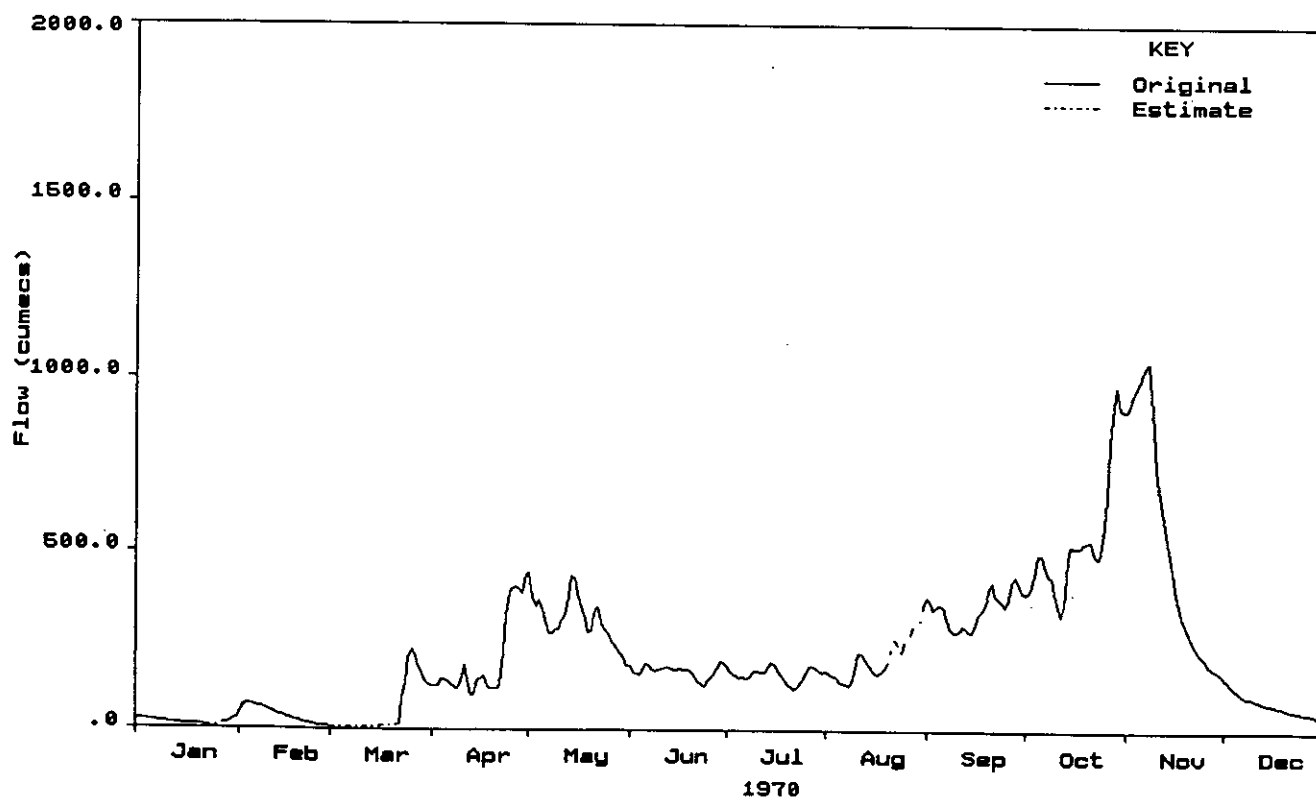


River Jubba at Bardheere

1969

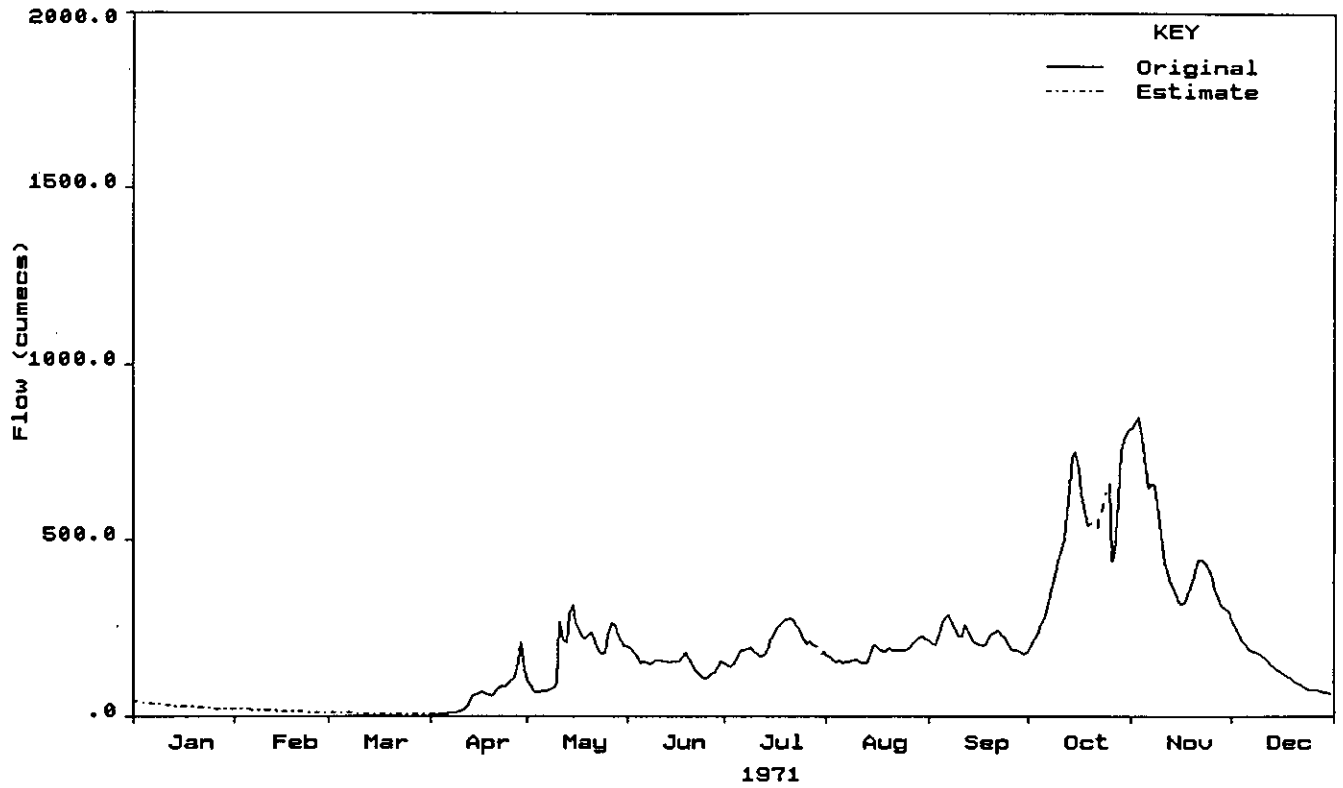


1970

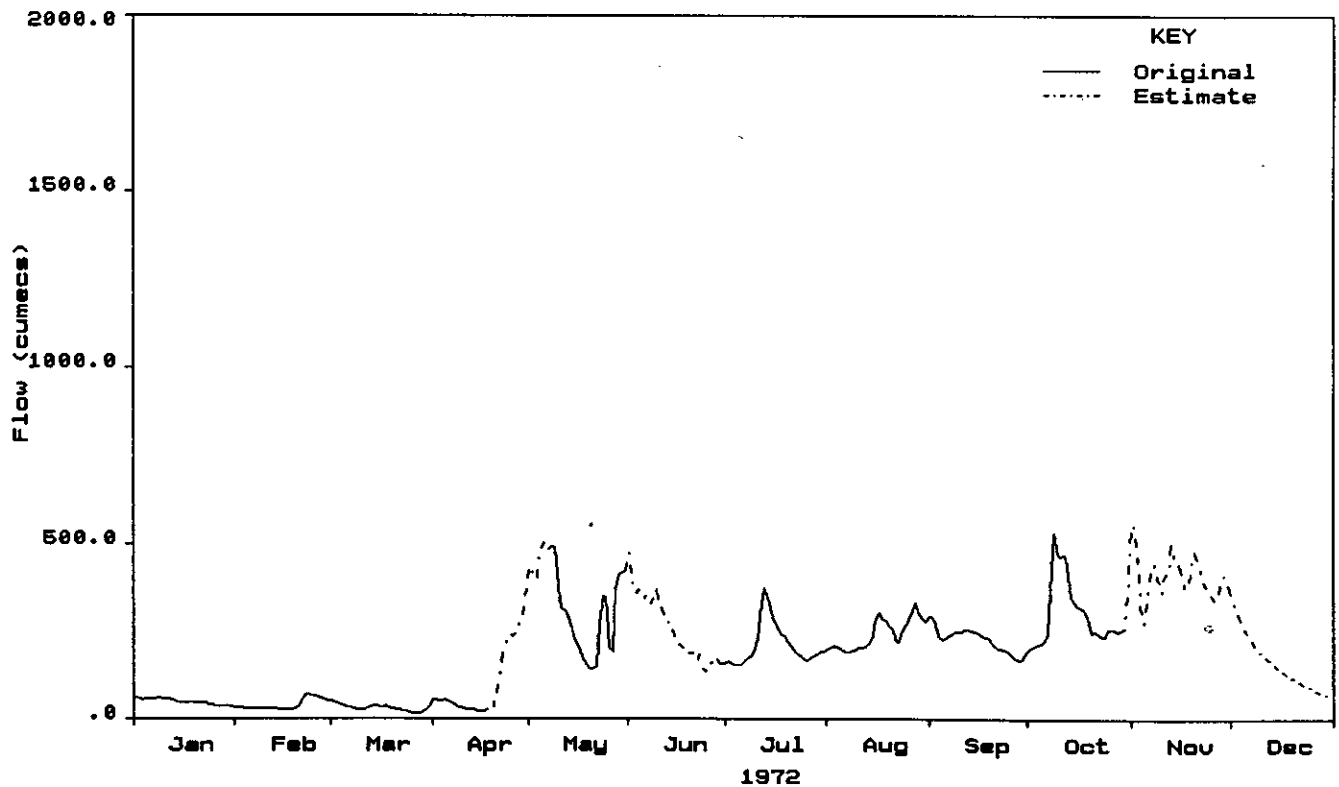


River Jubba at Bardheere

1971

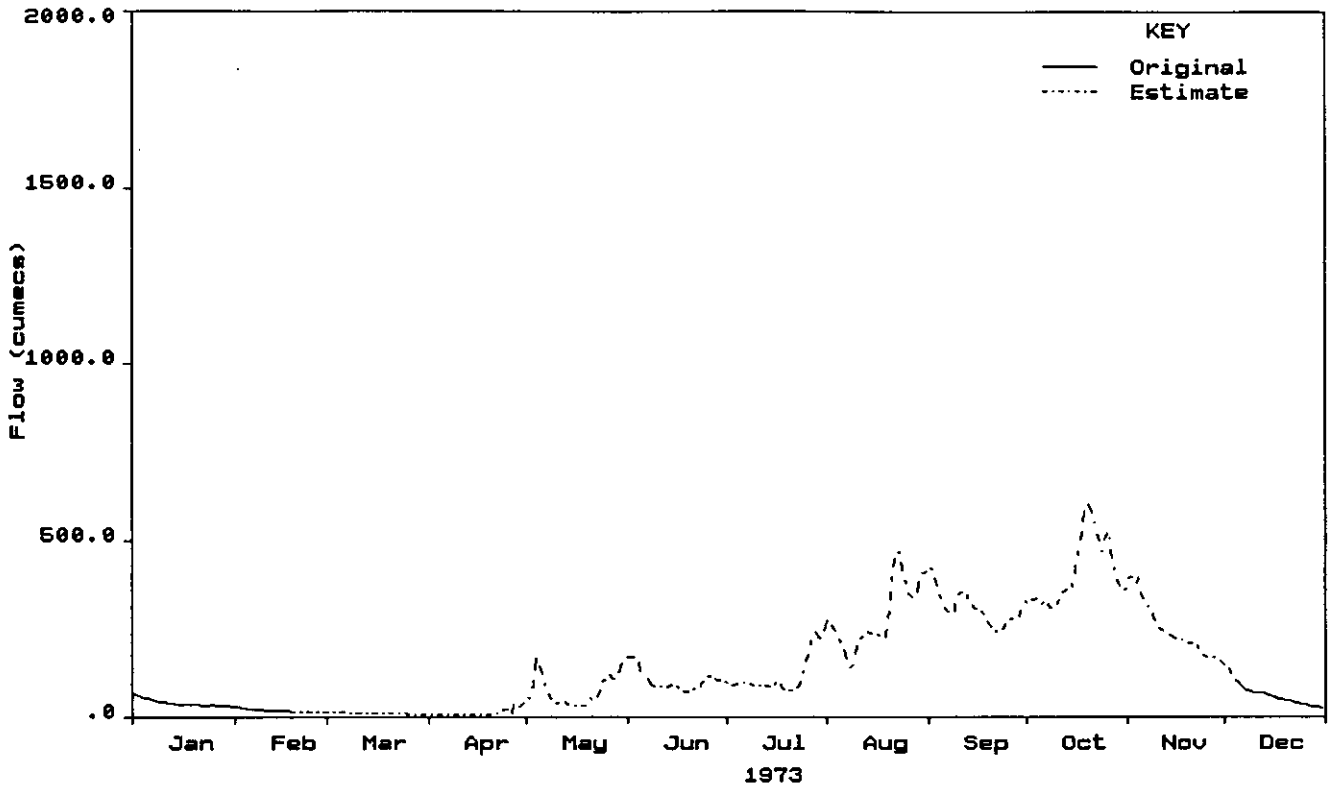


1972

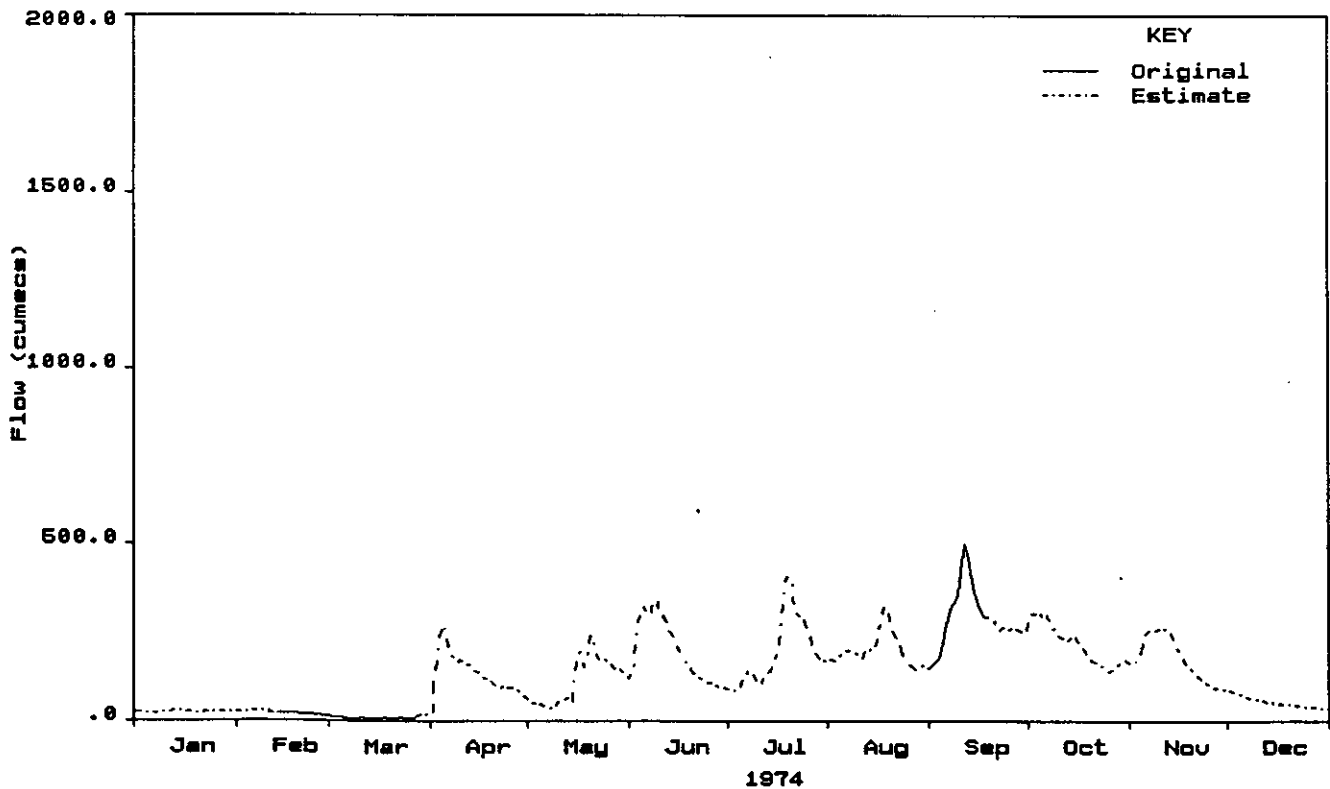


River Jubba at Bardheere

1973

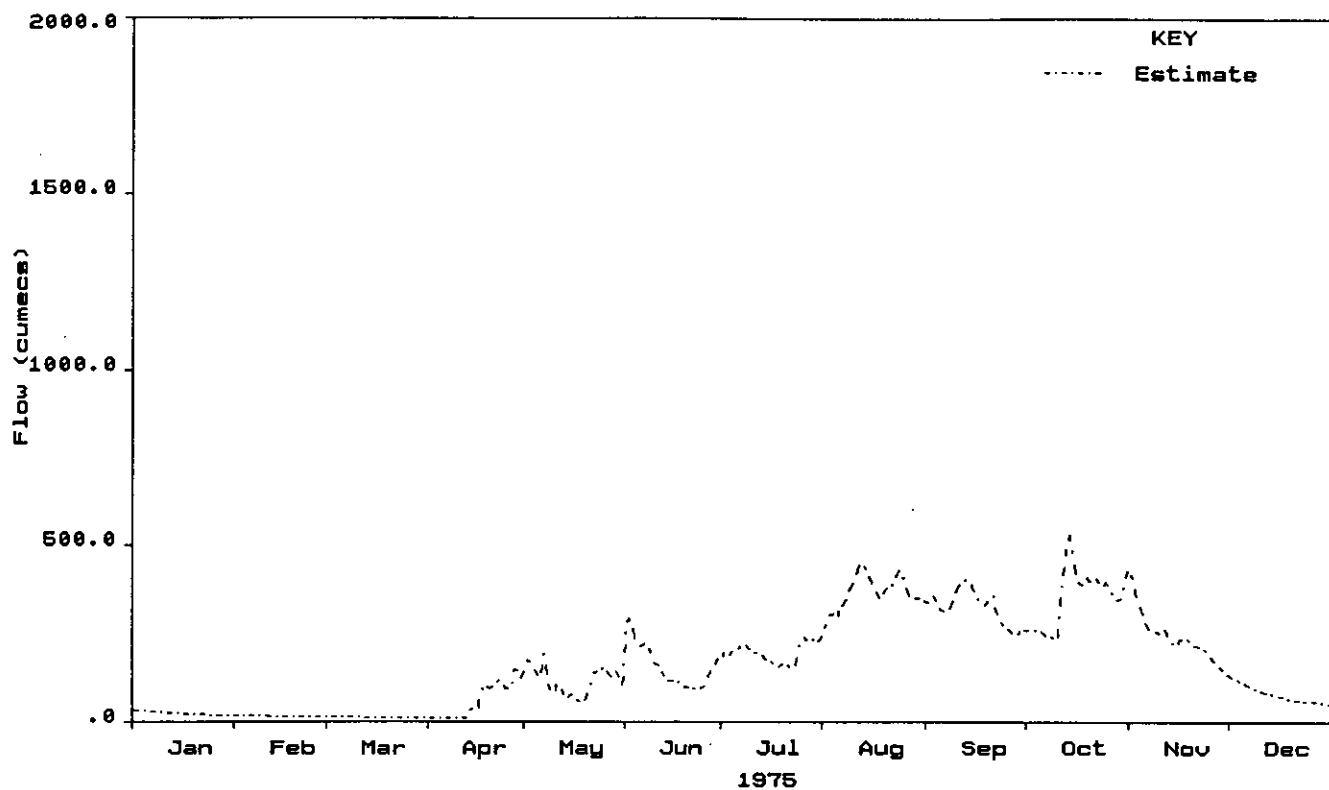


1974

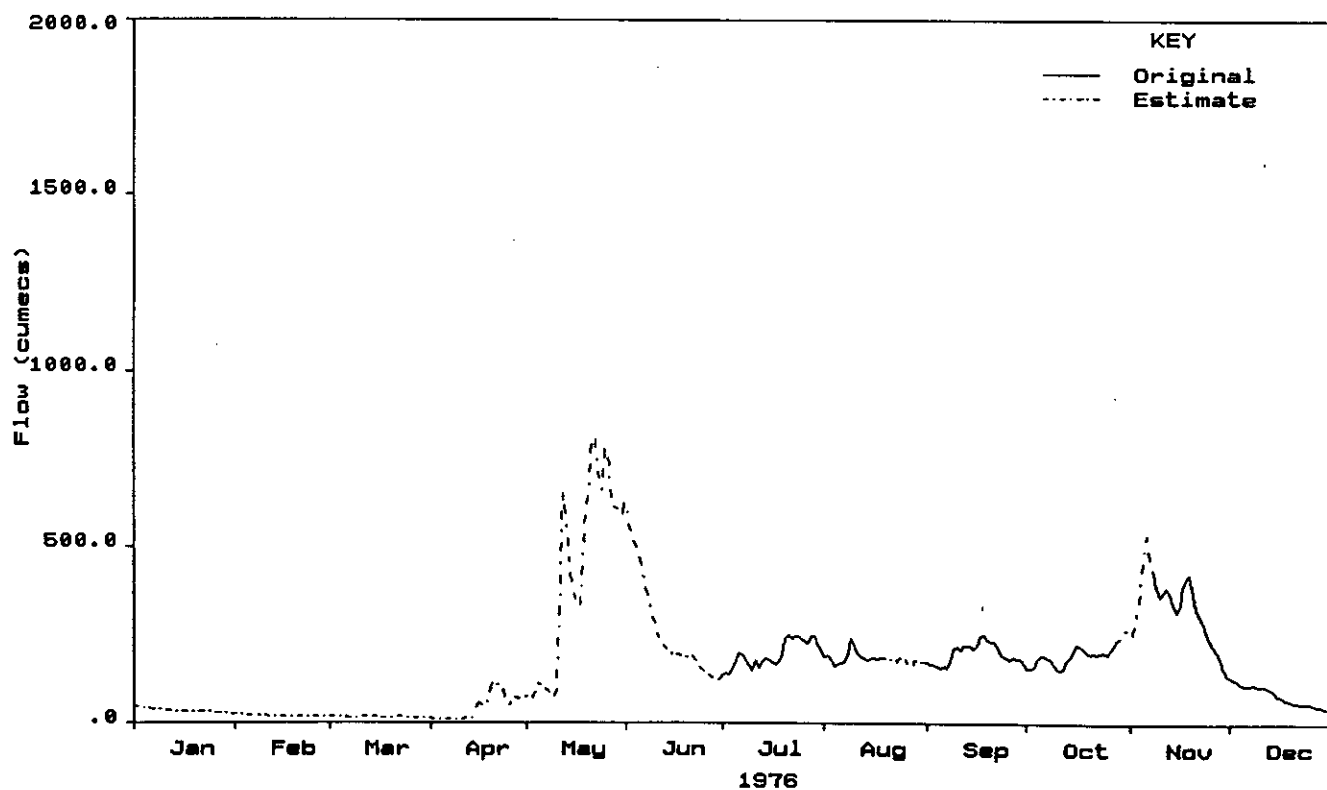


River Jubba at Bardheere

1975

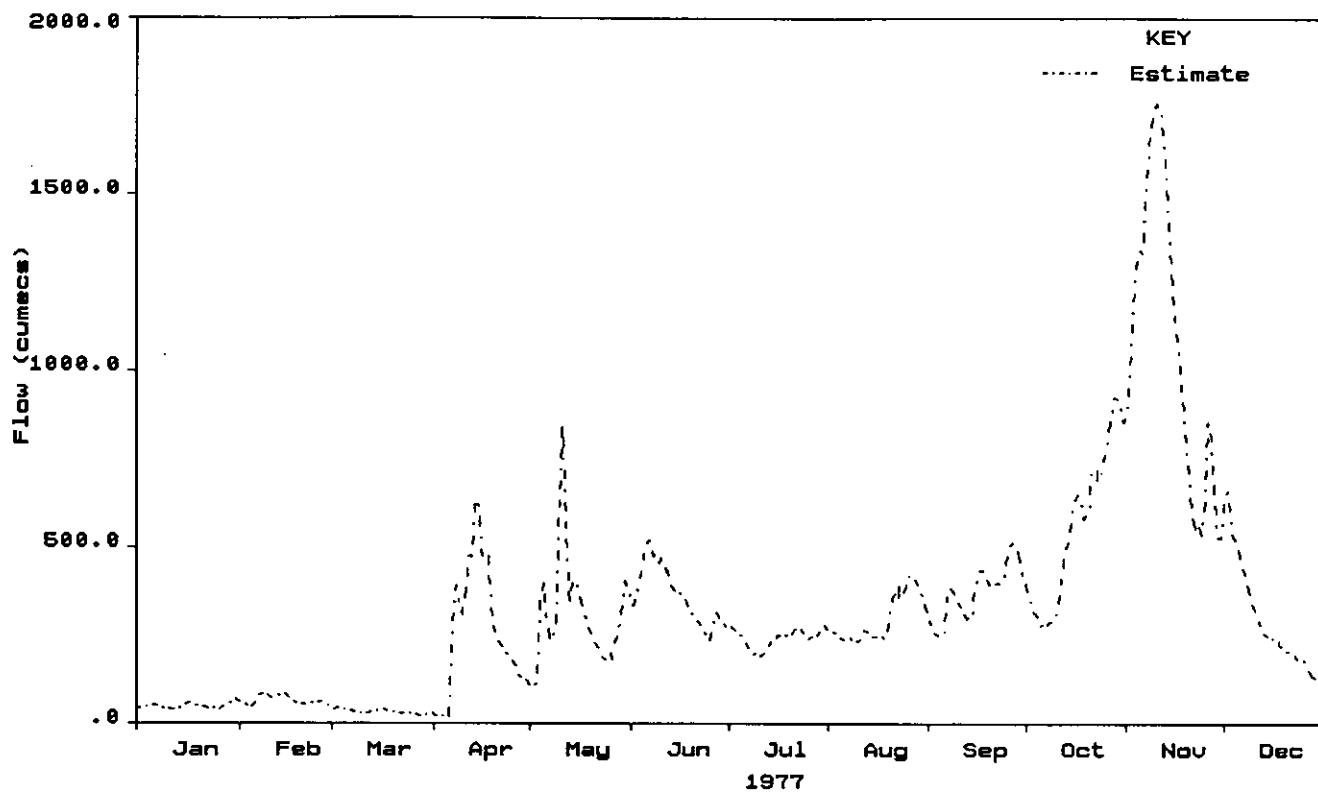


1976

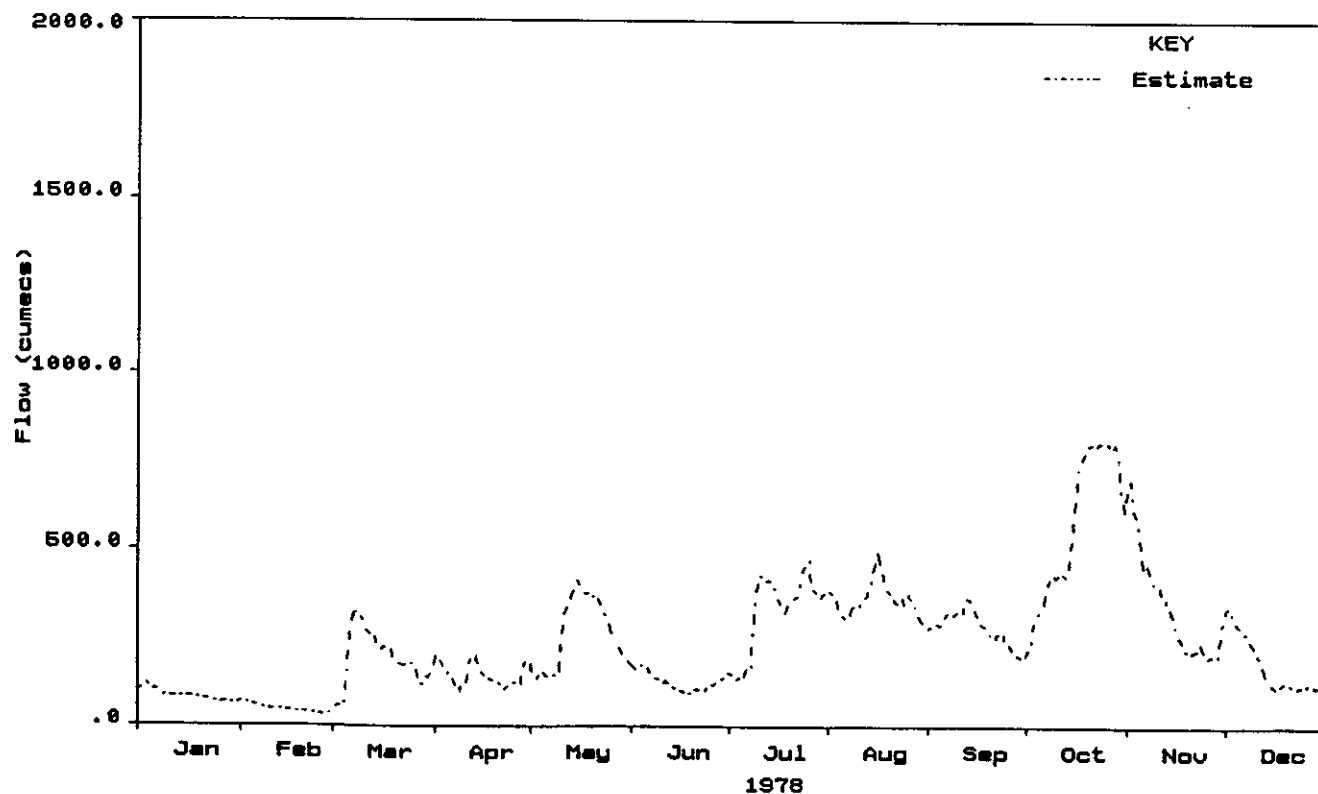


River Jubba at Bardheere

1977

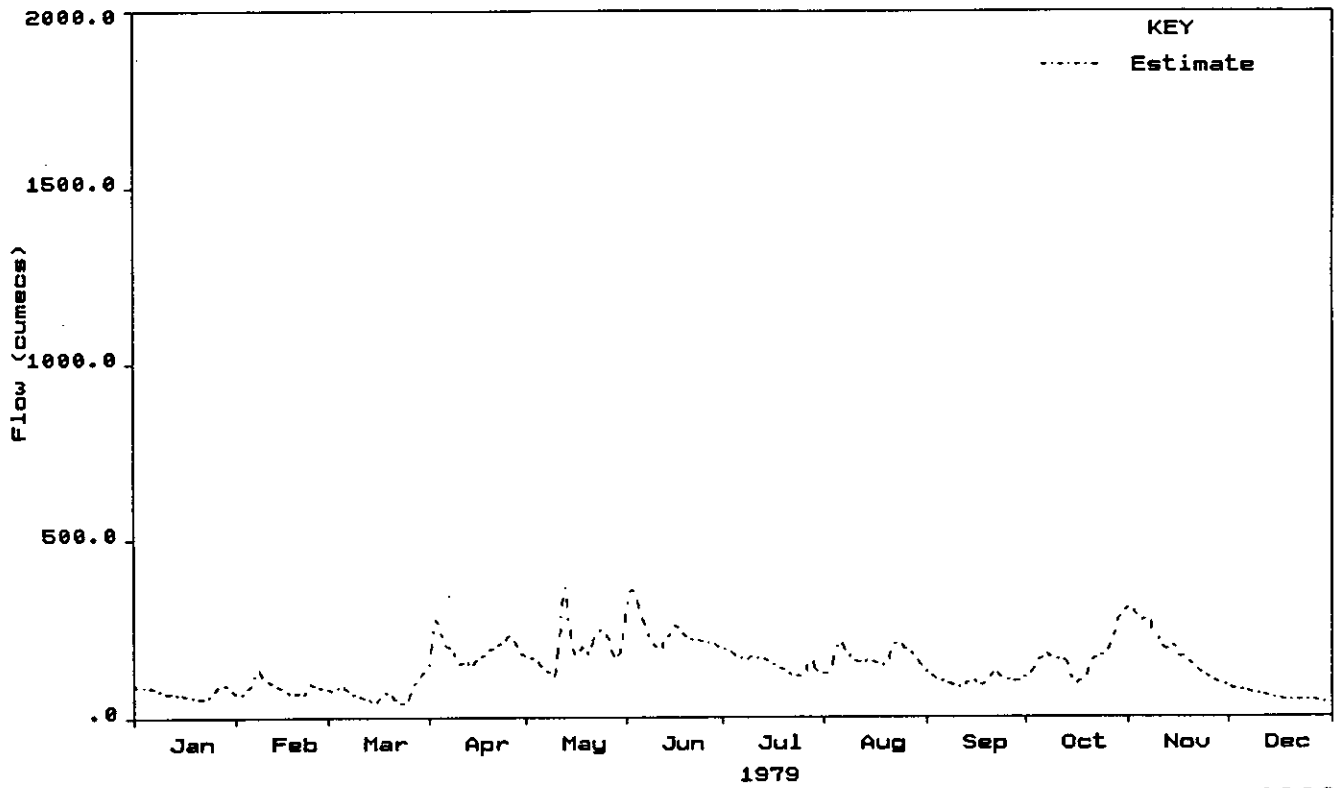


1978

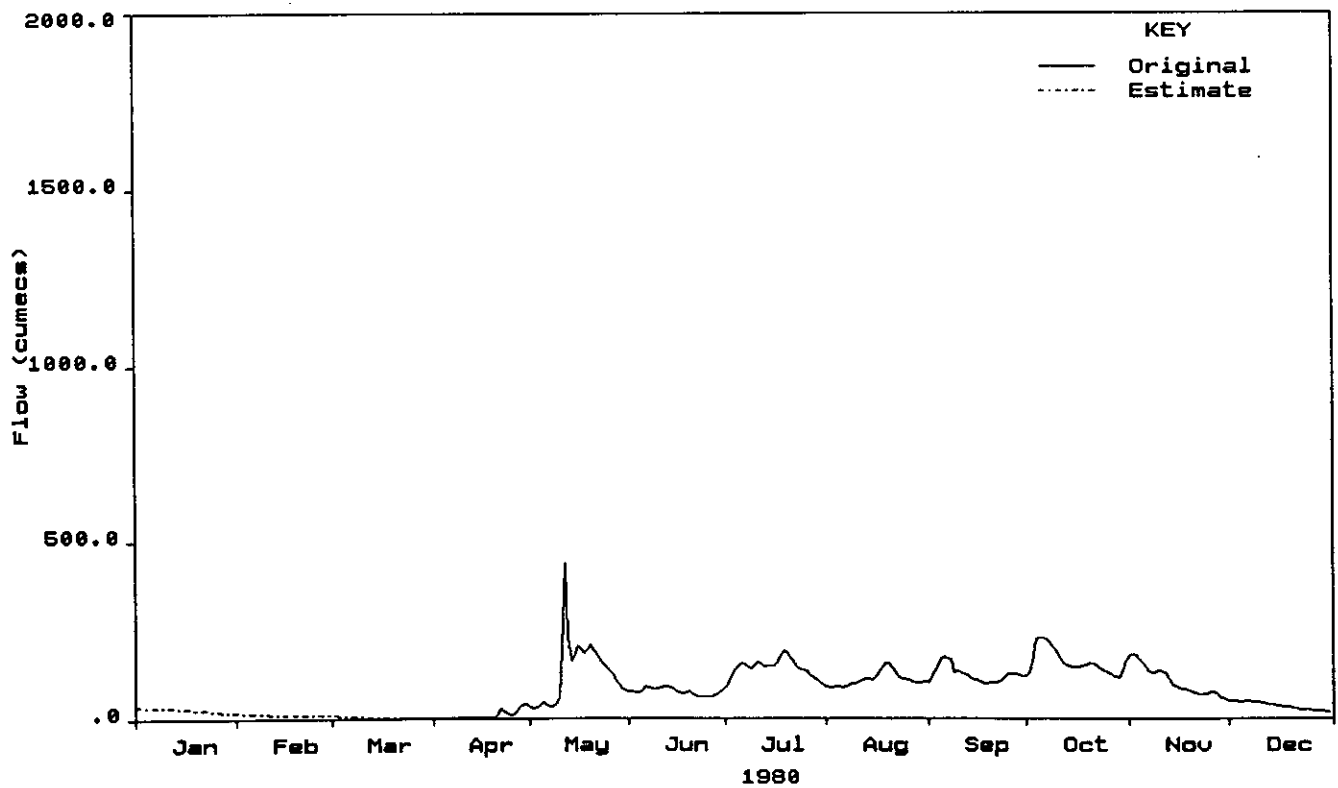


River Jubba at Bardheere

1979

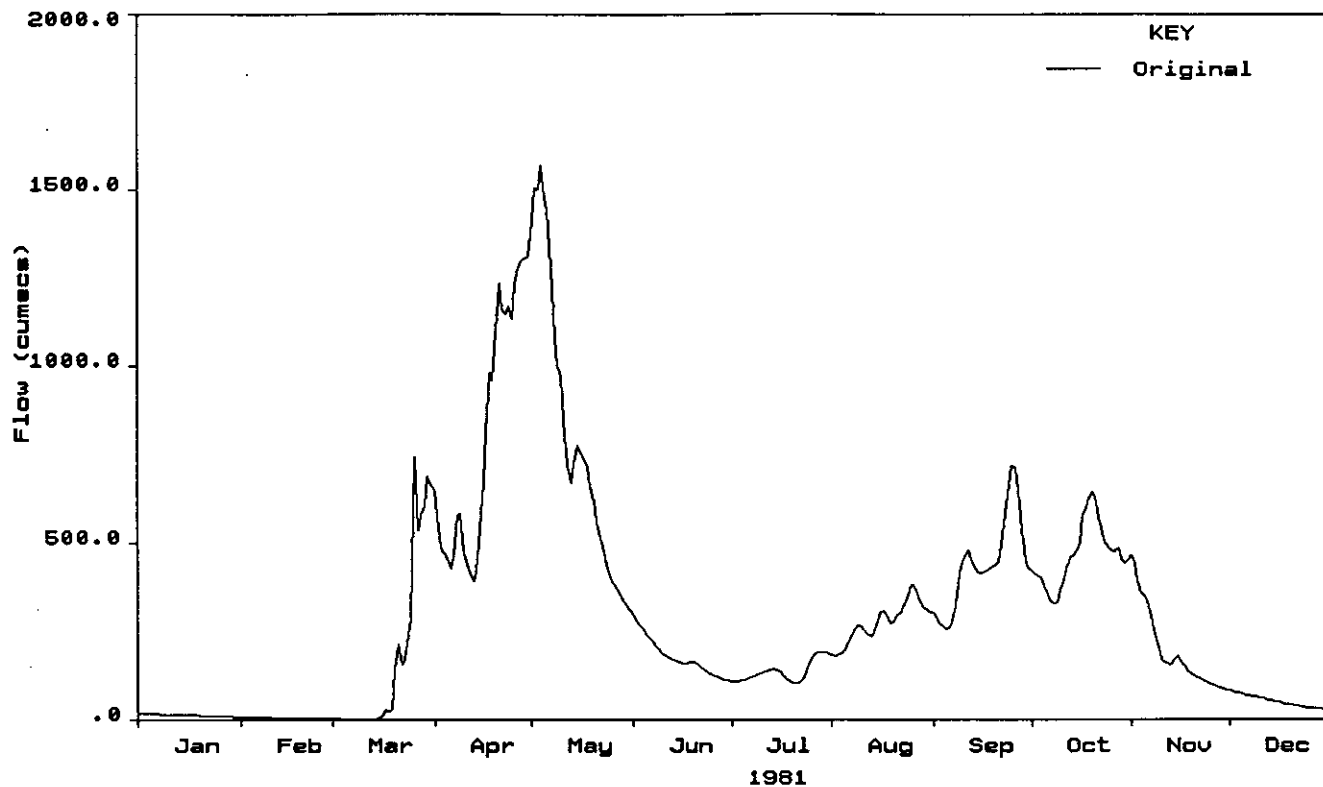


1980

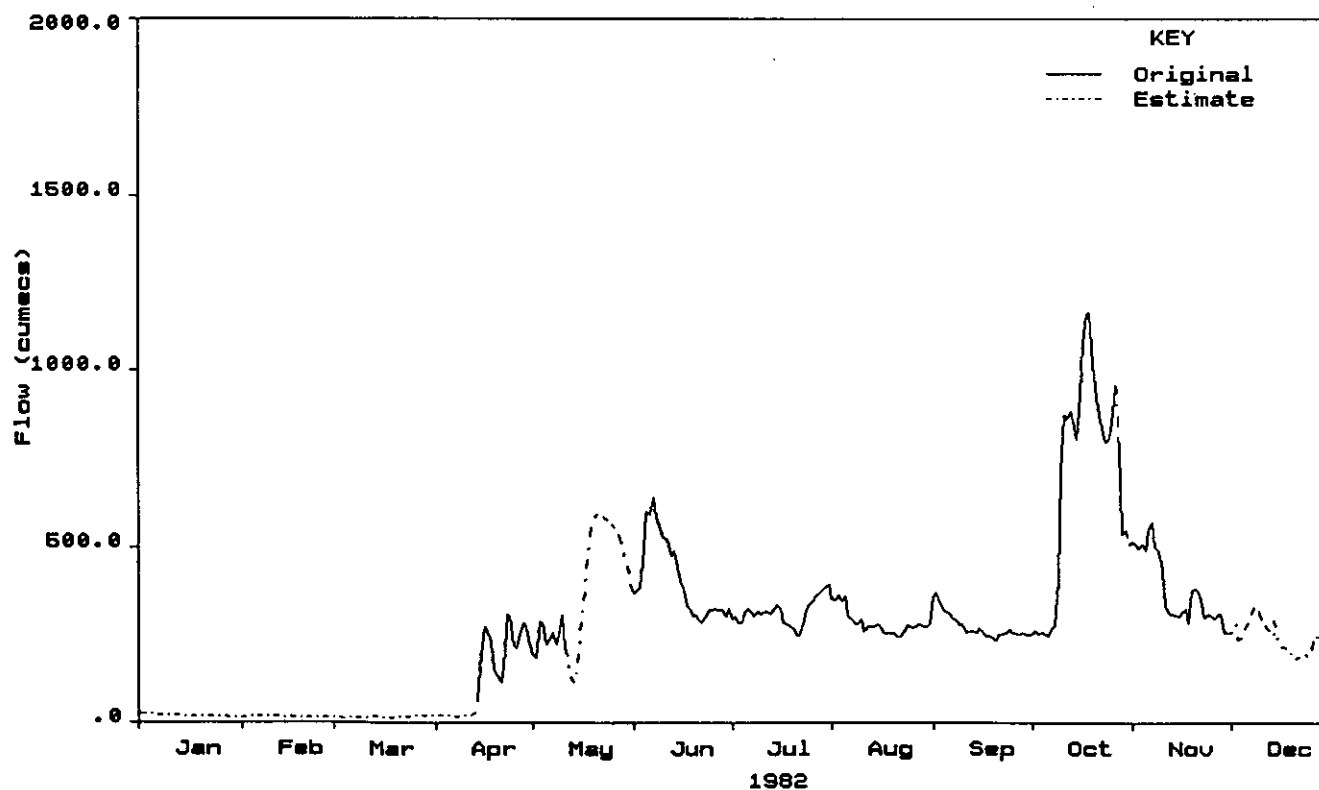


River Jubba at Bardheere

1981

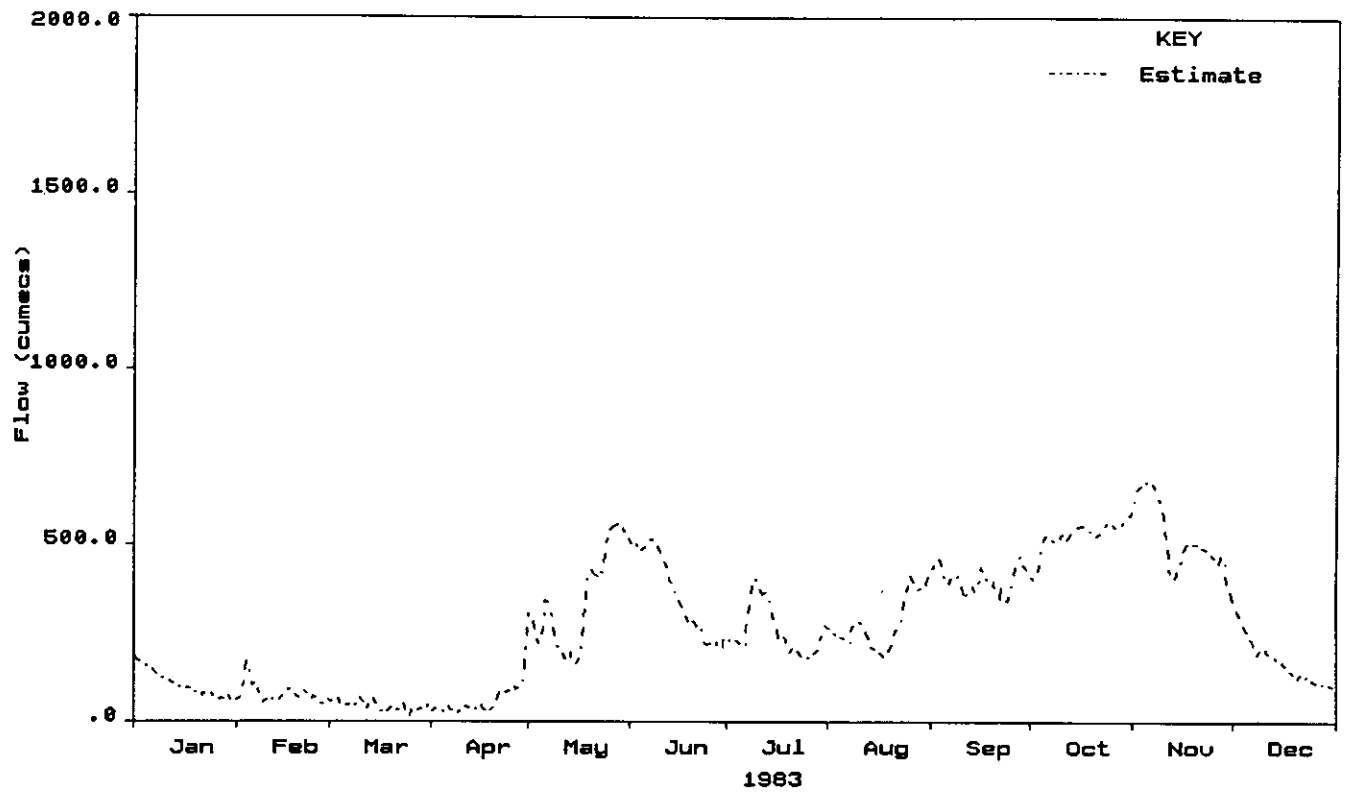


1982

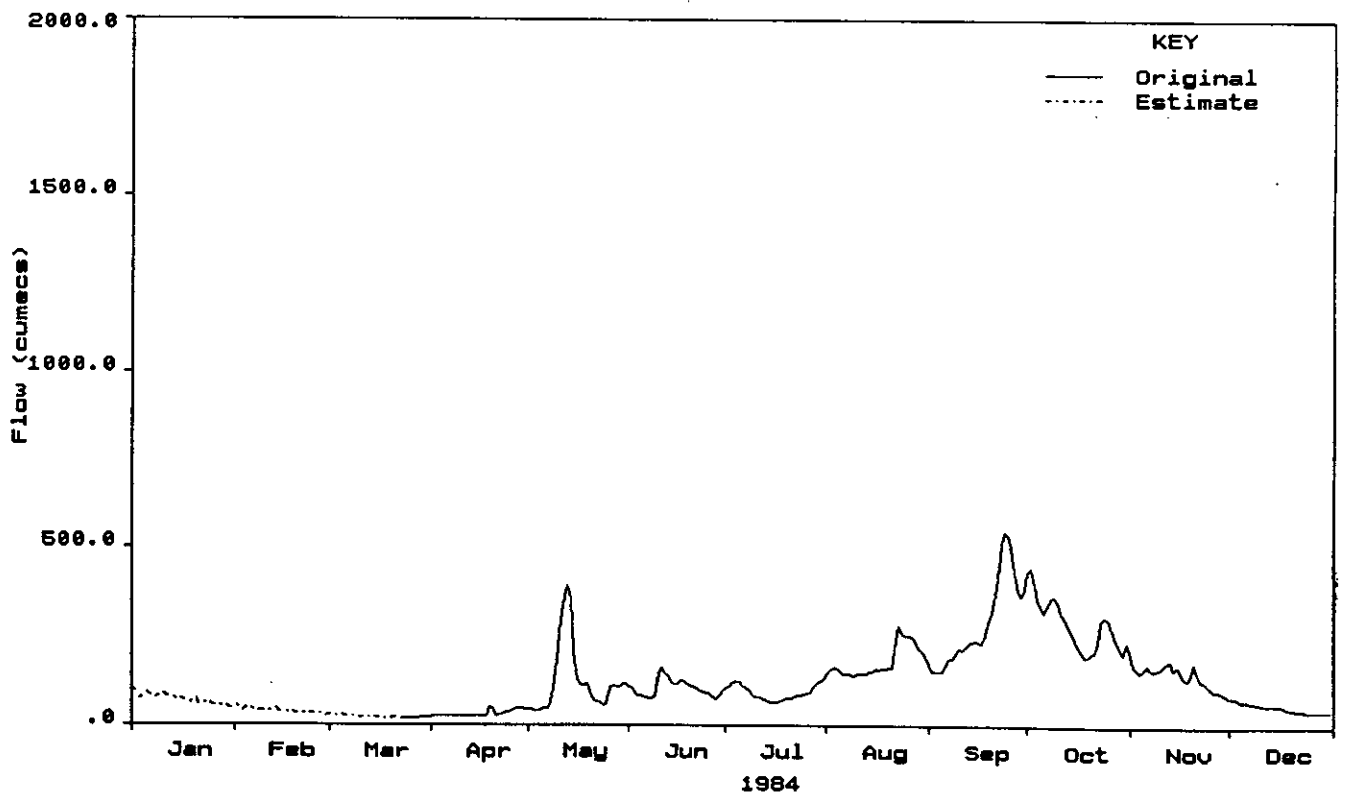


River Jubba at Bardheere

1983

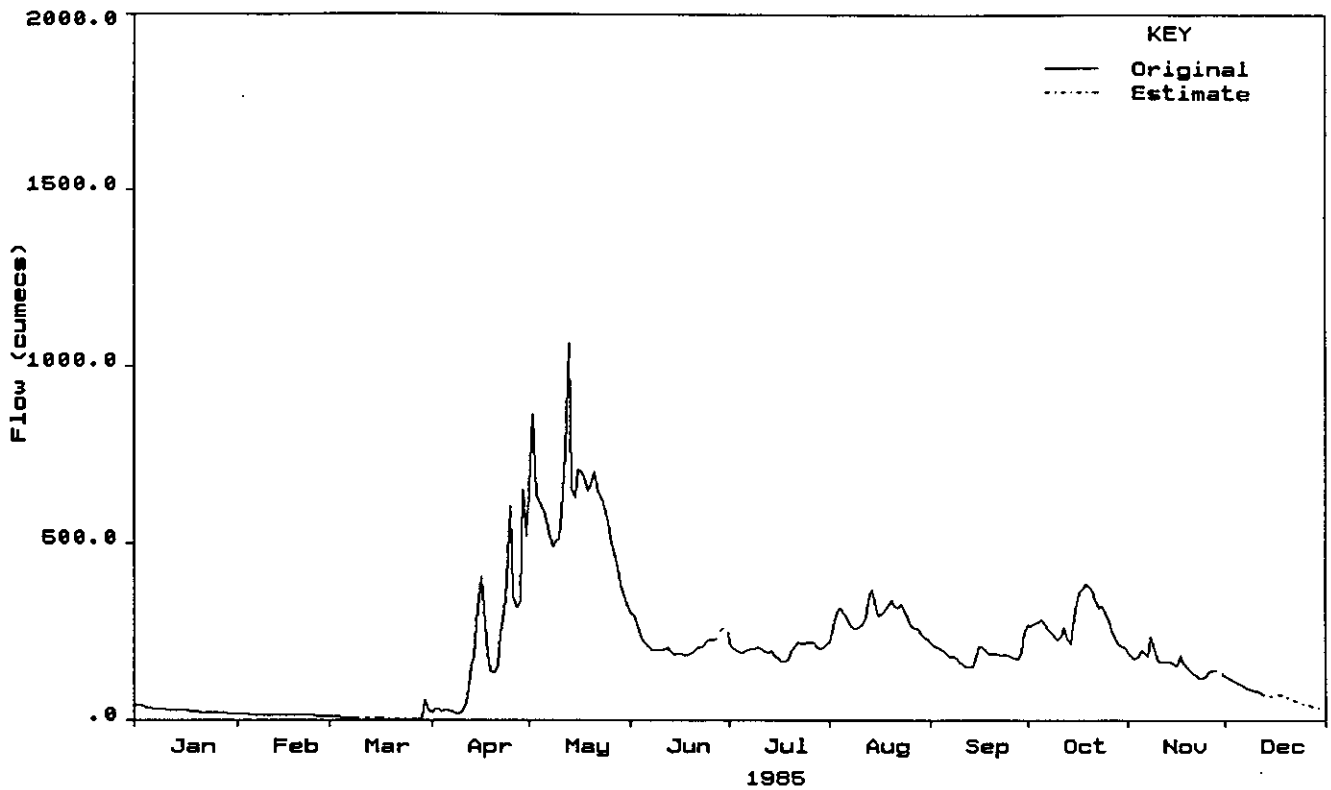


1984

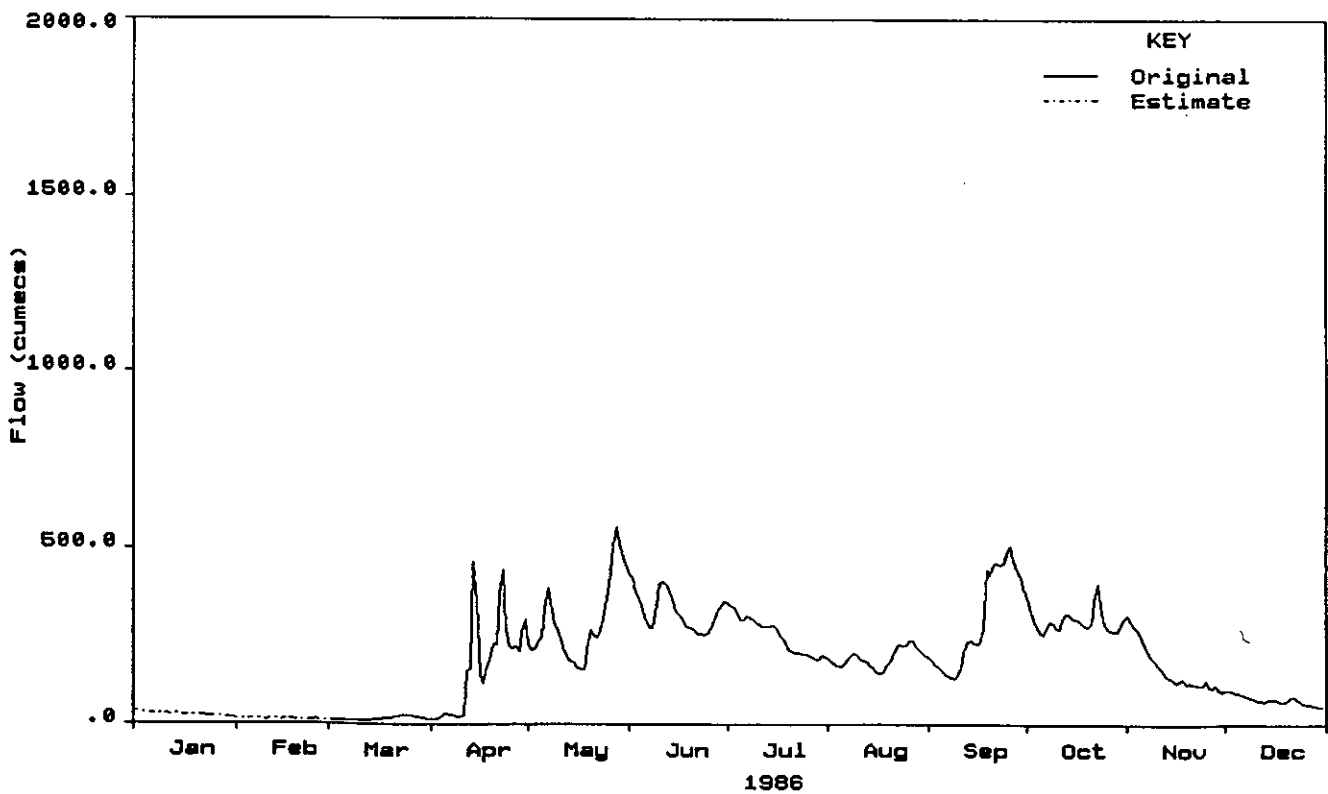


River Jubba at Bardheere

1985

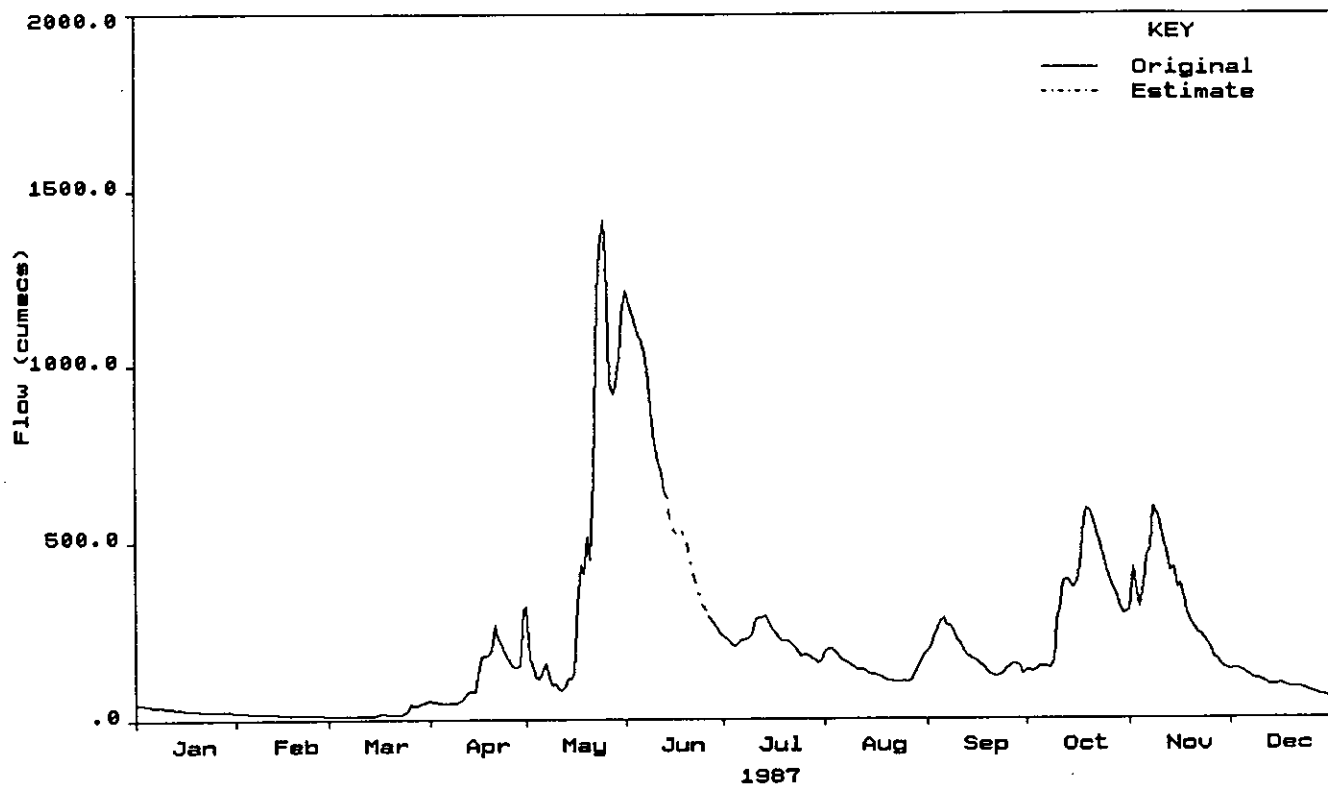


1986

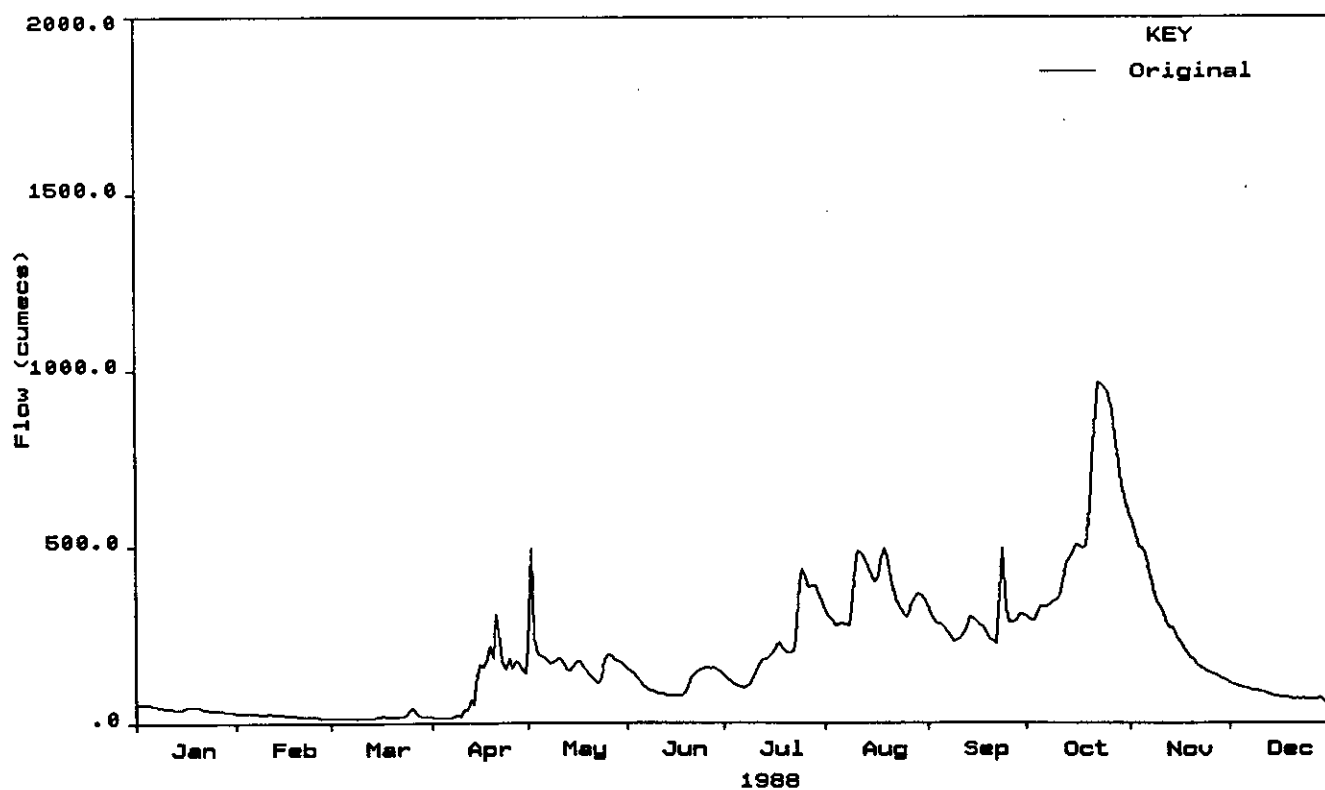


River Jubba at Bardheere

1987

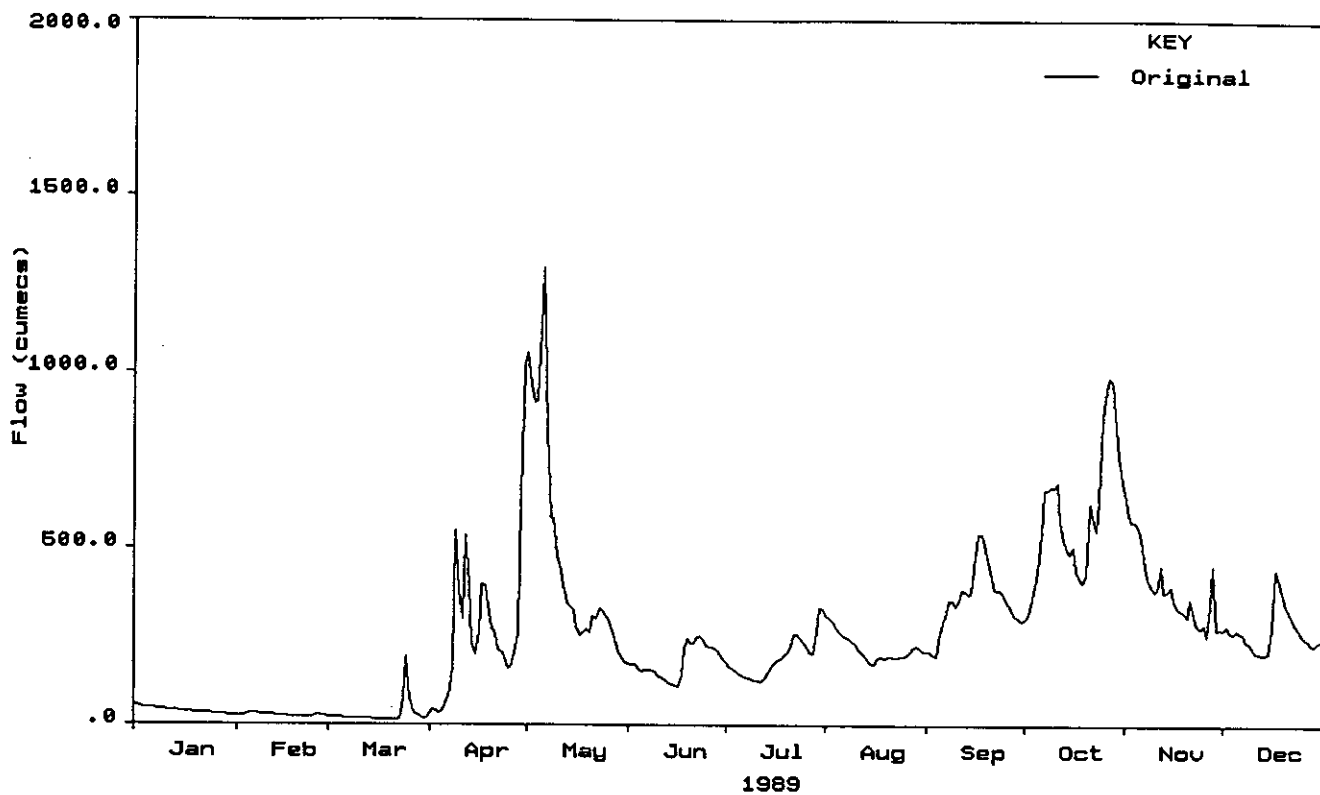


1988



River Jubba at Bardheere

1989



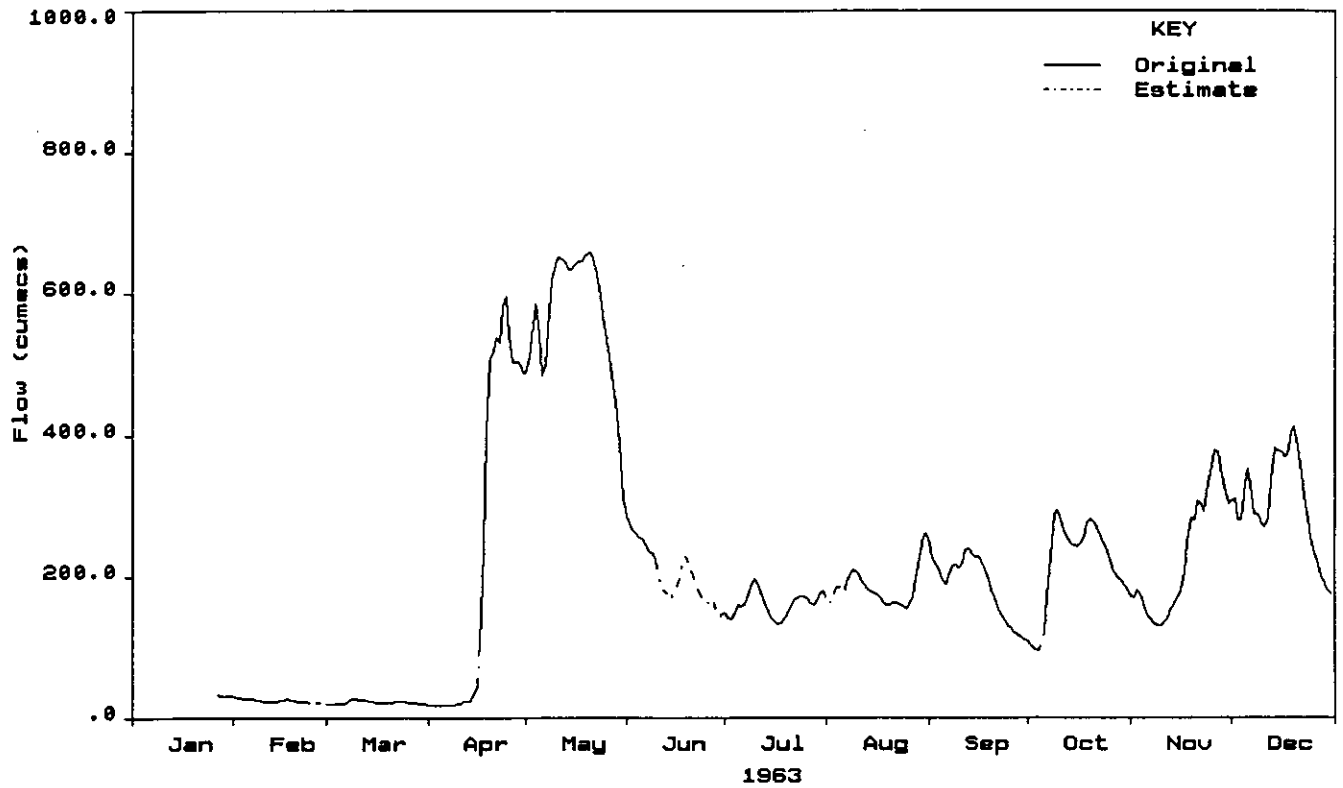
KAITOI

1963 - 1964

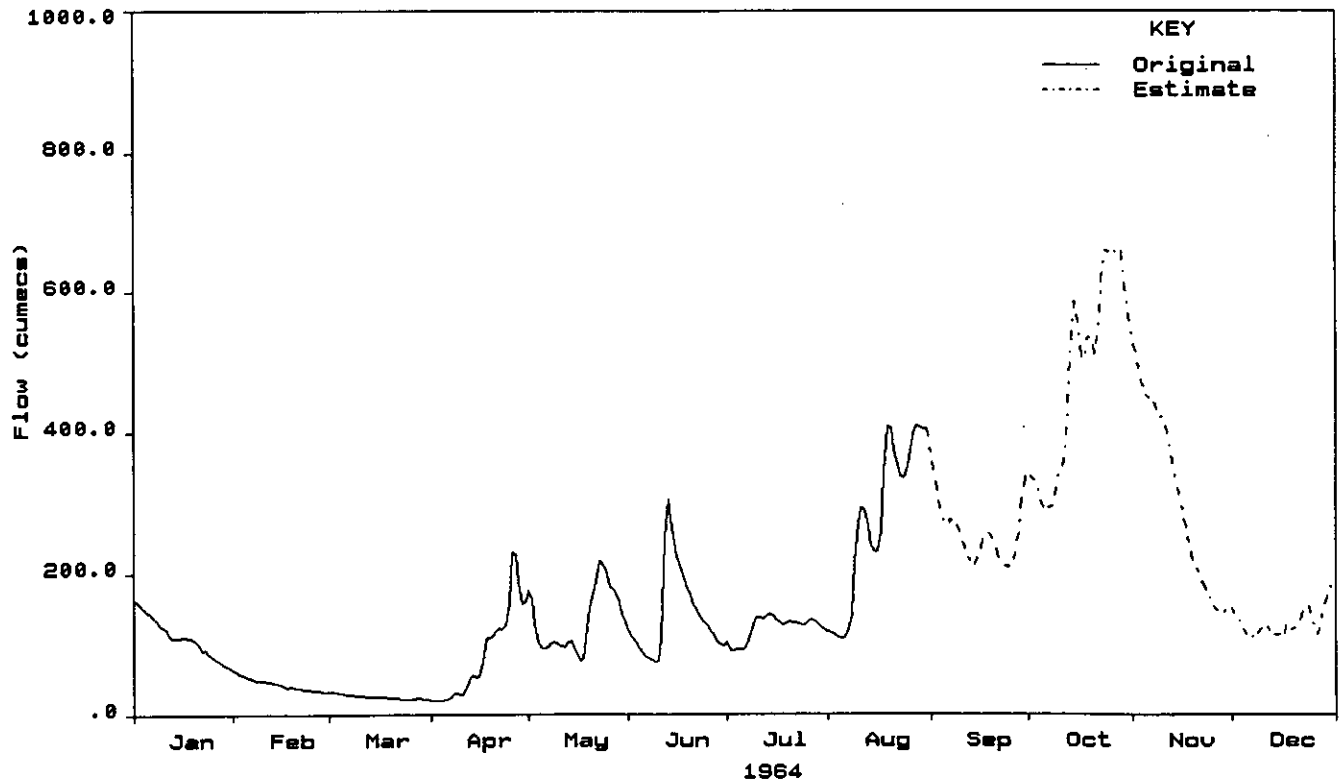
1972 - 1980

River Jubba at Kaitoi

1963

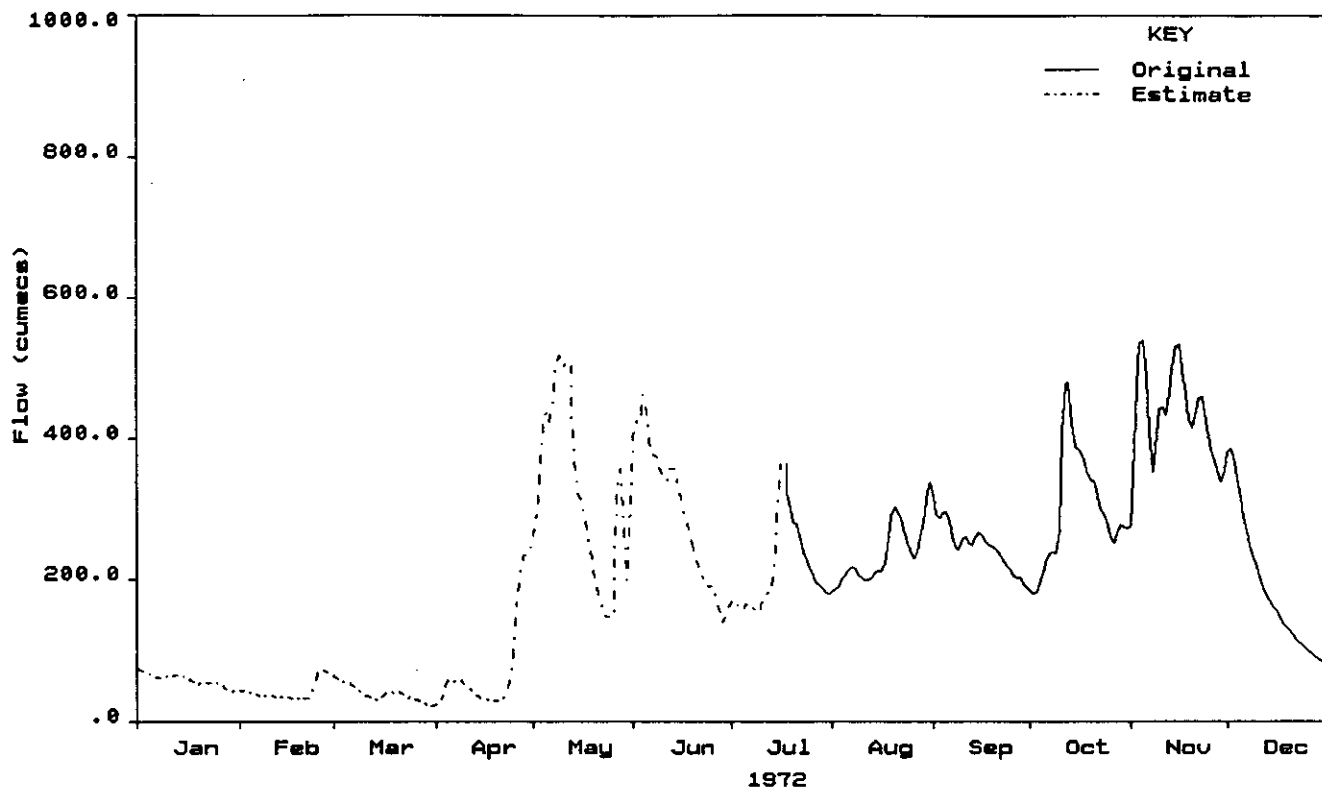


1964

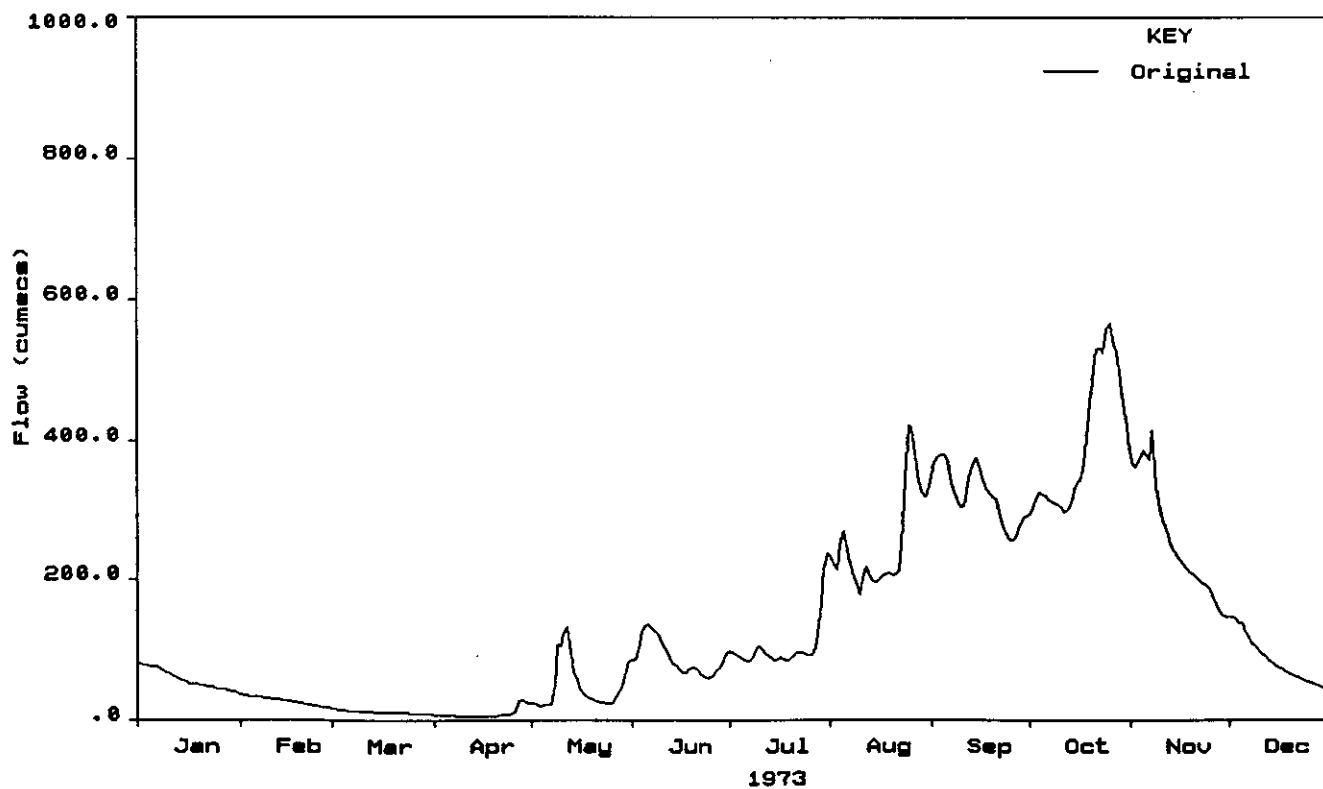


River Jubba at Kaitoi

1972

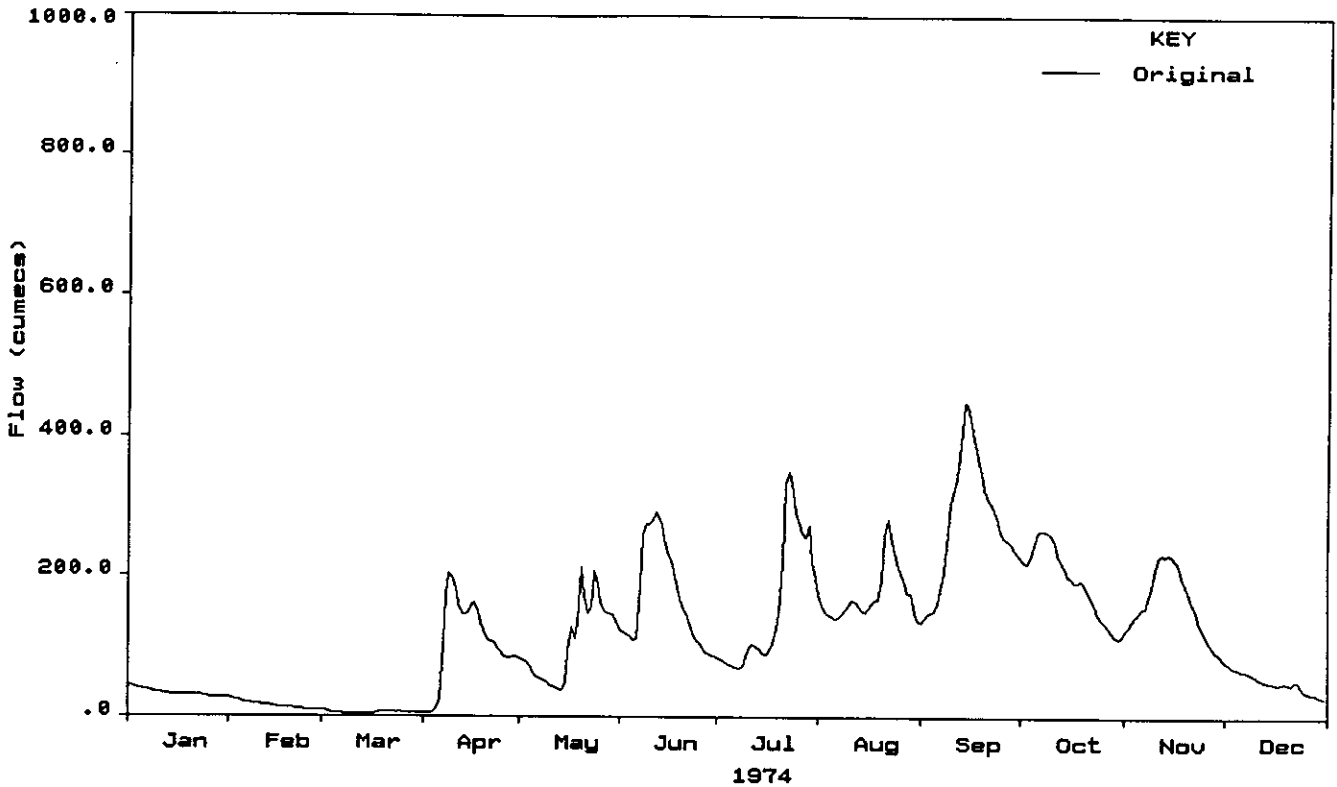


1973

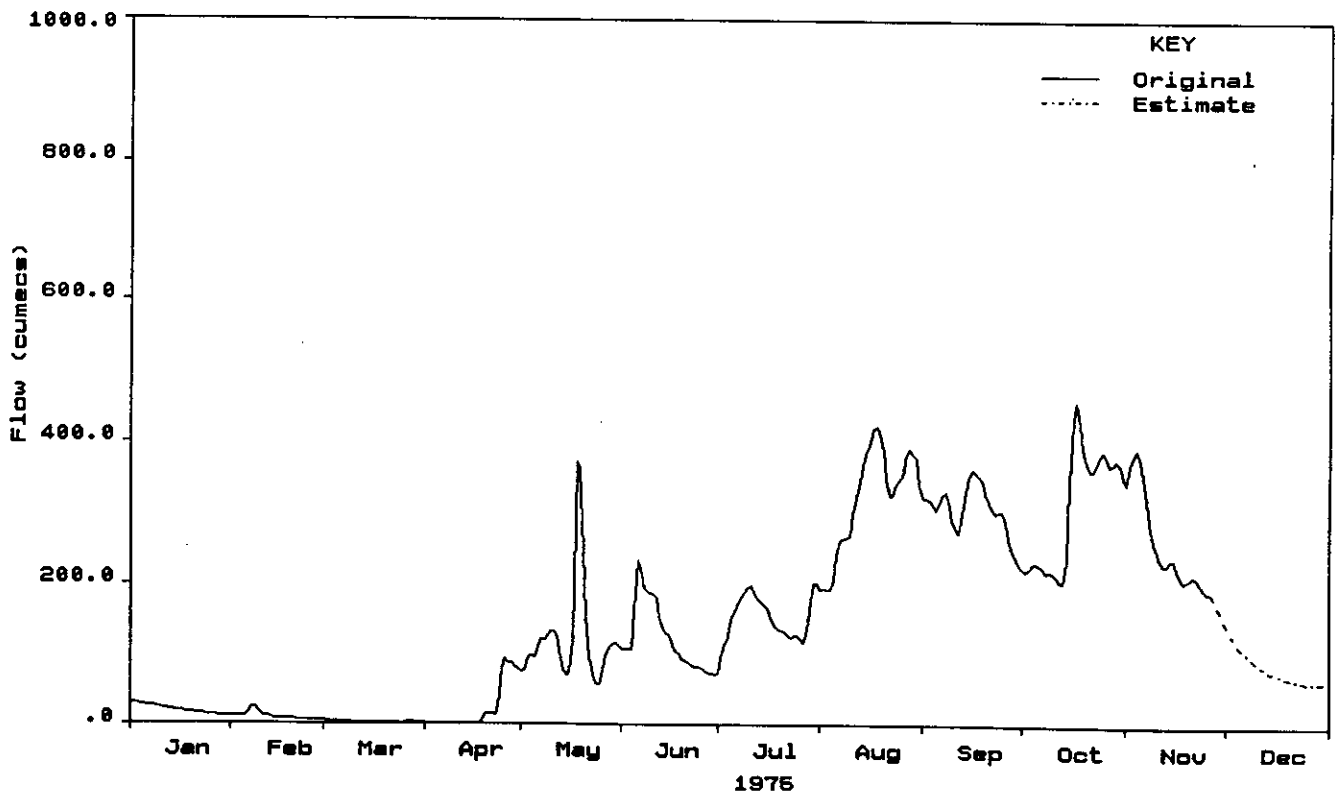


River Jubba at Kaitoi

1974

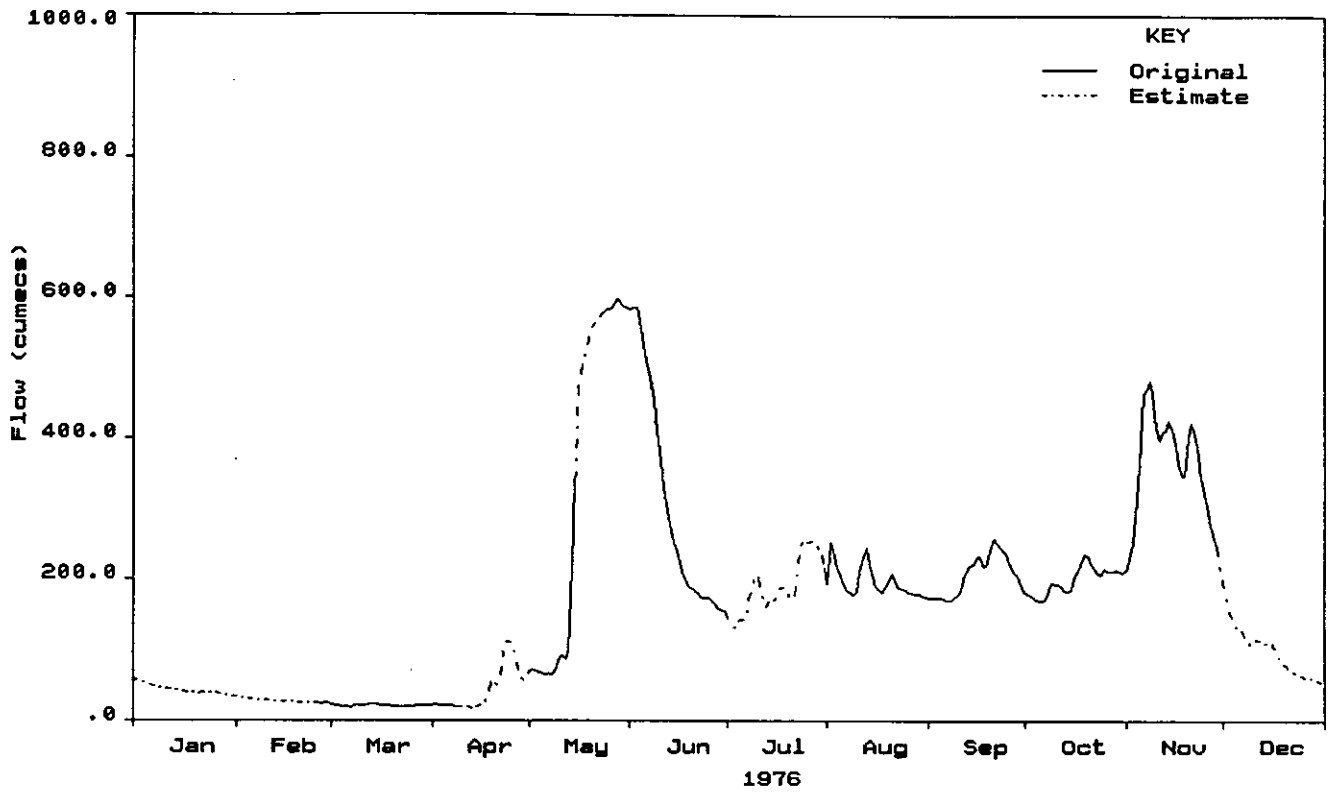


1975

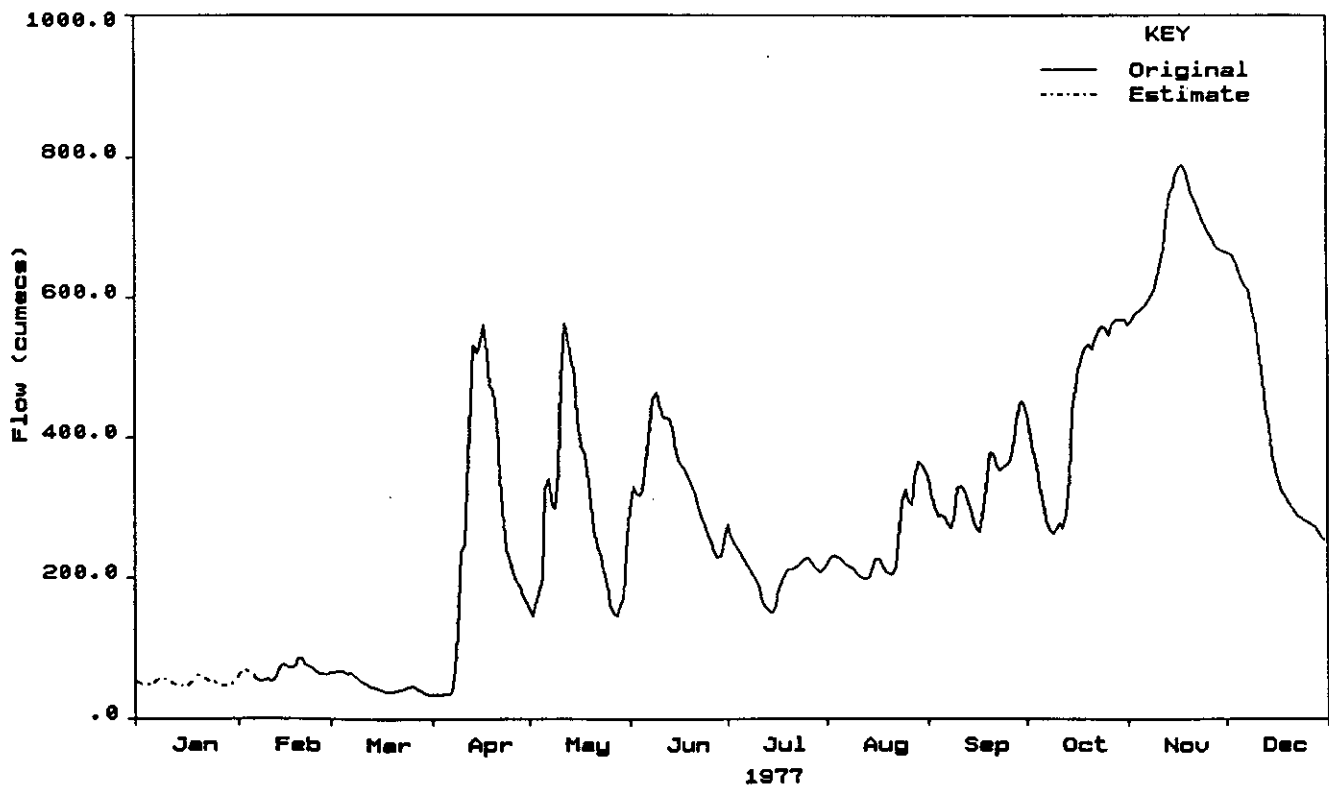


River Jubba at Kaitoi

1976

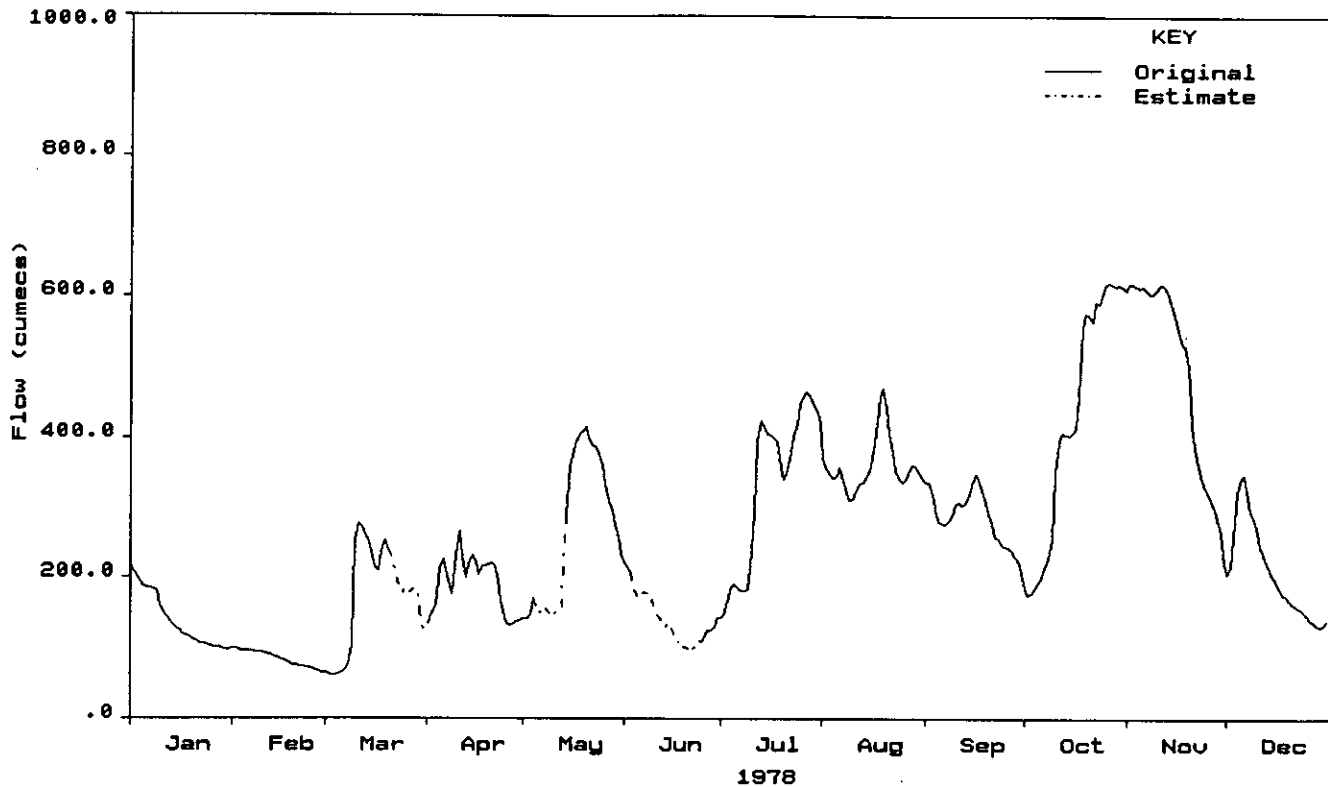


1977

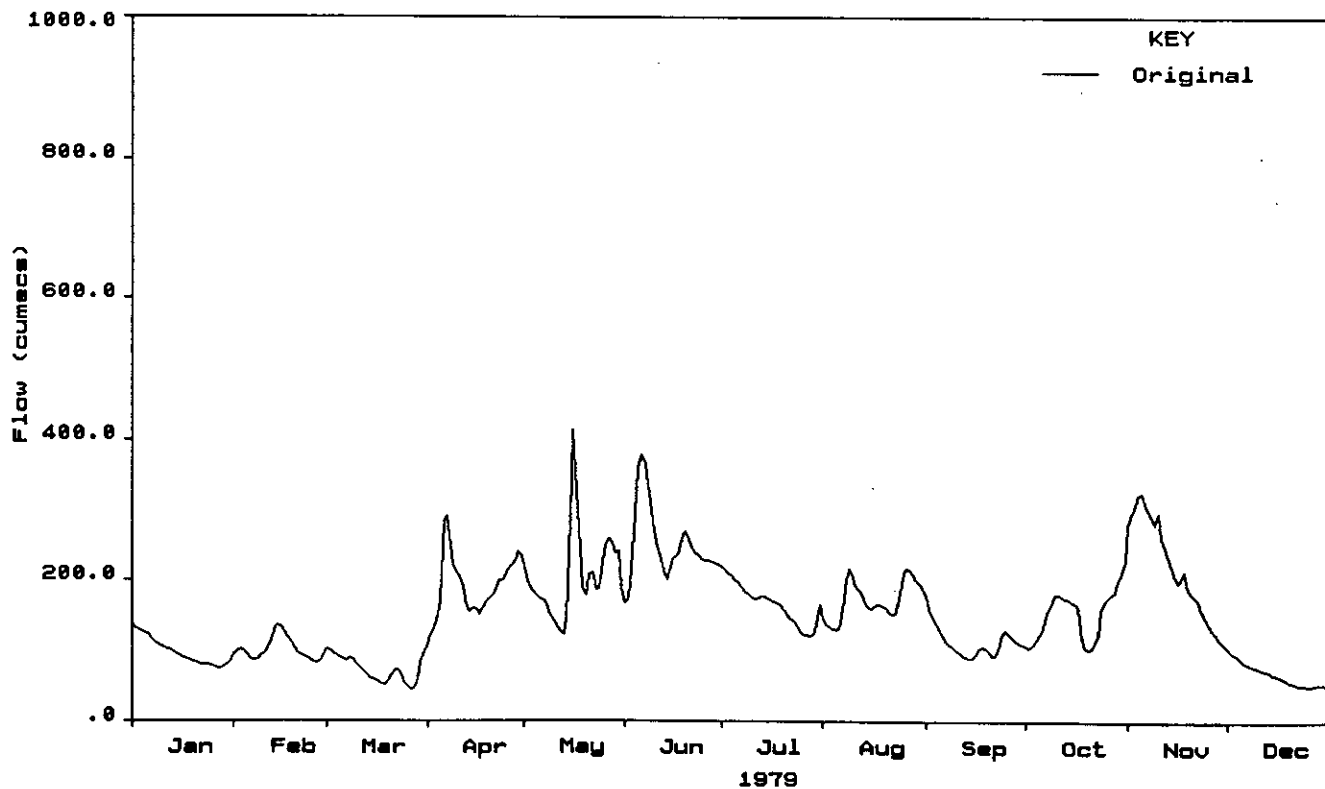


River Jubba at Kaitoi

1978

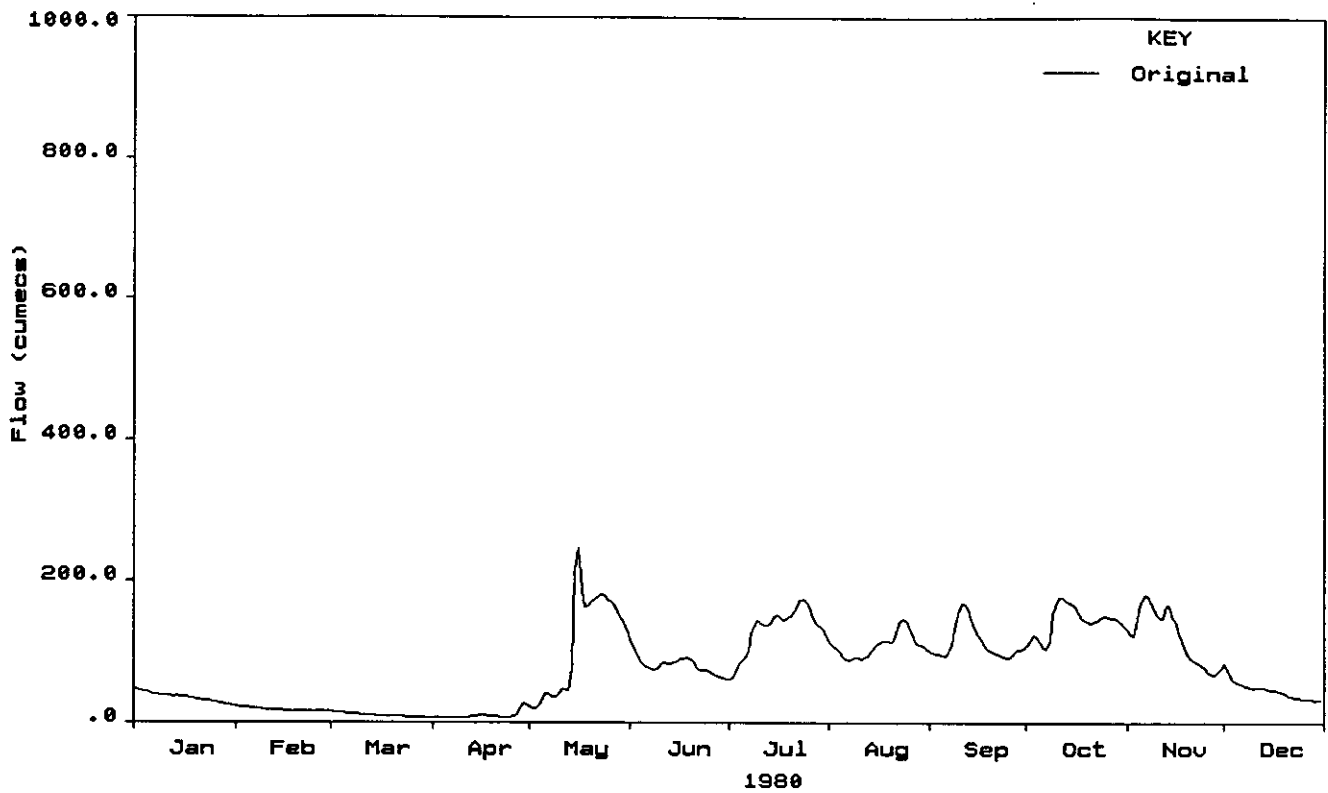


1979



River Jubba at Kaitoi

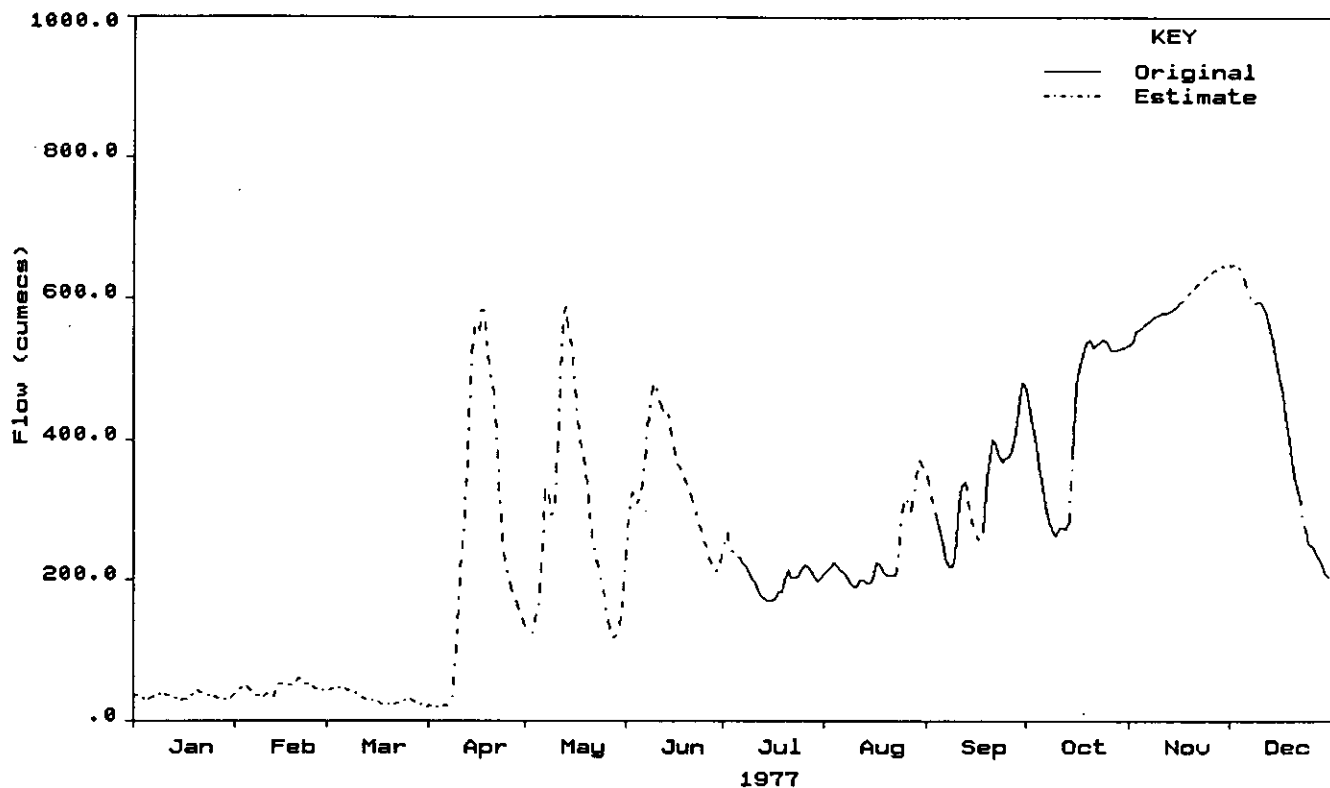
1980



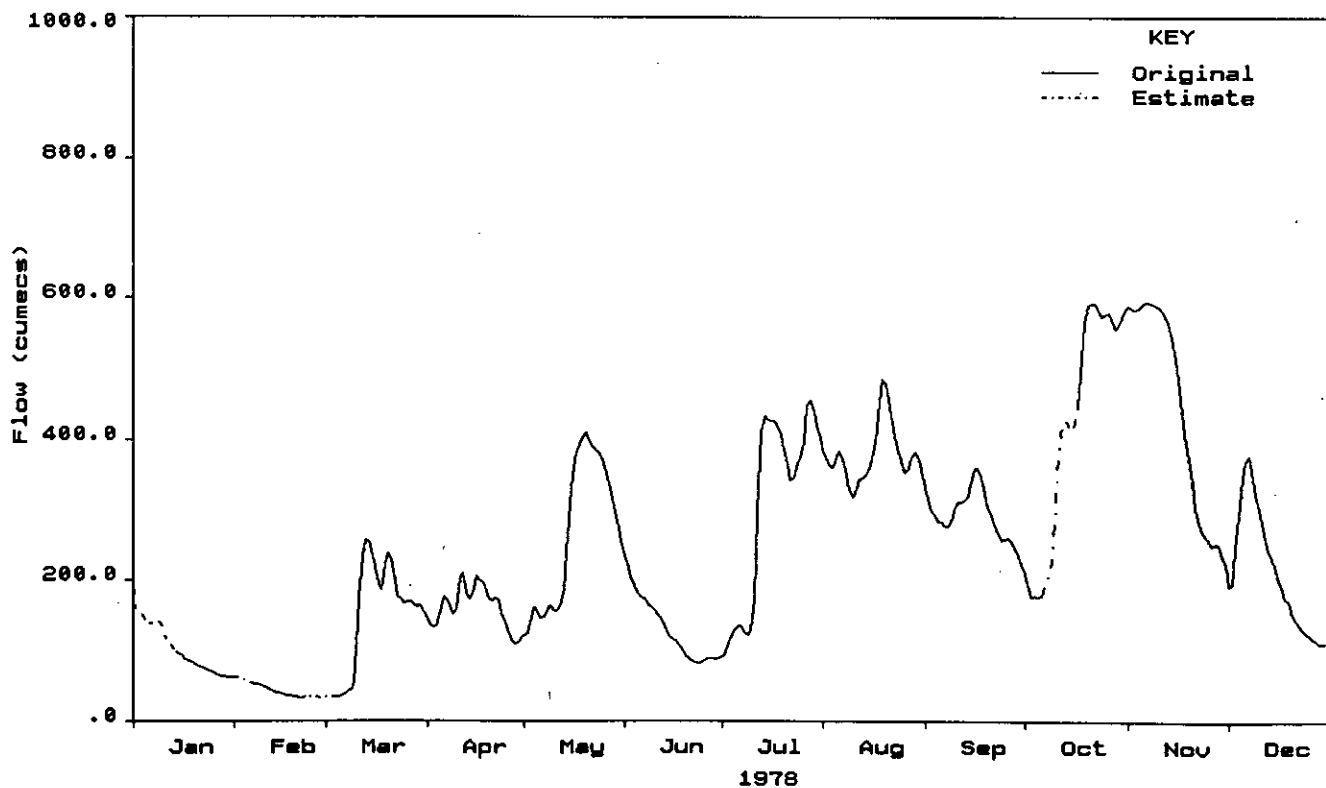
MAREERE
1977 - 1989

River Jubba at Mareere

1977

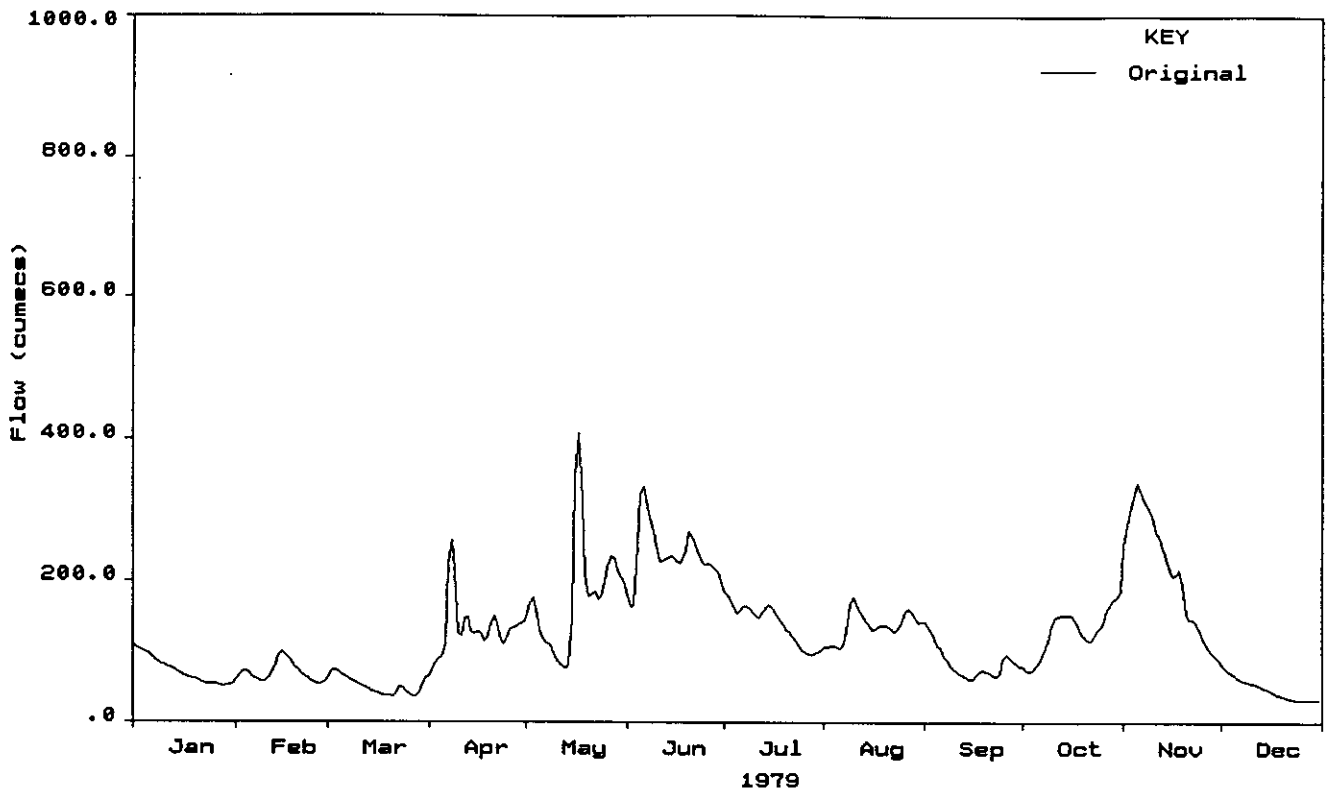


1978

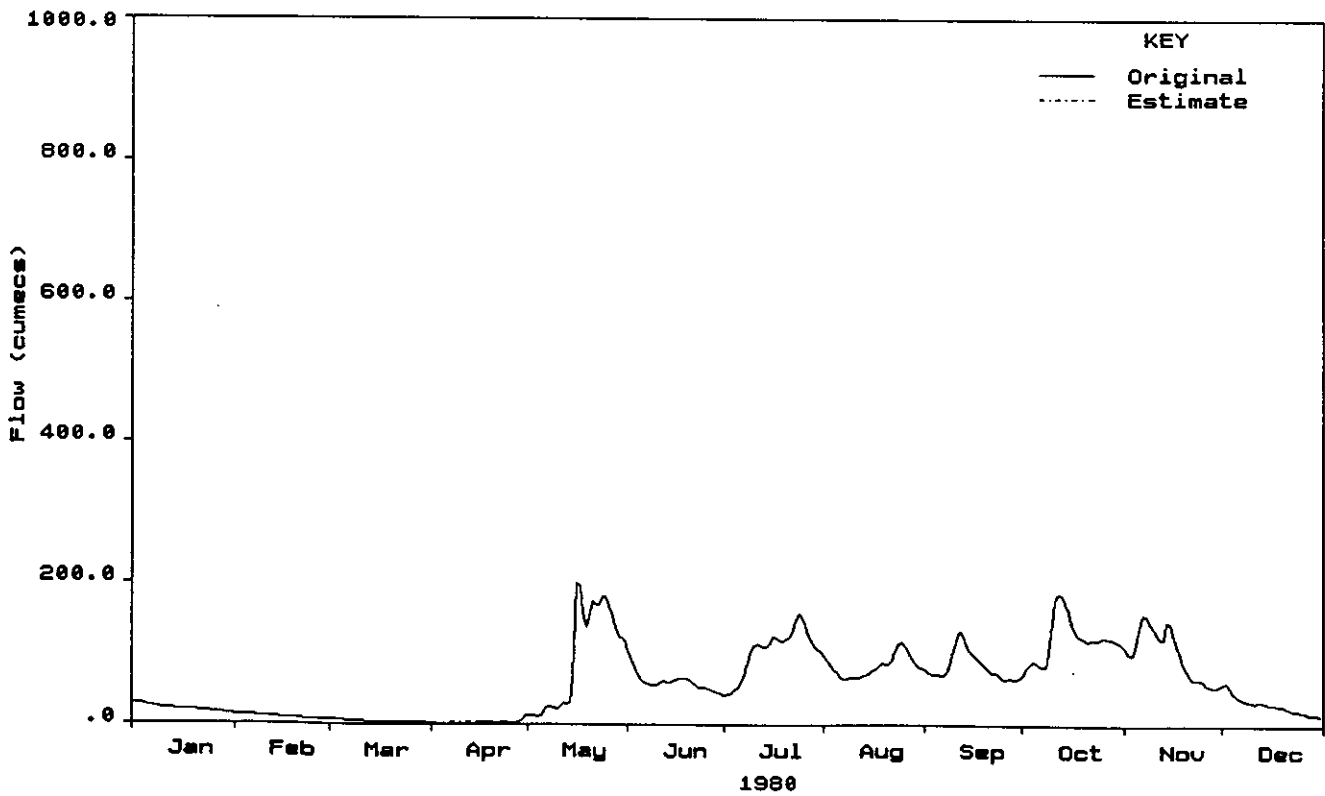


River Jubba at Mareere

1979

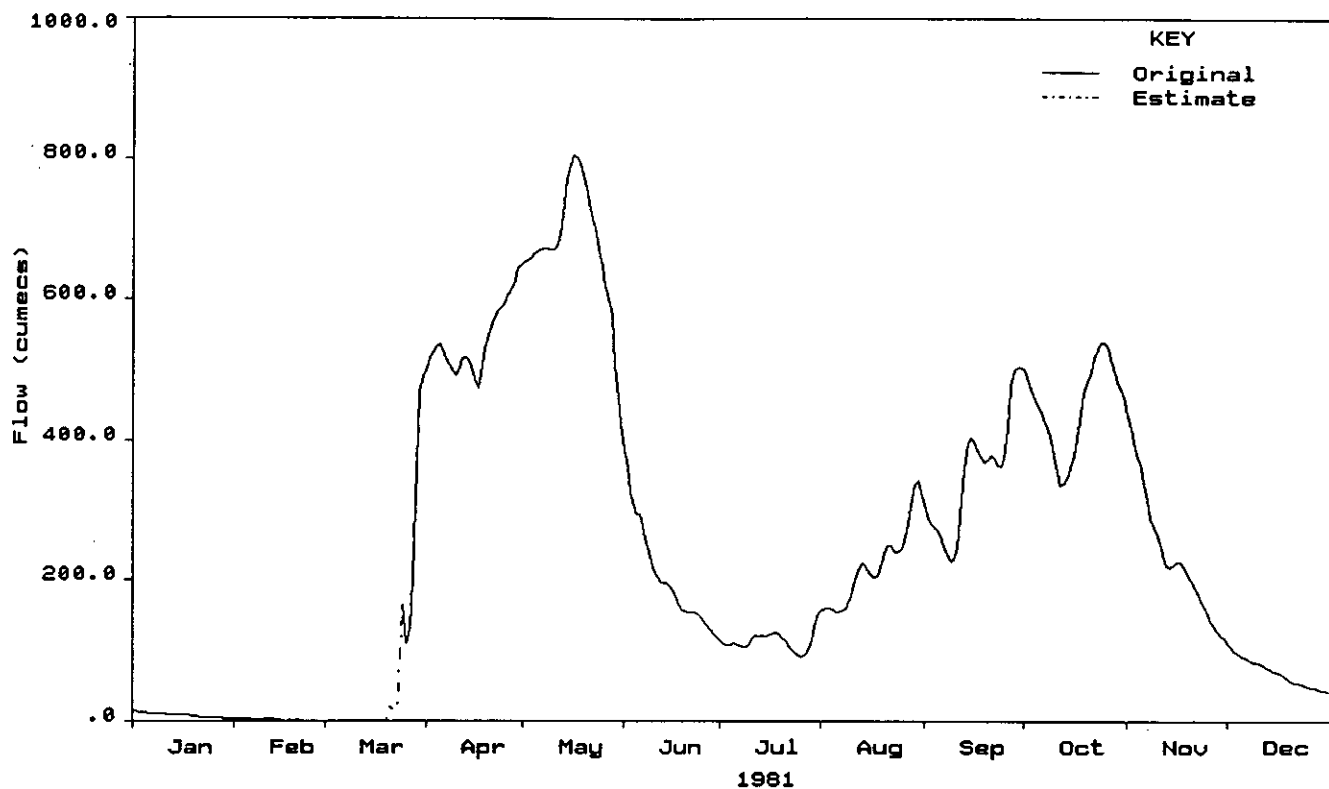


1980

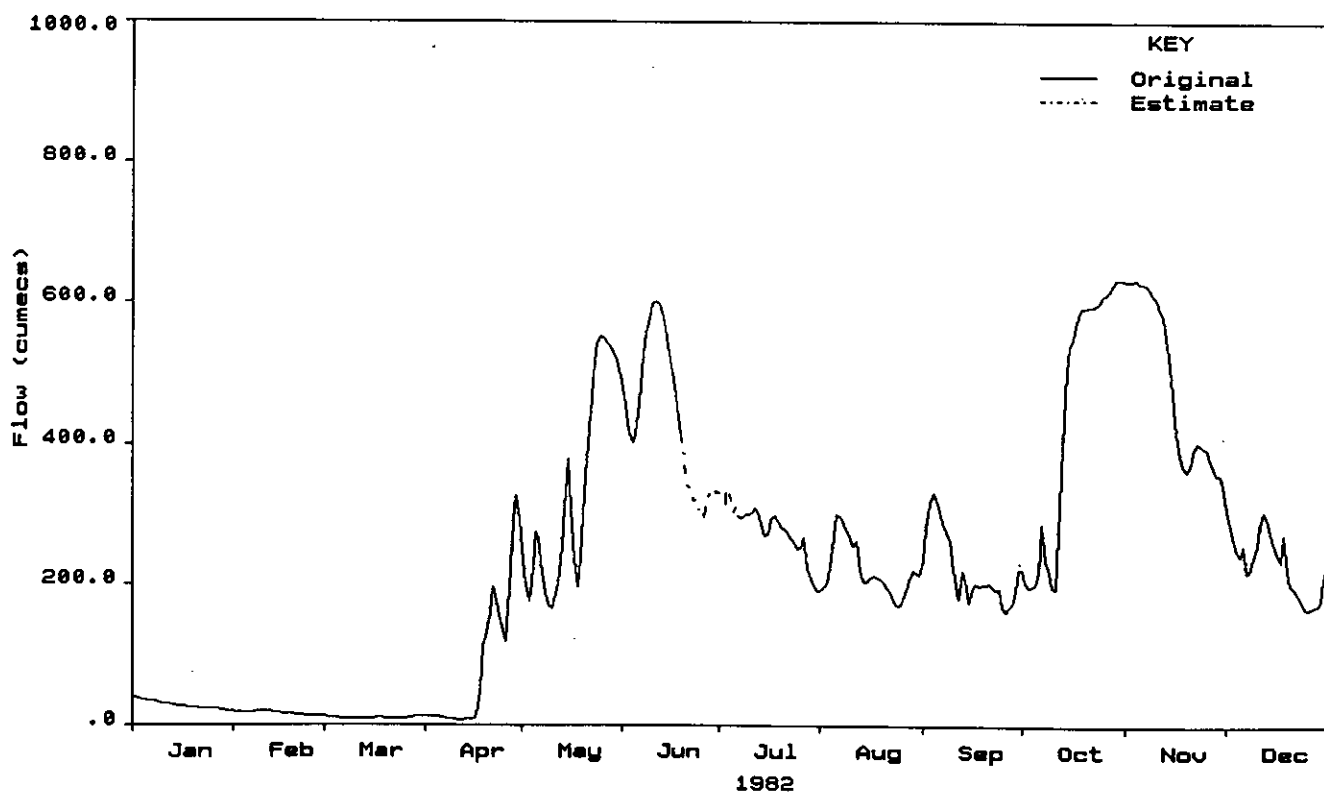


River Jubba at Mareere

1981

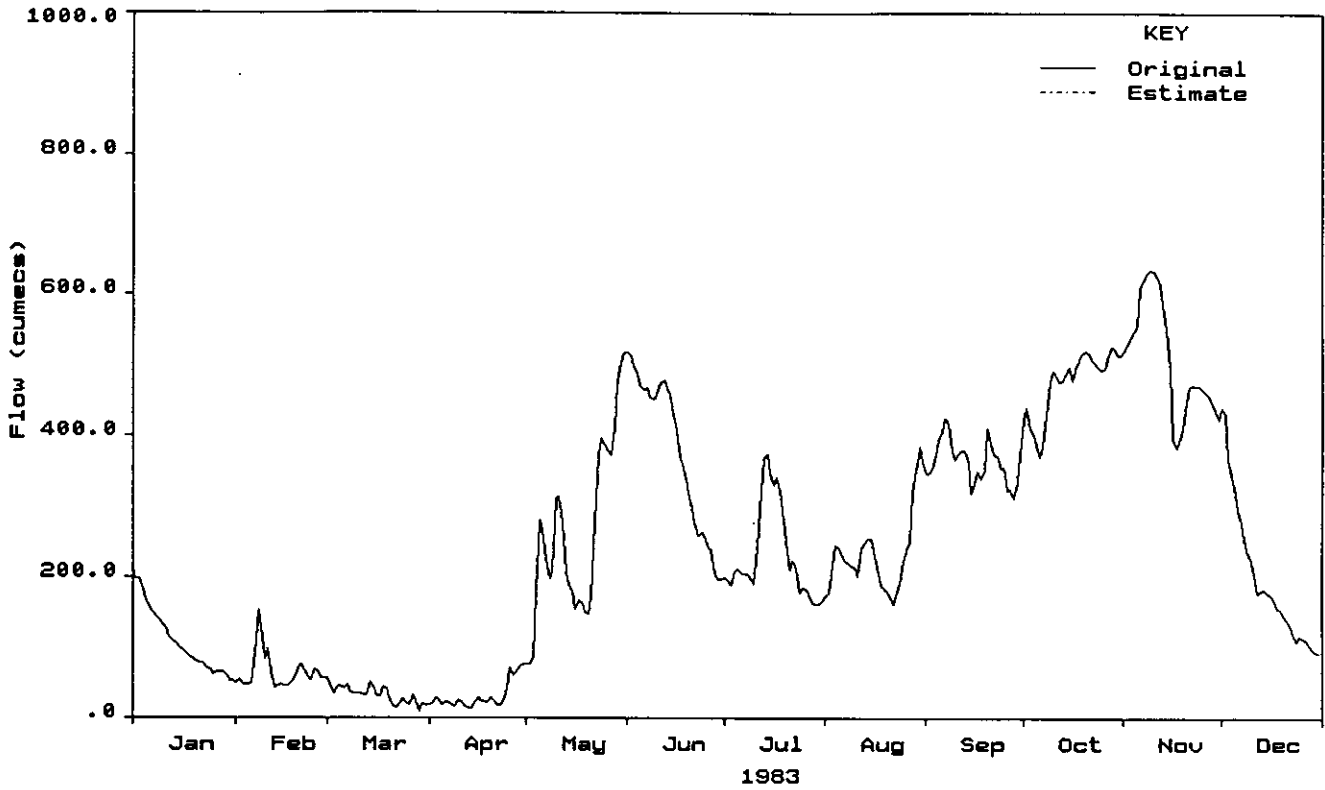


1982

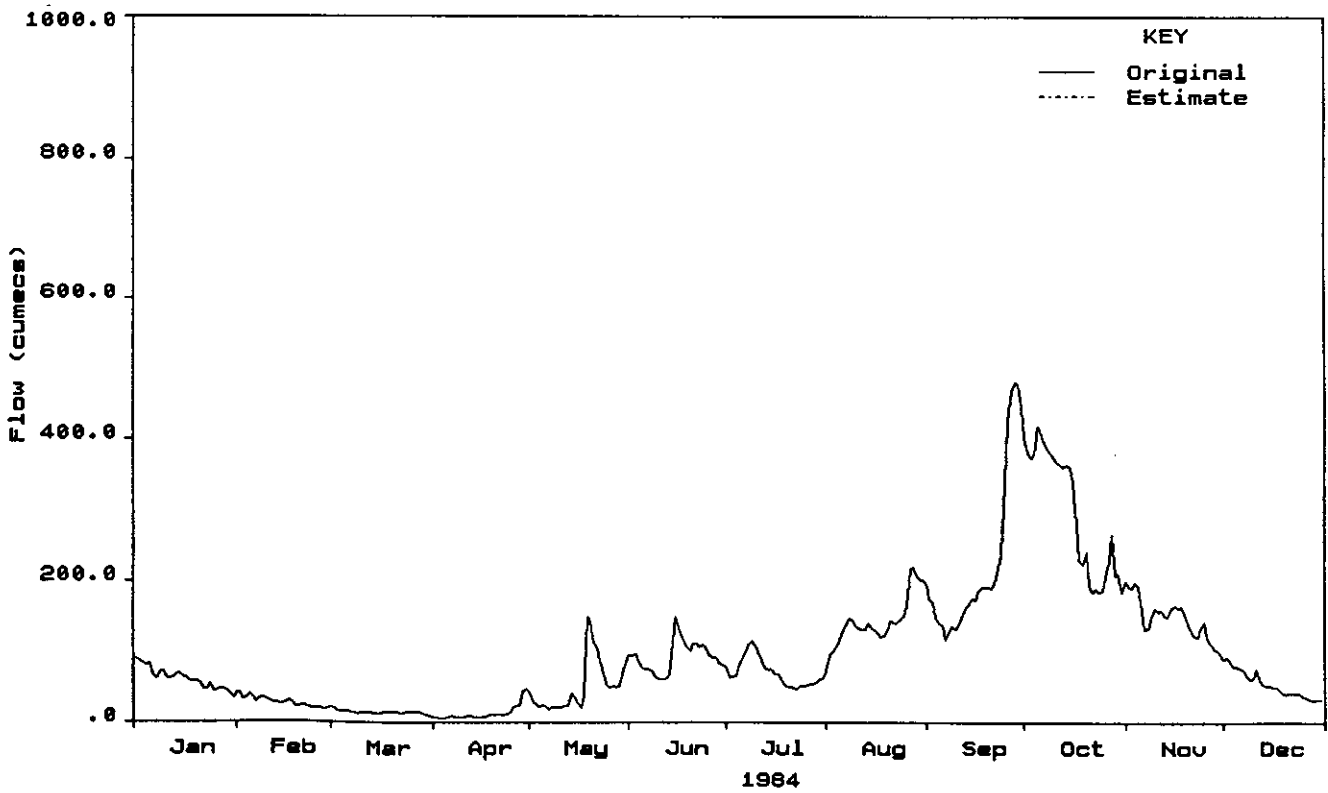


River Jubba at Mareere

1983

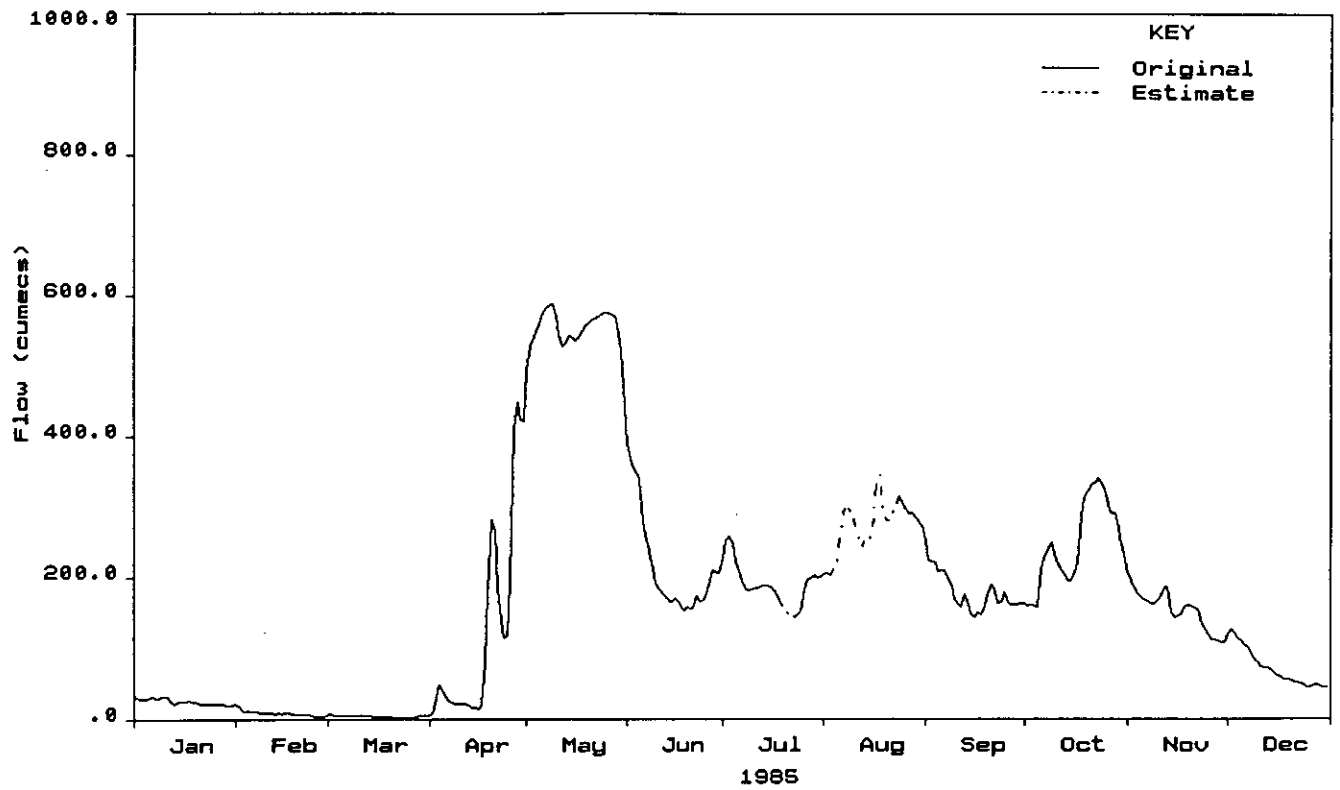


1984

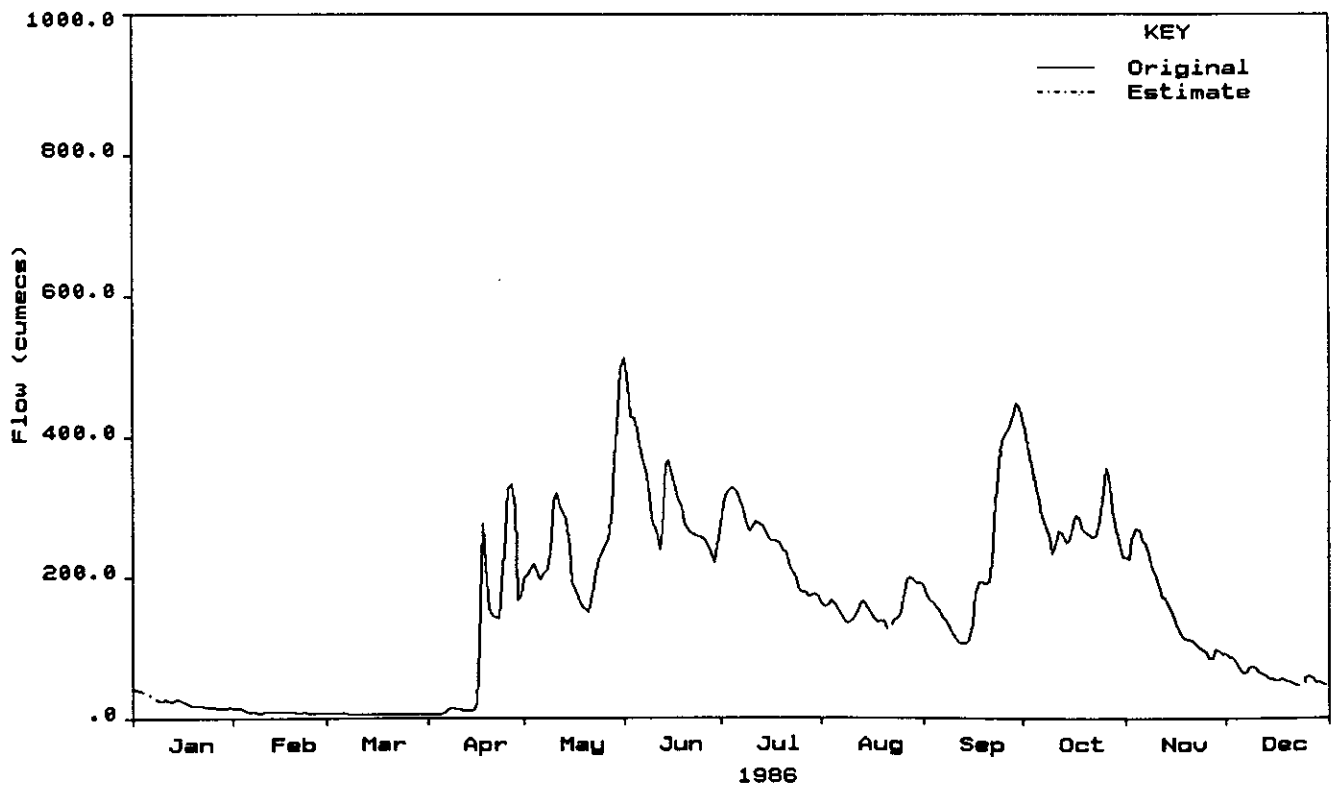


River Jubba at Mareere

1985

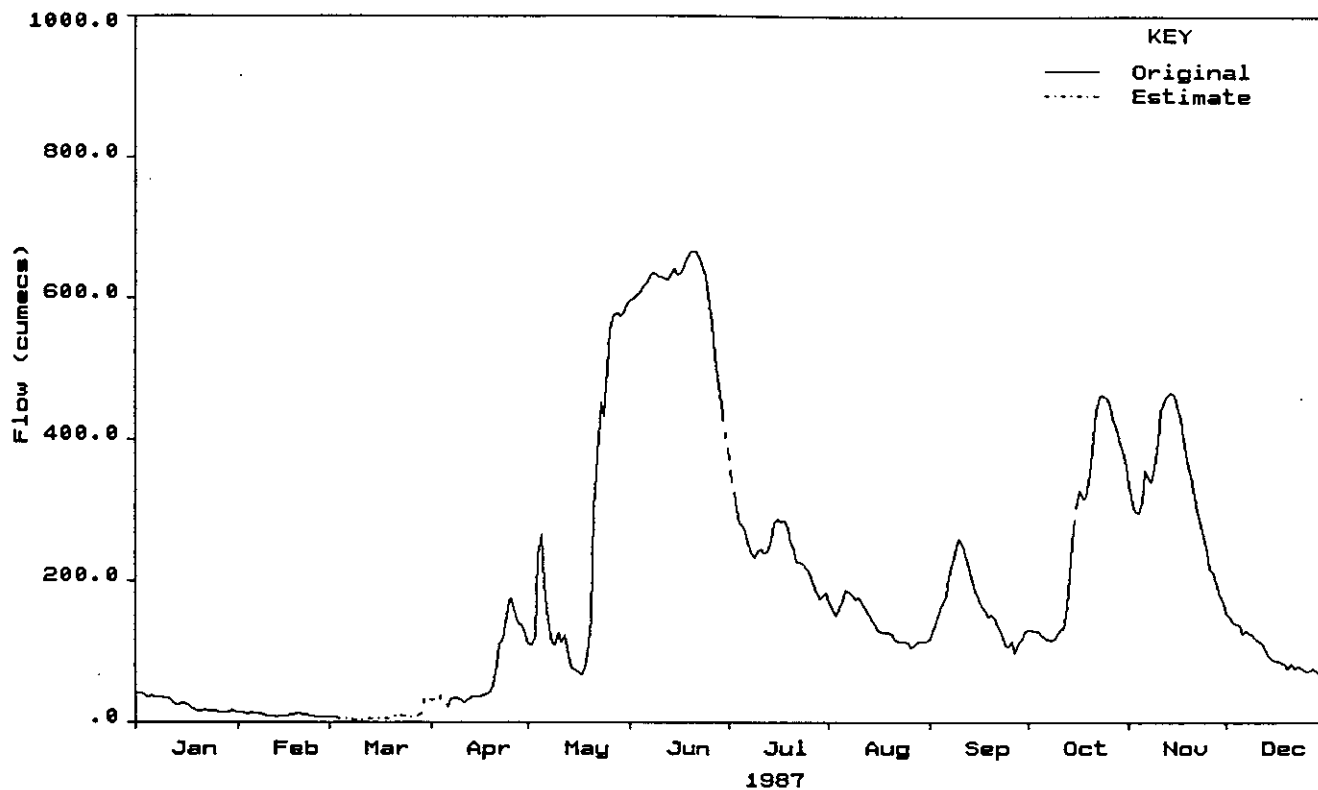


1986

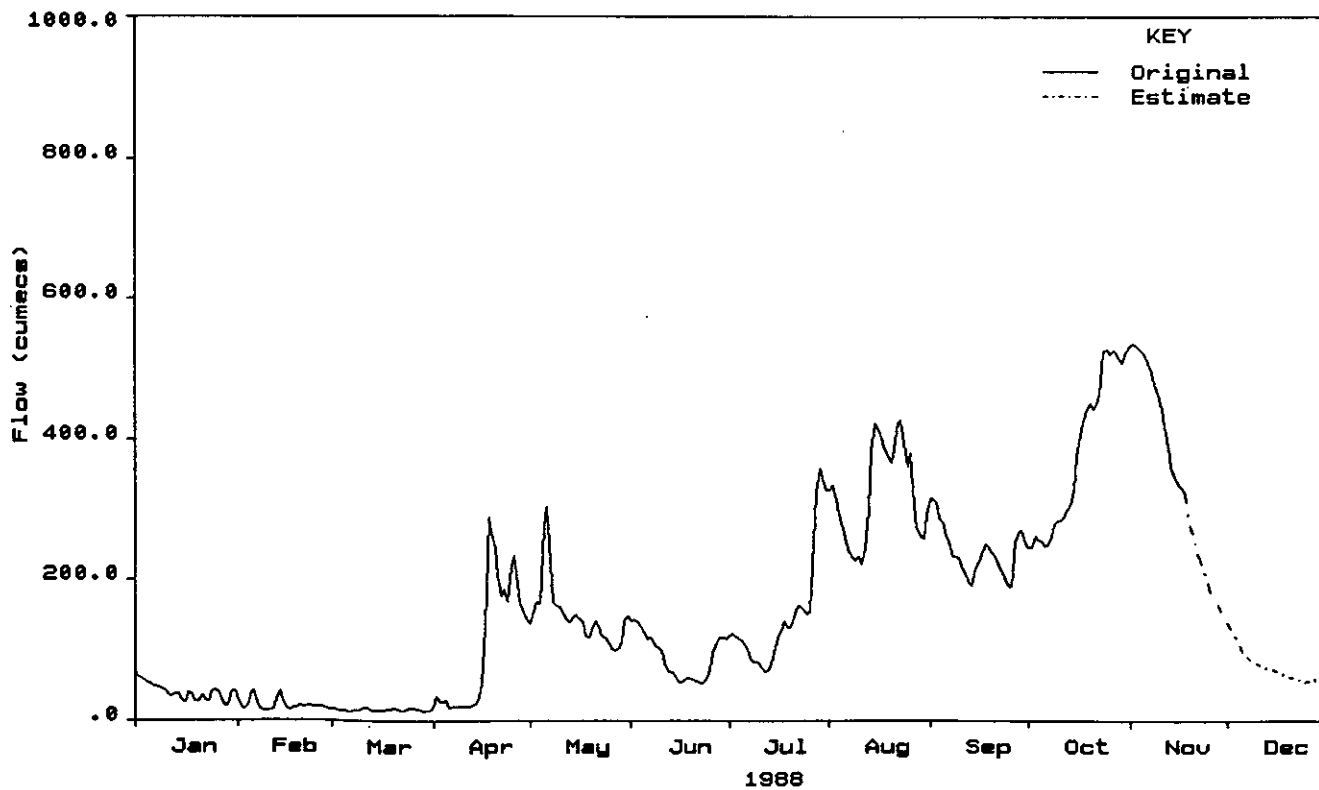


River Jubba at Mareere

1987

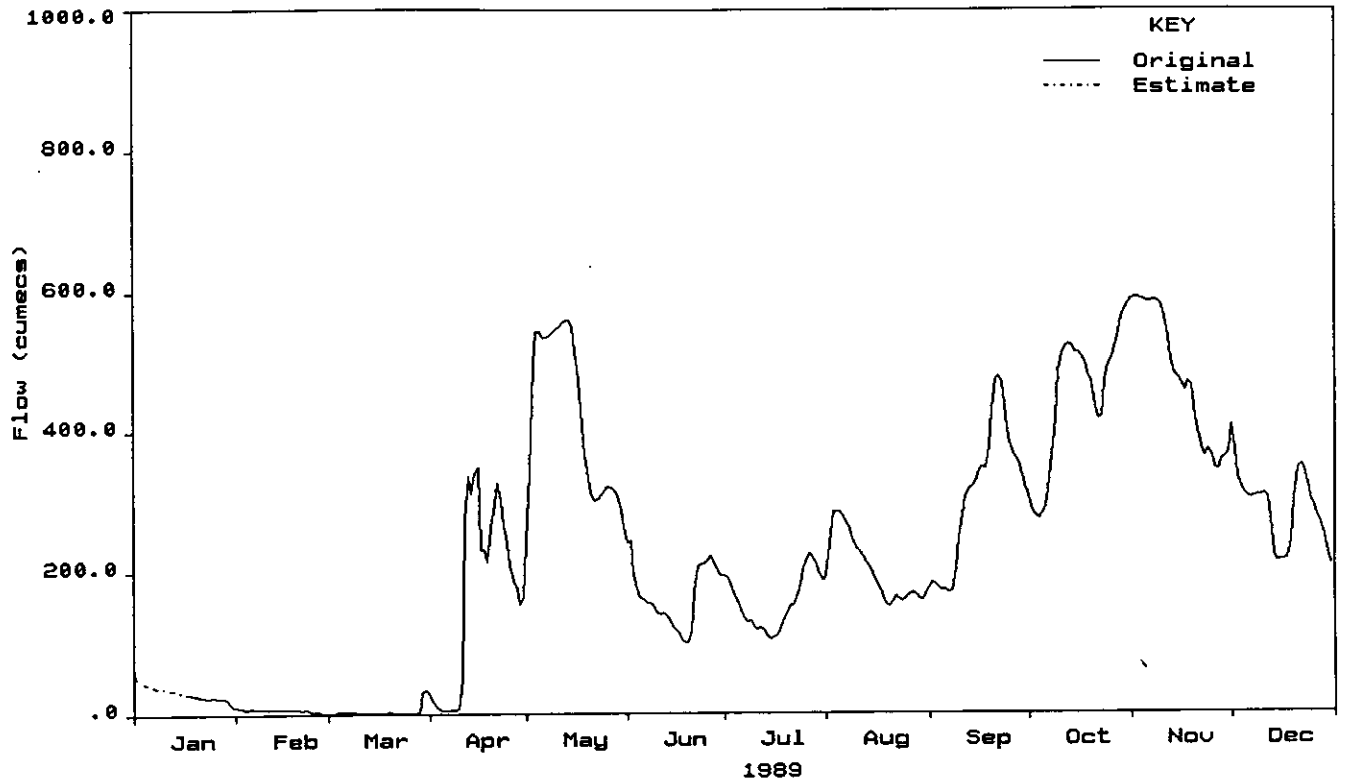


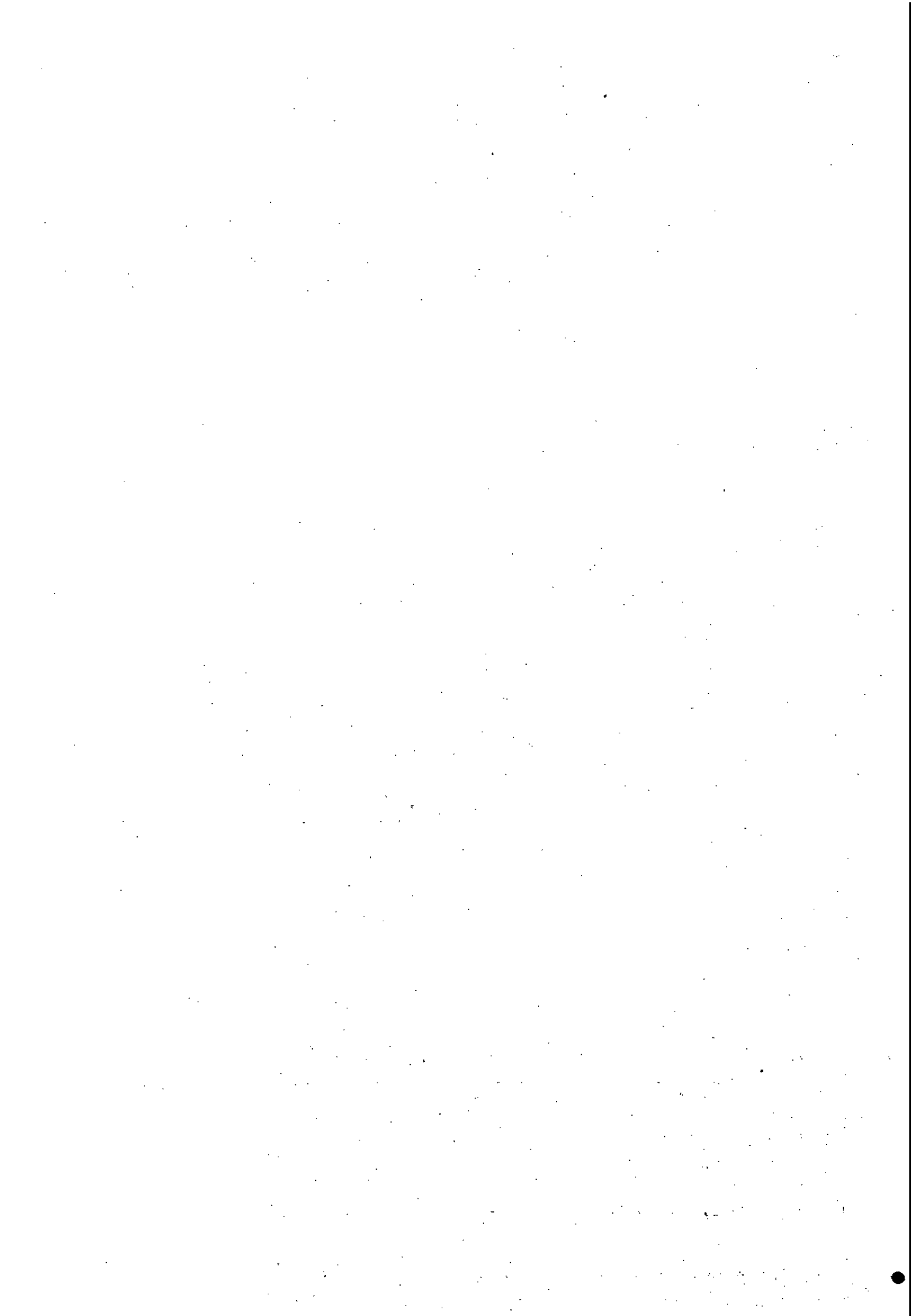
1988



River Jubba at Mareere

1989





KAMSUMA

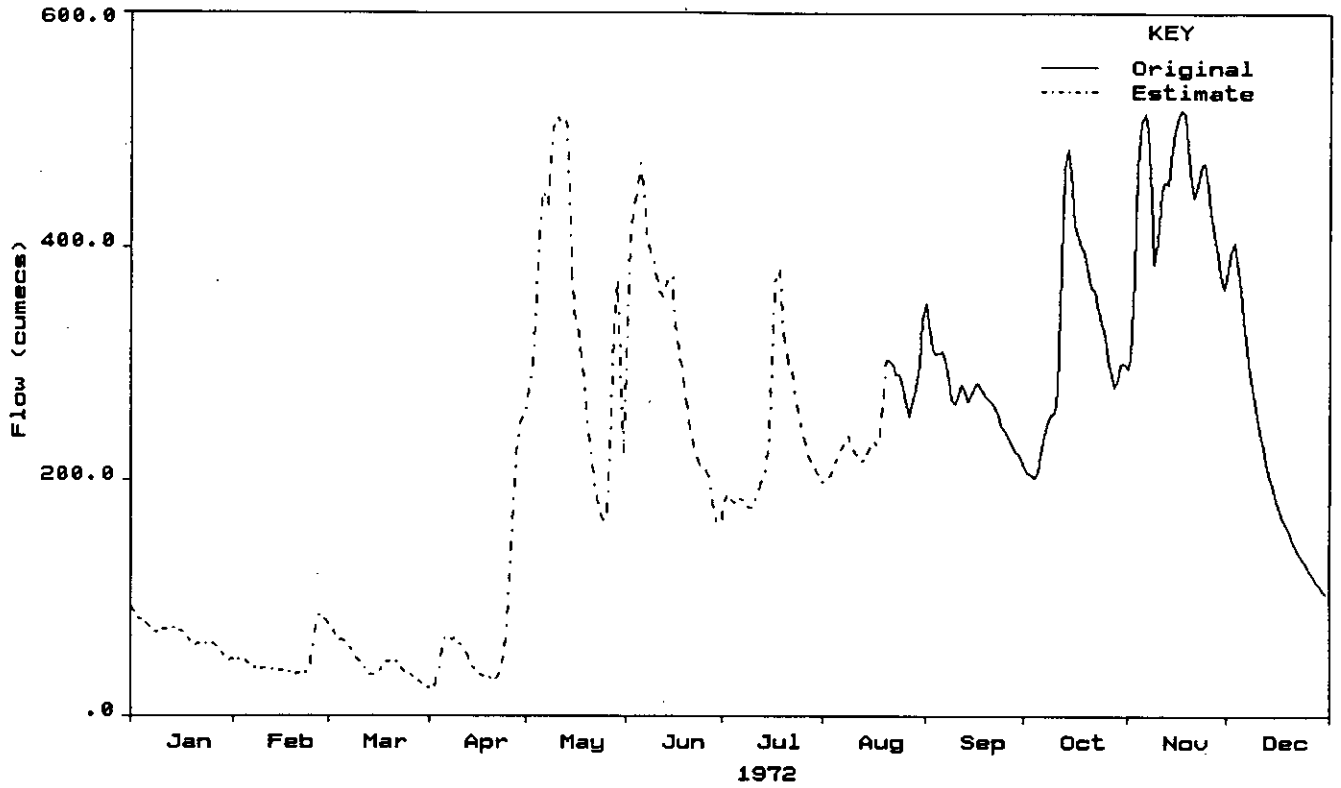
1972 - 1976

1988 - 1989

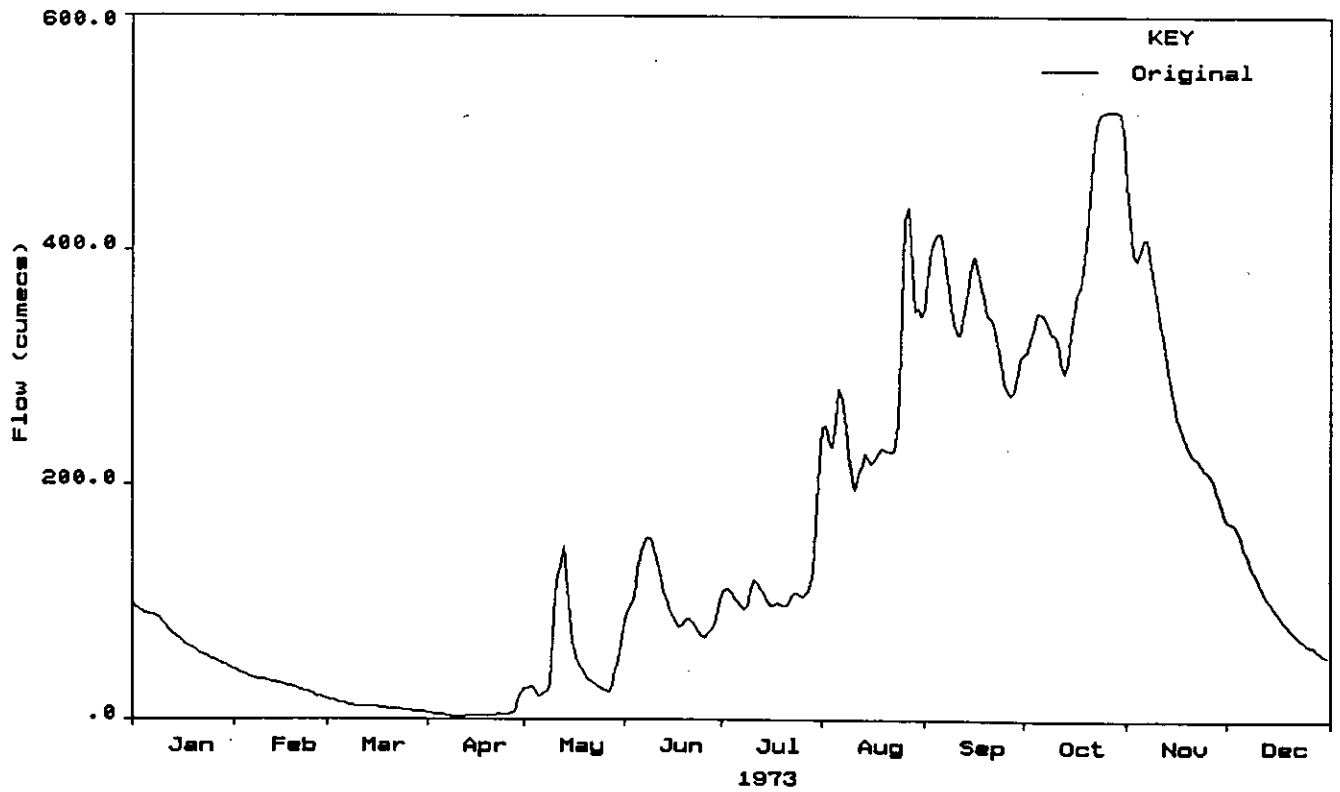


River Jubba at Kamsuma

1972

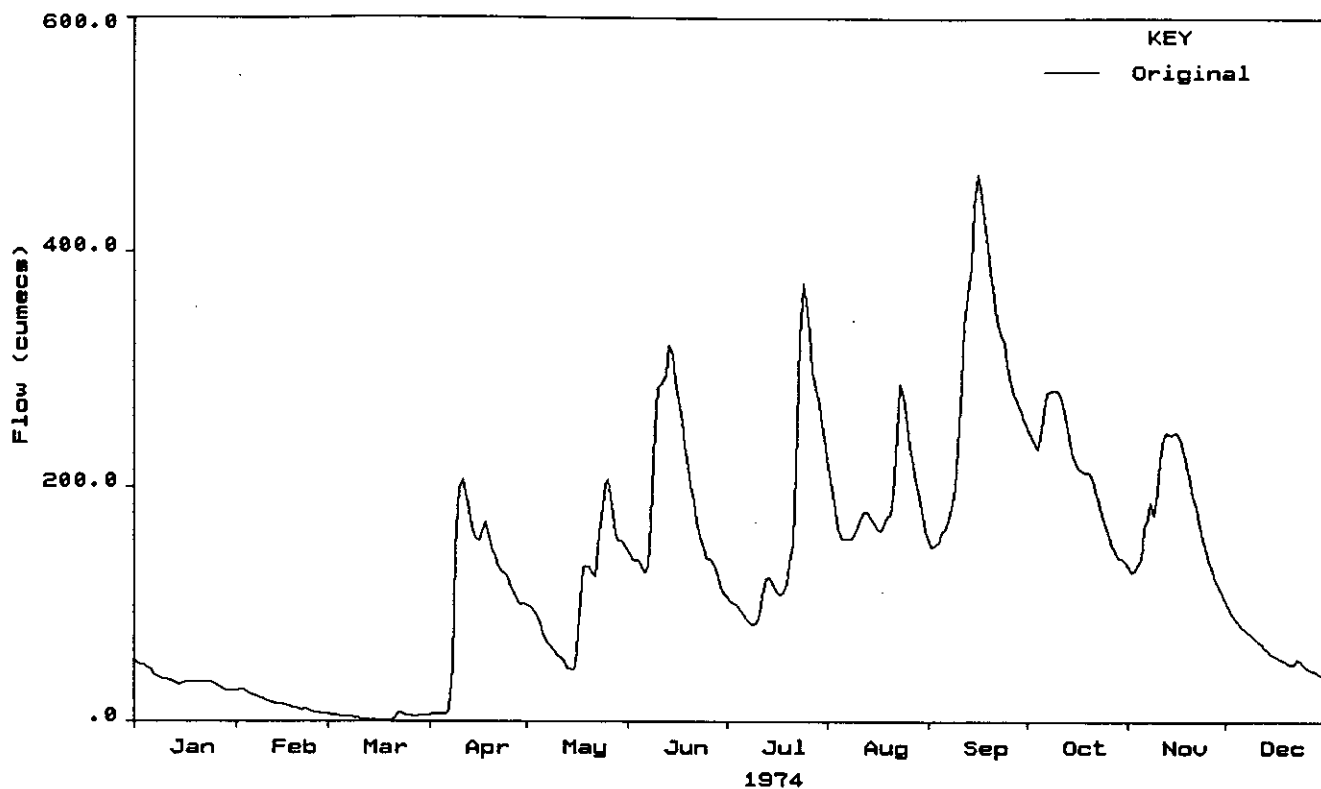


1973

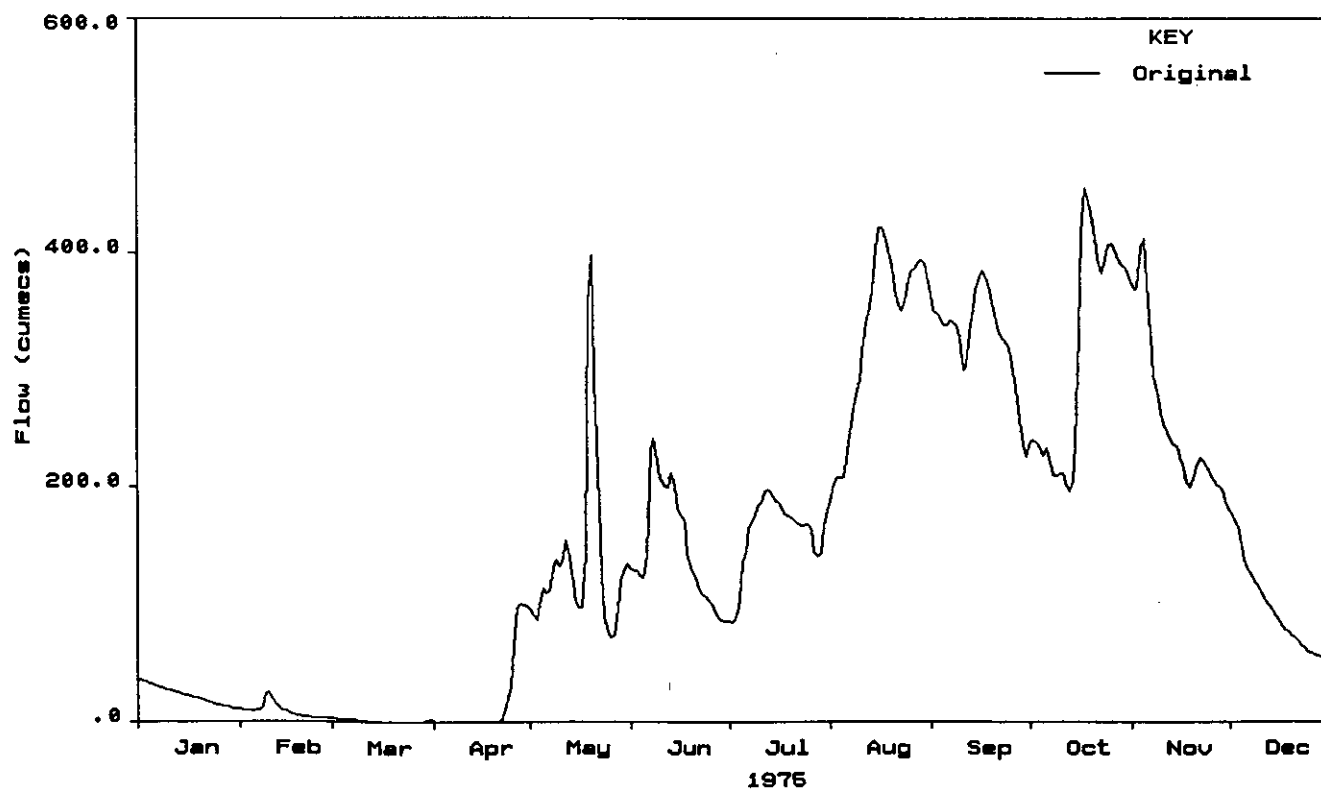


River Jubba at Kamsuma

1974

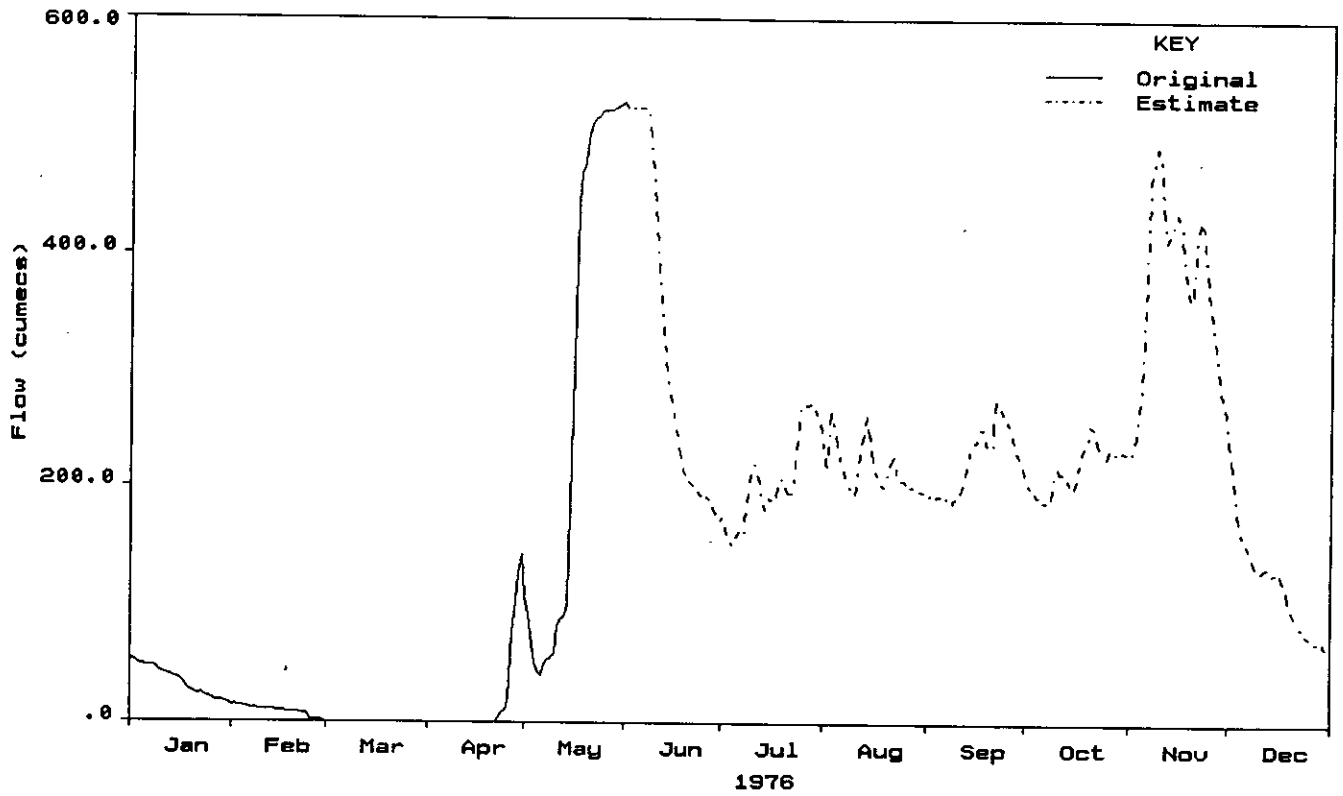


1975



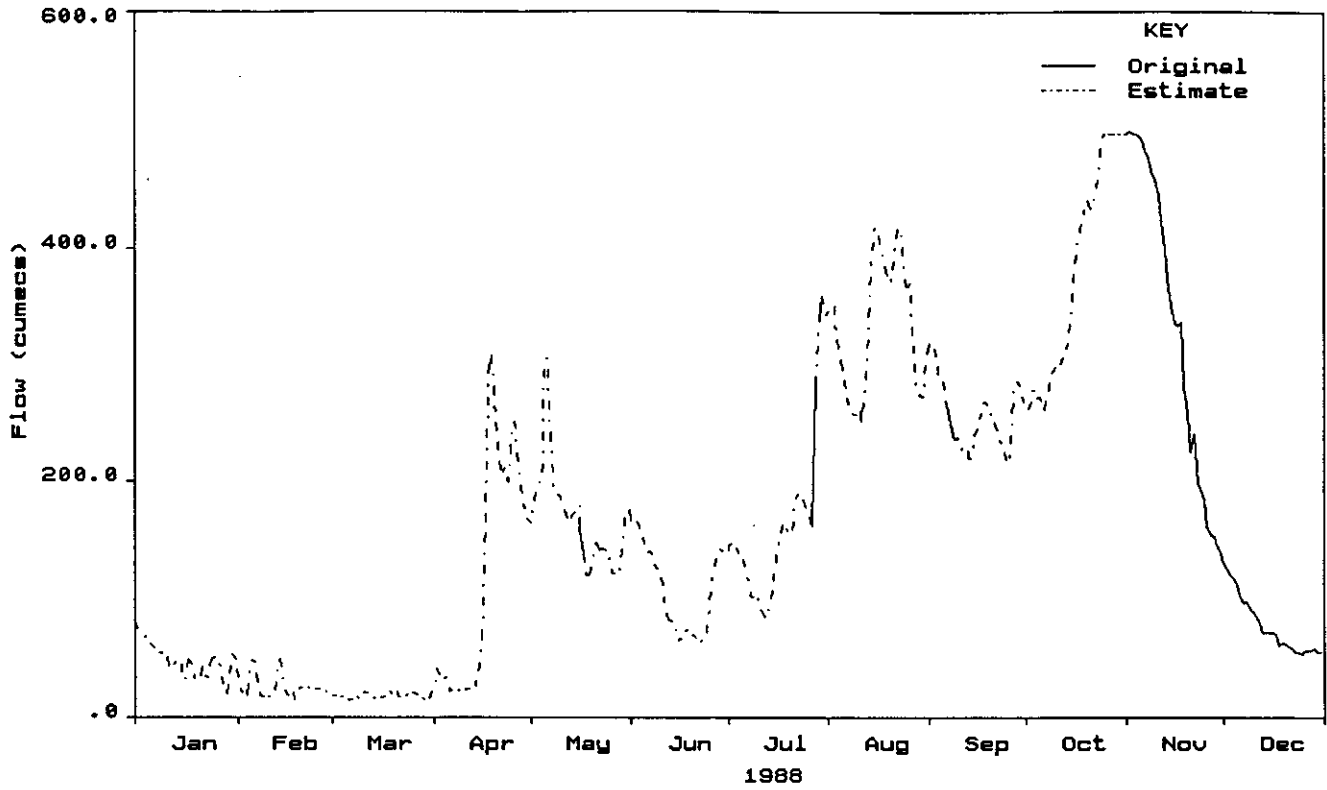
River Jubba at Kamsuma

1976

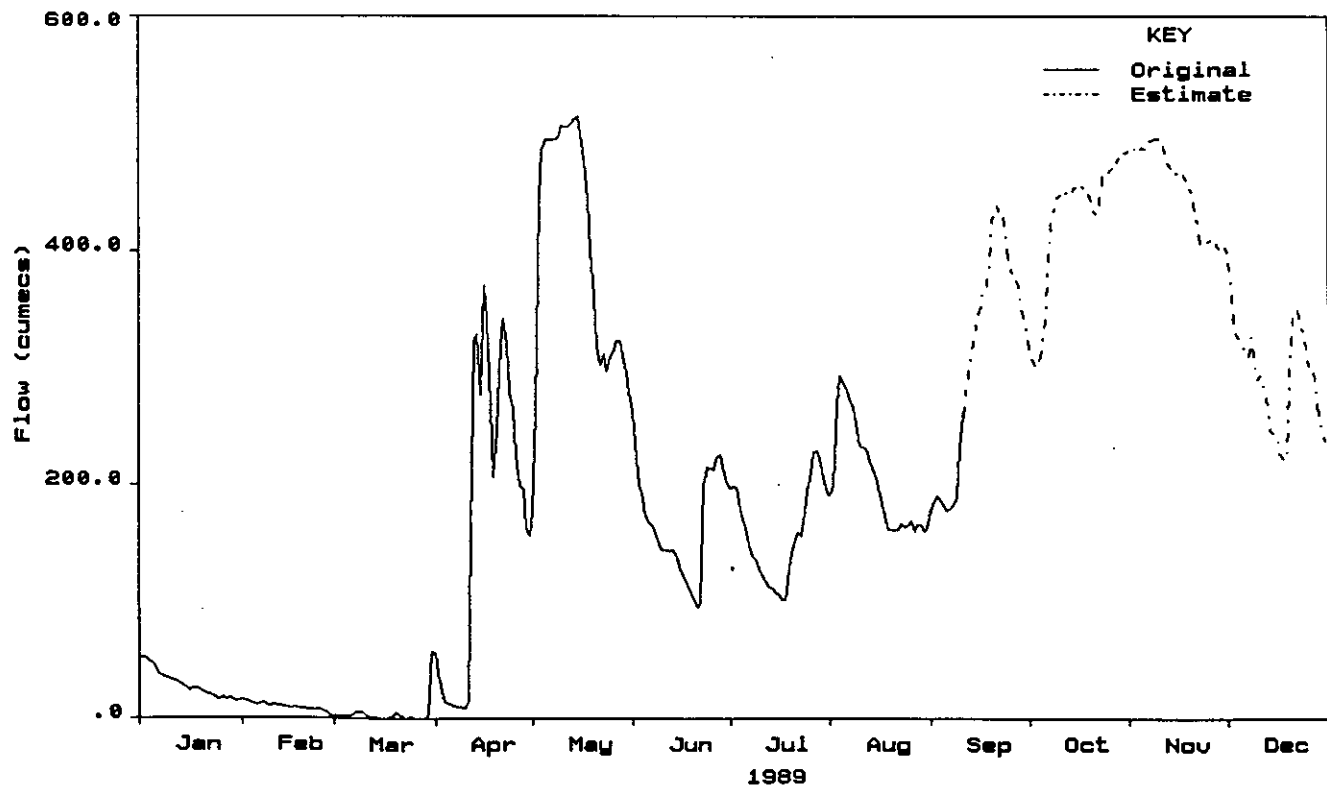


River Jubba at Kamsuma

1988



1989



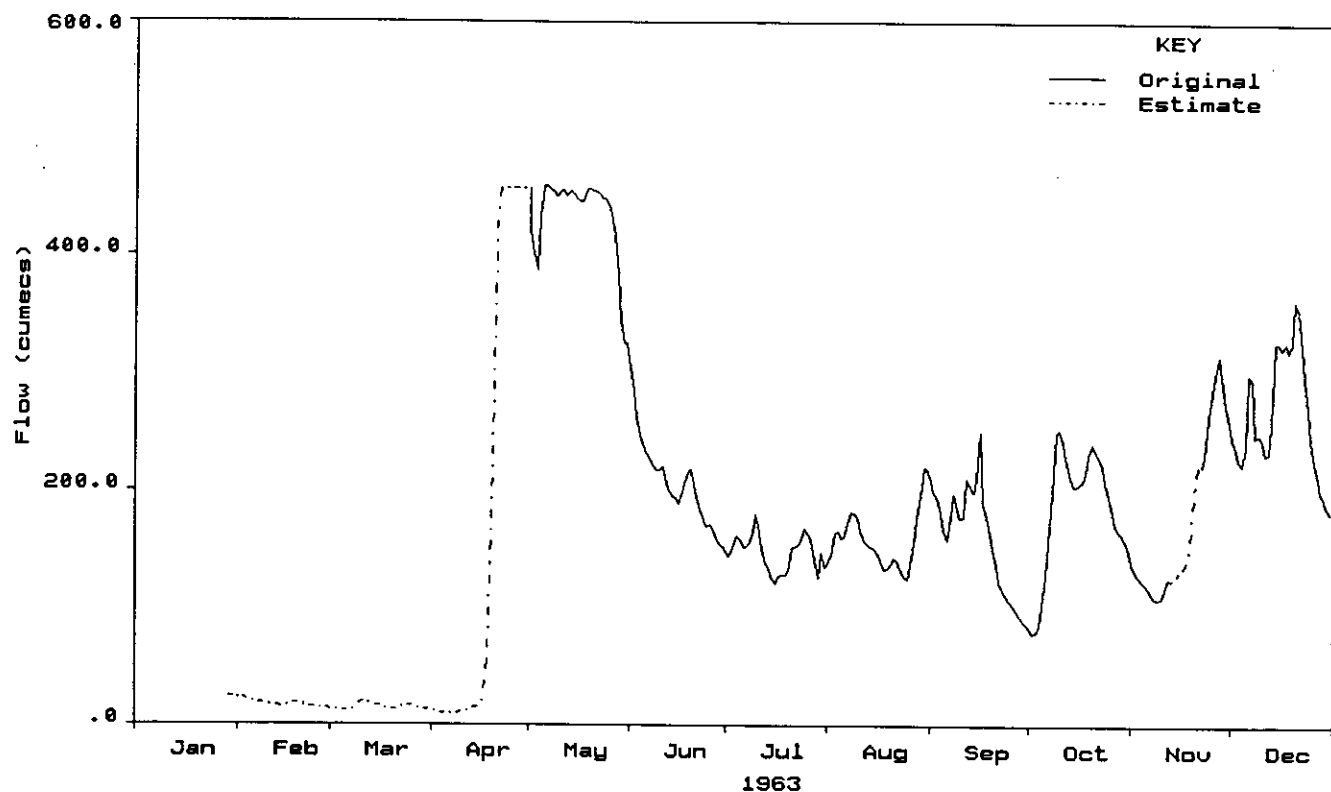
JAMAMME

1963 - 1989

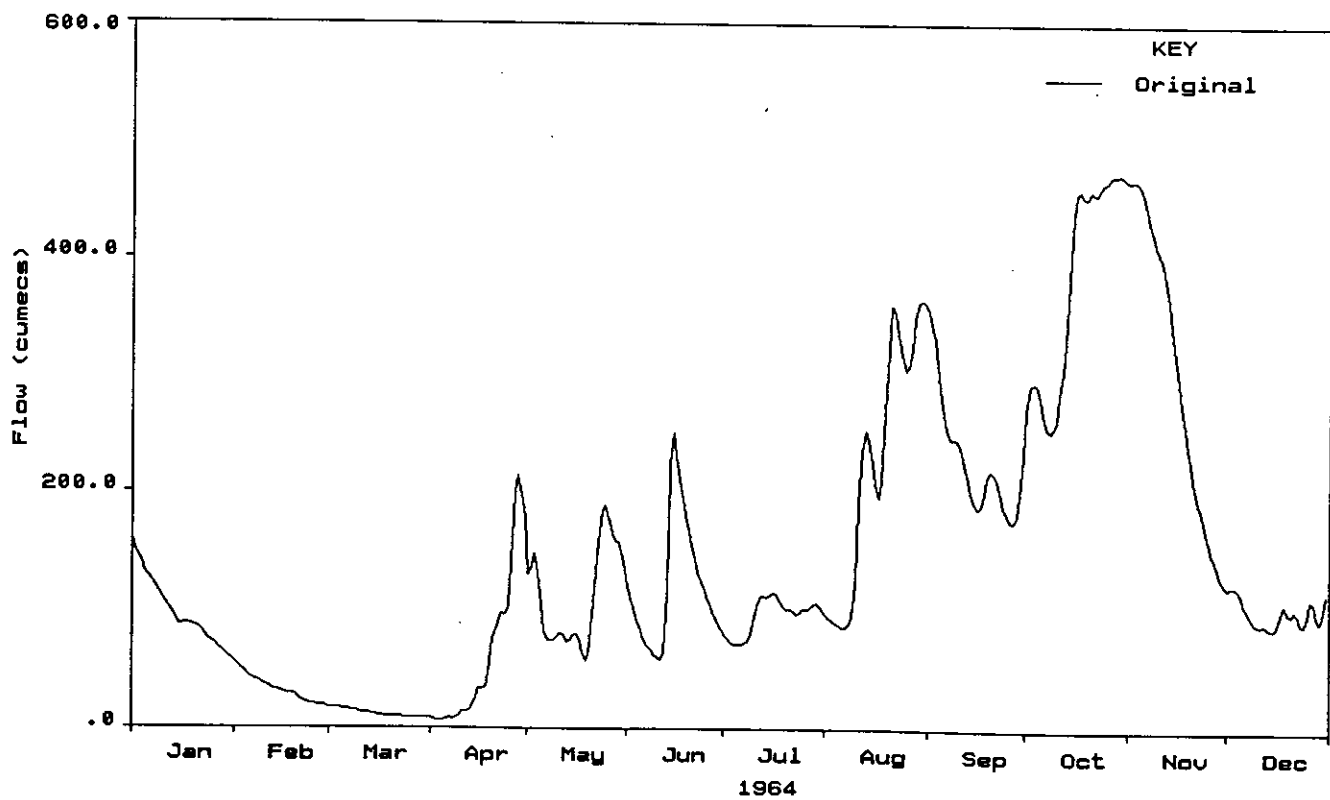


River Jubba at Jamamme

1963

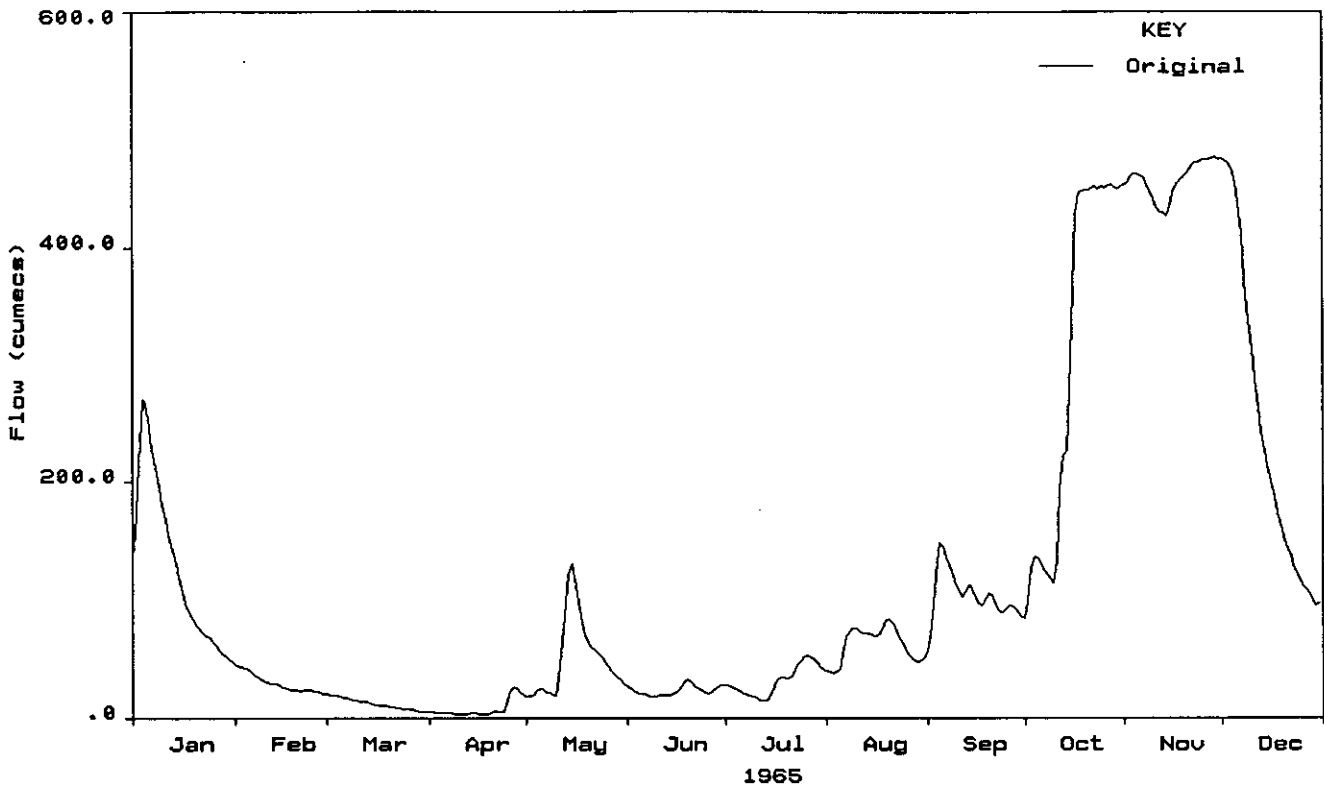


1964

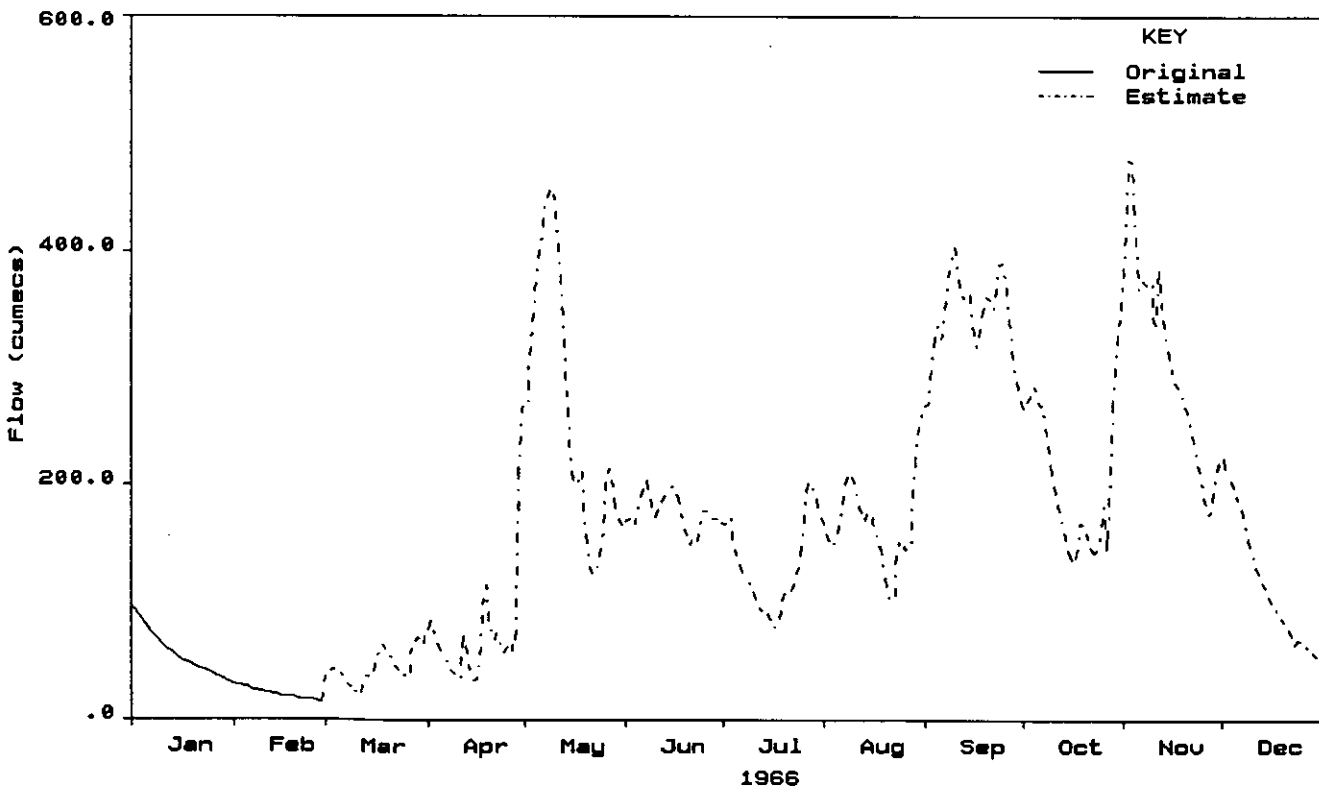


River Jubba at Jamamme

1965

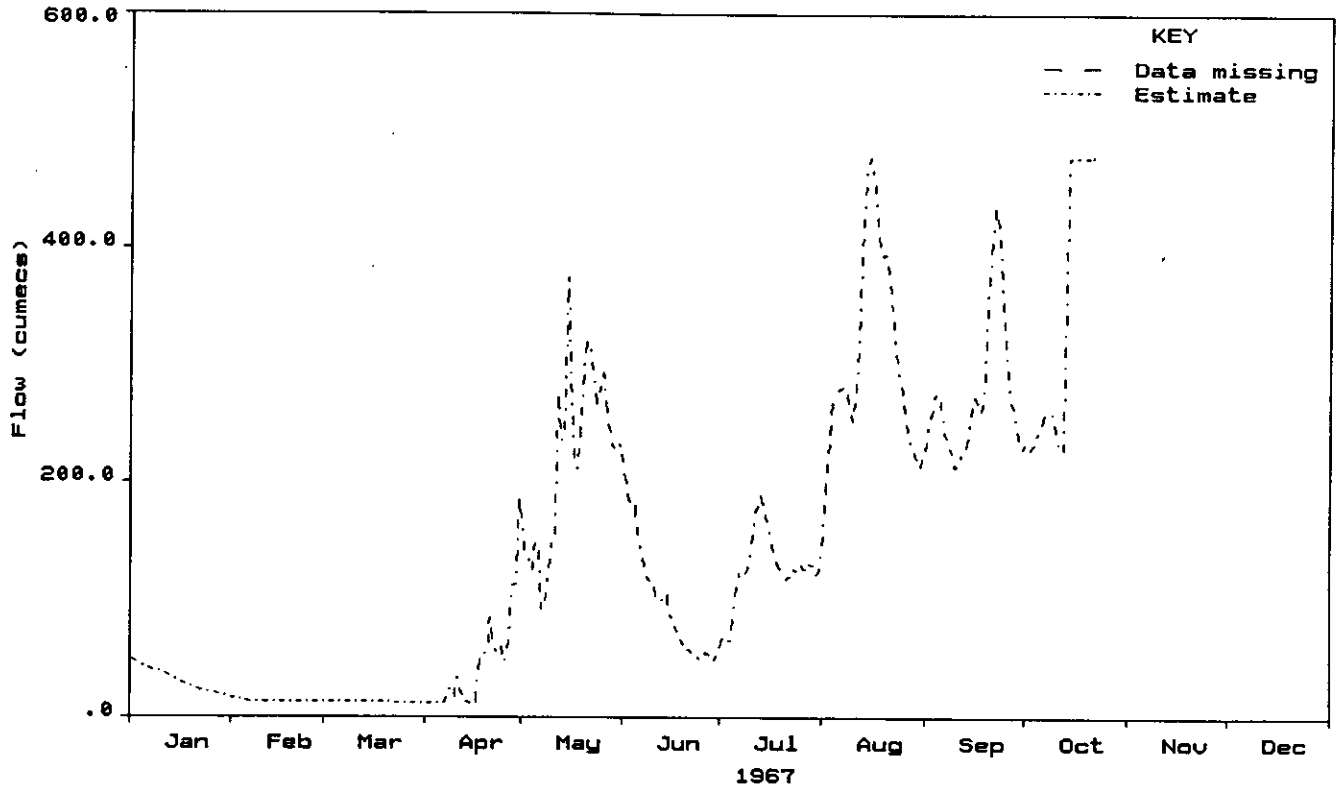


1966

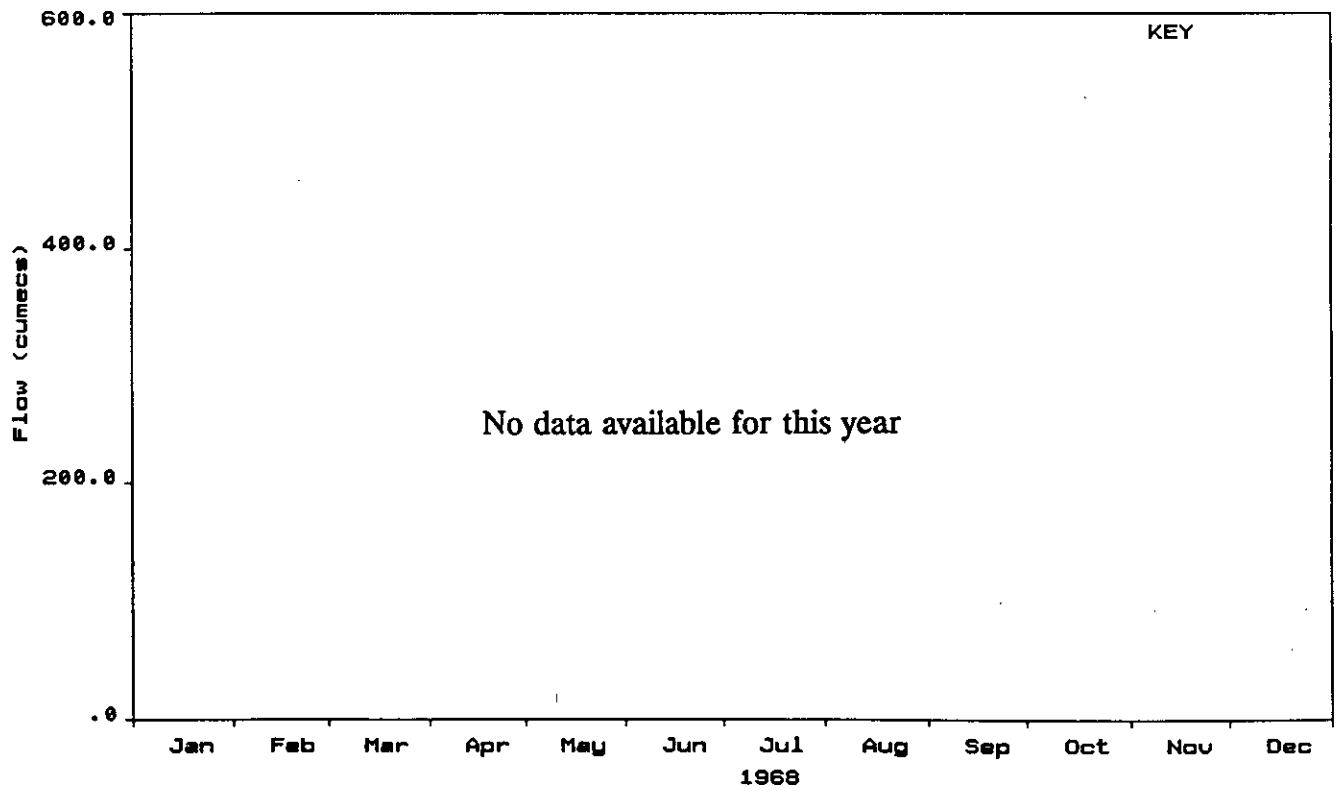


River Jubba at Jamamme

1967

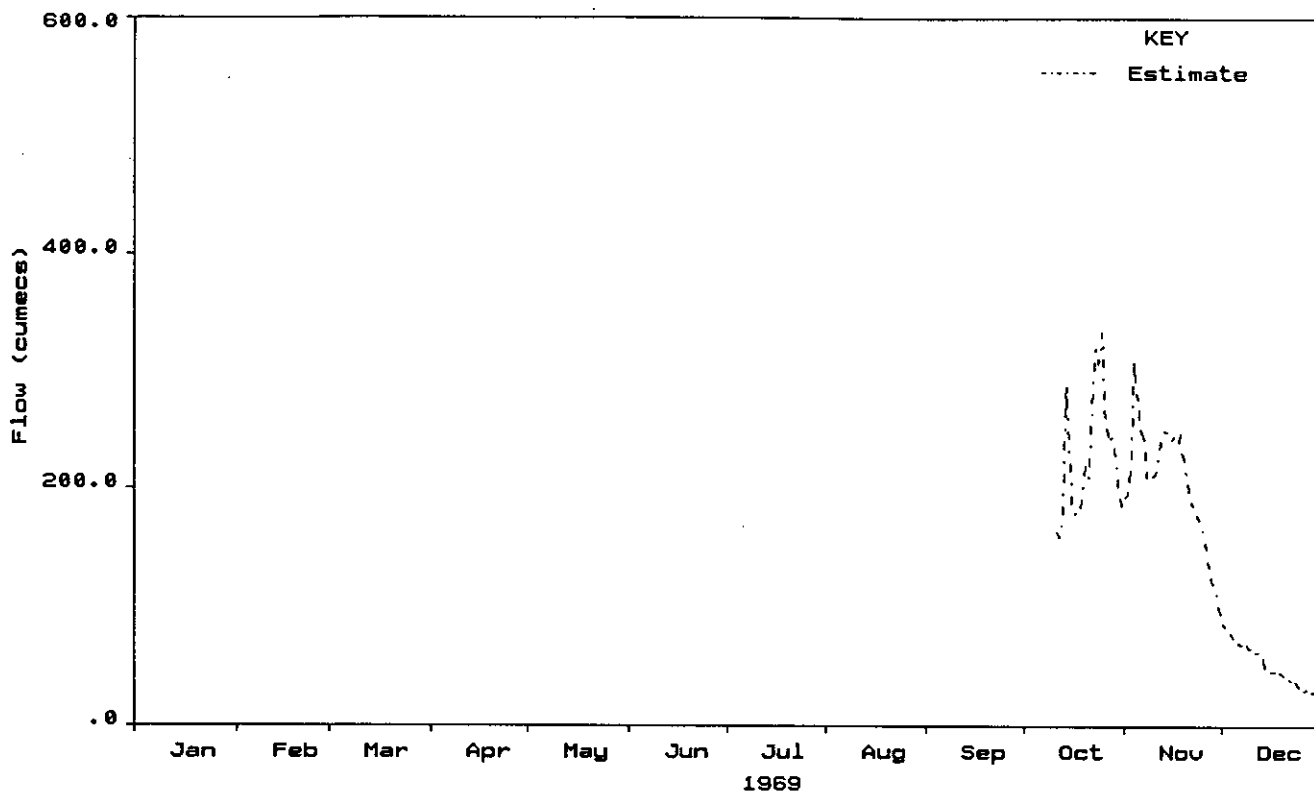


1968

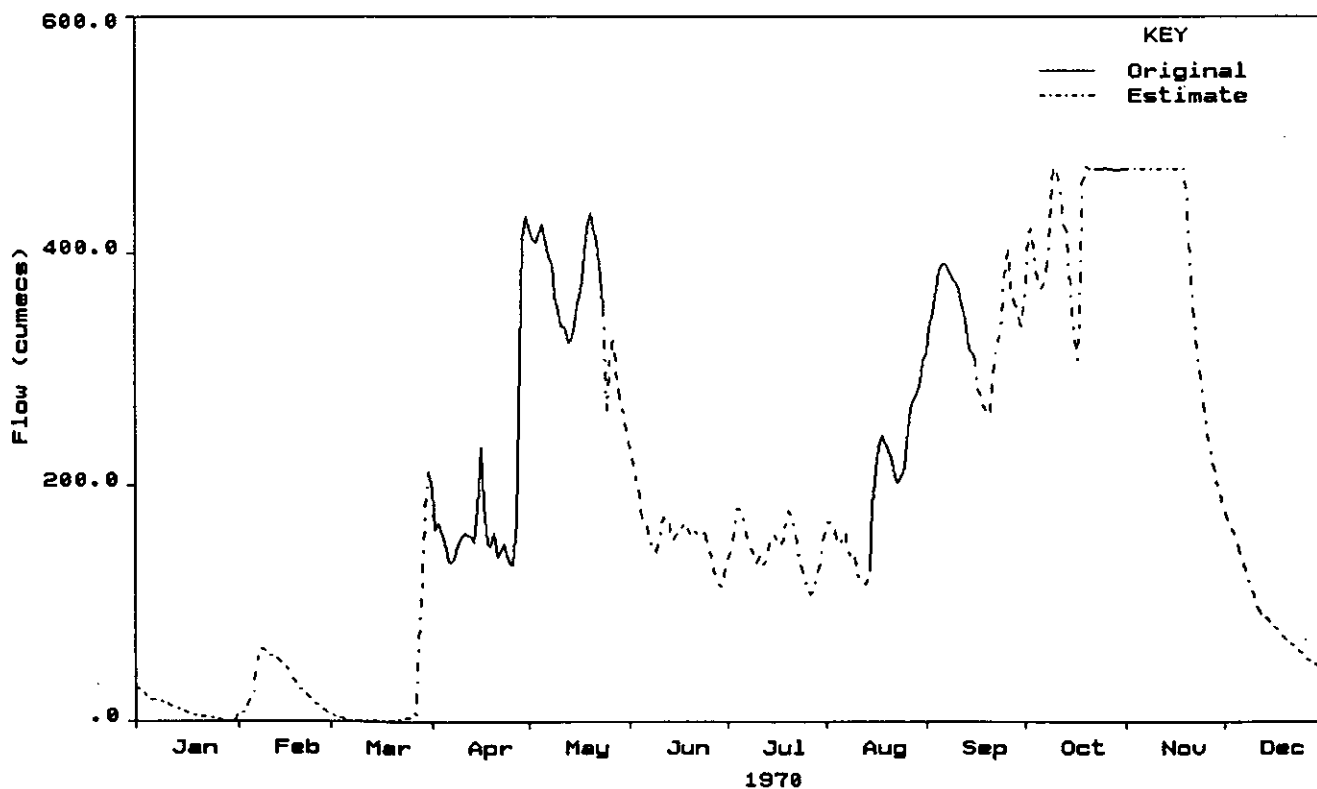


River Jubba at Jamamme

1969

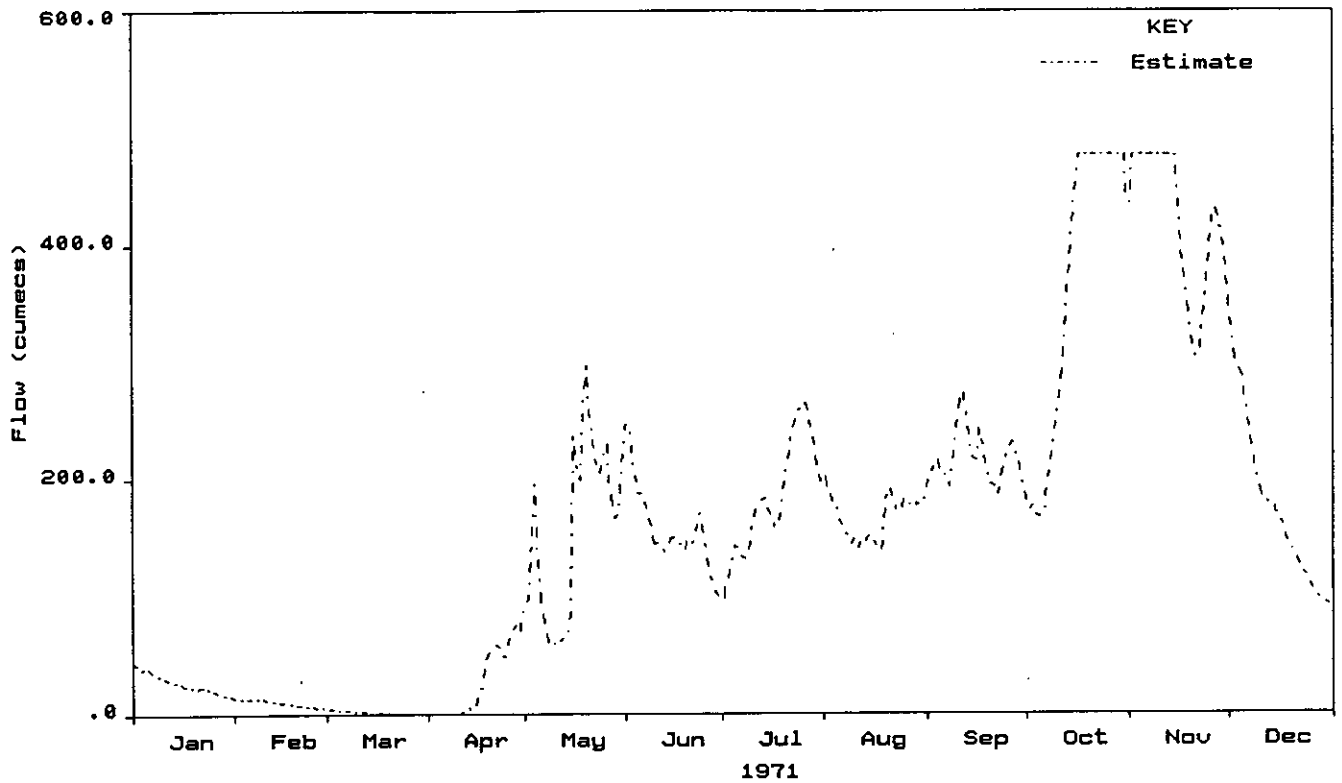


1970

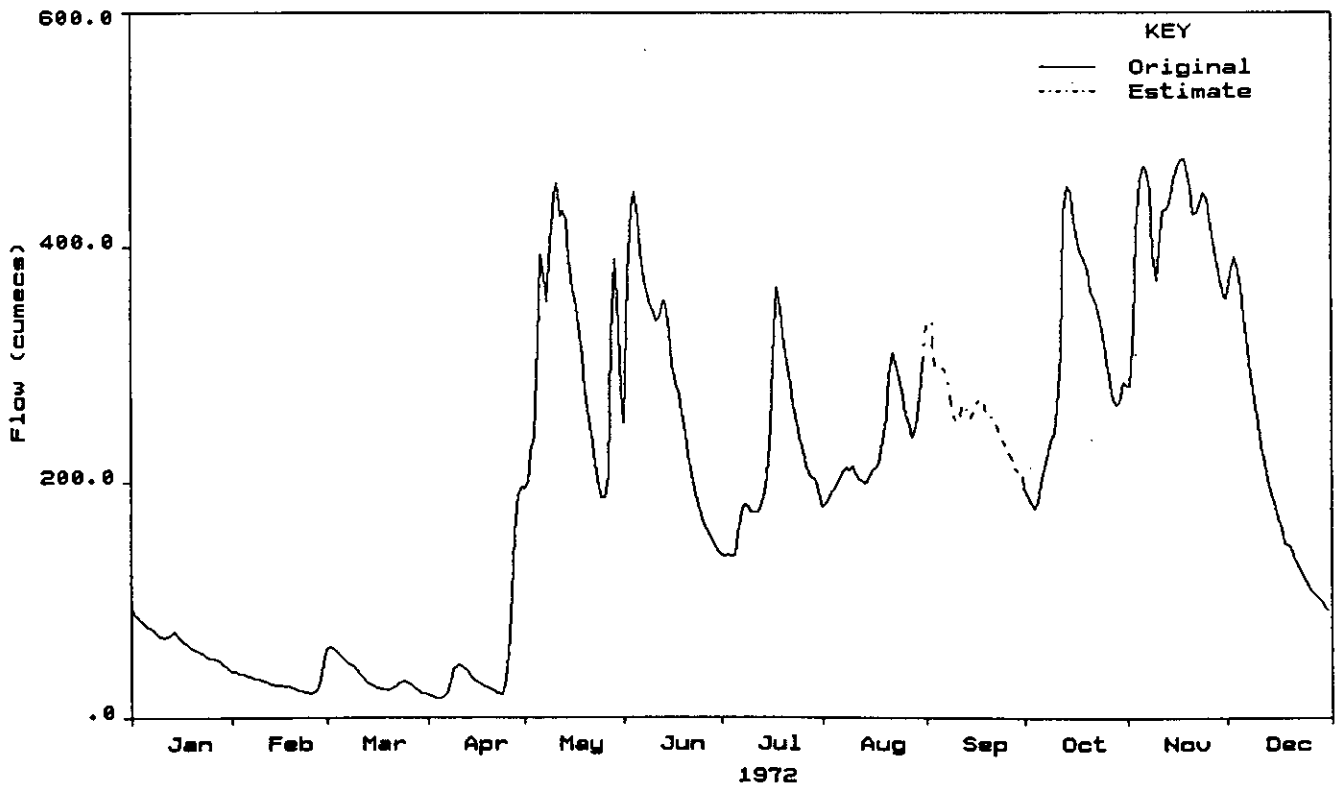


River Jubba at Jamamme

1971

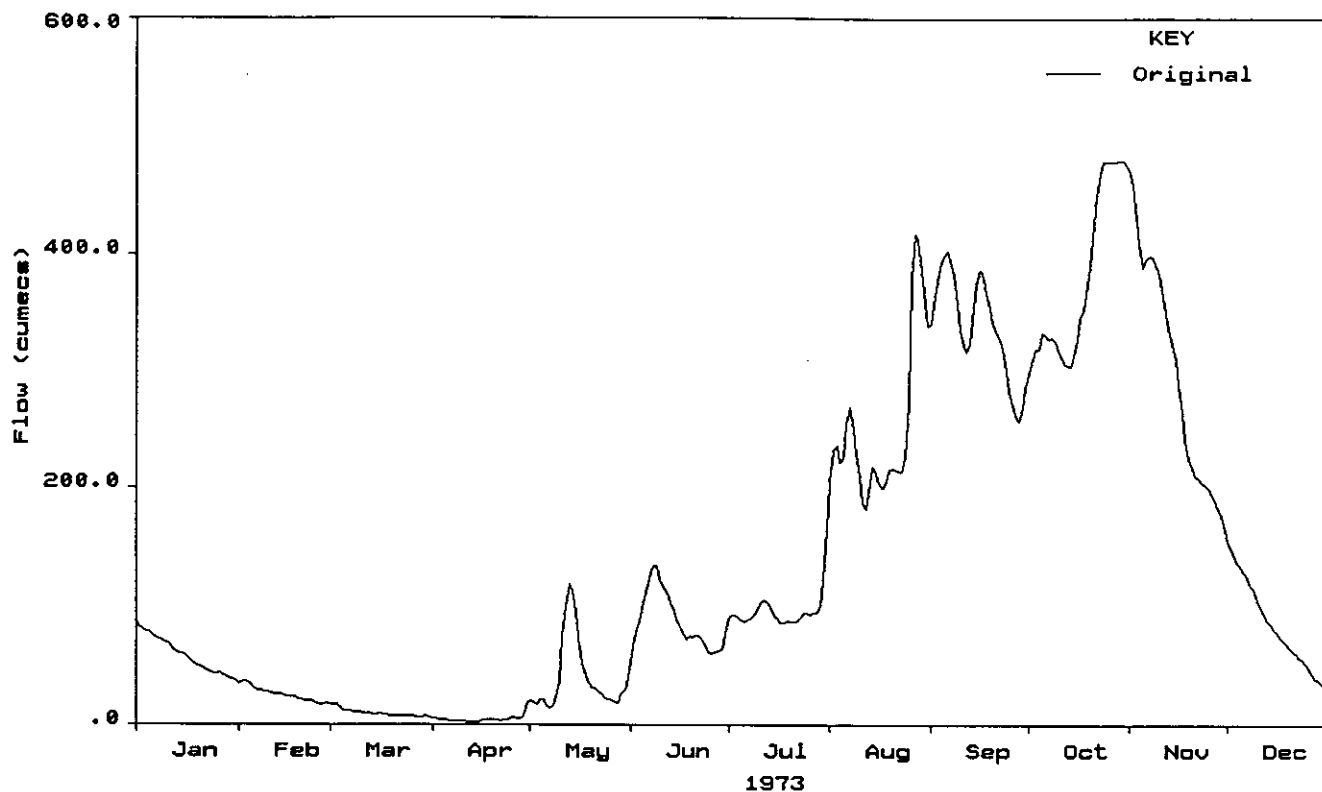


1972

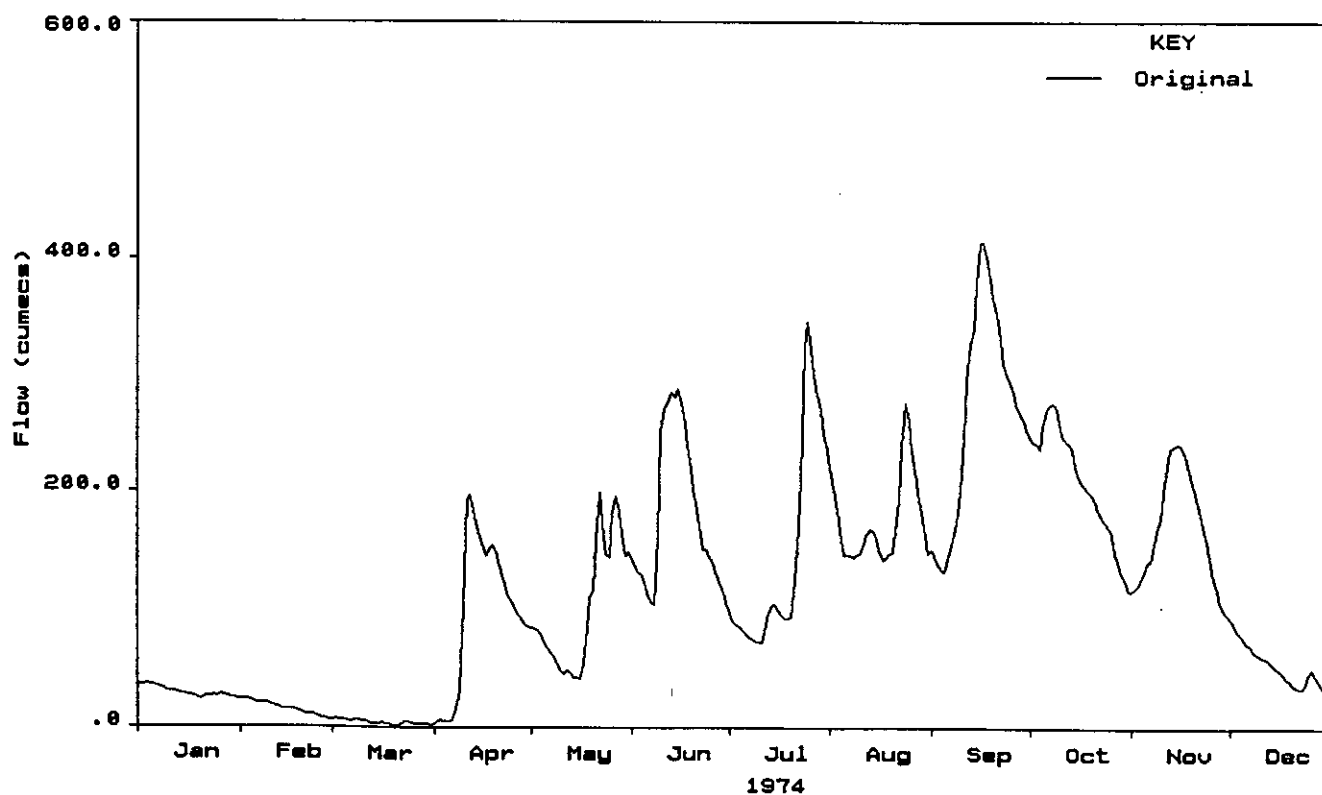


River Jubba at Jamamme

1973

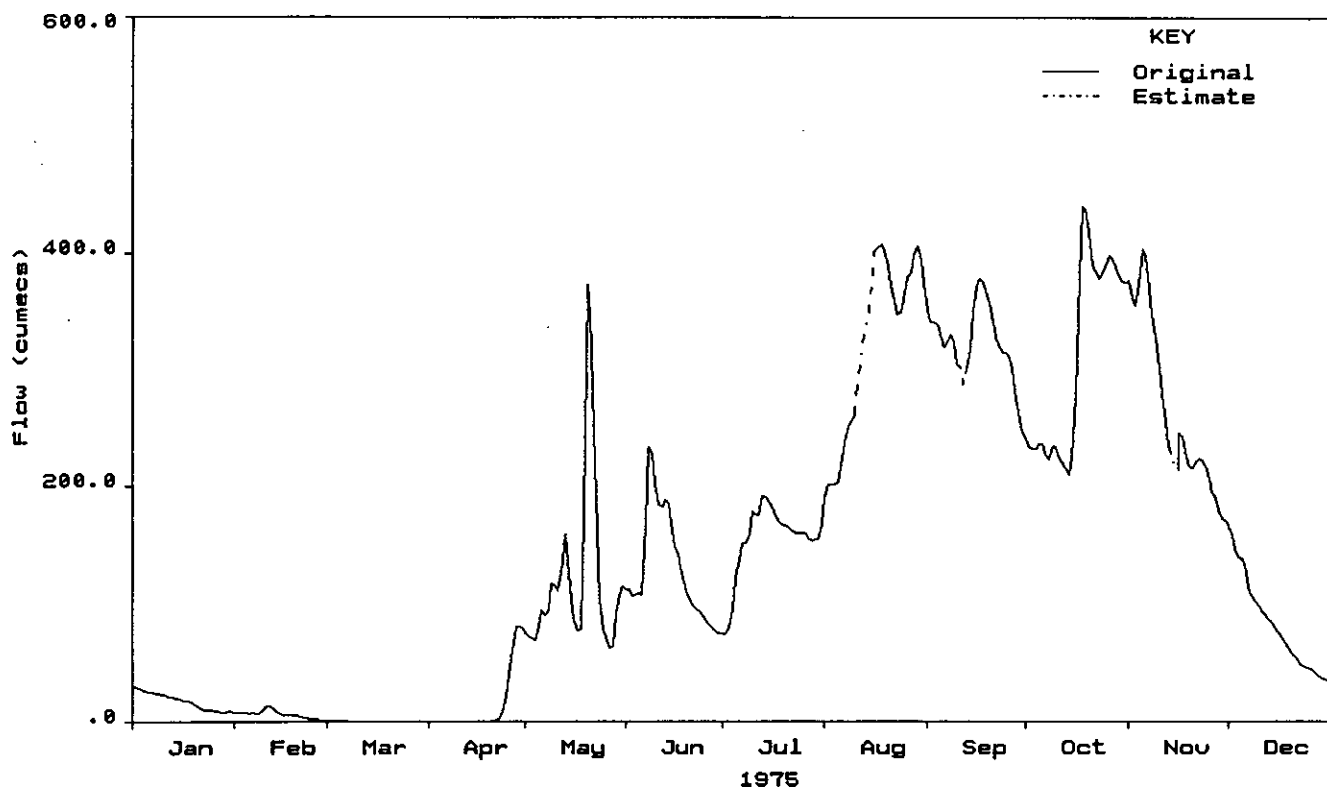


1974

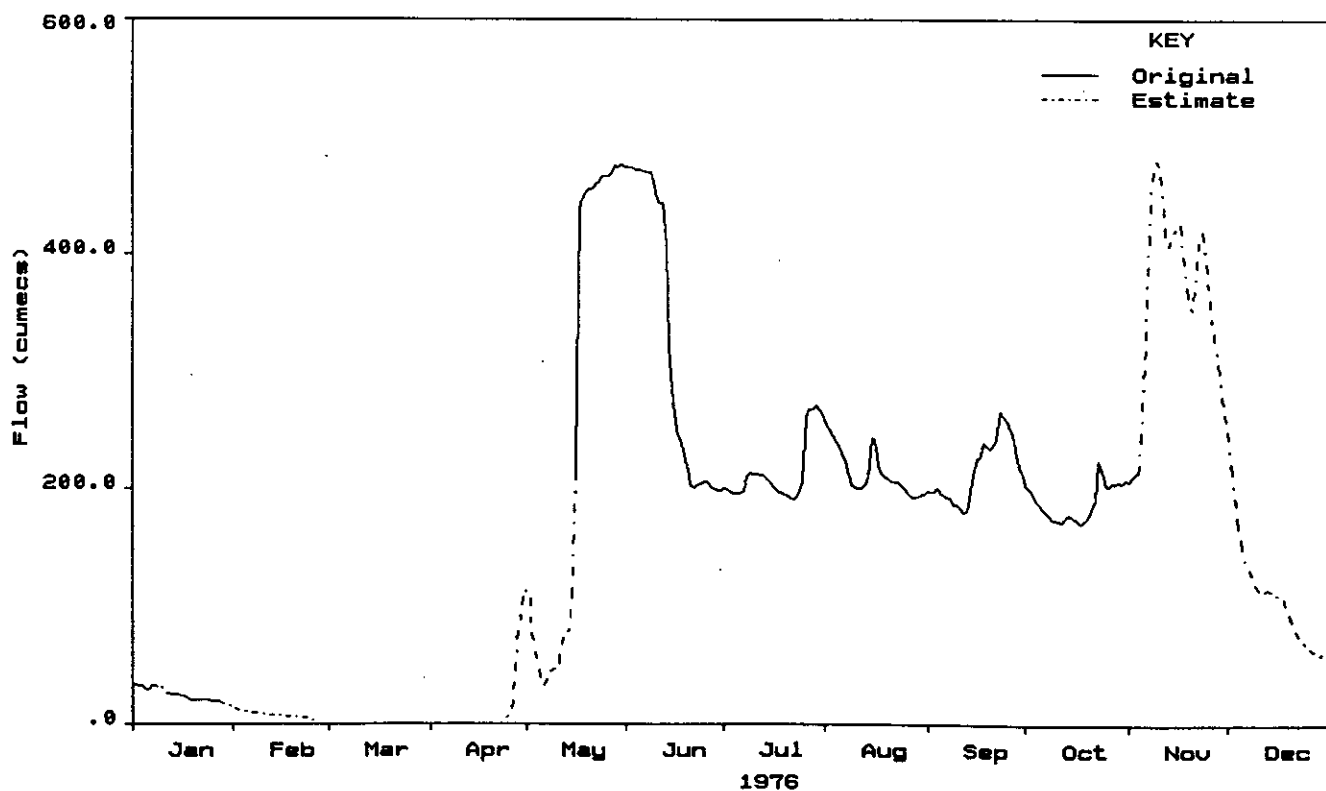


River Jubba at Jamamme

1975

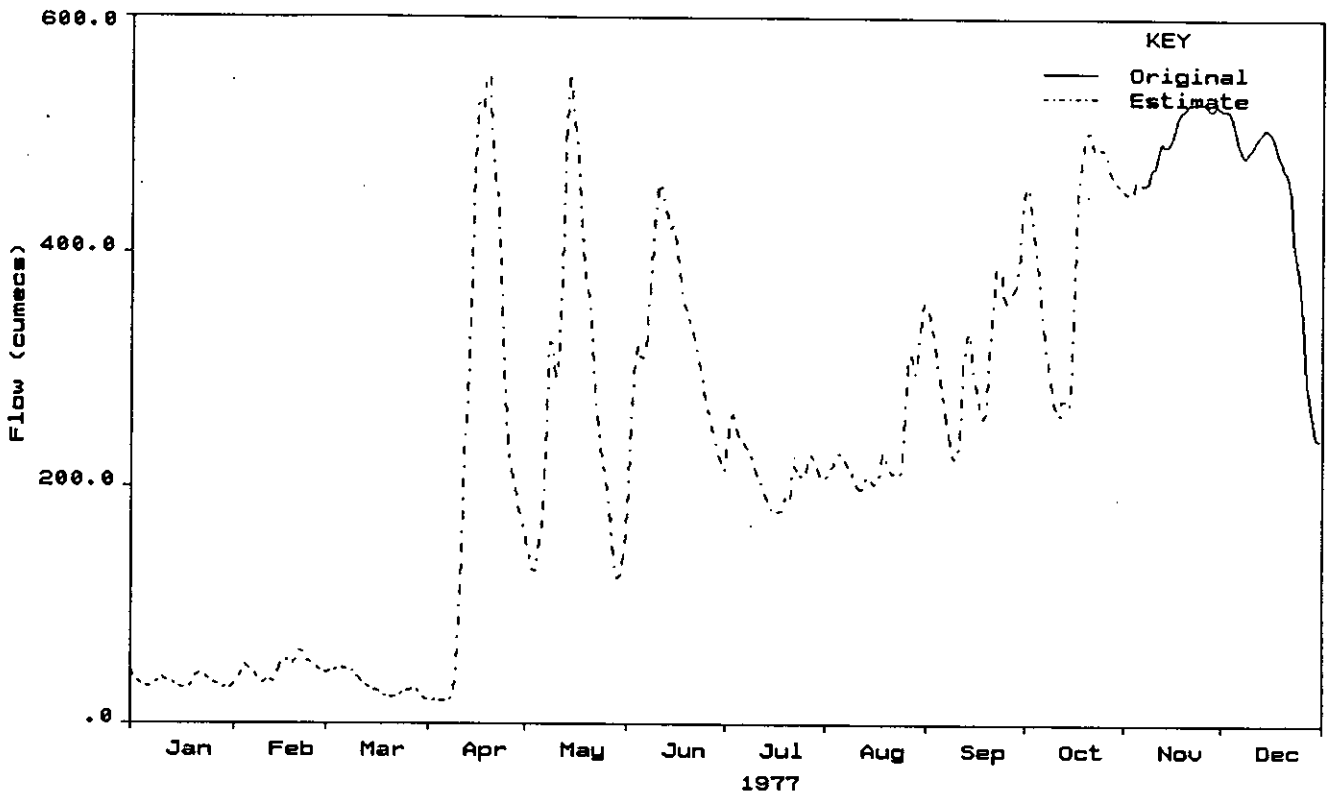


1976

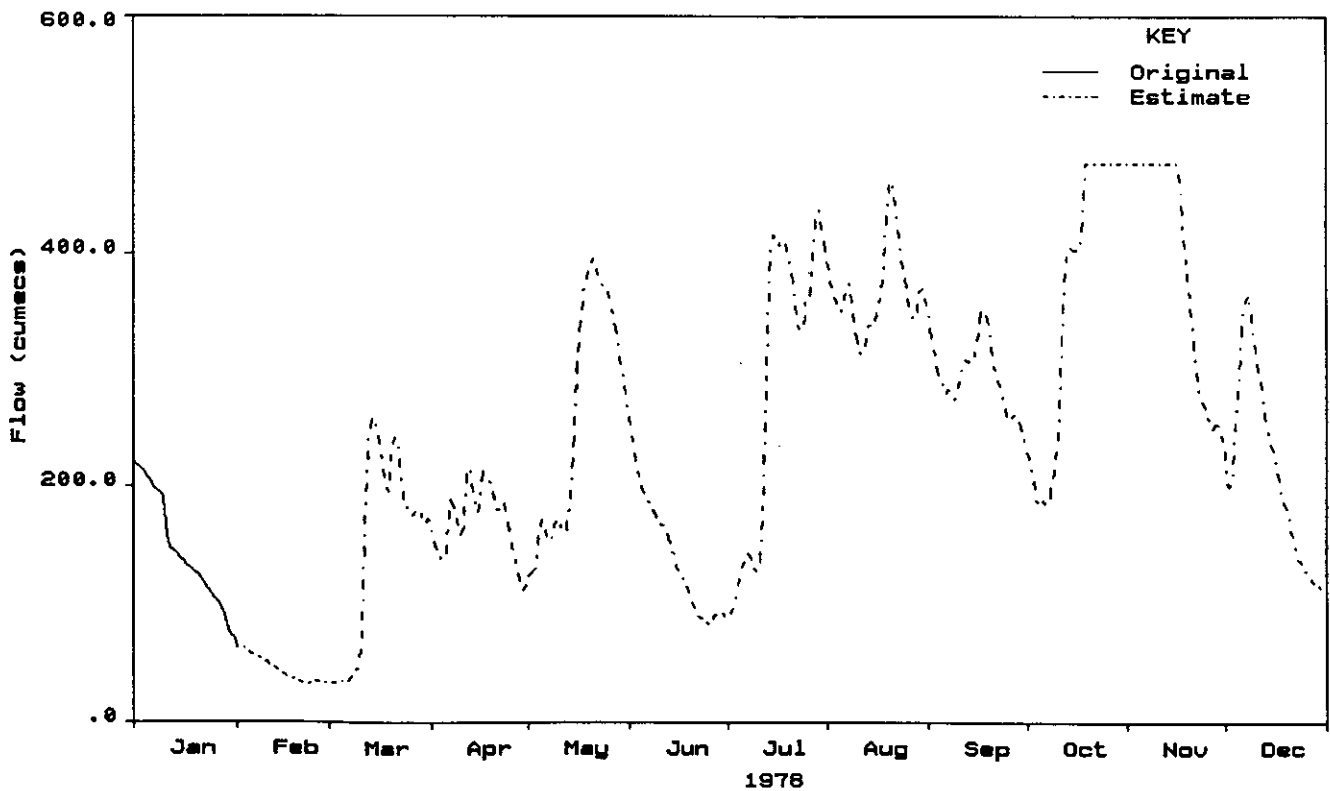


River Jubba at Jamamme

1977

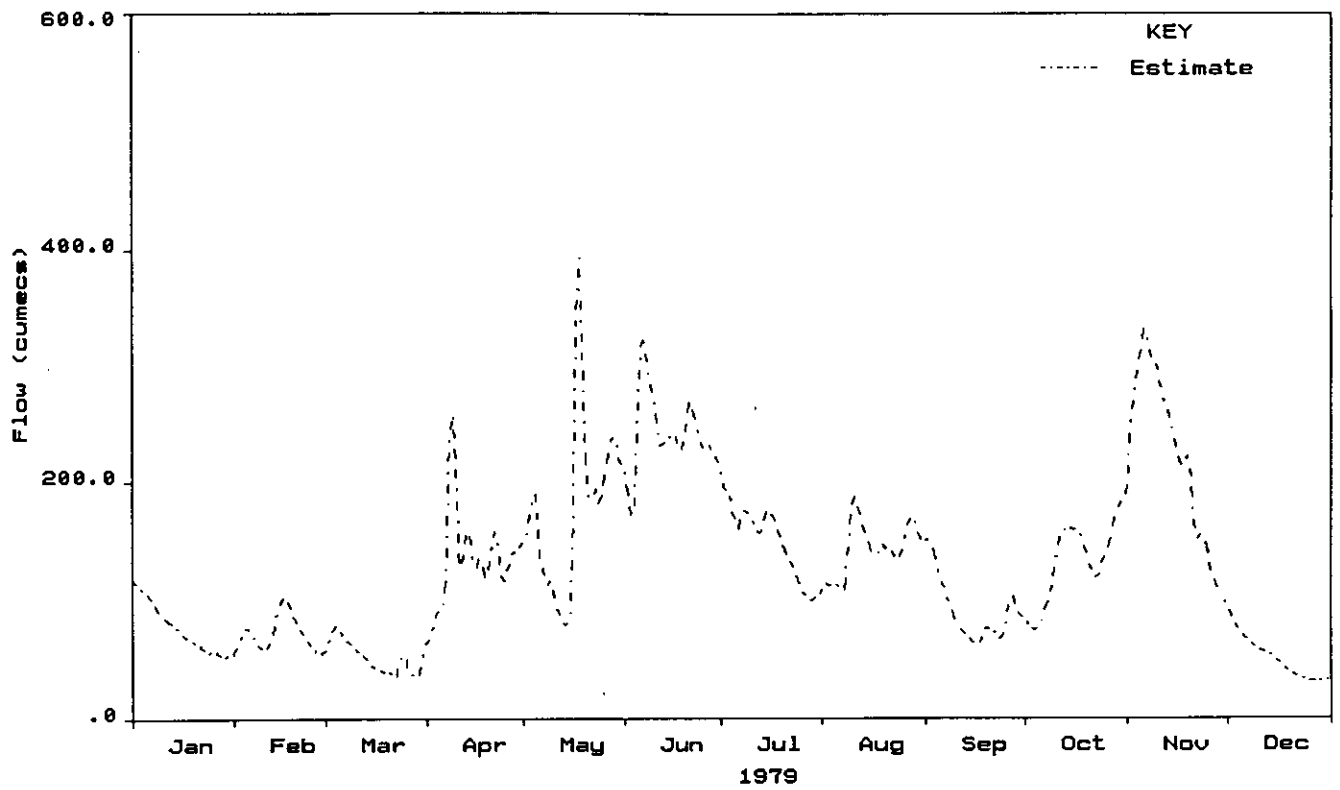


1978

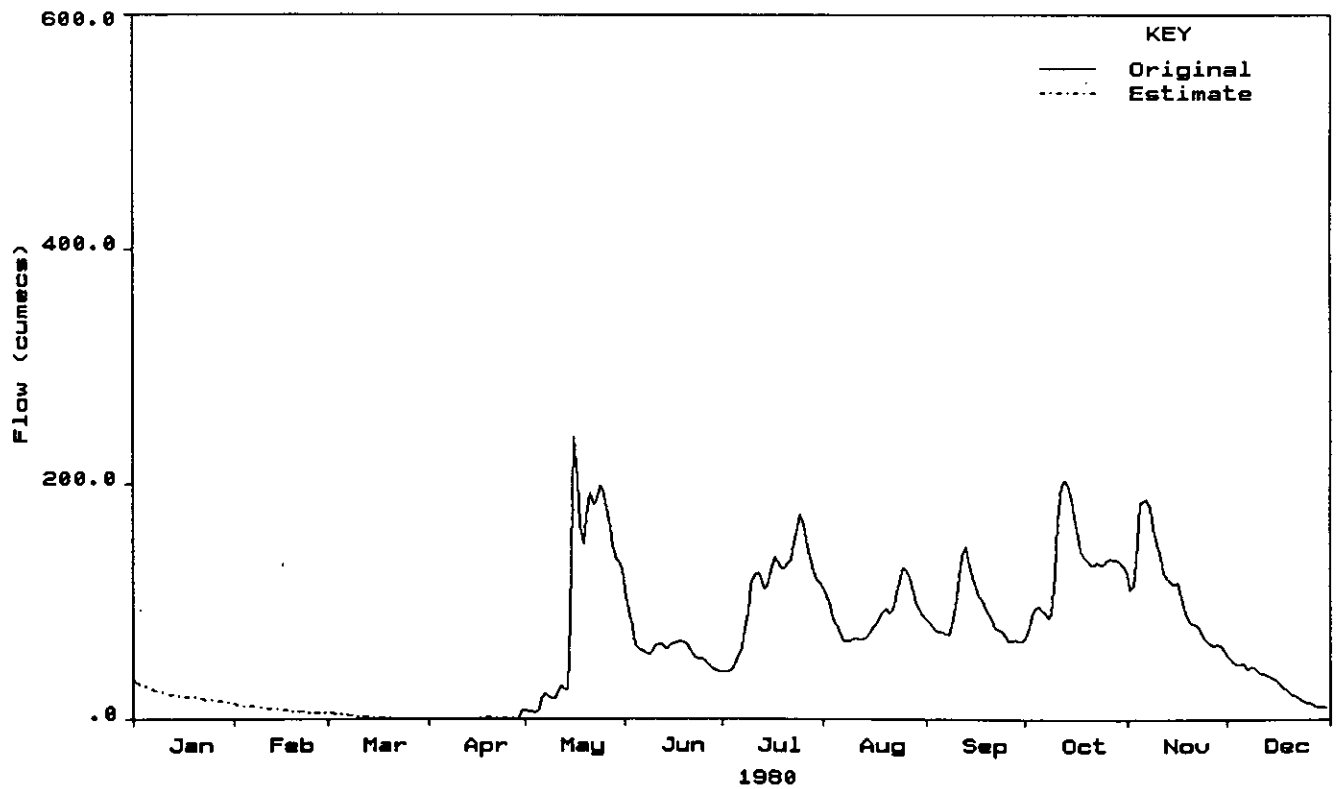


River Jubba at Jamamme

1979

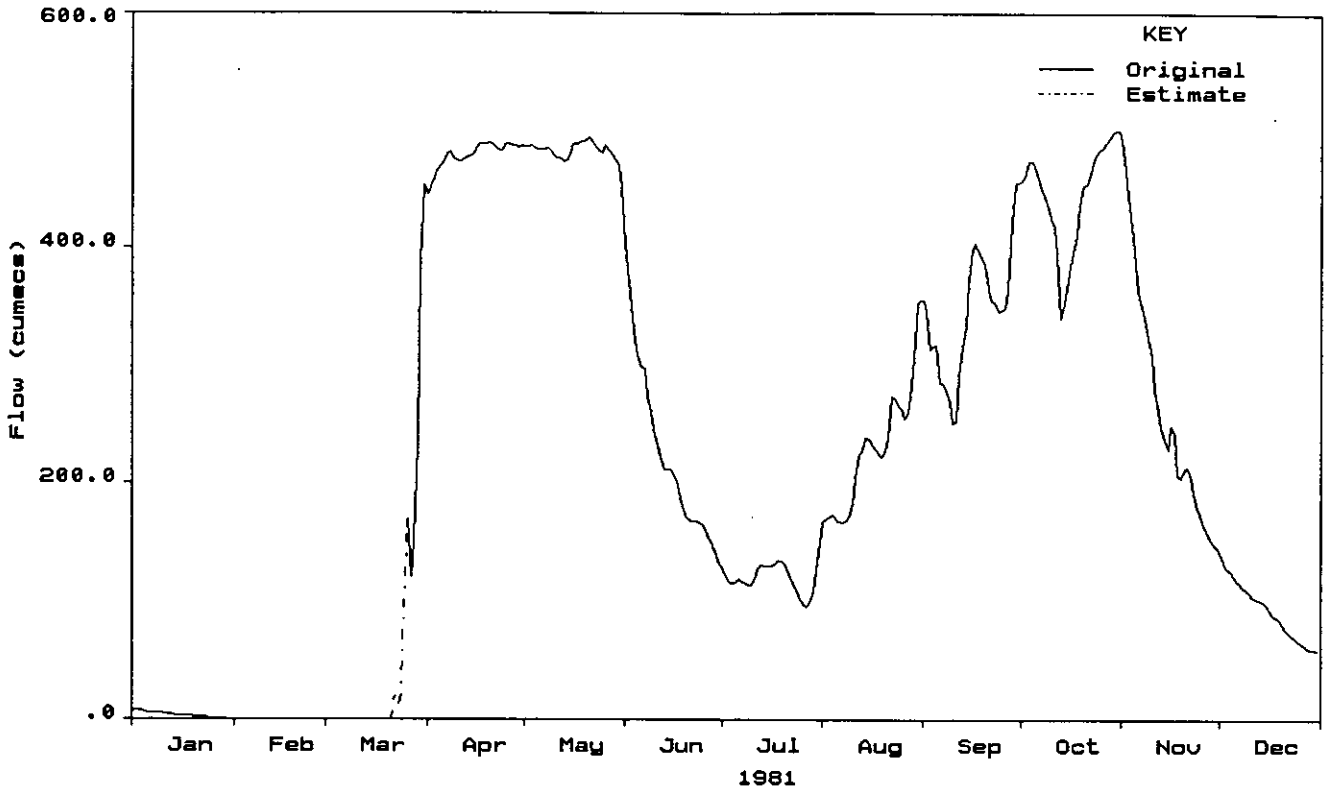


1980

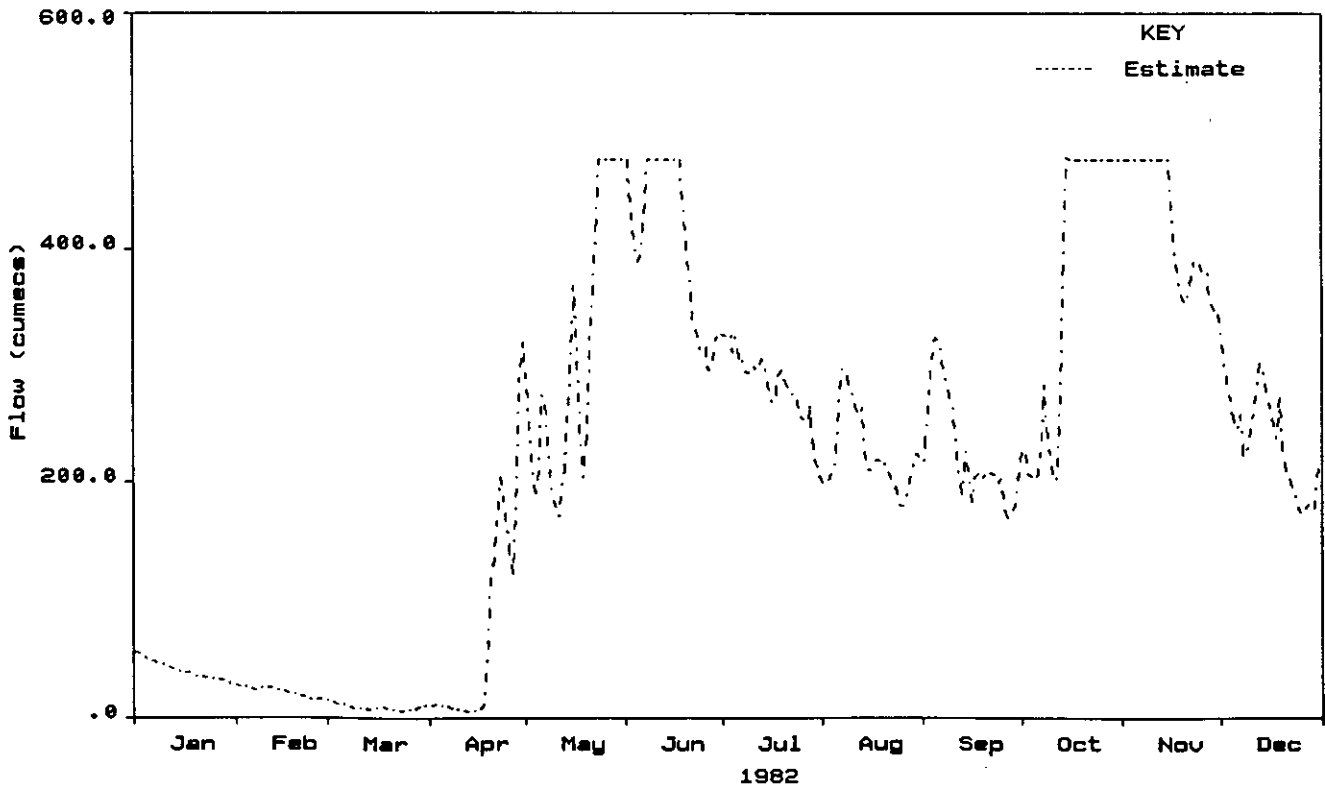


River Jubba at Jamamme

1981

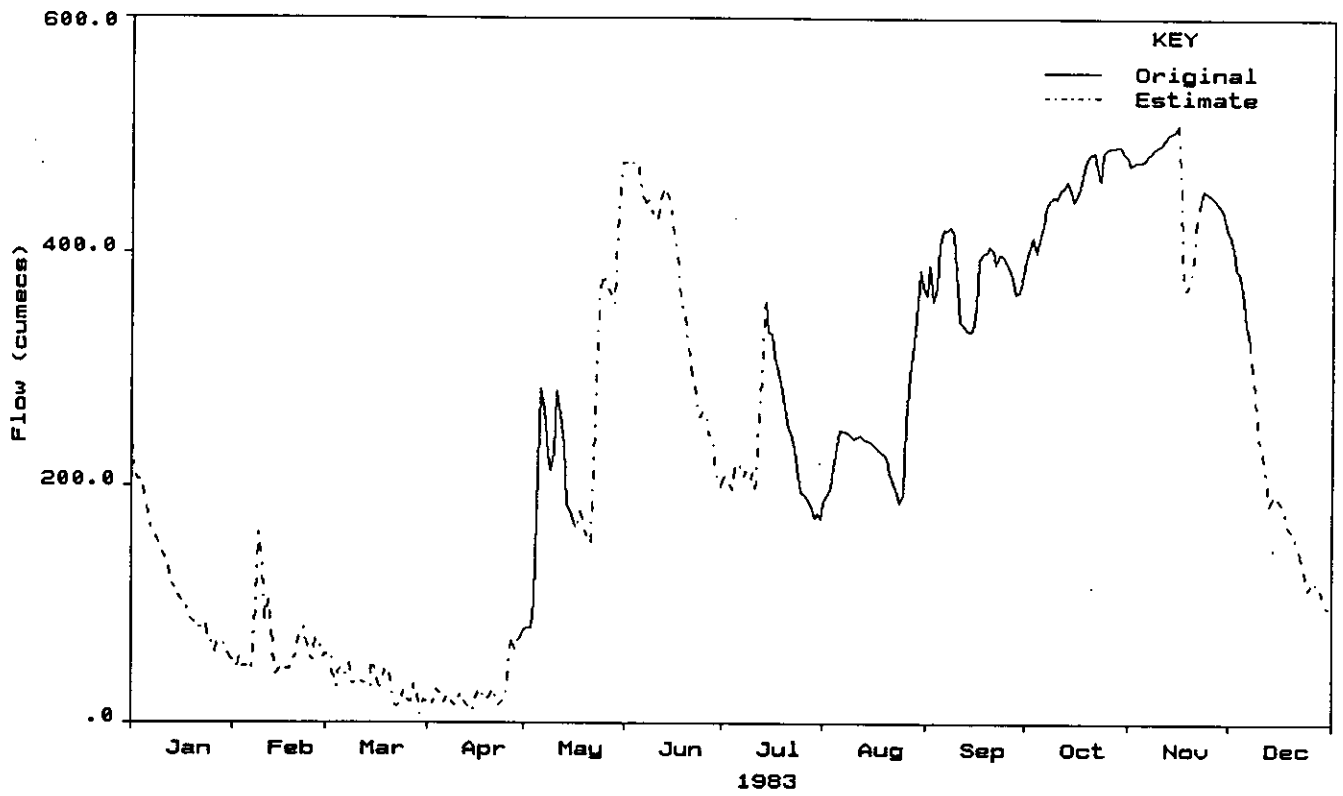


1982

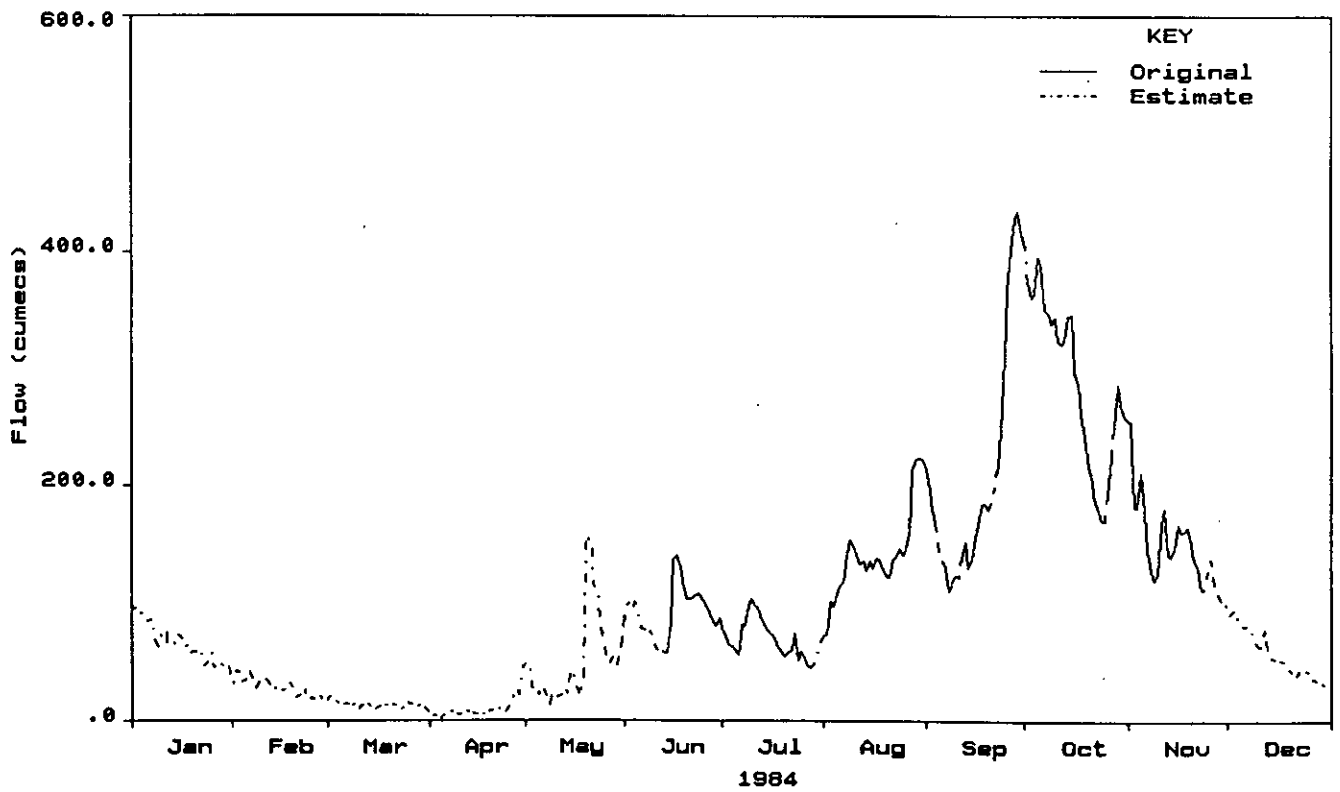


River Jubba at Jamamme

1983

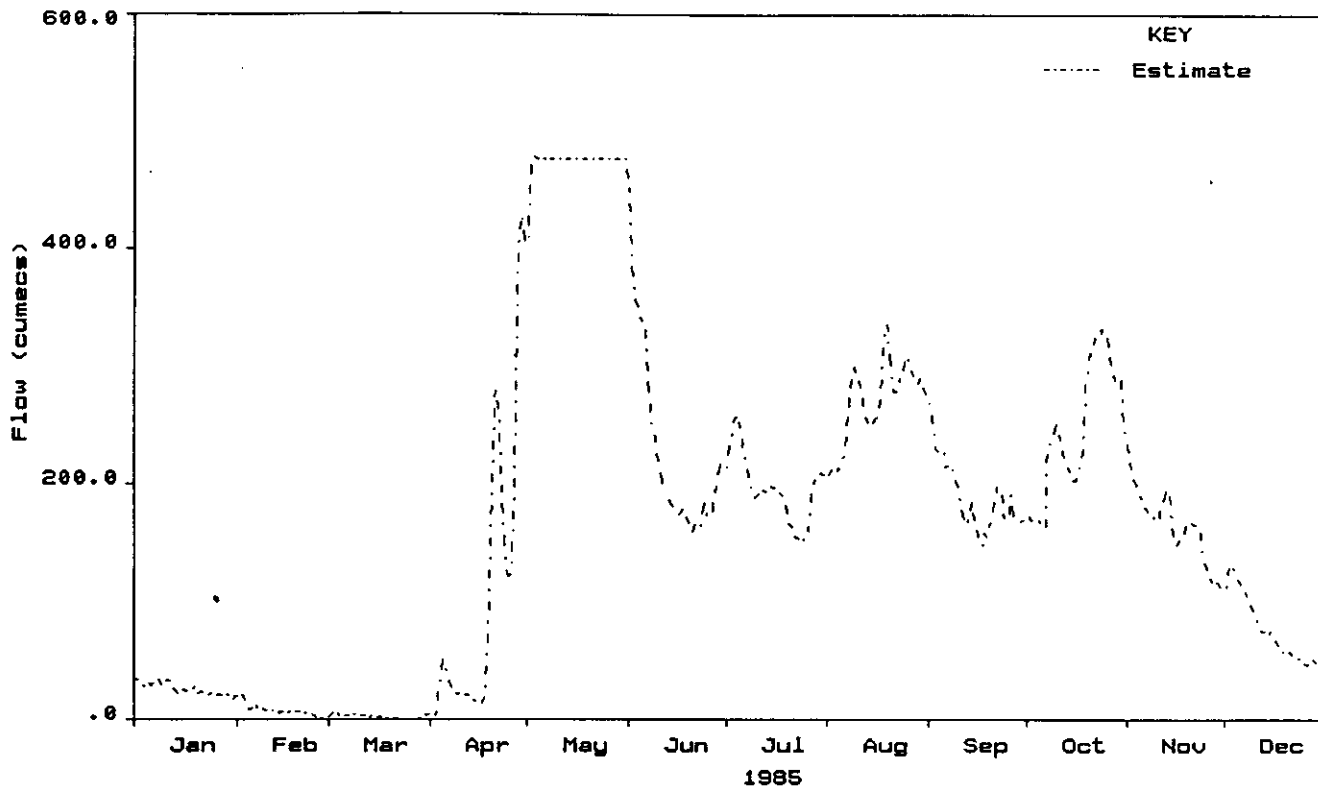


1984

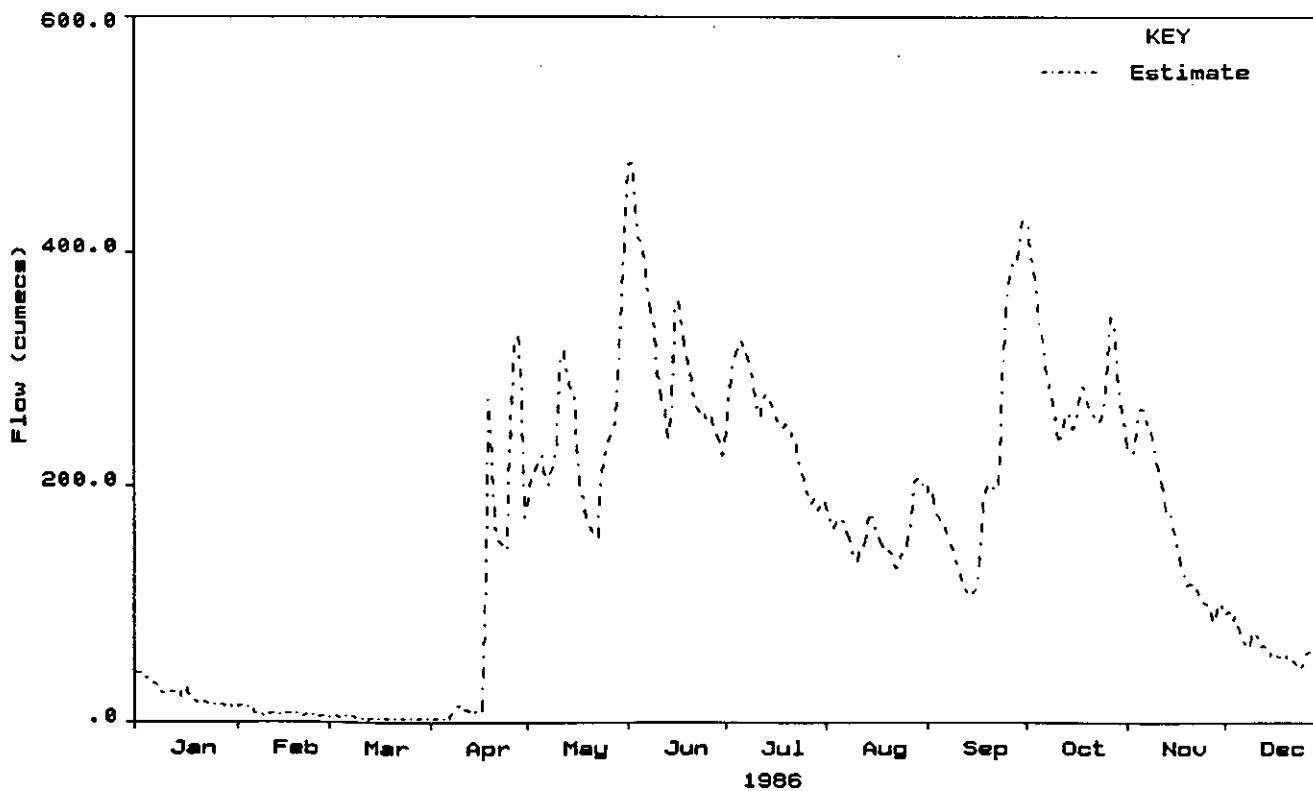


River Jubba at Jamamme

1985

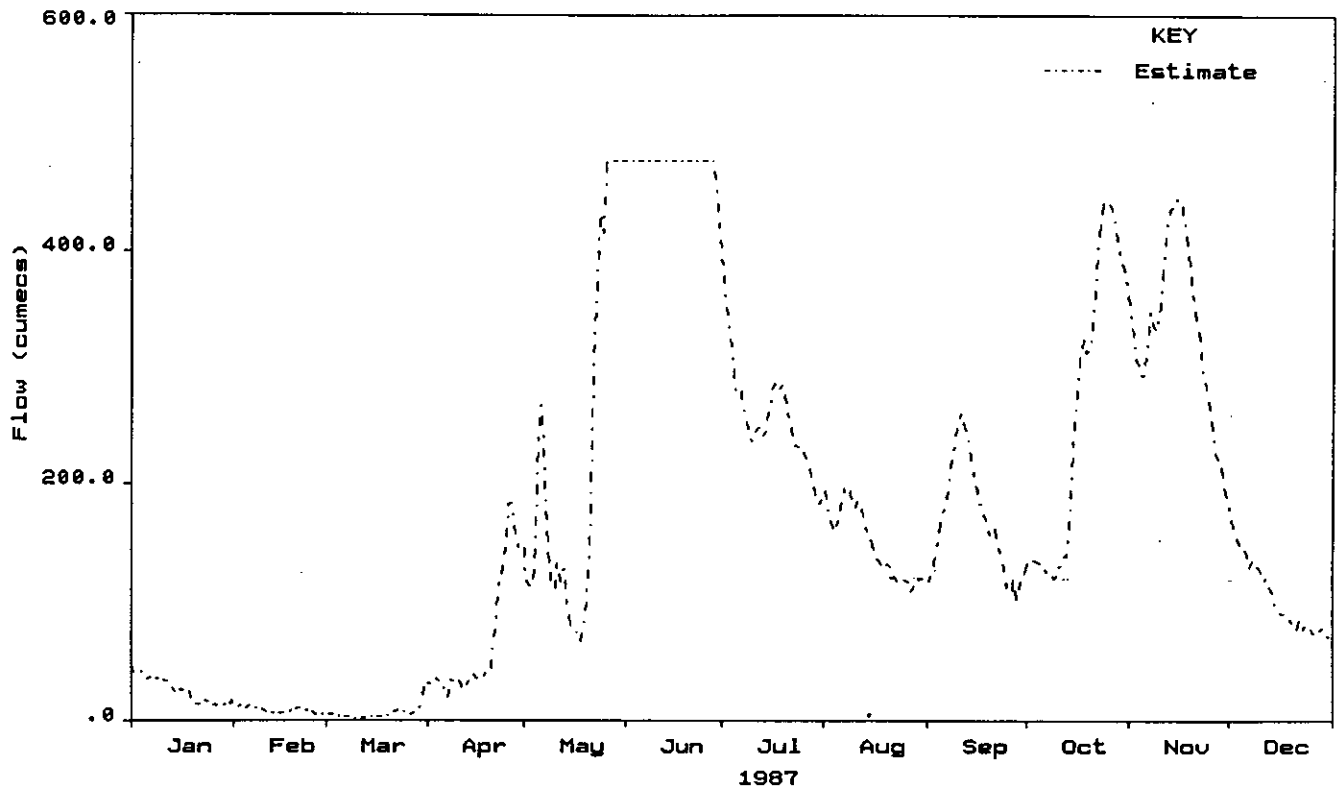


1986

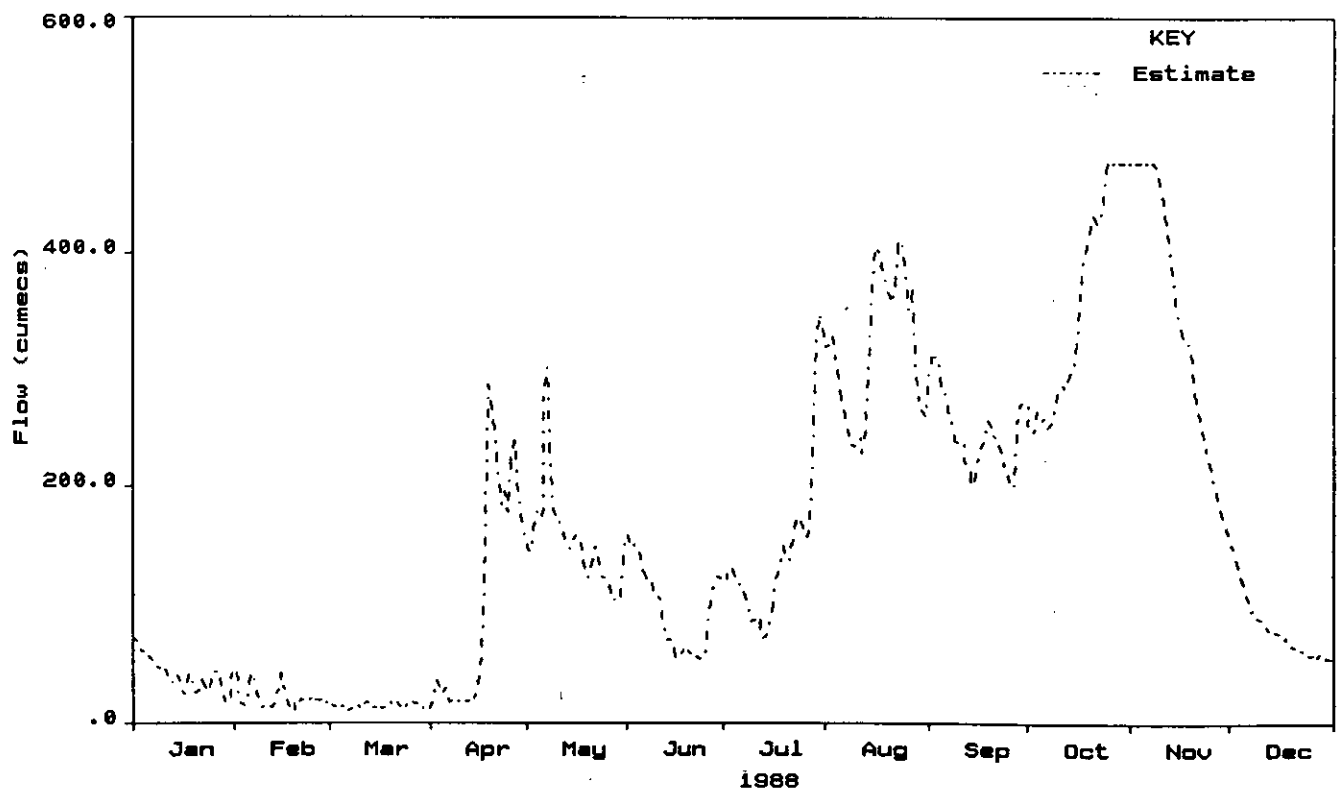


River Jubba at Jamamme

1987

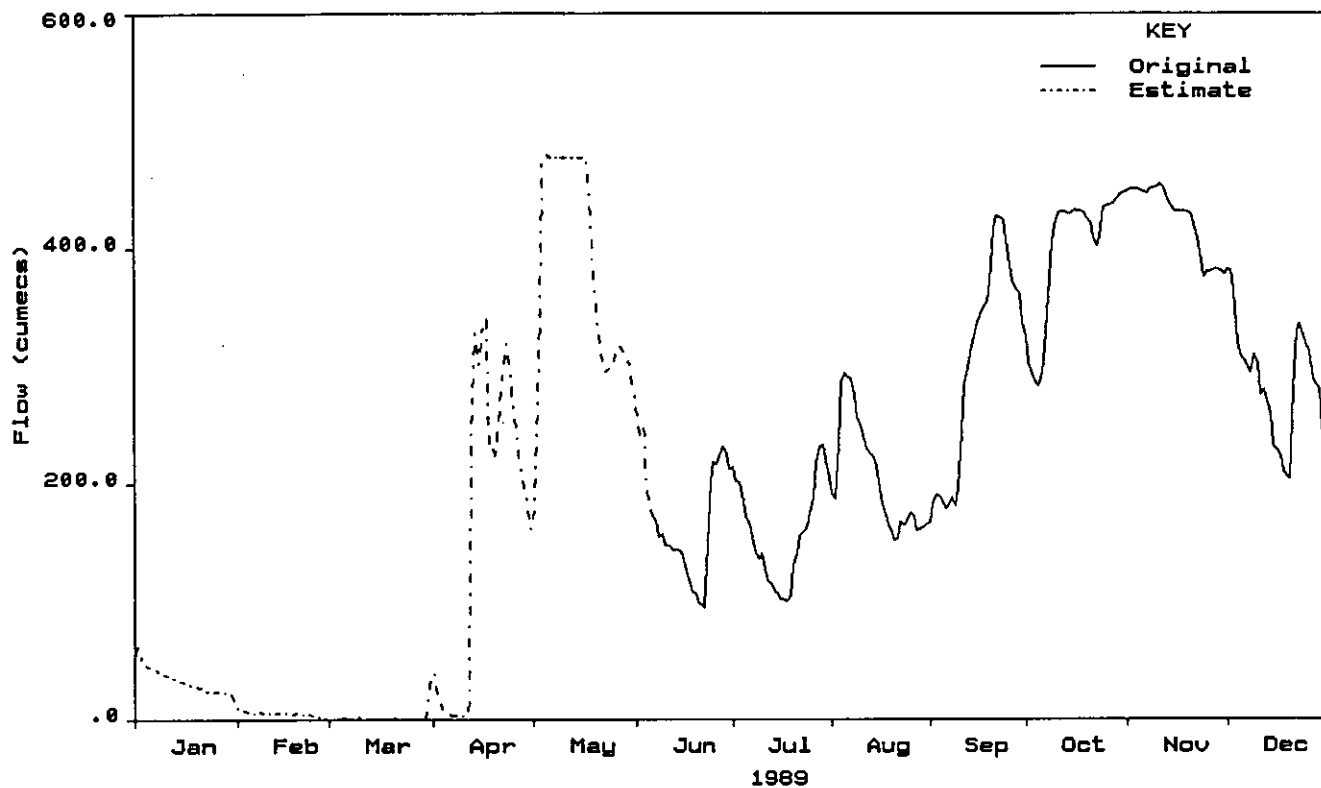


1988



River Jubba at Jamamme

1989

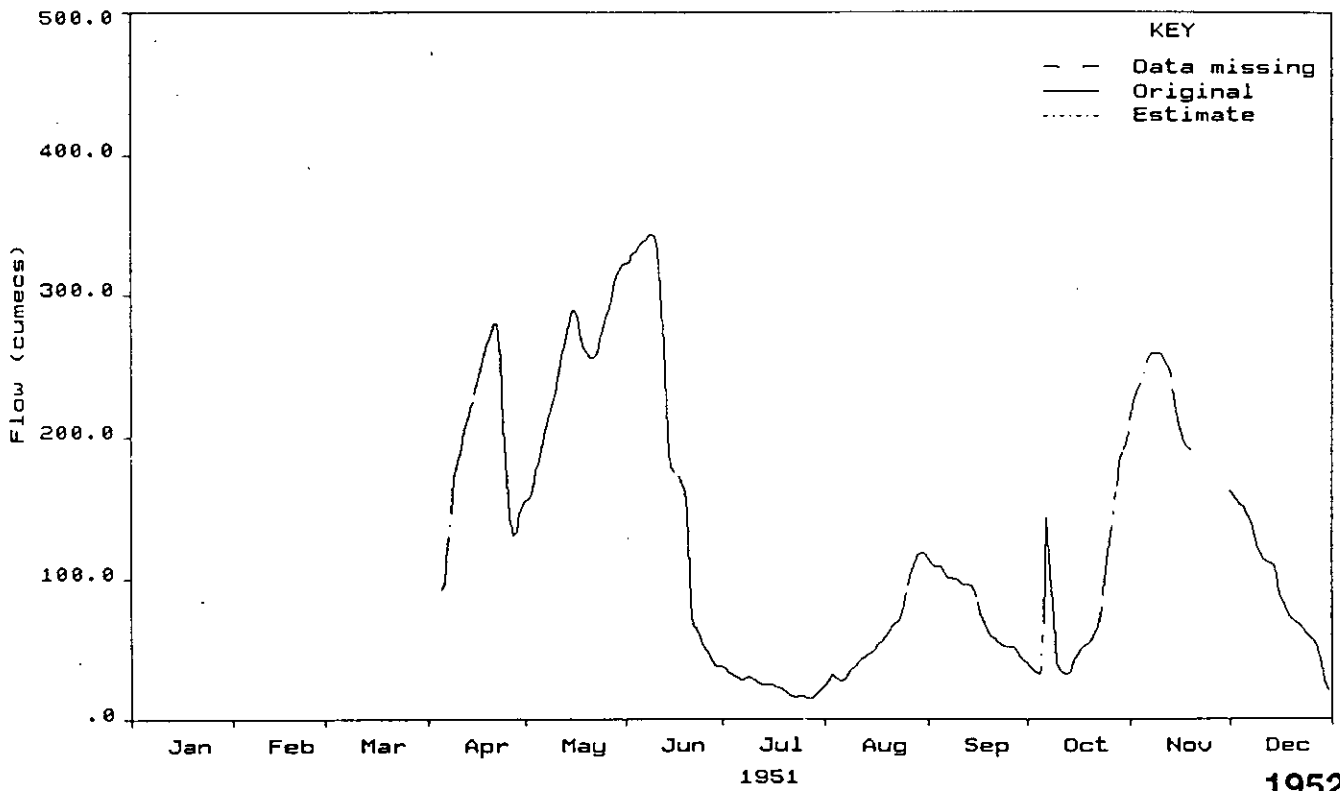


BELED WEYN
1951 - 1989

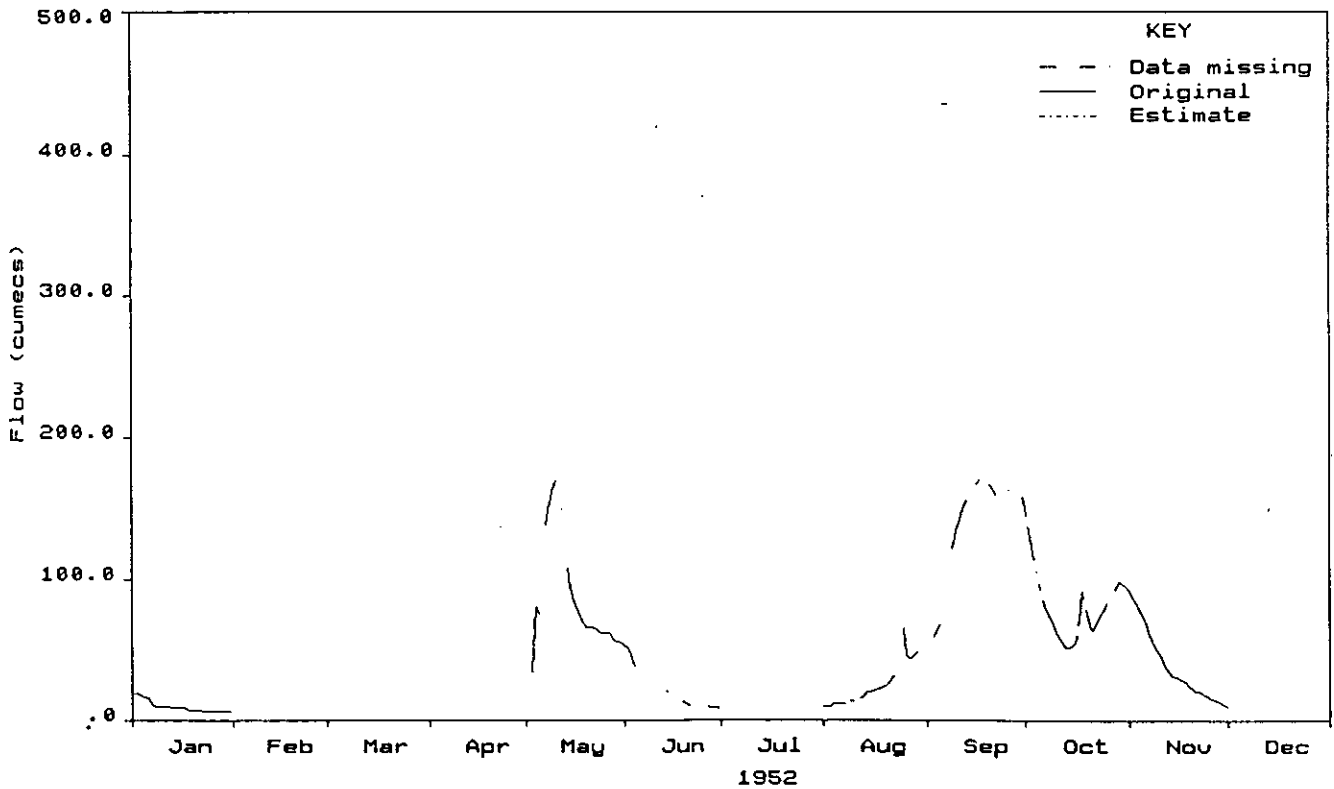


River Shebelli at Beled Weyn

1951

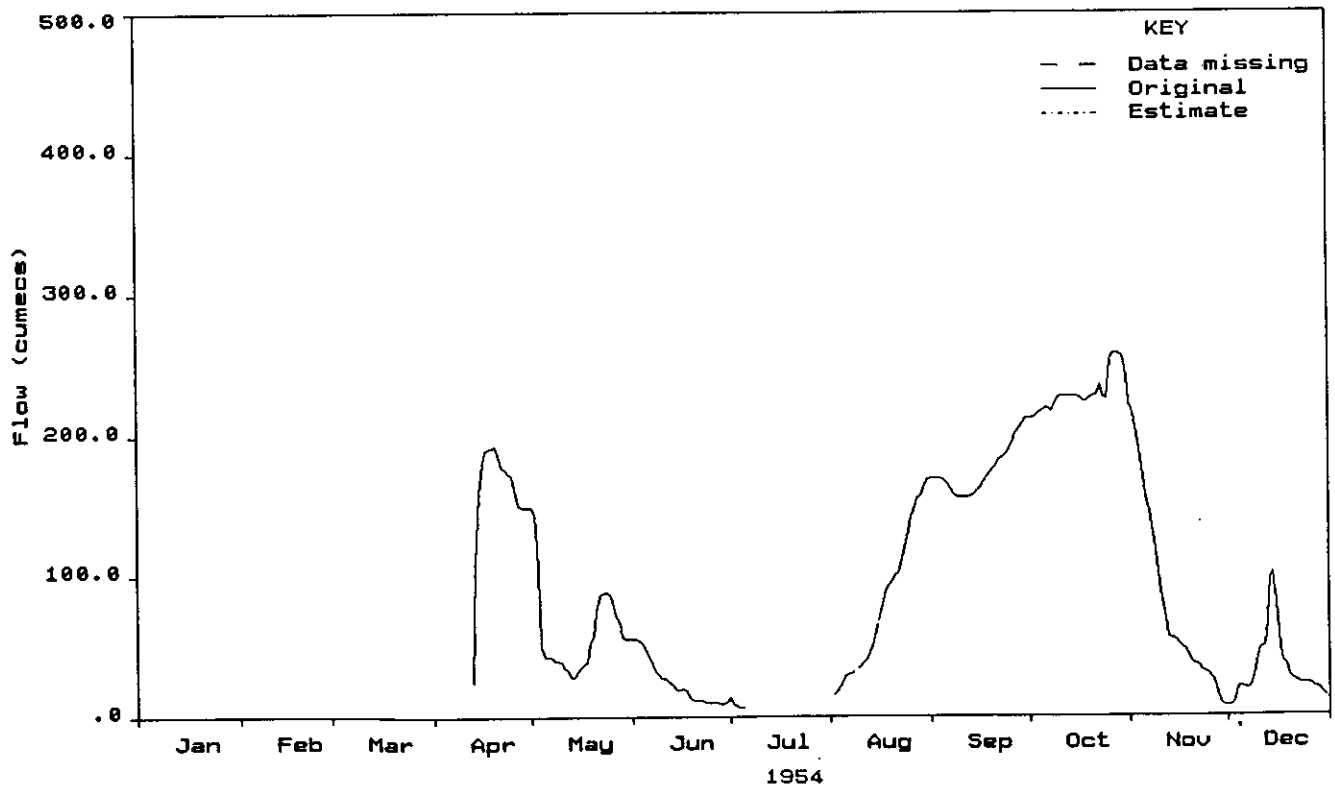
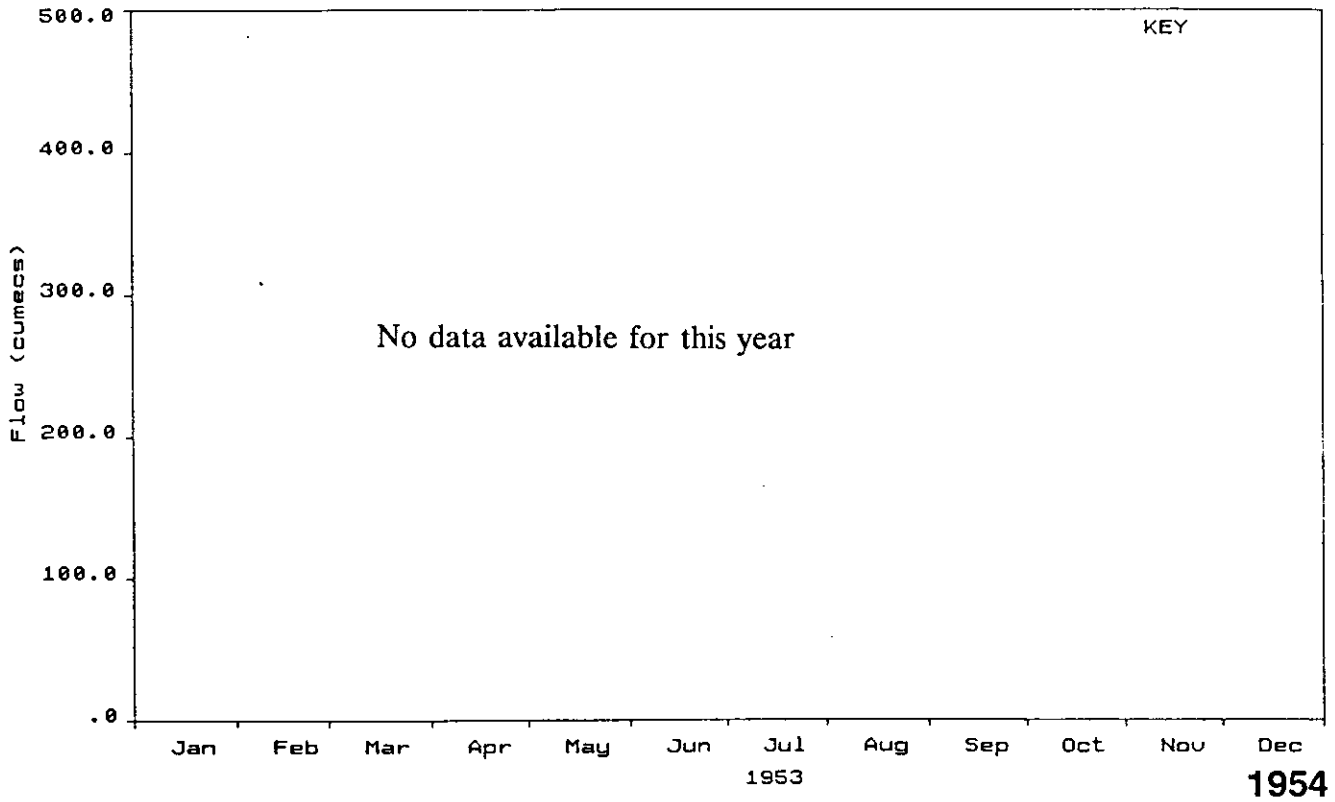


1952



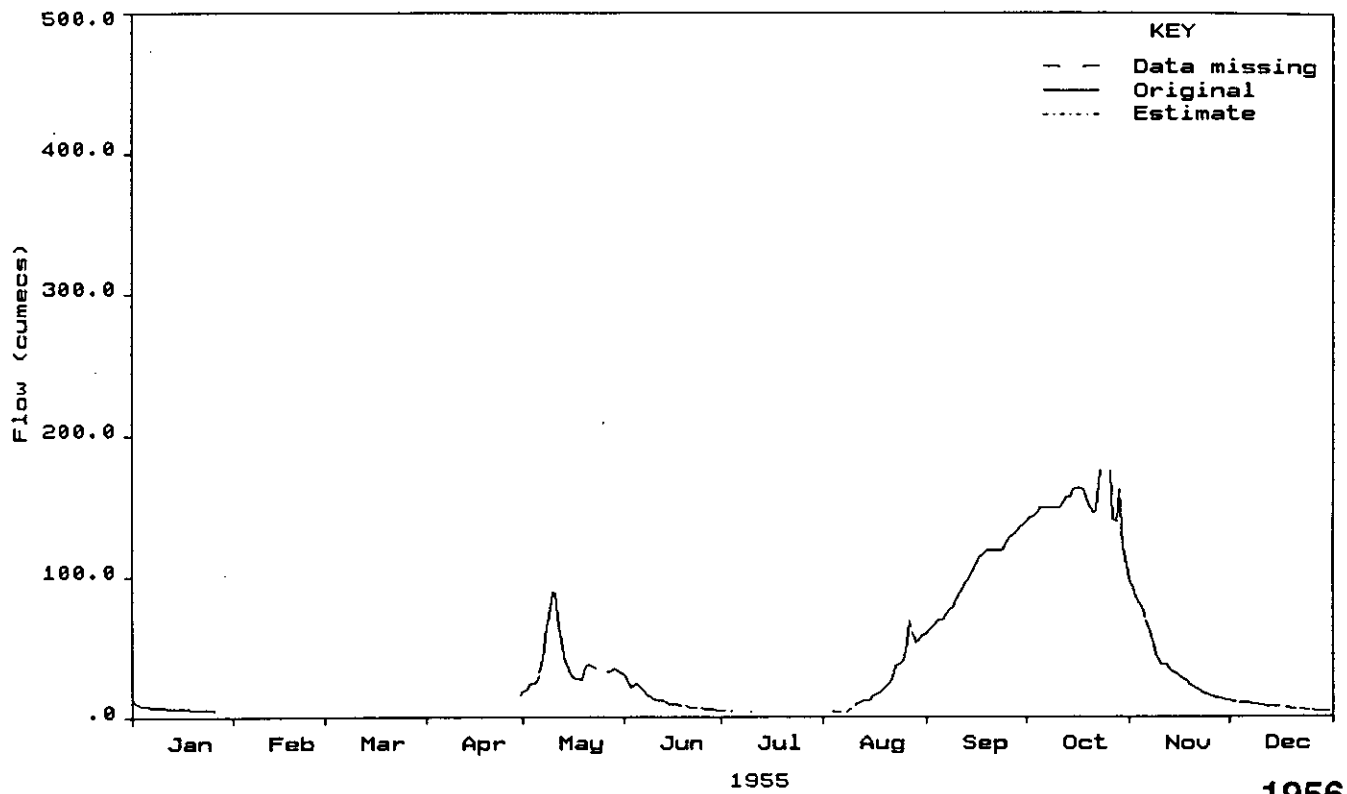
River Shebelli at Beled Weyn

1953

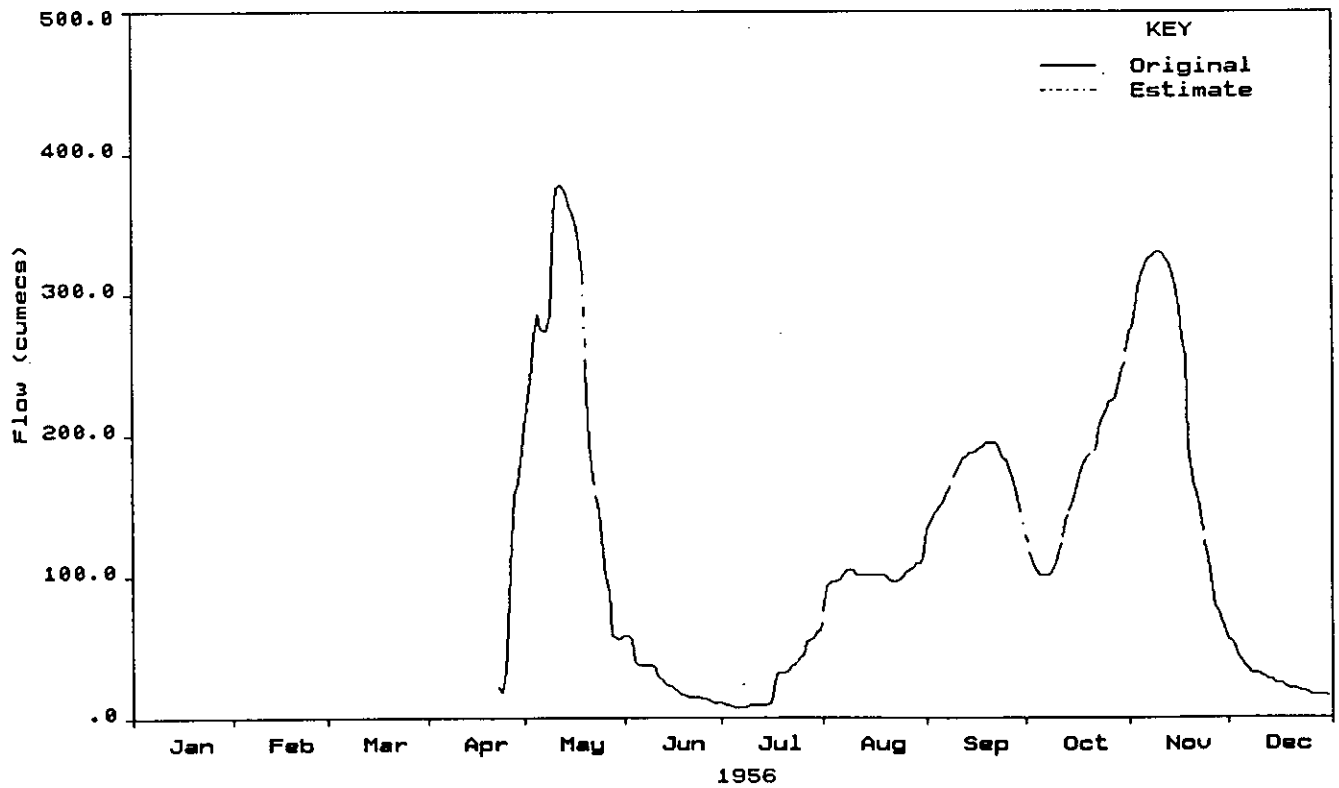


River Shebelli at Beled Weyn

1955

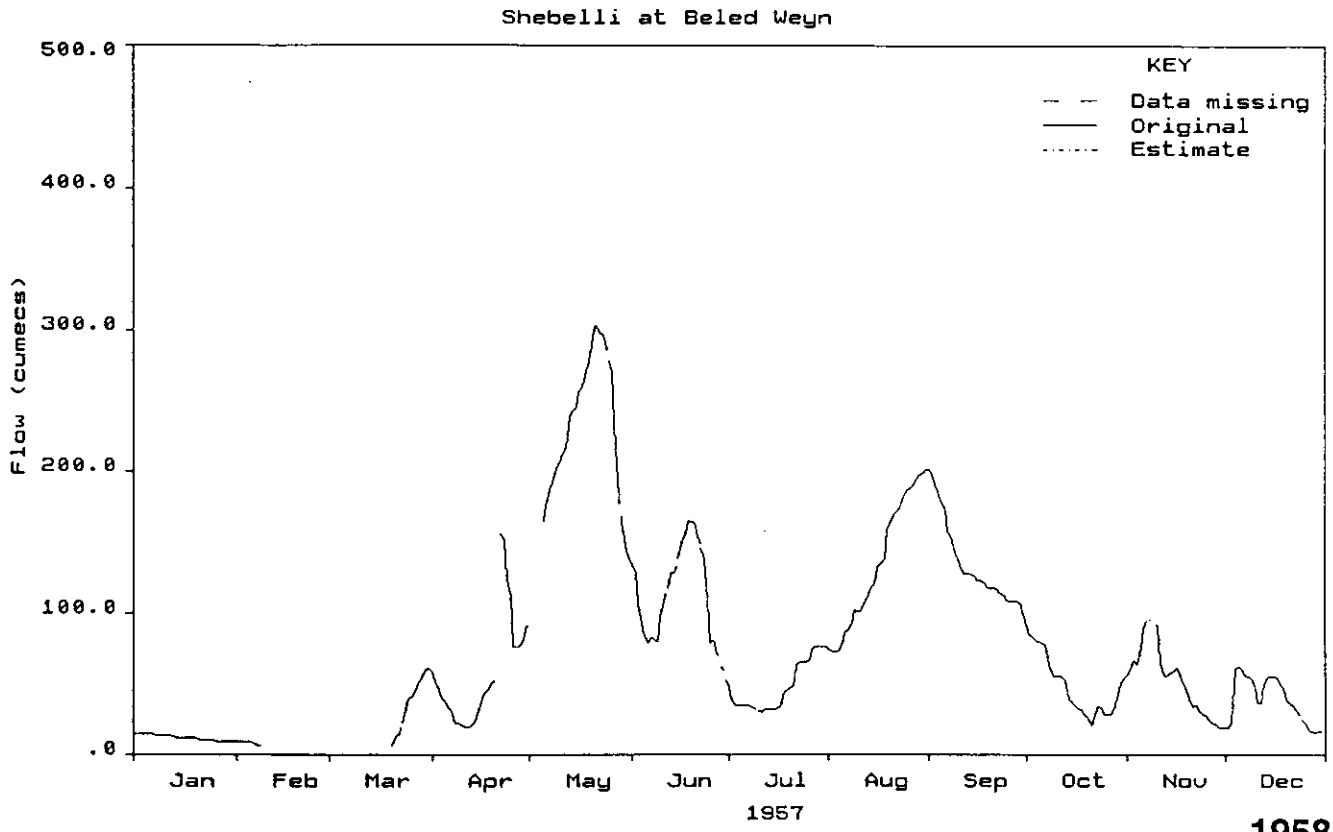


1956

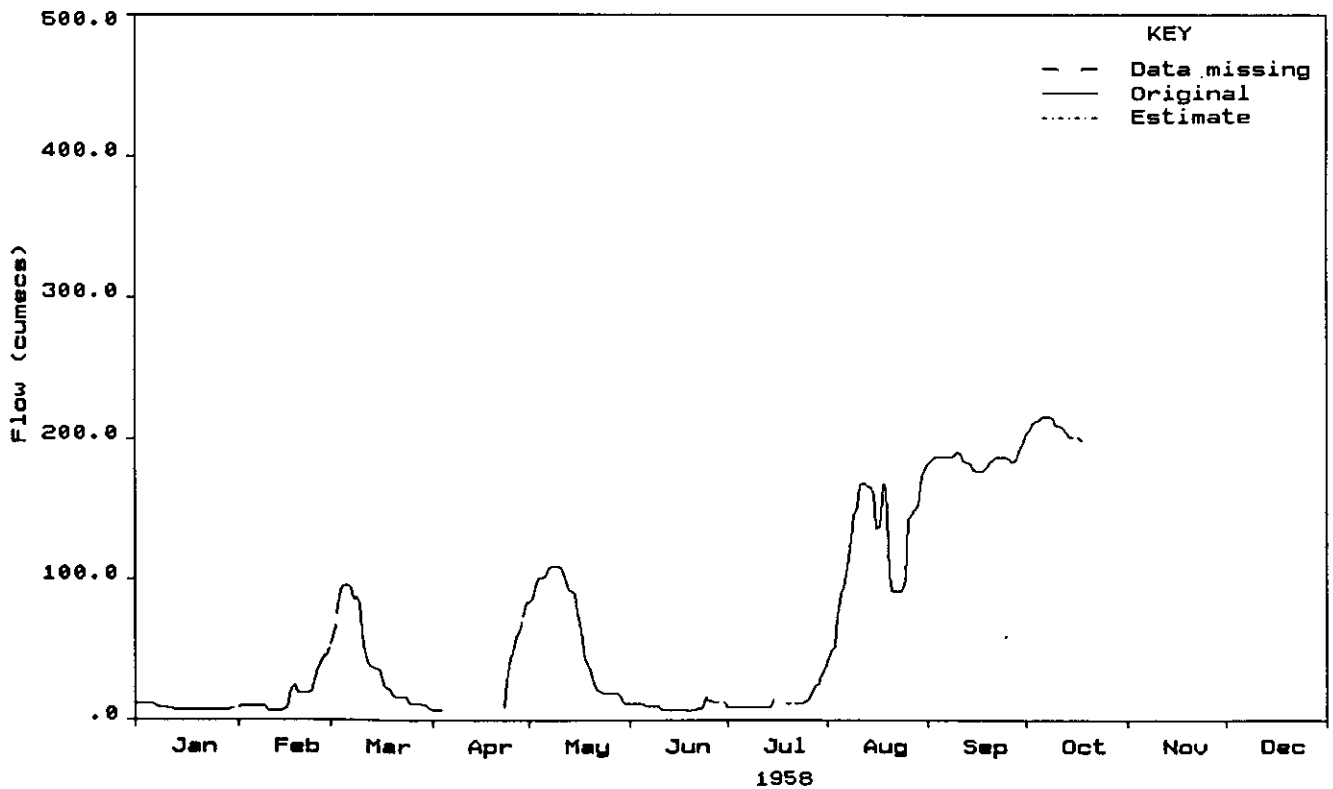


River Shebelli at Beled Weyn

1957

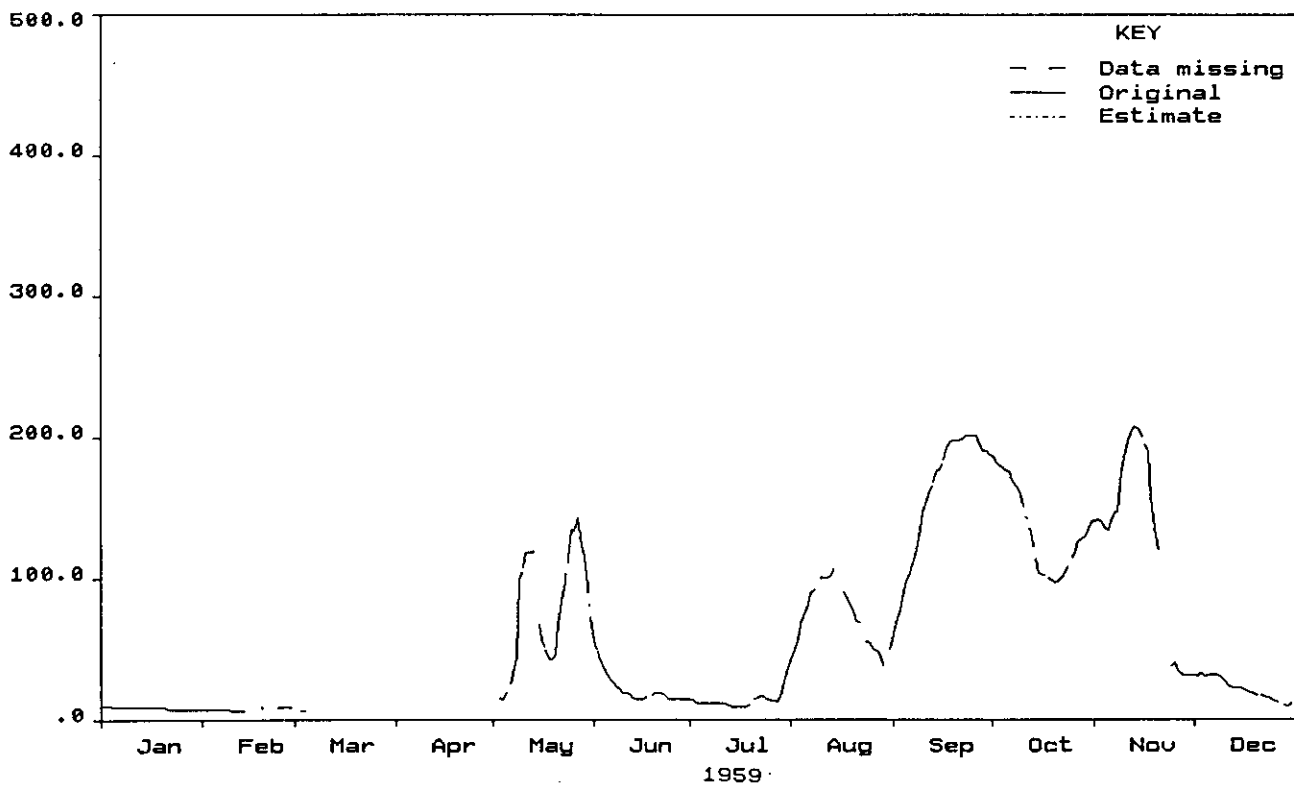


1958

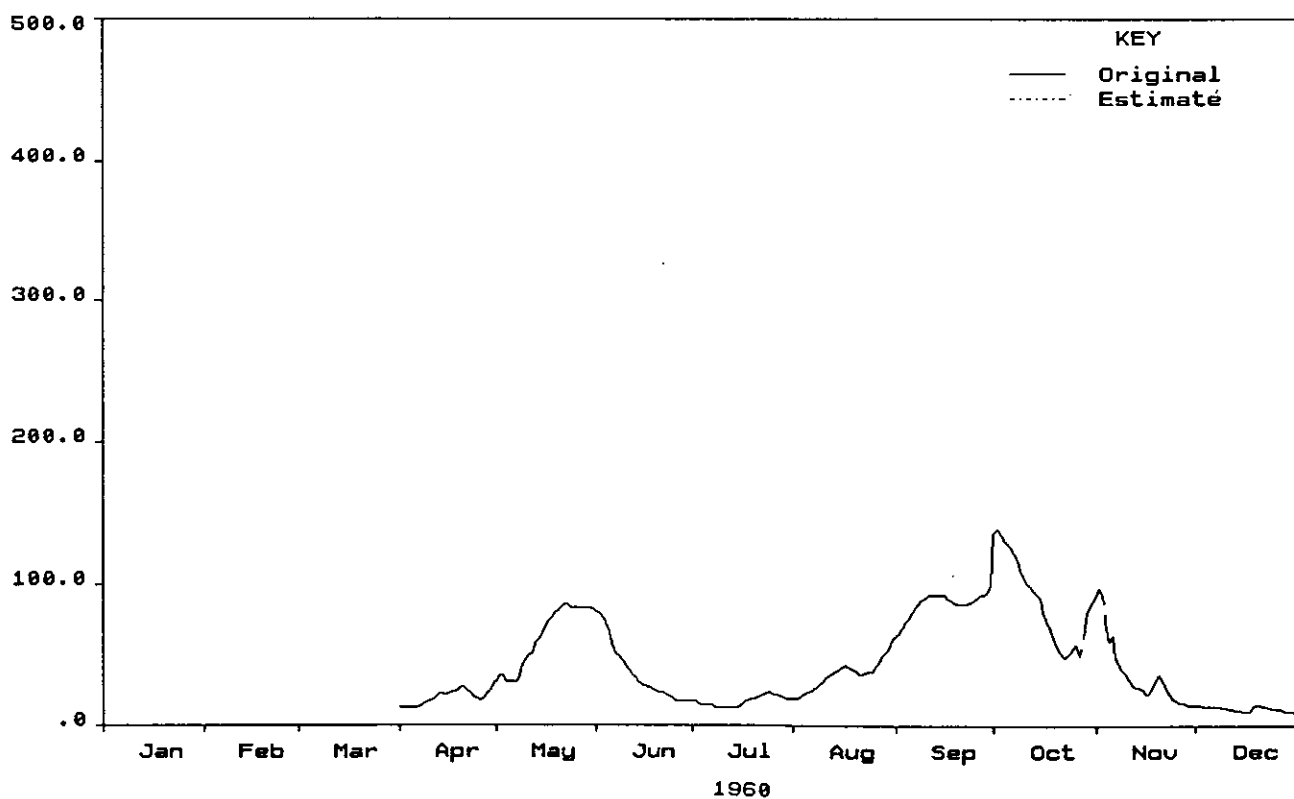


River Shebelli at Beled Weyn

1959

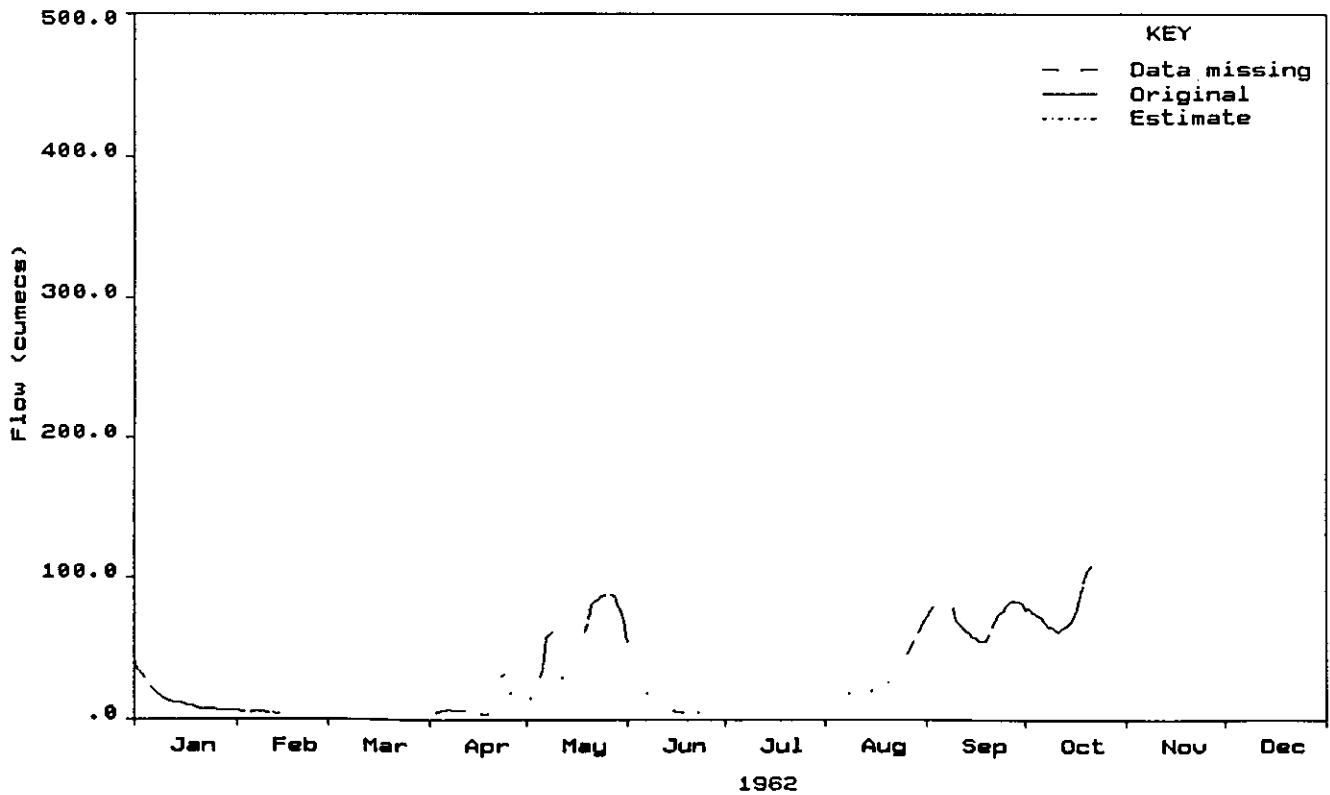
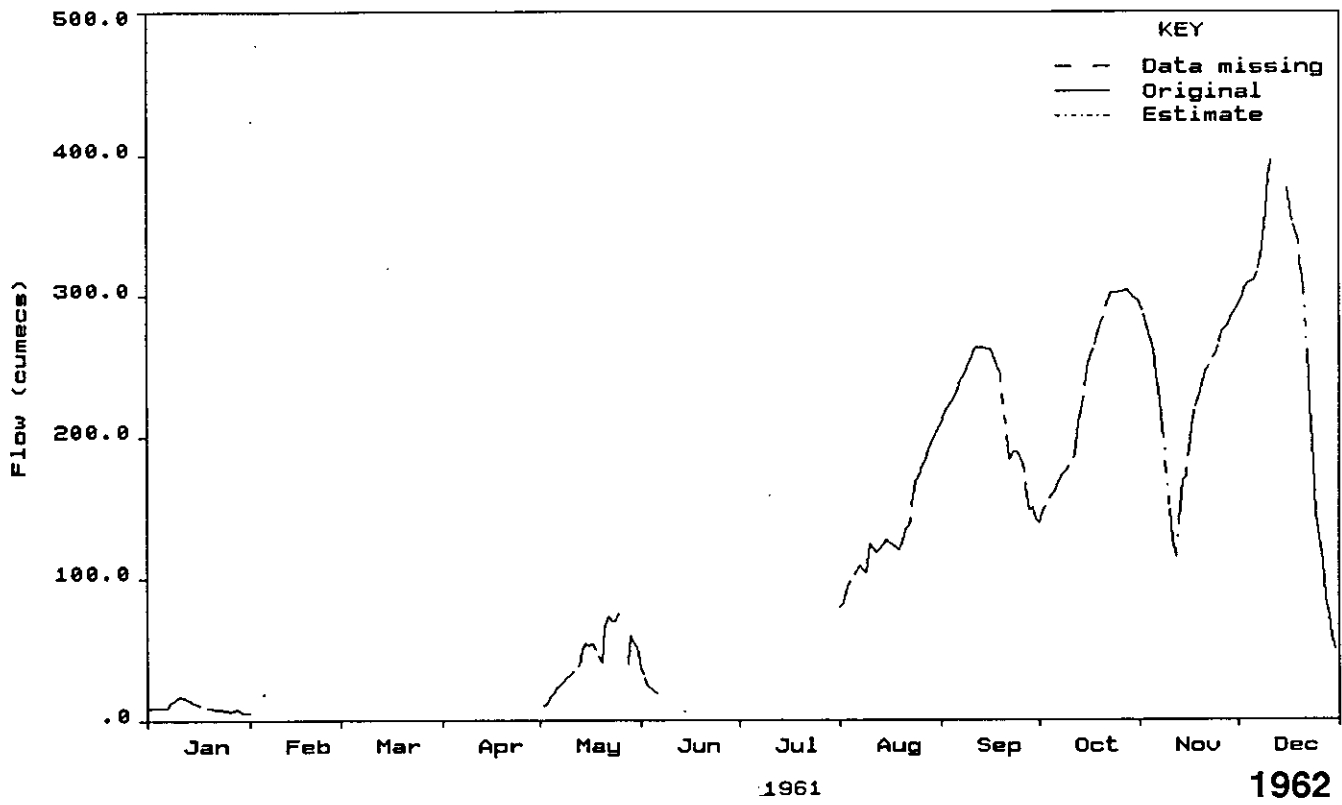


1960



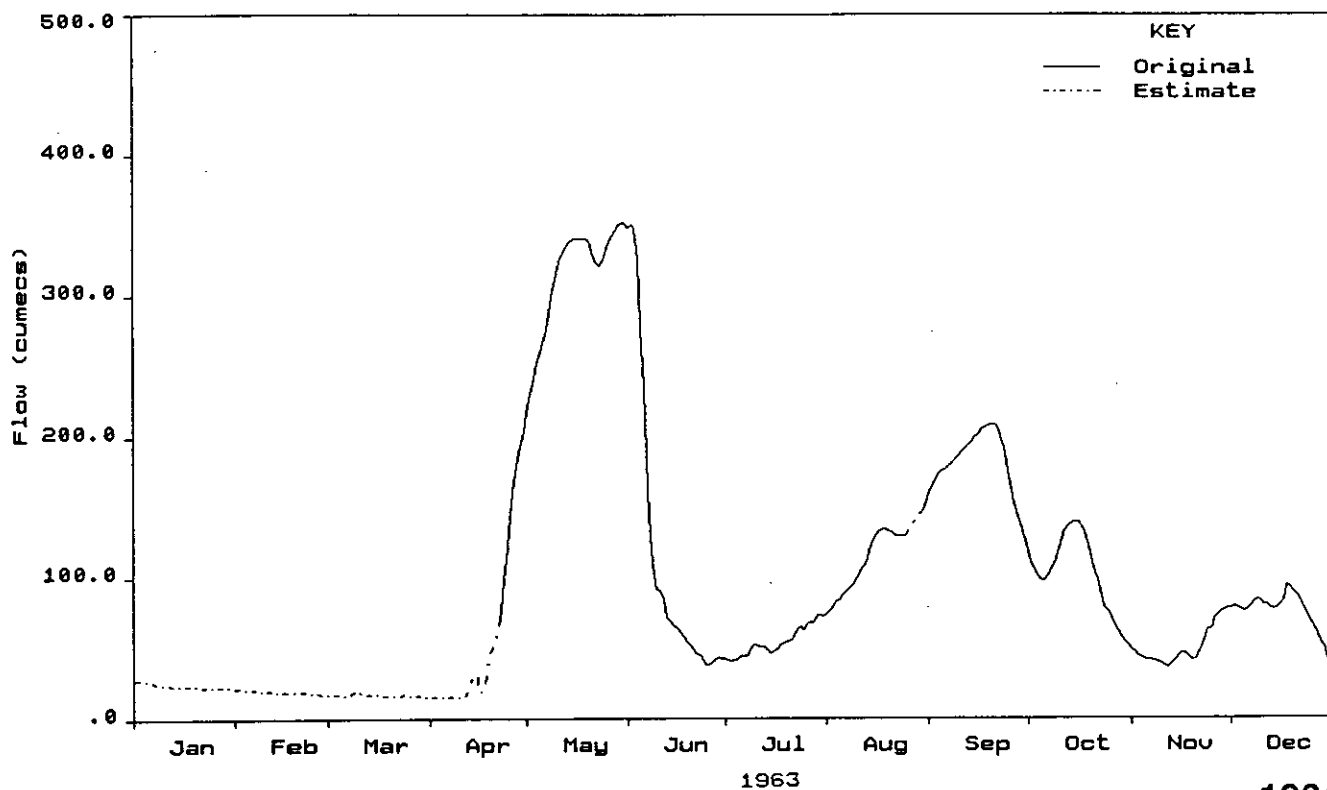
River Shebelli at Beled Weyn

1961

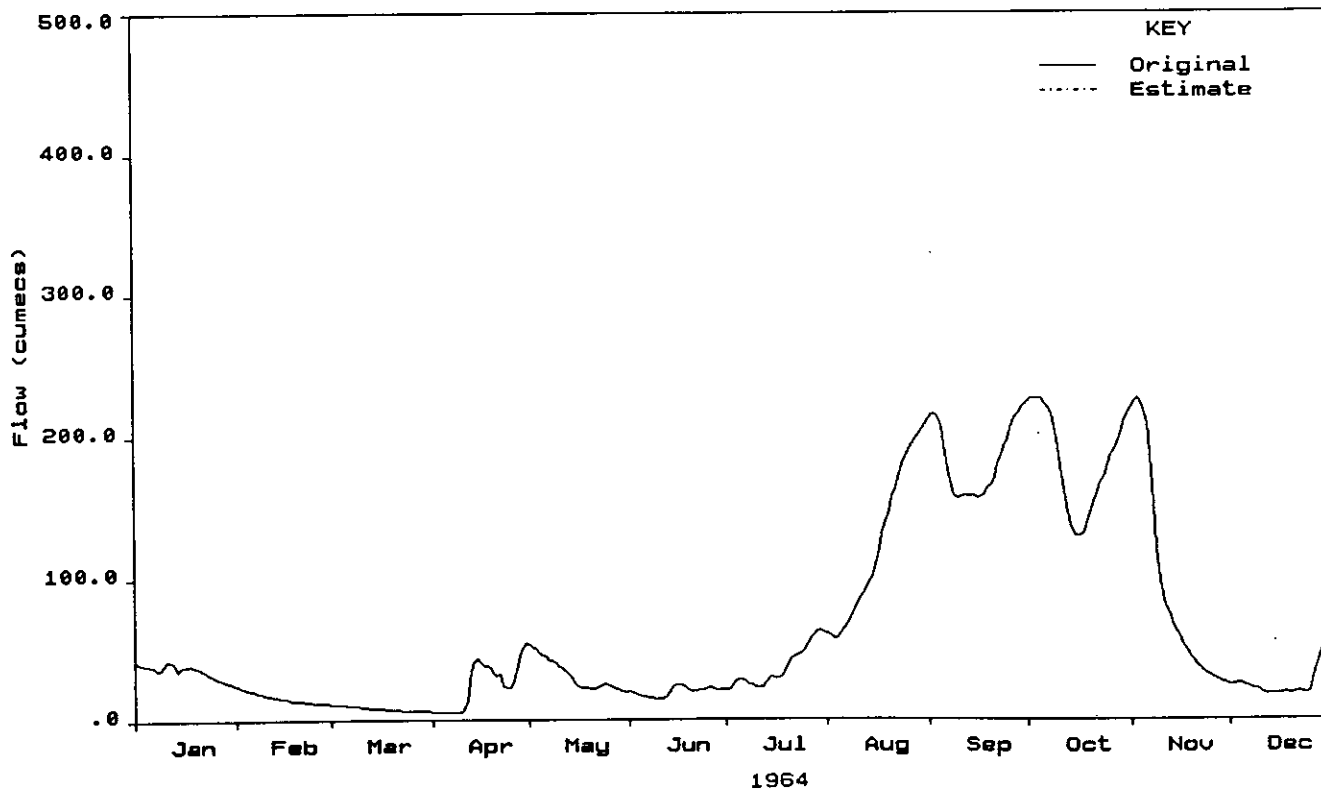


River Shebelli at Beled Weyn

1963

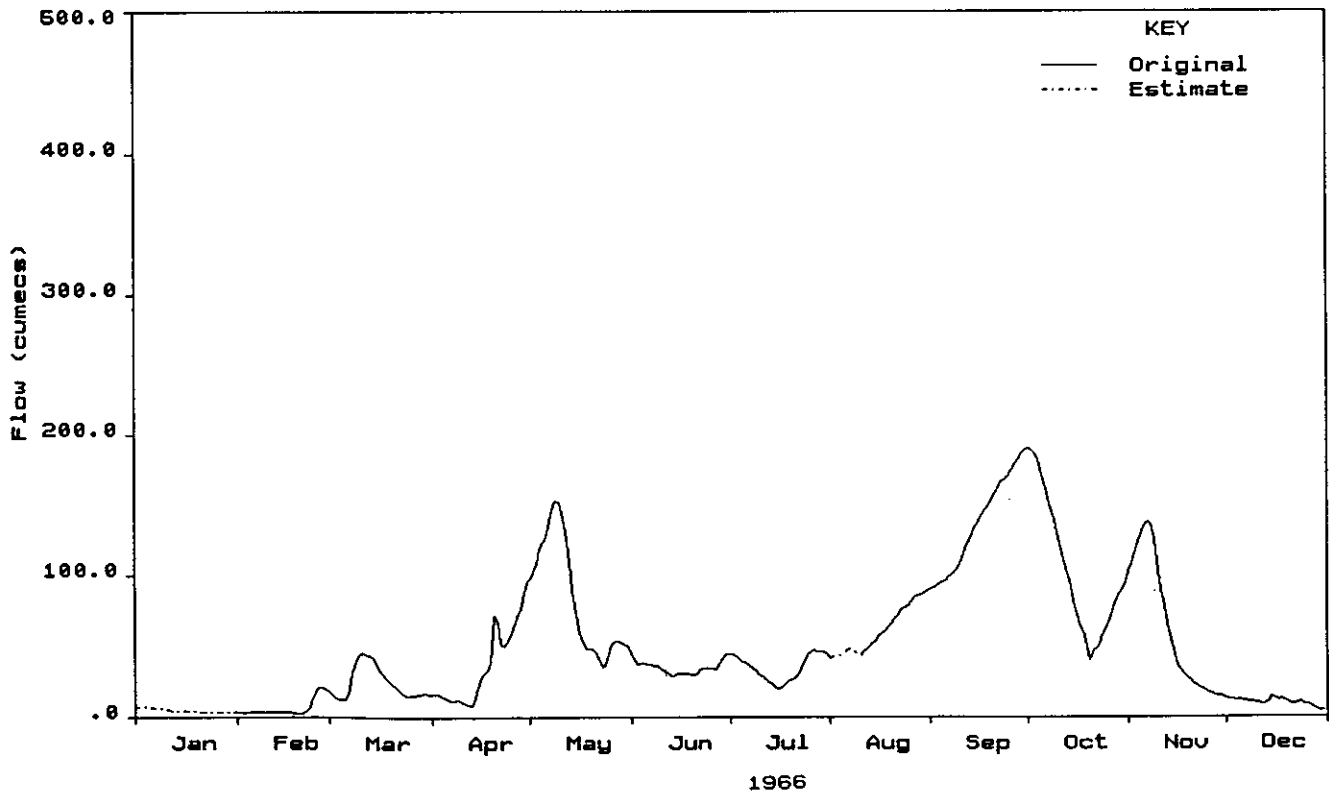
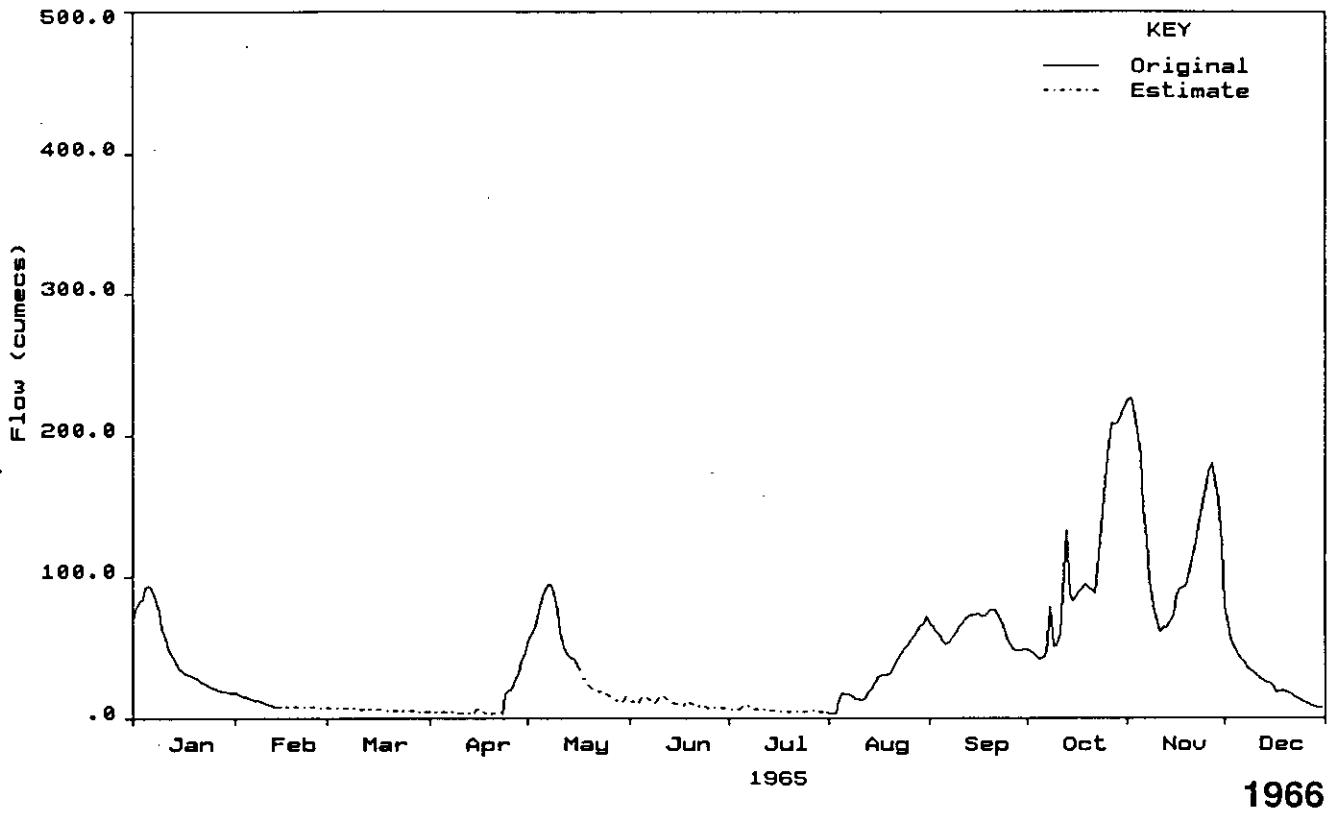


1964



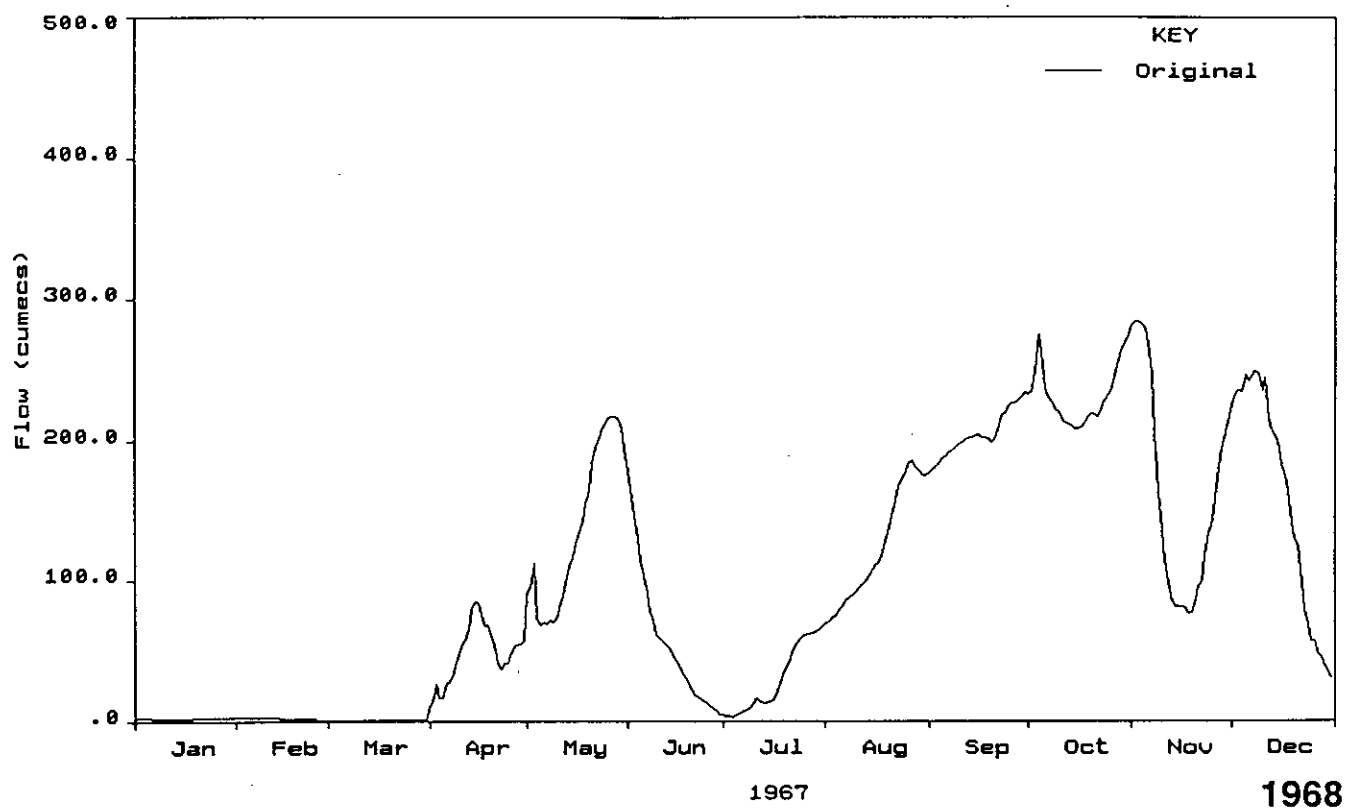
River Shebelli at Beled Weyn

1965

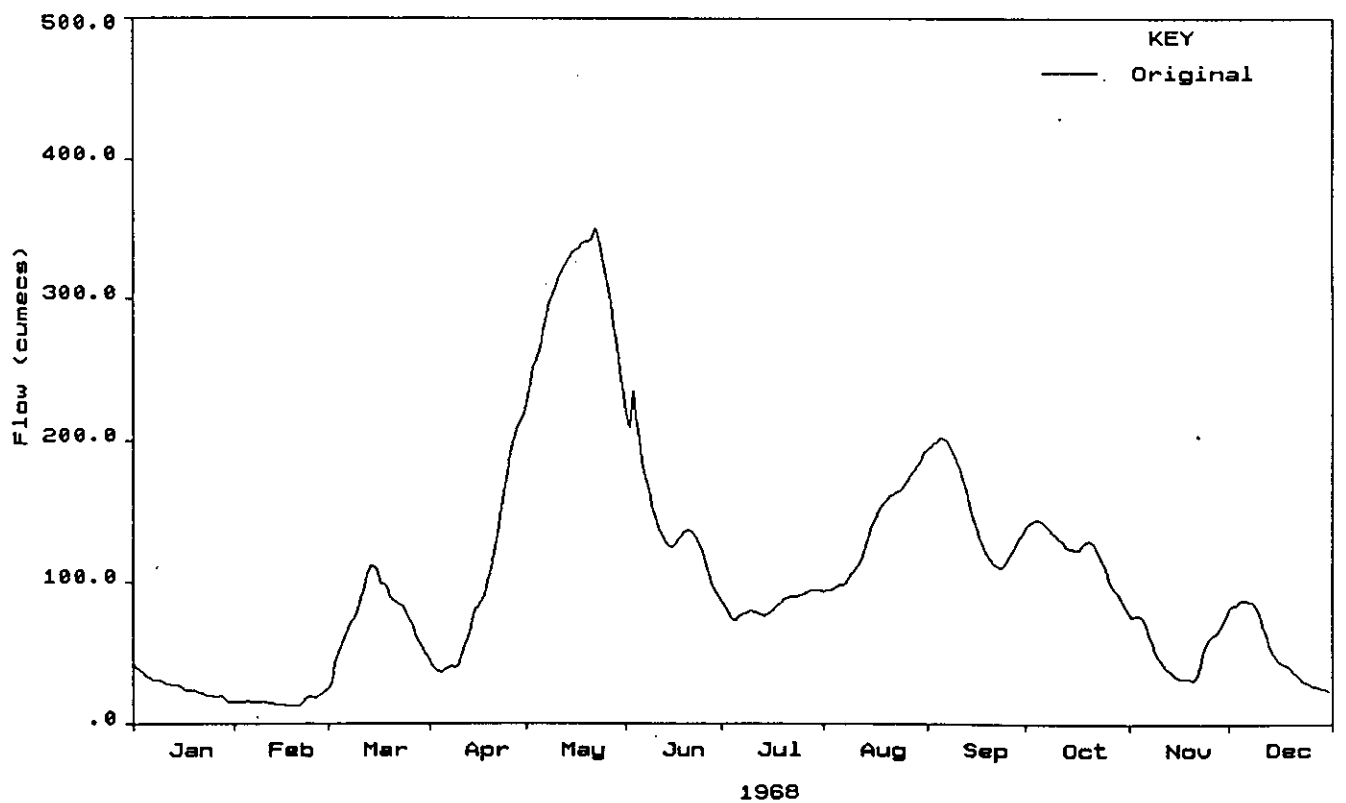


River Shebelli at Beled Weyn

1967

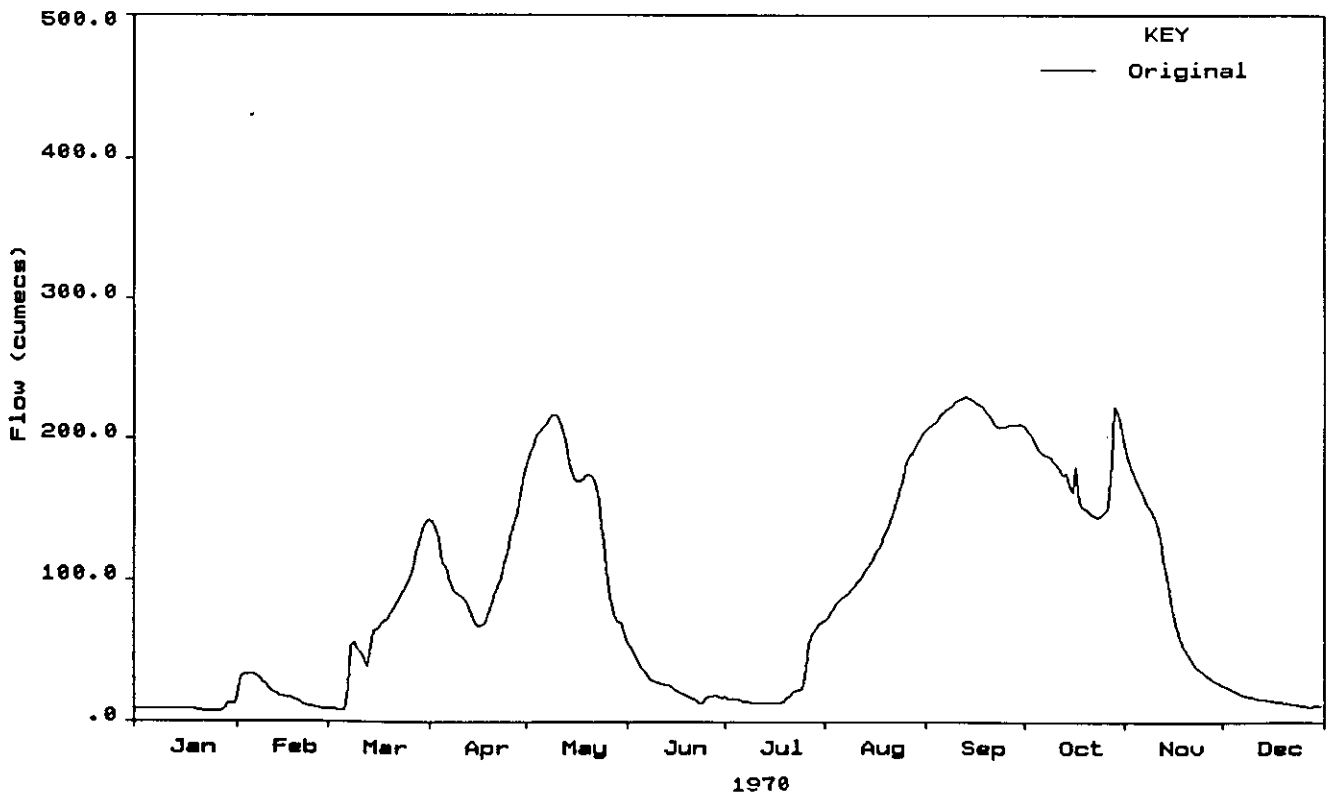
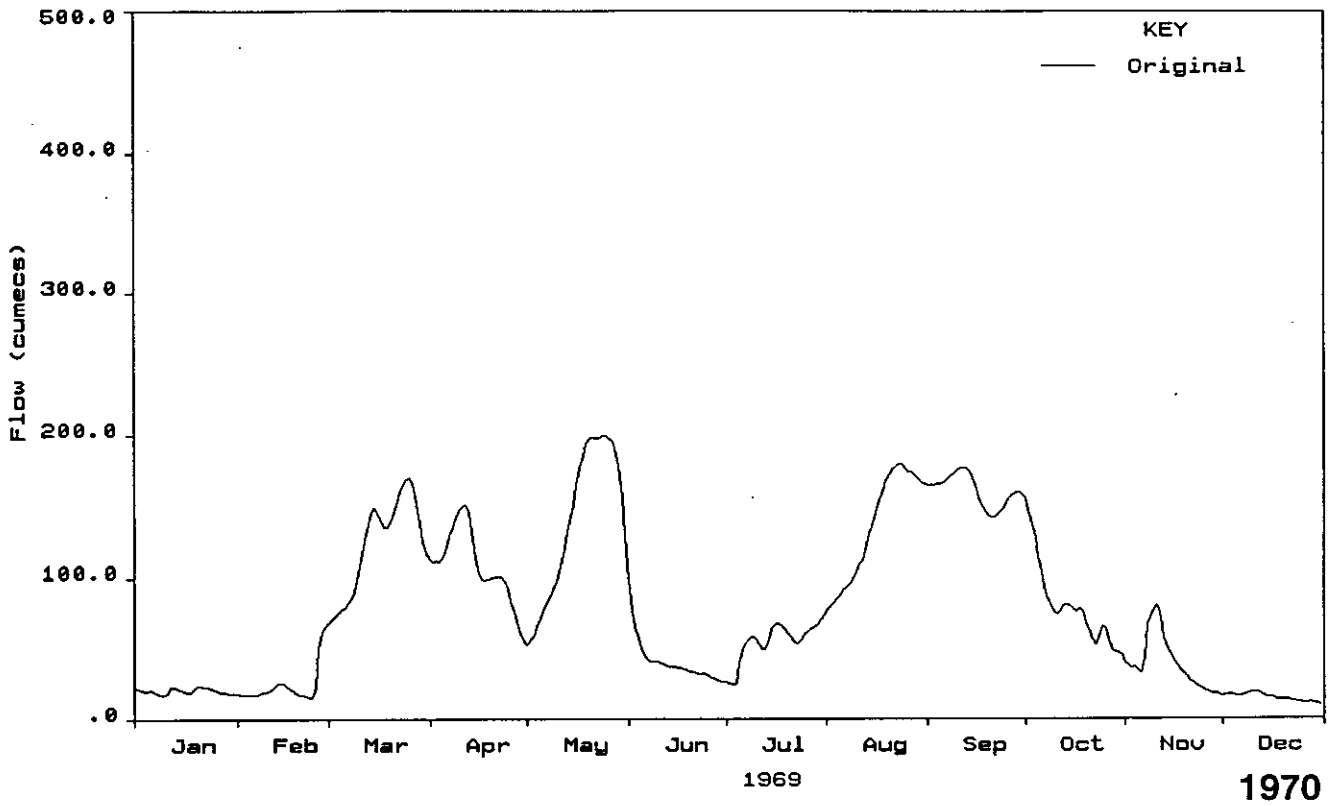


1968



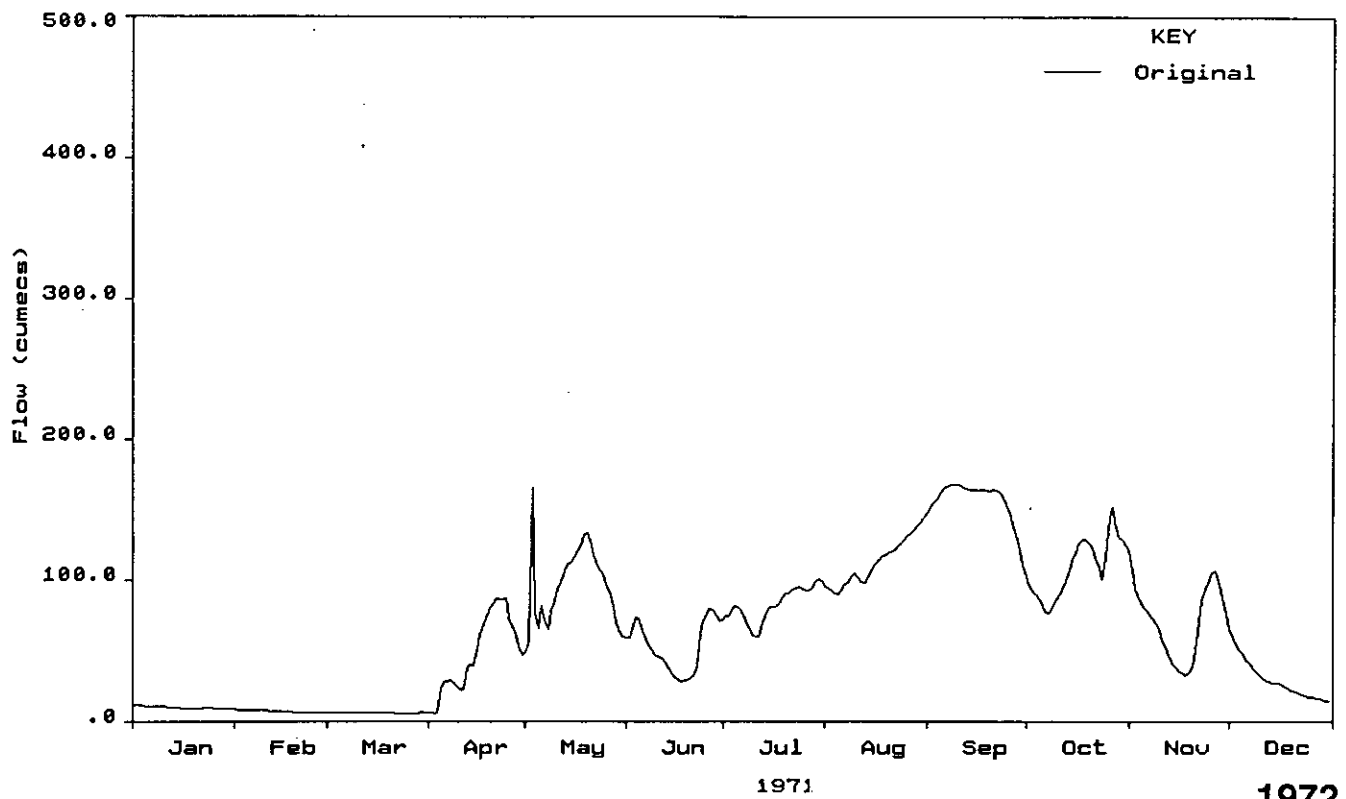
River Shebelli at Beled Weyn

1969

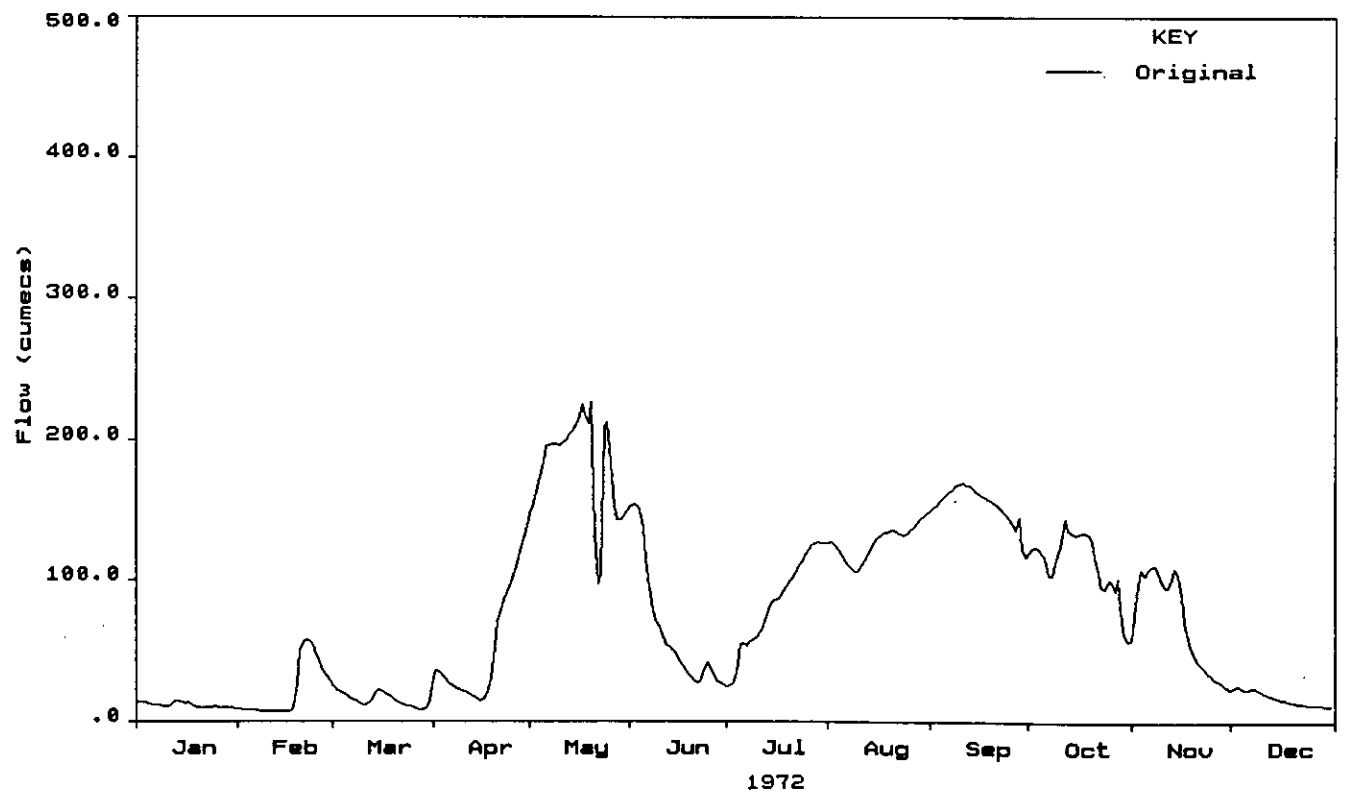


River Shebelli at Beled Weyn

1971

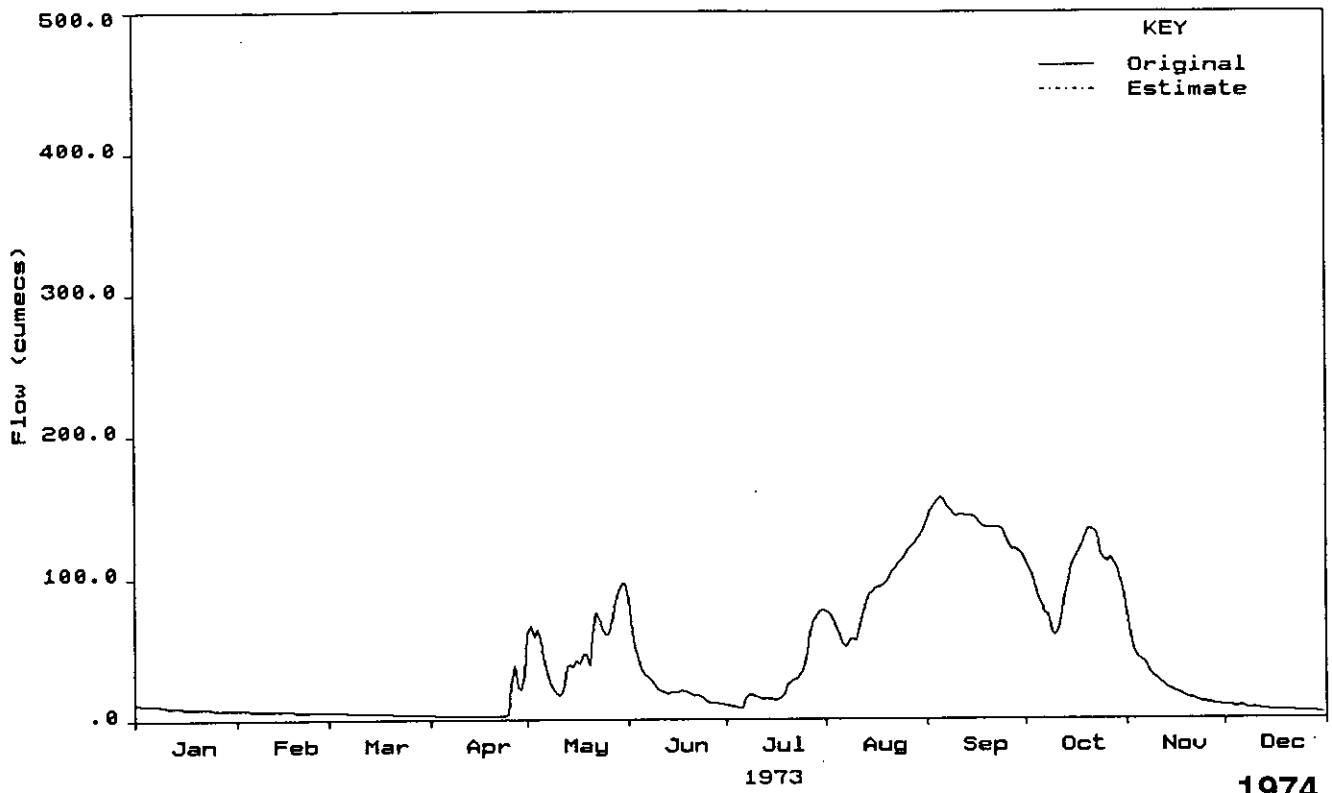


1972

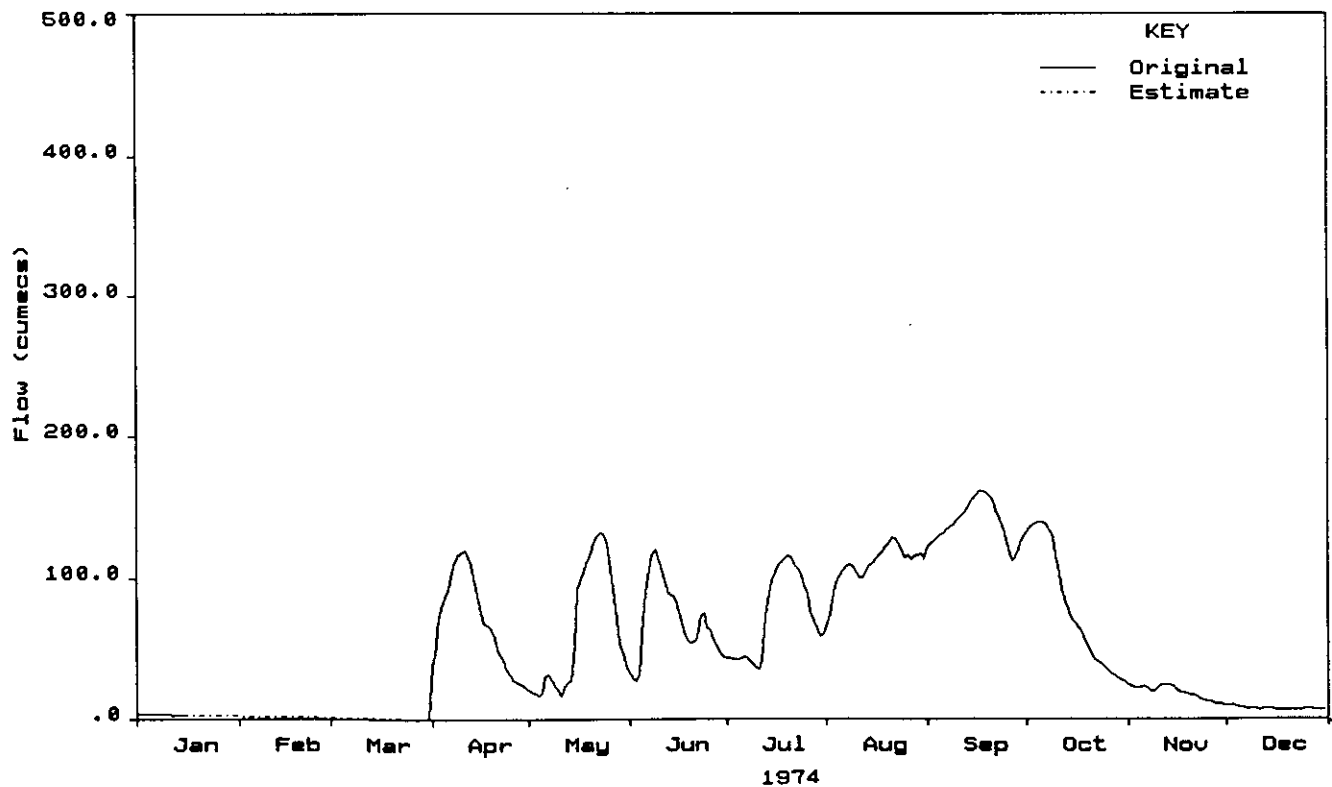


River Shebelli at Beled Weyn

1973

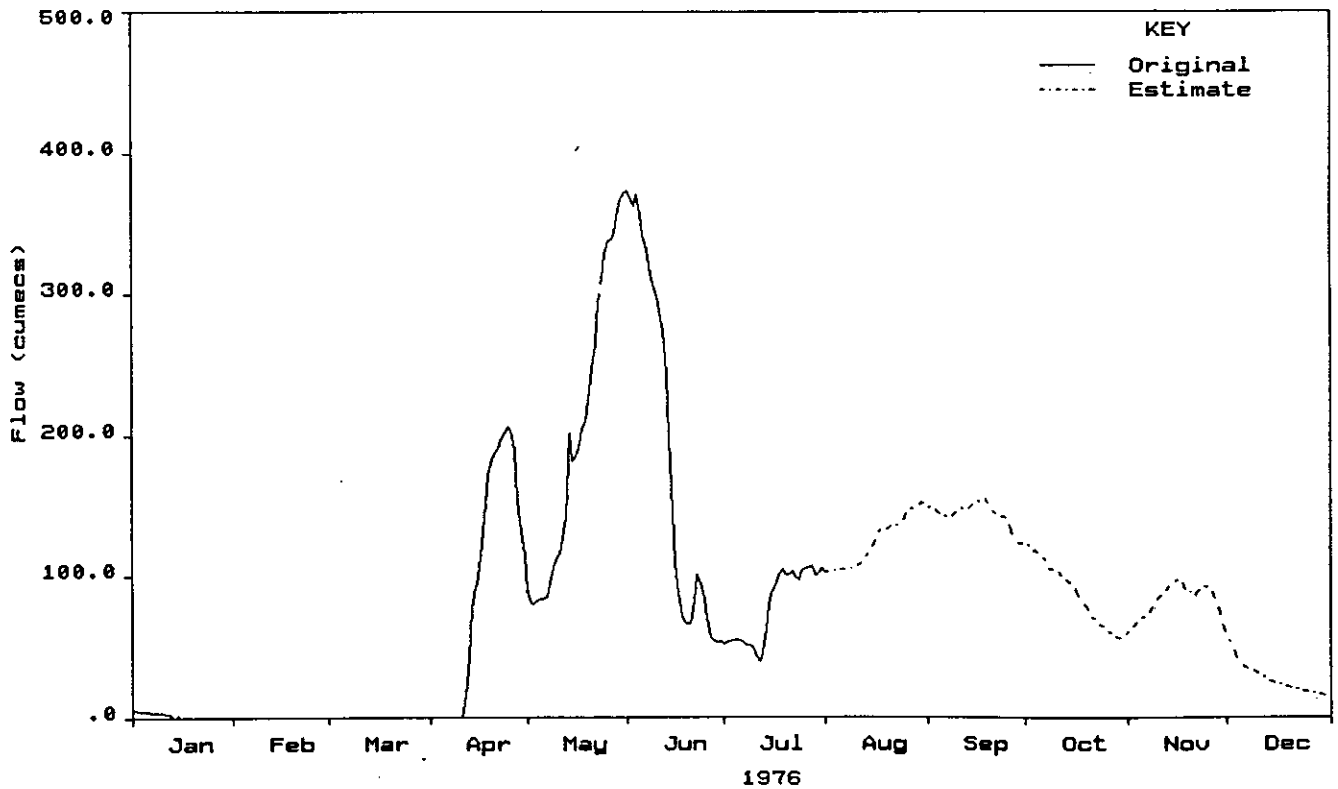
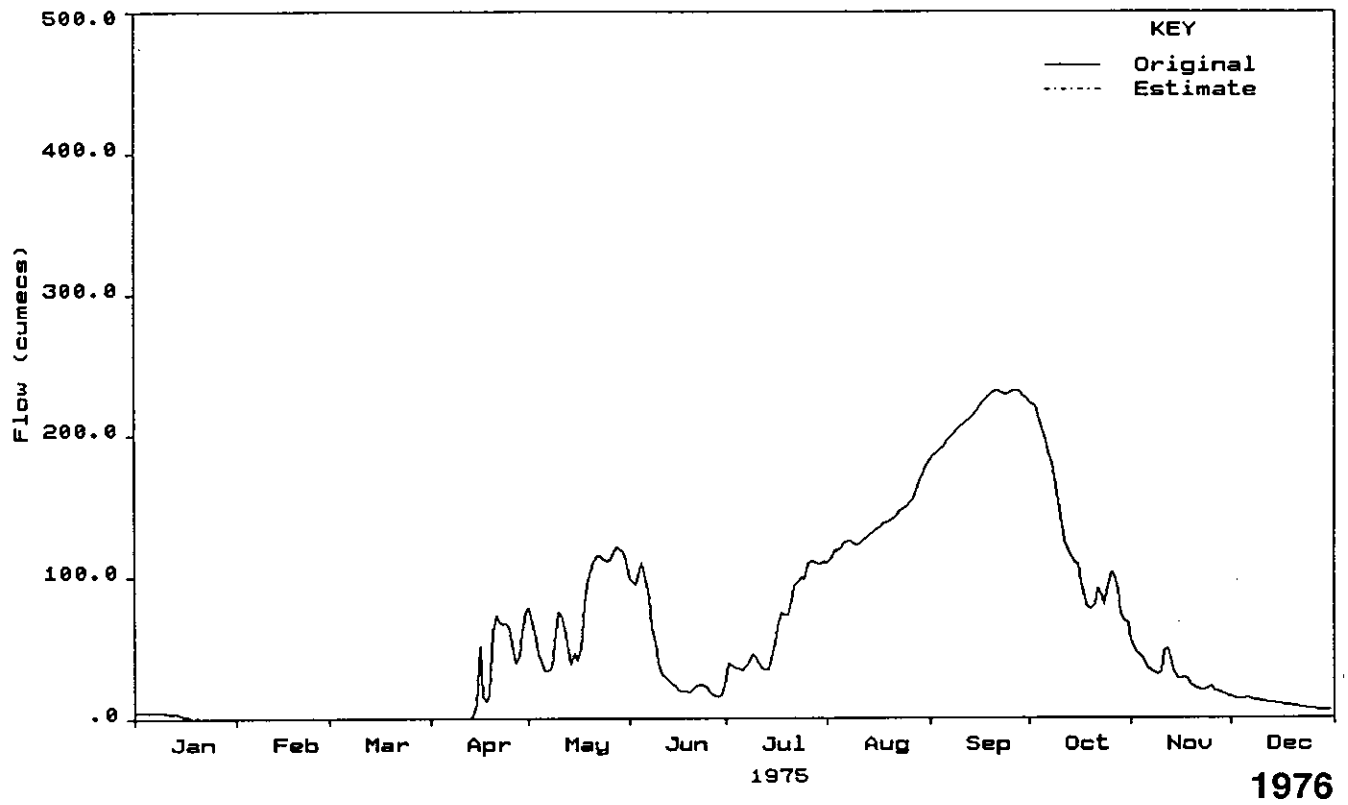


1974



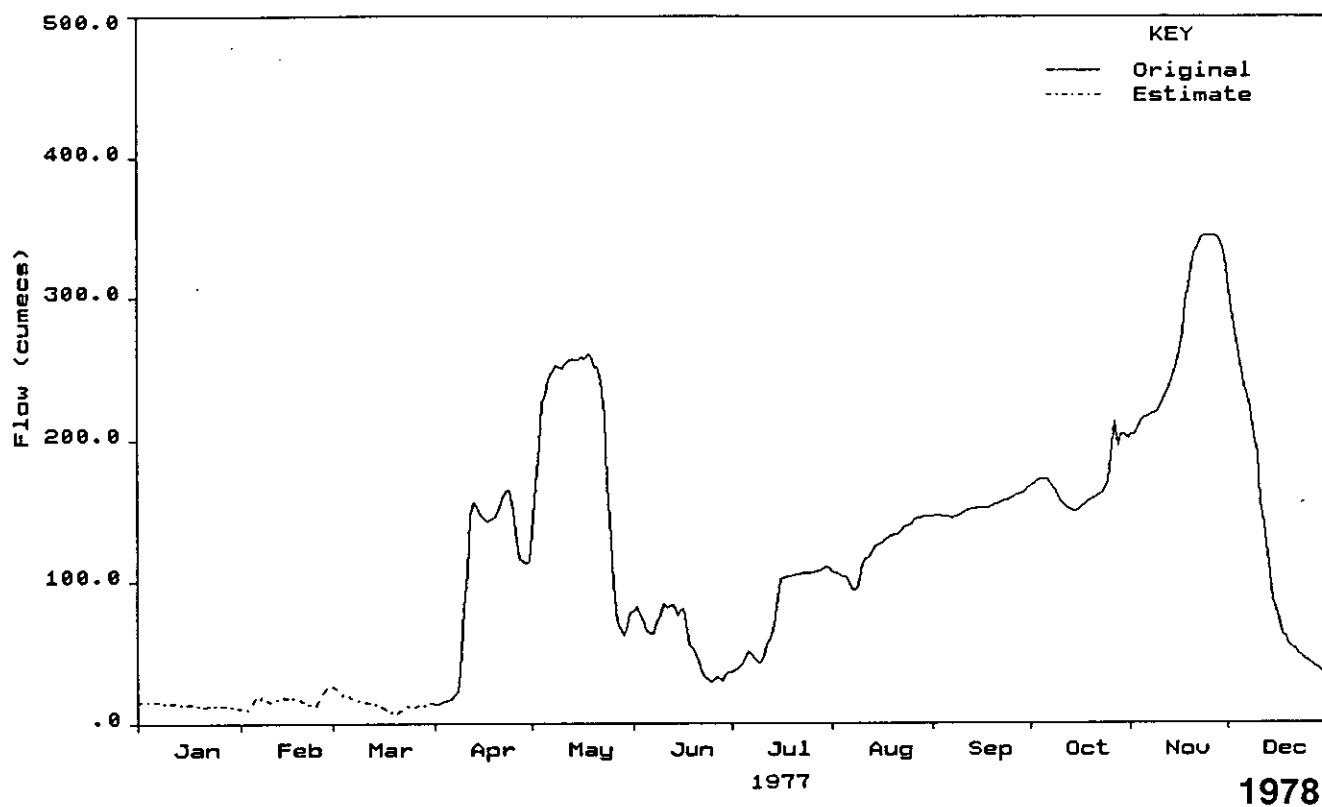
River Shebelli at Beled Weyn

1975

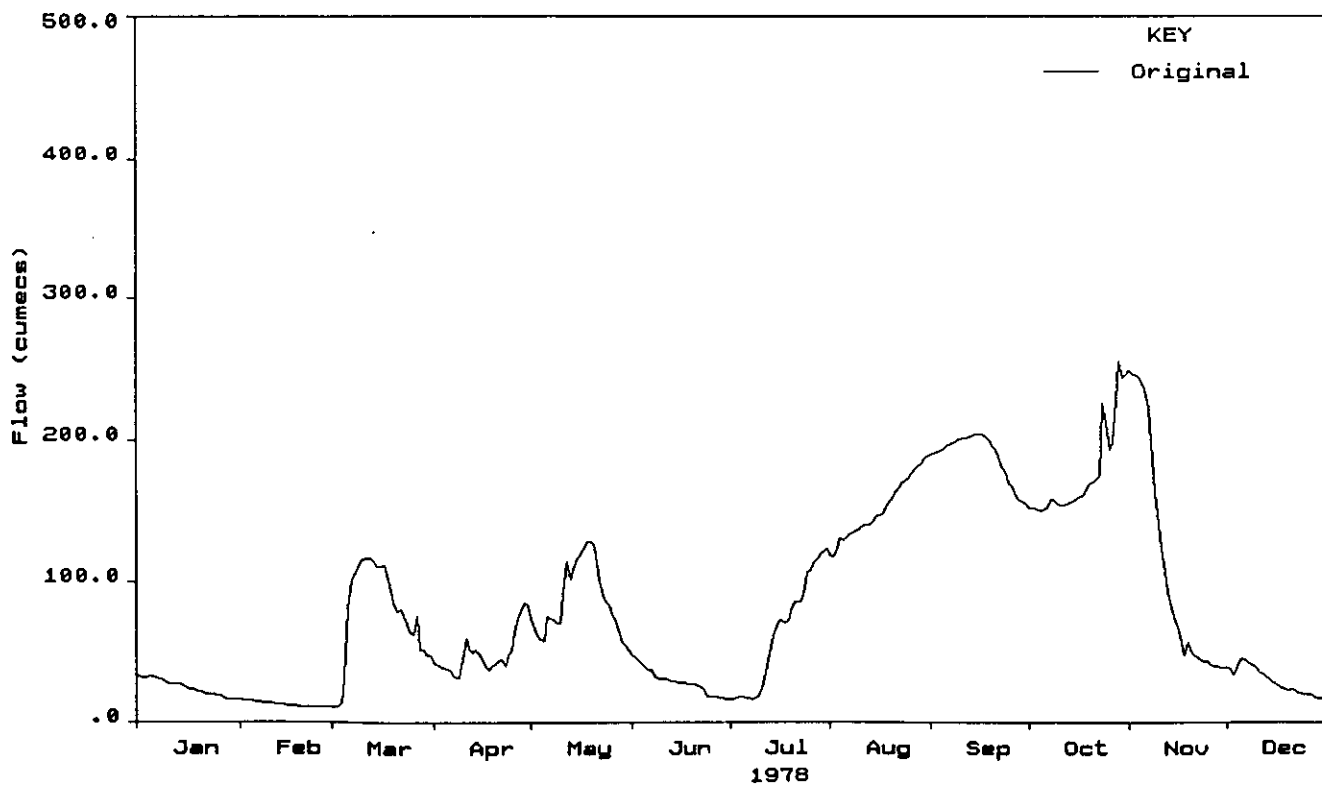


River Shebelli at Beled Weyn

1977

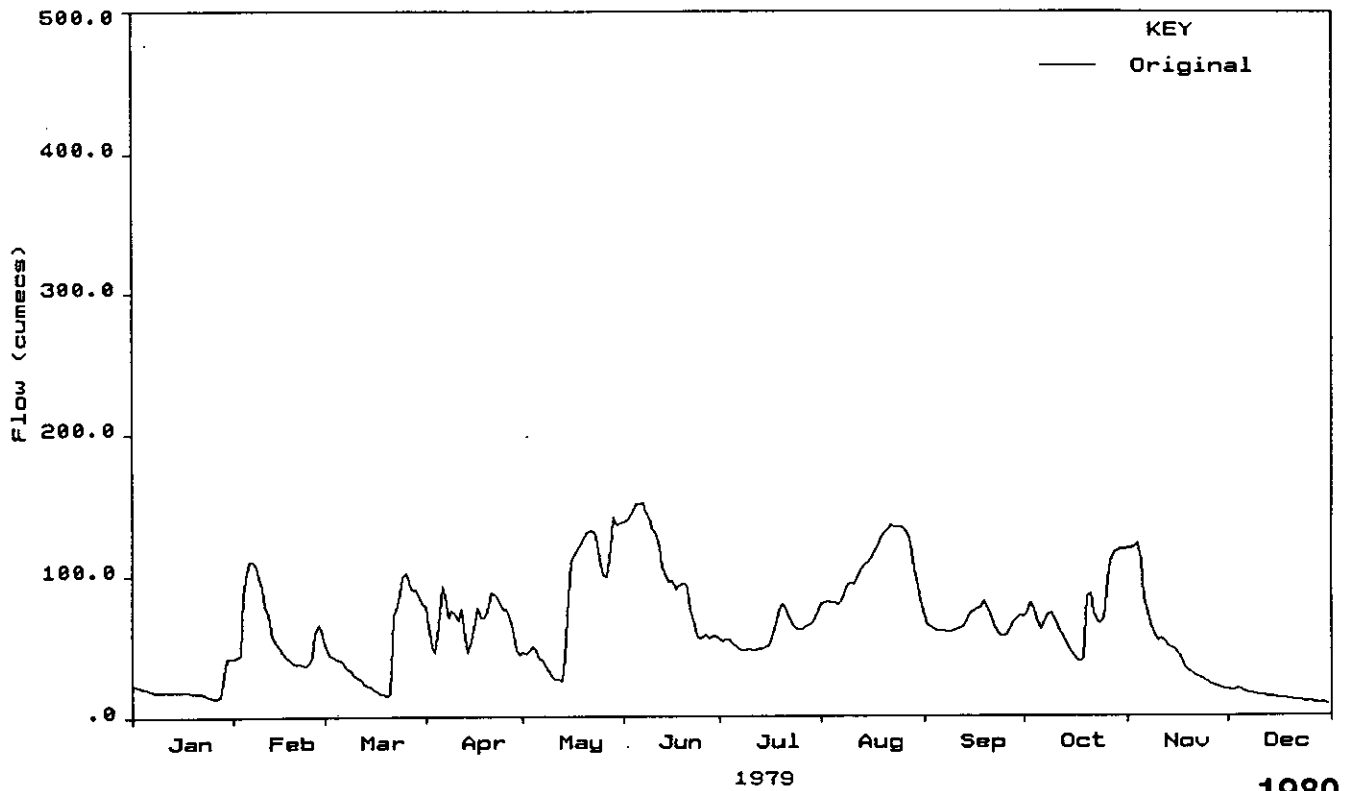


1978

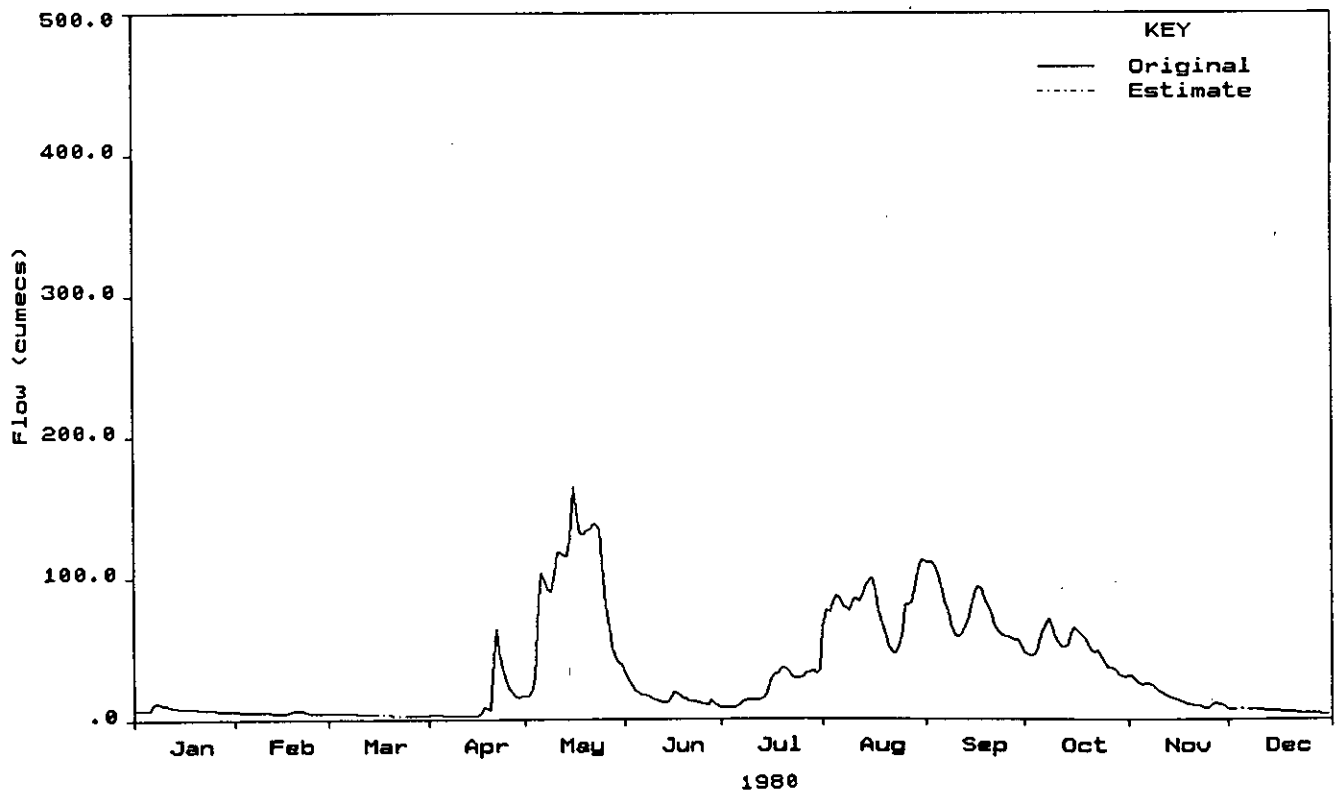


River Shebelli at Beled Weyn

1979

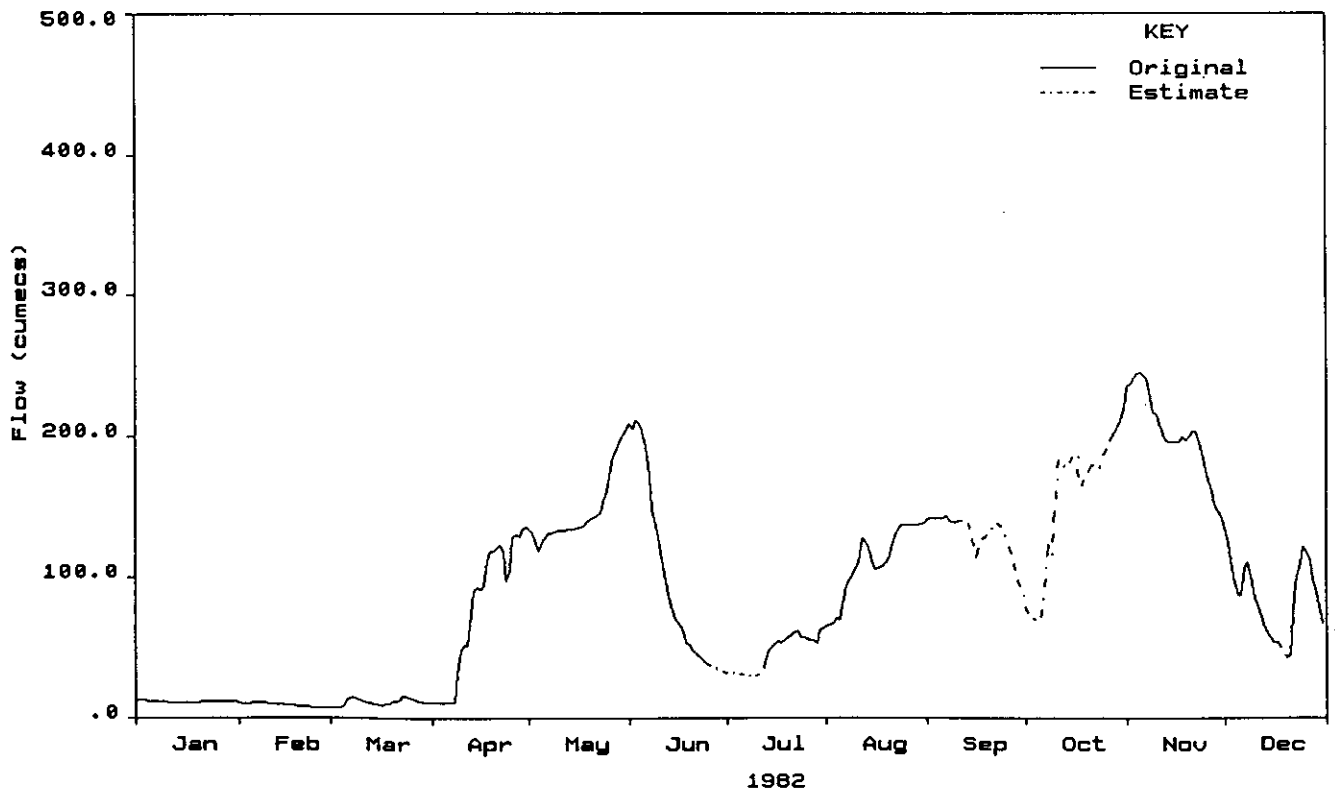
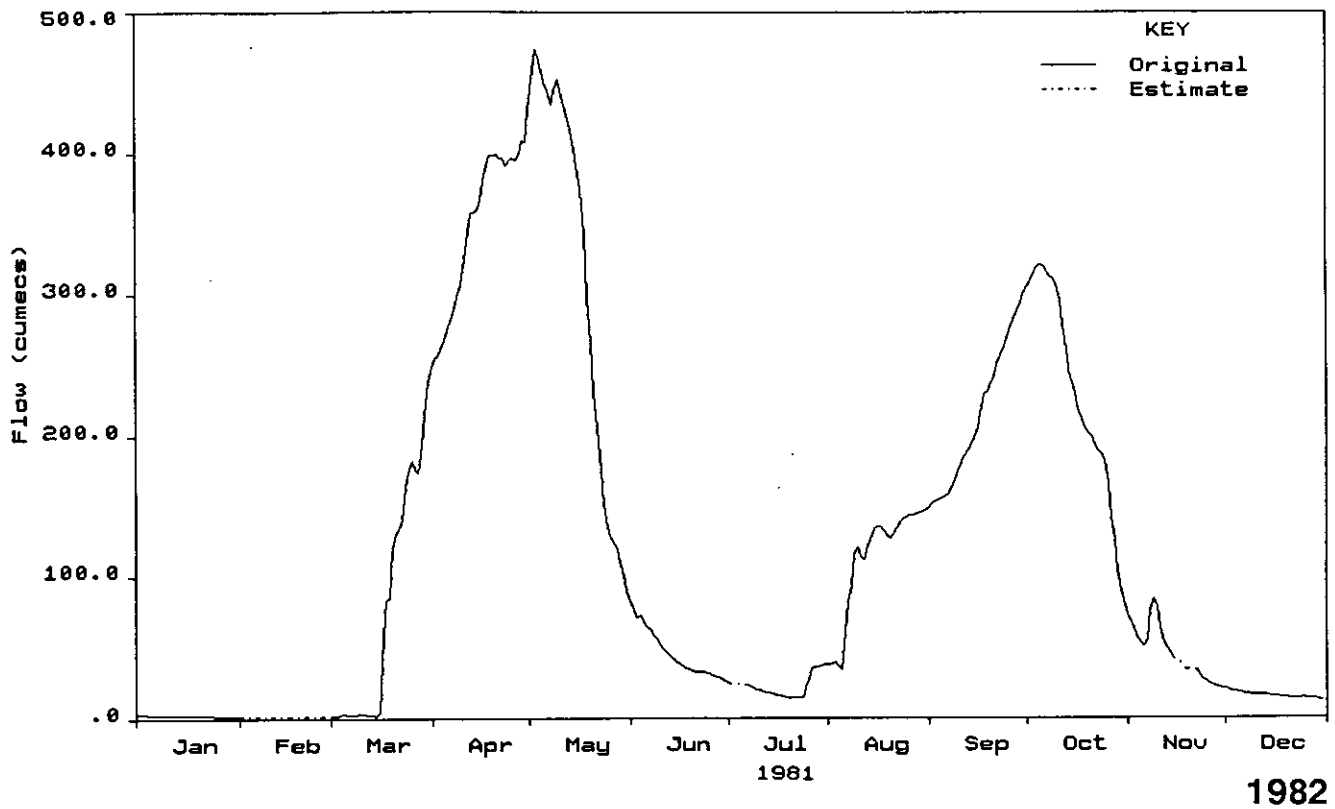


1980



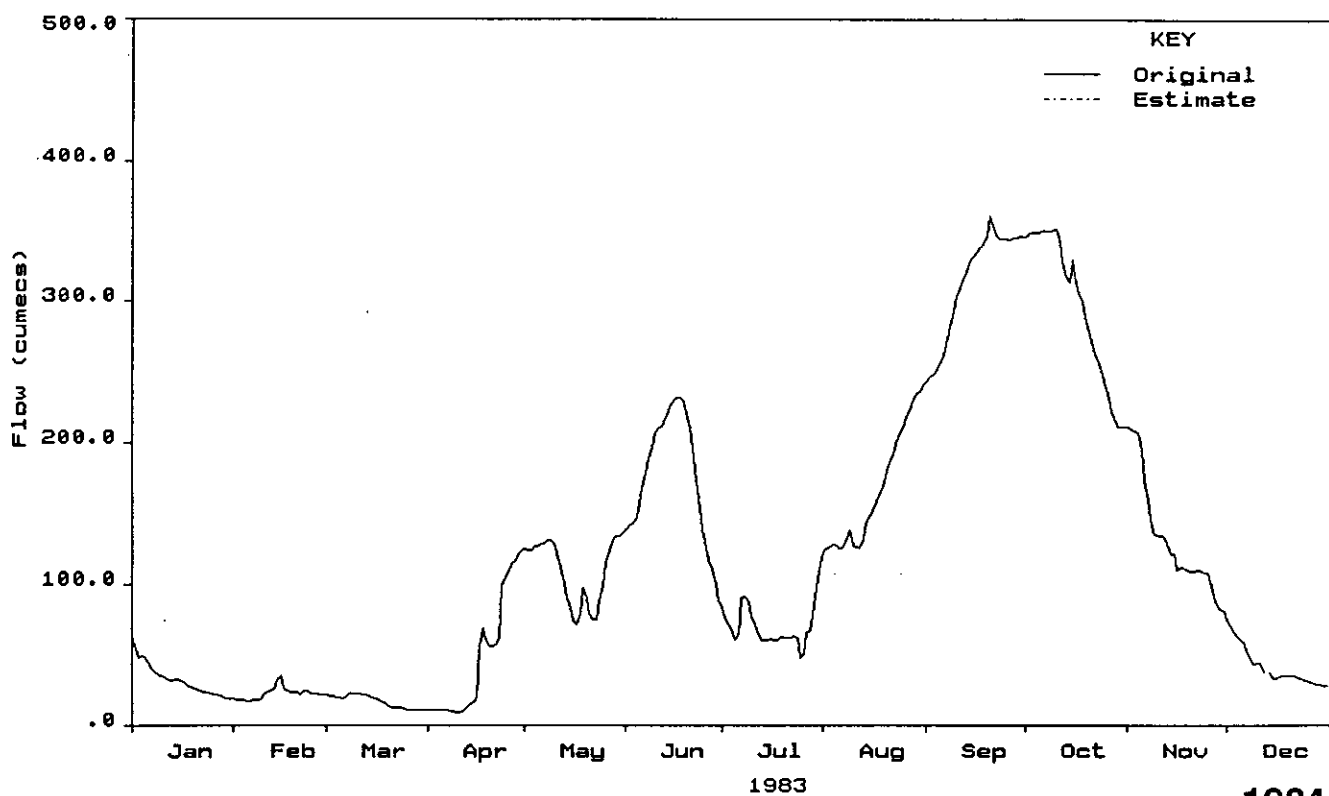
River Shebelli at Beled Weyn

1981

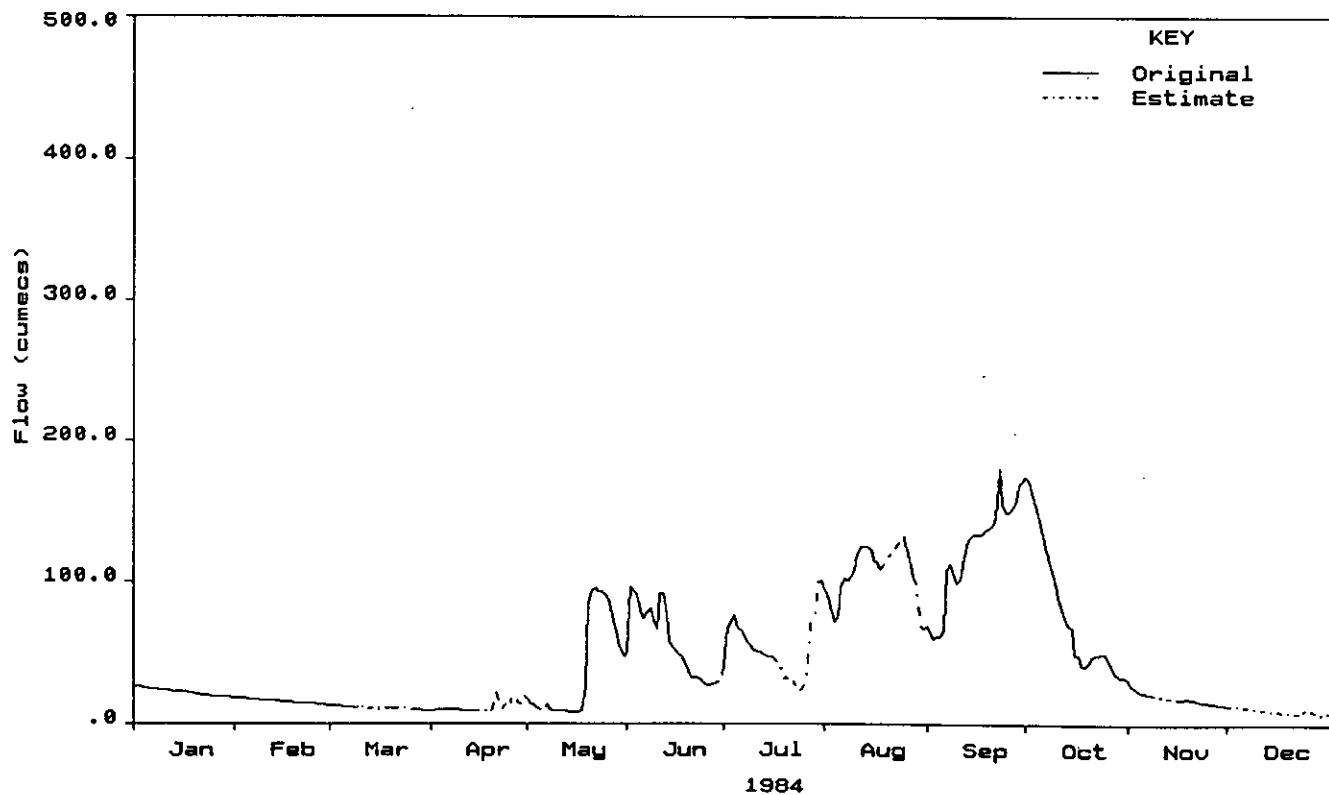


River Shebelli at Beled Weyn

1983

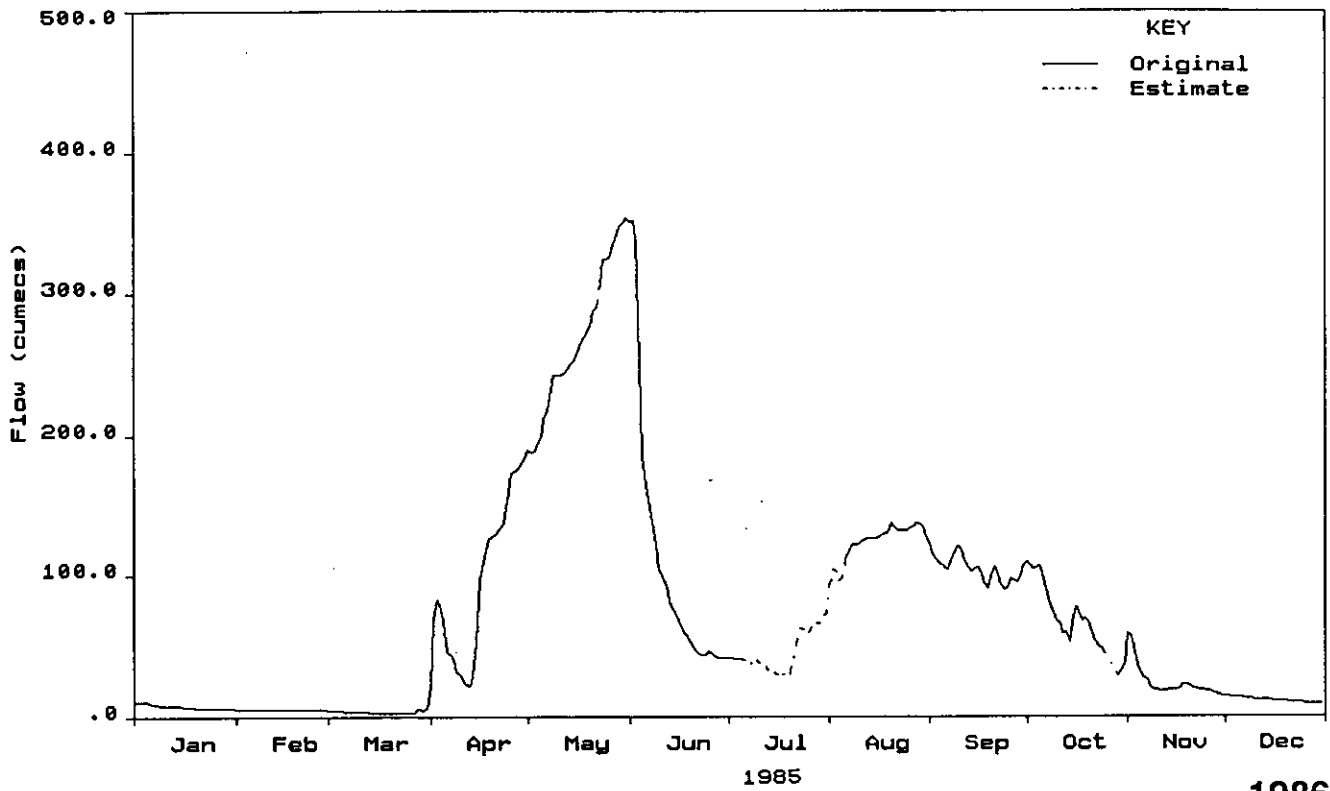


1984

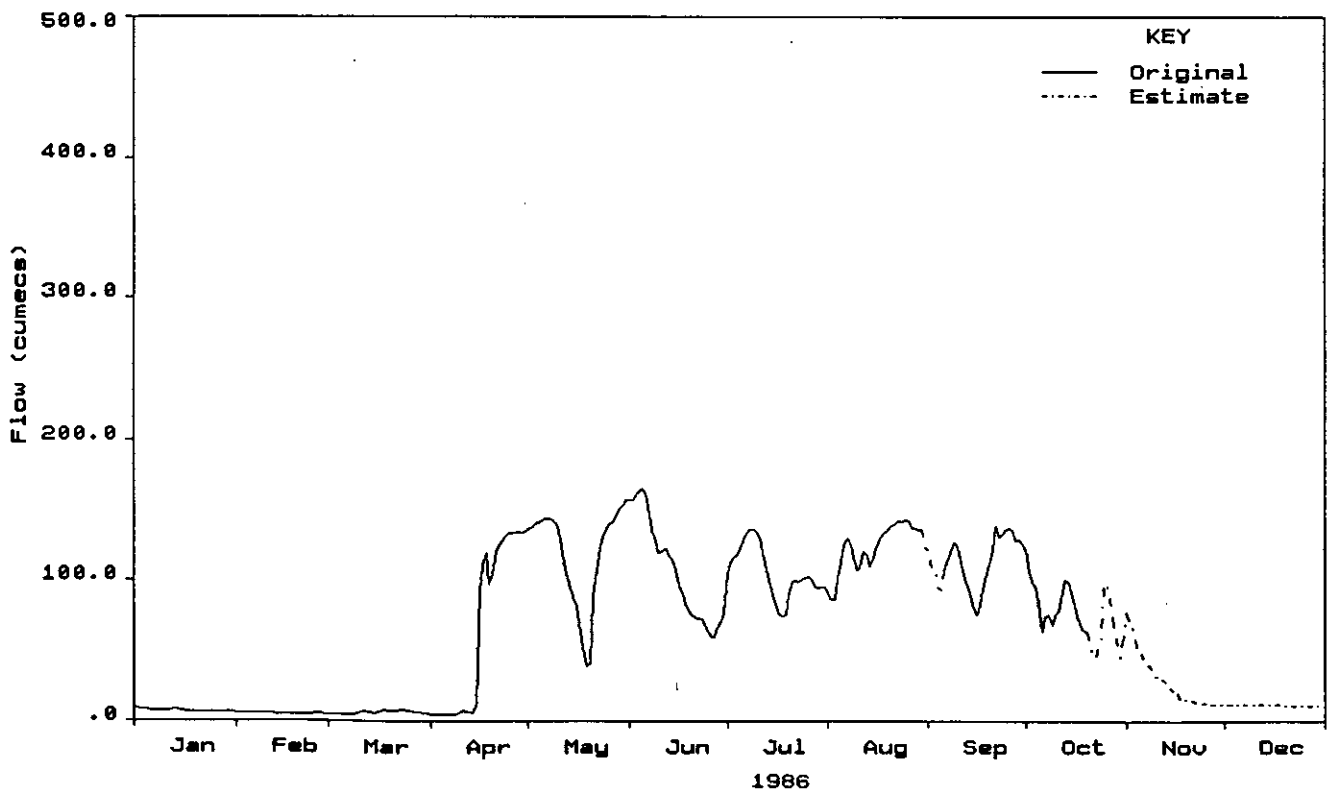


River Shebelli at Beled Weyn

1985

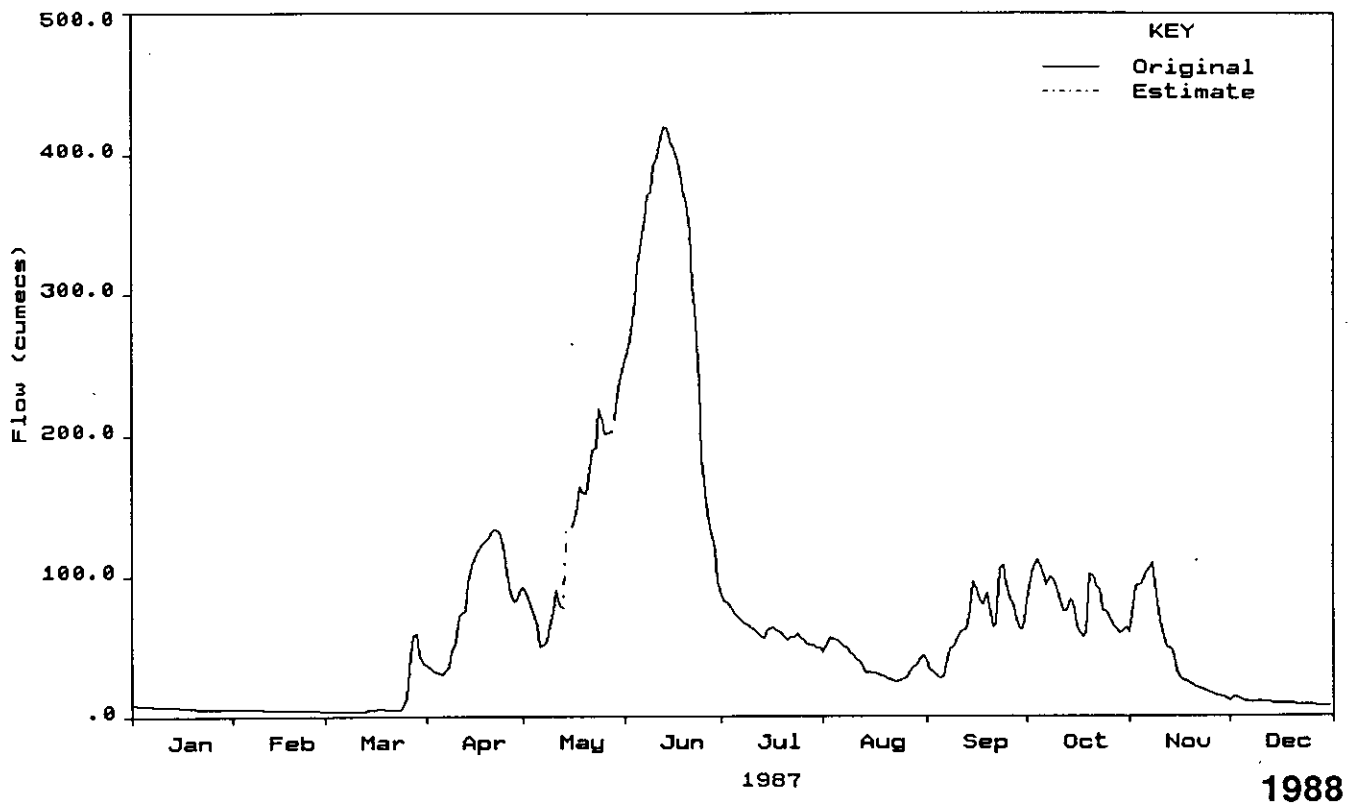


1986

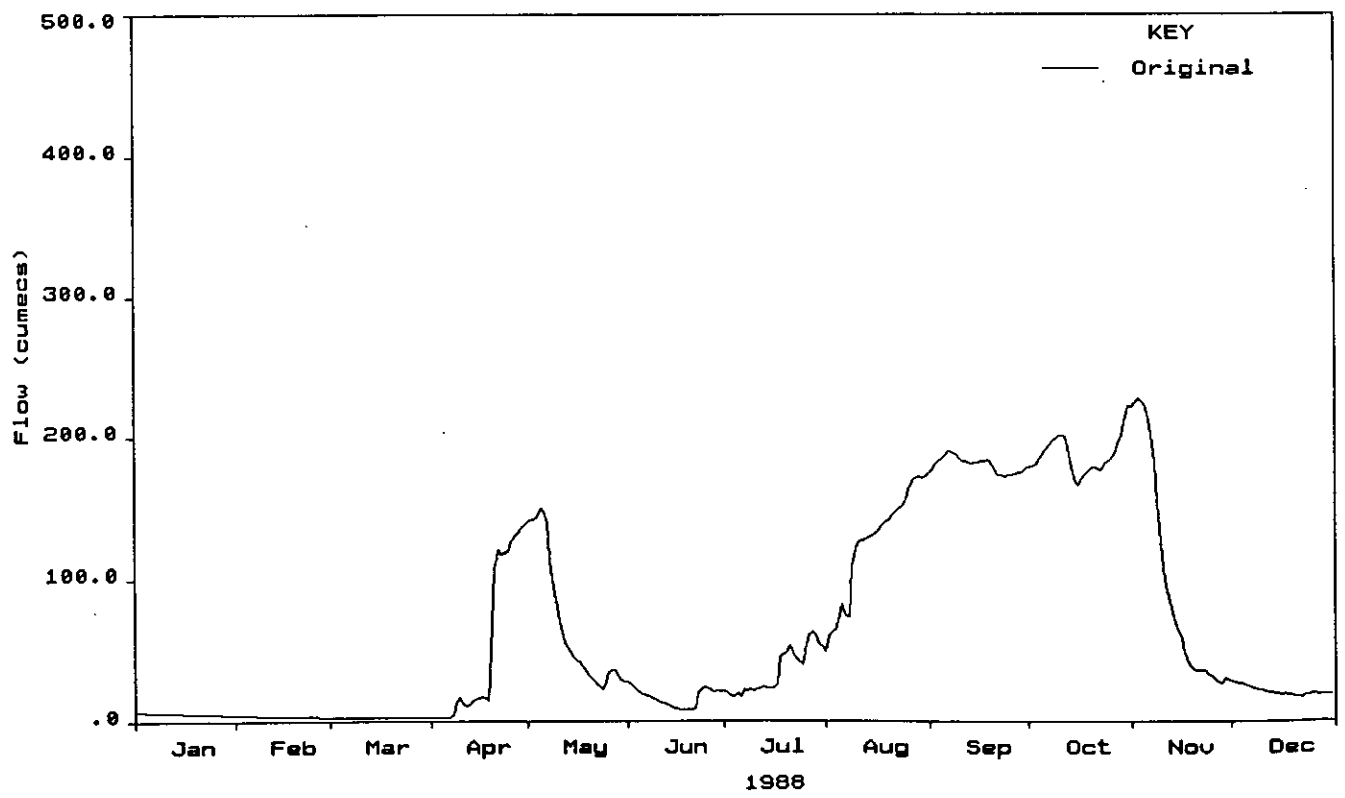


River Shebelli at Beled Weyn

1987

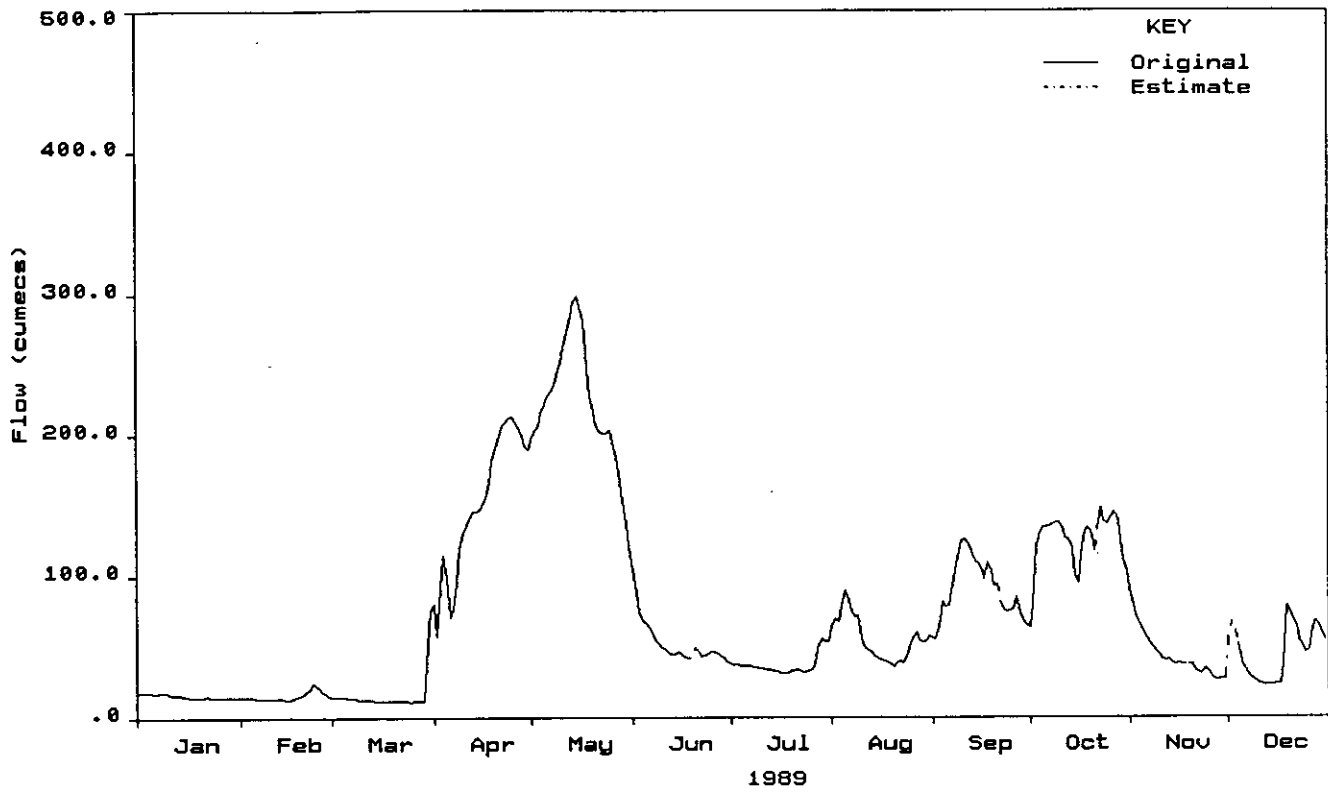


1988



River Shebelle at Beled Weyn

1989

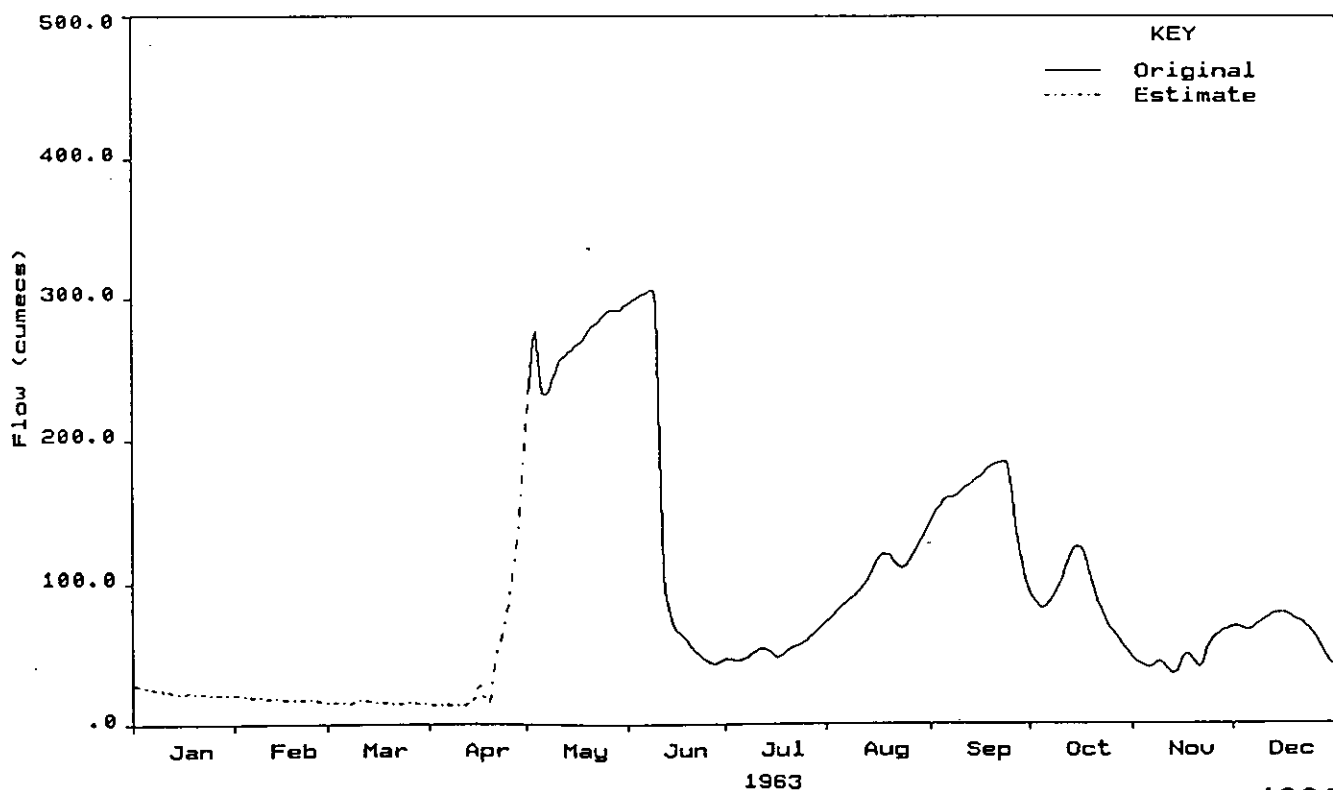


BULO BURTI
1963 - 1989

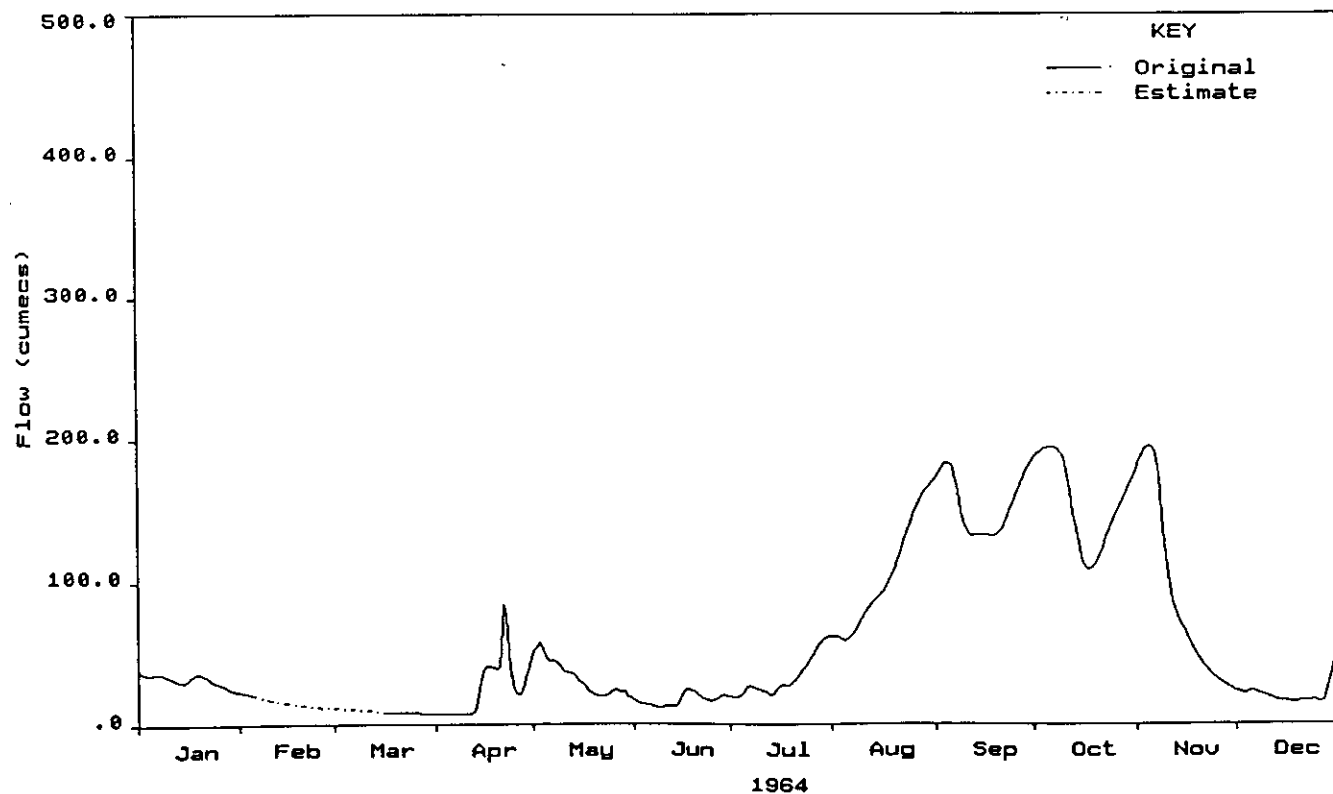


River Shebelli at Bulu Burti

1963

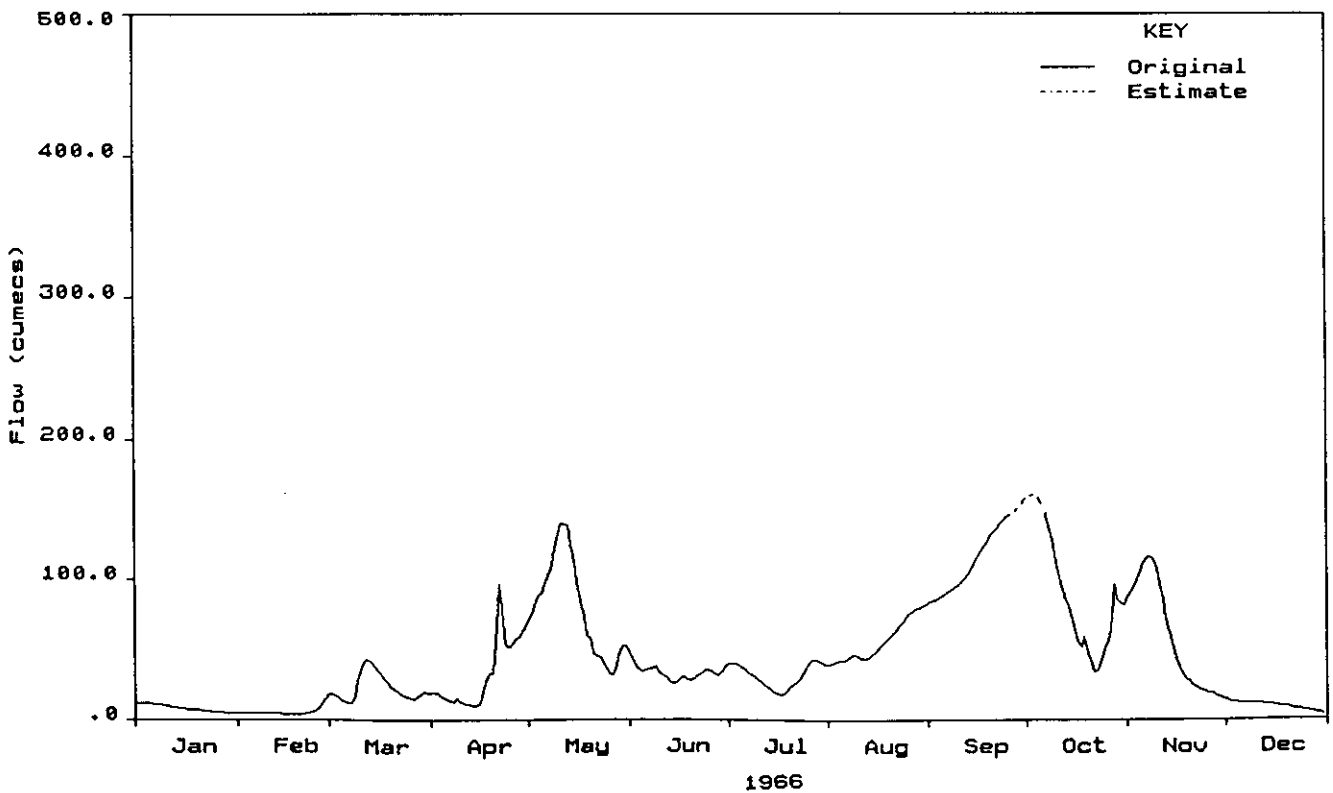
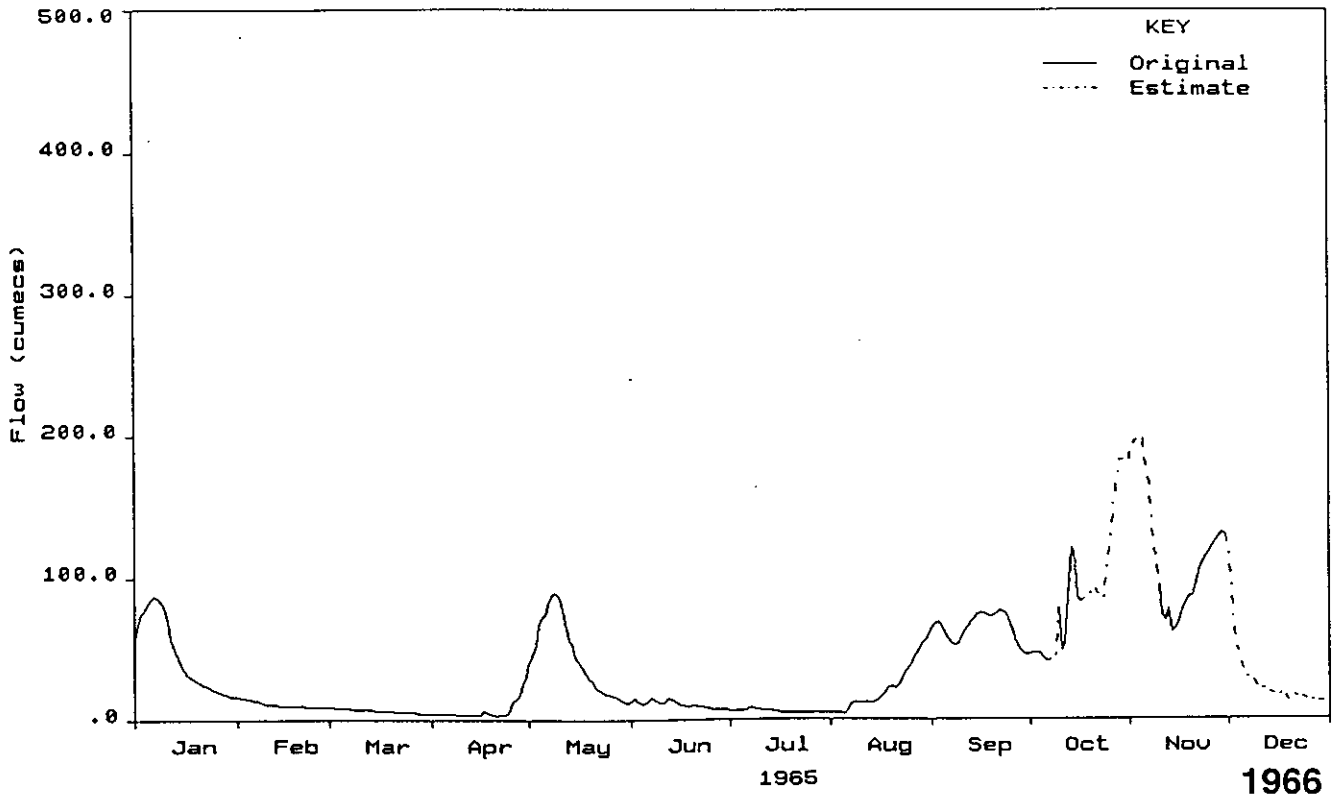


1964



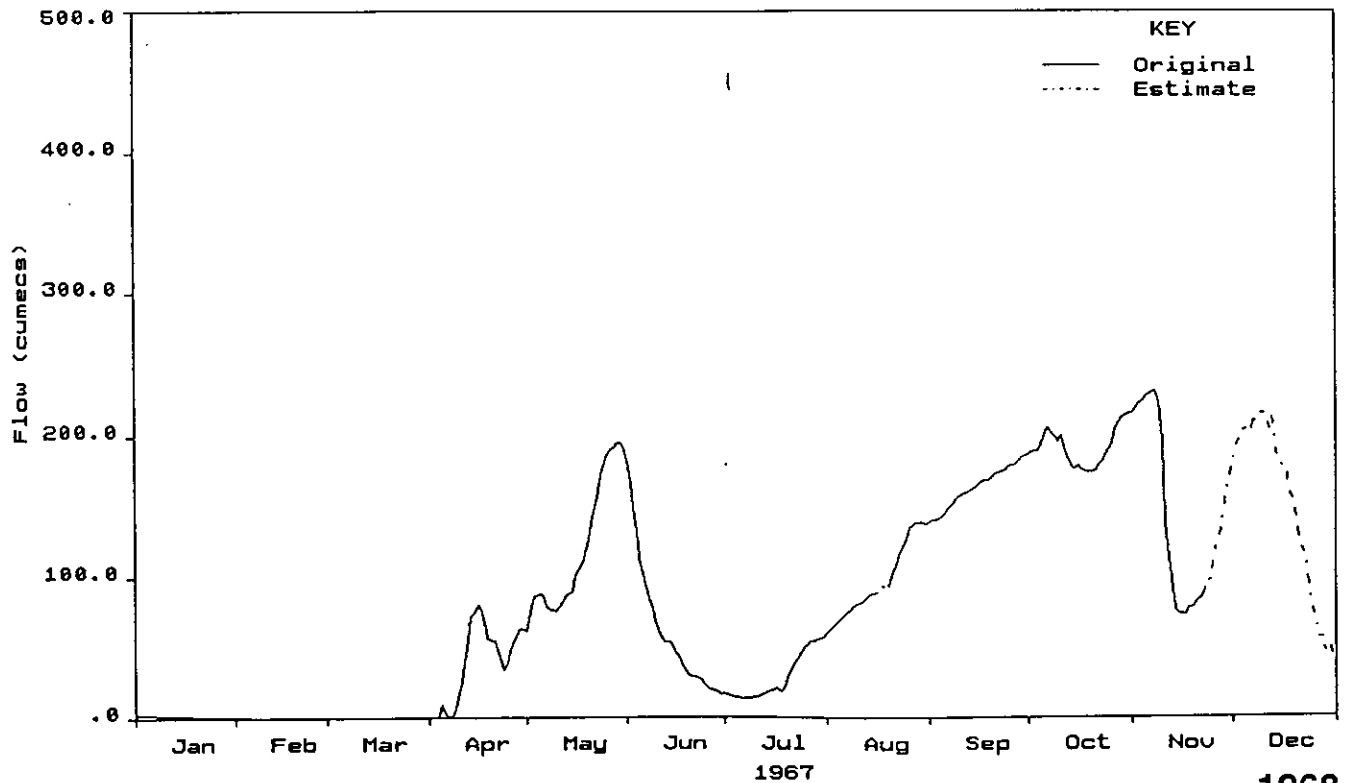
River Shebelli at Bulu Burti

1965

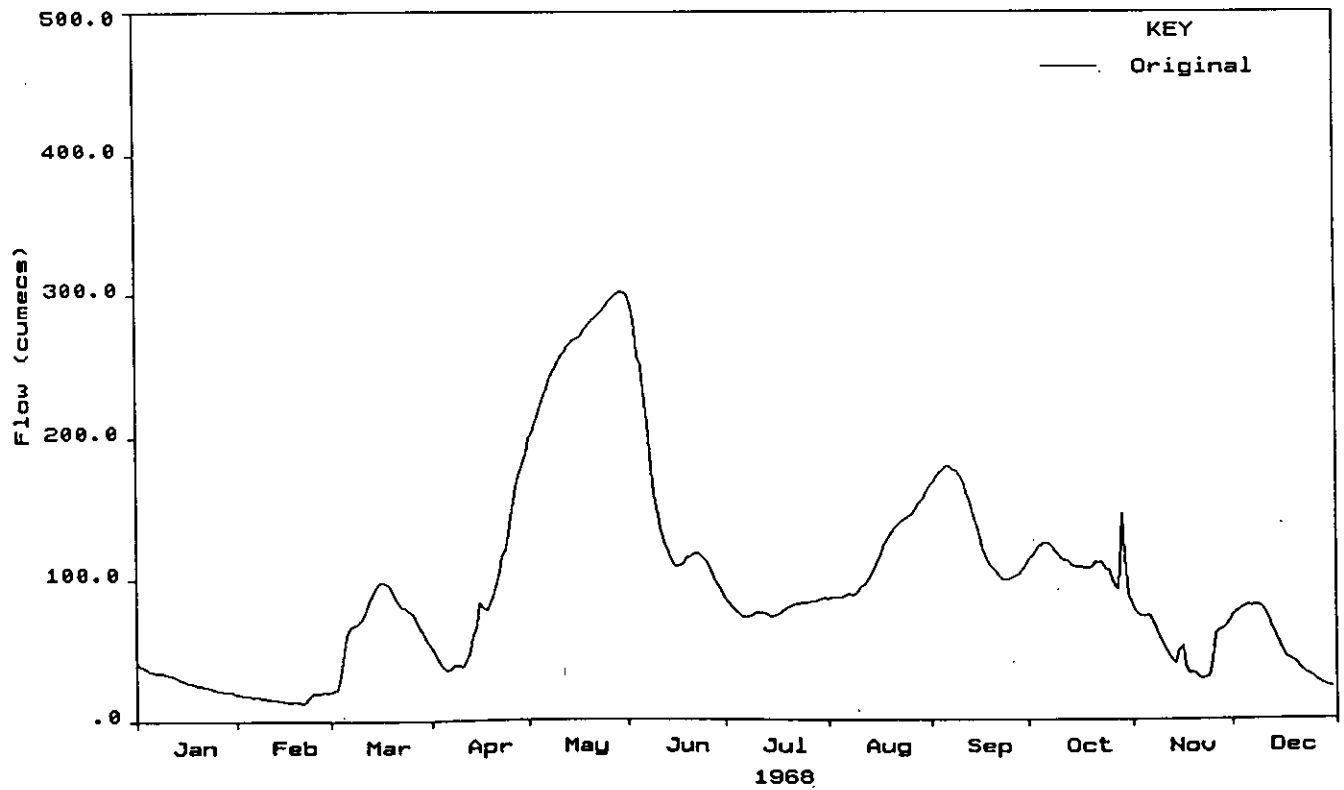


River Shebelli at Bulu Burti

1967

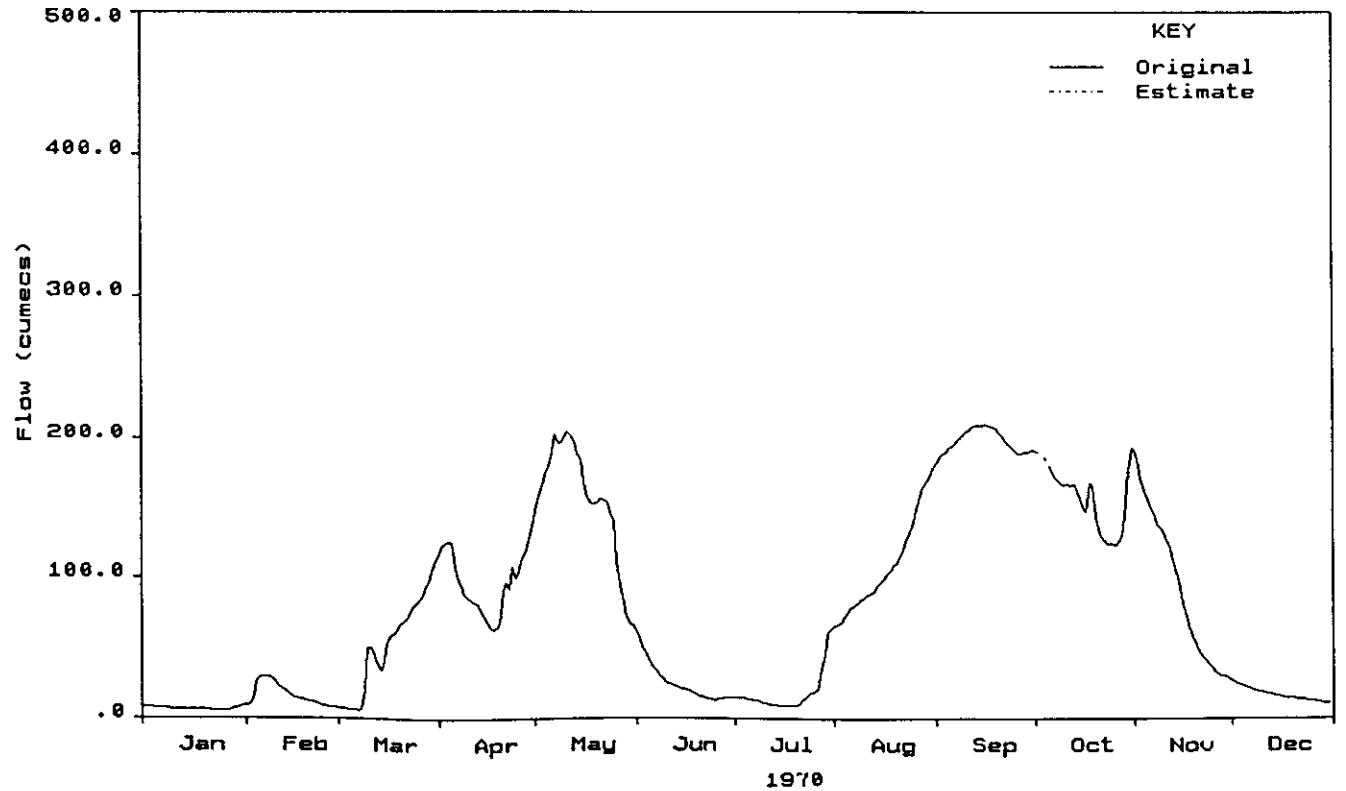
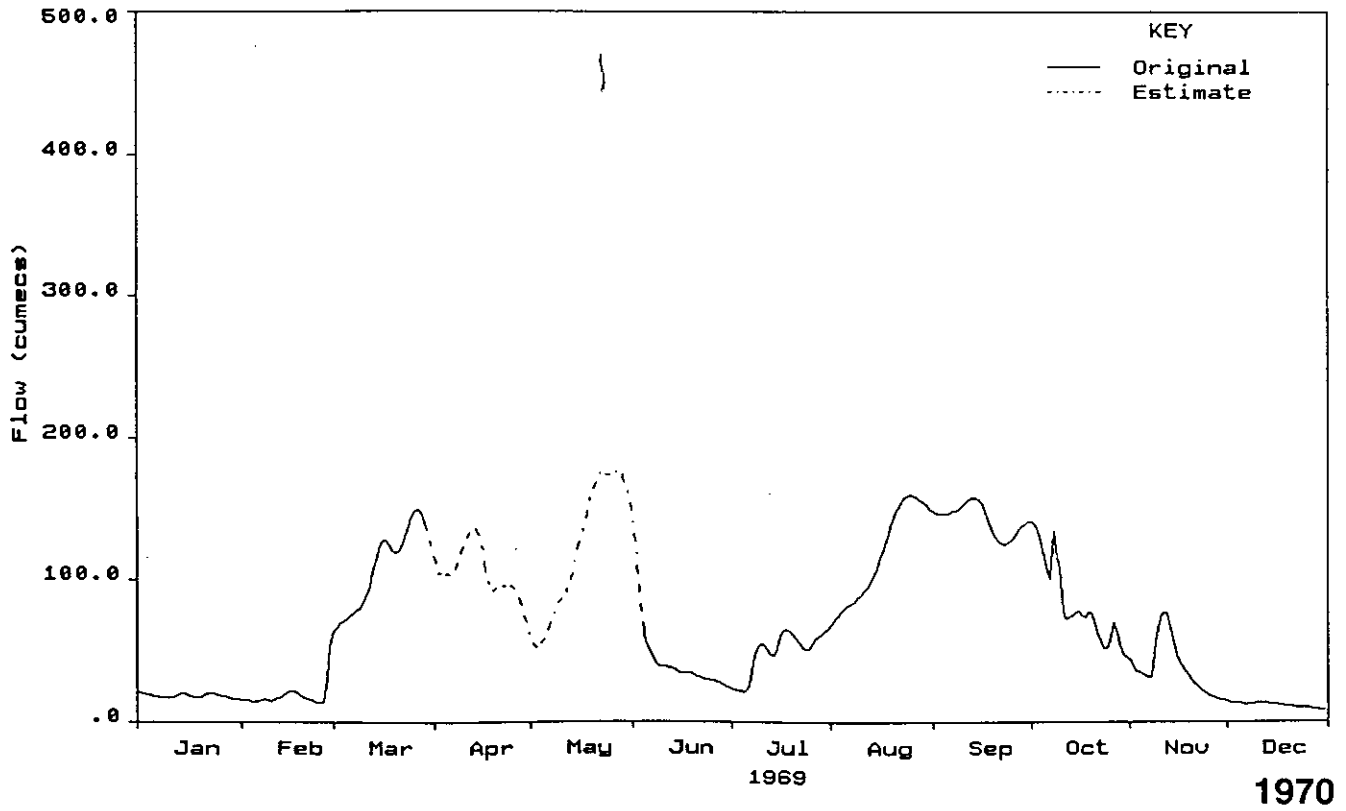


1968



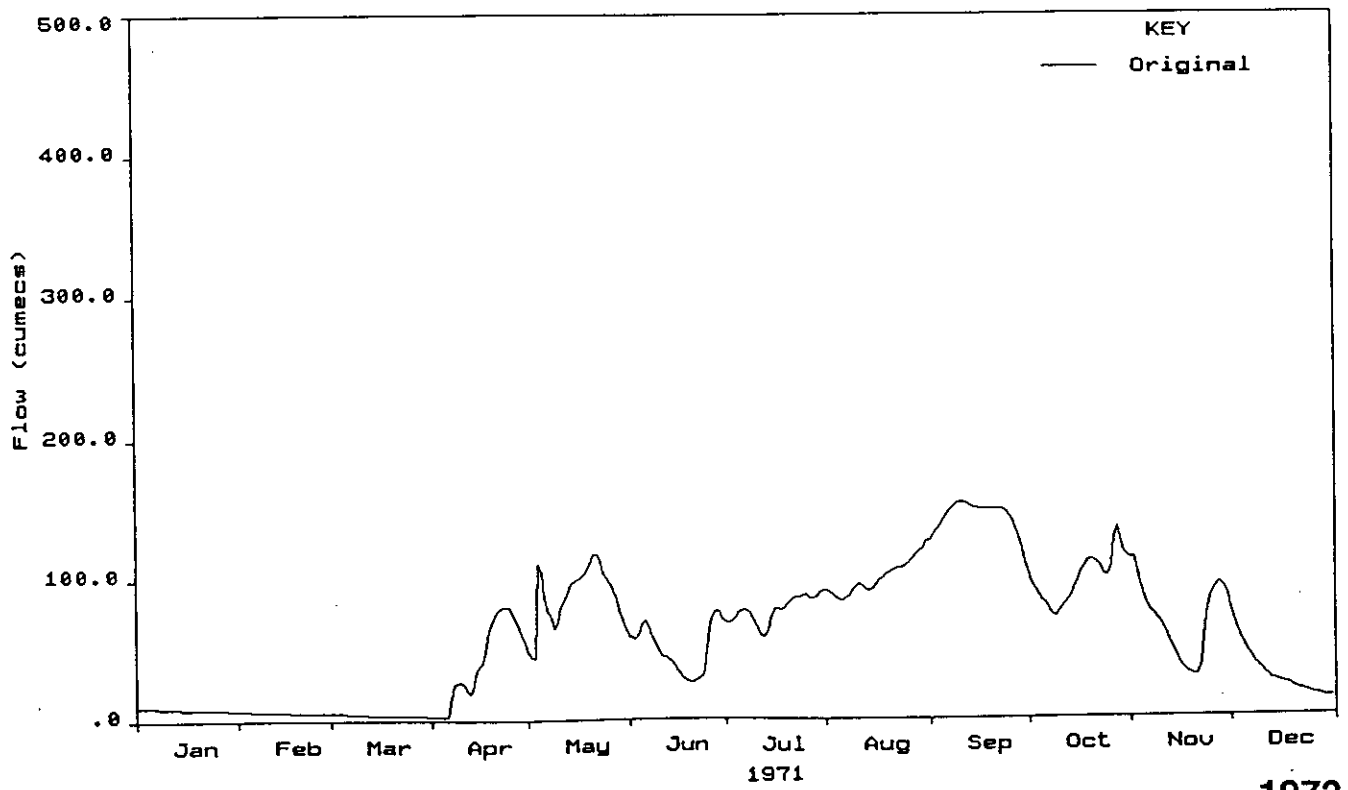
River Shebelli at Bulu Burti

1969

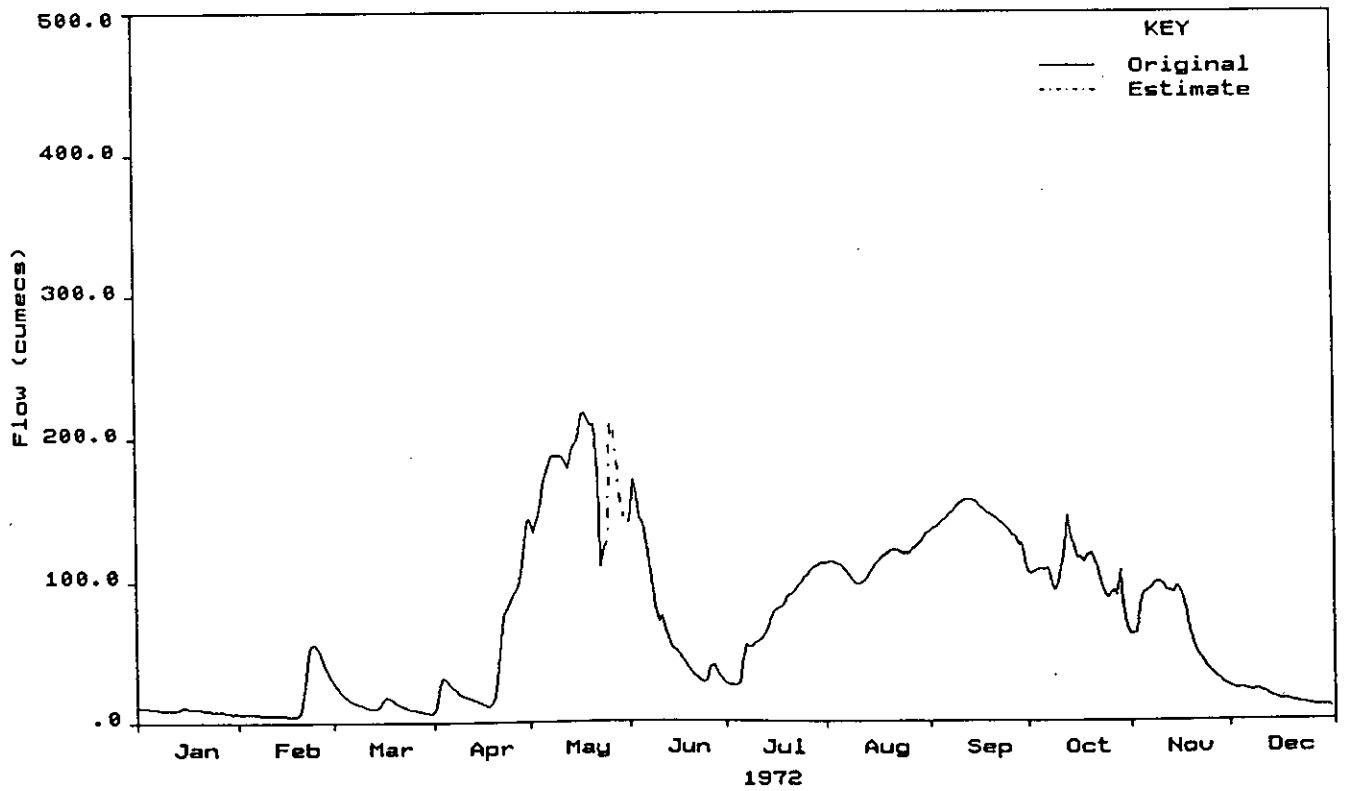


River Shebelli at Bulu Burti

1971

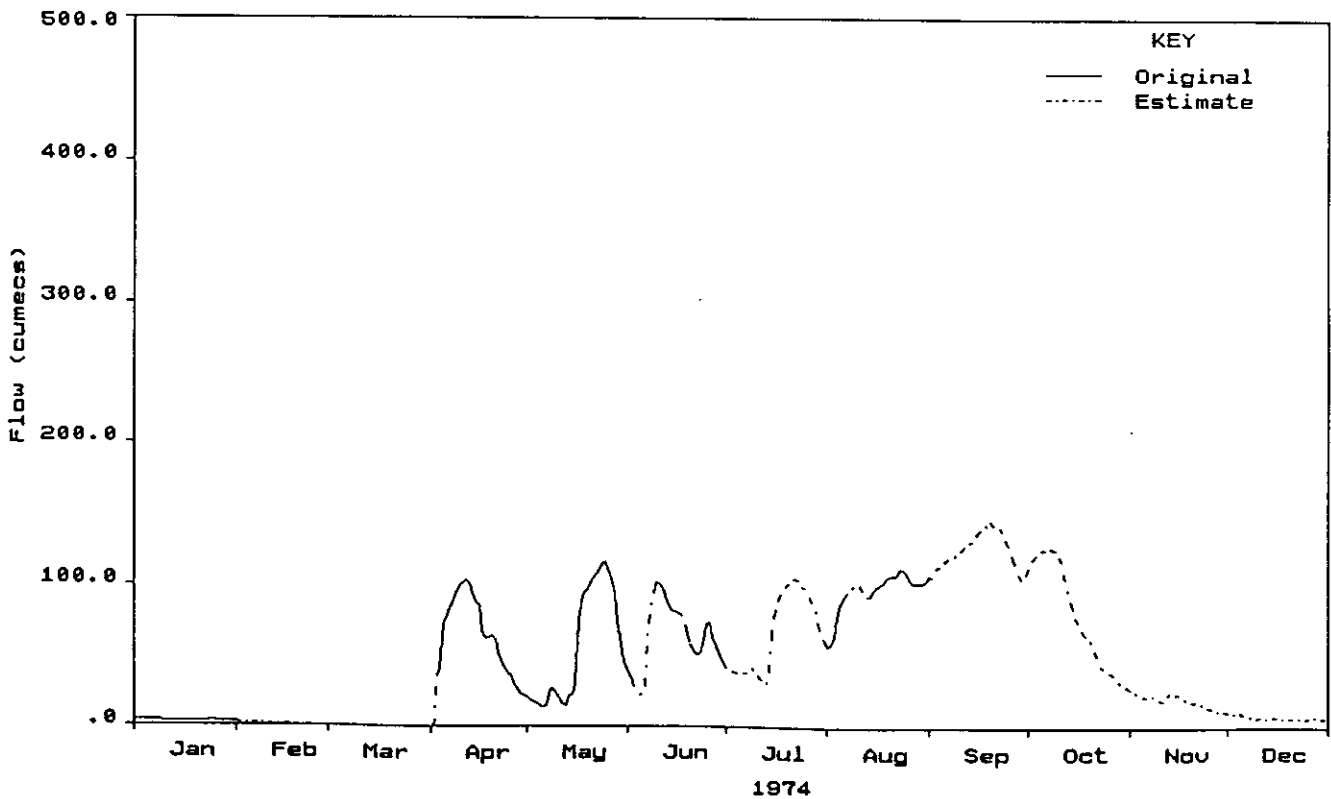
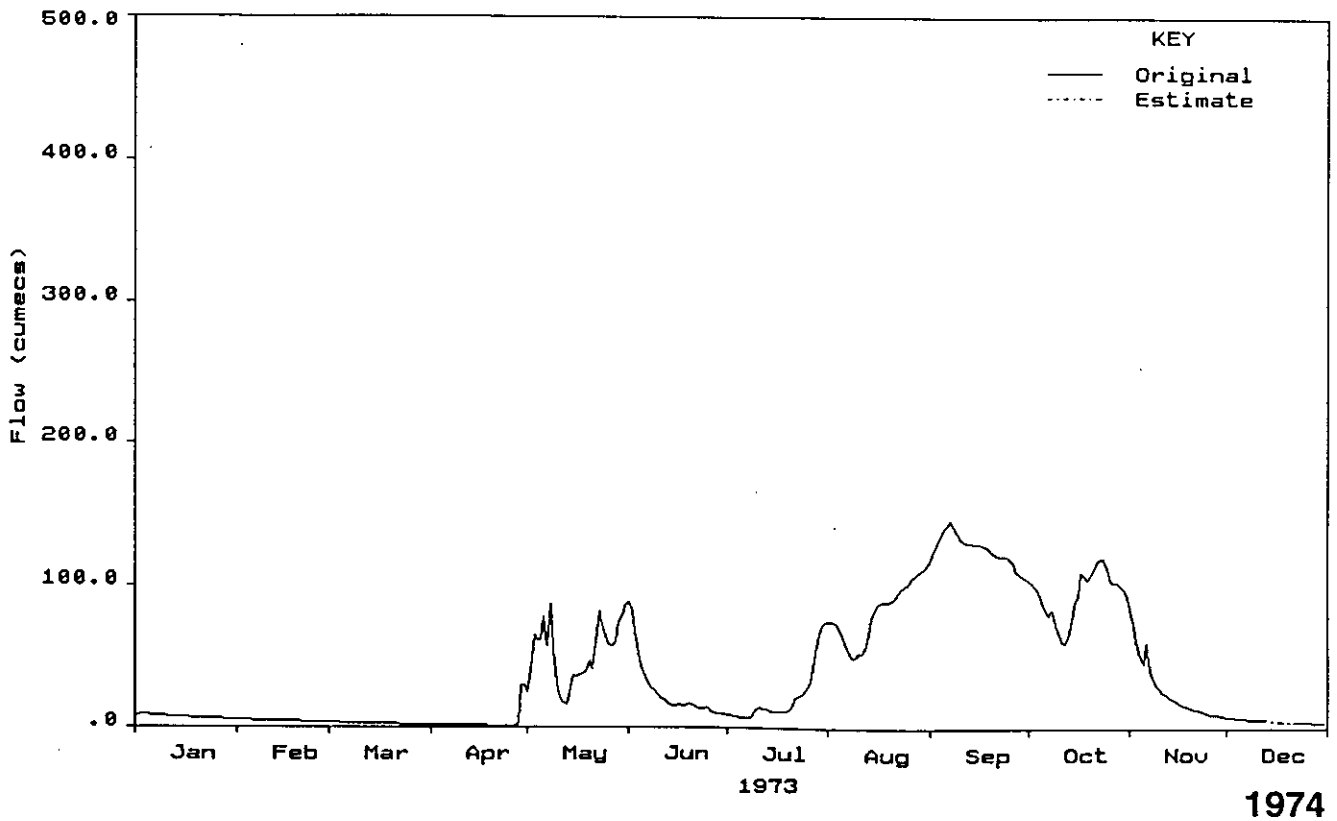


1972



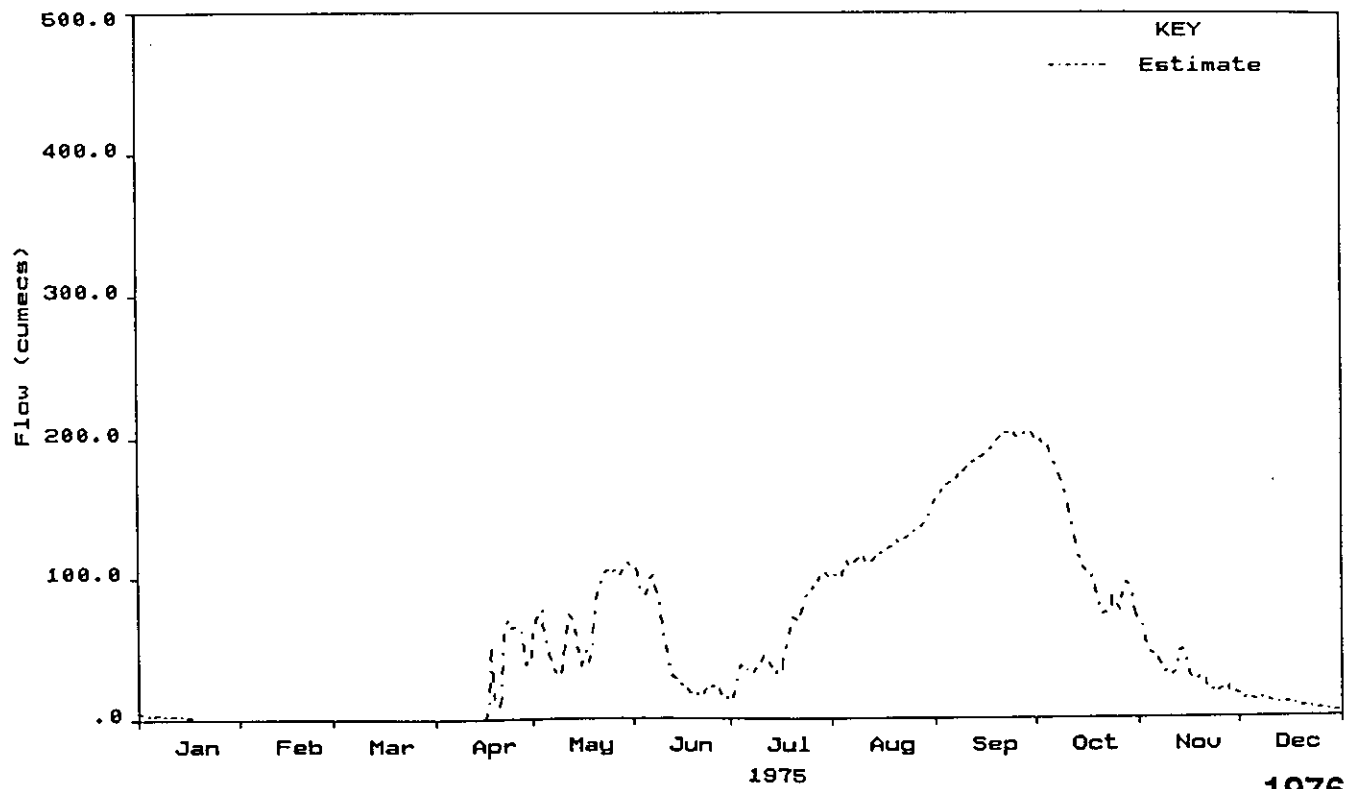
River Shebelli at Bulo Burti

1973

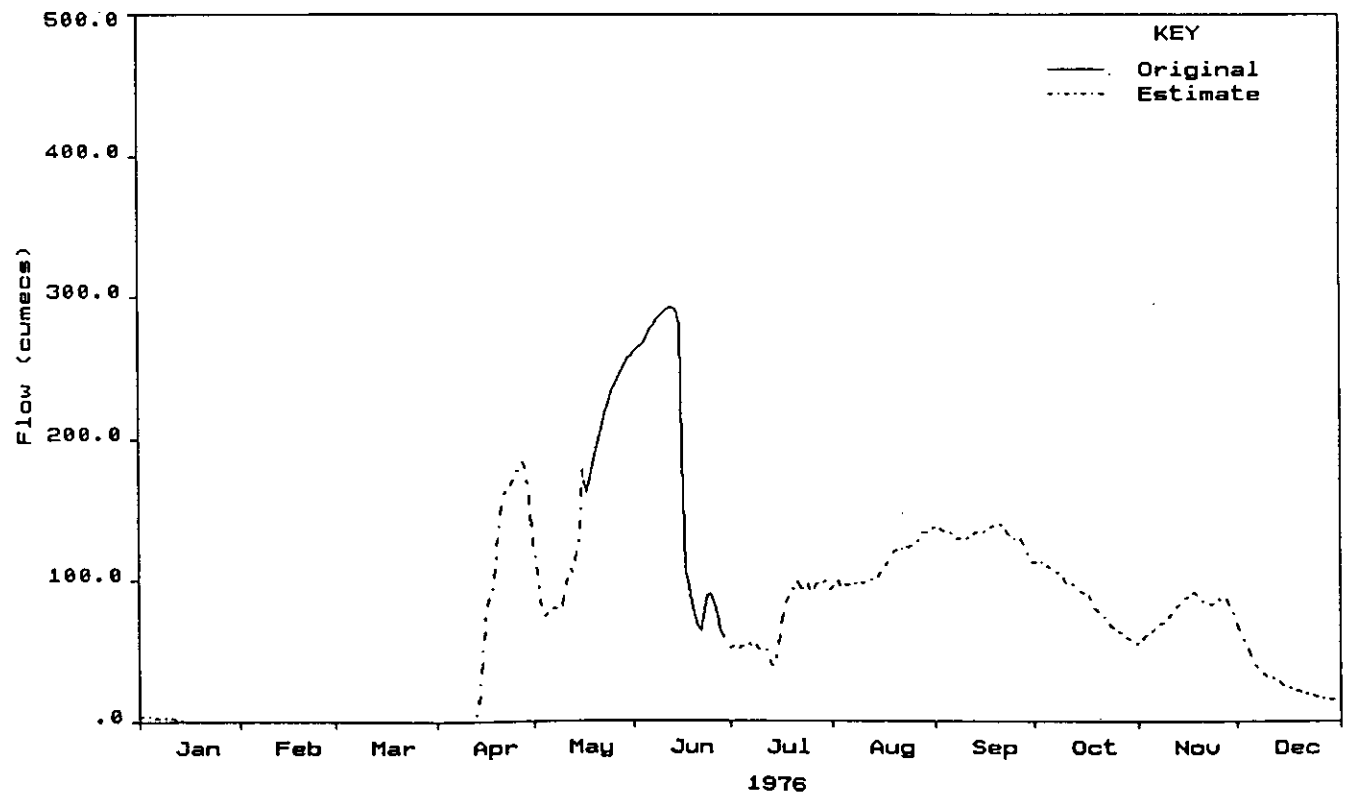


River Shebelli at Bulu Burti

1975

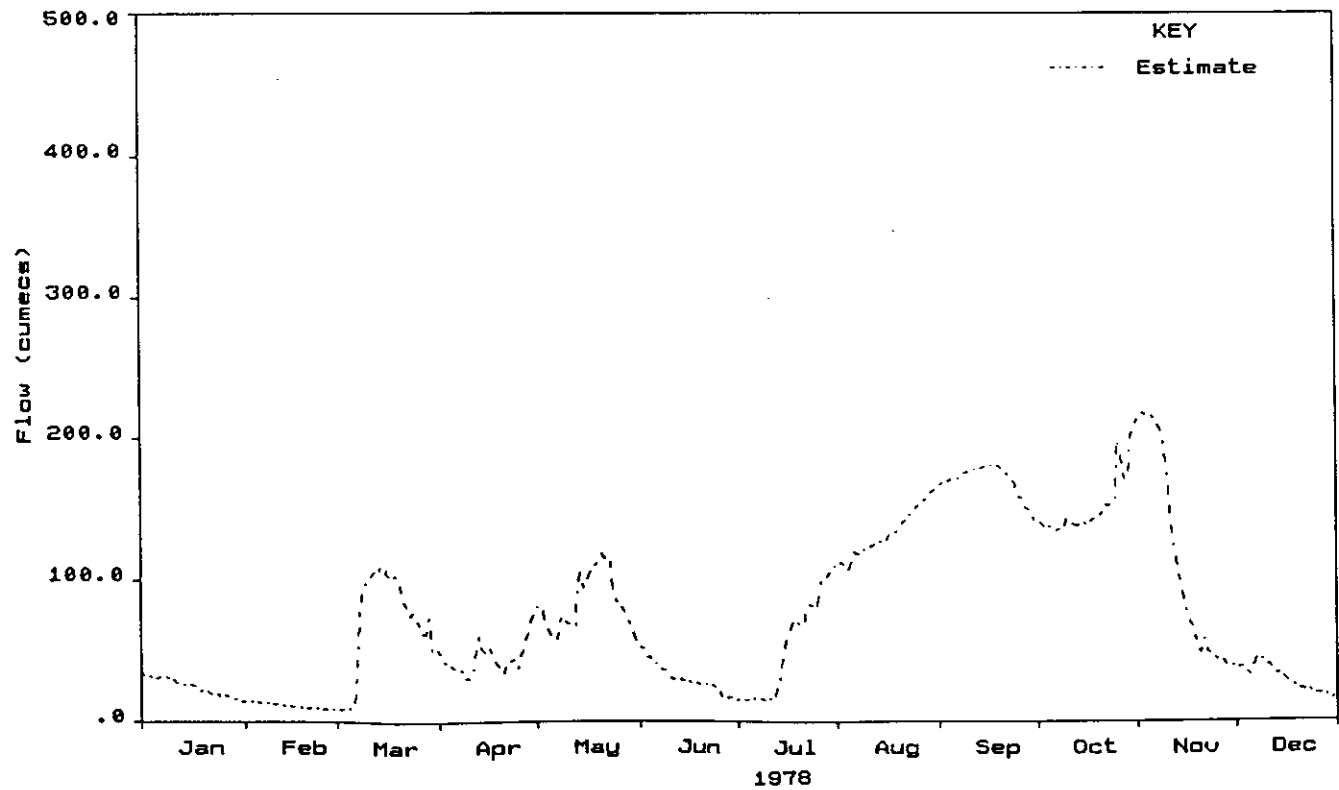
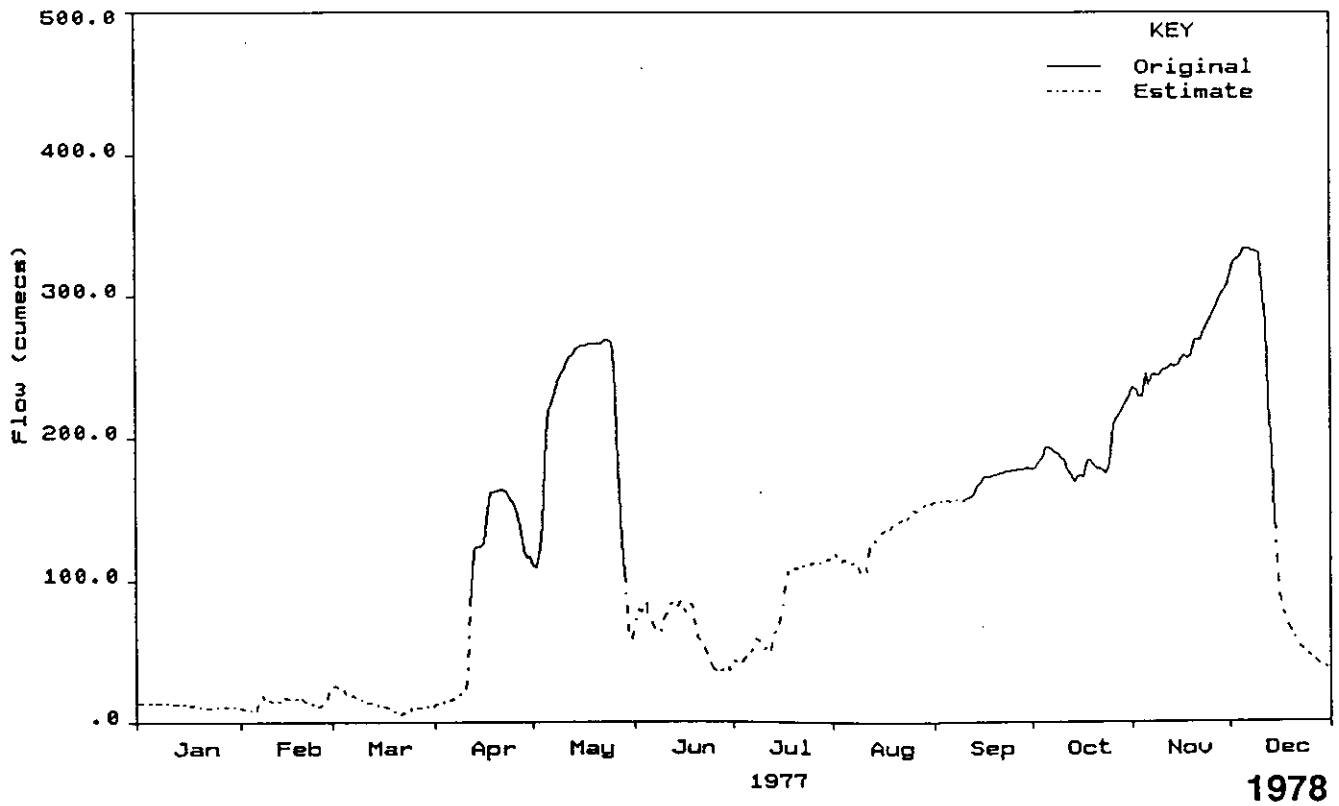


1976



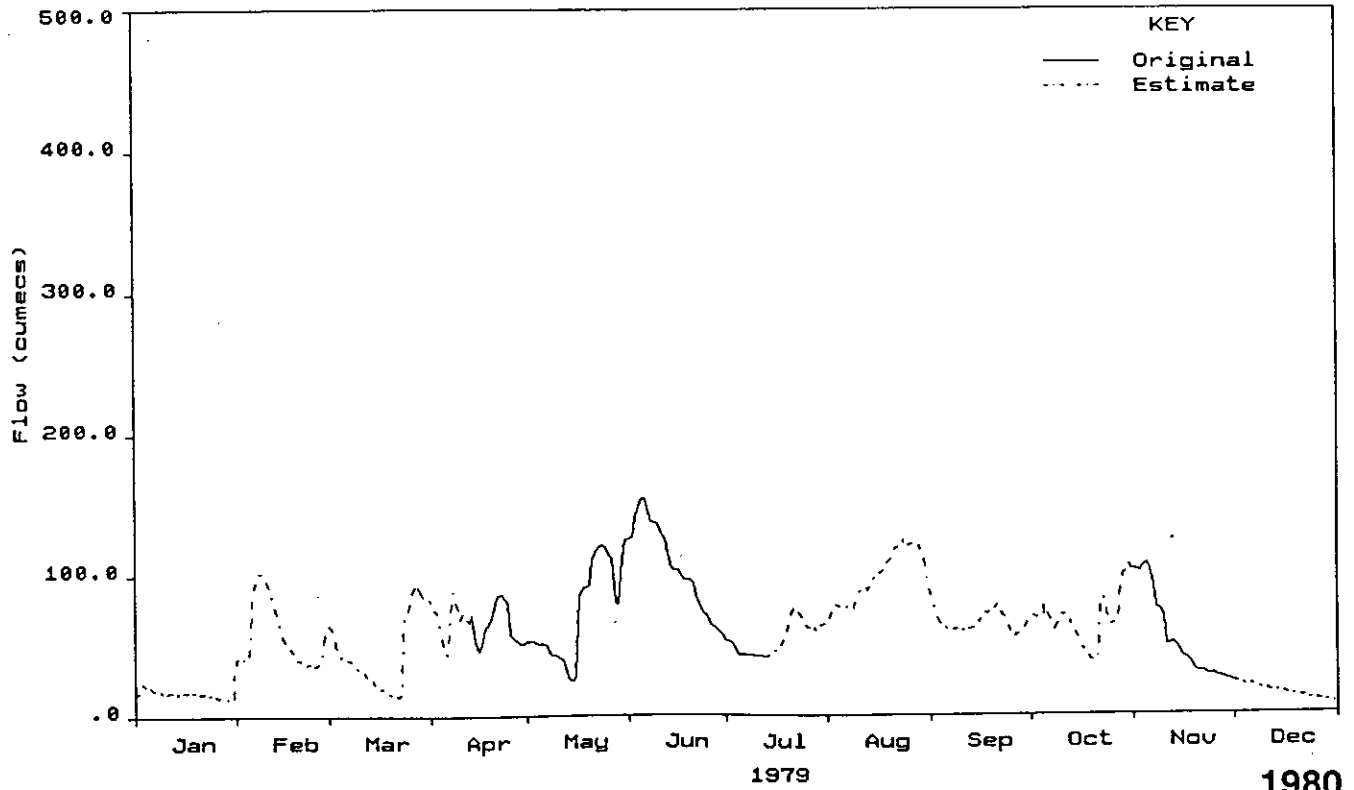
River Shebelli at Bulu Burti

1977

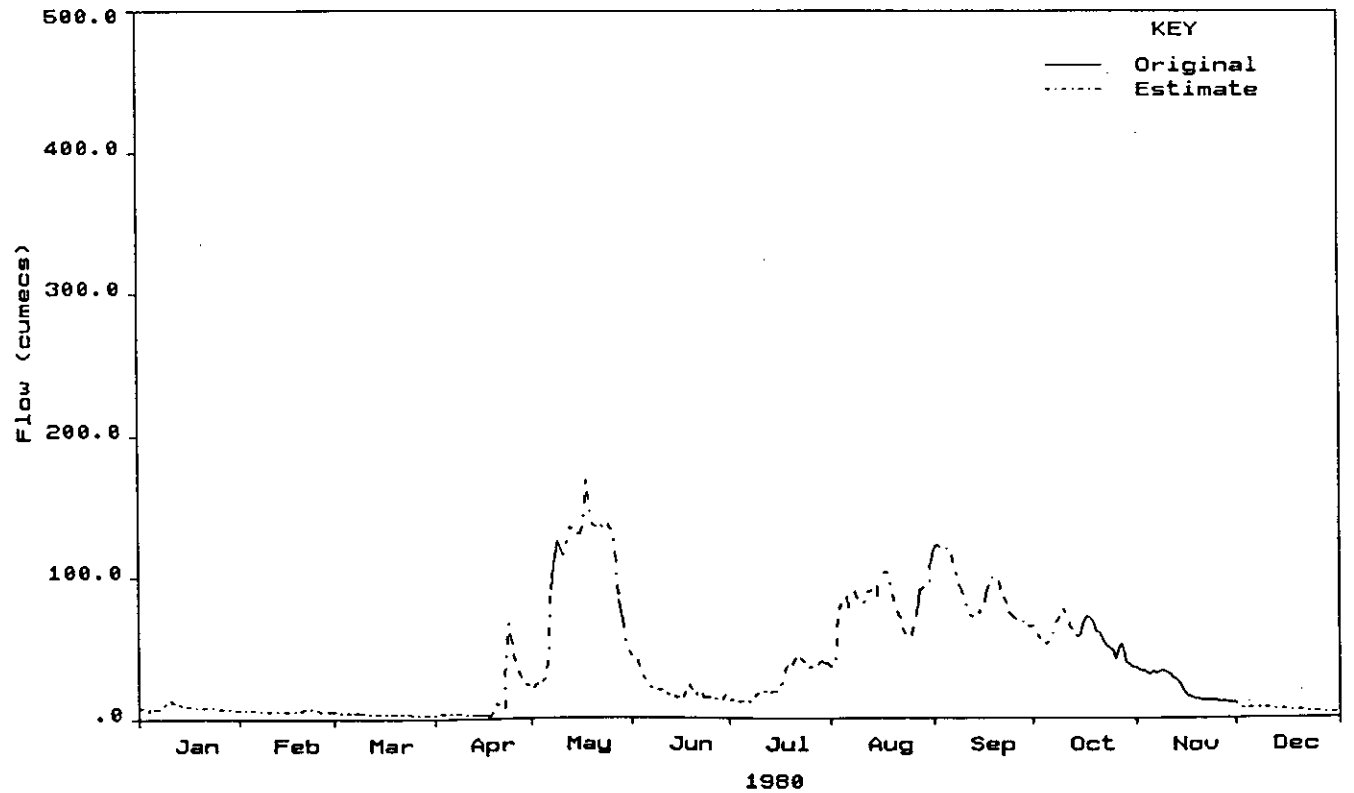


River Shebelli at Bulu Burti

1979

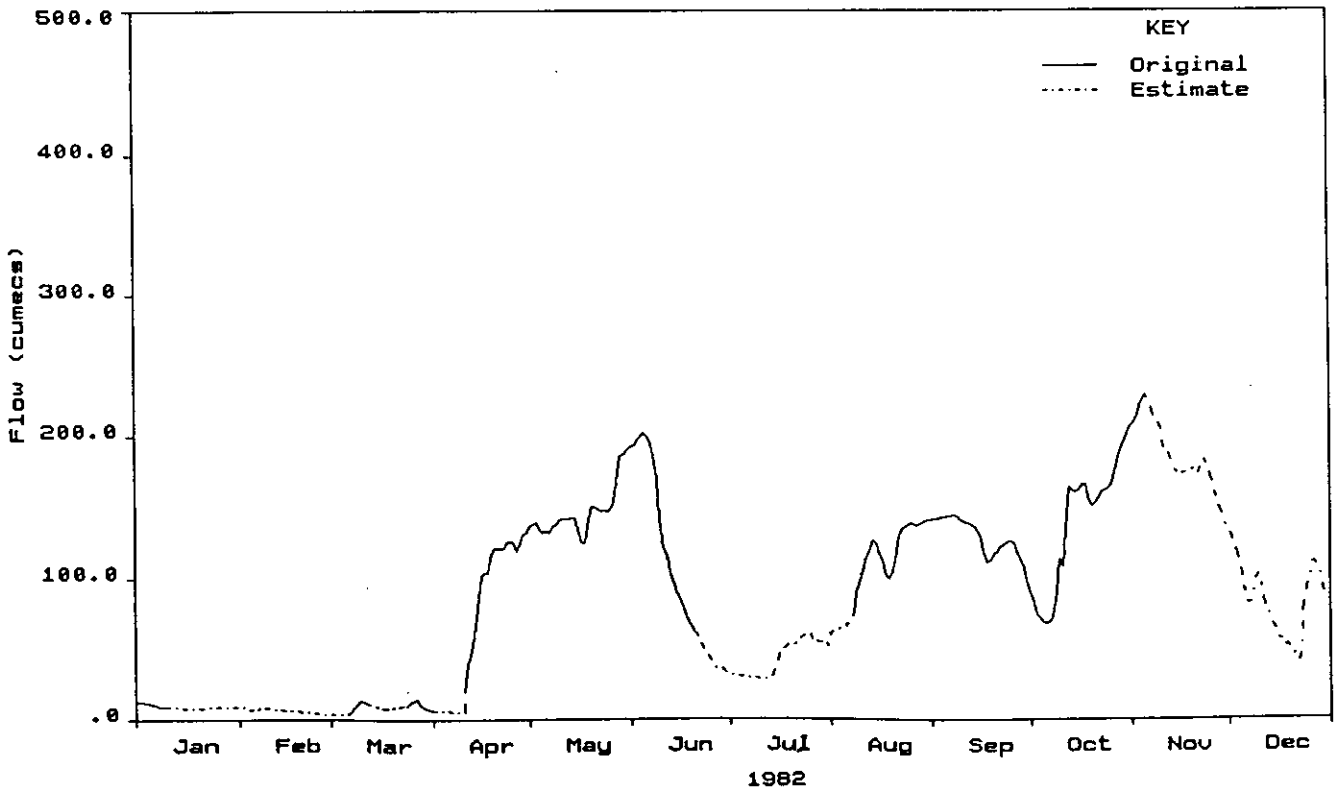
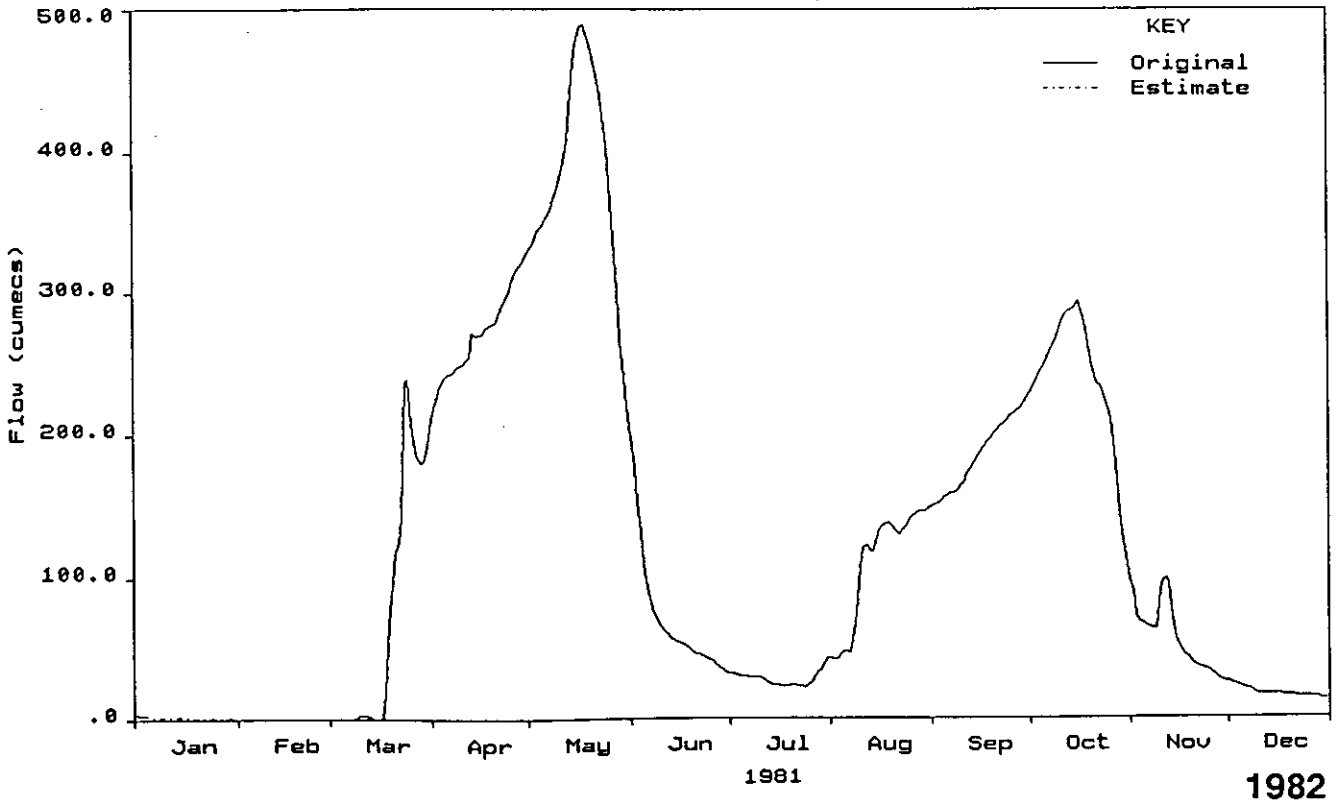


1980



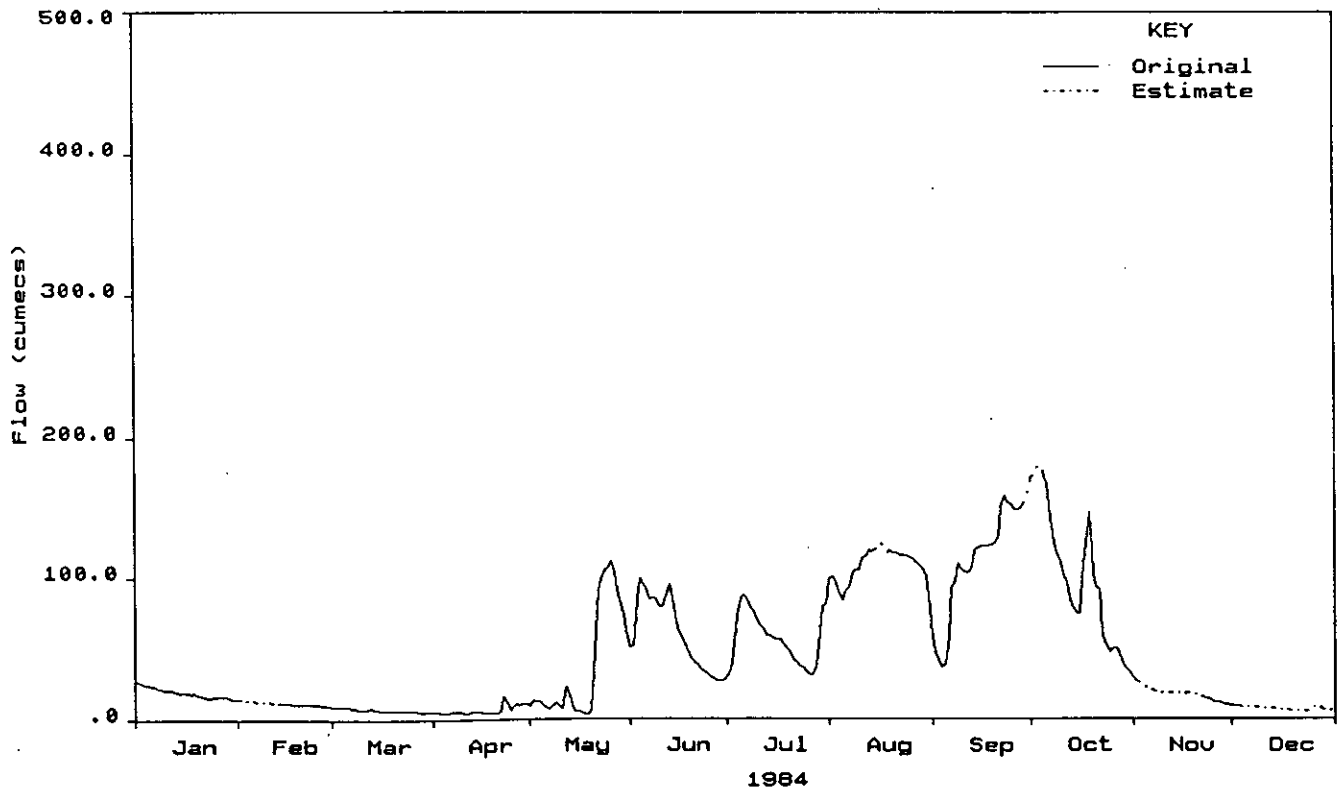
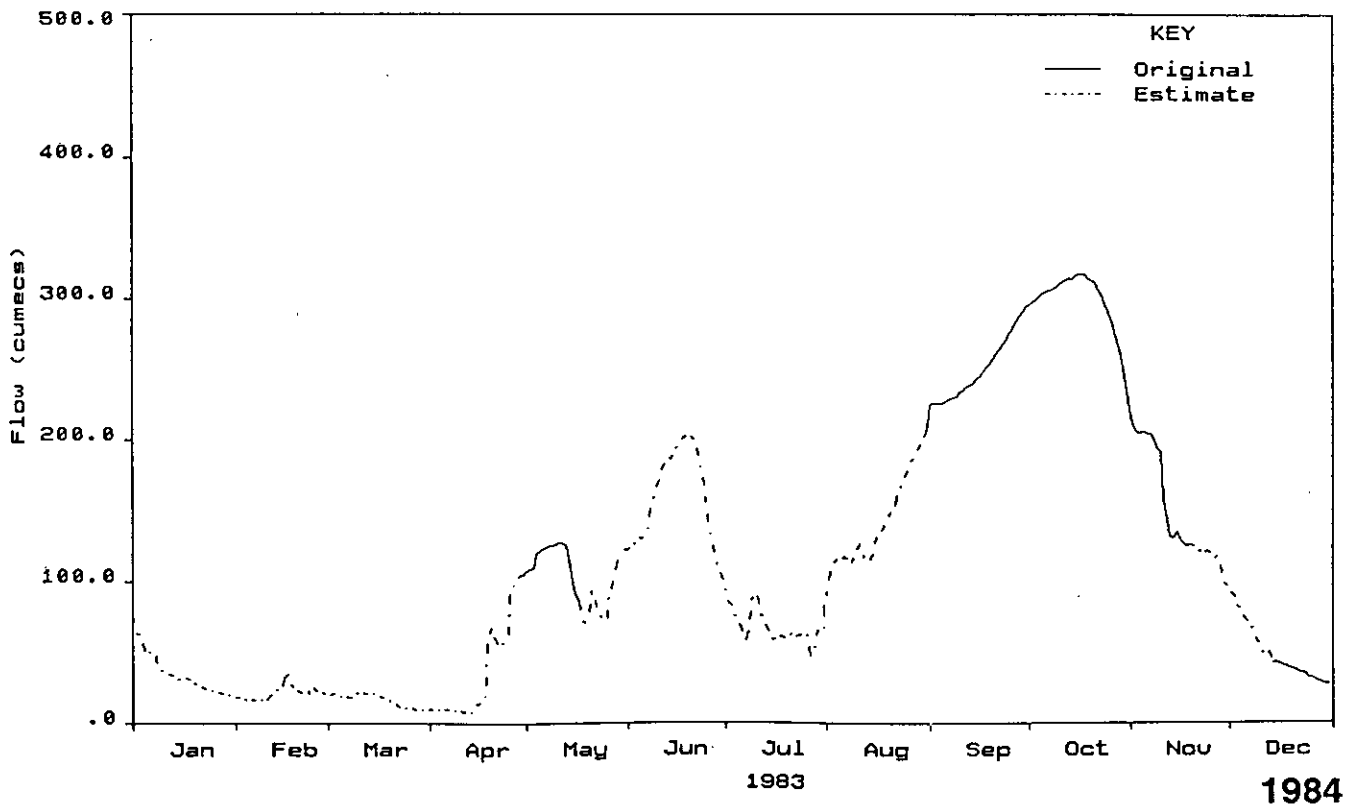
River Shebelli at Bulu Burti

1981



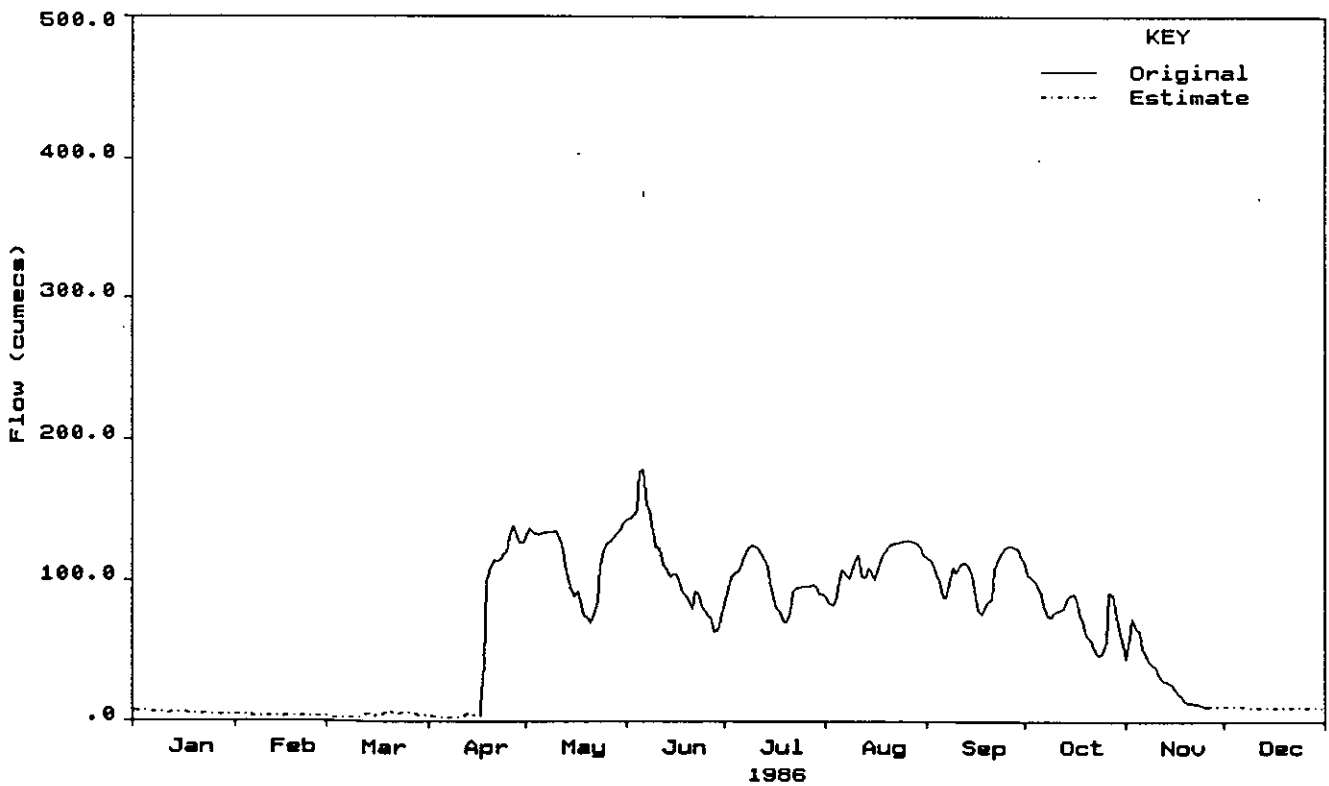
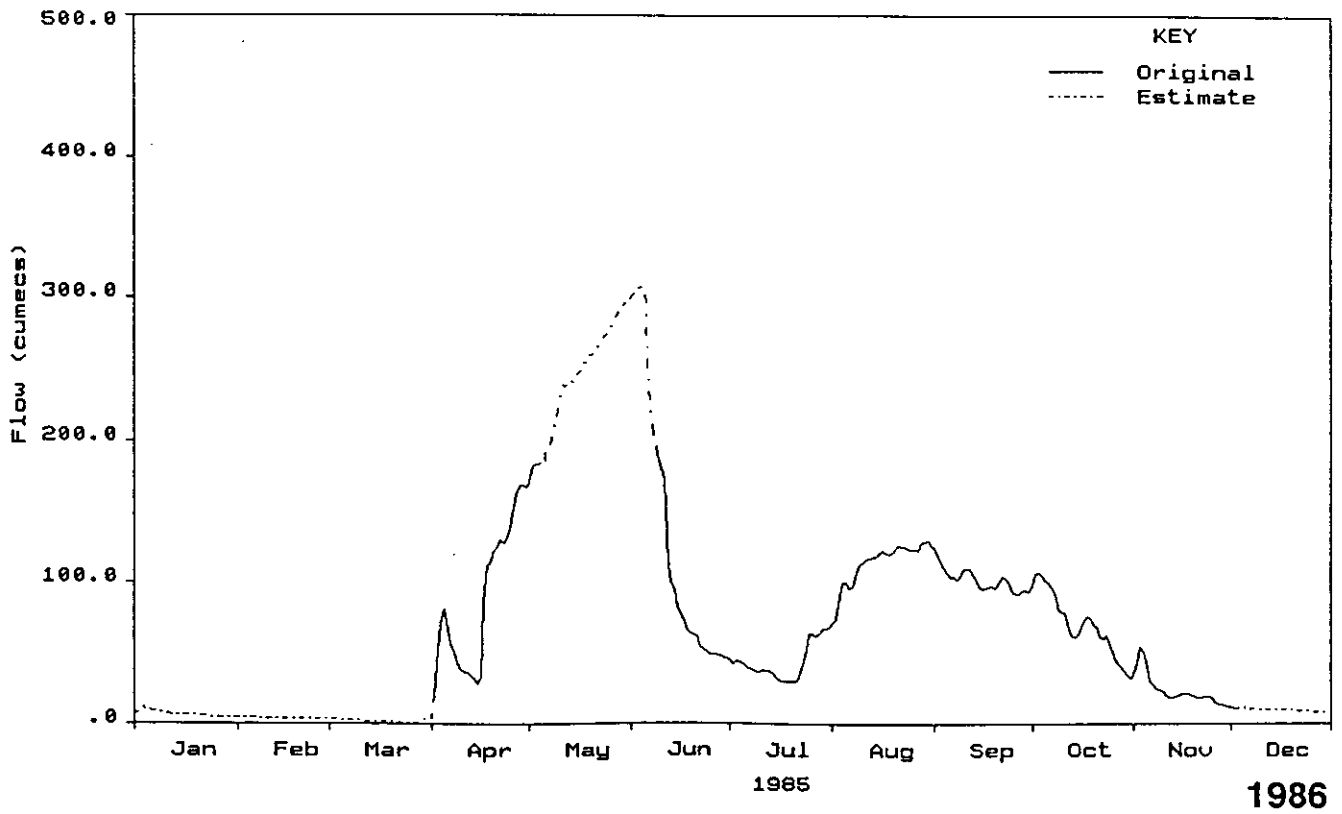
River Shebelli at Bulu Burti

1983



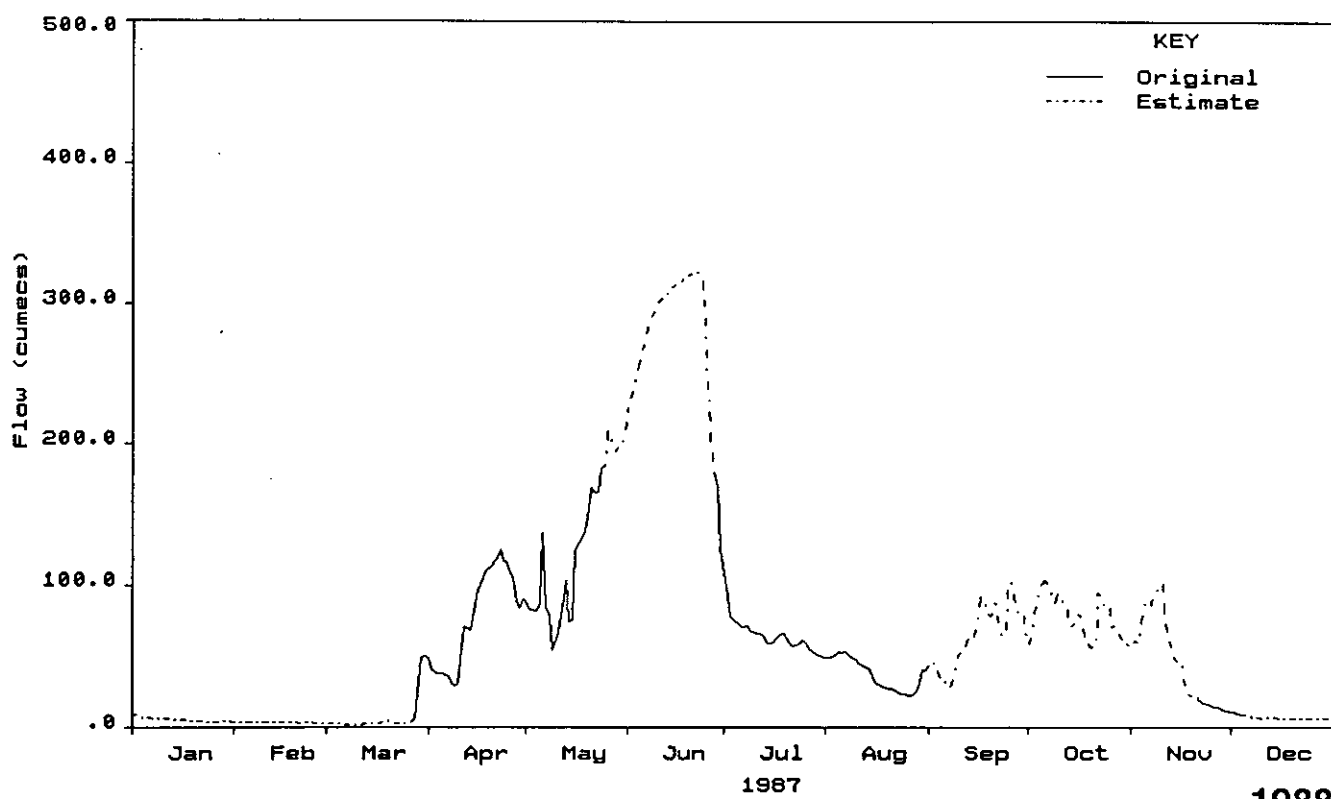
River Shebelli at Bulu Burti

1985

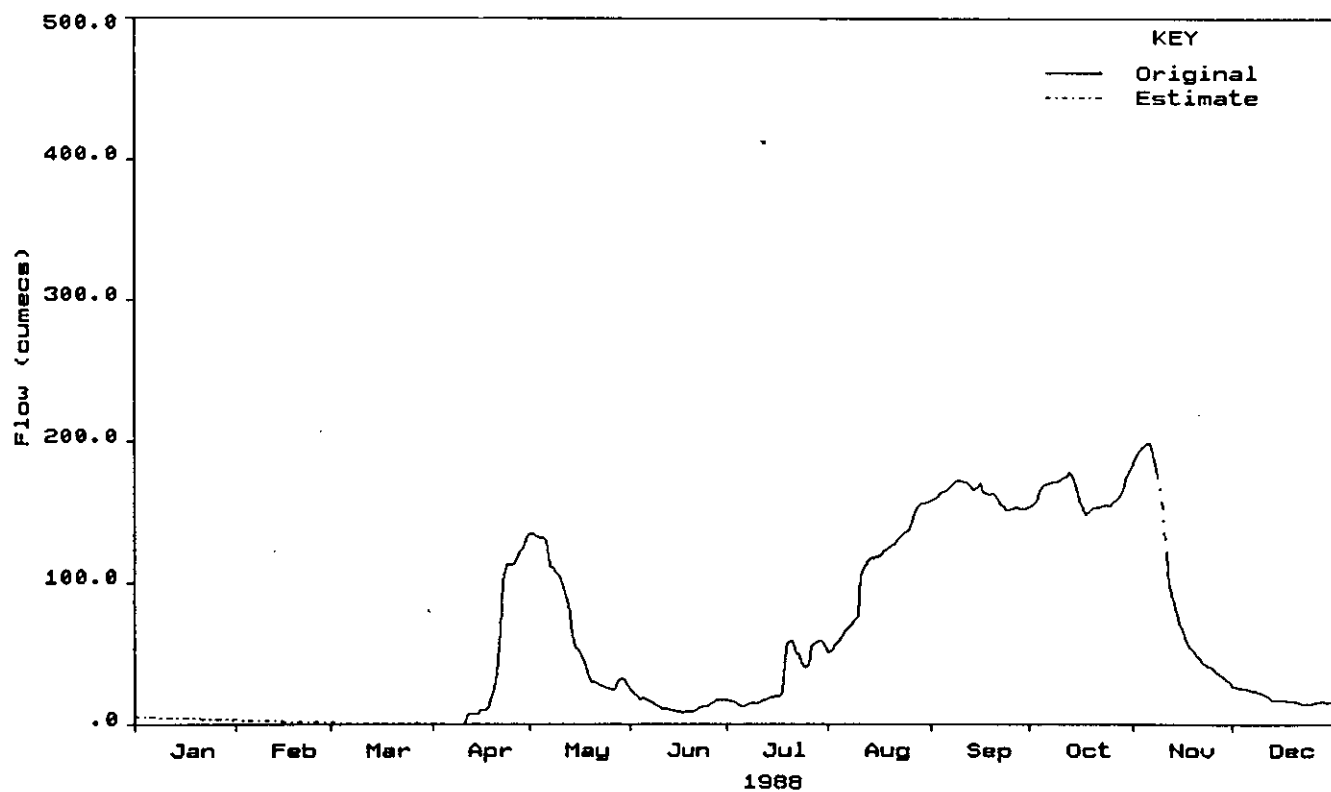


River Shebelli at Bulu Burti

1987

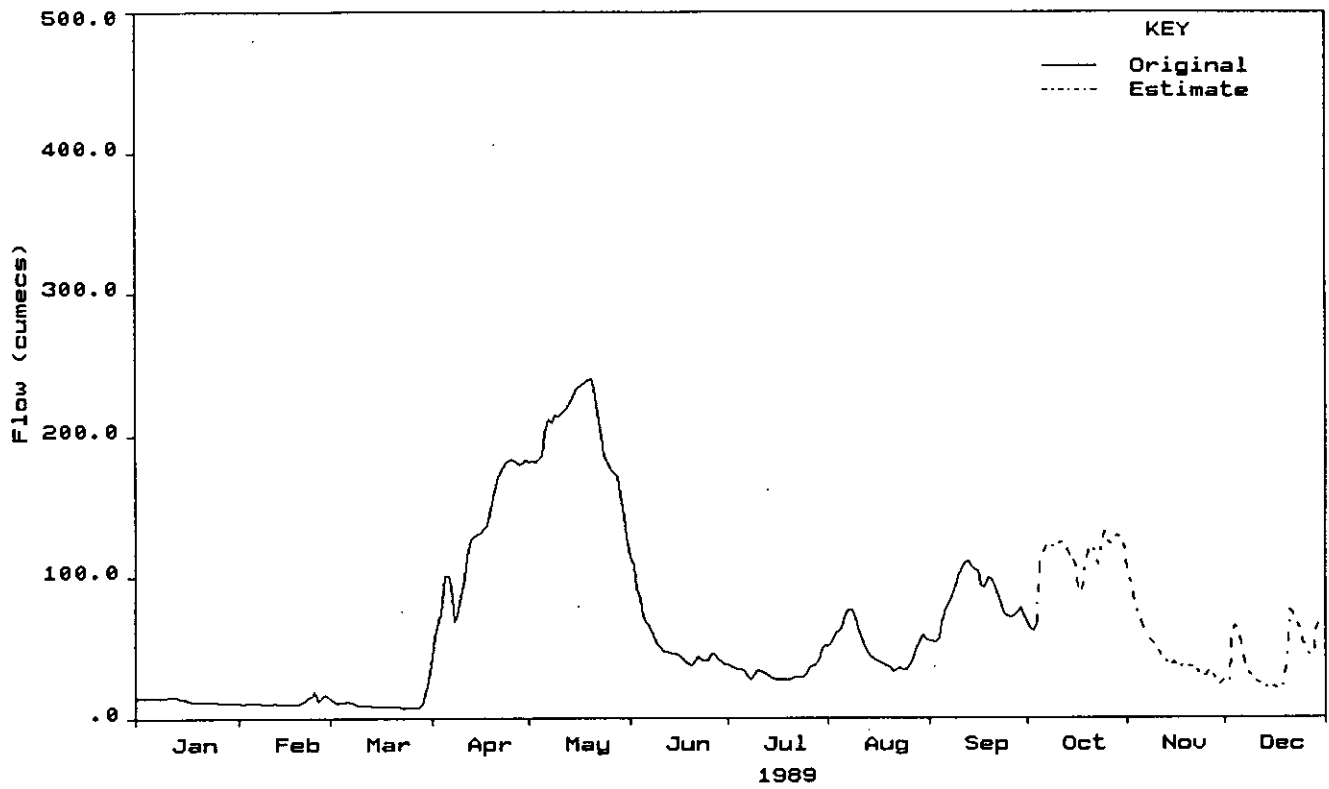


1988



River Shebelli at Bulo Burti

1989



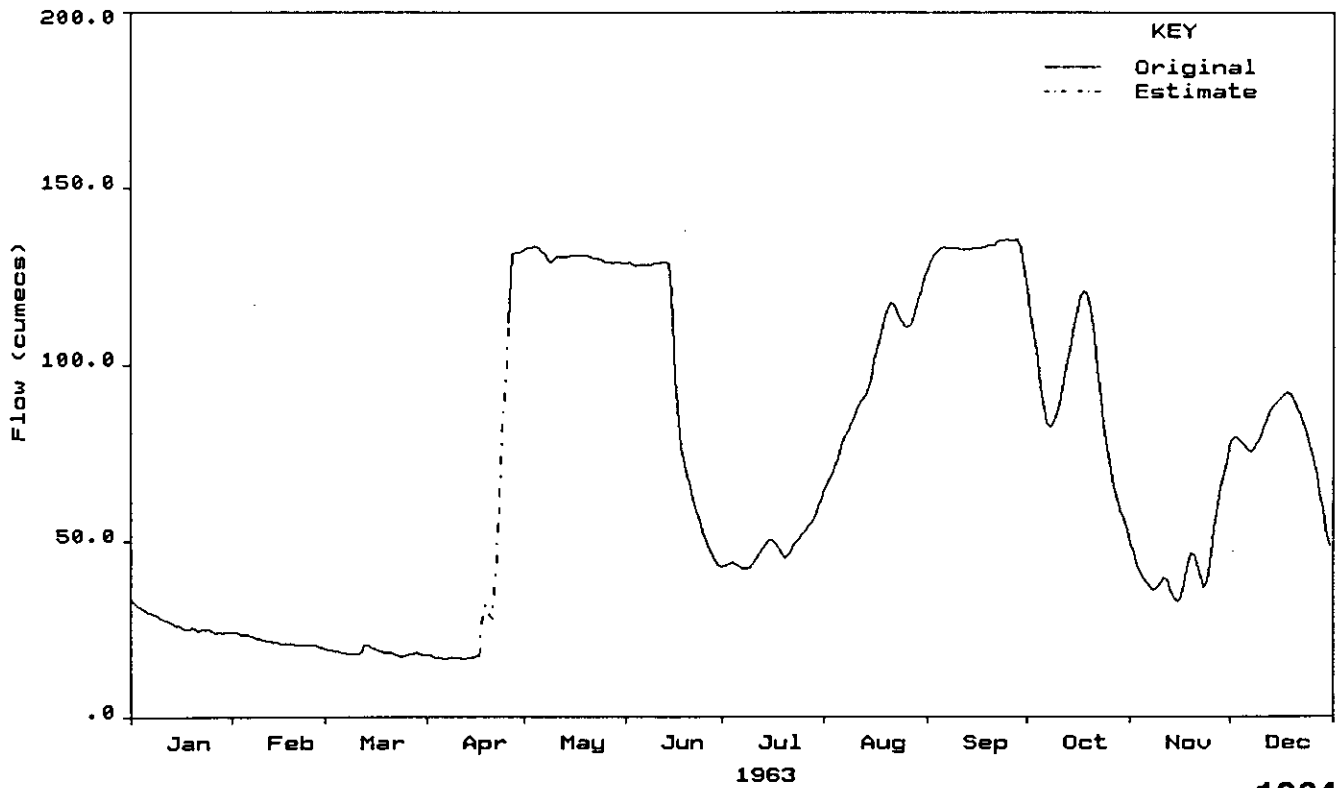
MAHADDEY WEYN

1963 - 1989

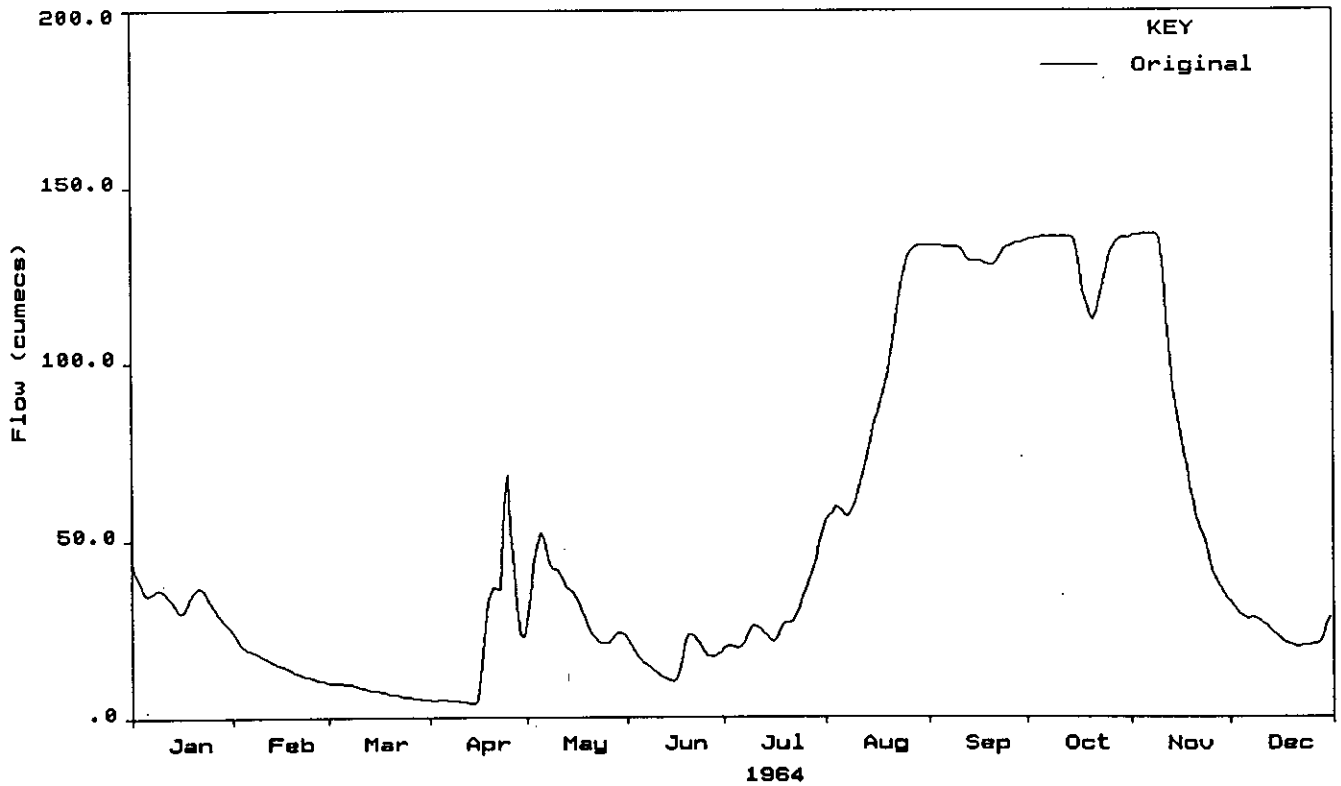


River Shebelli at Mahaddey Weyn

1963

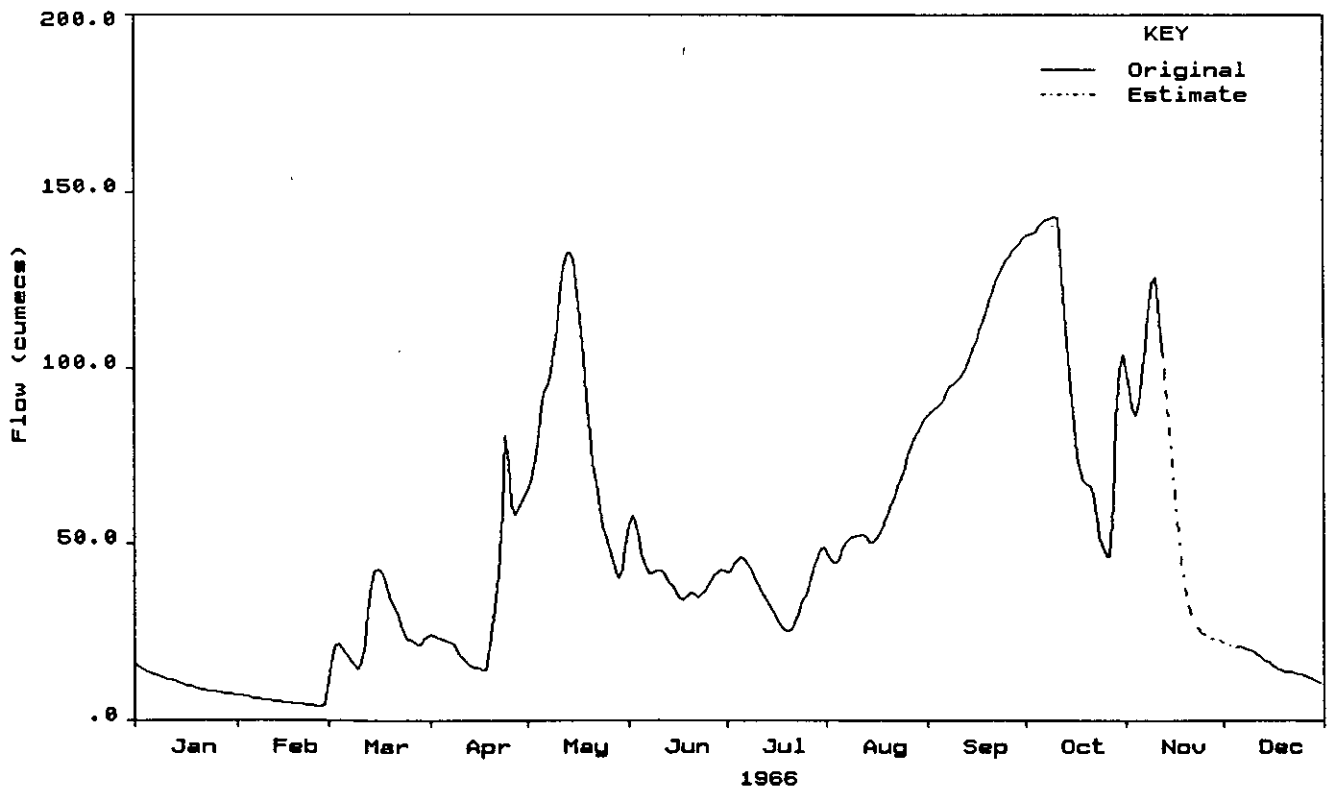
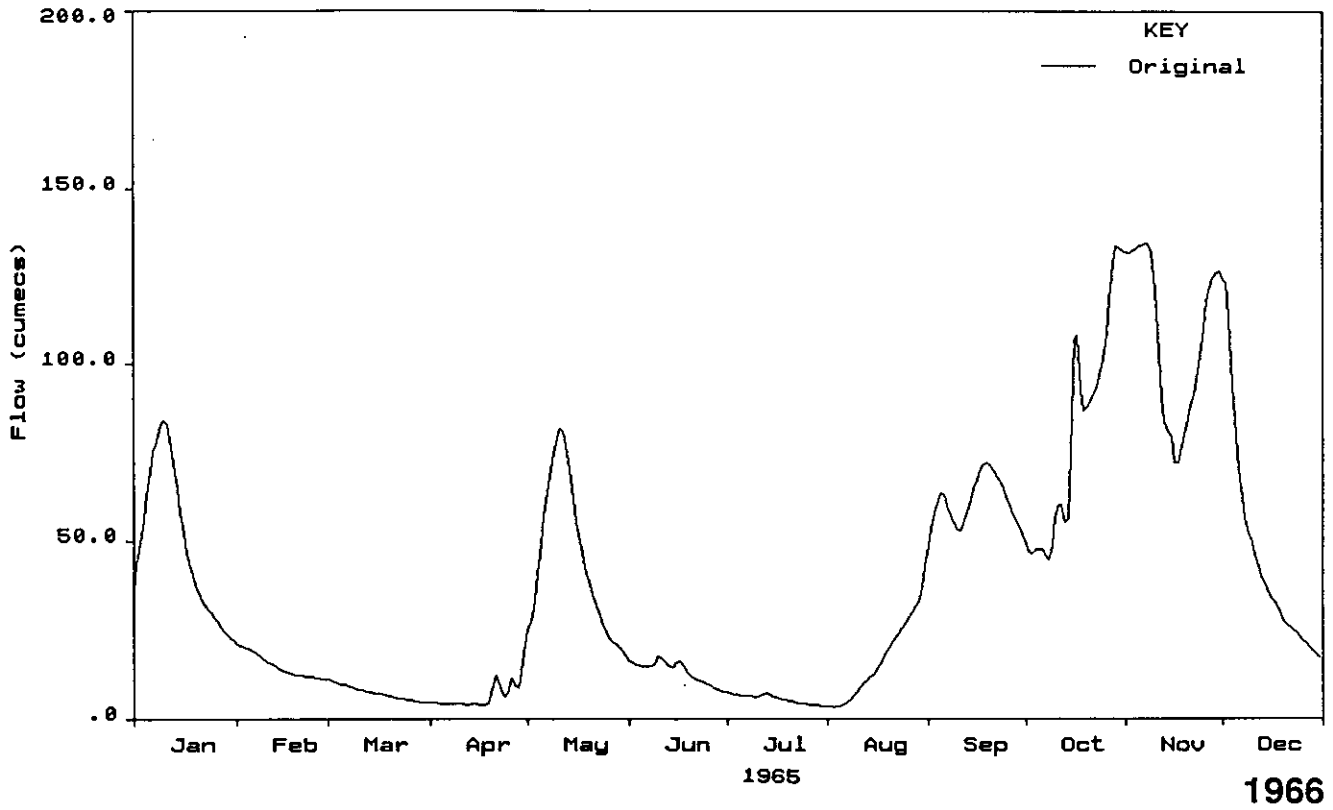


1964



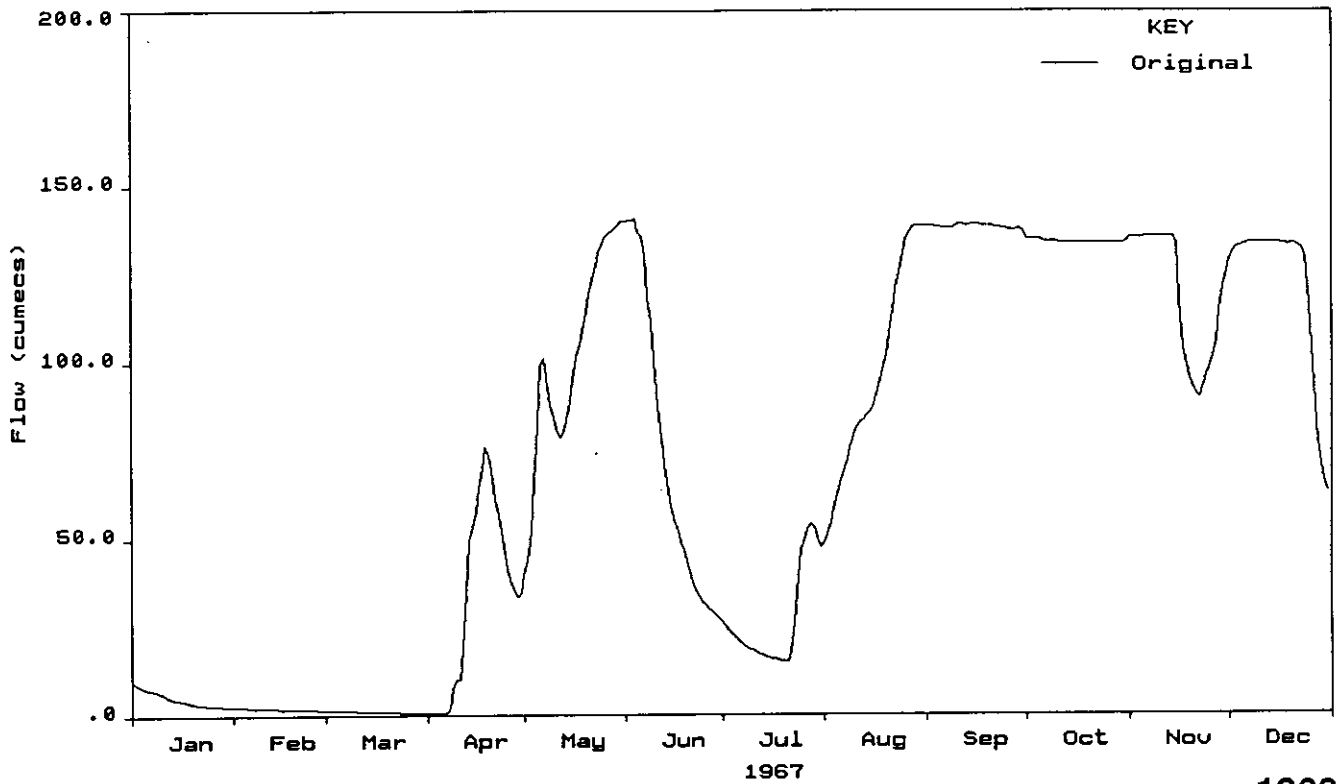
River Shebelli at Mahaddey Weyn

1965

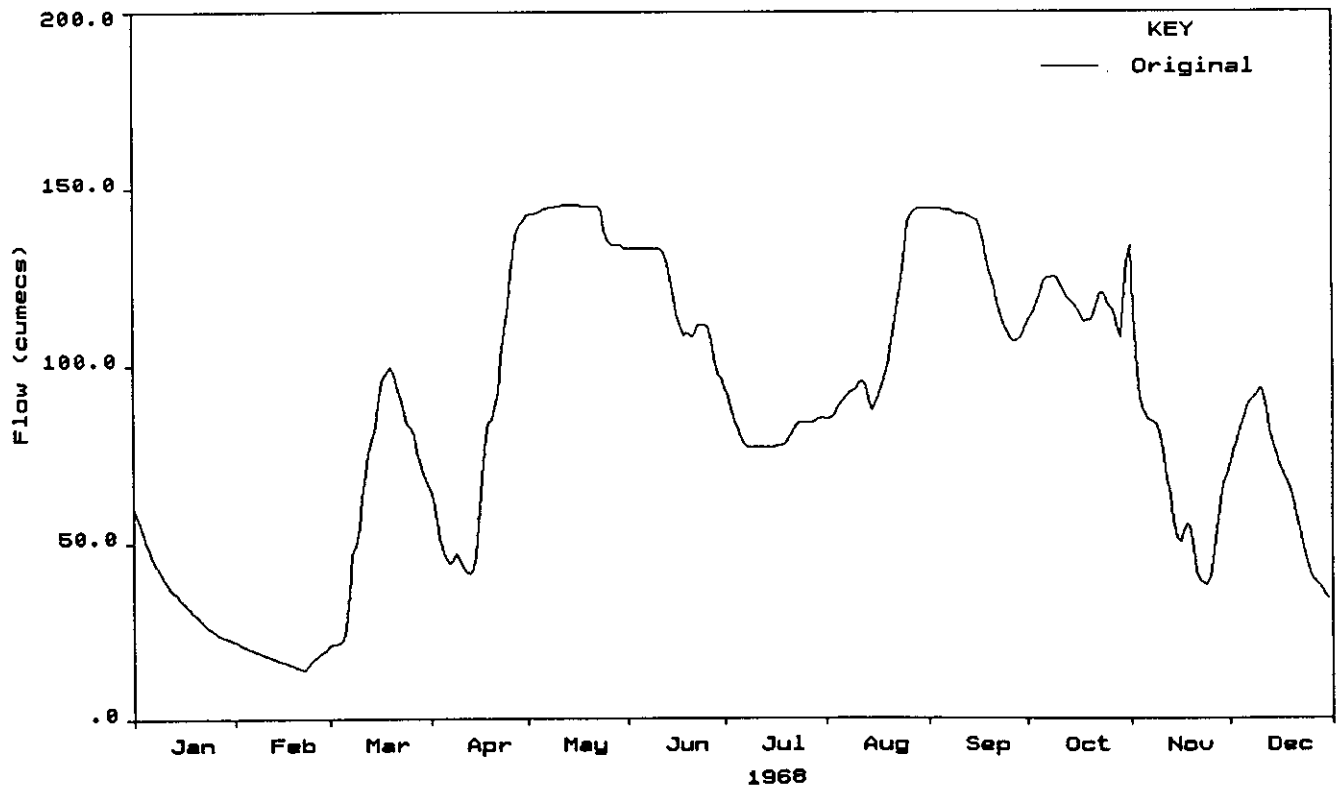


River Shebelli at Mahaddey Weyn

1967

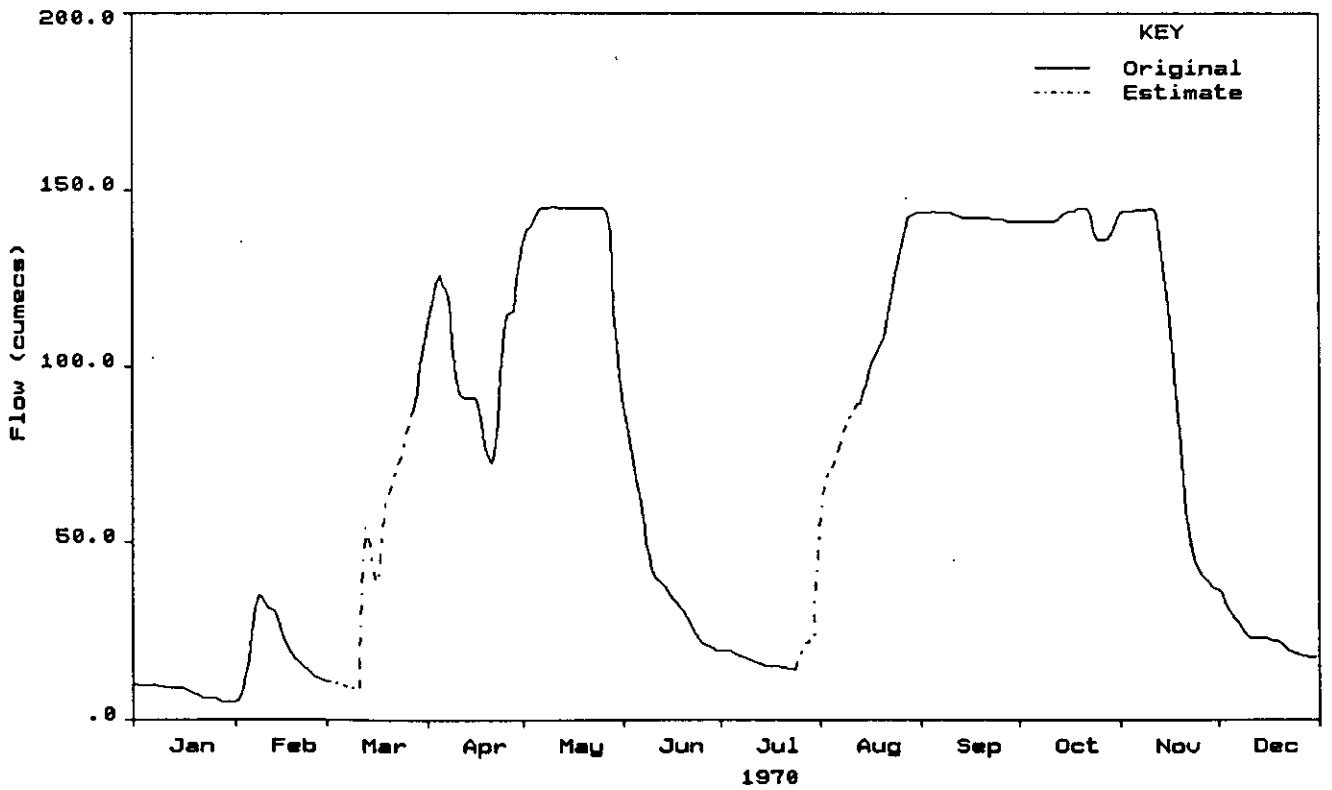
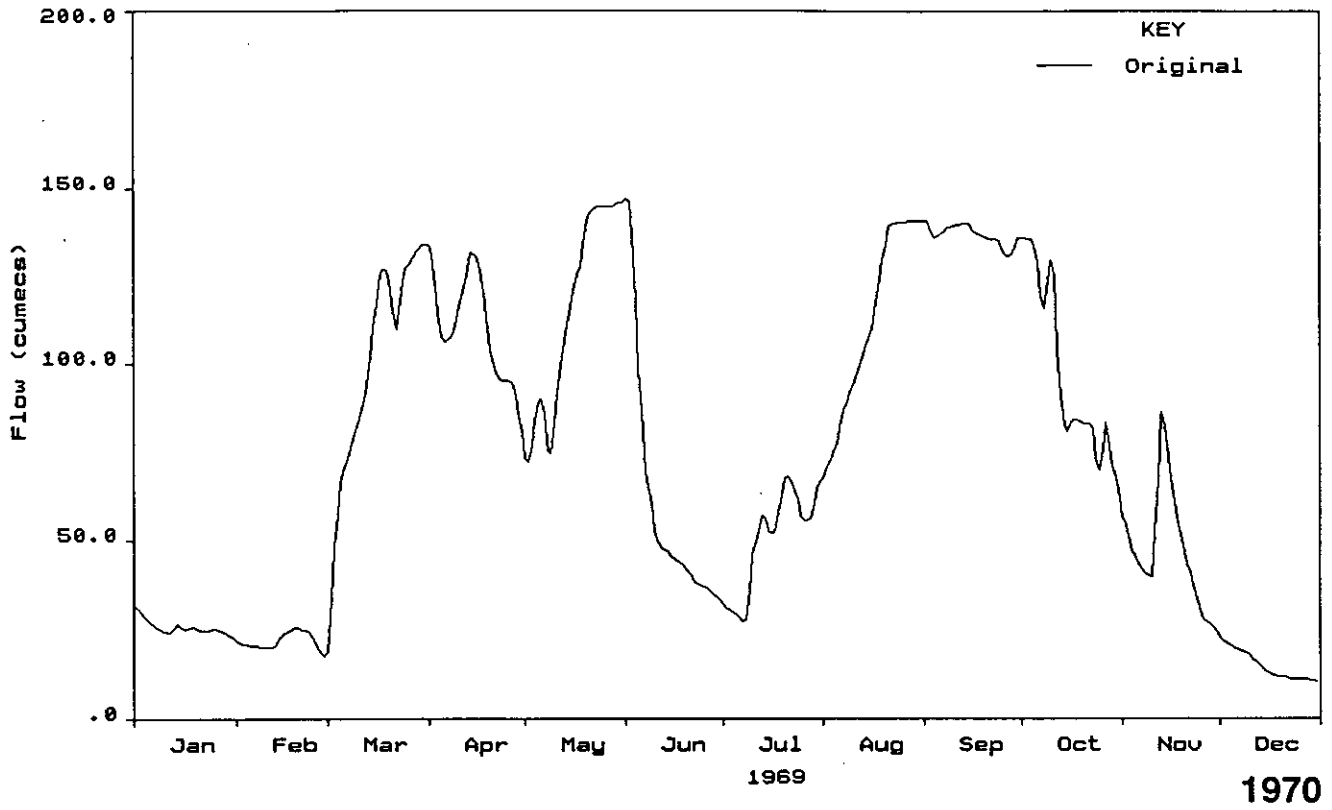


1968



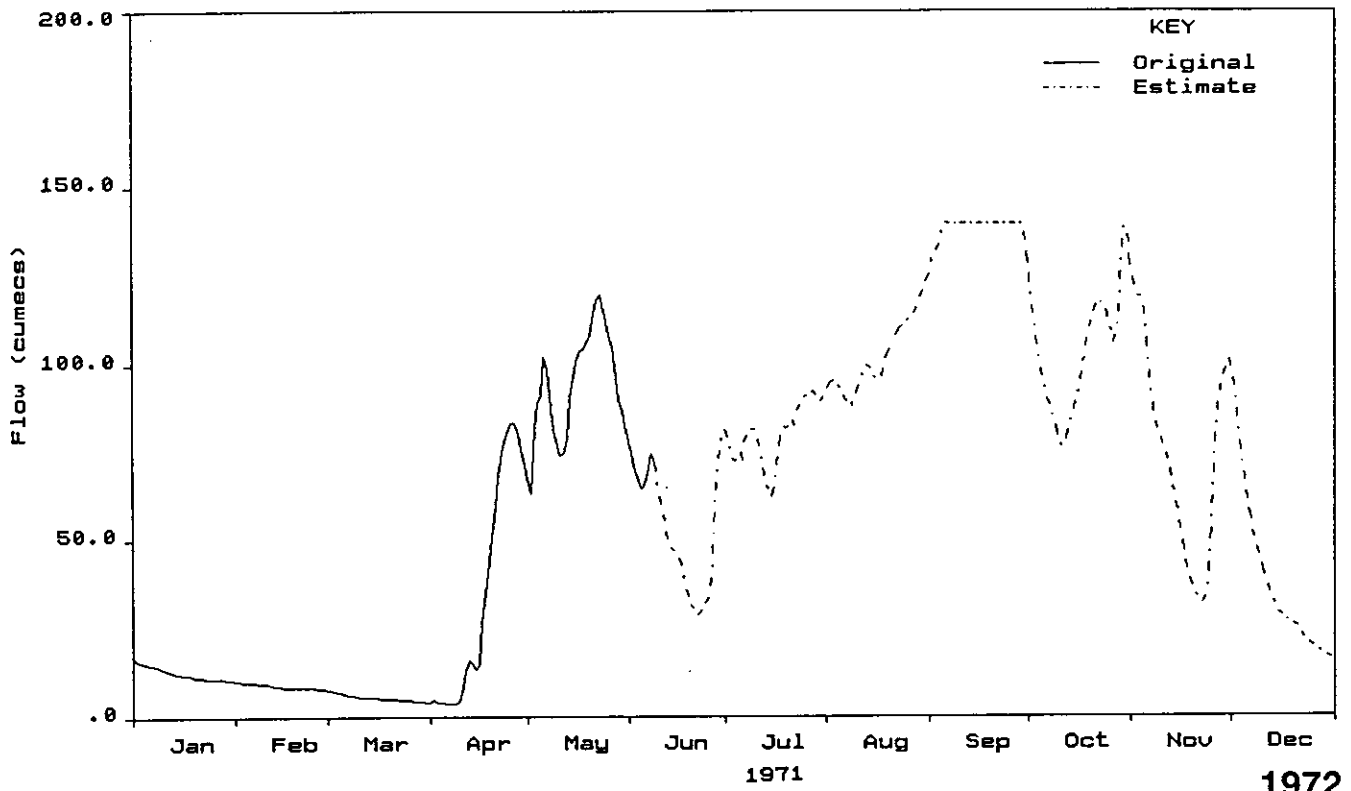
River Shebelli at Mahaddey Weyn

1969

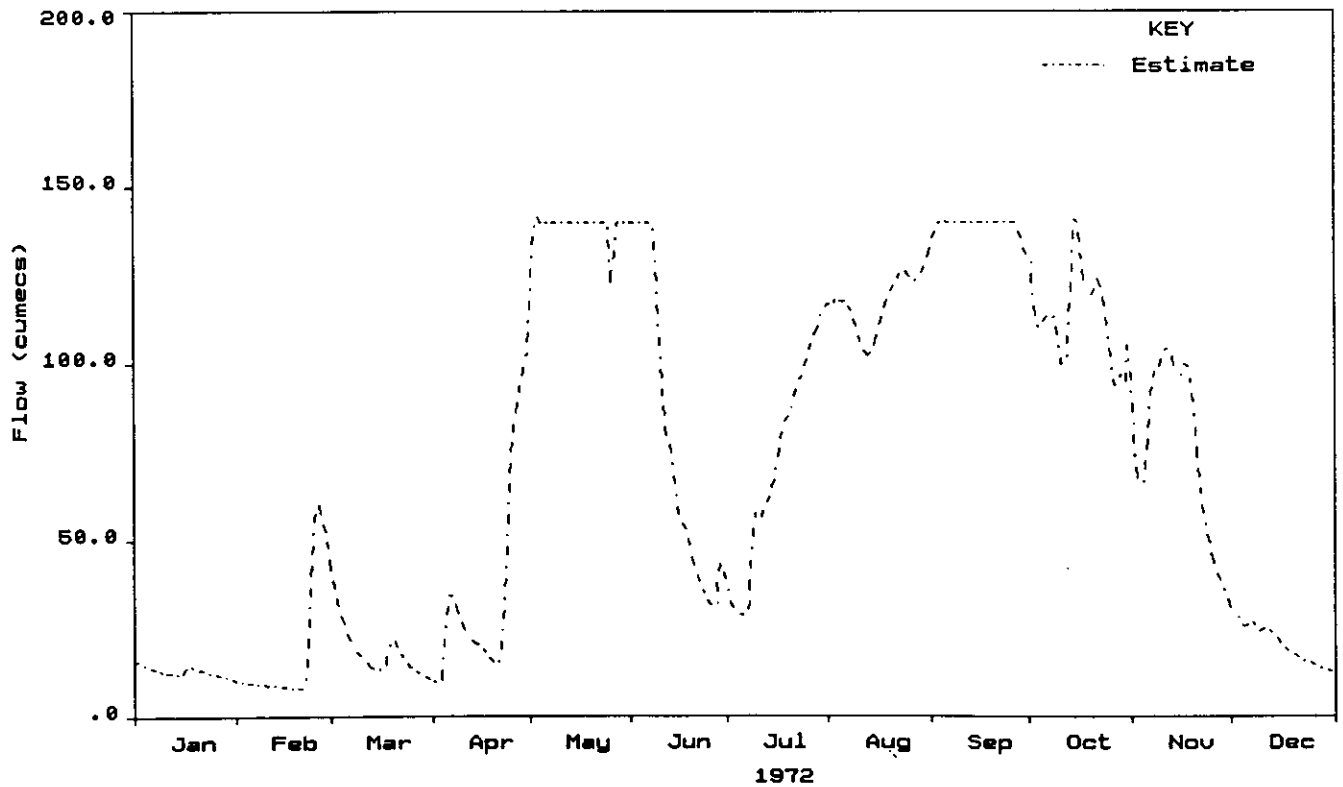


River Shebelli at Mahaddey Weyn

1971

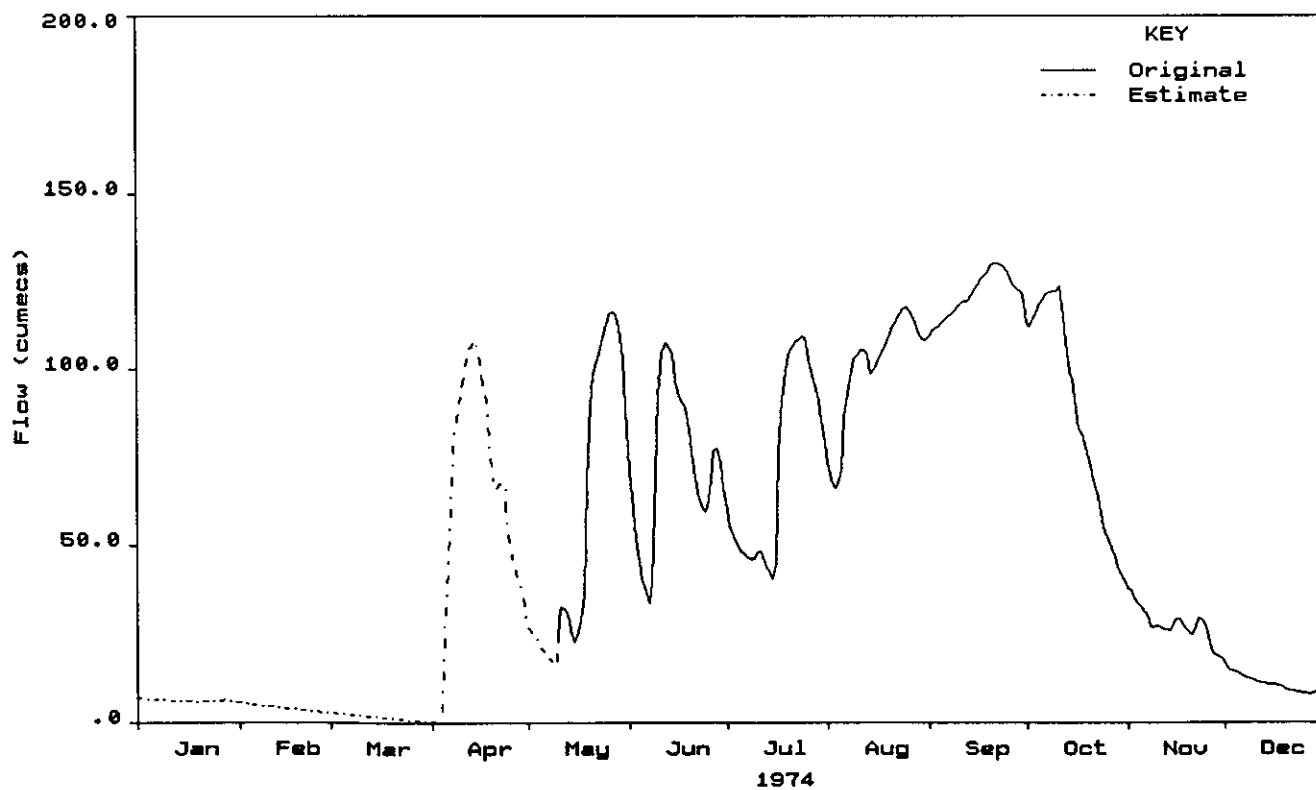
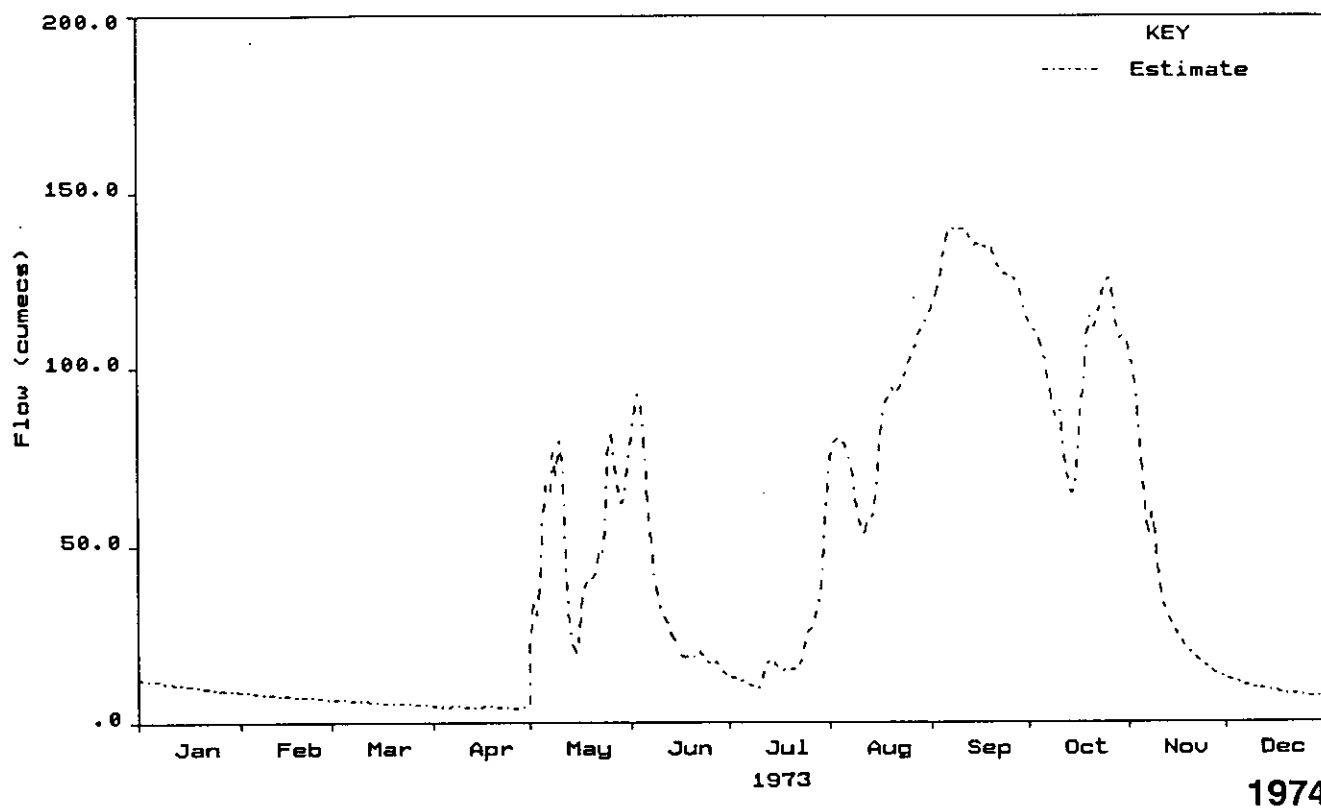


1972



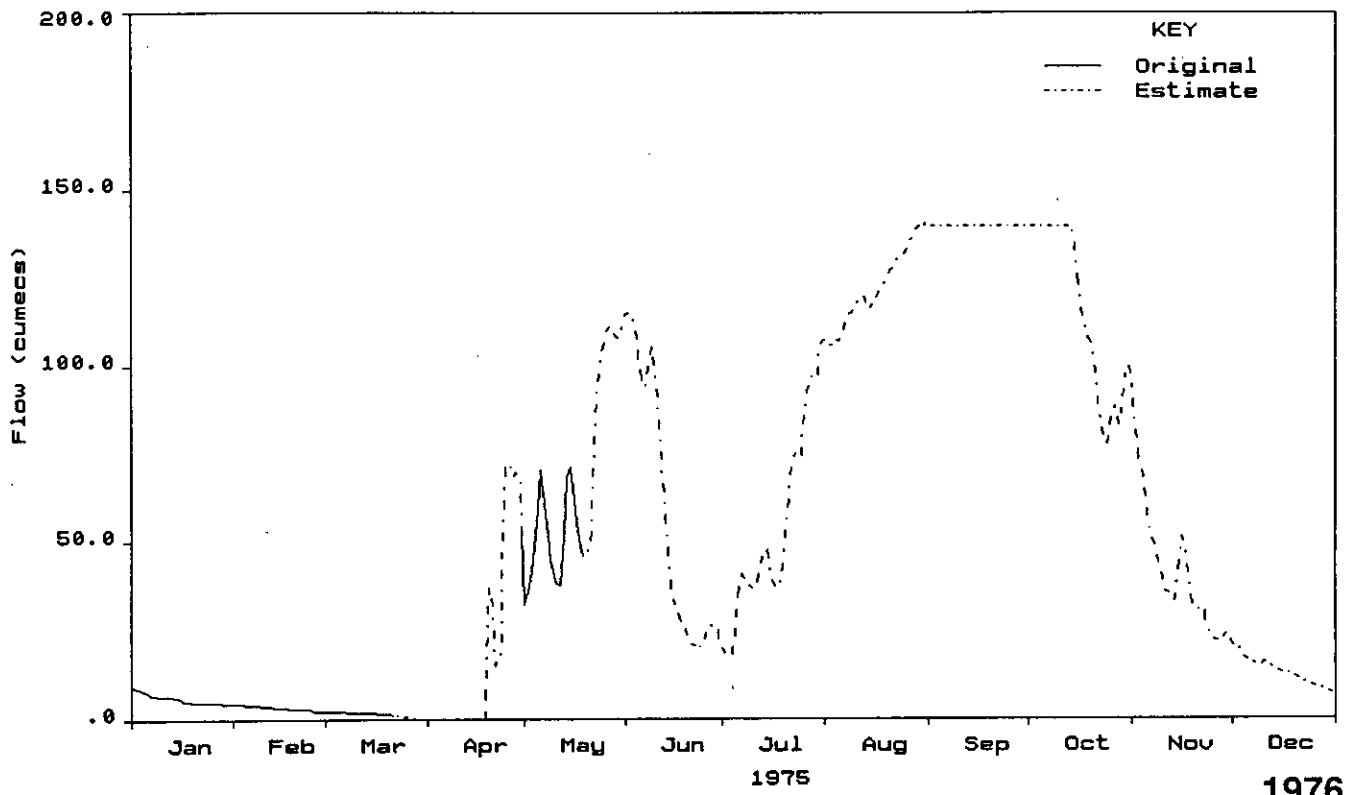
River Shebelli at Mahaddey Weyn

1973

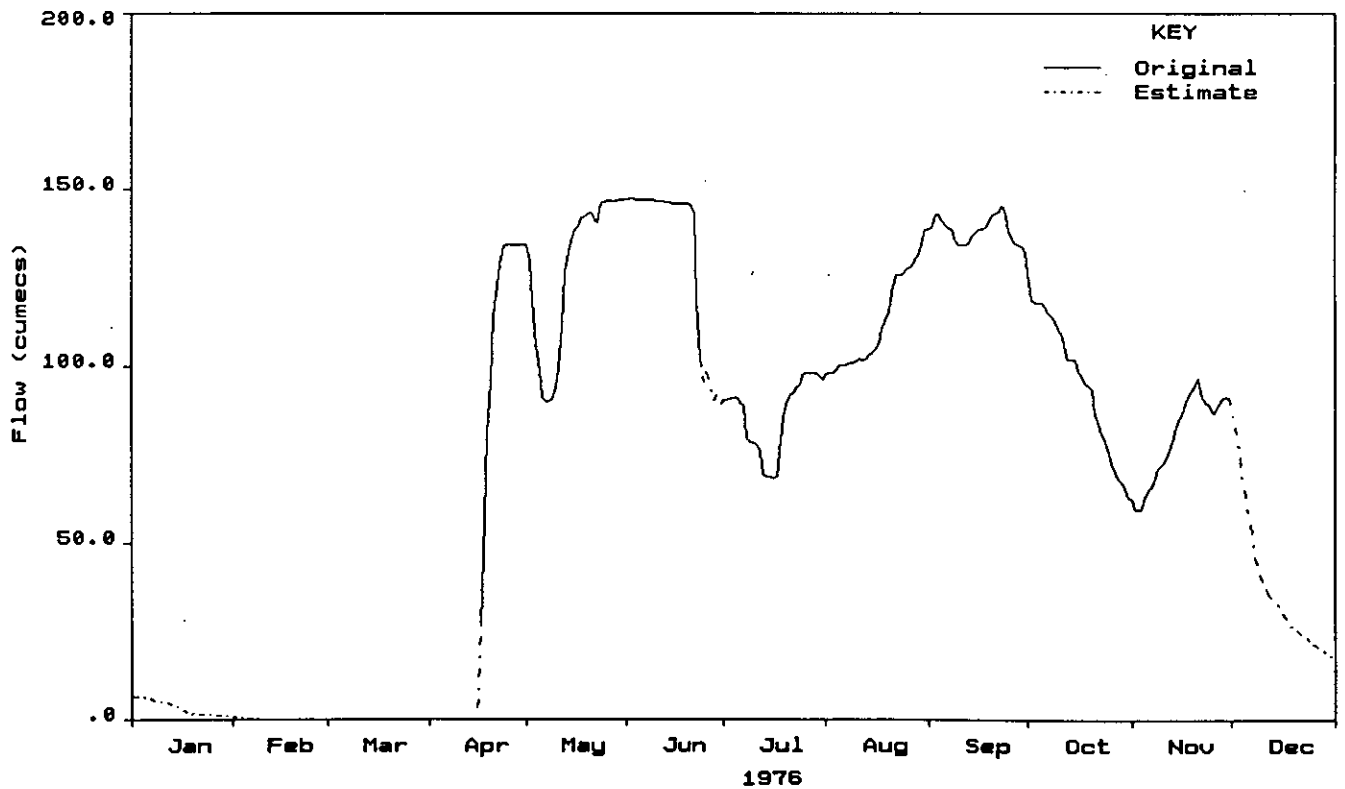


River Shebelli at Mahaddey Weyn

1975

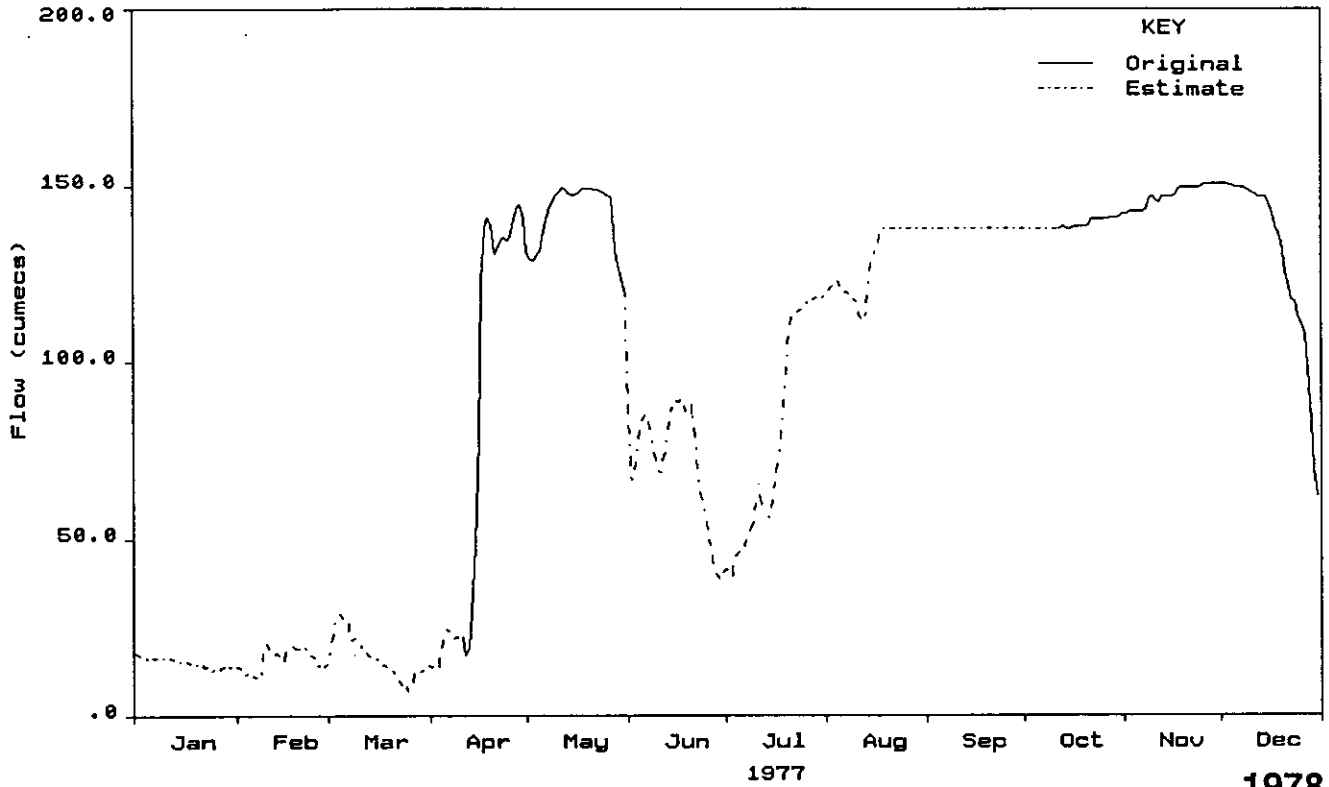


1976

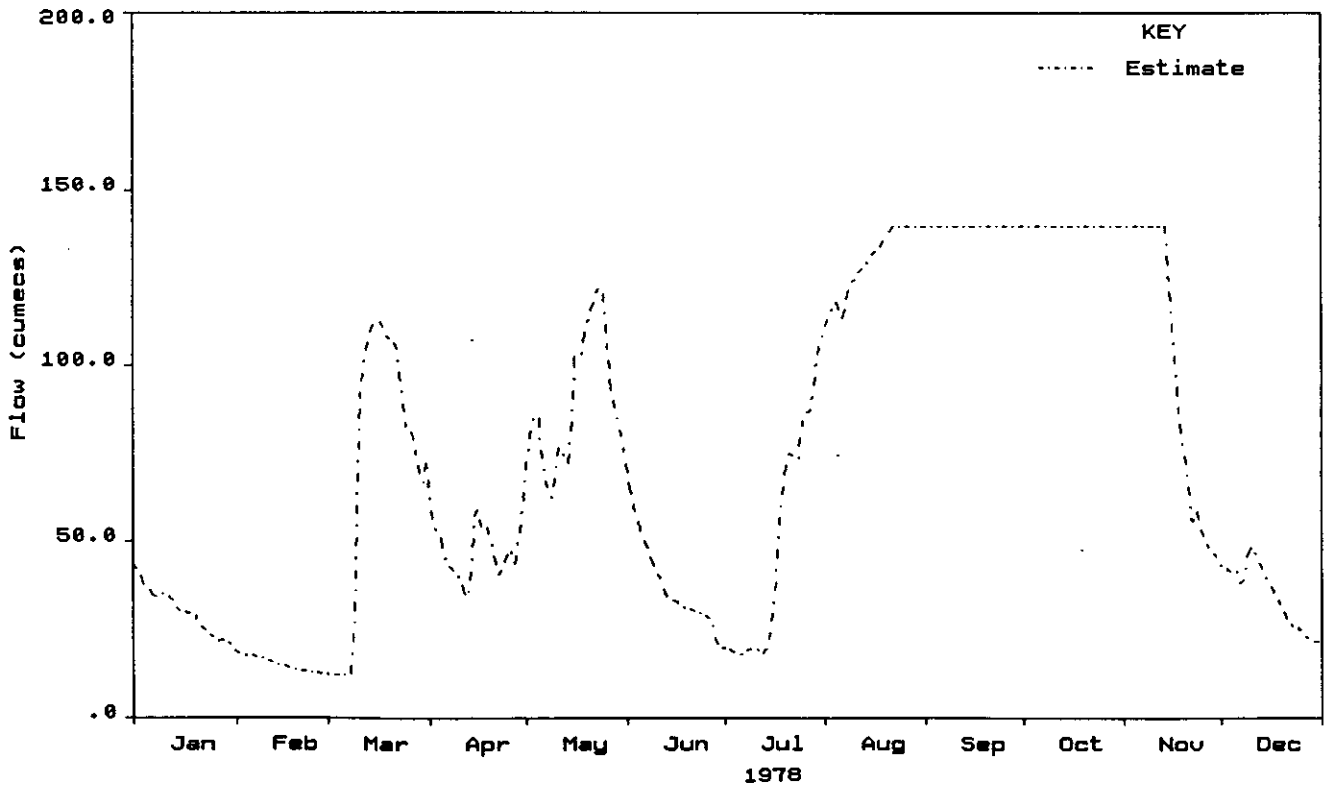


River Shebelli at Mahaddey Weyn

1977

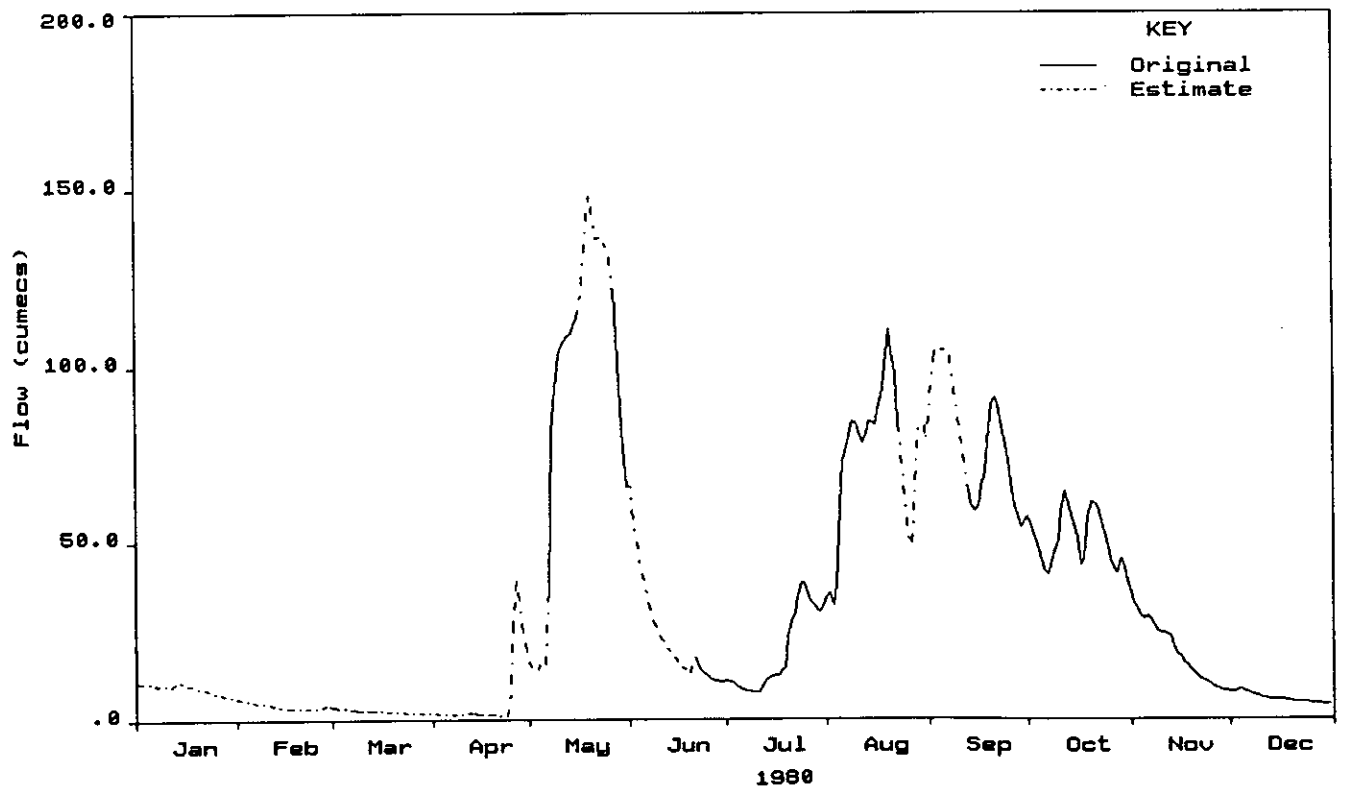
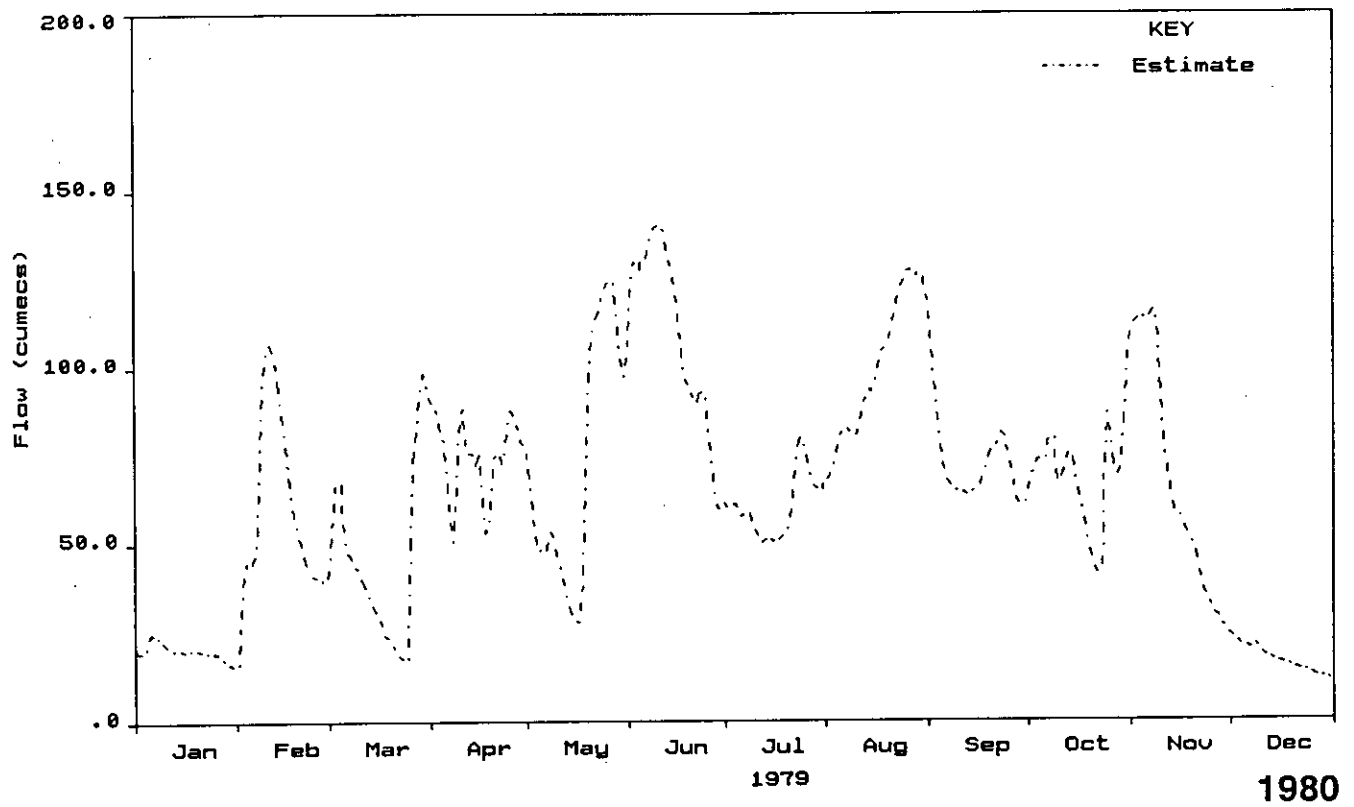


1978



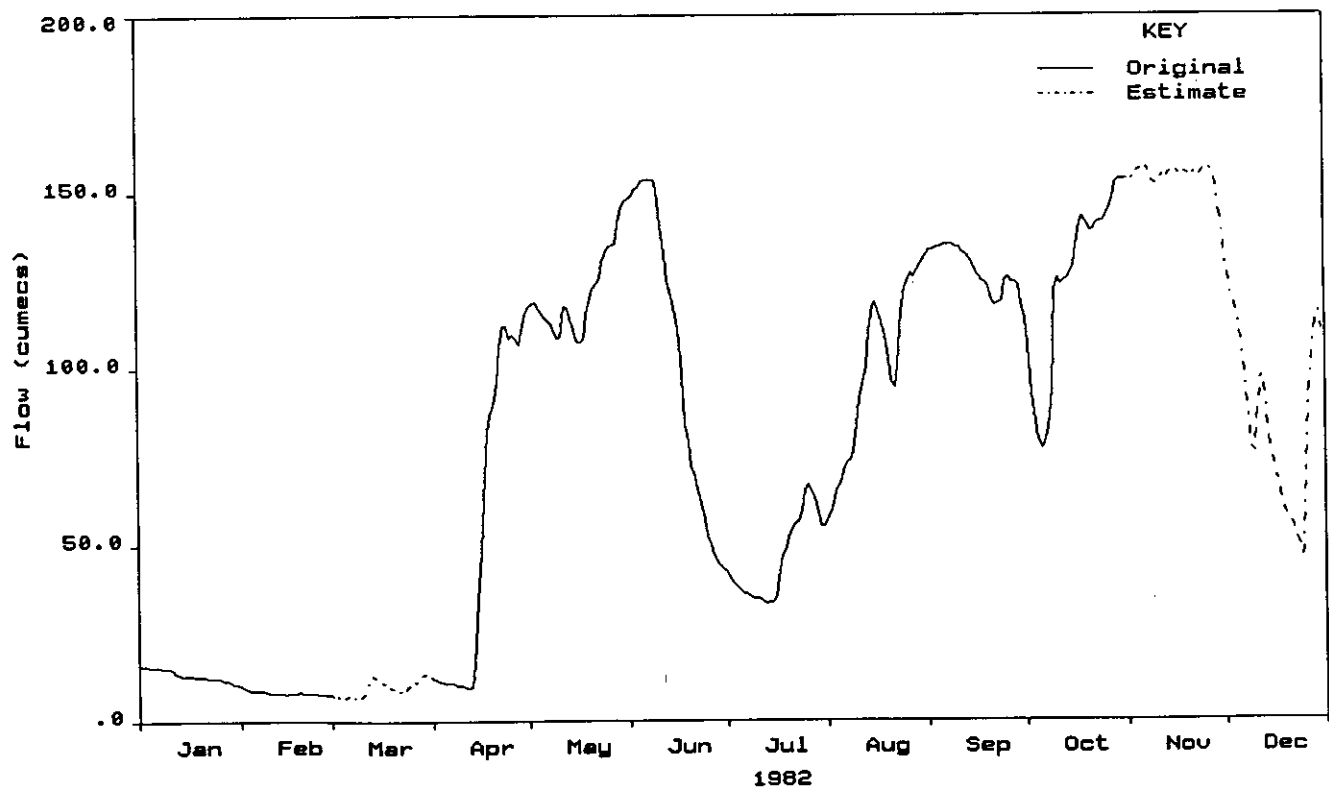
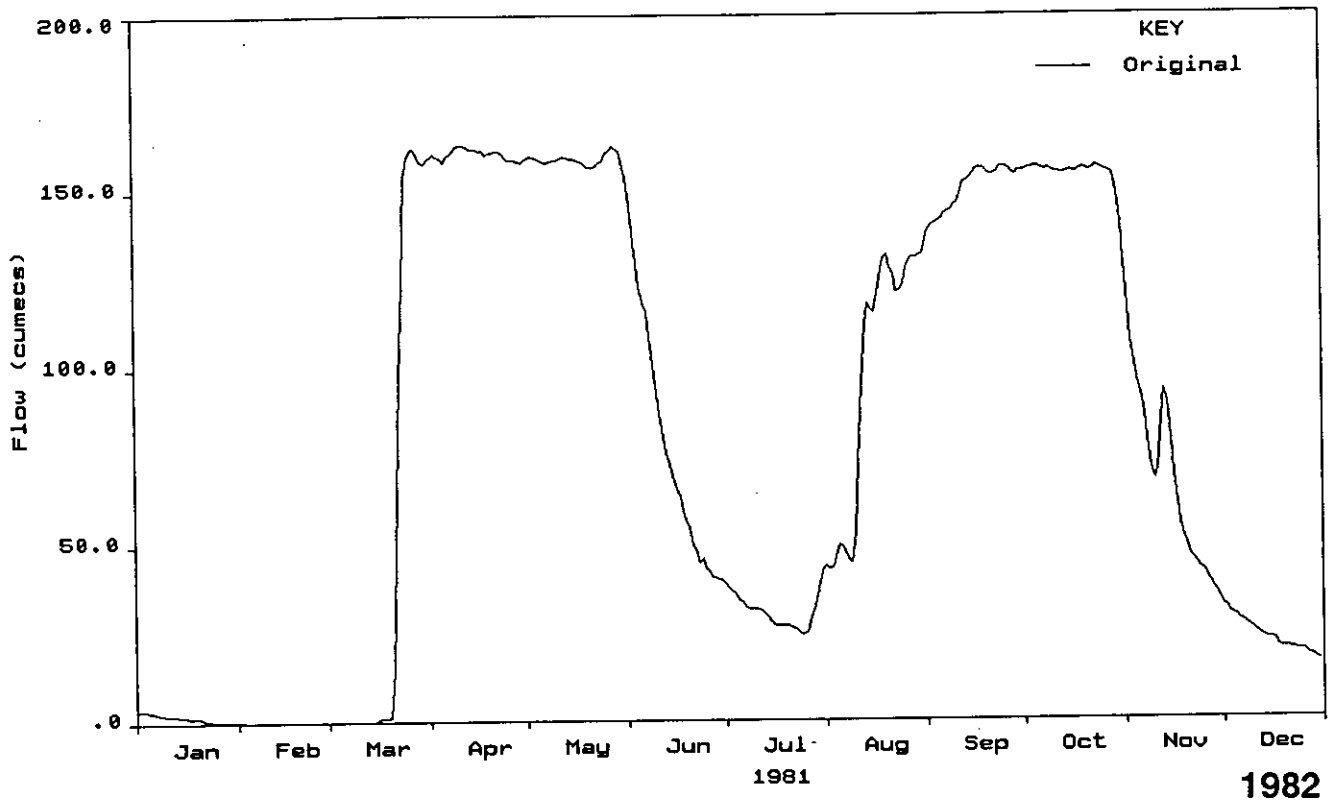
River Shebelli at Mahaddey Weyn

1979



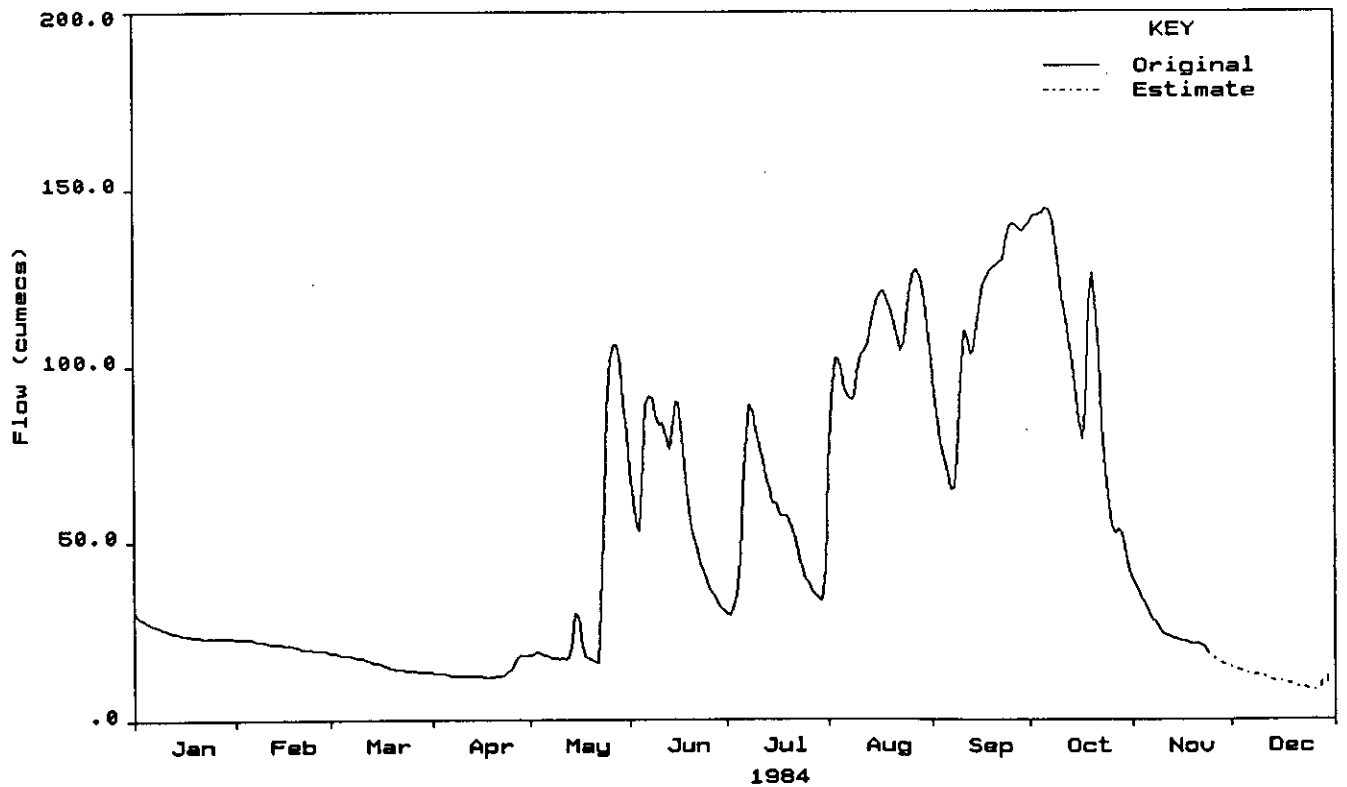
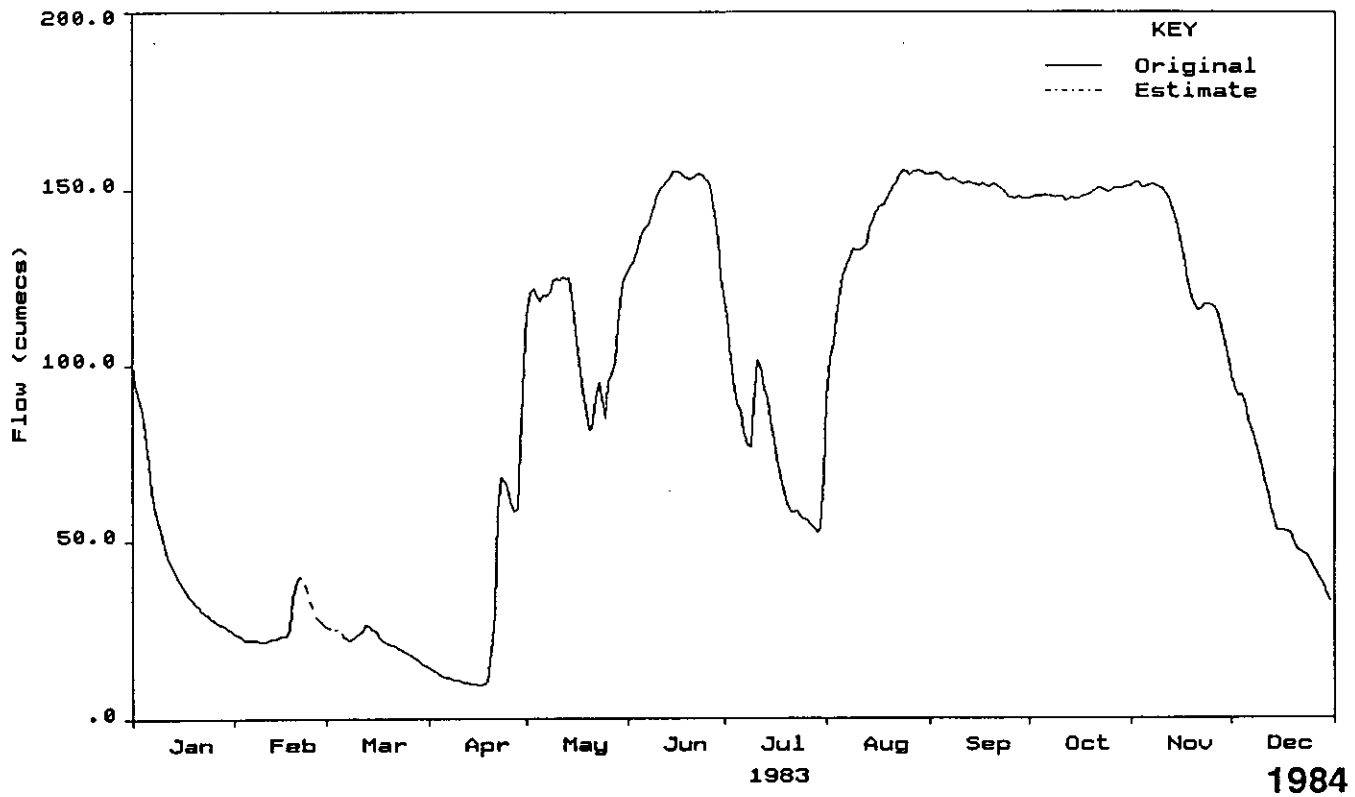
River Shebelli at Mahaddey Weyn

1981



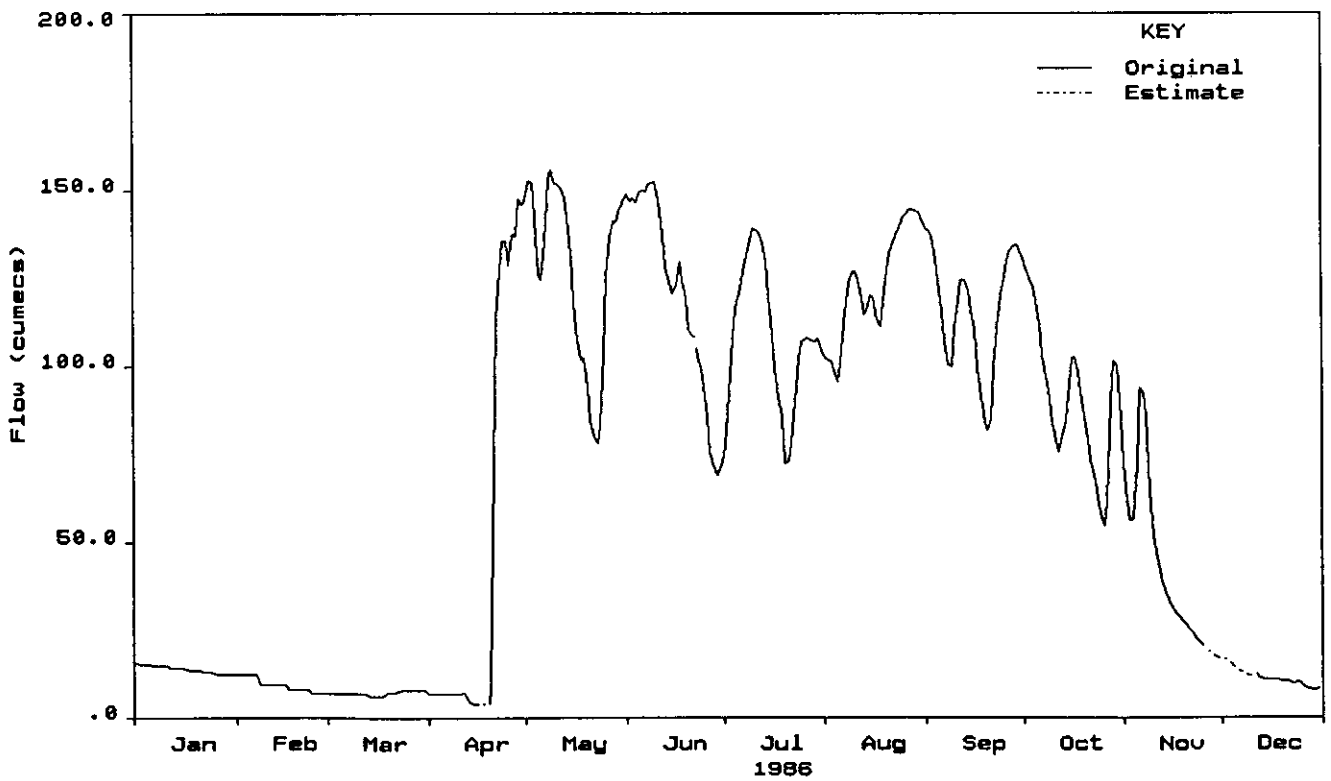
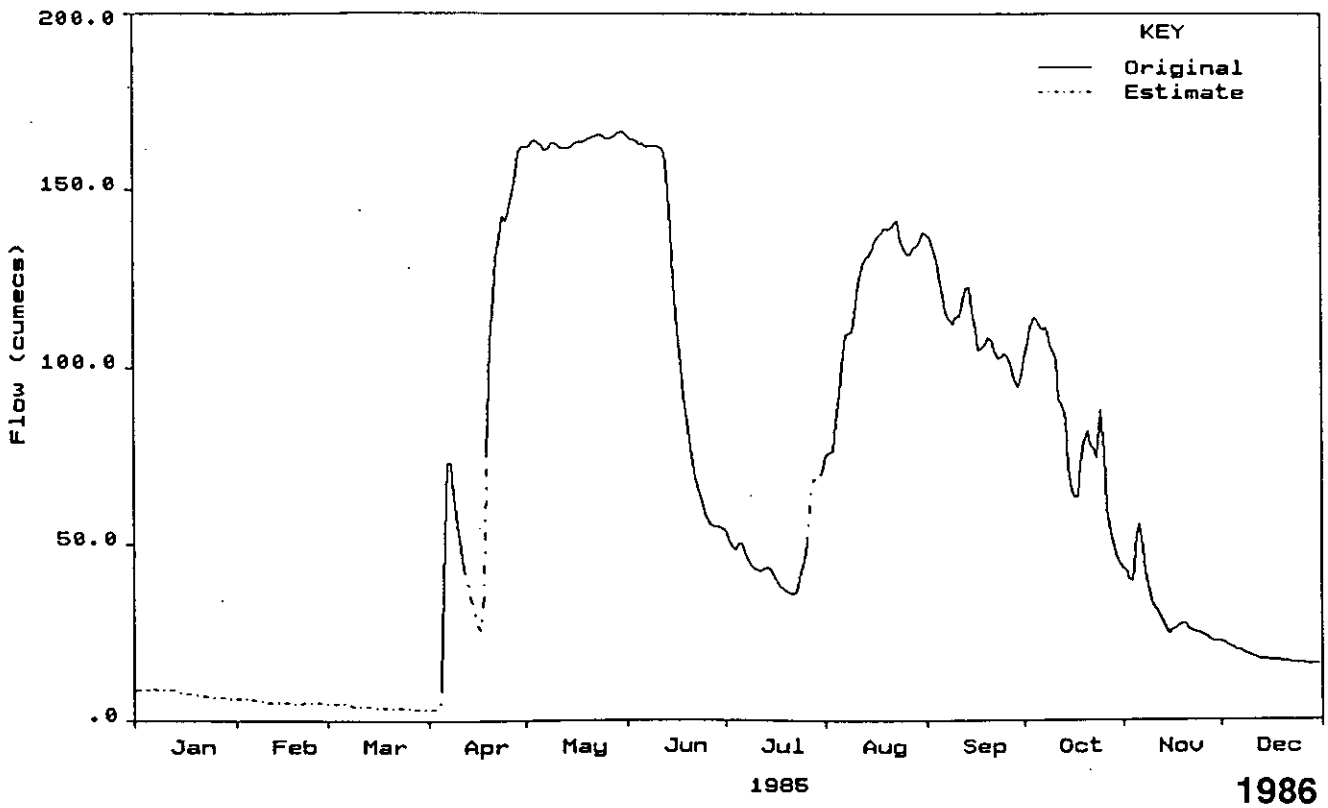
River Shebelli at Mahaddey Weyn

1983



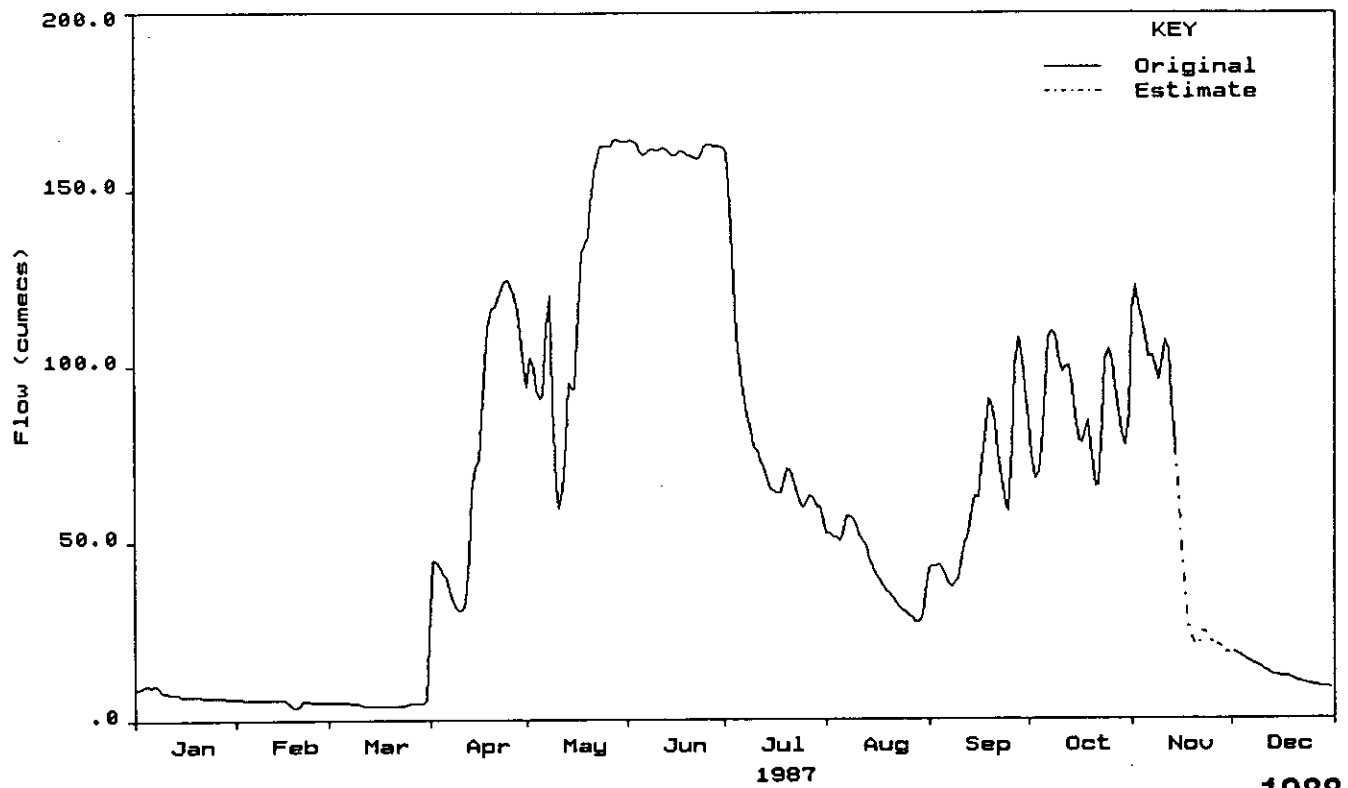
River Shebelli at Mahaddey Weyn

1985

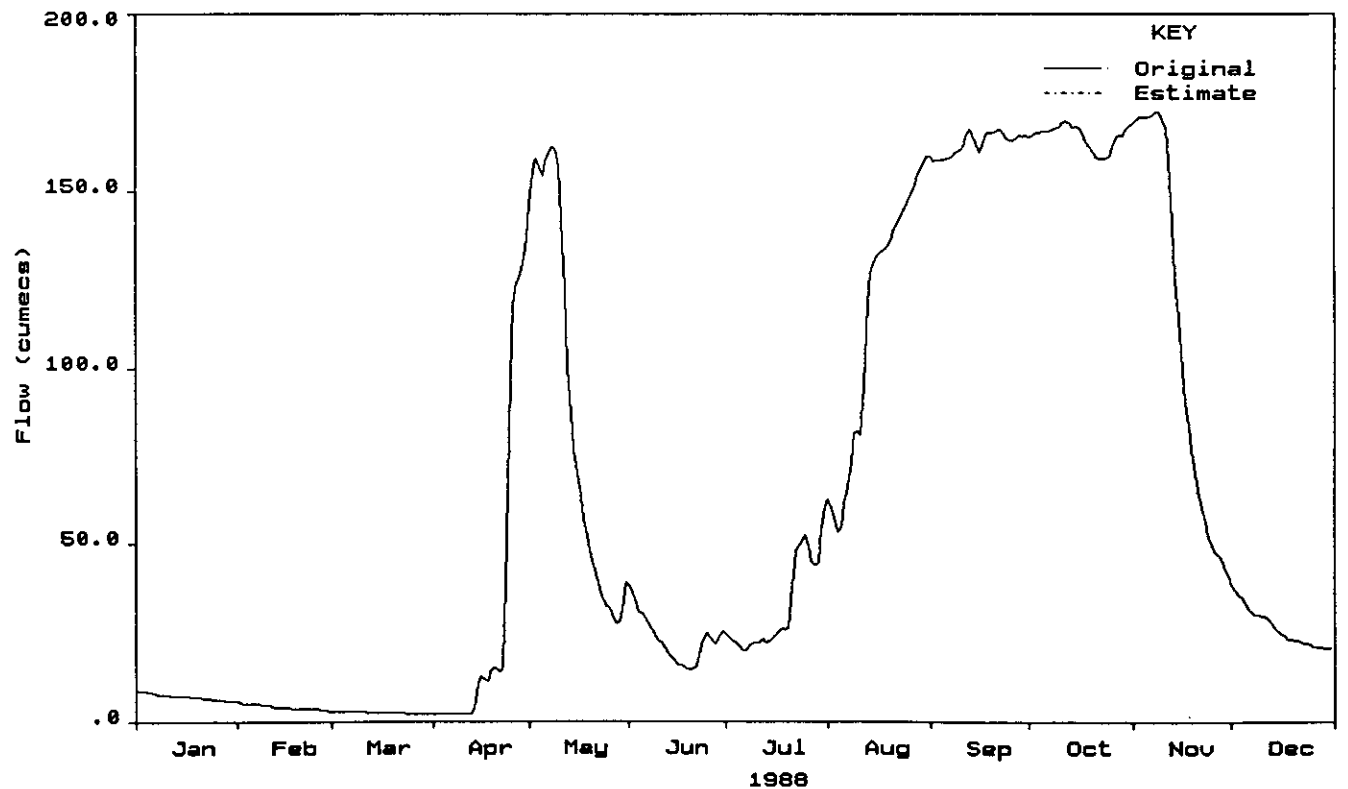


River Shebelli at Mahaddey Weyn

1987

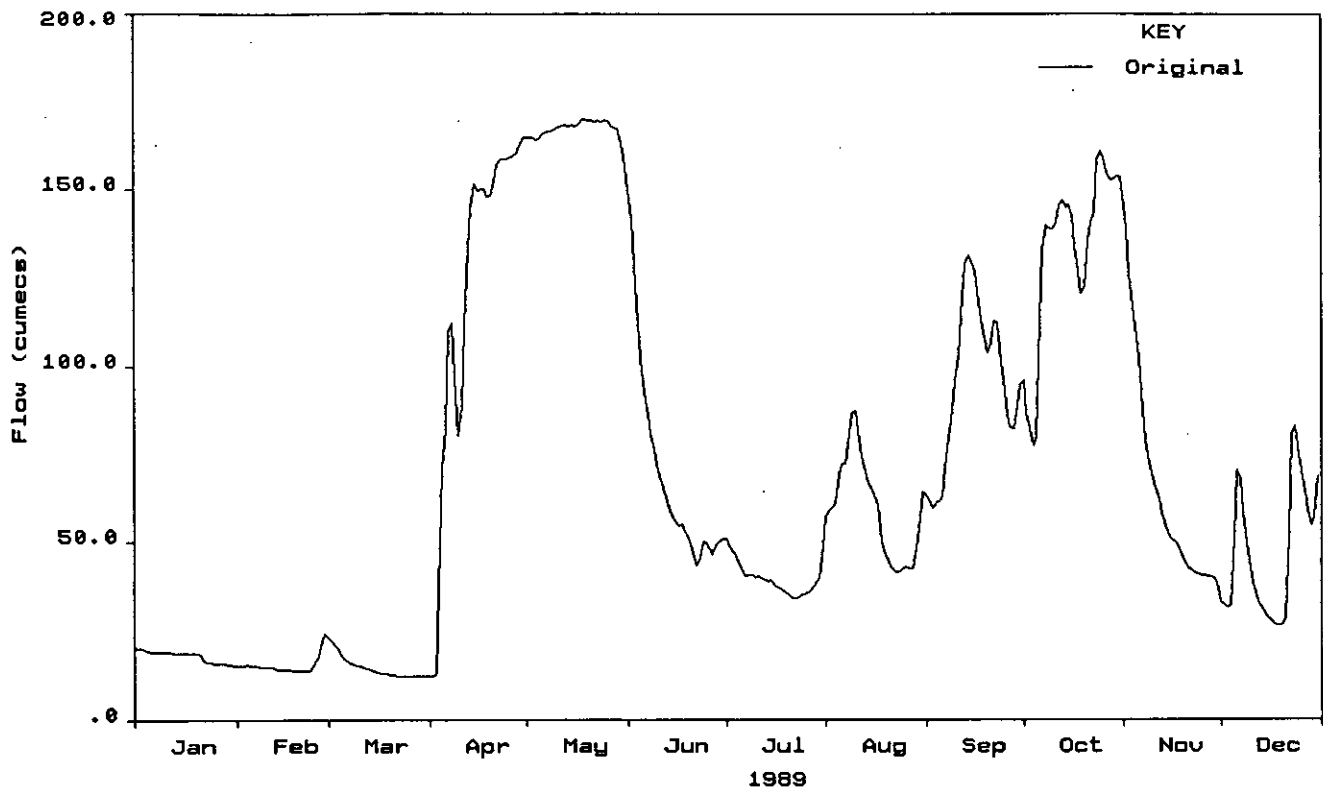


1988



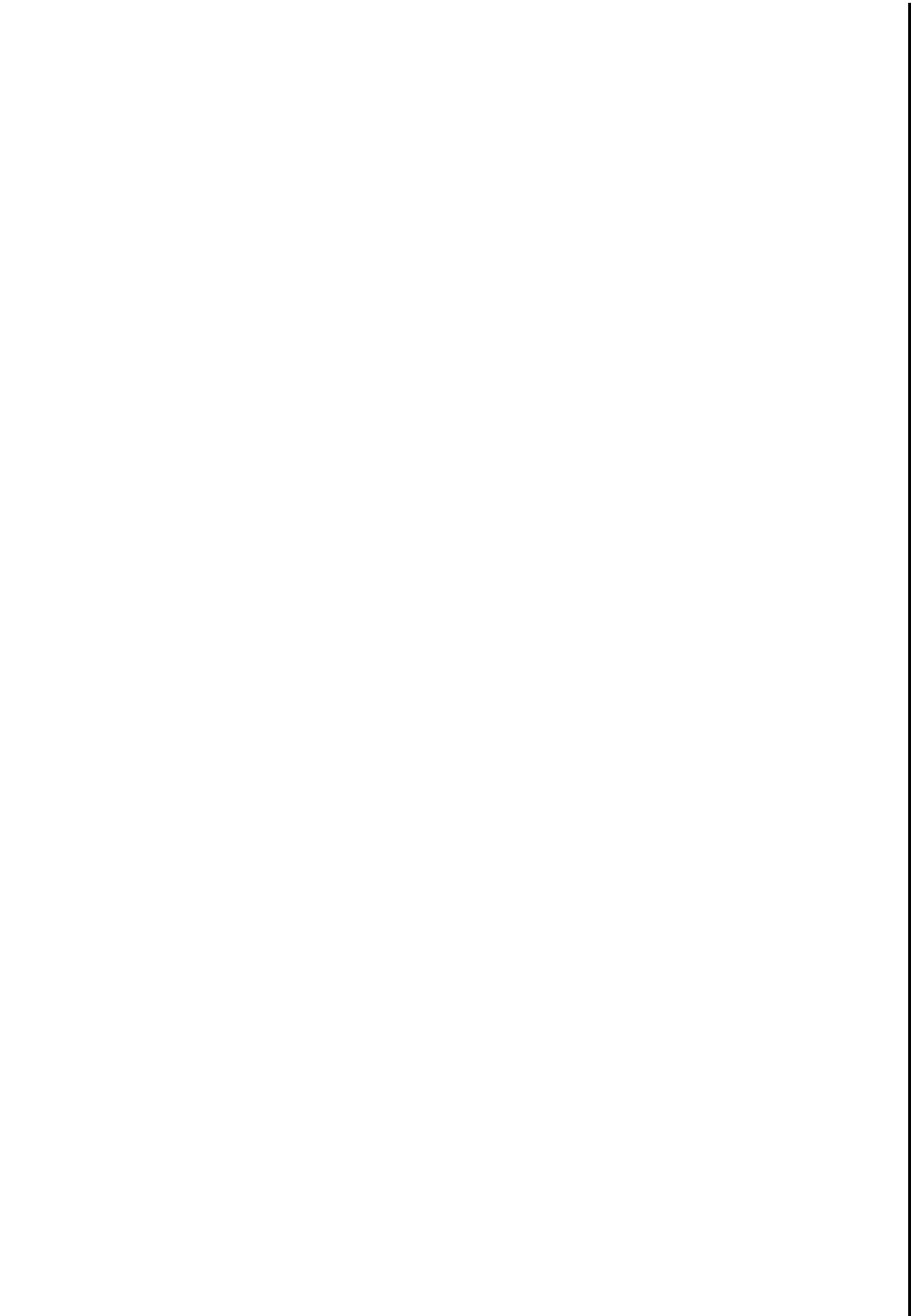
River Shebelli at Mahaddey Weyn

1989



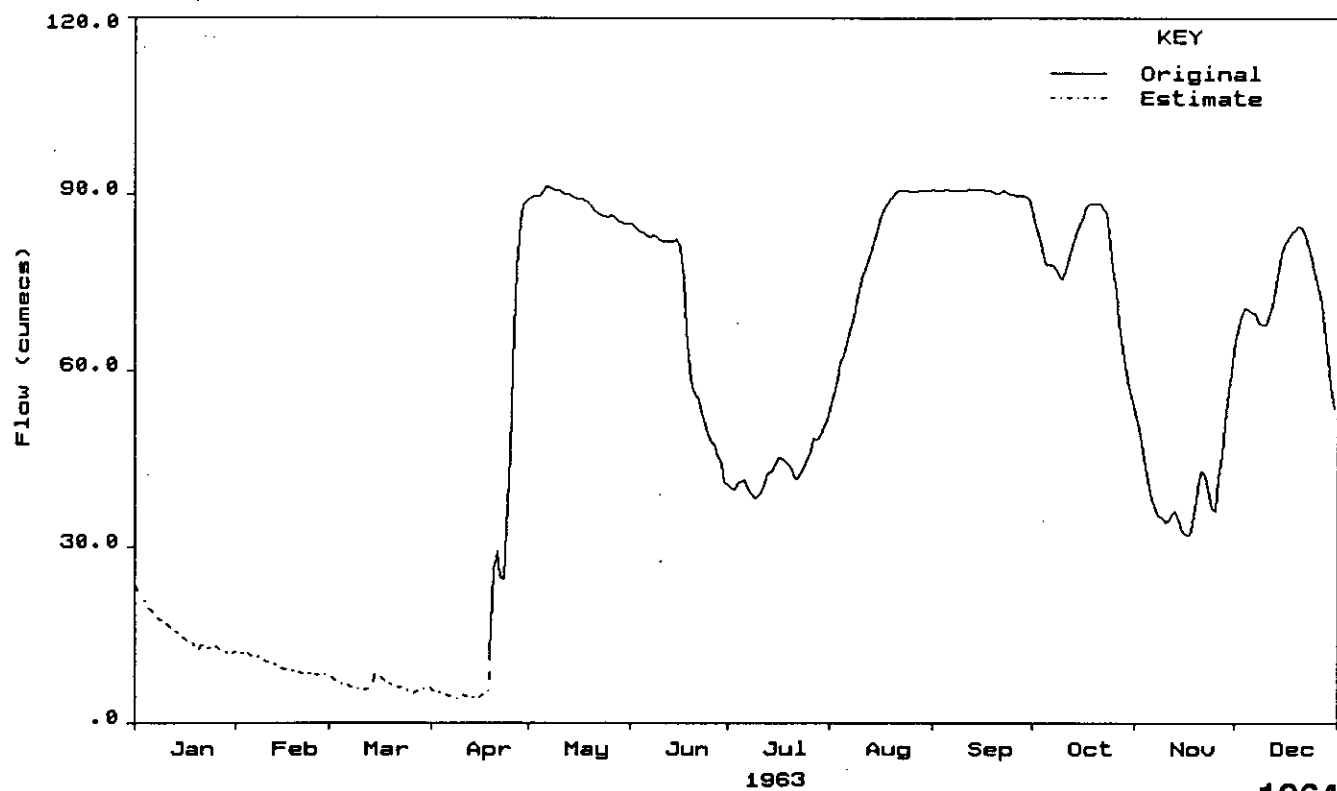
BALCAD

1963 - 1979

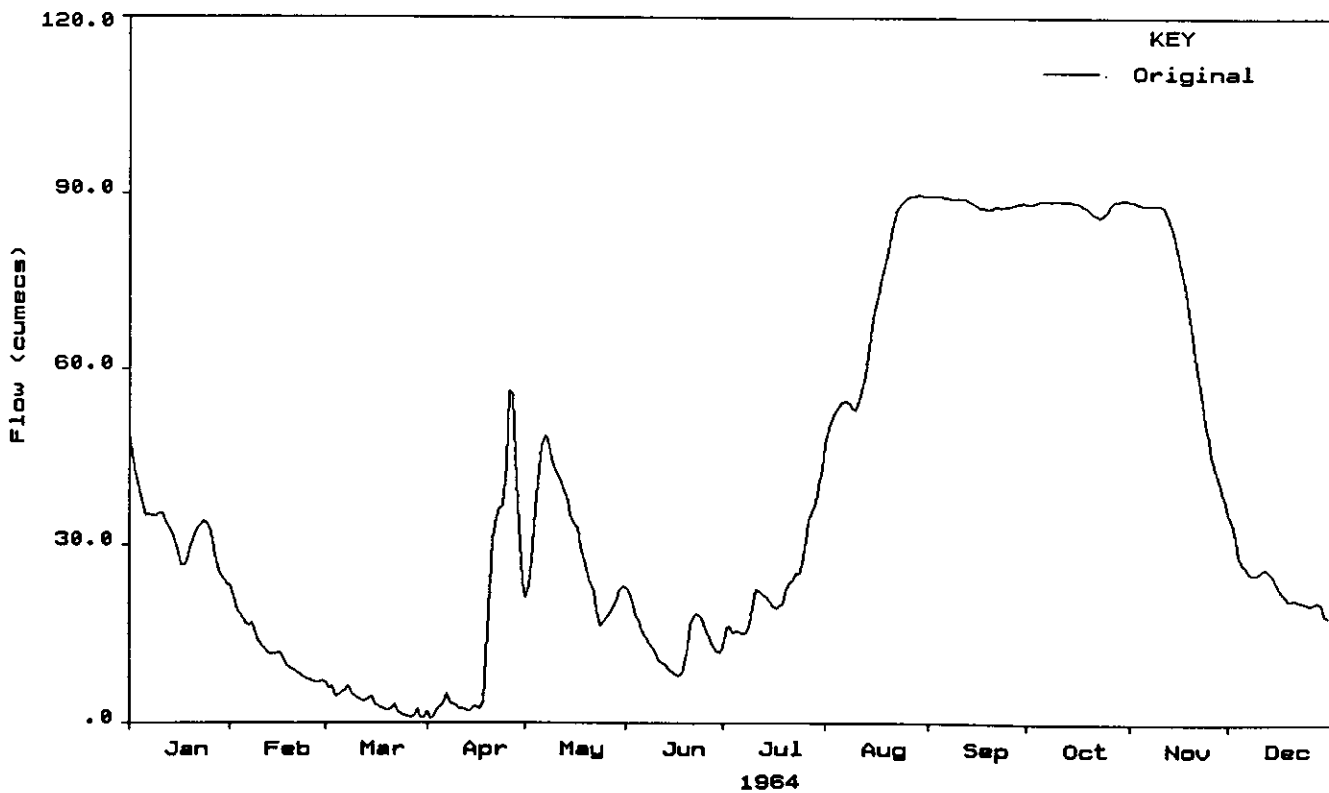


River Shebelli at Balcad

1963

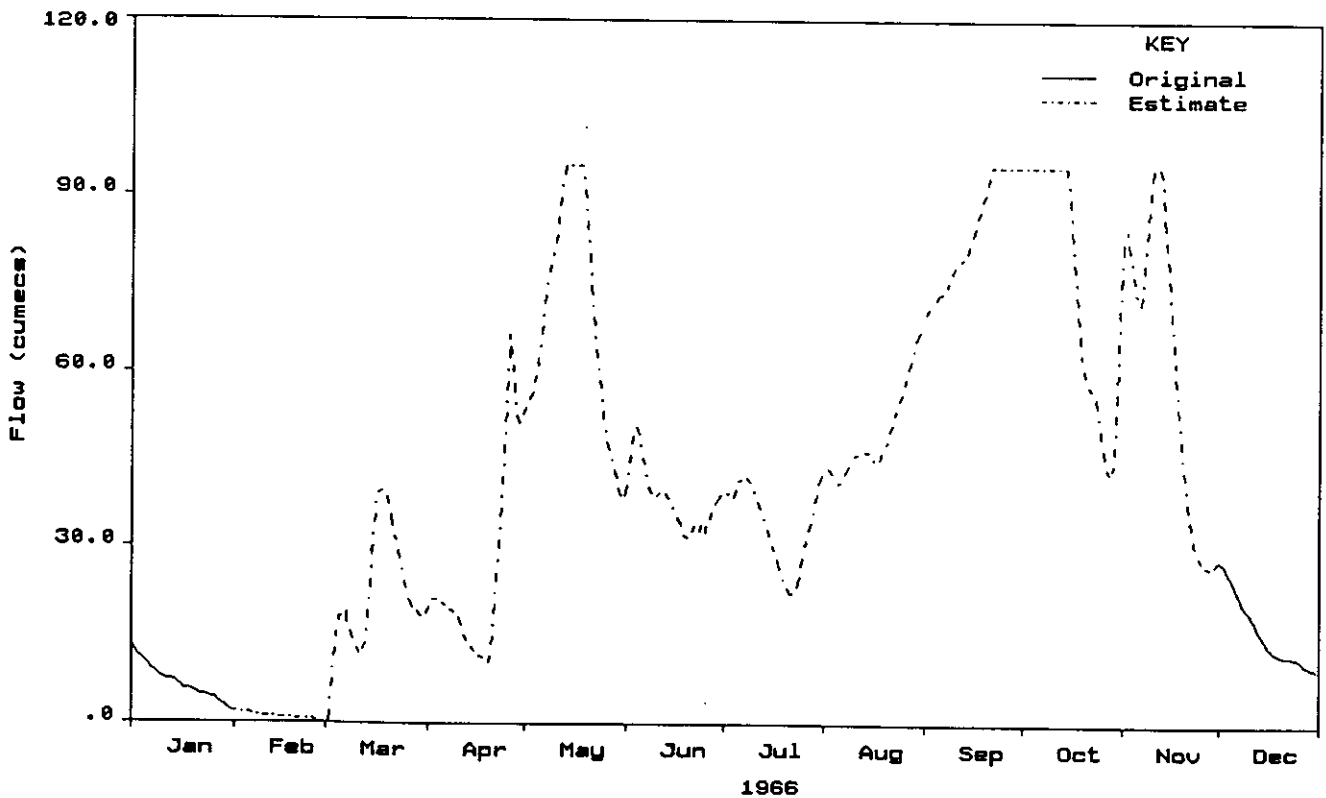
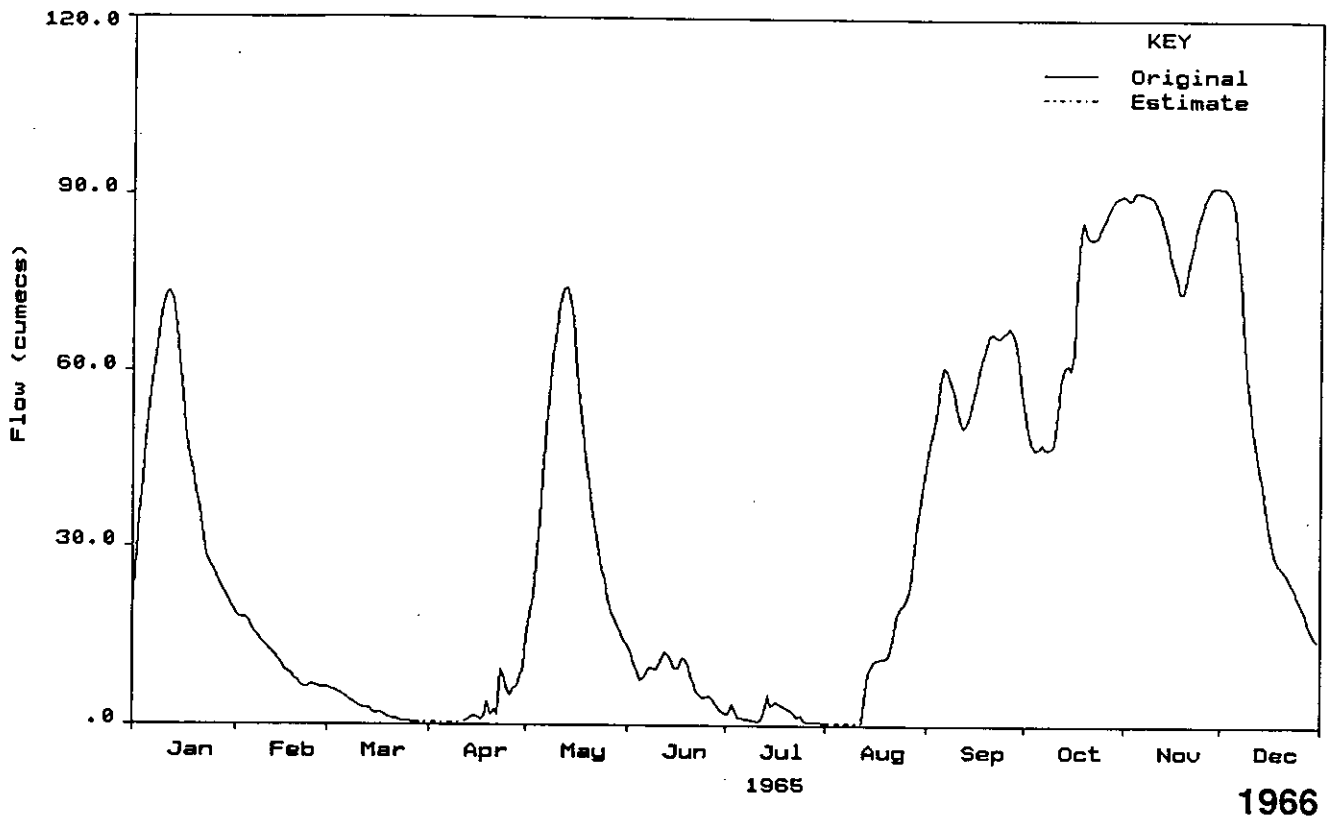


1964



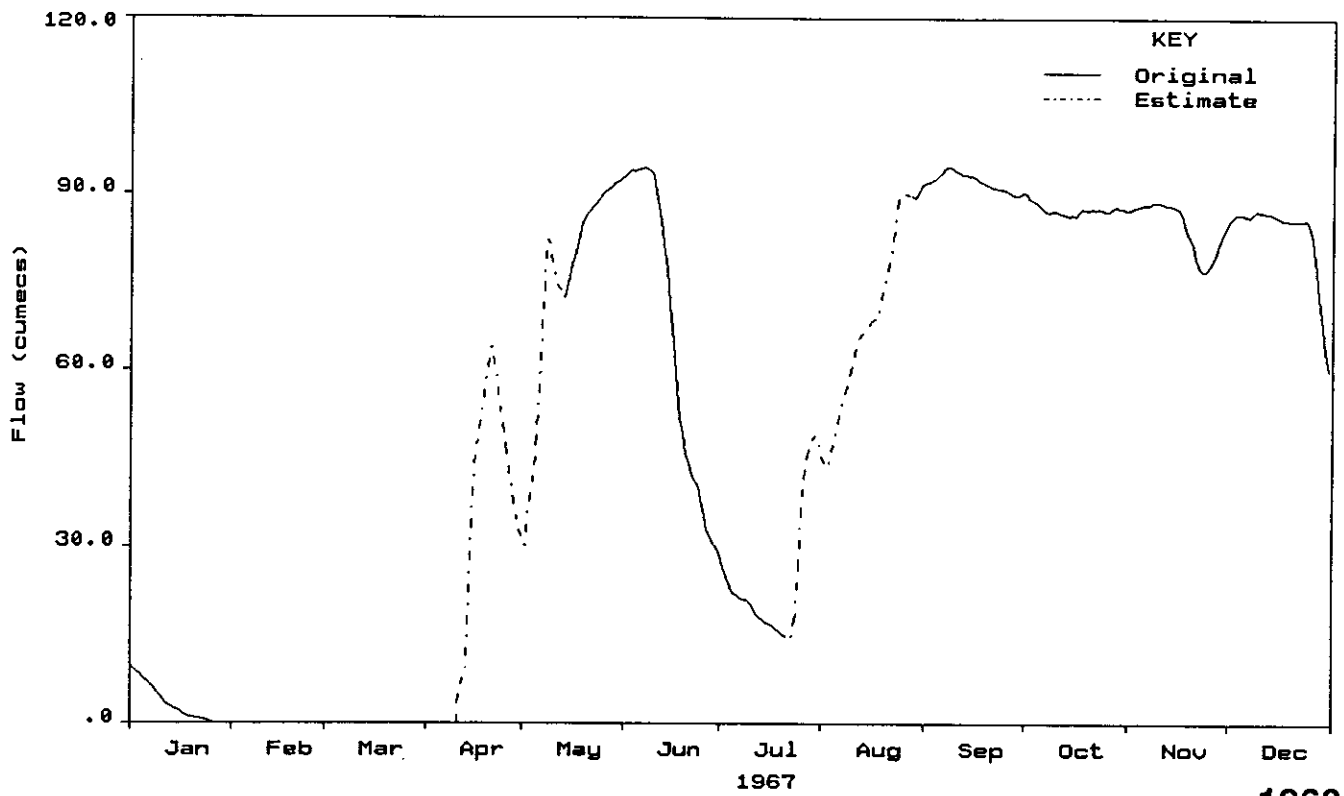
River Shebelli at Balcad

1965

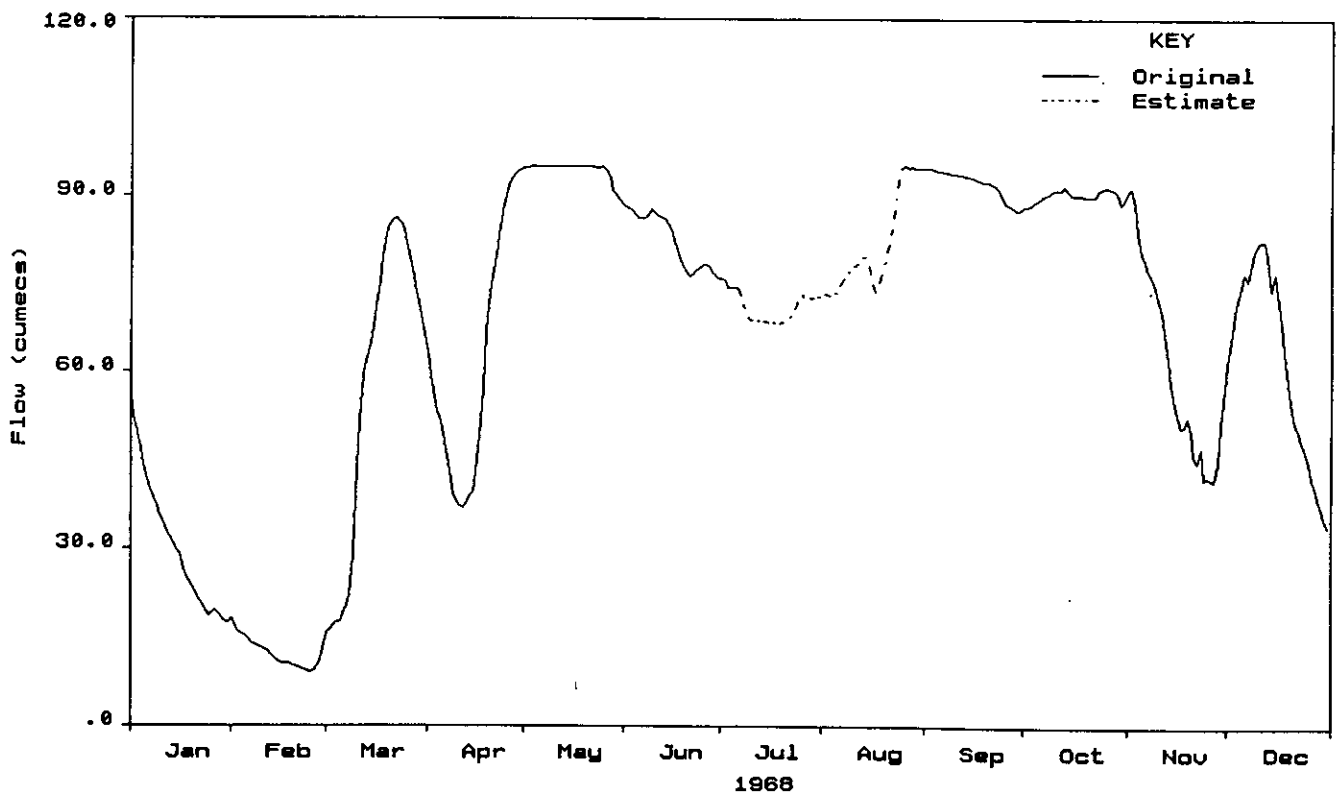


River Shebelli at Balcad

1967

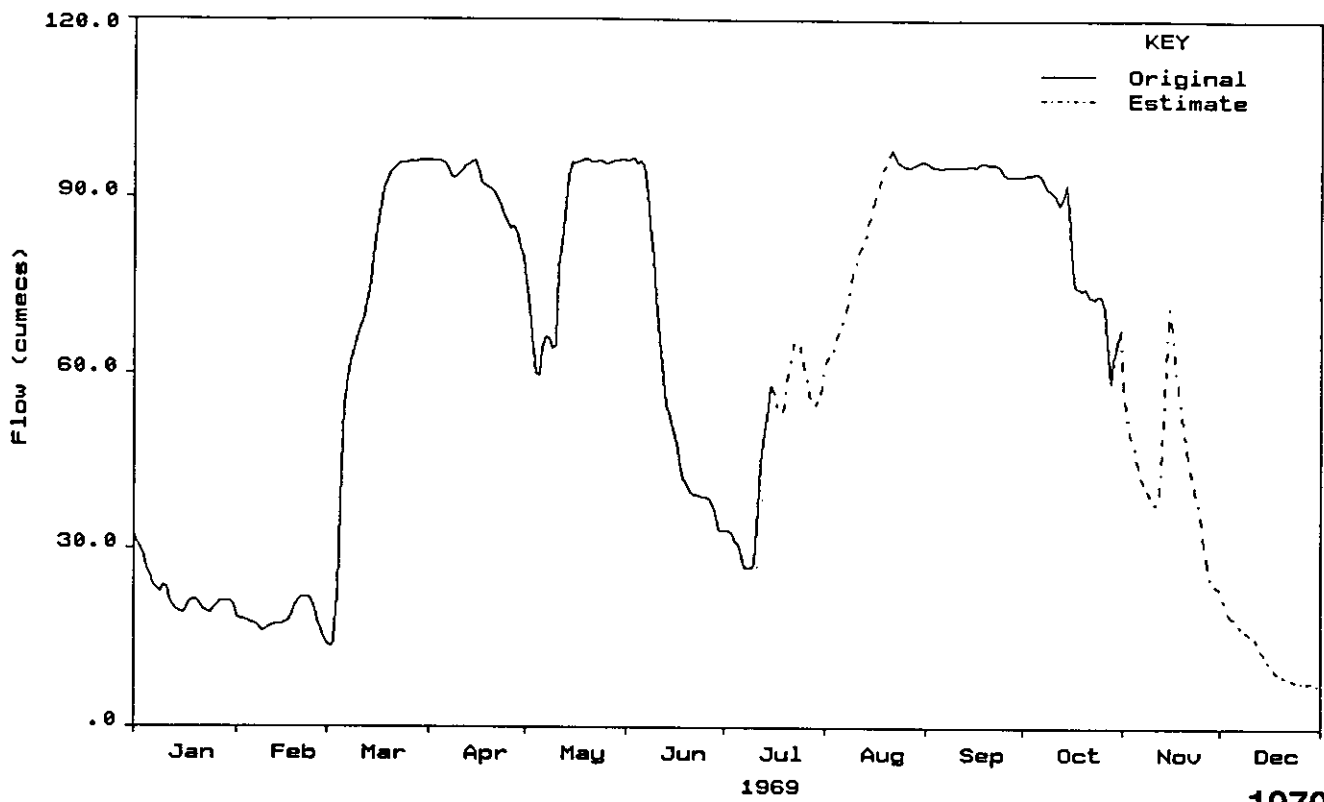


1968

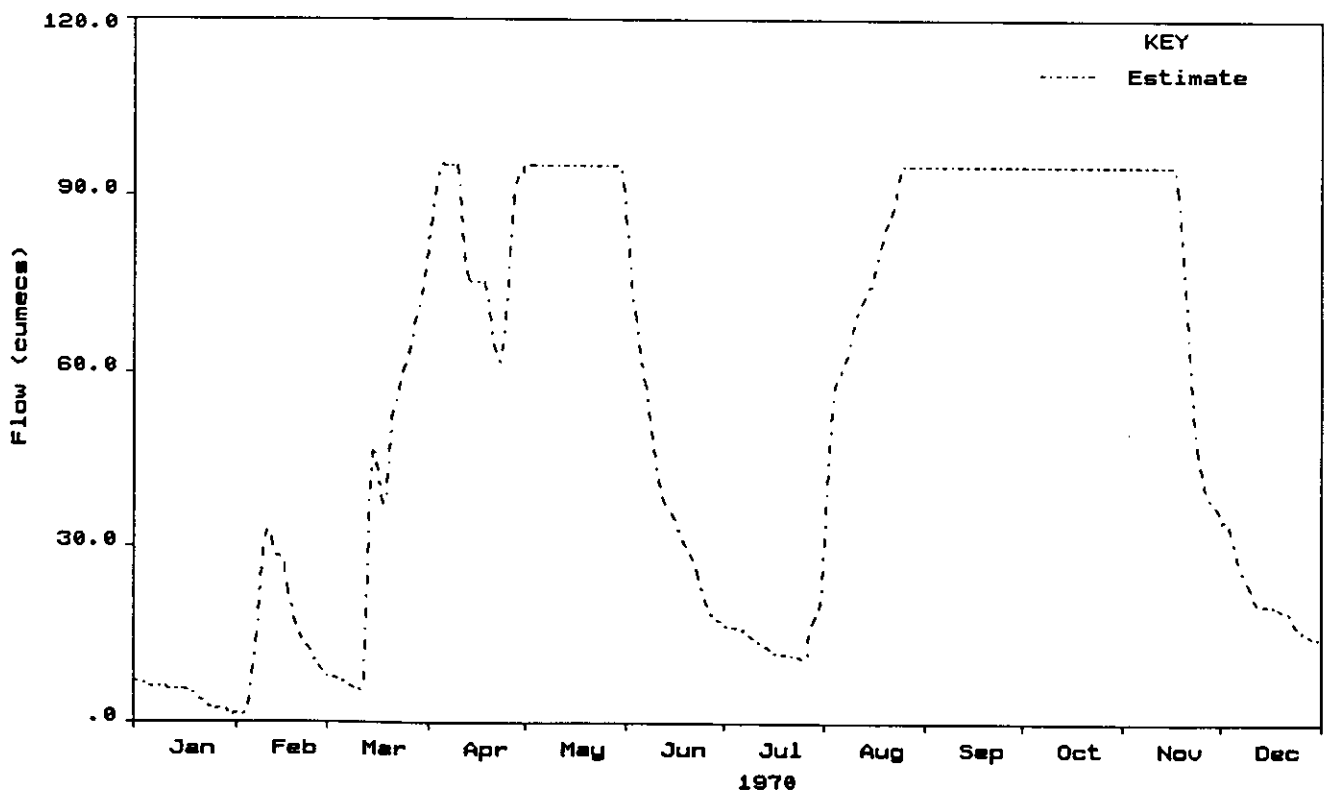


River Shebelli at Balcad

1969

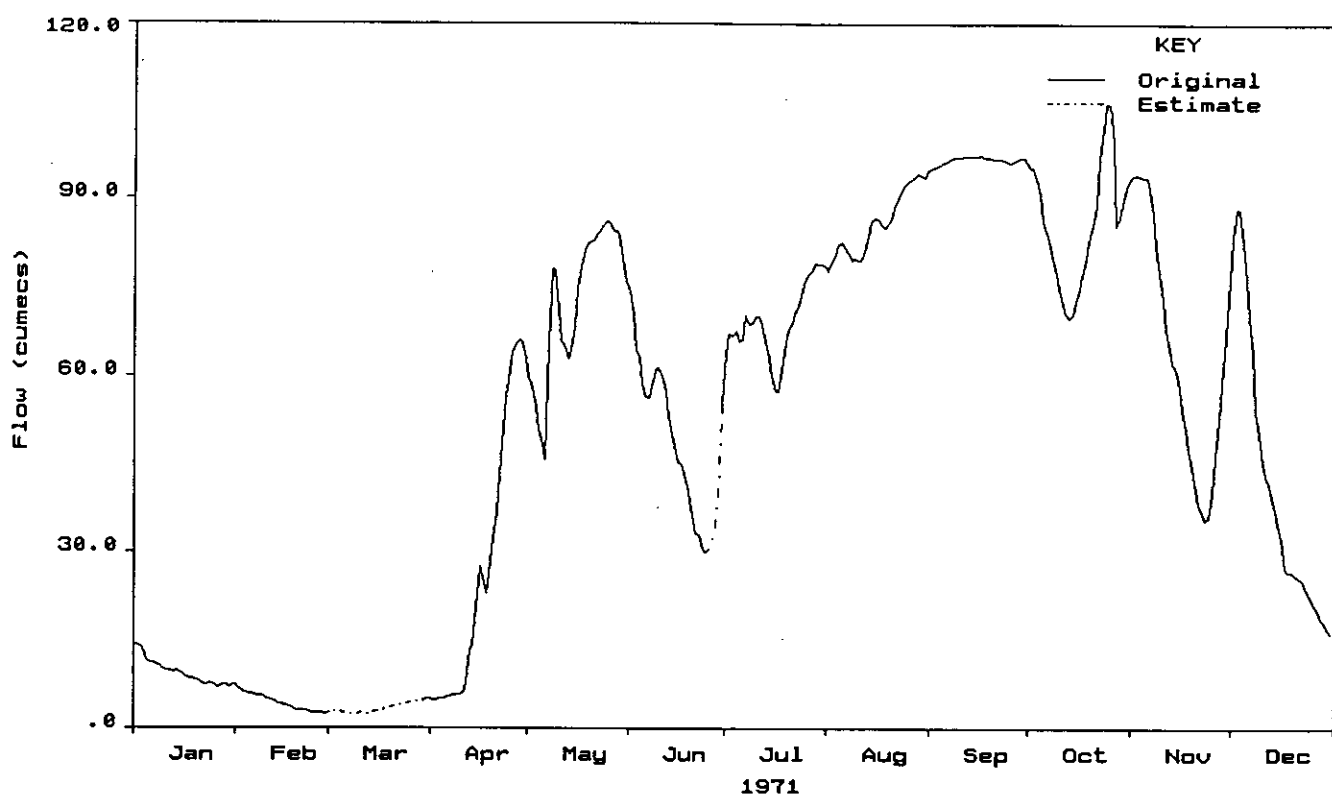


1970

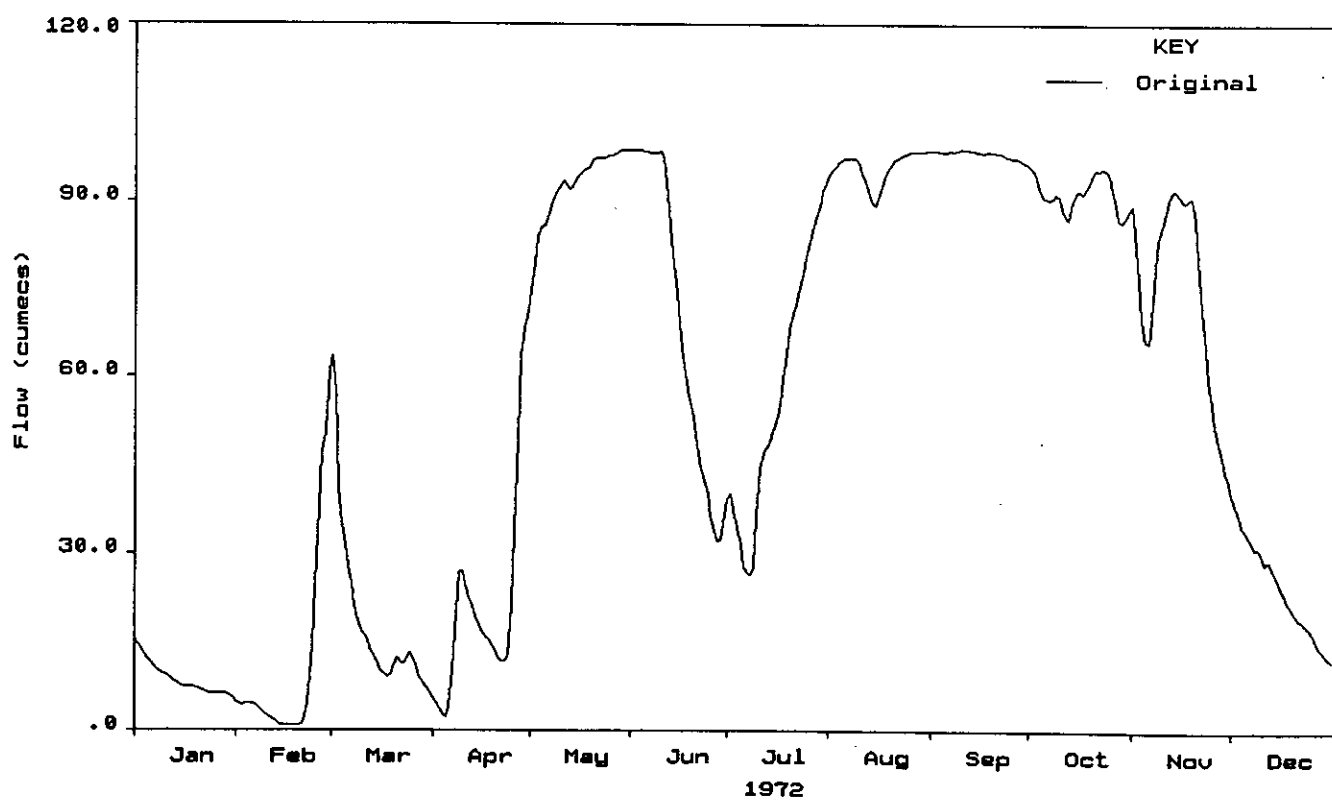


River Shebelli at Balcad

1971

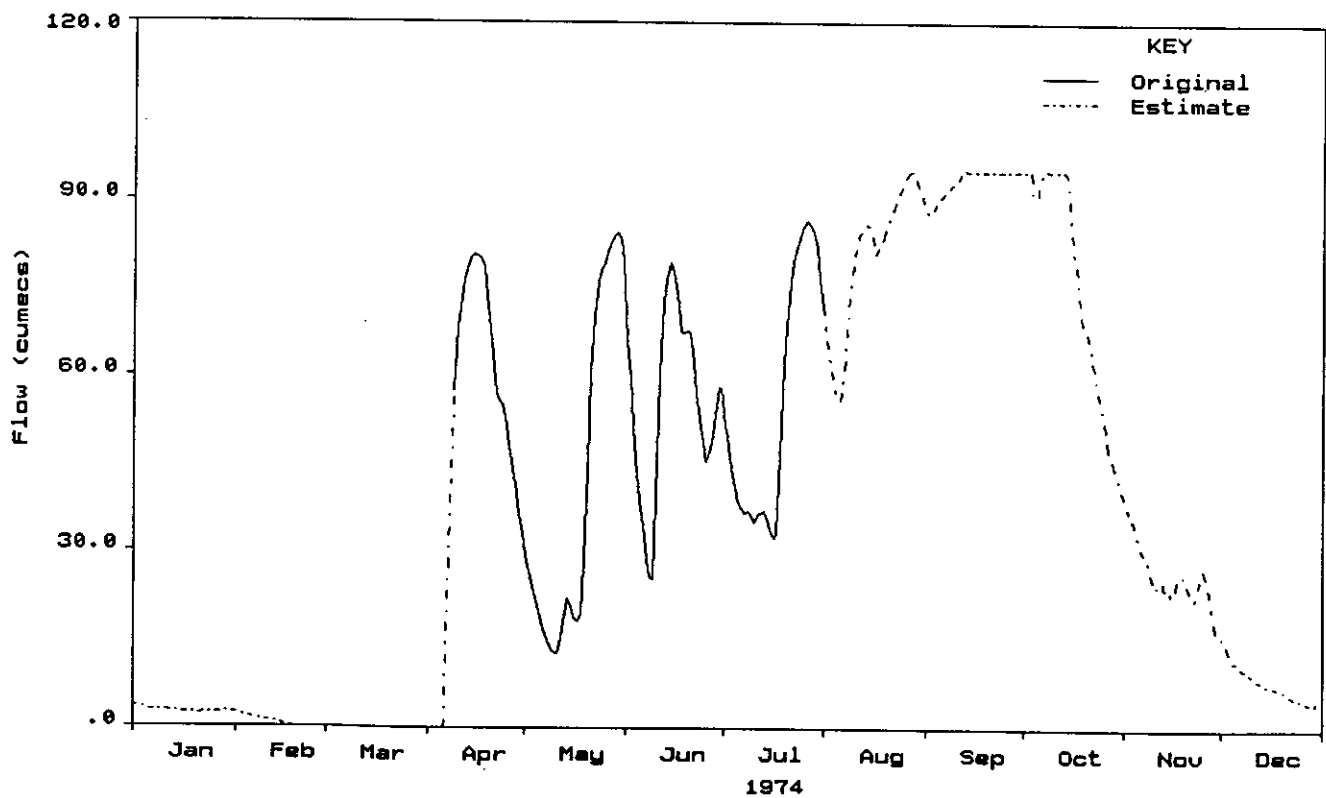
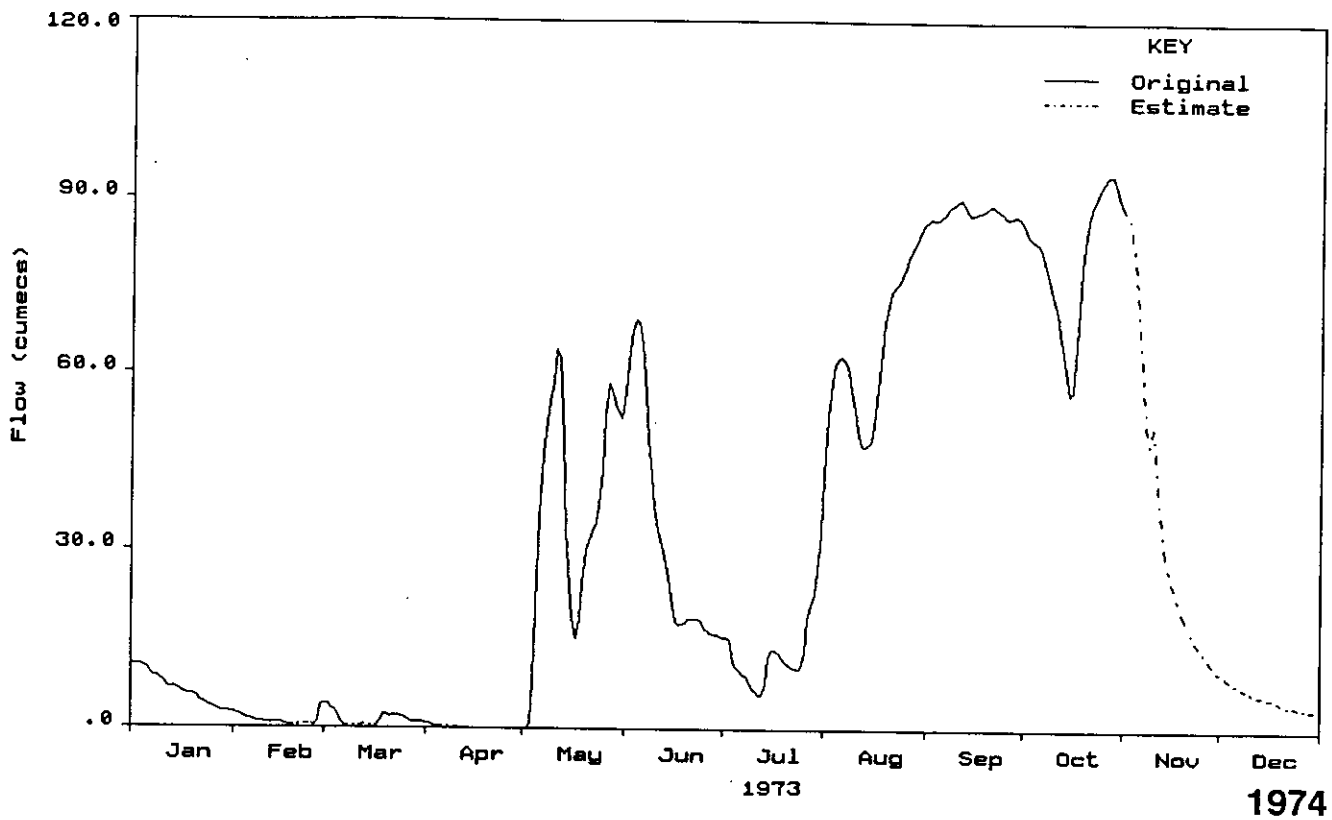


1972



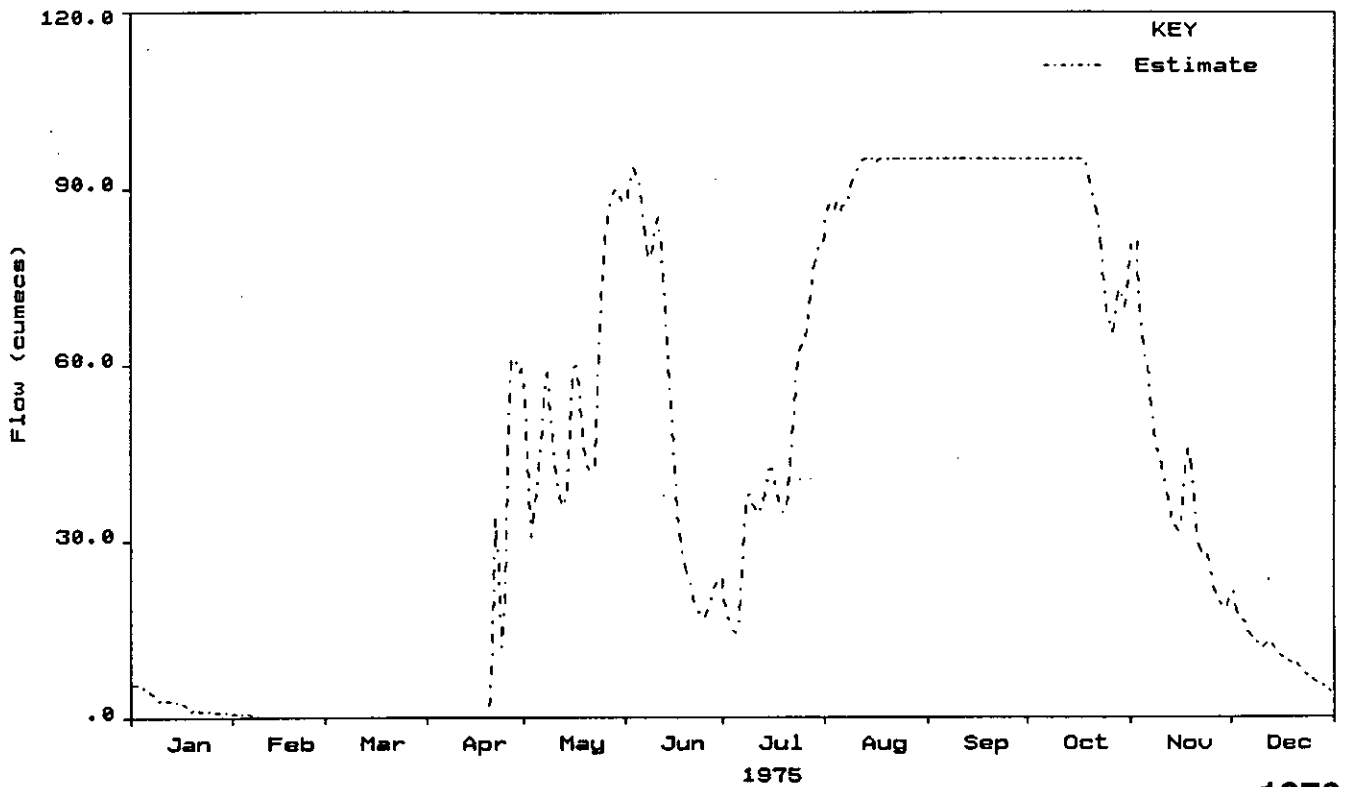
River Shebelli at Balcad

1973

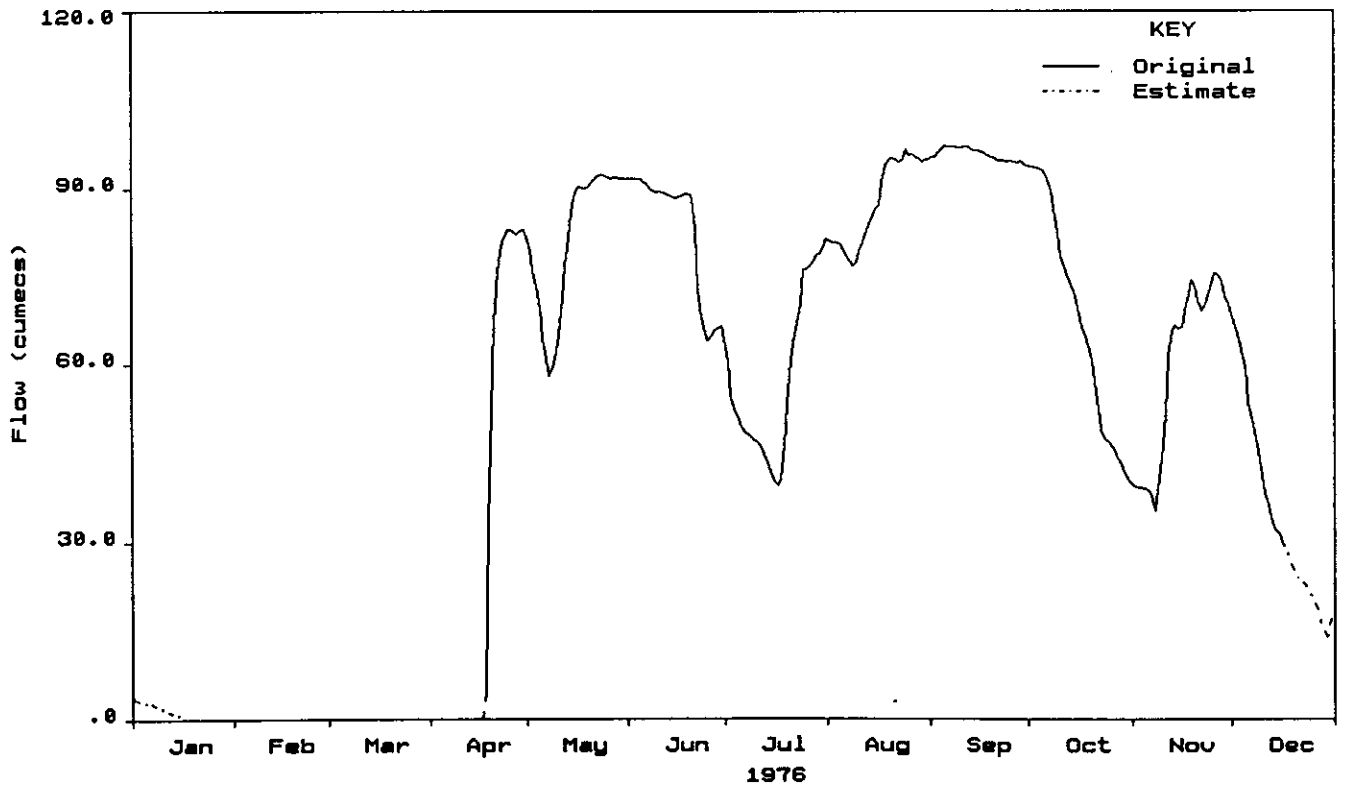


River Shebelli at Balcad

1975

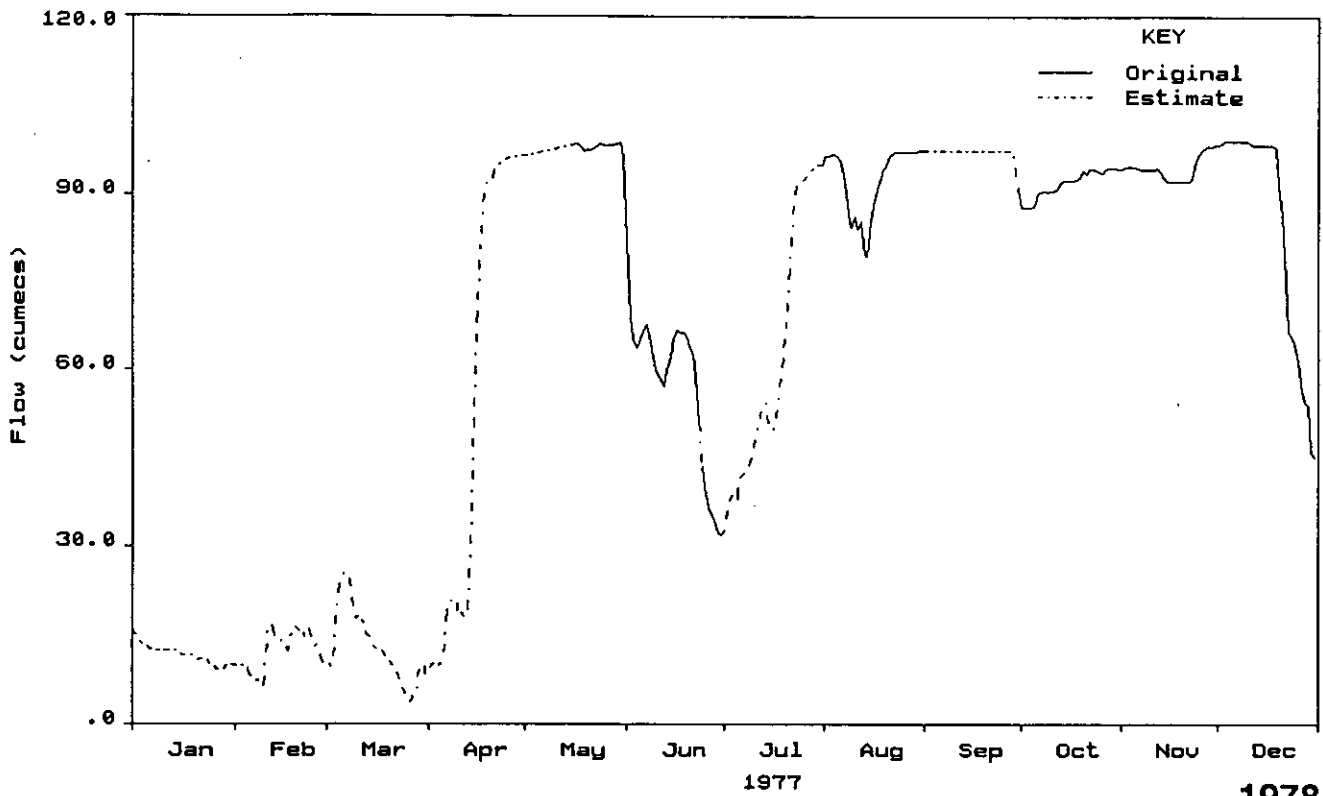


1976

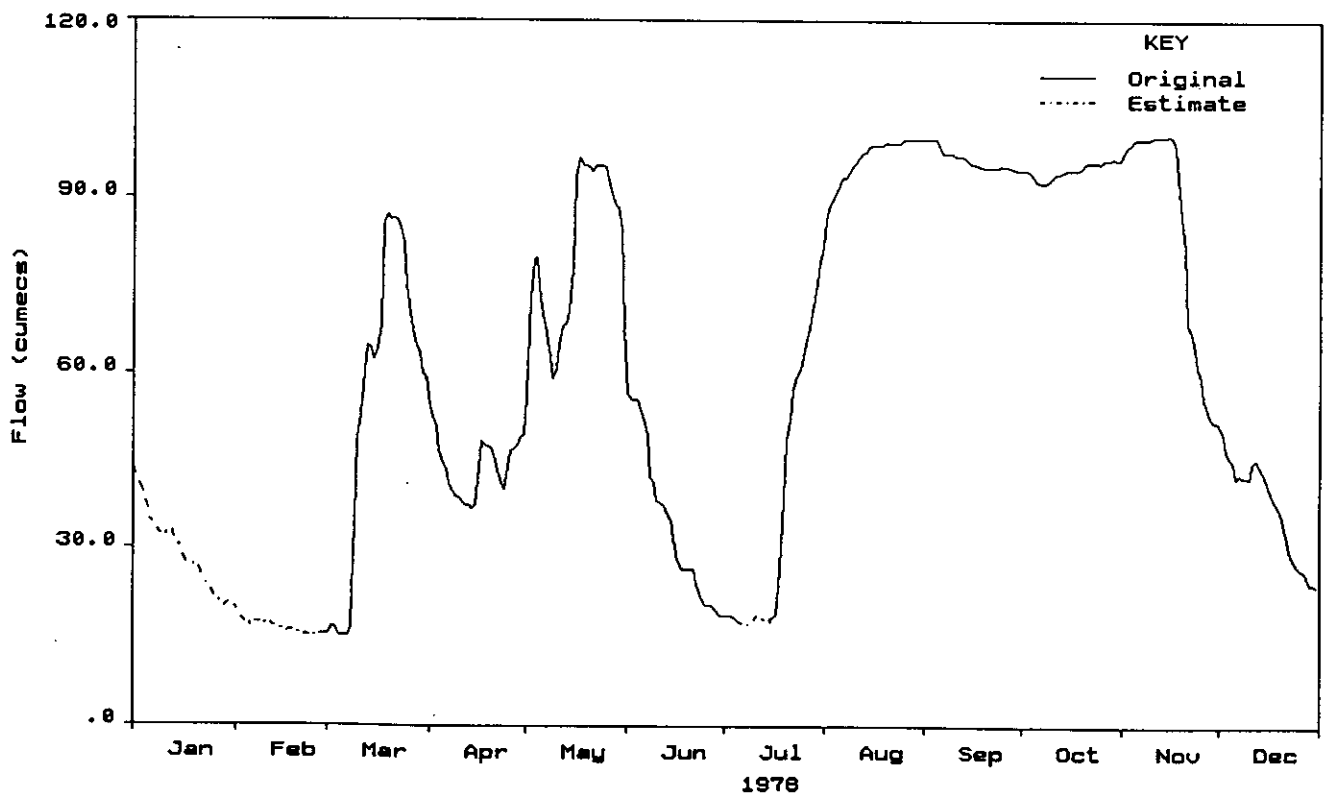


River Shebelli at Balcad

1977

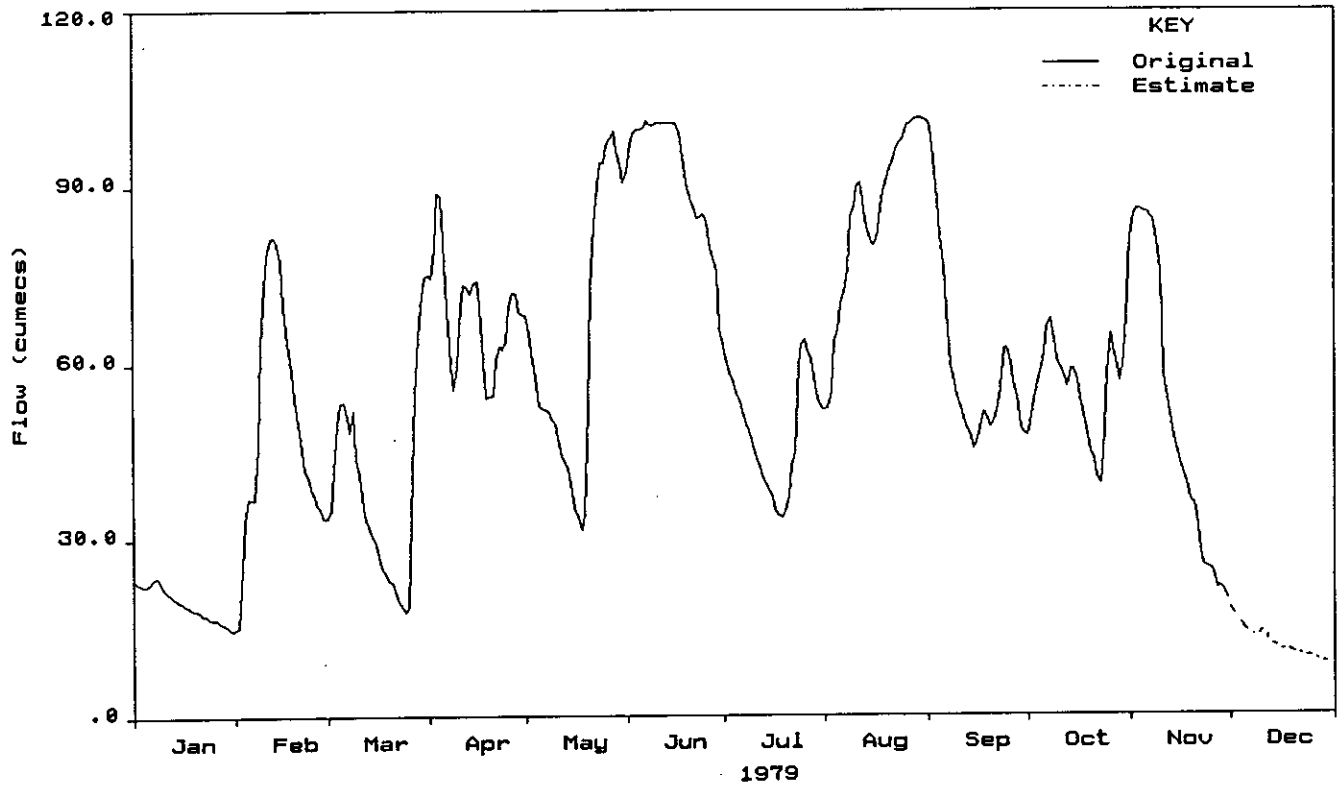


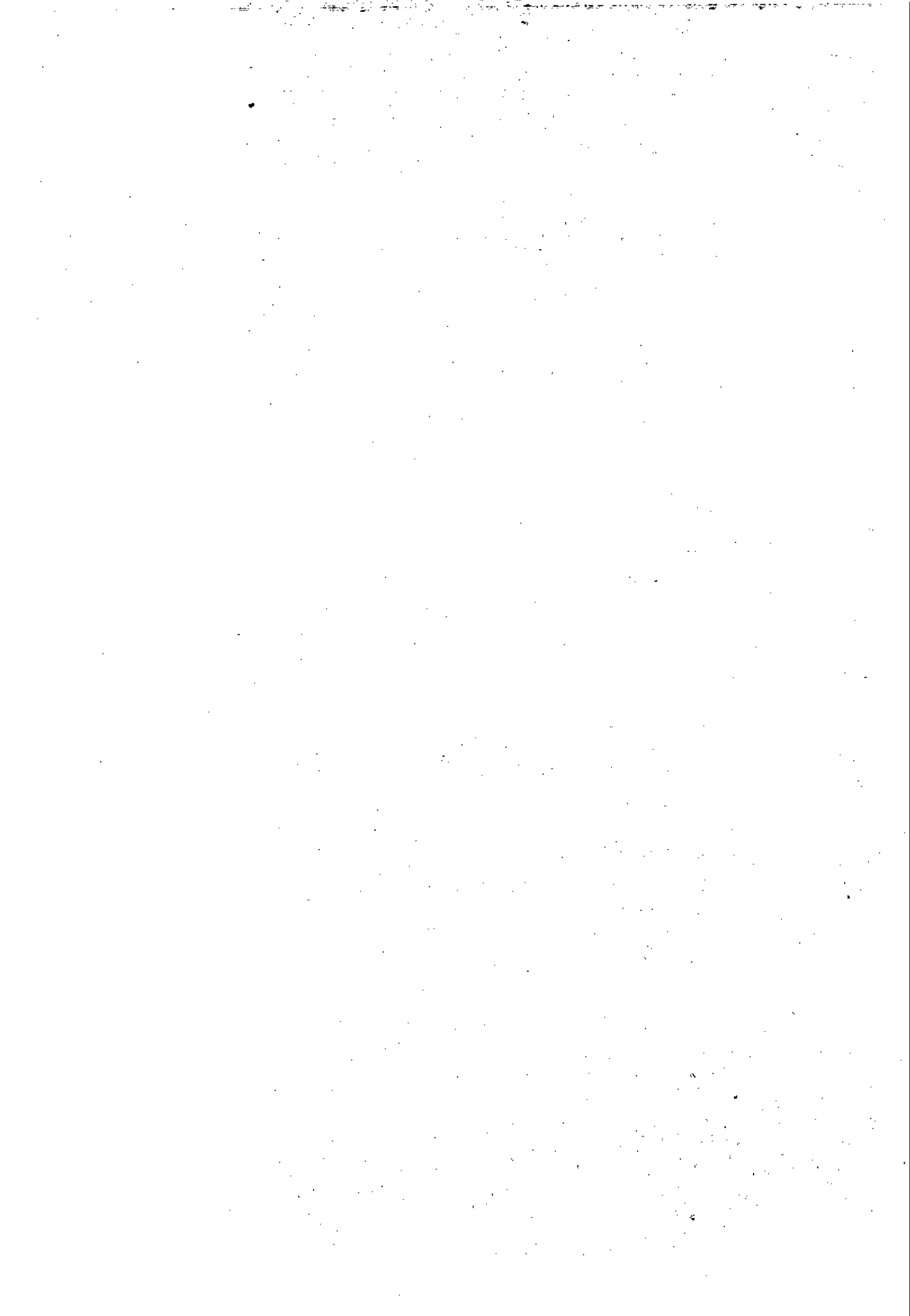
1978



River Shebelli at Balcad

1979





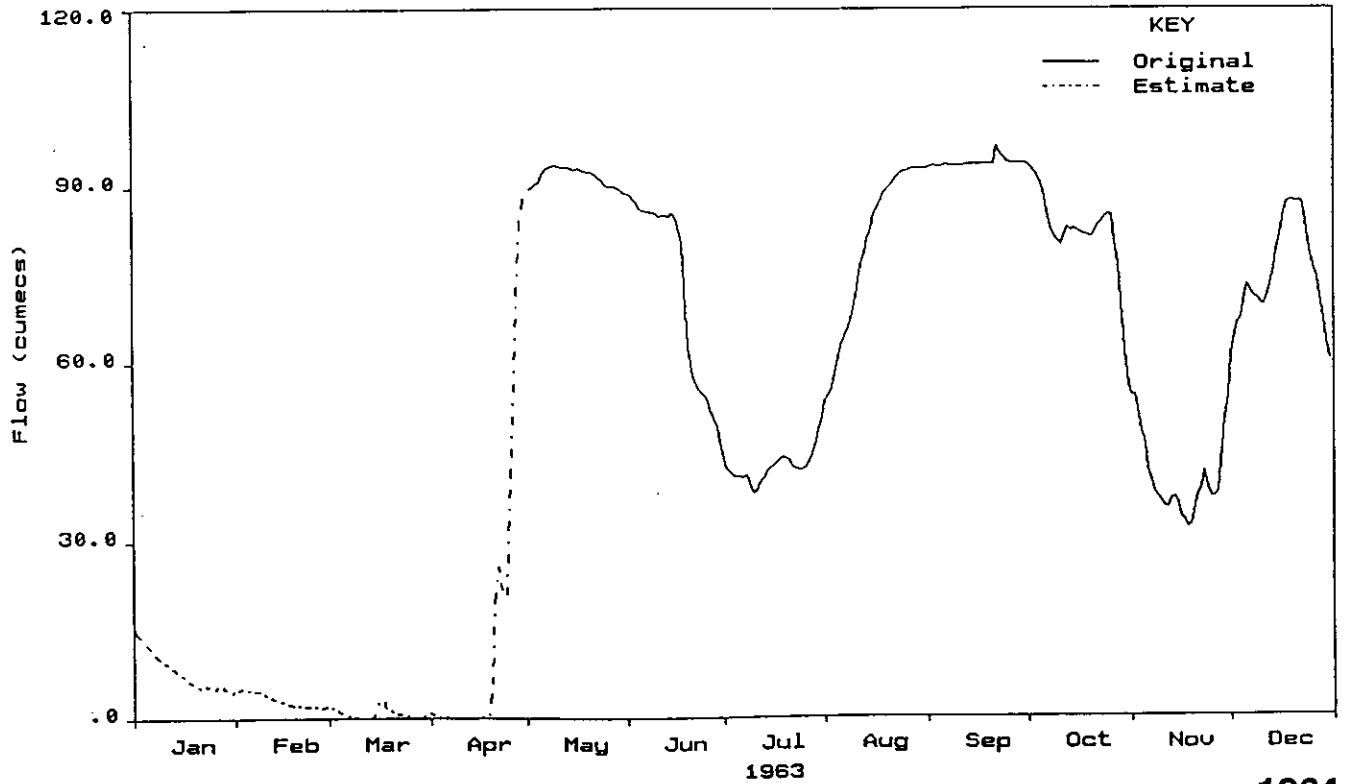
AFGOI

1963 - 1989

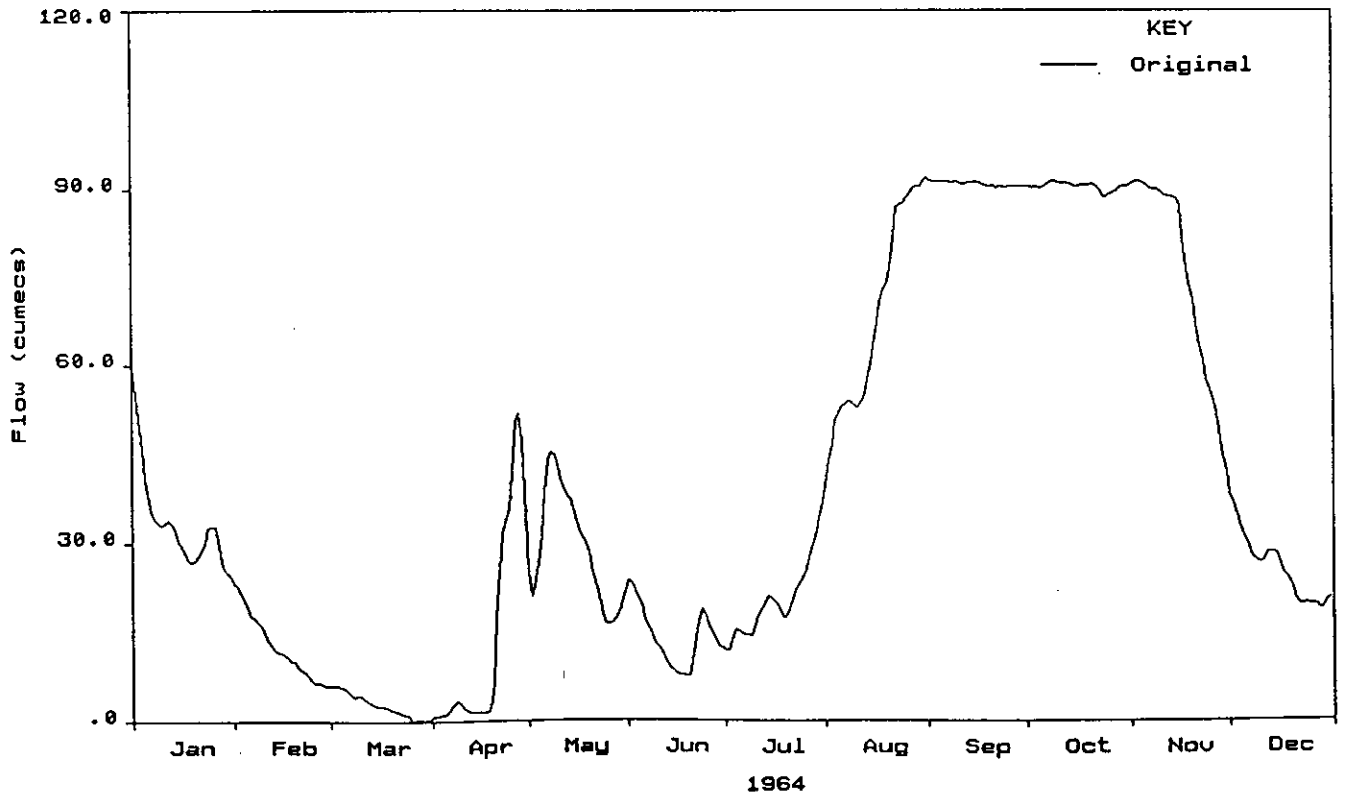


River Shebelli at Afgoi

1963

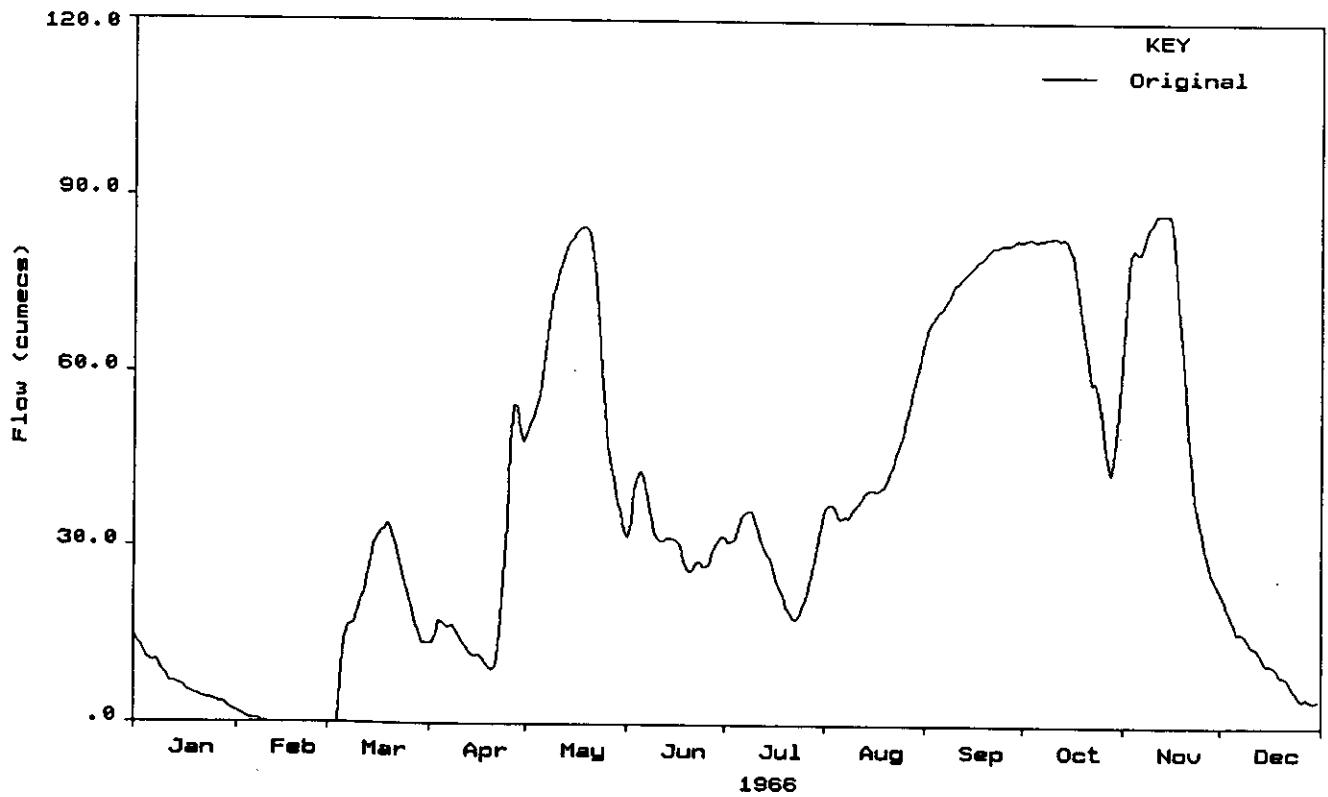
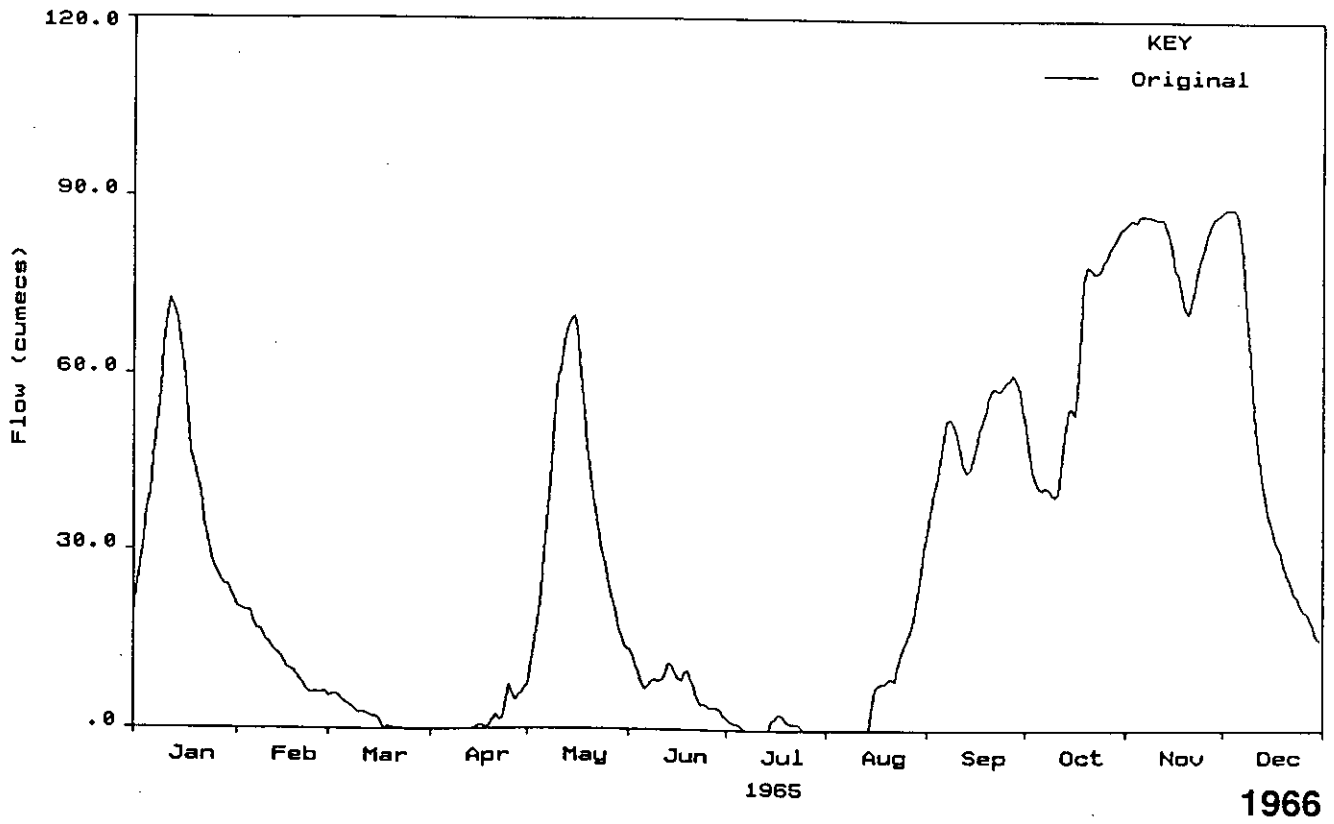


1964



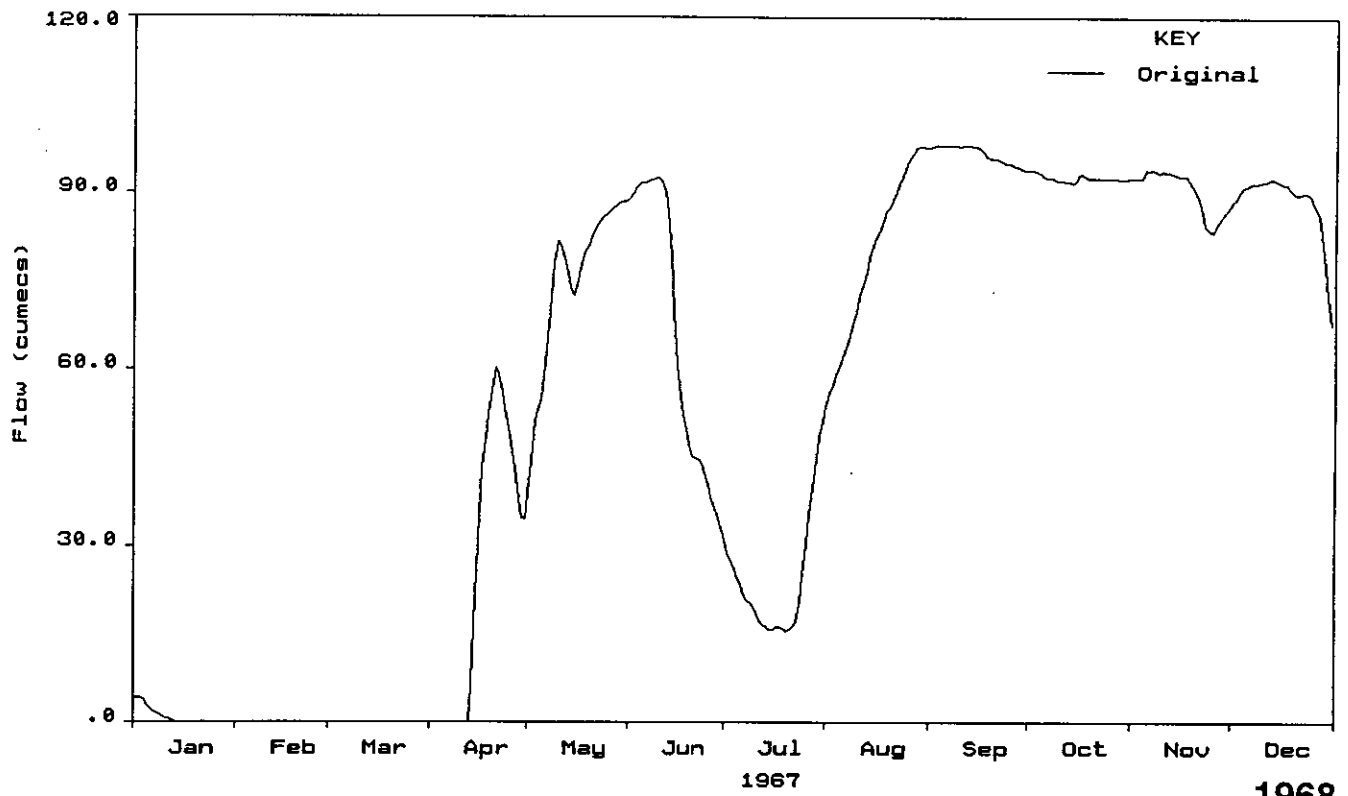
River Shebelli at Afgoi

1965

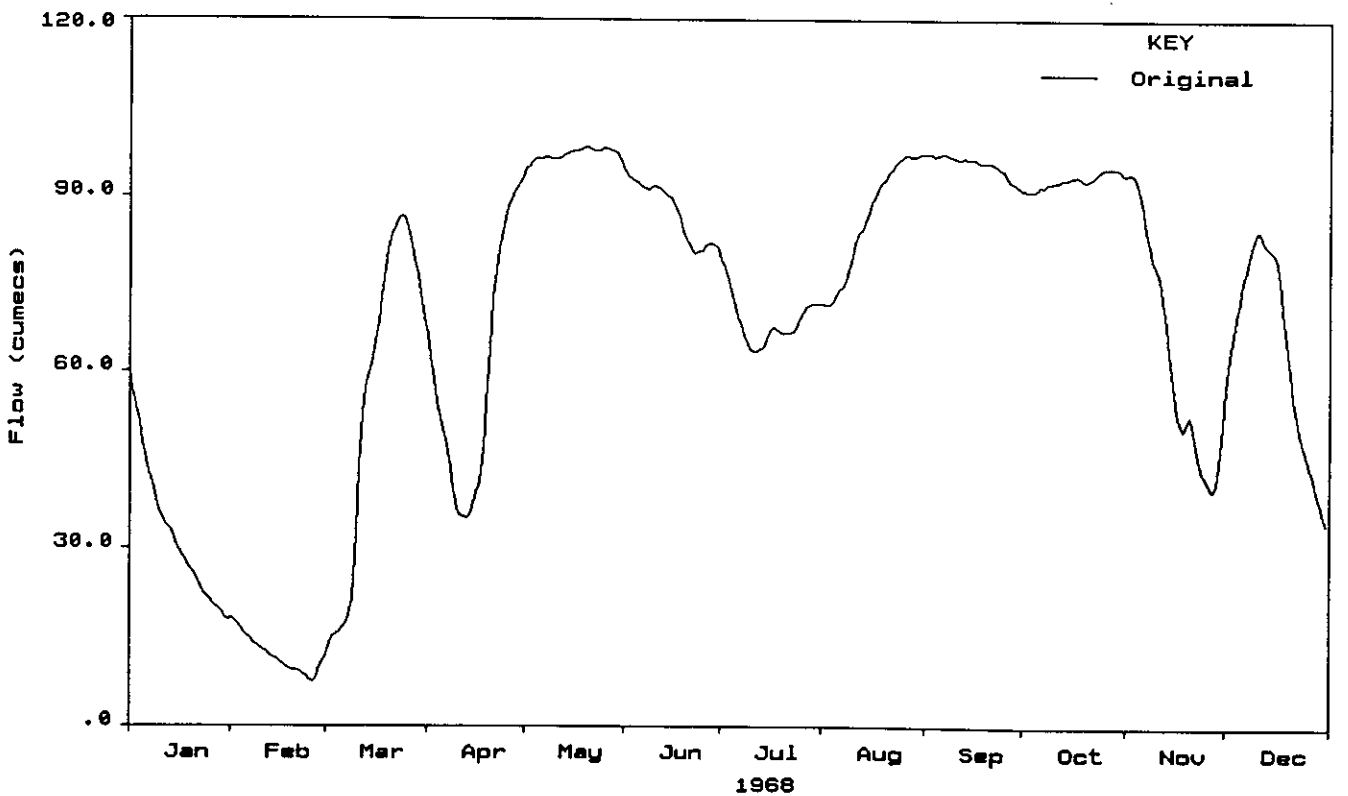


River Shebelli at Afgoi

1967

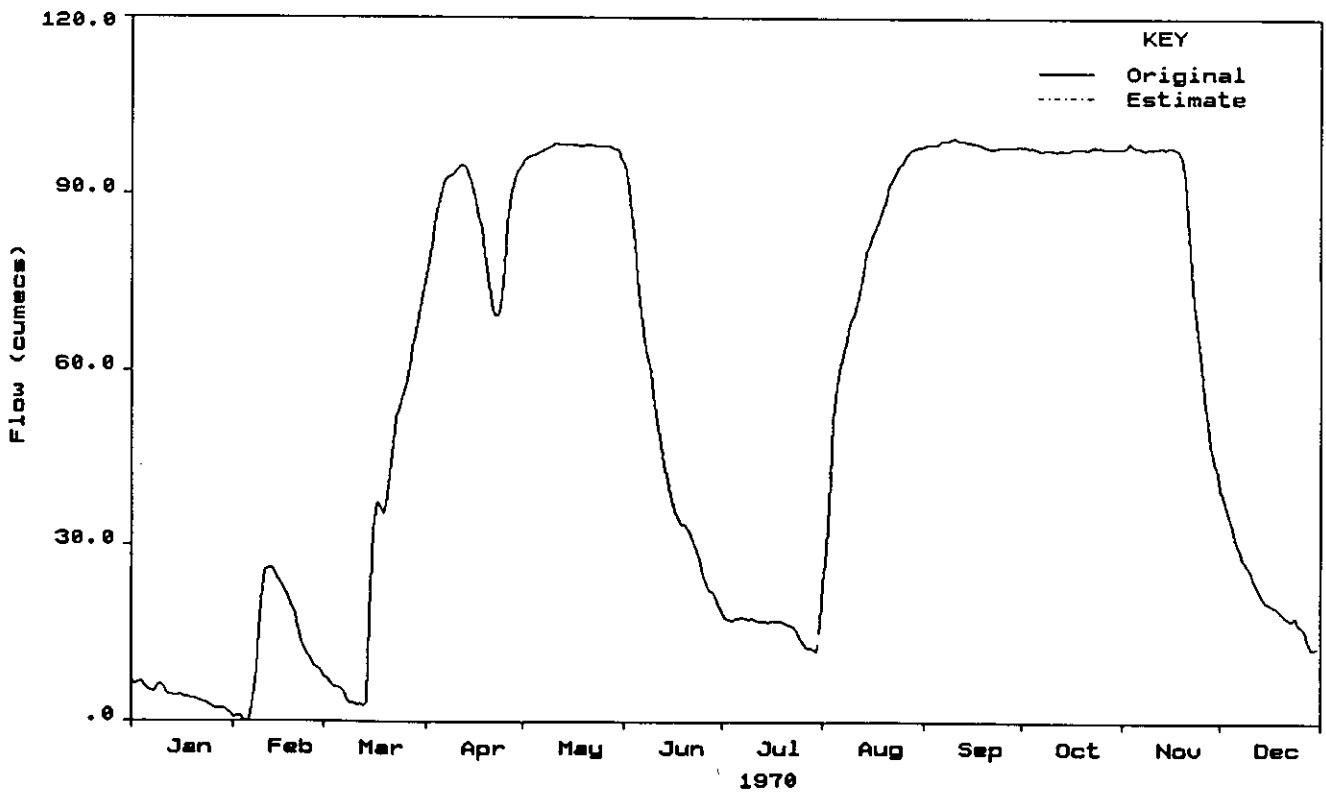
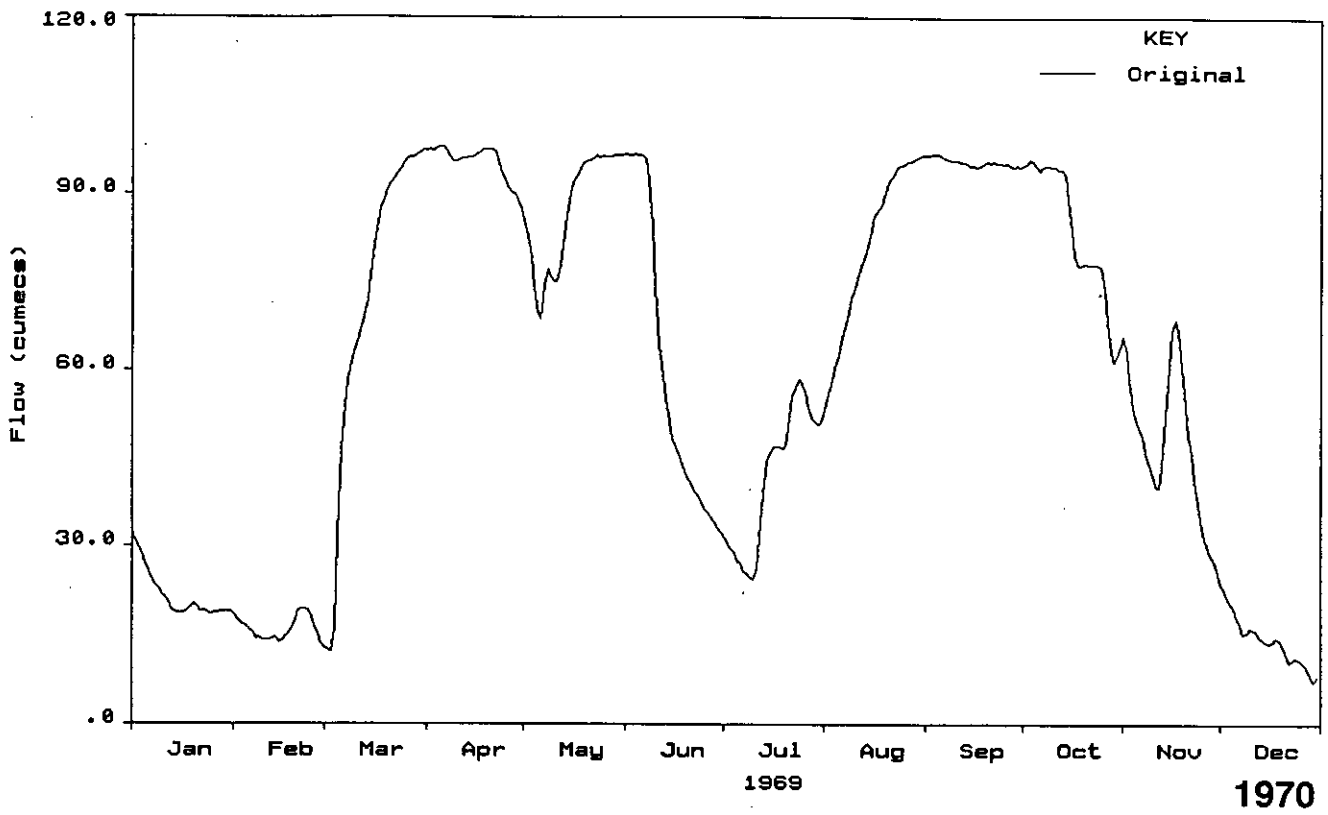


1968



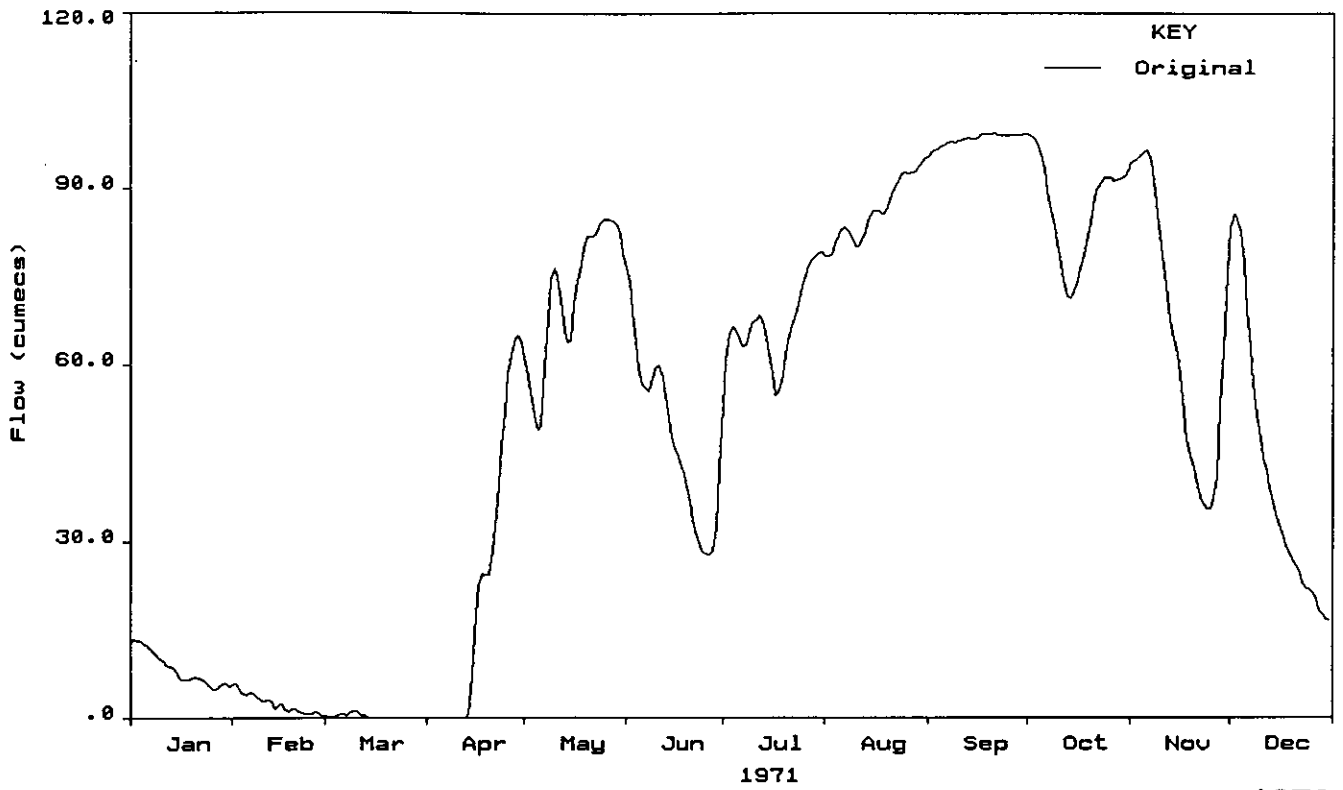
River Shebelli at Afgoi

1969

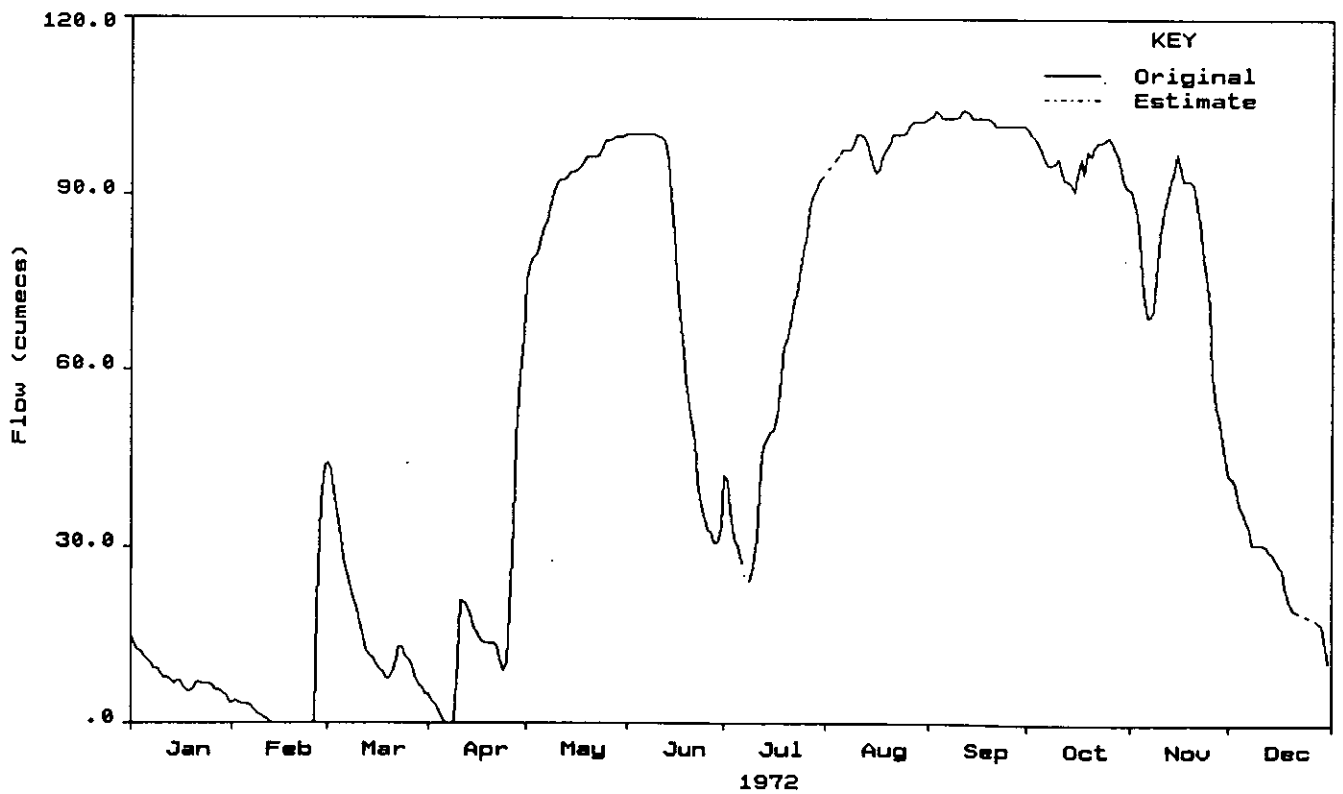


River Shebelli at Afgoi

1971

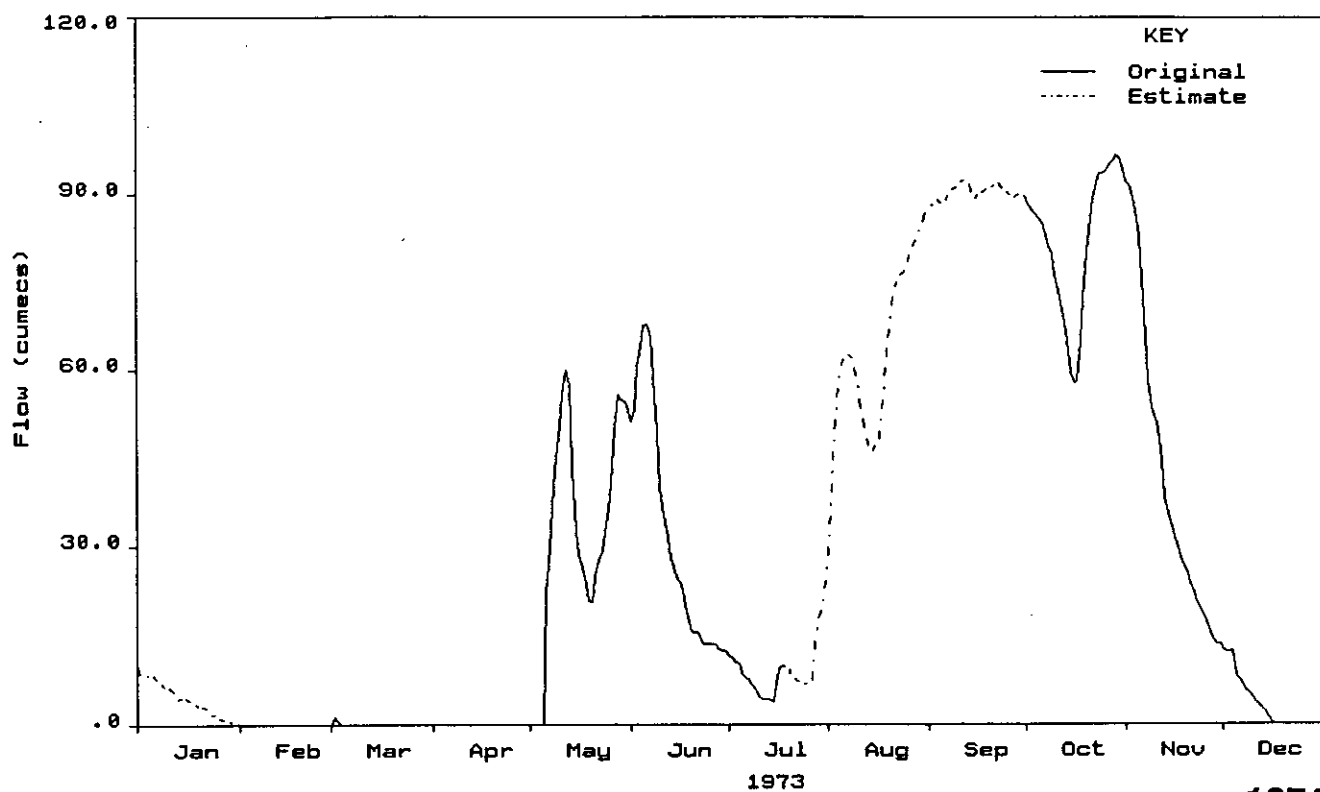


1972

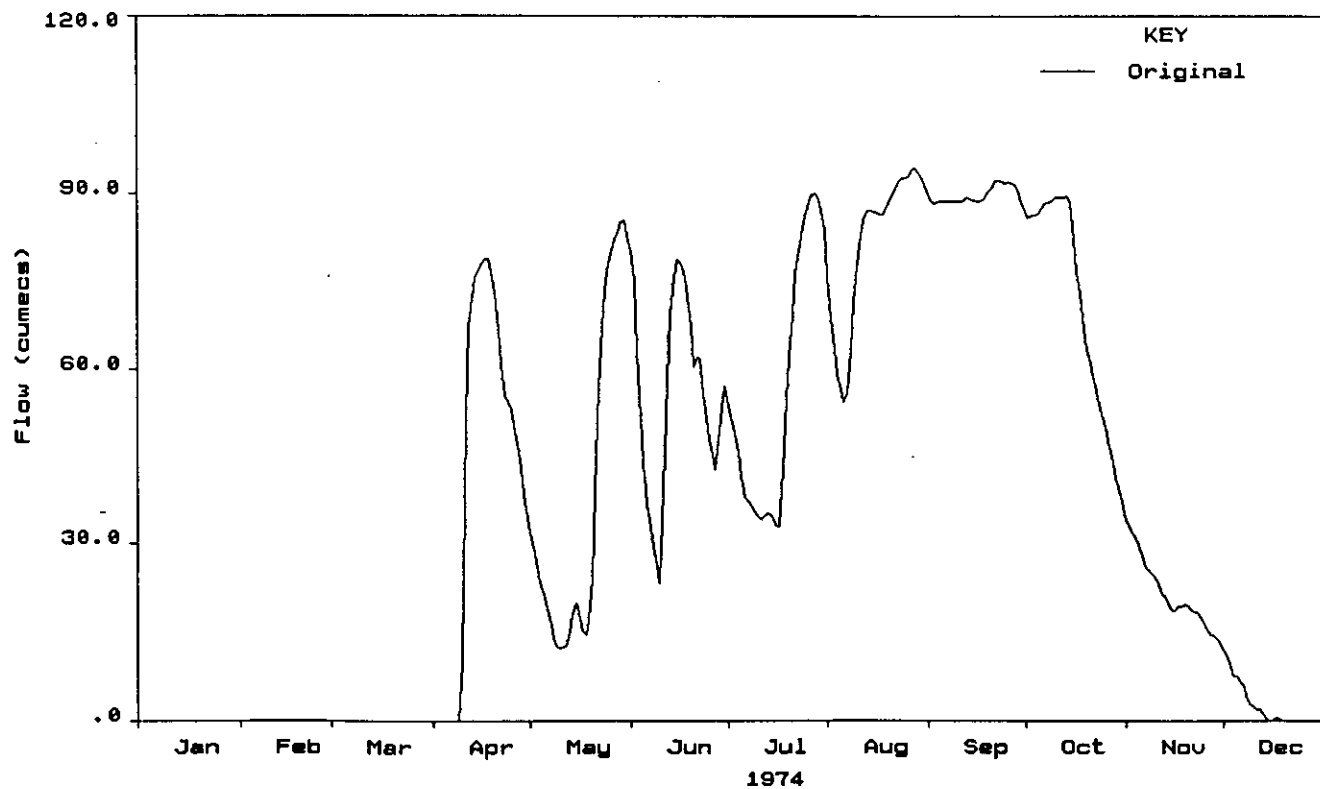


River Shebelli at Afgoi

1973

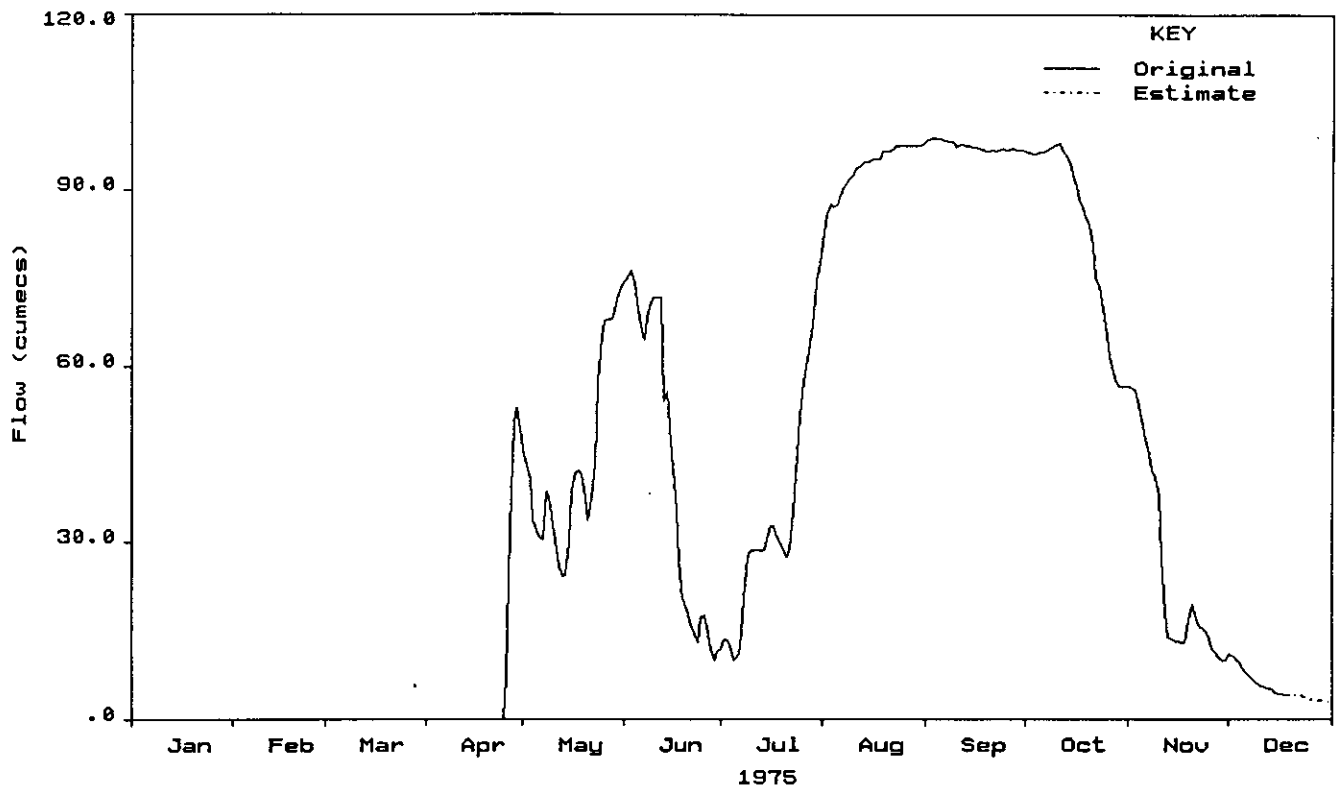


1974

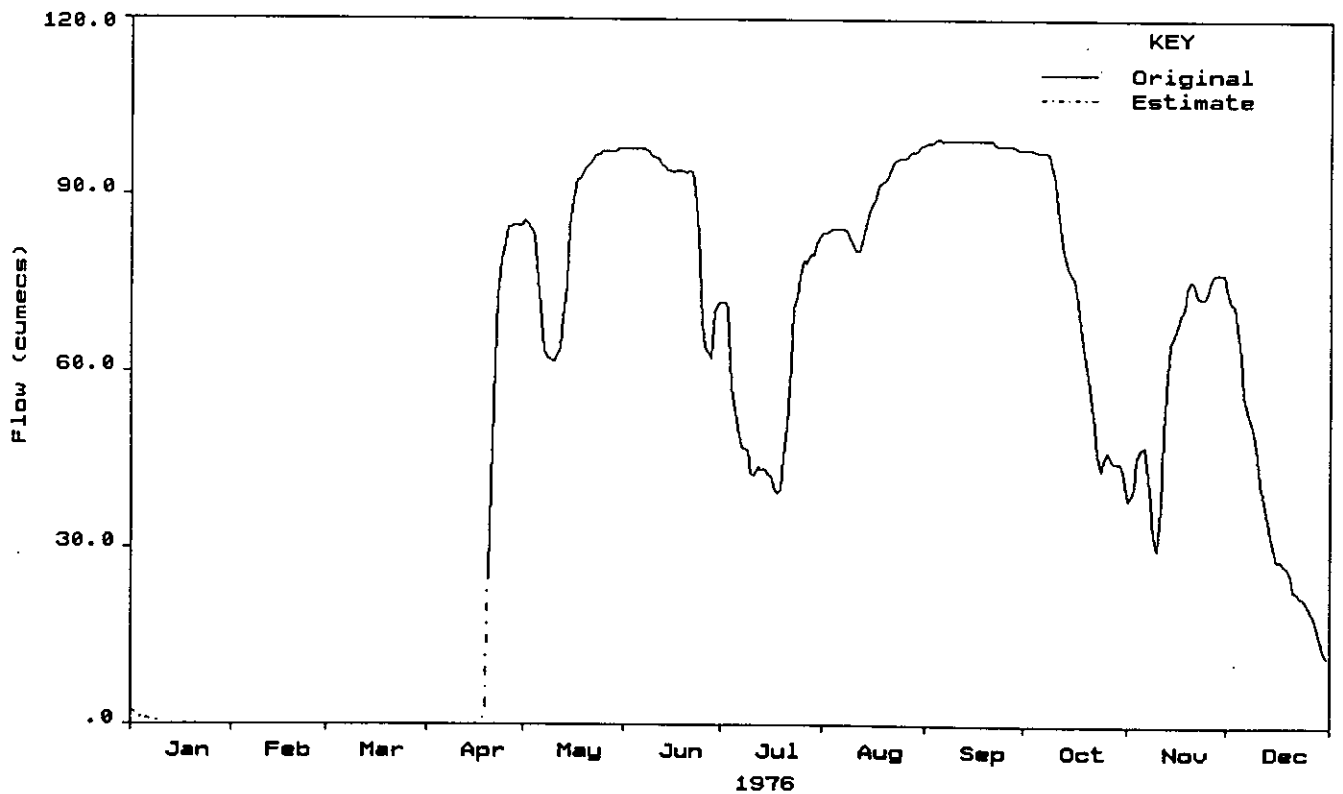


River Shebelli at Afgoi

1975

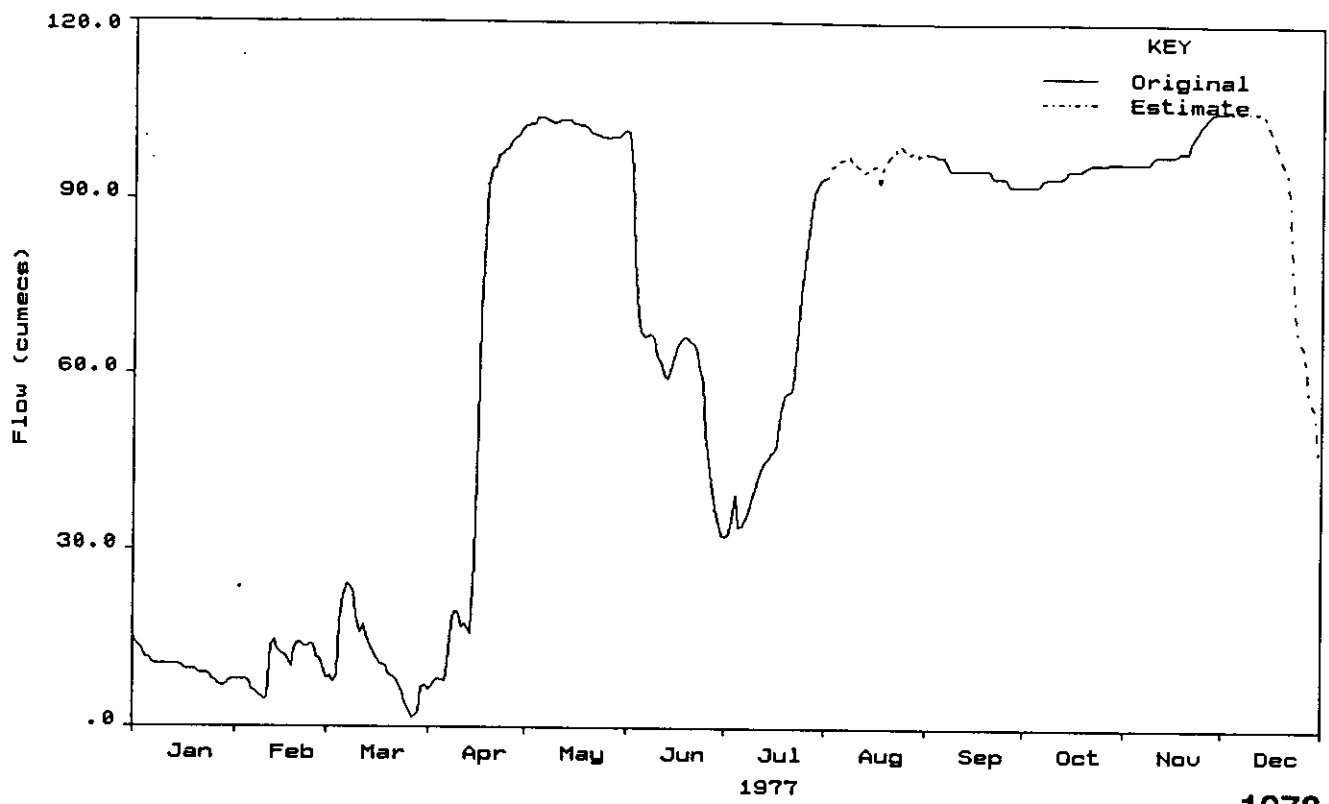


1976

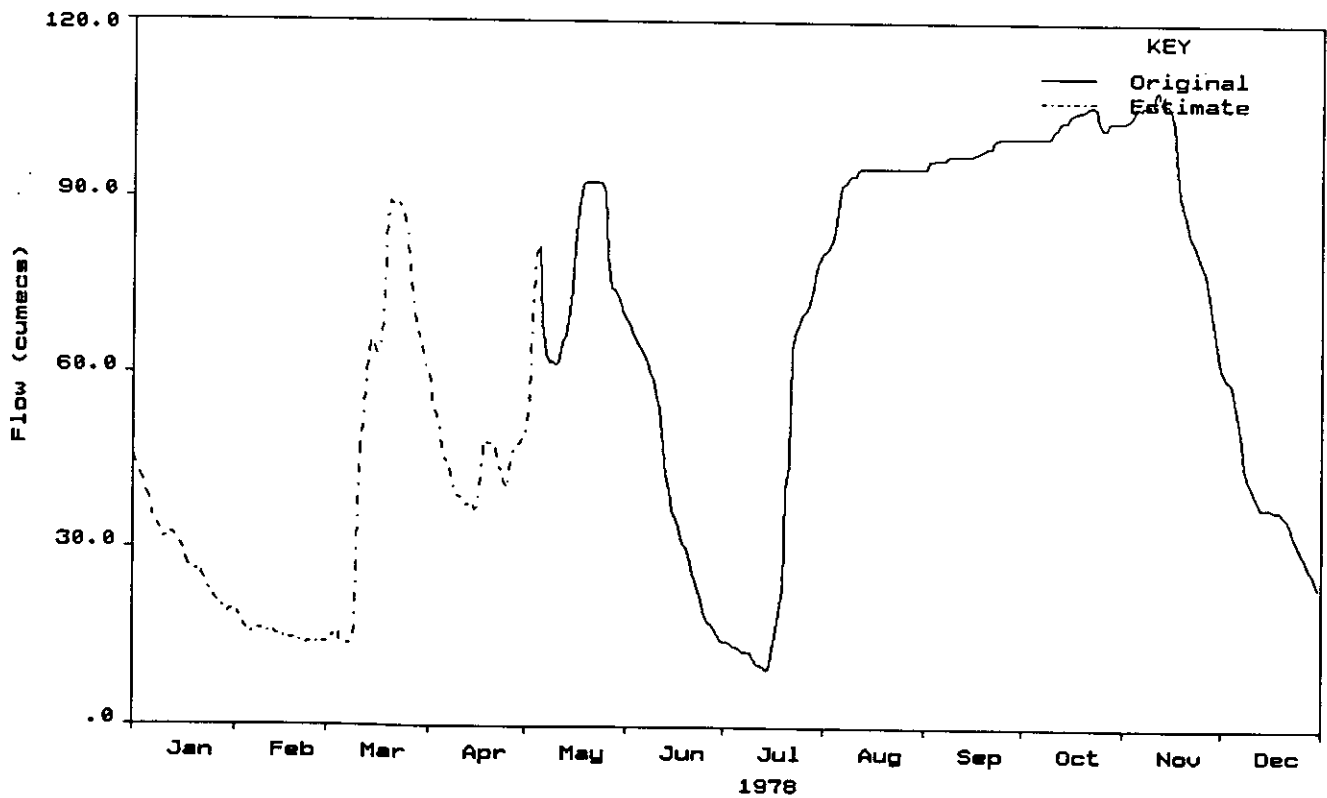


River Shebelli at Afgoi

1977

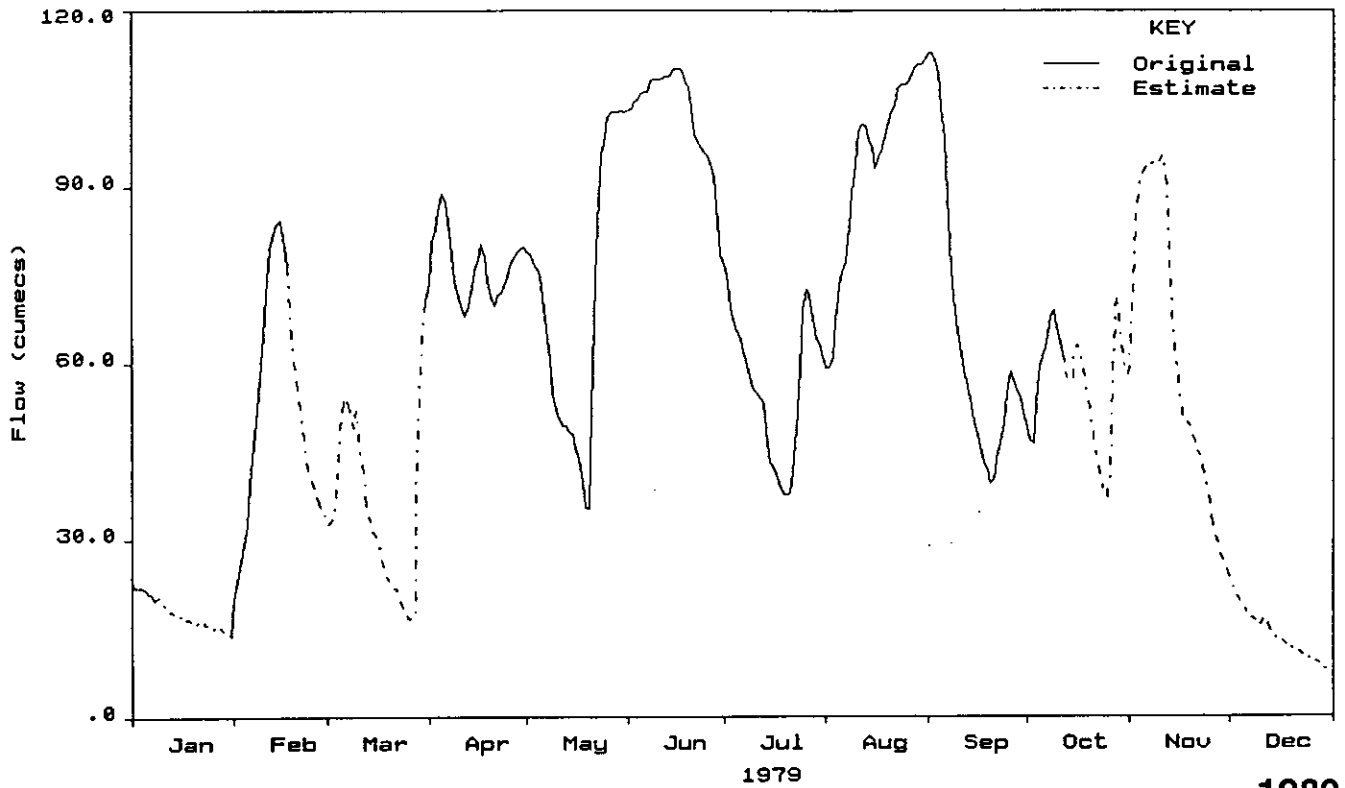


1978

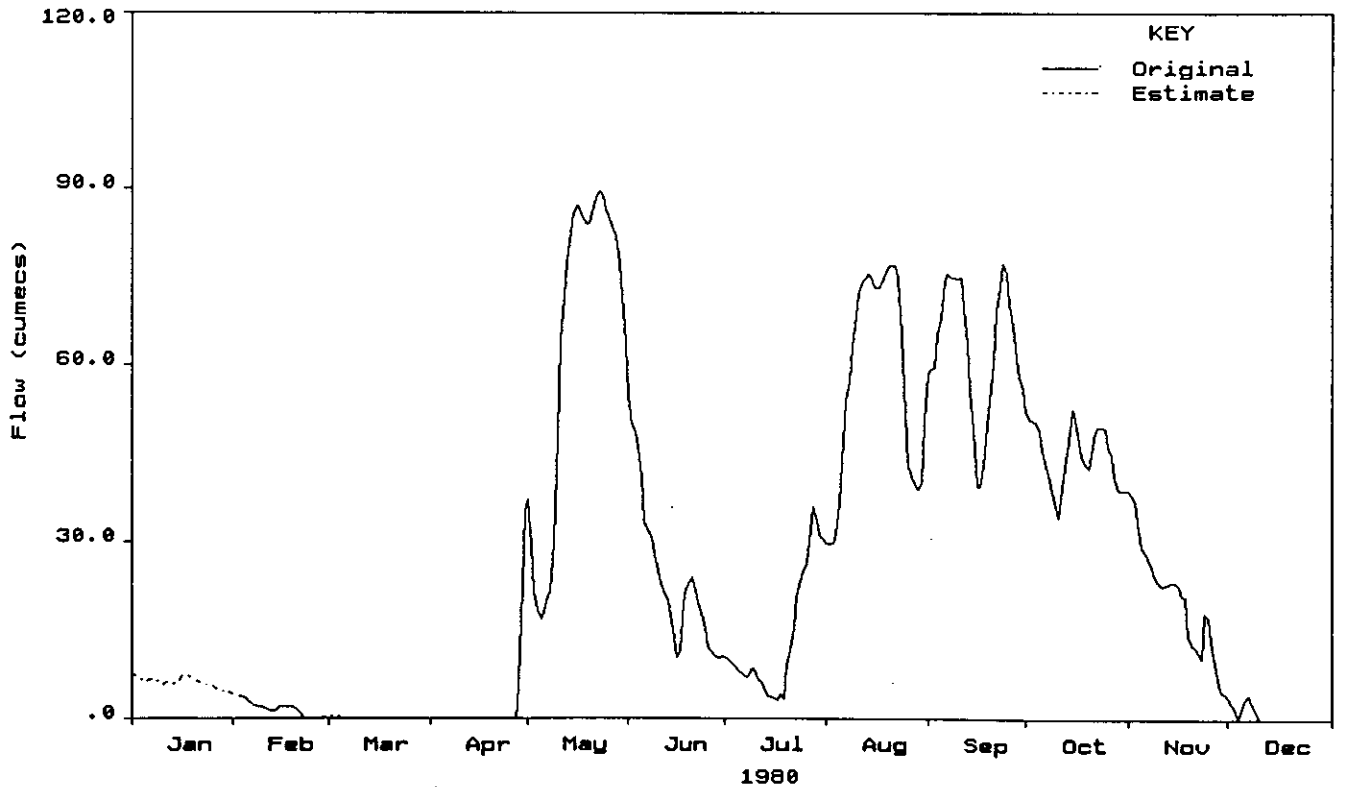


River Shebelli at Afgoi

1979

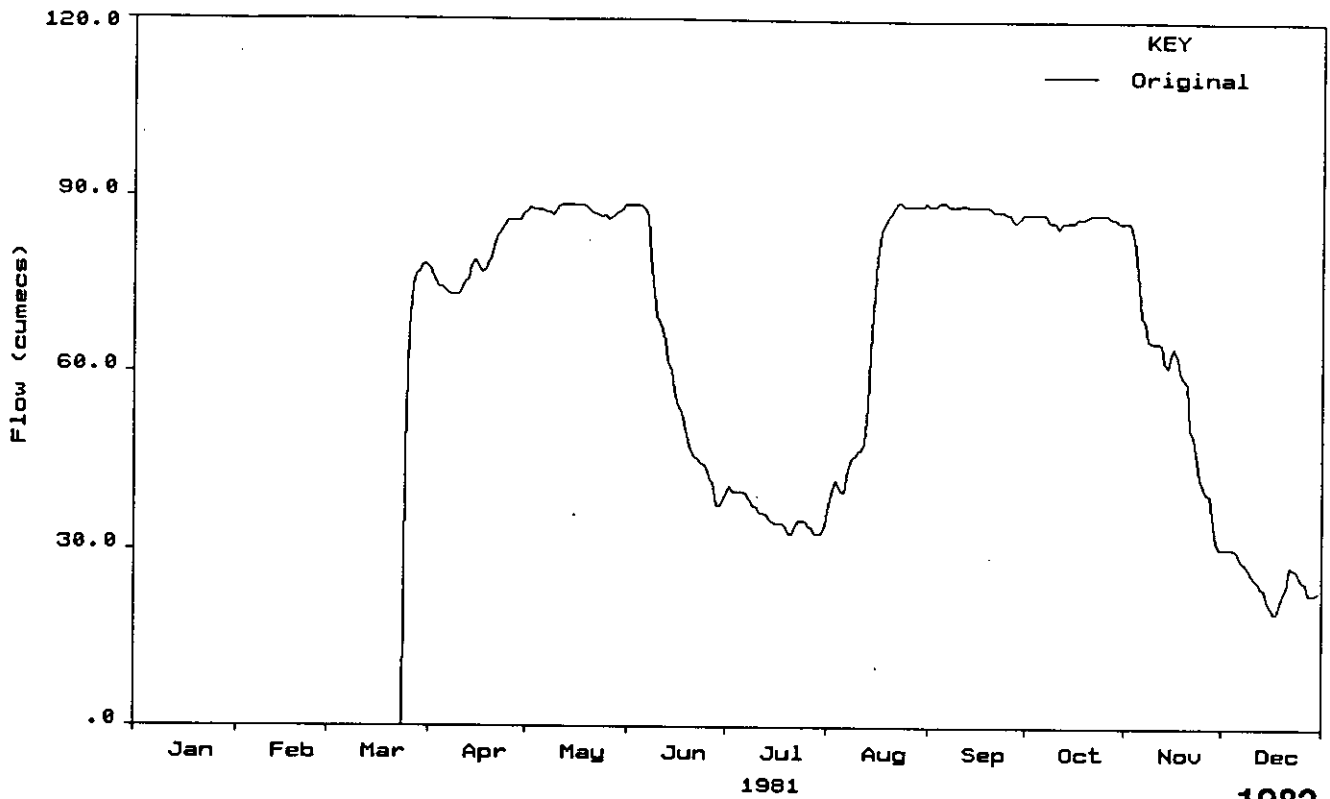


1980

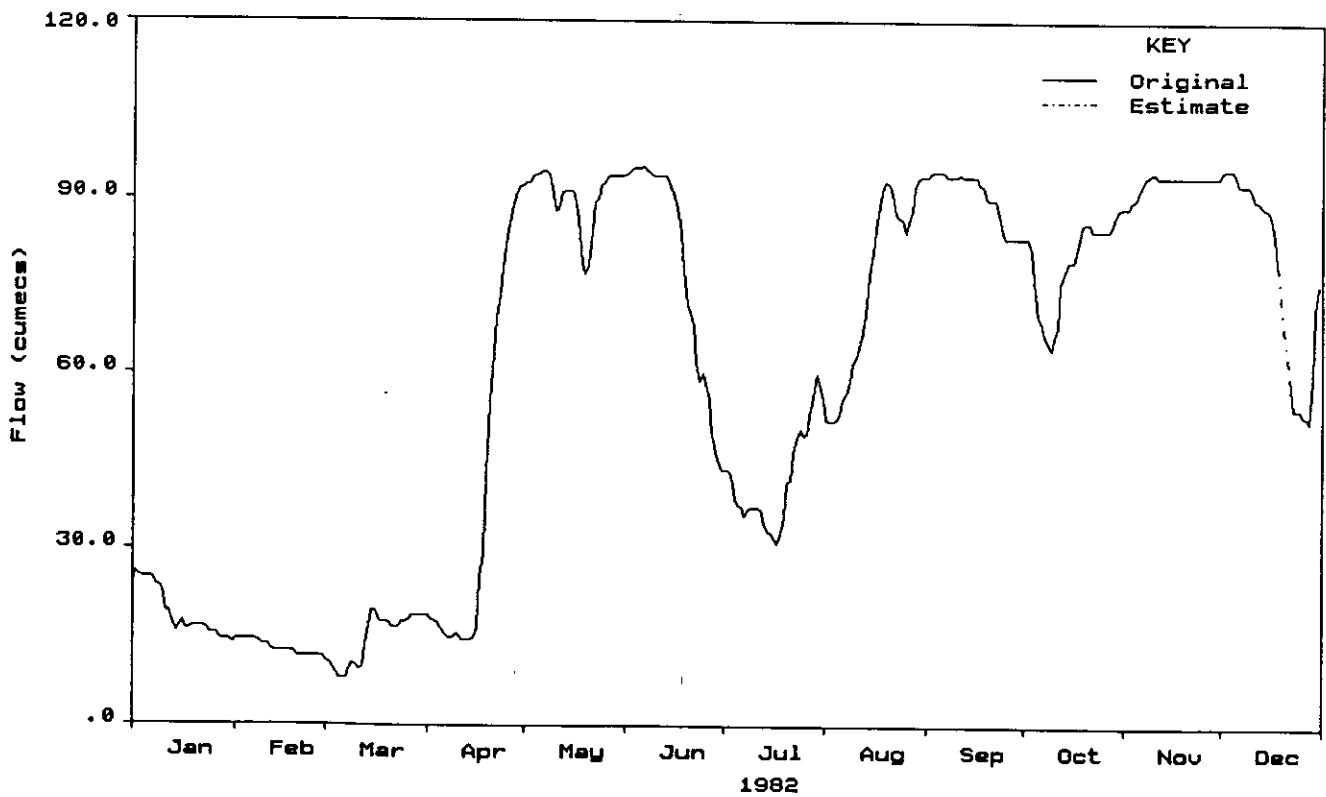


River Shebelli at Afgoi

1981

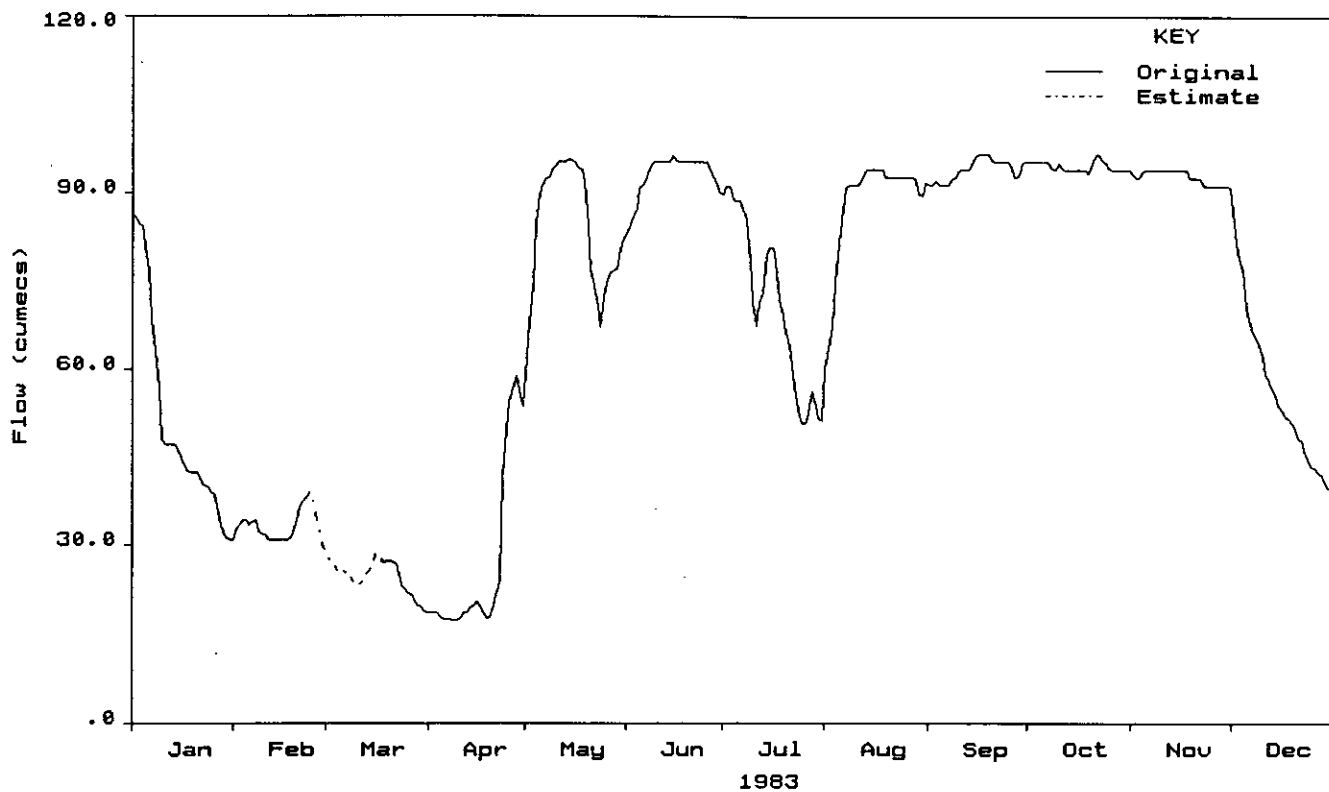


1982

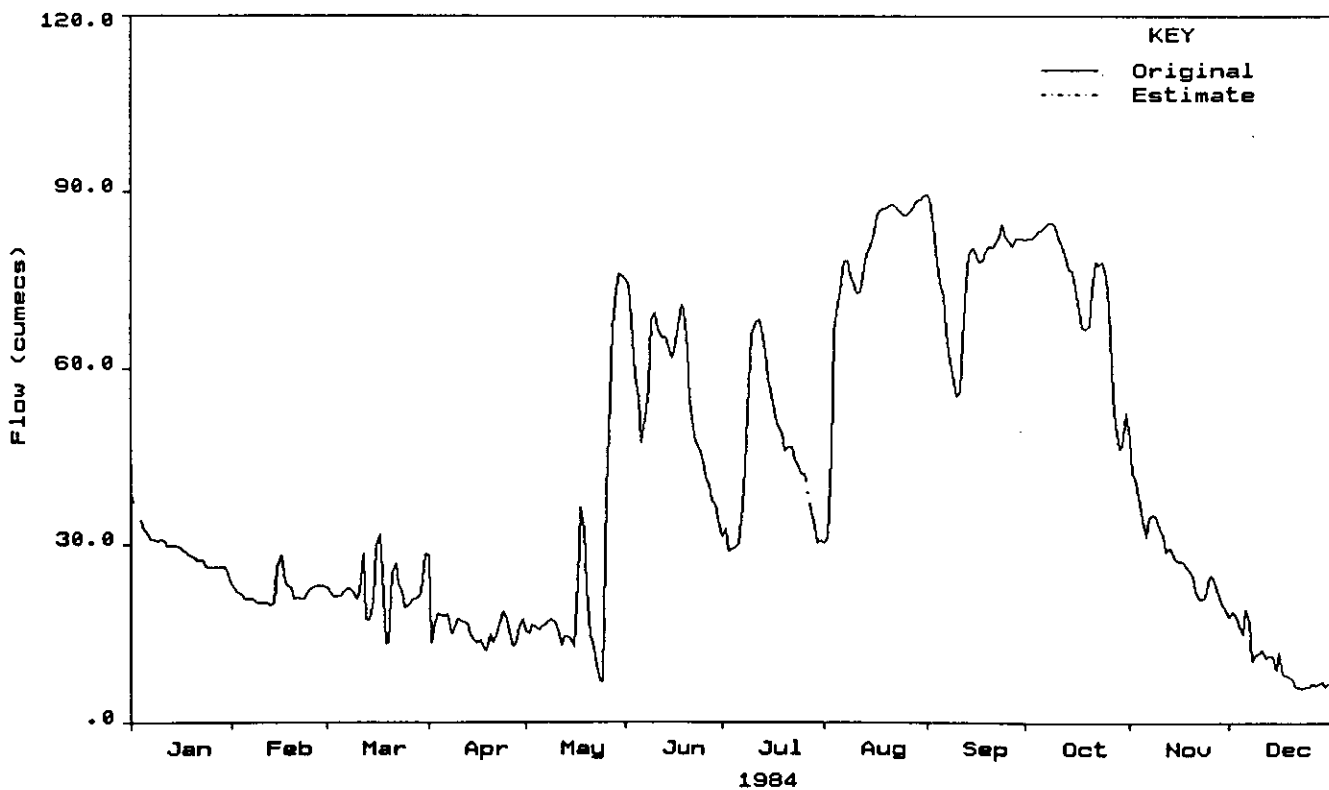


River Shebelli at Afgoi

1983

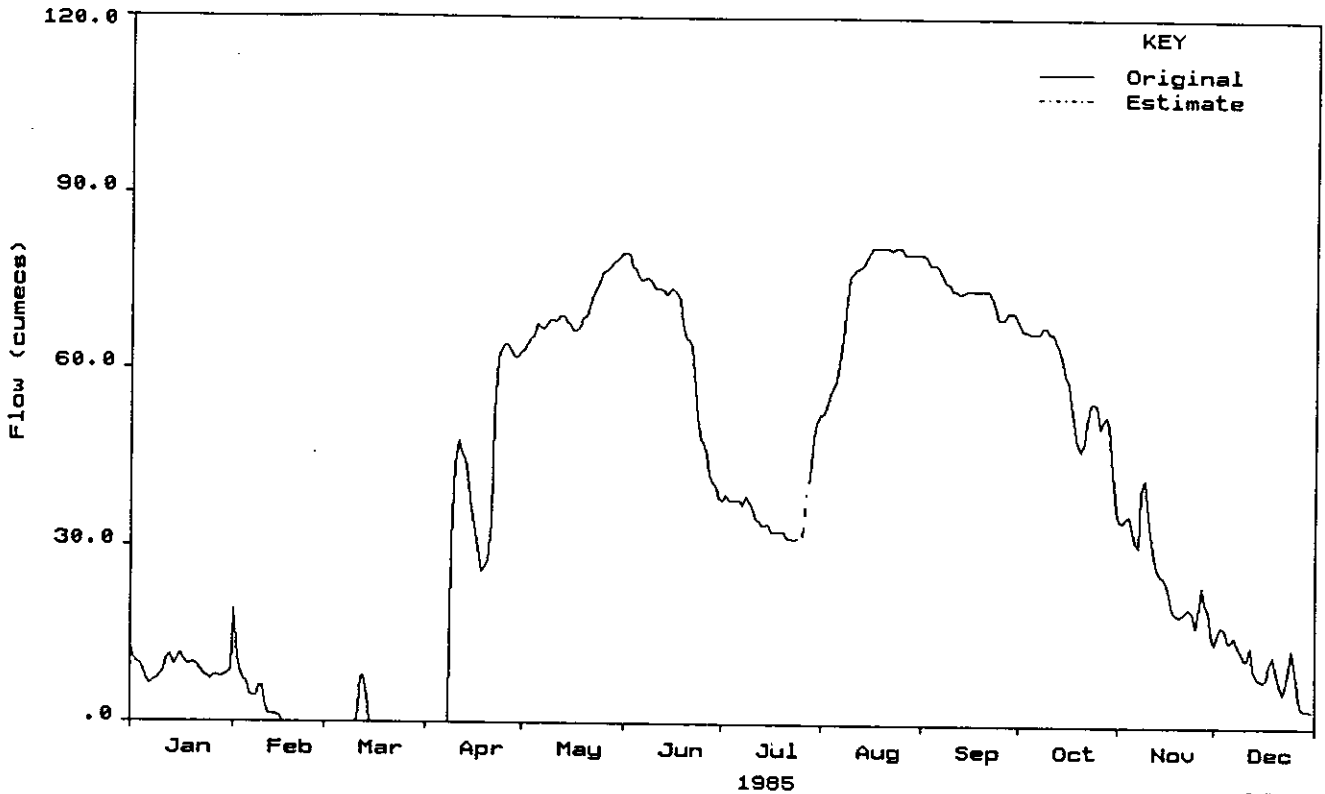


1984

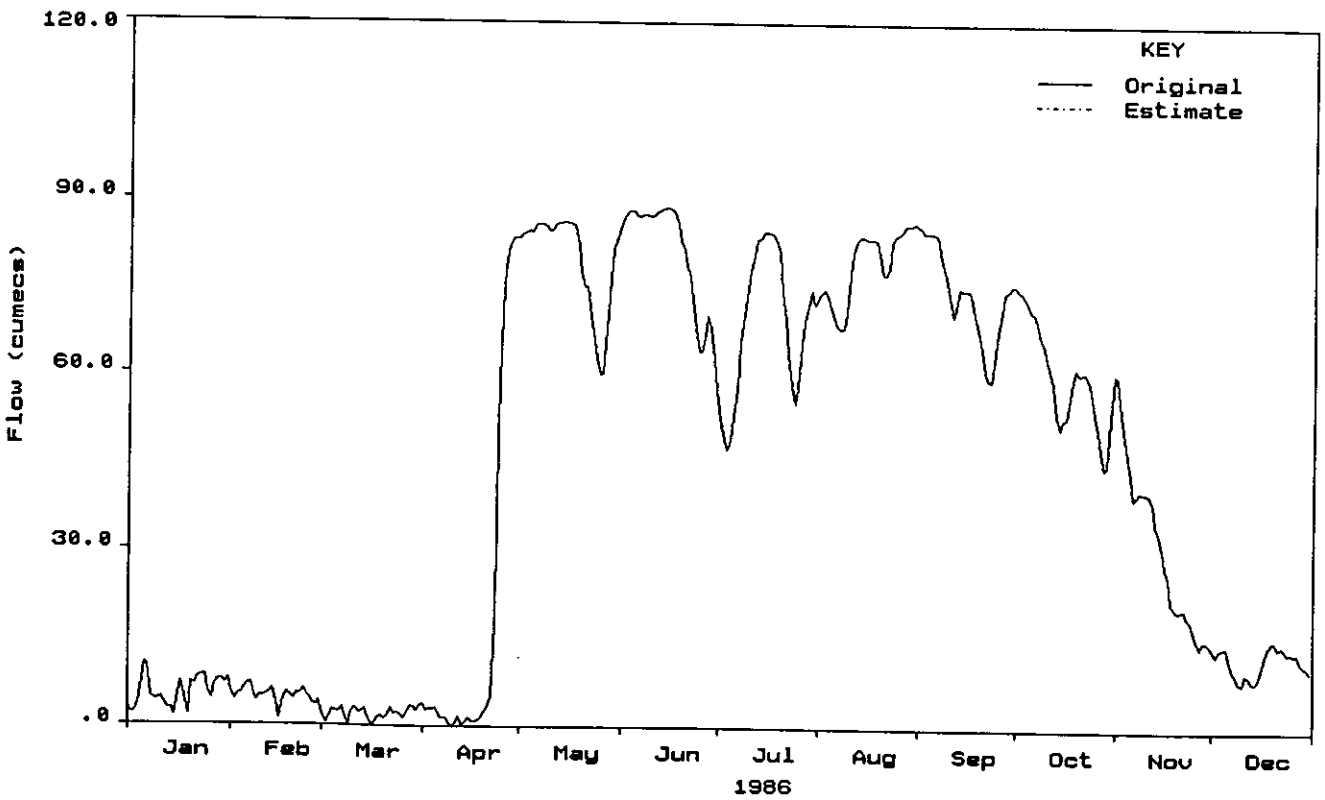


River Shebelli at Afgoi

1985

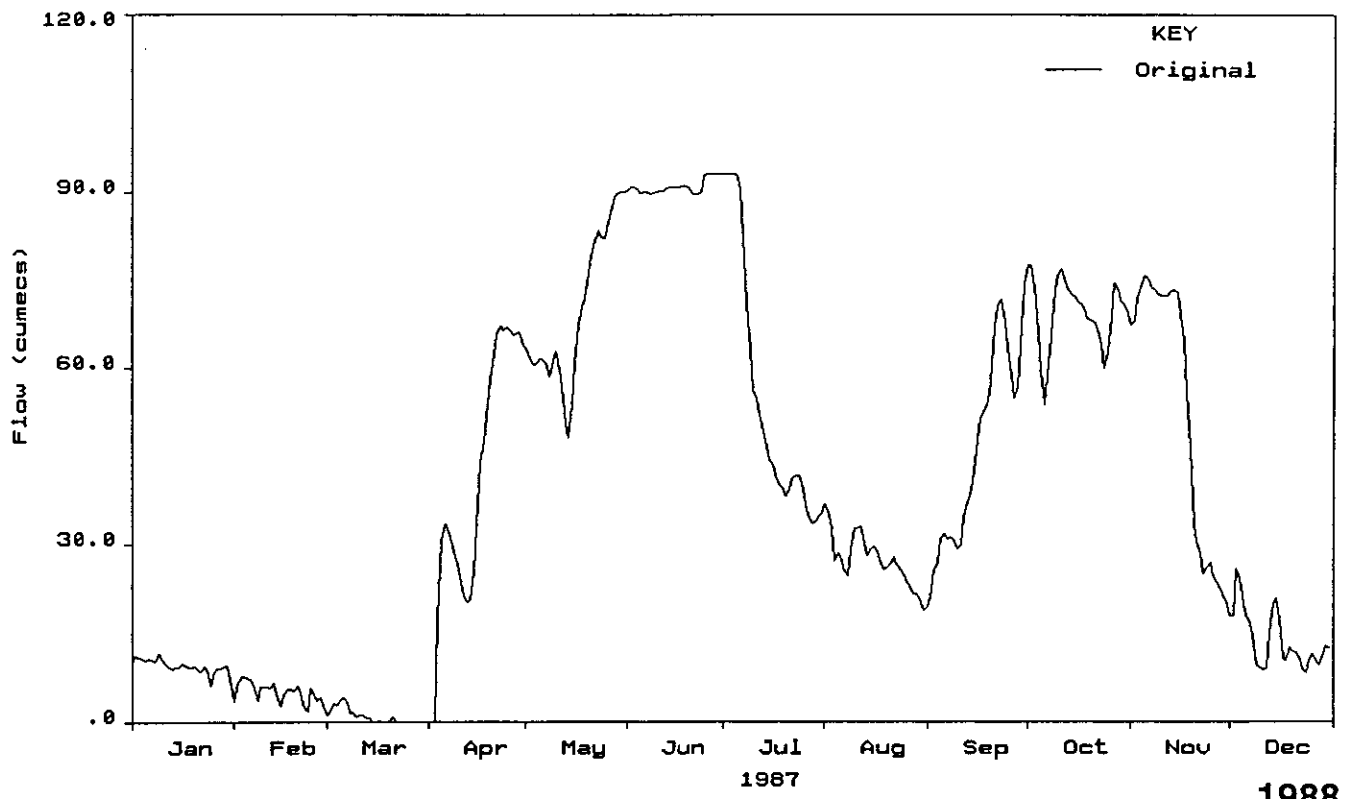


1986

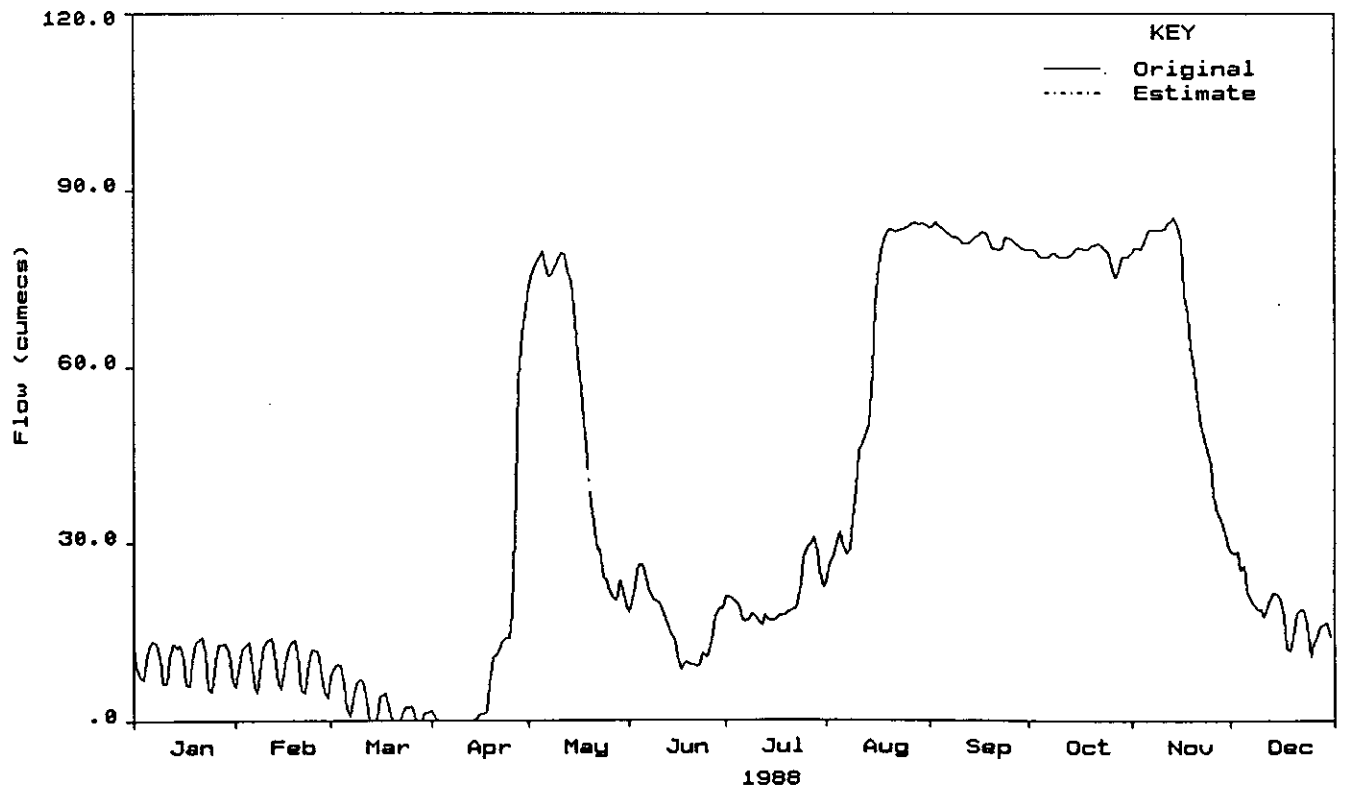


River Shebelli at Afgoi

1987

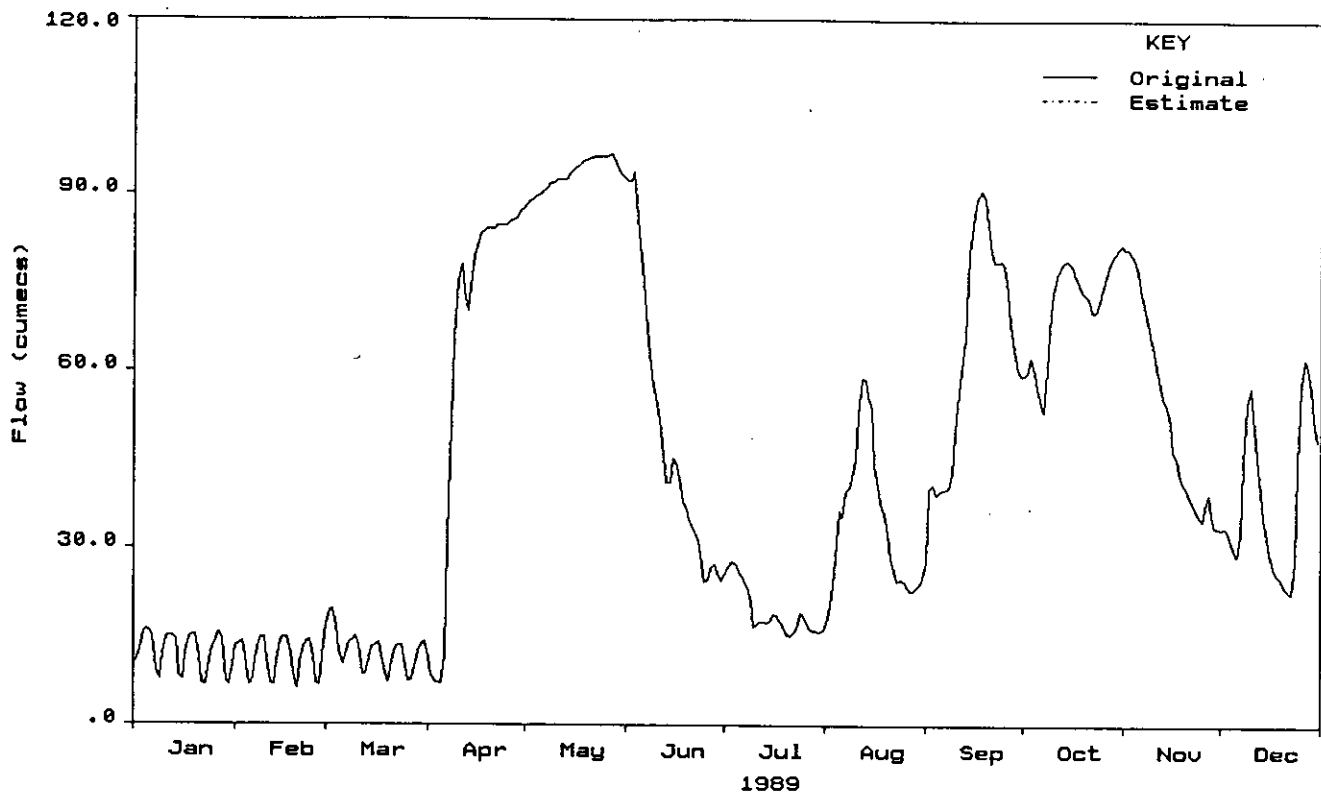


1988



River Shebelli at Afgoi

1989



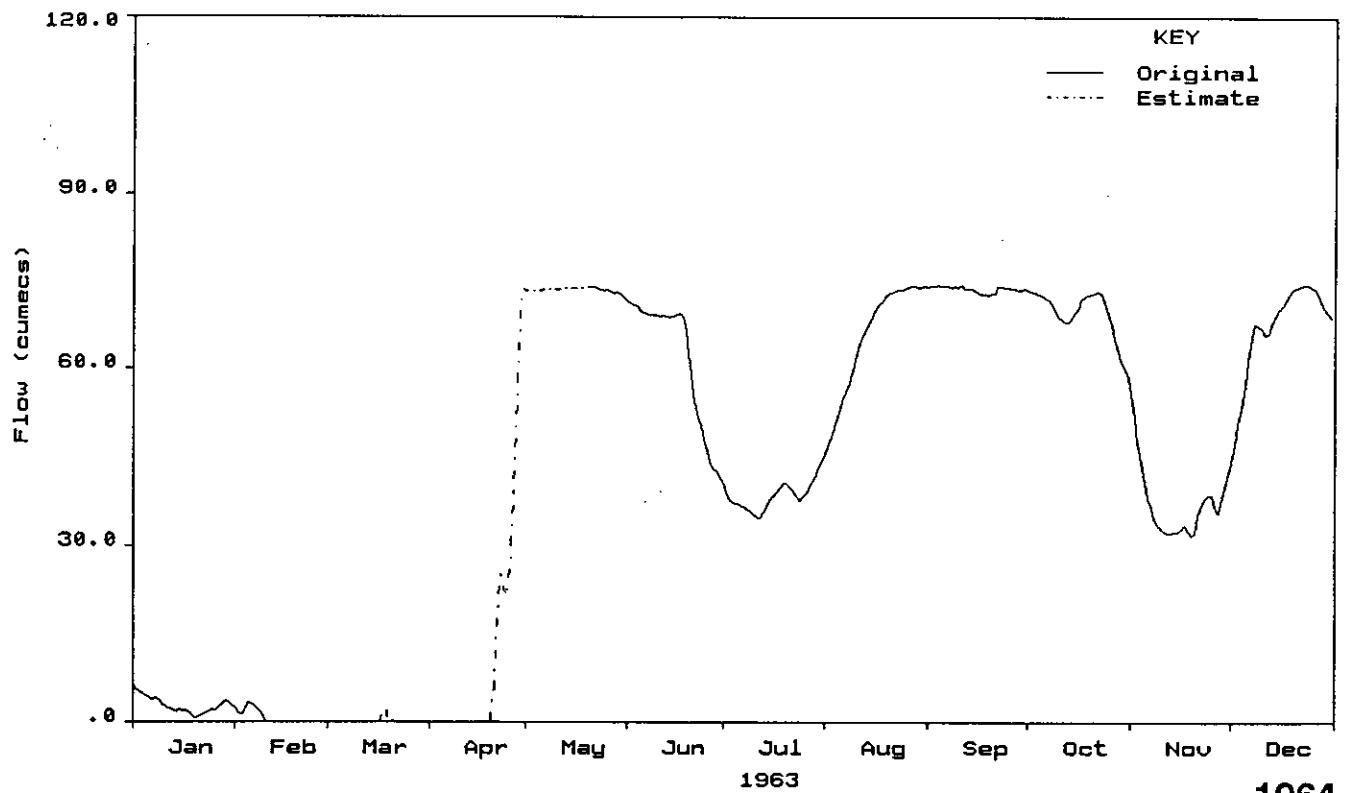
AUDEGLE

1963 - 1989

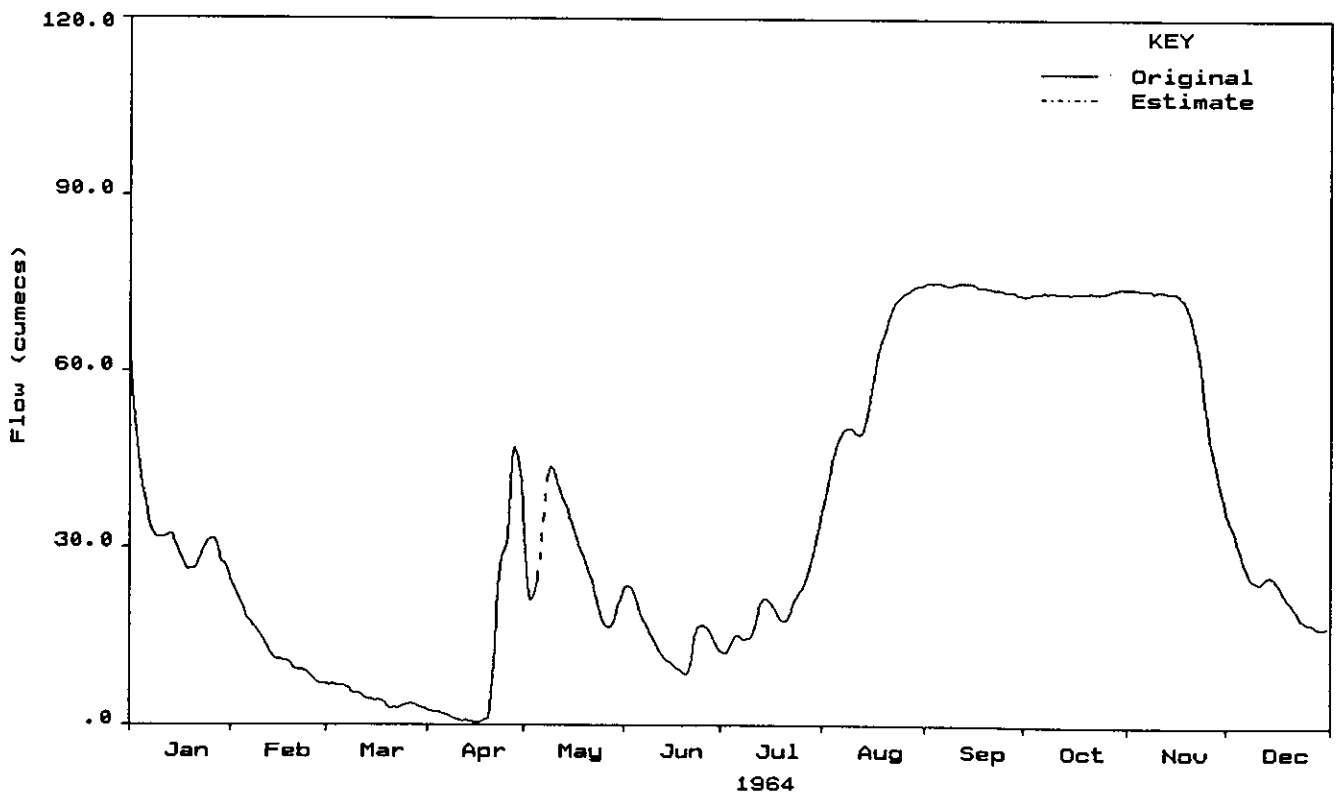


River Shebelli at Audegle

1963

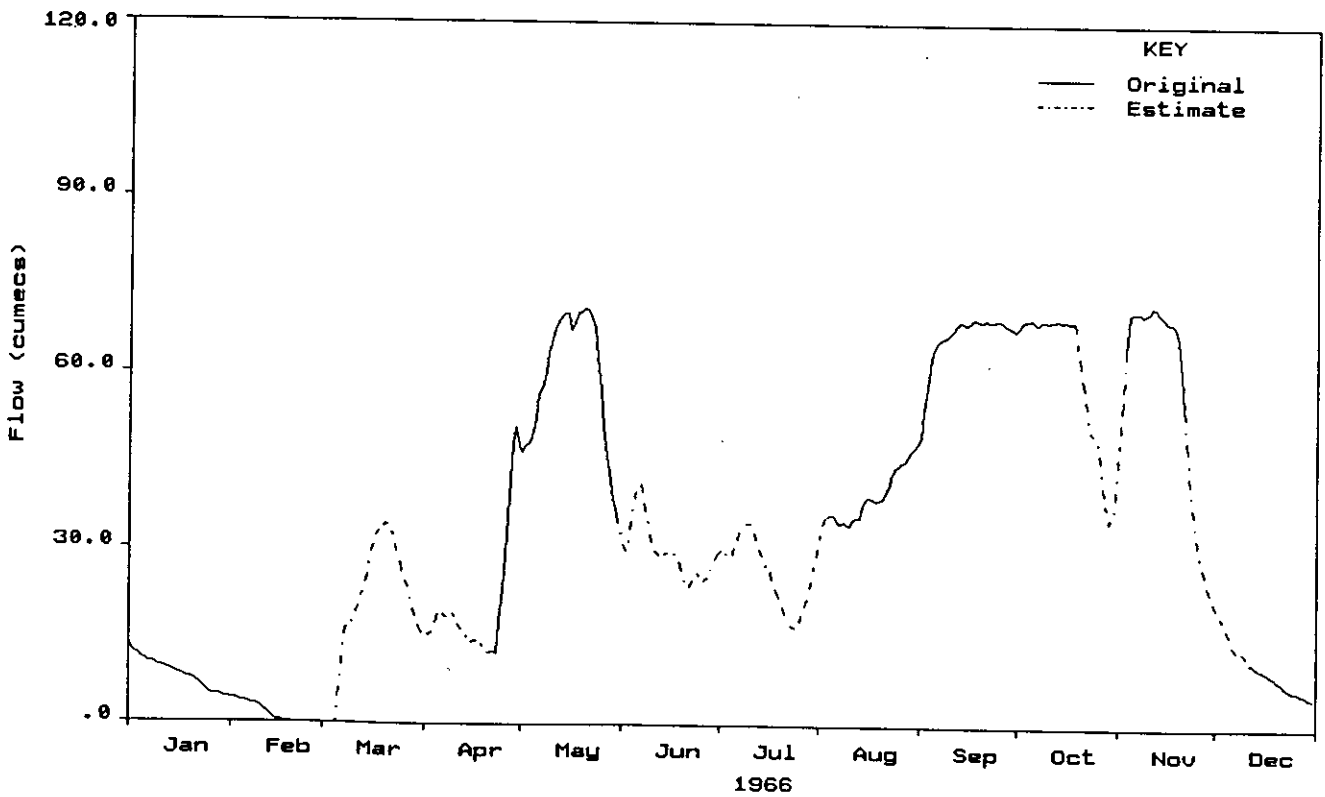
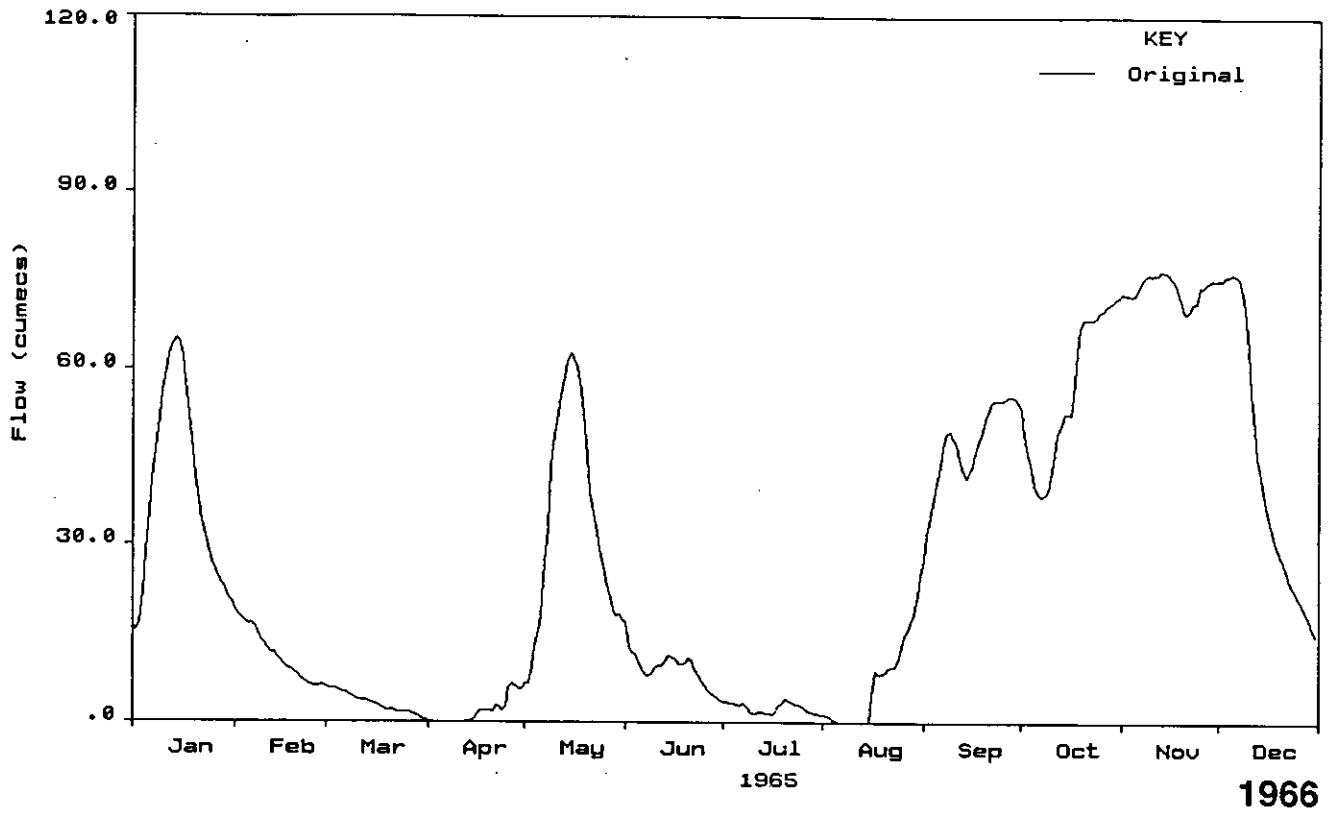


1964



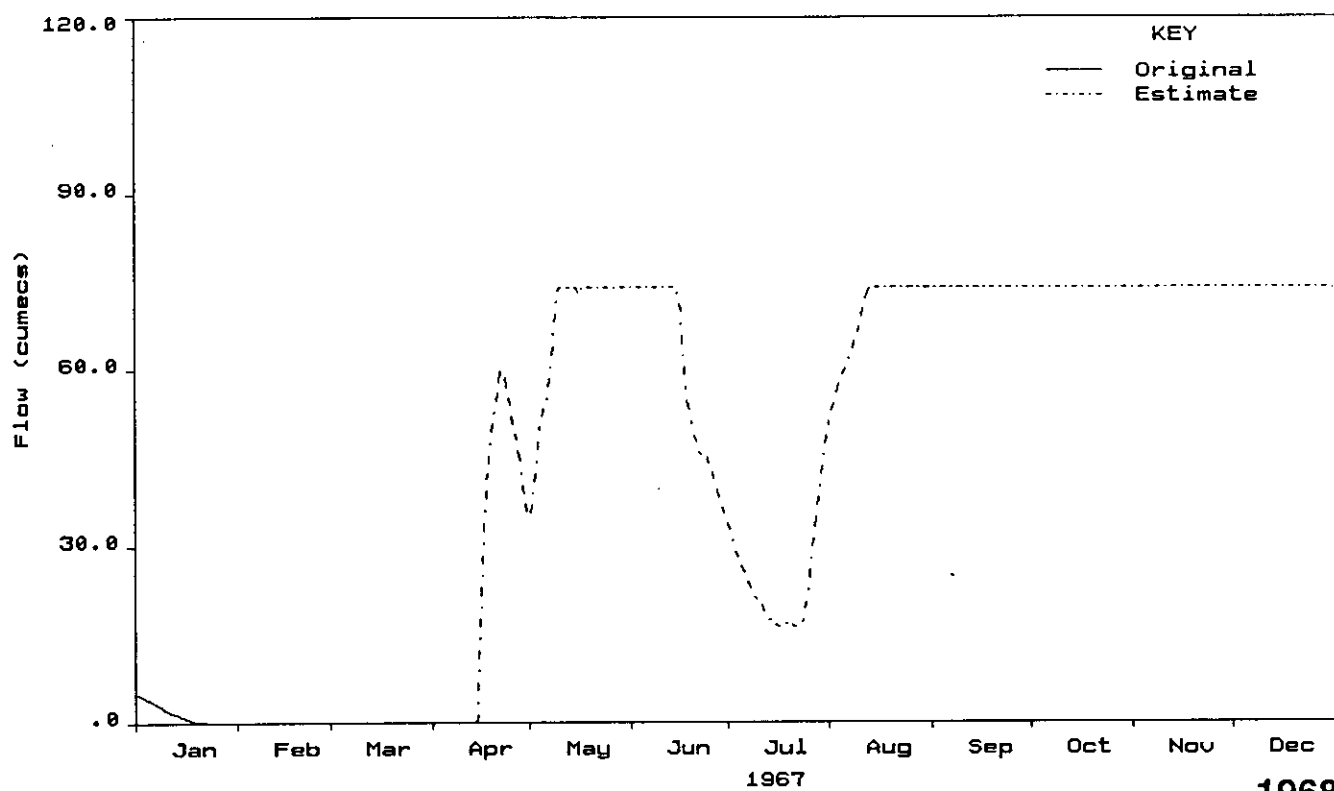
River Shebelli at Audegle

1965

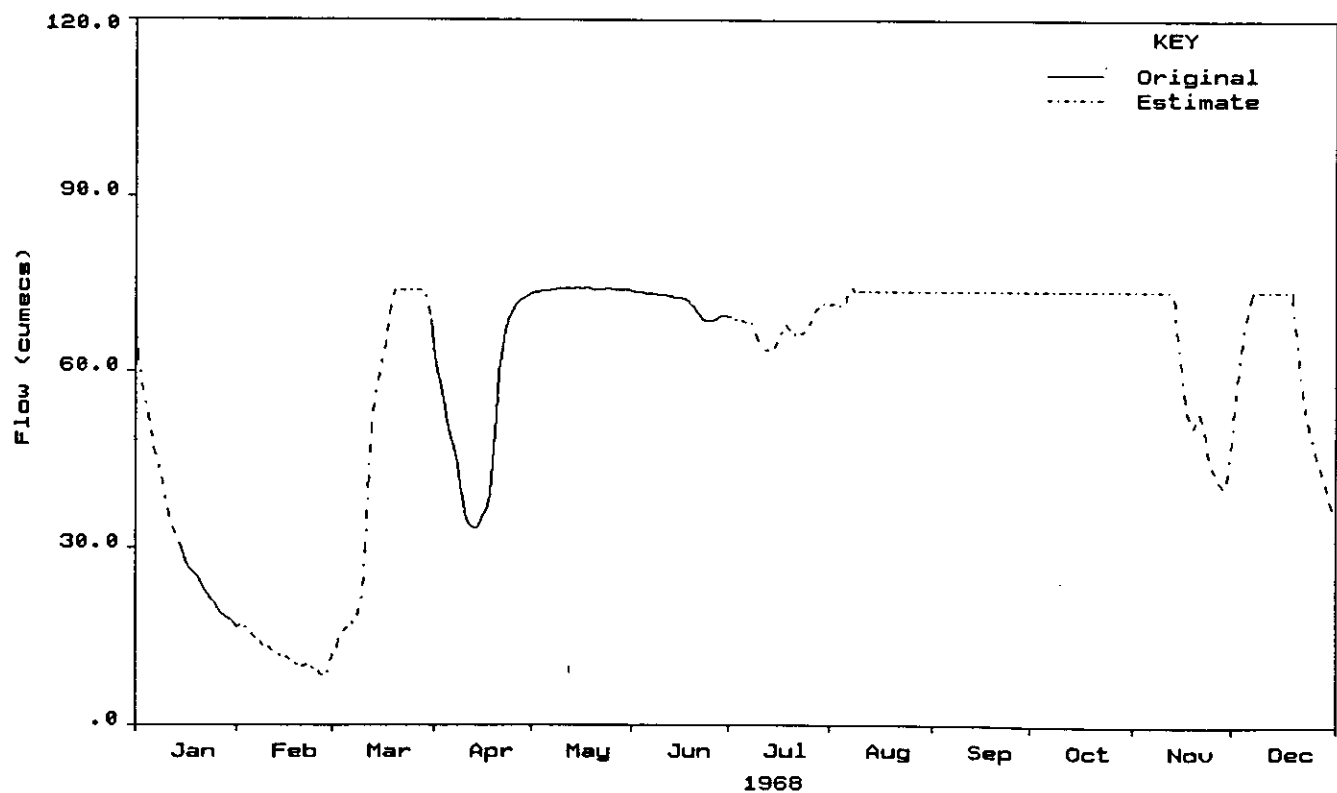


River Shebelli at Audegle

1967

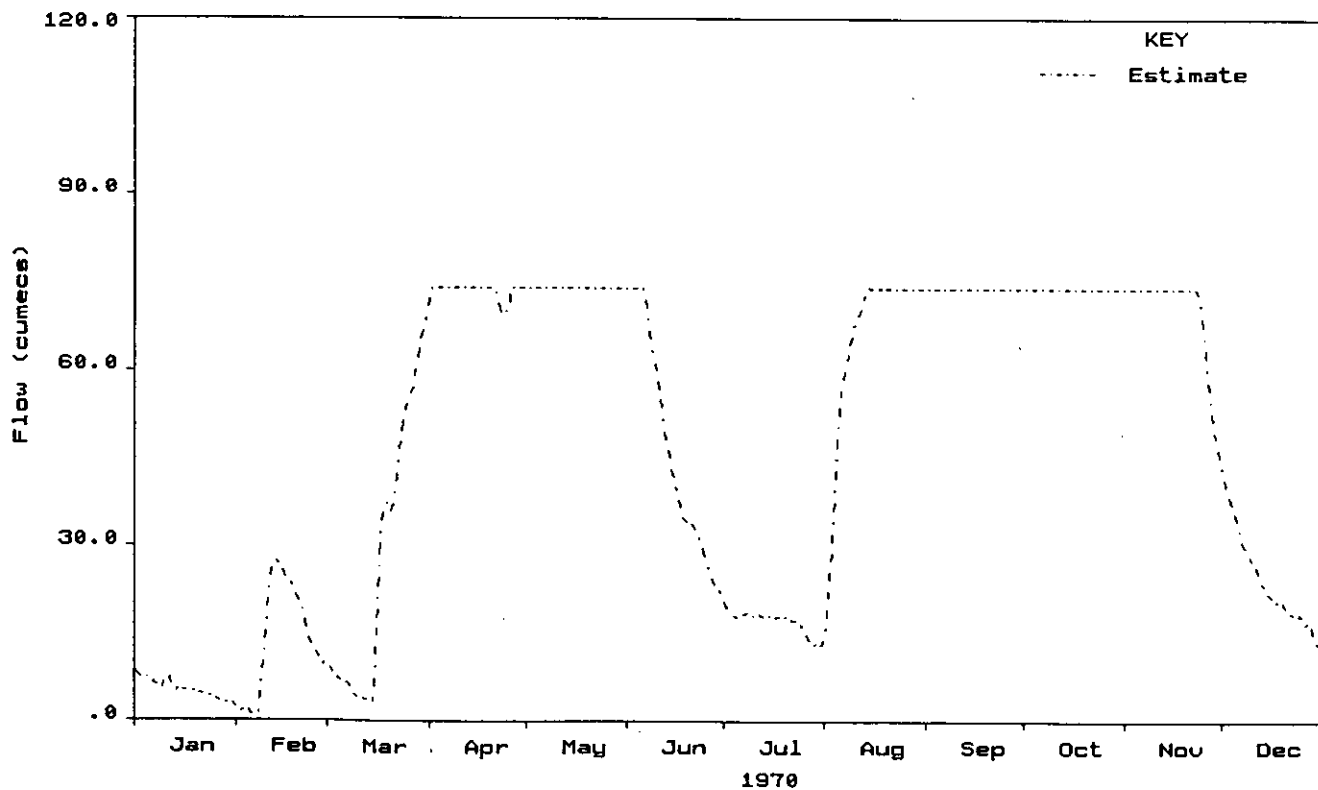
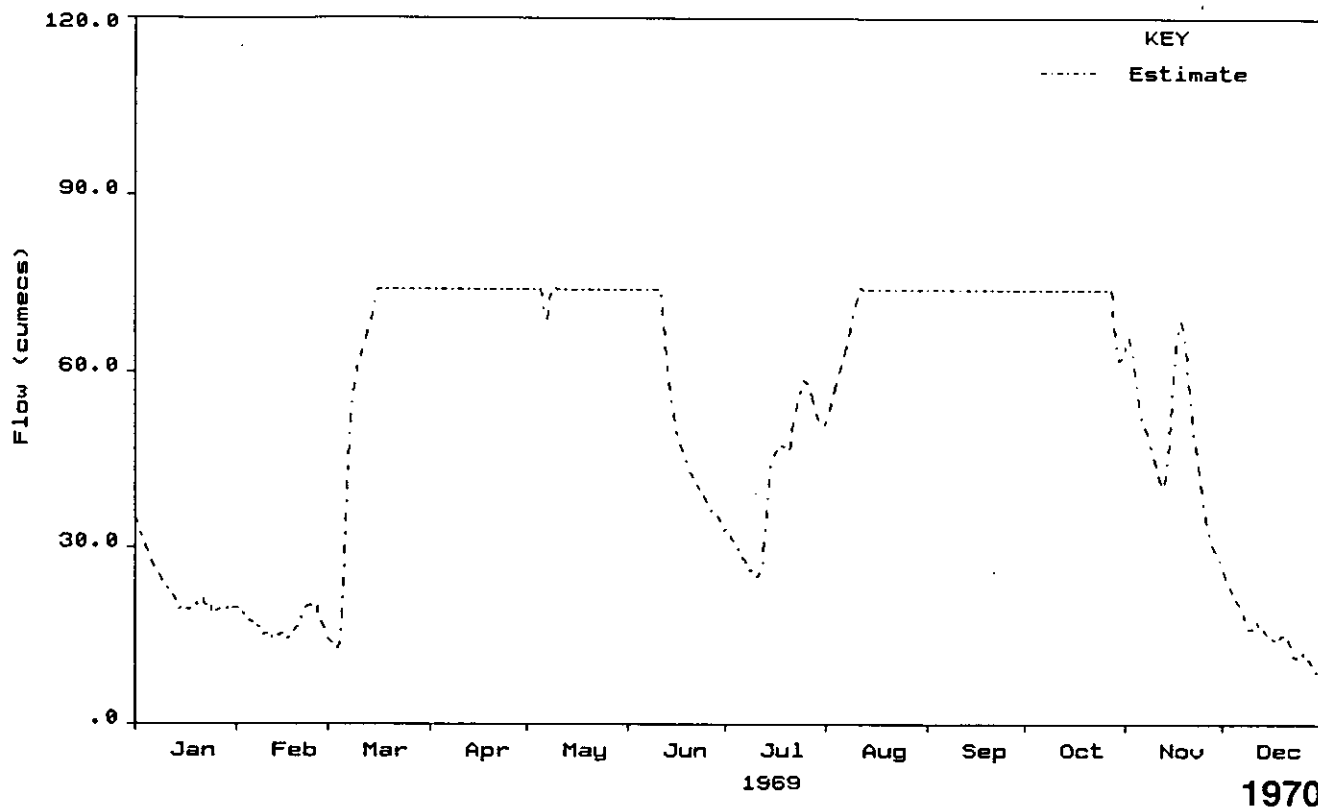


1968



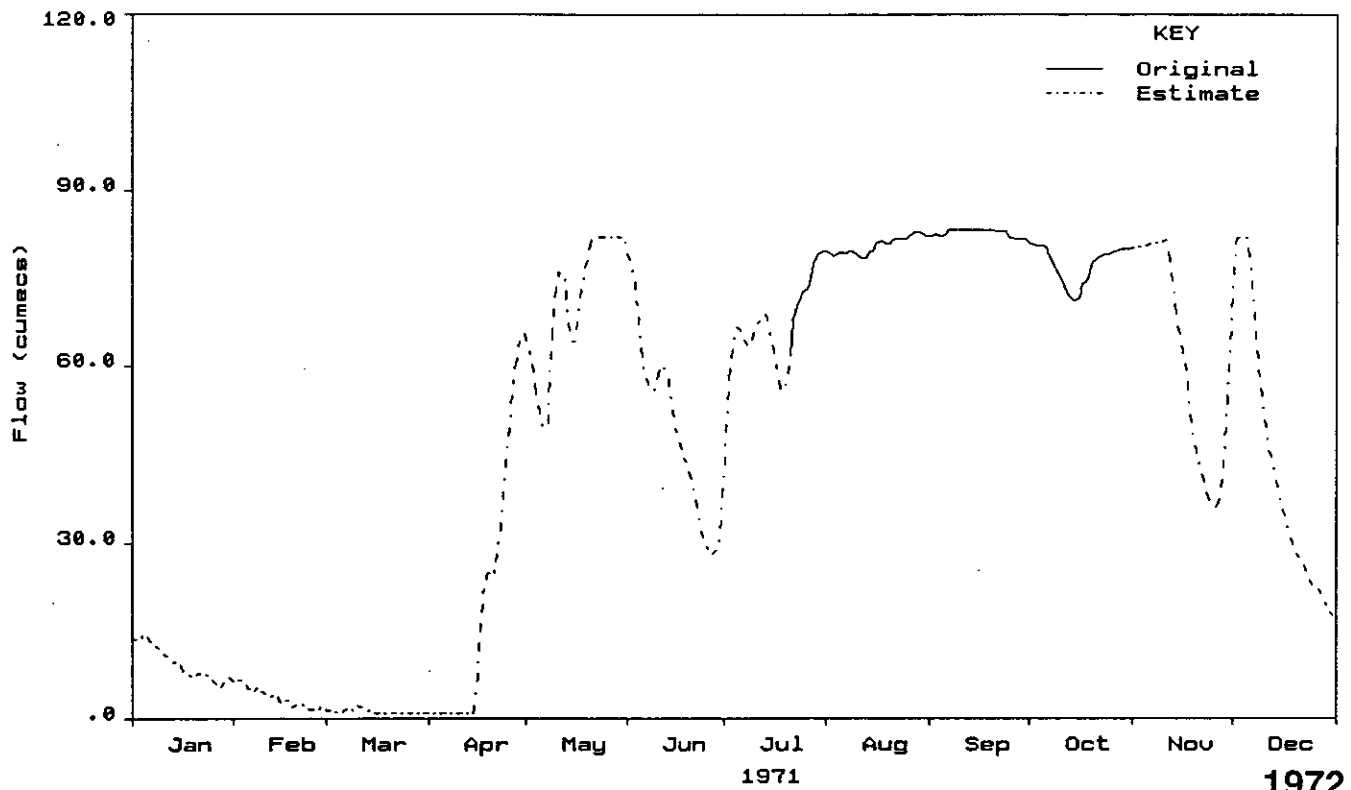
River Shebelli at Audegle

1969

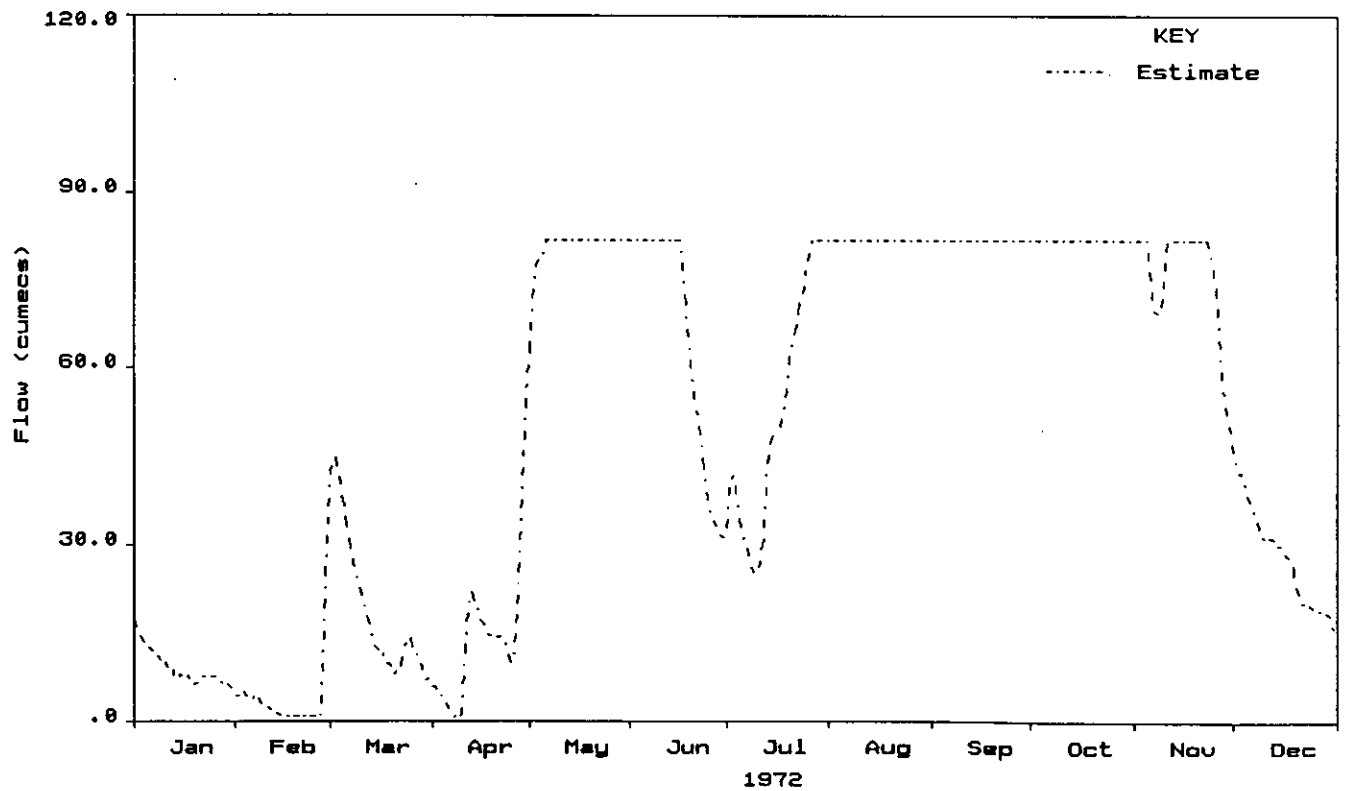


River Shebelli at Audegle

1971

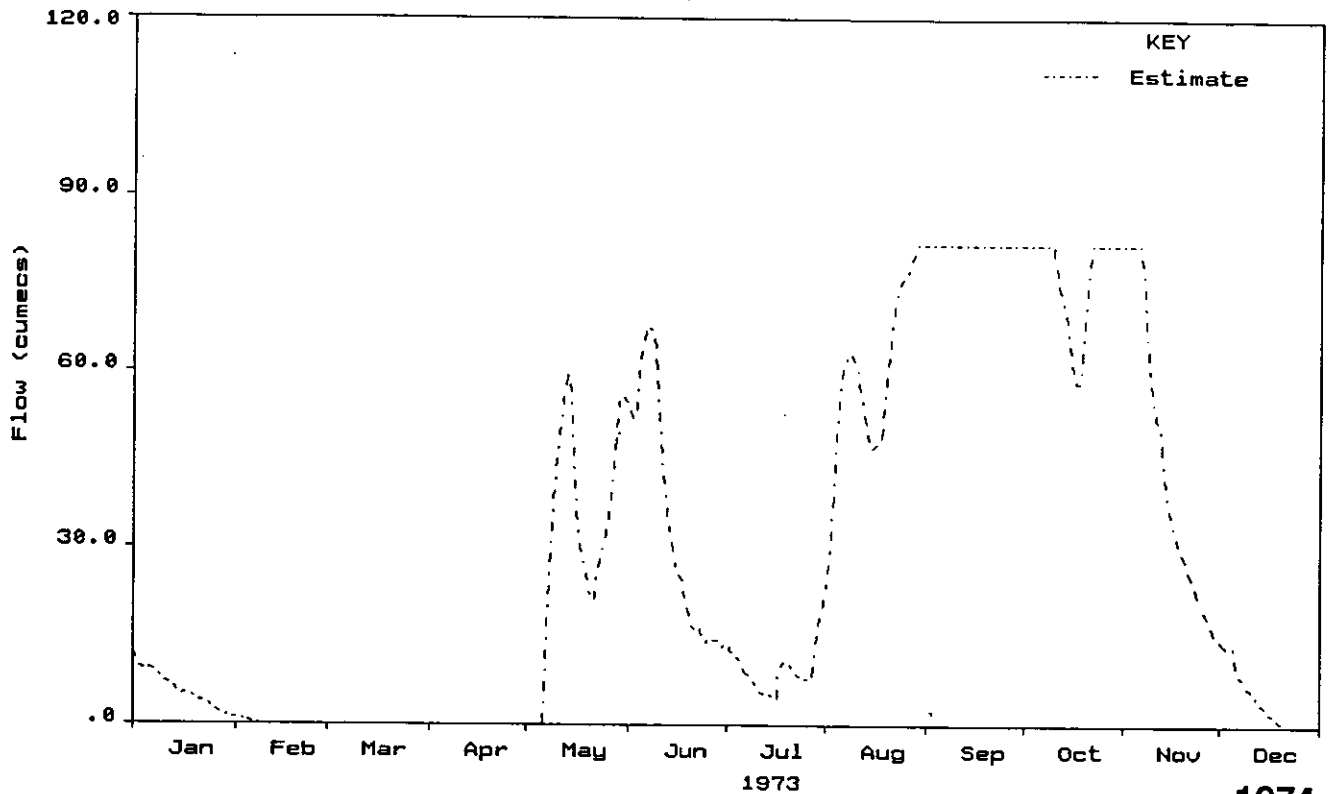


1972

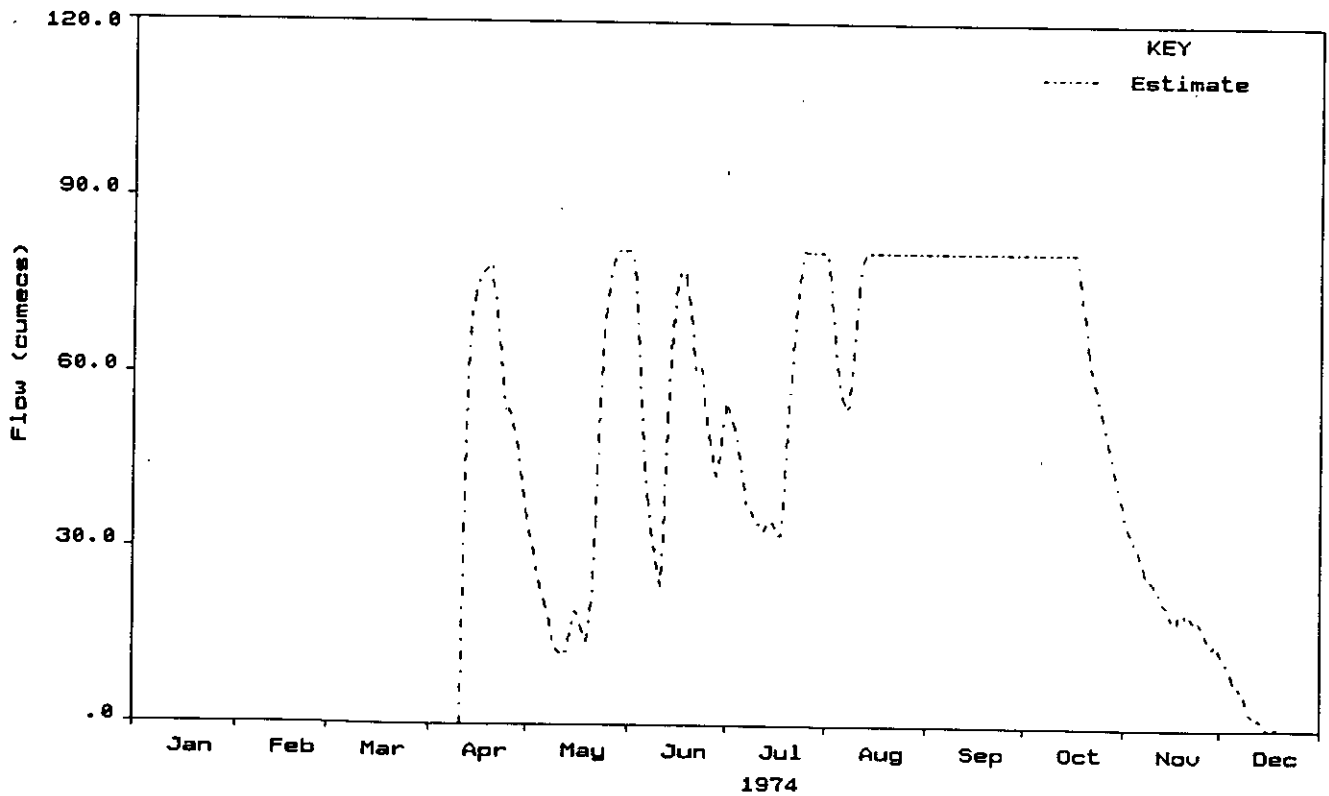


River Shebelli at Audegle

1973

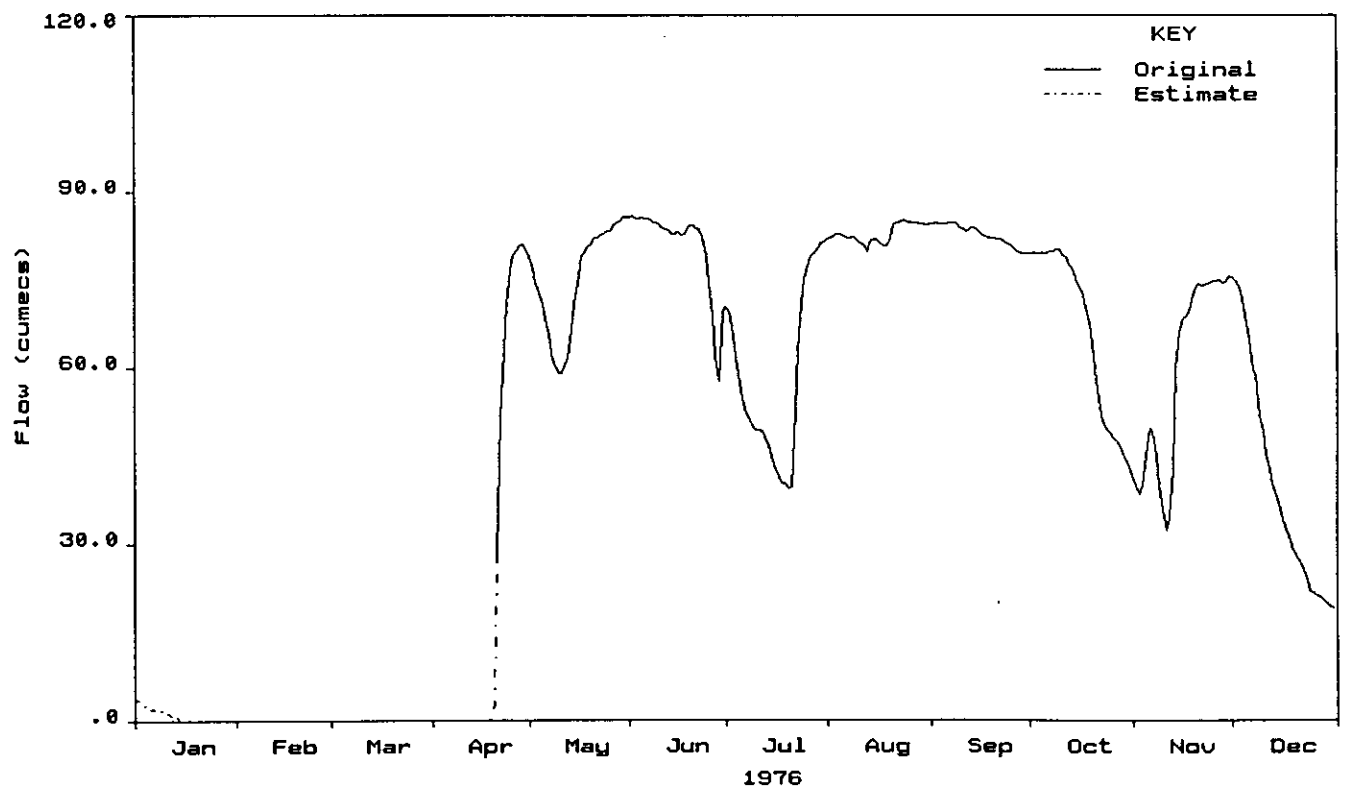
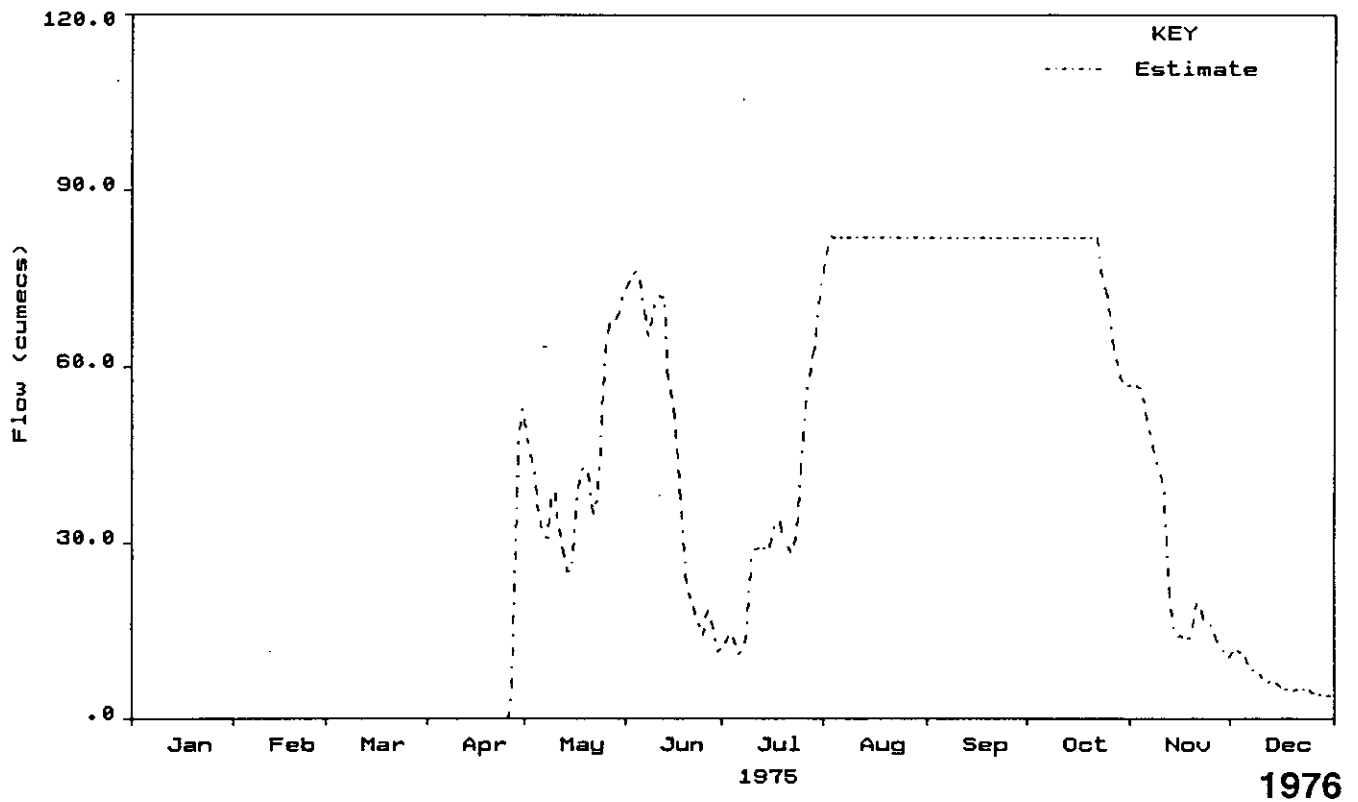


1974



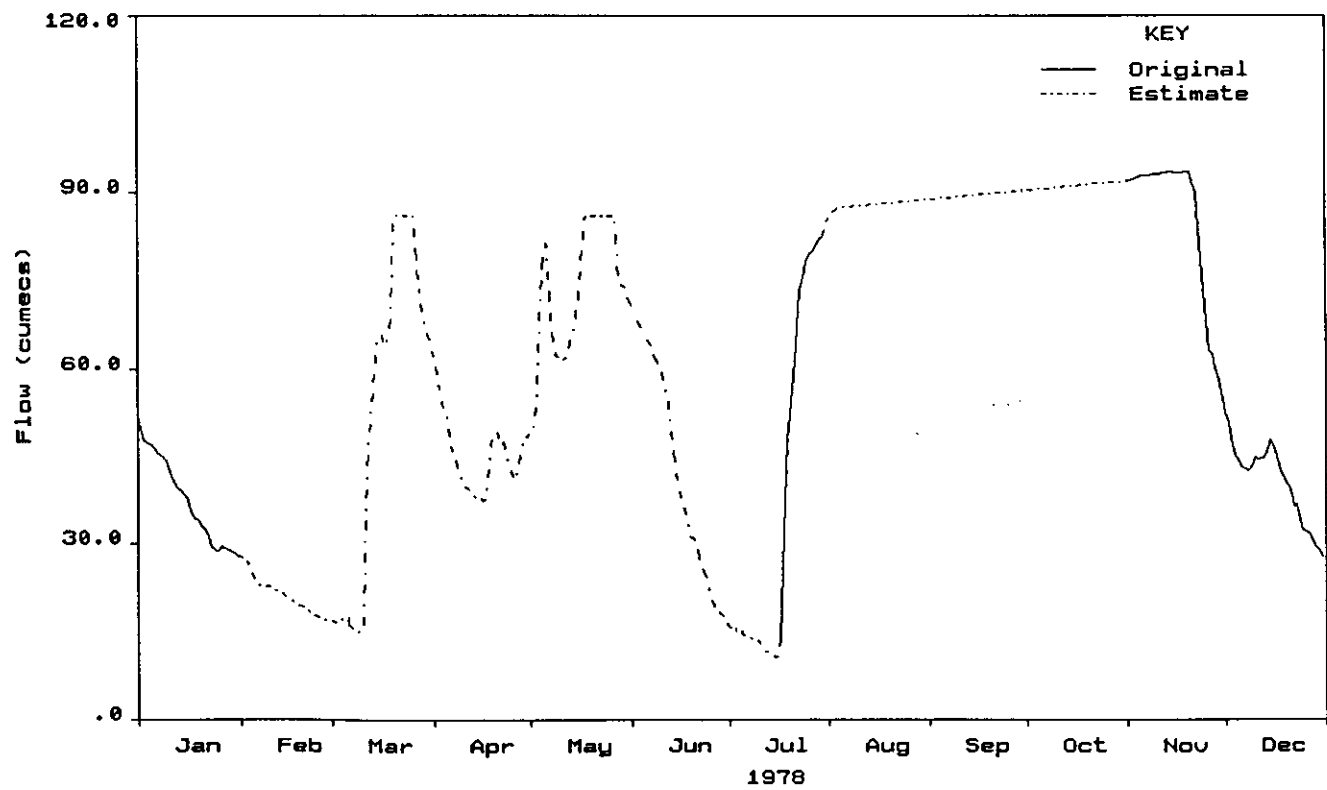
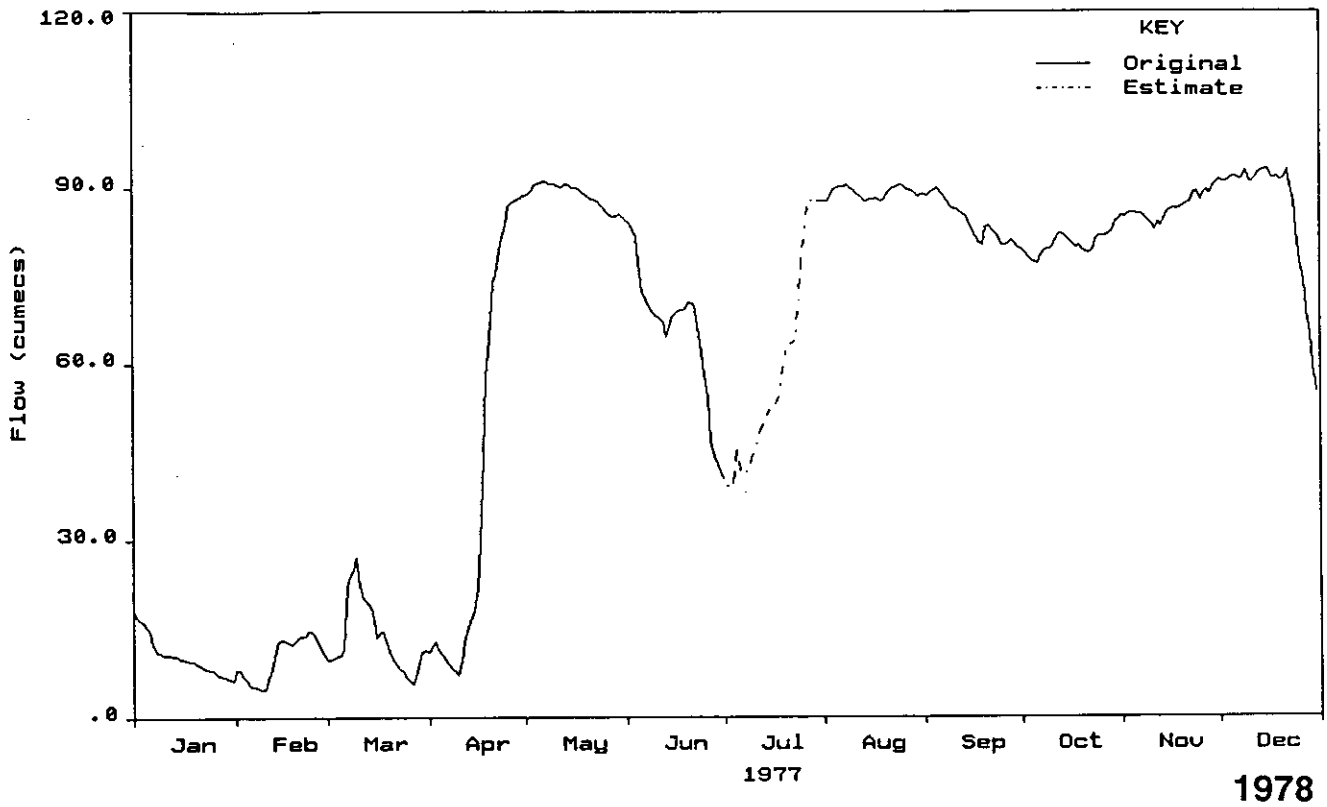
River Shebelli at Audegale

1975



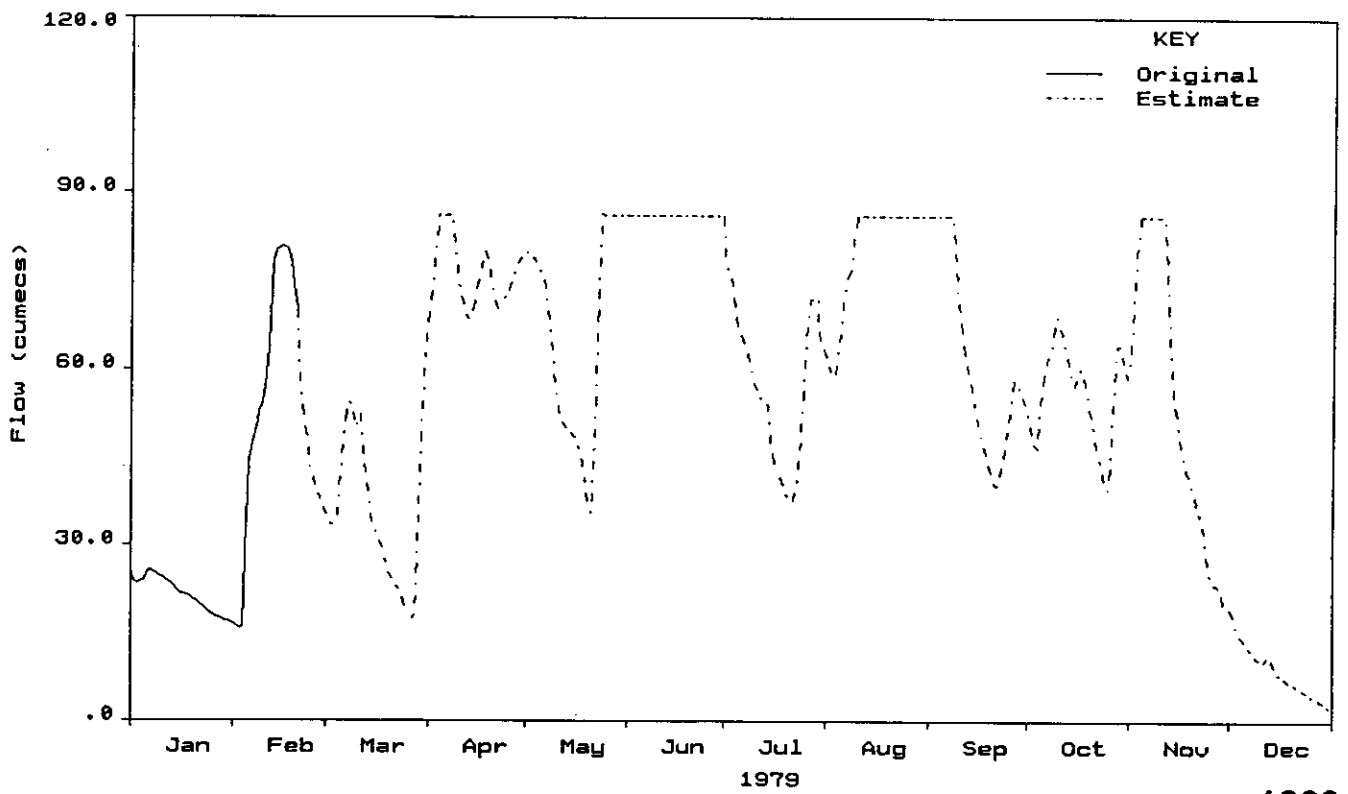
River Shebelli at Audegle

1977

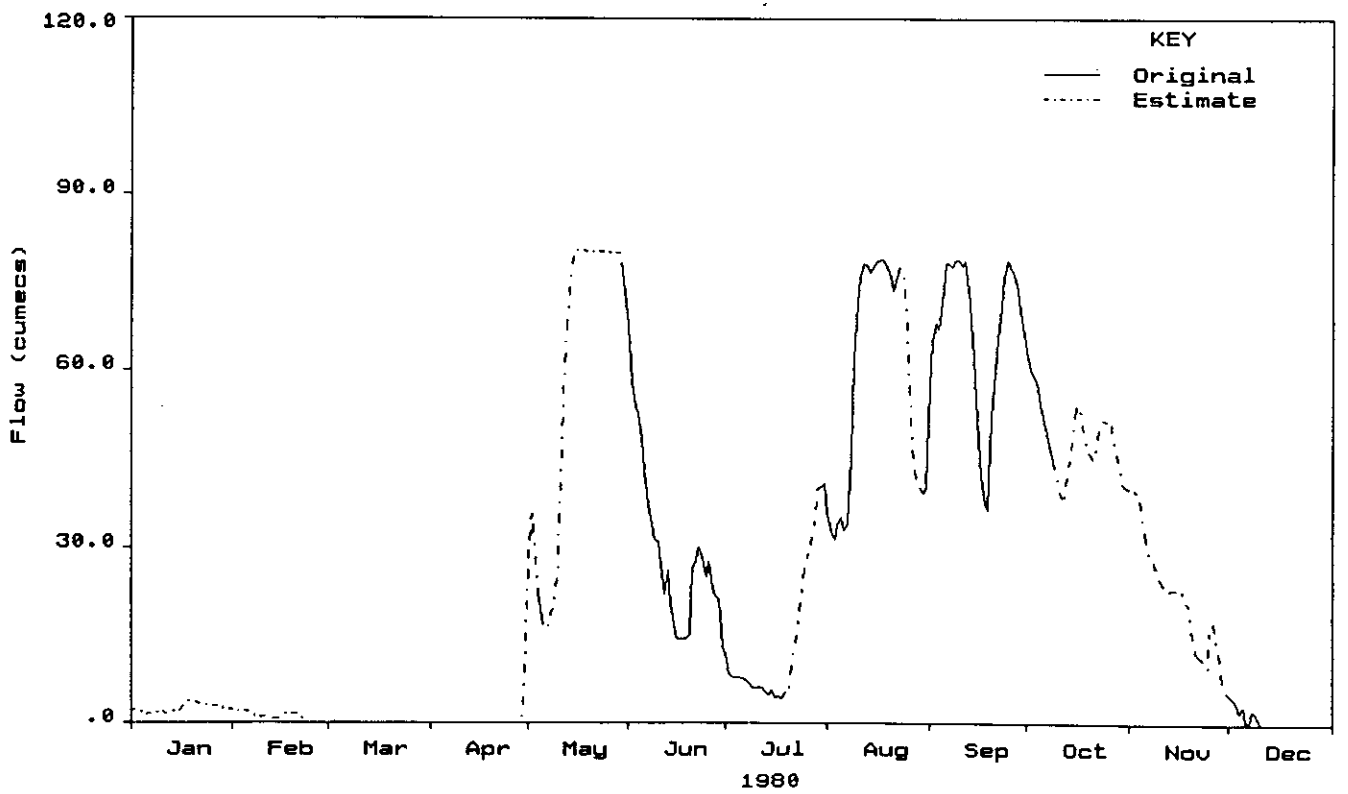


River Shebelle at Audegle

1979

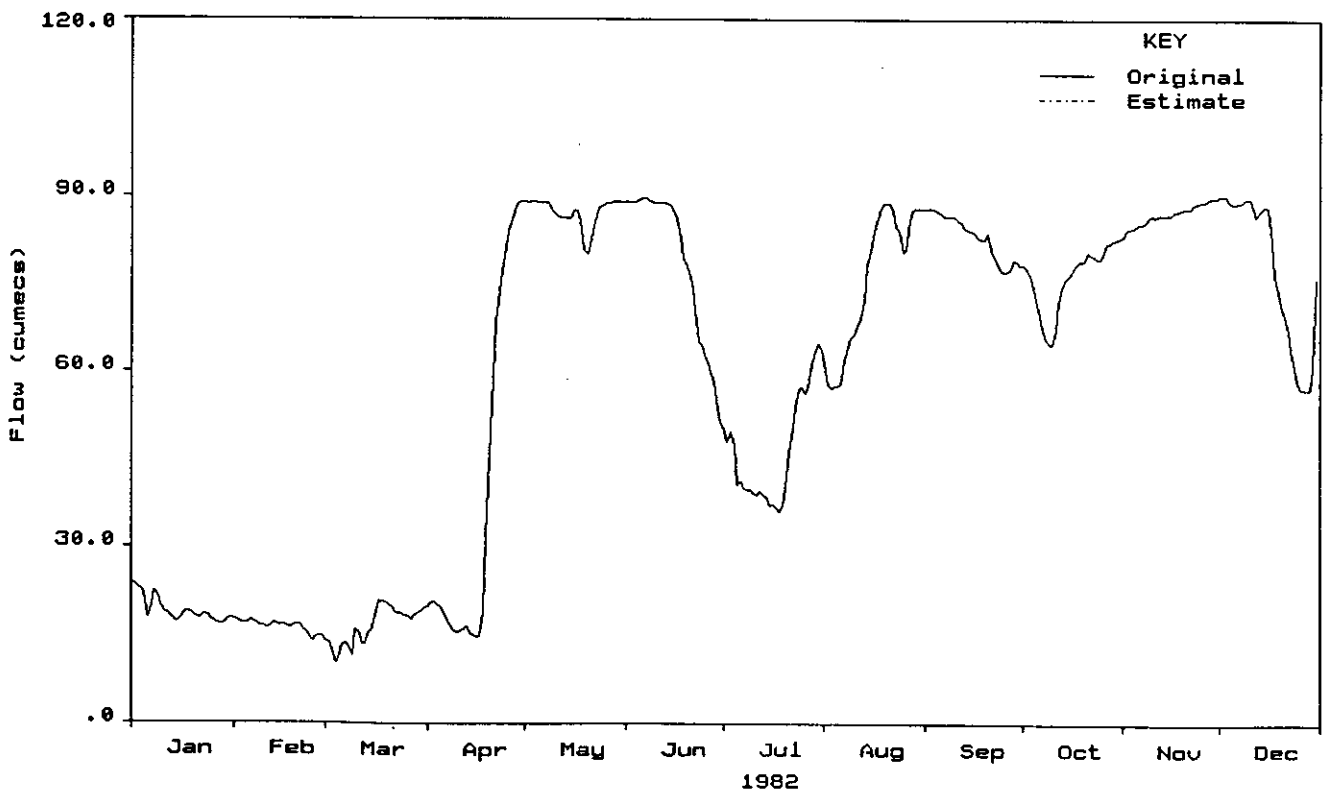
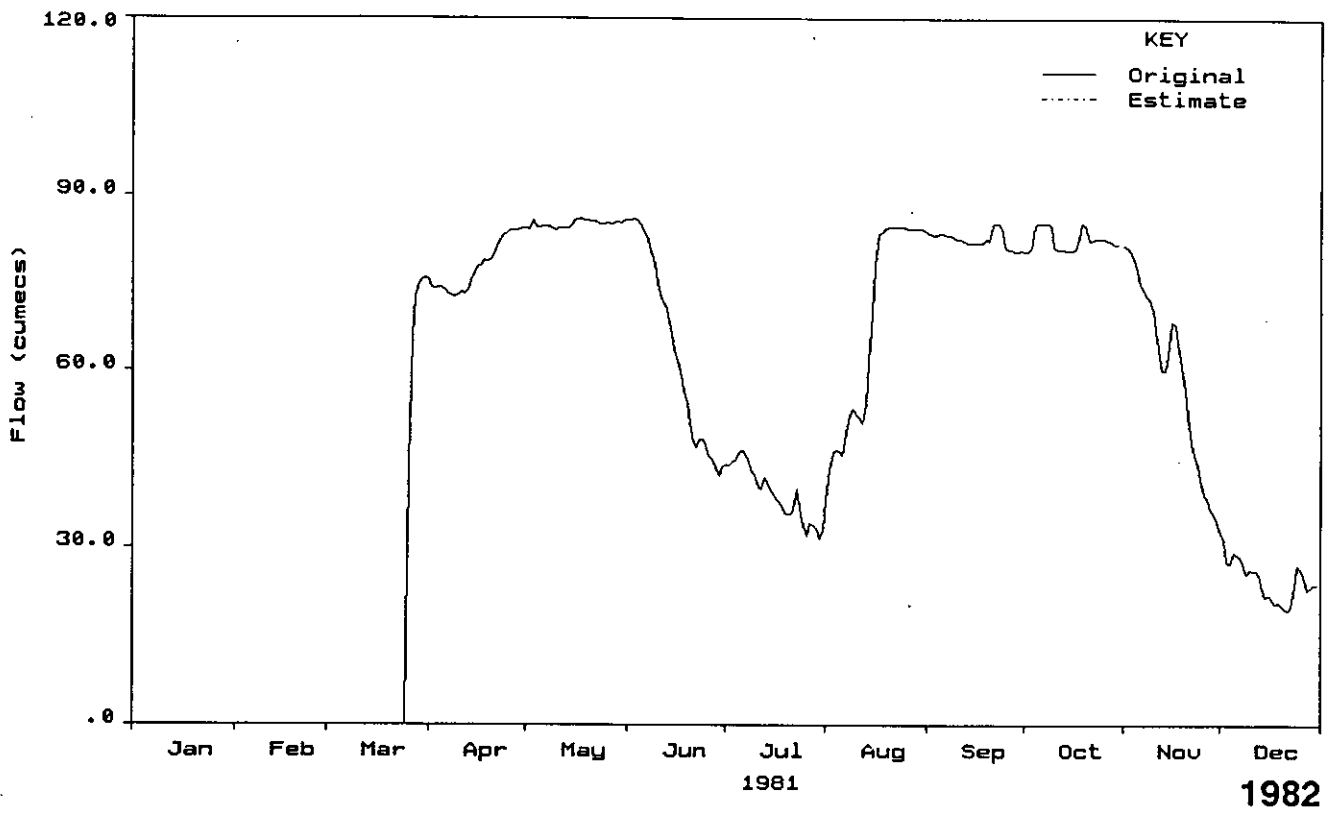


1980



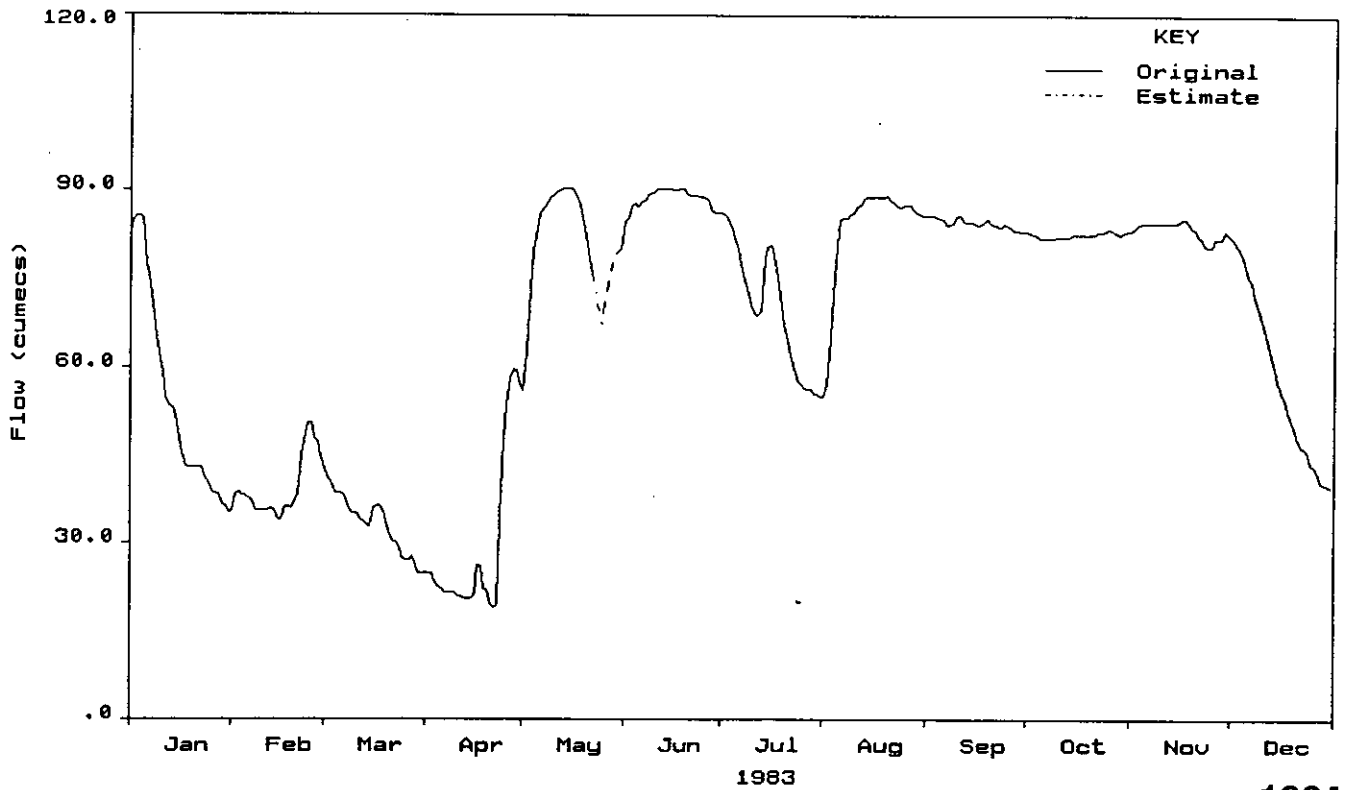
River Shebelli at Audegle

1981

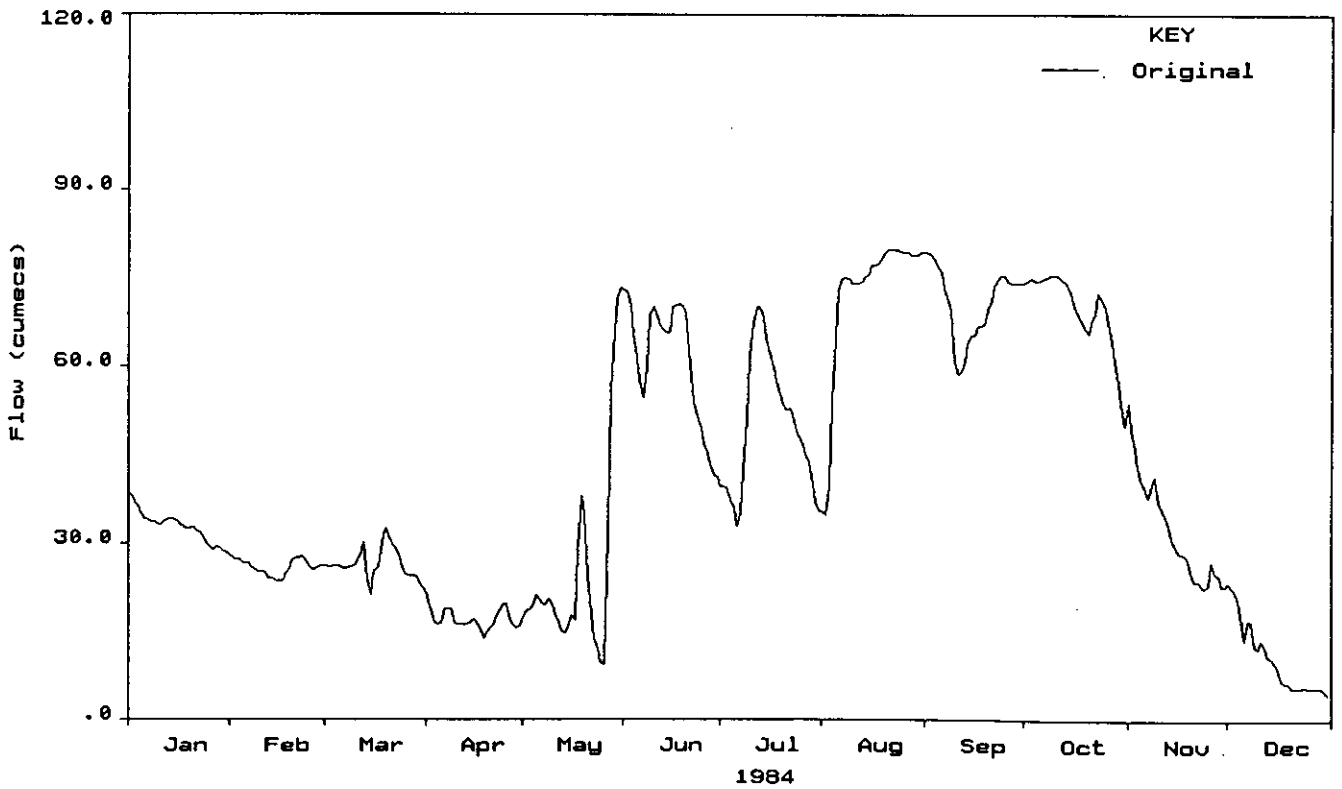


River Shebelli at Audegle

1983

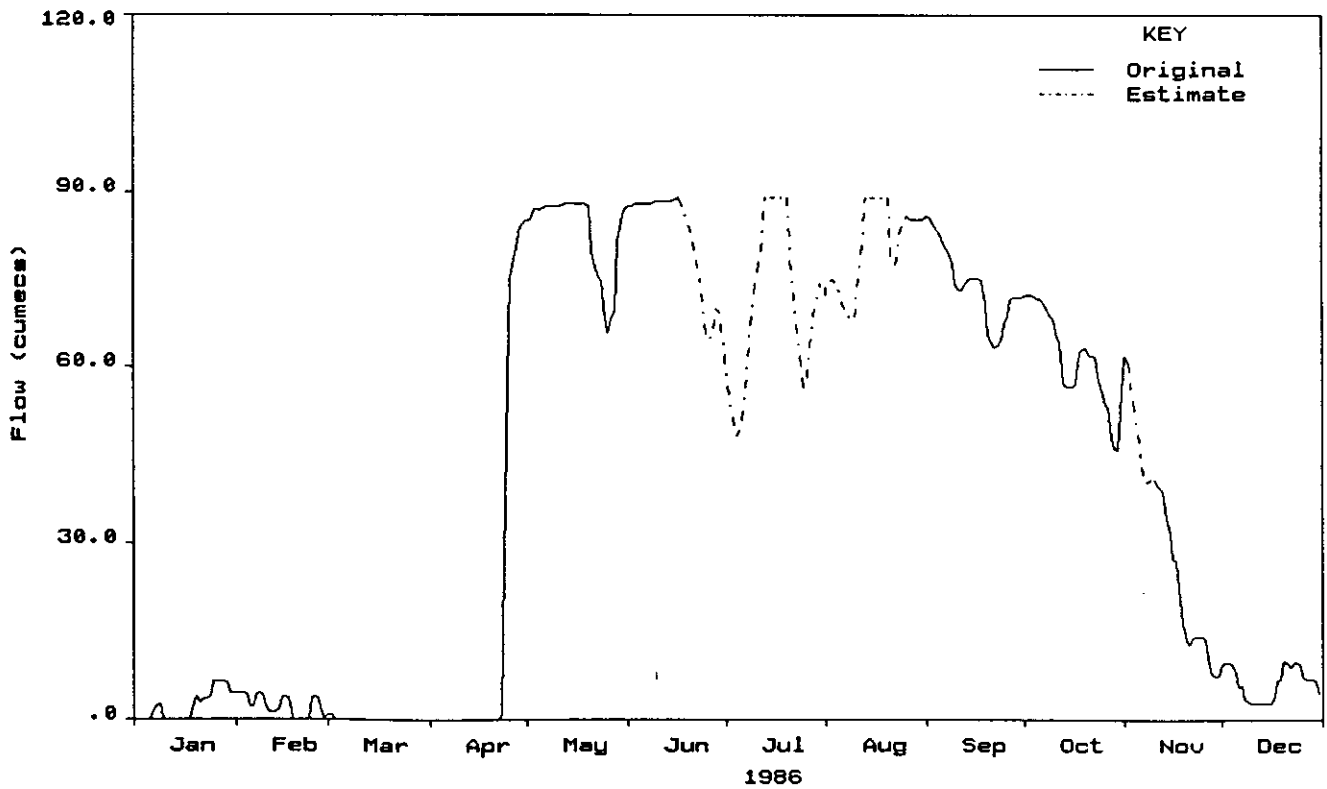
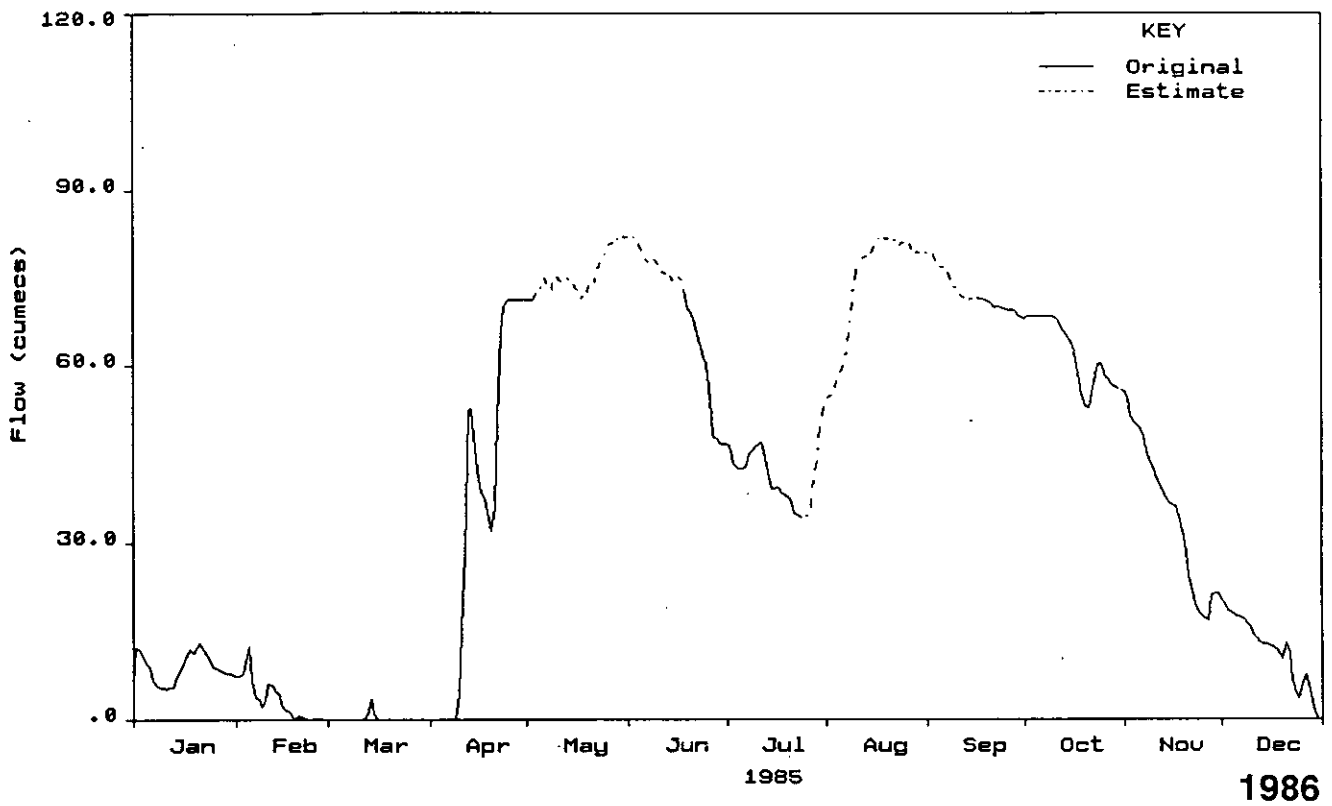


1984



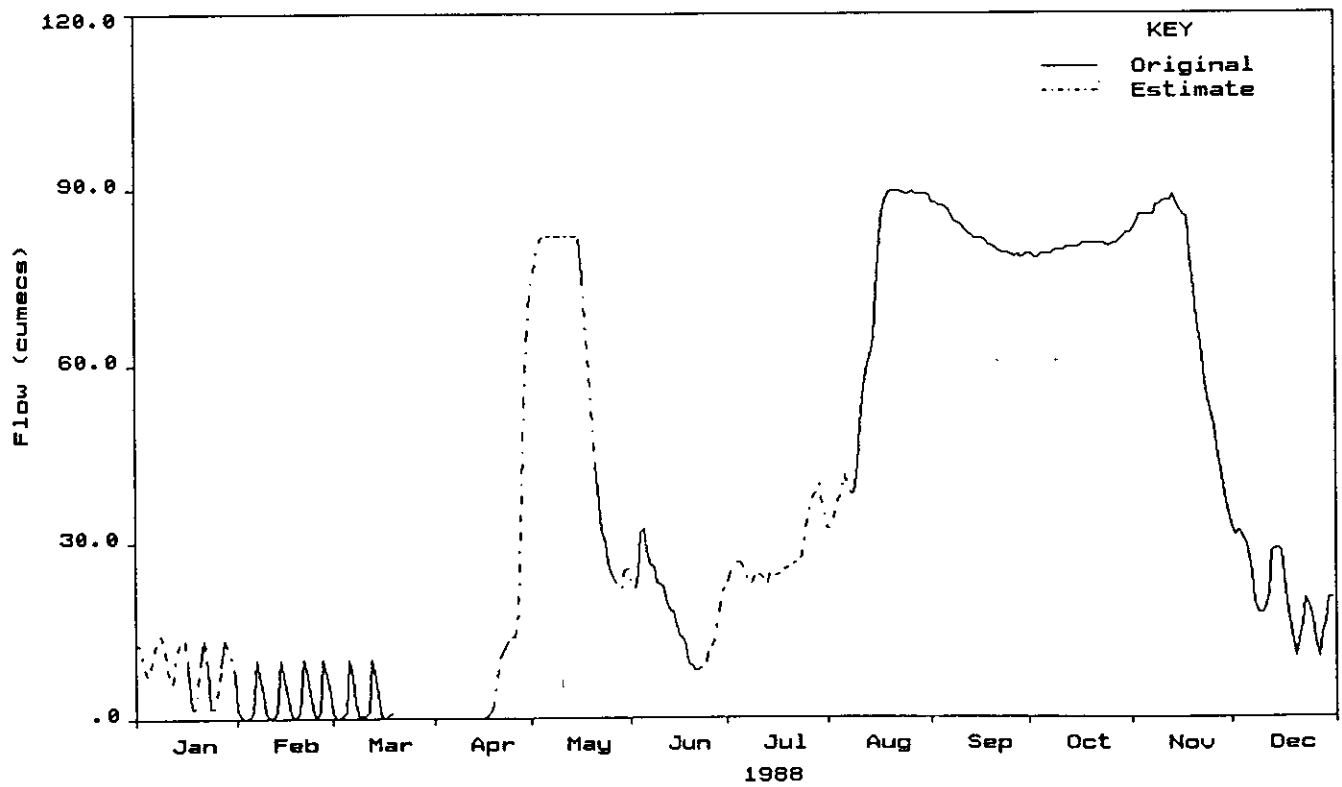
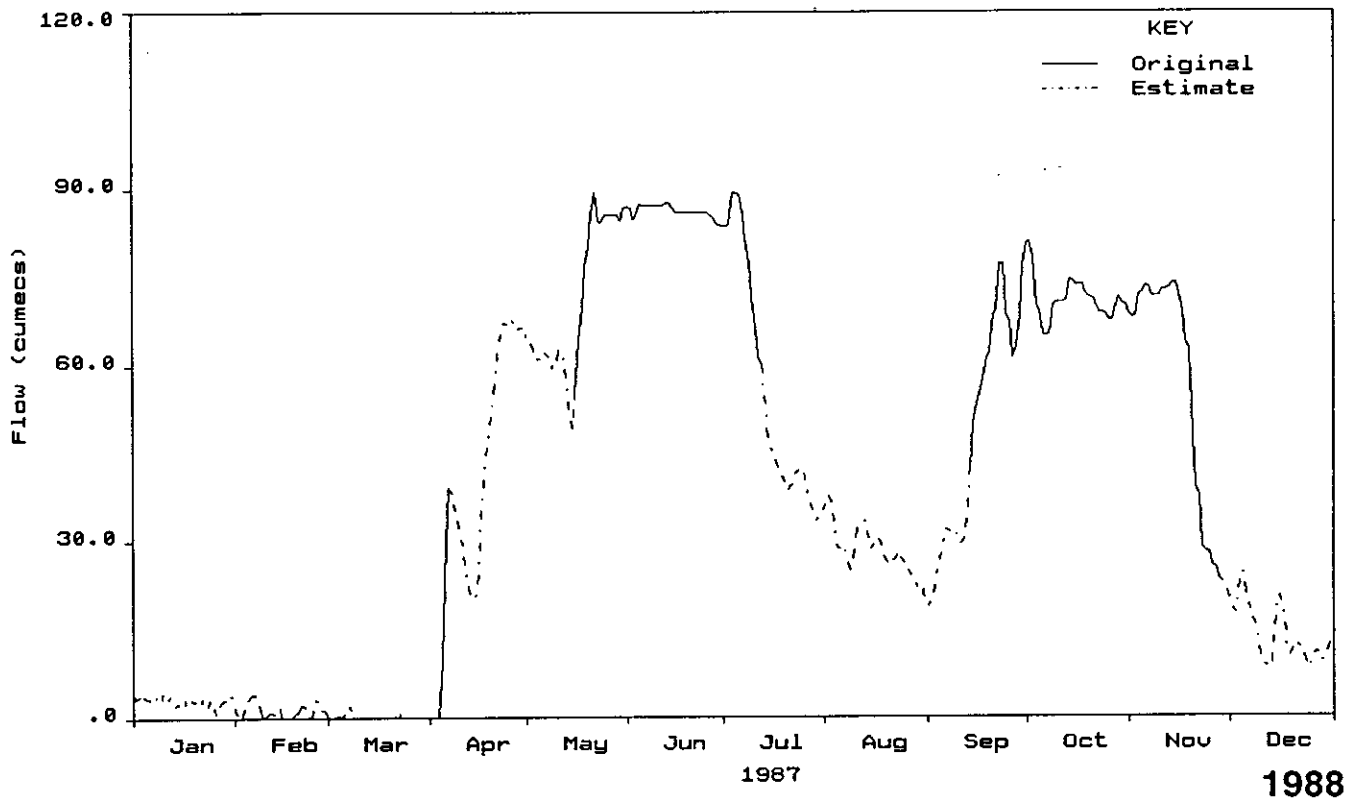
River Shebelli at Audegale

1985



River Shebelli at Audegale

1987



River Shebelli at Audegle

1989

