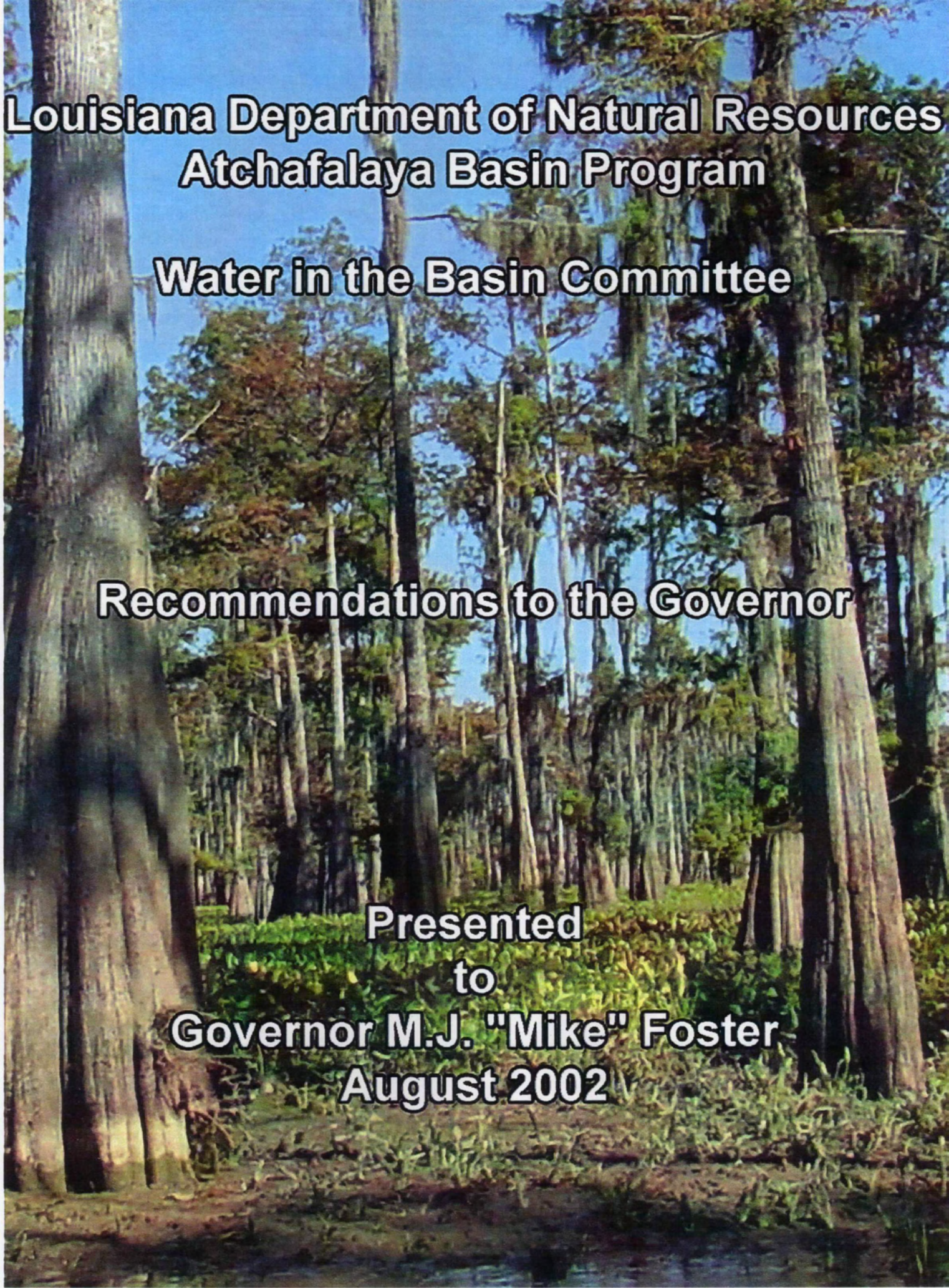


Louisiana Department of Natural Resources
Atchafalaya Basin Program

Water in the Basin Committee

Recommendations to the Governor

Presented
to
Governor M.J. "Mike" Foster
August 2002

State of Louisiana

M.J. "MIKE" FOSTER, JR.
GOVERNOR

JACK C. CALDWELL
SECRETARY

DEPARTMENT OF NATURAL RESOURCES

August 12, 2002

Hon. M.J. "Mike" Foster
Governor of Louisiana
P.O. Box 94004
Baton Rouge, LA 70804

Dear Governor Foster:

It is my pleasure to present you with this Water in the Basin final report. This document was prepared with input from all of the stakeholders in the Basin, including commercial and sport fishermen, landowners, environmentalists, recreationists, and parish and local governments. Information was requested and received from the Corps of Engineers and the hydroelectric plant.

We believe that the recommendations provide guidelines for responding to the numerous requests for "more water in the Basin". I would like to thank Charlie Demas of the USGS for chairing this important committee, Lamar Hale of the Atchafalaya Basin Program, and Karen Gautreaux of the Governor's Office. We also recognize the LSU Ag Center, Louisiana Wildlife and Fisheries, U.S. Fish and Wildlife Service, and all of the members of the Water in the Basin committee for their assistance.

If this report meets with your approval, it will be distributed to the Water in the Basin committee which will begin work on implementation of the recommendations.

Thank you for the opportunity to work in your administration on this important project.

Sincerely,

Sandra

Sandra Thompson Decoteau
Director, Atchafalaya Basin Program

STD/lb

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Division
3535 S. Sherwood Forest Blvd, Suite 120
Baton Rouge, LA 70816-2255

August 12, 2002

Ms. Sandra T. Decoteau, Director
Louisiana Department of Natural Resources
Atchafalaya Basin Program
P.O. Box 94396
Baton Rouge, Louisiana 70804-9396

Dear Ms. Decoteau;

It is with pleasure I present to you the Water In the Basin Committee final report. The purpose of the committee was to investigate and make recommendations concerning water availability and timing of possible additional releases of Mississippi River water through the Old River Control Structures. Specifically, the committee was directed to: 1. Evaluate opportunities for implementing short-term operational changes at the Old River Control Structures, and 2. Make recommendations to more effectively manage available water within the Atchafalaya Basin. These objectives were fully met and addressed, as you will read in the report. The report is brief, comprehensive and easy to read. I trust that this document will be informative and a useful tool for decision makers in determining possible future deviations in flow regimes at the Old River Control Structures, and distribution of existing water.

I wish to thank all those who served on the committee and those user groups who provided knowledge and input into creating this document. I especially wish to thank those who contributed their professional expertise, without whose assistance this would have been a monumental task.

If you should have questions, comments or desire more information please contact me by telephone at 225-298-5481.

Sincerely,

Charles R. Demas
Committee Chairperson

WATER IN THE BASIN

Introduction

The Louisiana Department of Natural Resources (LADNR), Atchafalaya Basin Program (ABP) authorized by the Louisiana Legislature in Act 3 and signed by Governor M.J. "Mike" Foster in April 1998, authorizes the development of a Master Plan specifically to "conserve, restore, and enhance (where possible) the natural habitat and give all people the opportunity to enjoy the Atchafalaya Experience". The program has successfully been in operation since that time with studies and implementation of many of the above-mentioned goals. There is and has been extensive public support and cooperation among the various user groups and concerned citizens for this vast national treasure. As a medium for input by the general public and also a means of disseminating plans and objectives for projects within the Atchafalaya Basin, 18 committees were organized. One of these committees is the Water in the Basin committee.

The Water in the Basin committee was formed as a result of concerned citizens and user groups who have witnessed the deterioration of backswamp areas due to a lack of available fresh water during three below average high-water seasons. Good water quality in the Atchafalaya Basin is dependent upon the availability of fresh river water and minimization of stagnant water remaining in the backswamp areas. Three below average high-water seasons resulted in environmental hardship for the aquatic eco-system within the Atchafalaya Basin and economic hardship for the traditional users. The purpose of this committee is to investigate and make recommendations on water availability and timing of releases from the Old River Control Structure (ORCS). Specifically the committee was directed to:

1. Evaluate opportunities for implementing short-term operational changes at ORCS.
2. Make recommendations to more effectively manage available water.

In order to determine those who favor more water in the Basin, those who object to more water in the Basin, and those who feel that no action should be taken, the committee sent out a questionnaire. In addition to the questionnaire, a group of environmental scientists and engineers from federal and state agencies met to discuss the same issues and to develop recommendations where needs are identified.

Background

This committee recognizes the primary use of the basin is for flood control, that is, passing its designated proportion of the project flood. The committee identified the following user groups that have an interest in whether more water is needed in the Atchafalaya Basin: coastal restoration agencies, commercial fishermen, eco-tourism operators, environmentalists, hunters, land owners, Morgan City, navigation interests, oil and pipeline interests, power plant operators, recreational fishermen, salt water commercial and recreational fishermen (those using the Atchafalaya and Vermilion Bays), and timber interests. The committee convened and determined that there should be a simple questionnaire developed for distribution to all interested parties and user groups. This was done (see attachment I). Approximately three thousand were sent by mail to individuals with ninety-seven responses returned. An analysis of the responses was made with results shown in Attachment II.

Upon careful analysis of the responses, the committee determined that more water in the basin should be interpreted as more water in the backswamp. Although the overwhelming response was "yes" to the question "Does the Basin need more water," discussions with the various user groups indicated that this affirmative response included serious reservations dependent on timing and duration of releases. Groups that favored more water in the Basin with minimal reservations included: freshwater commercial and recreational fishermen, environmentalists, and eco-tourism operators. Those that favored more water but had serious reservations included hunters (did not want their leases flooded), power plant operations (if it has a negative impact on power generating capabilities due to change in hydraulic head), landowners (potential trespass issues due to increased accessibility by the general public, negative impact to timber), Morgan City (concerns with prolonged flooding, impact on navigation, safety), navigation (concerns with increased fuel consumption, safety), saltwater commercial fishermen (did not want more water during "traditional" low water periods, impacts on oyster beds) and timber interests (prolonged flooding impact on productivity/growth, and increased sediment deposition with related negative impact on tree growth). Hydrological perspectives such as channel morphology (form and structure), sediment load, and bank

stabilization should also be considered.

The Atchafalaya Basin is a complex, dynamic, and delicate fluvial eco-system, which provides many opportunities for commercial, private and recreational interests. The Flood Control Act of 1954 authorized the Corps of Engineers to manage flow between the Mississippi and Atchafalaya Rivers to the ratio that existed in 1950 at the latitude of Old River. As a result, the ORCS is operated so that, on an annual basis, 70 % of the combined flow of the Red and Mississippi Rivers above Old River is distributed to the Mississippi River, and 30 % is distributed to the Atchafalaya River. This is commonly referred to as the "70/30 flow distribution". As a matter of policy, the Corps maintains the 70/30 latitude flow on a daily basis. A misconception by many is that the Atchafalaya River receives thirty percent of the total flow of the Mississippi River. In actuality, the volume of water diverted from the Mississippi River is dependent on flow in the Red River.

An important concern of user groups is that sufficient fresh water is not getting into the backswamp areas and providing sufficient oxygenated water for sustaining the eco-system. This can be attributed to many factors, some of which are: accretion in distribution streams, natural levee development along all streams, dredging with related spoil disposal and the development, and distribution of oil and gas reserves within the lower basin through pipeline and well location canals.

The hydrographic records indicate that flow within the Atchafalaya River has remained relatively consistent within the guidelines of the 70/30 flow regime since the completion and operation of the ORCS began, as indicated by the attached partial flow records (see Attachment III). In the same time period, records indicate that for a given stage at Red River Landing in the Mississippi River below the ORCS, gage readings at Butte LaRose in the Atchafalaya River are lower (see Attachment IV). This may be an indication that the Atchafalaya Basin Main Channel (including Whiskey Bay Pilot Channel) is scouring and increasing its cross-sectional area, thereby creating more capacity for discharge through the main stem, thus lowering stages in the backswamp.

Along and adjacent to major channels, there are spoil banks as high as forty feet, as measured by National Geodetic Vertical Datum (NGVD), in some places. Spoil banks, along with natural accretion, tend to contain water within the channel and have successfully isolated large areas of natural backswamp. A natural and unobstructed backswamp will flood and de-water annually.

During periods of high water (in excess of 9.0 feet on the Butte LaRose Gage (BLR)); there are some avenues for introduction of source water into some backswamp areas. Generally, above 17.0 feet on the BLR gage, there is good over-bank flow in unobstructed areas. With little or no outlet for water to escape once the source water stream recedes, an oxygen-depleted (hypoxic) water condition exists over time. Natural physical and biological processes under existing conditions are not capable of offsetting this hypoxic state. This oxygen-deficient condition can result in depleted eco-system habitat and fish kills. Major fish kills have been generated by these hypoxic conditions during hurricanes as exemplified by Hurricane Andrew in 1992, when an estimated 182 million fish were killed due to anoxic (severe oxygen-depleted) conditions.

Recommendations

In order to determine the recommended timing, duration and stage requirement of small scale adjustments in the 70/30 flow distribution at ORCS, the committee recognizes that a comprehensive engineering study should be completed. This study should also determine the impact on hydrologic conditions within the Atchafalaya Basin for recommendation number five presented in this report. Recommendations, not listed in order of preference, are as follows:

1. Remove barriers to water flowage through the backswamp. The primary impediment to flow through most backswamp areas is the presence of spoil and natural accretion along natural waterways and manmade canals. Although adding water through the ORCS may increase the volume of water entering the backswamp through existing pathways, the distribution of water to the swamp will continue to be limited by these barriers. The long term objective of water management must include the removal of blockage in natural waterways, spoil along pipeline and location canals, and improved channel flow (as outlined in recommendation #5).
2. Short term deviations from the daily 70/30 flow distribution at the ORCS are recommended, using BLR as the control gage. Due to changed Atchafalaya main channel conditions discussed earlier, however, there are no appreciable benefits for additional diversions when the BLR gage is below 9.0 feet NGVD. There should be no additional diverted flows into the Basin during stages higher than 18 feet at BLR or during traditional low flow periods, such as occurred in 2001.

3. Water diversions should be maintained for a minimum of 14 days unless hydrological conditions change, so that no benefits are derived from additional diversions.
4. Minimize abrupt falls (0.5 ft or more in a 24-hr period) at the BLR Gage.
5. Lower bed elevations in the Atchafalaya Main Channel distributaries to offset the deepening of the Main Channel that has occurred over time. By lowering bed elevation in distributaries, water may get into the backswamp at lower BLR gage readings than currently occurs, minimizing the need to change the flow ratios at the ORCS.
6. Introduce additional flow during January through April, if recommended, but only if Mississippi River water temperature, measured at Red River Landing, remains below 20 degrees Centigrade (68 ^{0}F).
7. Avoid additional flow from May through December except during emergencies. This would minimize any negative impact to commercial and recreational salt-water fisheries during traditional periods of low flow in the Atchafalaya River.
8. Implementation by the Corps of Engineers of the authorized Big Alabama/Sherburne and Big Graw/Henderson diversion structures to provide freshwater inflow from the Atchafalaya River to the Henderson Lake and Alabama Bayou areas, respectively.
9. Recognize that the use of ORCS is in response to "emergency situations" and not a long-term management tool.
10. In addition to conditions identified, the ability to respond, or react, to emergency situations not covered by any of these recommendations should be continued.
11. The USACE is requested to provide information on effects at BLR gage from percent changes in flow ratio at ORCS.
12. The USACE is requested to provide an assessment of risk associated with proposed changes in water diversion at ORCS.
13. A committee should be formed composed of federal, state, non-government organizations (NGO's), and users that shall review all requests and recommendations made to the Governor, prior to changes requested at the ORCS.

Executive Summary

Good water quality in the Atchafalaya Basin is dependent upon the availability of fresh river water and minimization of stagnant water remaining in the backswamp areas. Three below average high-water seasons resulted in environmental hardship for the aquatic eco-system within the Atchafalaya Basin and economic hardship for the traditional users. Recent stage data from several gages in the Atchafalaya Basin indicate deepening in the main channel of the Atchafalaya River. This has resulted, over time, in less water getting into the backswamp areas for similar river stages that occurred at Butte LaRose prior to channel training.

This committee investigated the advantages and disadvantages of getting more water into the backswamp areas of the Atchafalaya Basin in order to mimic the natural hydrologic cycle. This can be achieved by augmenting flows into the backswamp during periods of below-average high water seasons. The committee recommends implementing short-term deviations from the daily 70/30 flow distribution at the latitude of Old River. Other opportunities for introducing more water into the backswamp areas include lowering the beds of distributaries off of the Atchafalaya Main Channel, and implementation, by the Corps of Engineers, of the two authorized freshwater diversion projects in the Big Alabama Bayou and Big Graw areas. This committee does not recommend augmenting flow during average high-water years or during low water seasons except during emergencies.

This committee recognizes that any plan to get more water into the backswamp areas must consider the following:

1. The primary use of the basin is for flood control; that is, passing its designated proportion of the project flood.
2. Distribution of flow at the latitude of the Old River is legislatively mandated, and the Old River Control Structures (ORCS) provide the only means of flow control.
3. Other users of the basin, such as navigation concerns, power plant operations, timber operations, Atchafalaya and Vermilion Bay commercial and recreational users, hunters, land owners, Morgan City river front concerns, and oil and gas interests should be considered when adjustments to flow is proposed.

WATER-IN-THE-BASIN QUESTIONNAIRE

All User Groups and Interested Parties:

Please provide a written response to the listed questions and bring to the next "Water In The Basin" meeting, or mail to Atchafalaya Basin Program, LA. Dept of Natural Resources, P. O. Box 94396, Baton Rouge, LA 70804-9396 to arrive before August 9, 2001. Responses must be in writing to be considered. The meeting on August 9, 2001 will be to collect all responses. The comments will be summarized and mailed to all people who responded so that they can review the different thoughts, ideas and suggestions, and be prepared to discuss them at the next meeting to be scheduled in September.

1. Do we need more water in the Basin?

2. If yes, when do we need more water and how much (in relation to stage at Butte LaRose)?

3. How will the changes you want benefit you and the Basin? That is, what resources will benefit from these changes?

4. What other resources and users in the Basin will benefit by this request?

5. What resources or users will be harmed by this request?

Use additional pages as required.

Analysis of Responses To

W A T E R - I N - T H E - B A S I N Q U E S T I O N N A I R E

1. *DO WE NEED MORE WATER IN THE BASIN?*

100%	Replied YES.

2. *(If Yes, WHEN DO WE NEED MORE WATER AND HOW MUCH (in relation to Stage at Butte LaRose)?*

73%	*17', or more from December through Spring Rise*
2%	*11' early as possible through May 15*
10%	*15', or more, from November to June*
8%	*Same level as River - through Spring Rise*
3%	*Same Level as in Past Before Channelization*
1%	*Channel all Basin Water to Wax Lake Outlet*
3%	*Water Level Over Entire Basin 6'-8' Year Around*

3. *HOW WILL THE CHANGES YOU WANT BENEFIT YOU AND THE BASIN? THAT IS, WHAT RESOURCES WILL BENEFIT FROM THESE CHANGES:*

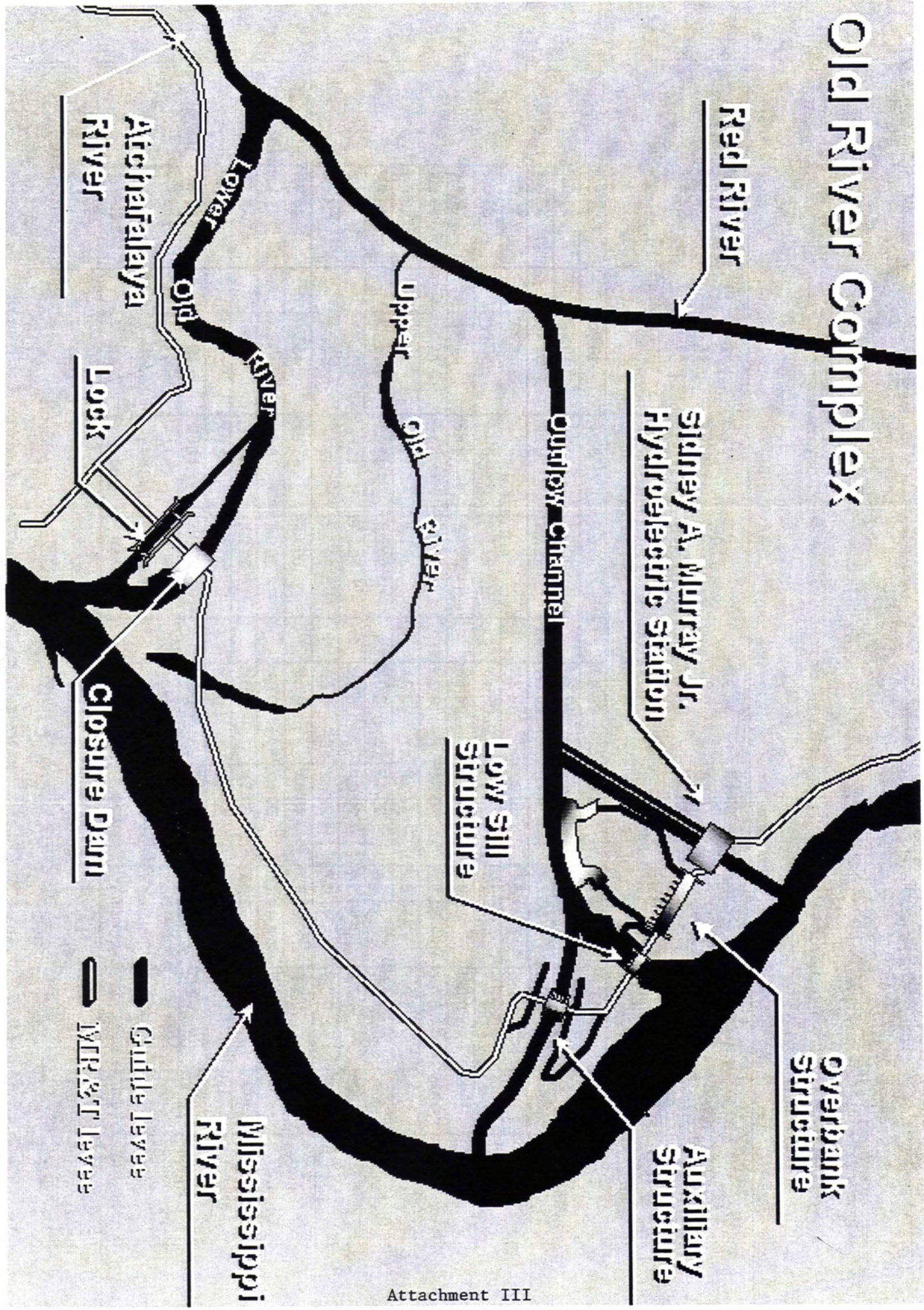
70%	Crawfish (and all Fish) and Livelihood of Those Who Work in the Basin
30%	All Resources, Commercial and Recreational Fishermen, Better Access, and Tourism

4. *WHAT OTHER RESOURCES AND USERS IN THE BASIN WILL BENEFIT BY THIS REQUEST?*

2%	Water Quality
31%	All Basin Renewable Living Resources
11%	Landowners, Timber, Access, Reduce Siltation
55%	Commercial and Recreational Users
1%	No one

5. *WHAT RESOURCES OR USERS WILL BE HARMED BY THIS REQUEST?*

2%	Each Time Man Attempts to Manipulate the Flow Something is Hurt - Let Nature Handle It
8%	Salt Water Fisheries, Particularly in Coastal Estuaries
84%	None
1%	Hydroelectric Plant and Users Along Mississippi River
2%	Areas Treated Differently By Political Decisions
2%	Bottomland Hardwoods
1%	More Water Brings In More Silt



Attachment III

Old River Complex
Flow Statistics

year	overbank percent Old R	auxiliary percent Old R	lowsill percent Old R	hydropower percent Old R		Simmes percent lat	Red R percent lat	Old R percent lat		outflow percent Miss
1983	8.2%	0.0%	91.8%	0.0%		30.0%	11.6%	18.4%		20.8%
1984	4.1%	0.0%	95.9%	0.0%		30.0%	9.9%	20.1%		22.3%
1985	0.8%	0.0%	99.2%	0.0%		30.0%	10.1%	19.9%		22.1%
1986	0.0%	1.1%	98.9%	0.0%		30.0%	9.4%	20.6%		22.7%
1987	0.0%	59.2%	40.9%	0.0%		30.1%	12.8%	17.2%		19.8%
1988	0.0%	42.0%	58.0%	0.0%		30.0%	12.0%	18.0%		20.4%
1989	0.3%	43.2%	56.8%	0.0%		30.0%	12.8%	17.2%		19.7%
1990	1.2%	45.5%	53.4%	0.0%		30.0%	15.7%	14.3%		16.9%
1991	0.0%	29.0%	11.3%	59.8%		30.0%	14.7%	15.3%		18.0%
1992	0.0%	21.7%	0.0%	78.3%		30.0%	12.7%	17.3%		19.8%
1993	0.0%	28.9%	6.7%	64.4%		30.0%	8.6%	21.4%		23.4%
1994	0.0%	23.3%	7.3%	69.4%		30.0%	9.1%	20.9%		23.0%
1995	0.0%	15.9%	10.8%	73.3%		30.0%	10.2%	19.8%		22.0%
1996	0.0%	30.1%	6.1%	63.8%		30.0%	5.9%	24.1%		25.6%
1997	0.0%	15.5%	10.6%	73.8%		30.0%	11.4%	18.6%		21.0%
1998	0.0%	18.4%	12.9%	68.8%		30.0%	9.2%	20.8%		22.9%

1990-1998							
Average	25.4%	13.2%	61.3%	30.0%	10.8%	19.2%	21.4%
Maximum annual	15.5%	0.0%	0.0%	30.0%	5.9%	14.3%	16.9%
Minimum annual	45.5%	53.4%	78.3%	30.0%	15.7%	24.1%	25.6%

10 May 01

Changes in Flow Distribution through the Old River Complex due to requests from the Governors Office.

Date	Diversion	Reason	Duration
May - June 1983	held Red River Landing Gage to 60.4 ft. equal to 31.6 % at the crest.	to prevent the evacuation of the state penitentiary at Angola.	16 Days
May 1991	the distribution of flow through the Old River Complex was reduced to about 28.5-29.0 %	allowed for rapid evacuation of flood waters in the Red, Black, and Ouachita Rivers	21 Days
1993	the State of Louisiana, through the Governor's office, requested that the Mississippi River Commission reduce flows into the Atchafalaya Basin to minimize the probability of a fish kill within ,the basin following an extensive restocking by the state and other private organizations.	This request was denied because the resulting increased flow in the Mississippi River would have increased the probability of flooding of low-lying agricultural lands in both Louisiana and Mississippi.	
April 1996	the distribution of flow through the Old River Complex was increased from 30 % to 32 %	to increase crawfish production	14 Days
March 2000	the distribution of flow through the Old River Complex was increased from 30 % to 32 %	to increase crawfish production	16 Days
Feb-March 2001	The New Orleans District is prepared to increase flows in the Atchafalaya River up to a maximum of 32 % of the latitude flow to maintain the Butte LaRose stage above 9 ft. NGVD.	This request is pending and will be for a 2-week duration. The reason is to aid crawfish production. 32% flow distribution began on 5/5/01	to date 6 days

Flow Distribution

Calendar Year	Percent in Mississippi River	Percent in Atchafalaya River
1950	70.1	29.9
1954	73.5	26.5
1955	72.4	27.6
1956	71.6	28.4
1957	69.7	30.3
1958	67.4	32.6
1959	70.4	29.6
1960	69.9	30.1
1961	68.6	31.4
1962	68.1	31.9
1963	70.8	29.2
1964	77.7	22.3 (influenced by barge incident)
1965	69.2	30.8
1966	73.9	26.1 (influenced by barge incident)
1967	69.7	30.3
1968	67.8	32.2
1969	67.6	32.4
1970	66.7	33.3
1971	67.5	32.5
1972	66.8	33.2
1973	65.4	34.6 - Period of
1974	65.3	34.7 - impaired ability
1975	65.5	34.5 - to control
1976	68.2	31.8 - diversions
1977	69.9	30.1
1978	69.9	30.1
1979	69.9	30.1
1980	70.1	29.9
1981	69.9	30.1
1982	69.9	30.1
1983	70.0	30.0
1984	70.0	30.0
1985	70.0	30.0
1986	70.0	30.0
1987	69.9	30.1
1988	70.0	30.0
1989	70.0	30.0
1990	70.0	30.0
1991	70.0	30.0
1992	70.0	30.0
1993	70.0	30.0
1994	70.0	30.0
1995	70.0	30.0
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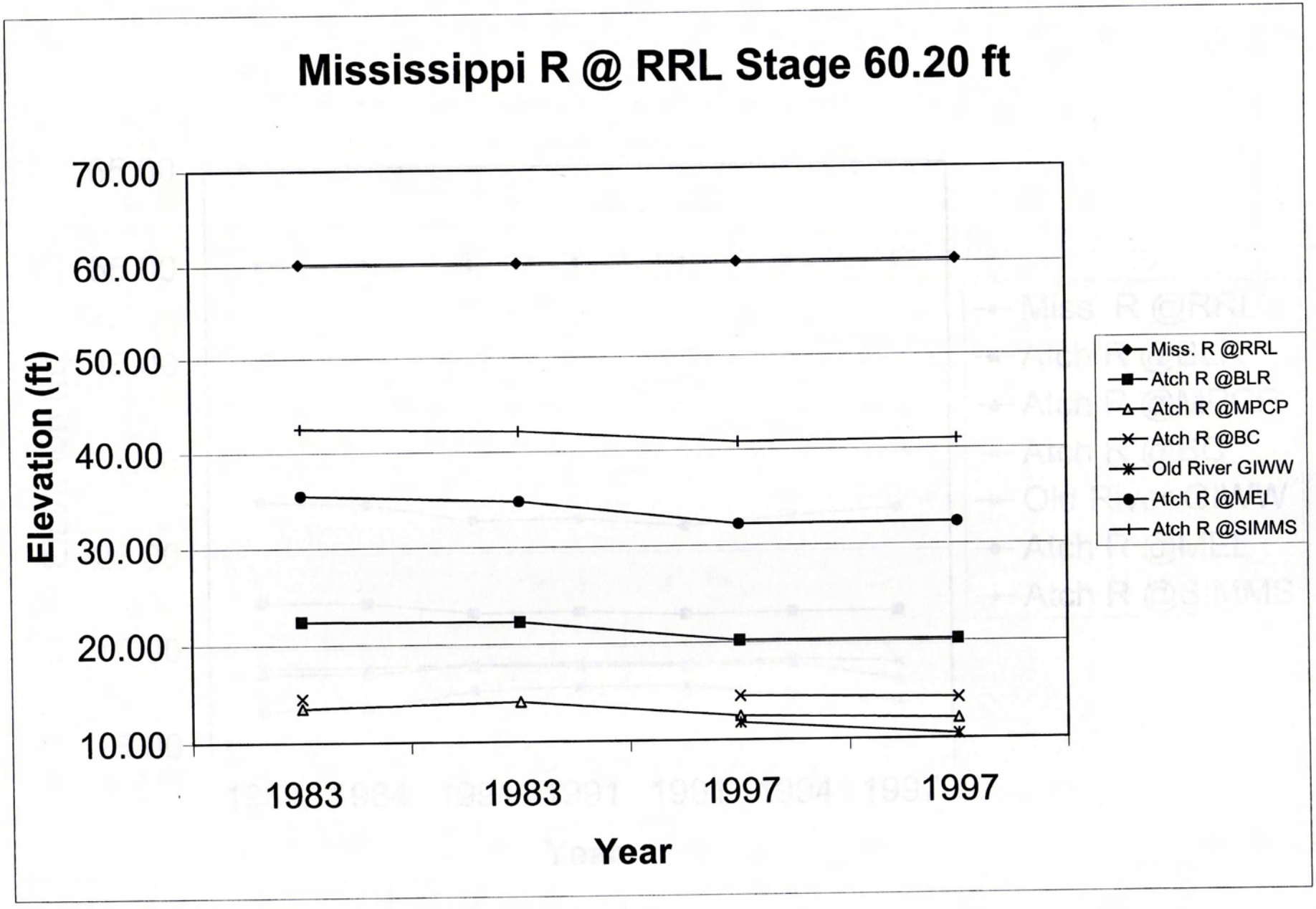
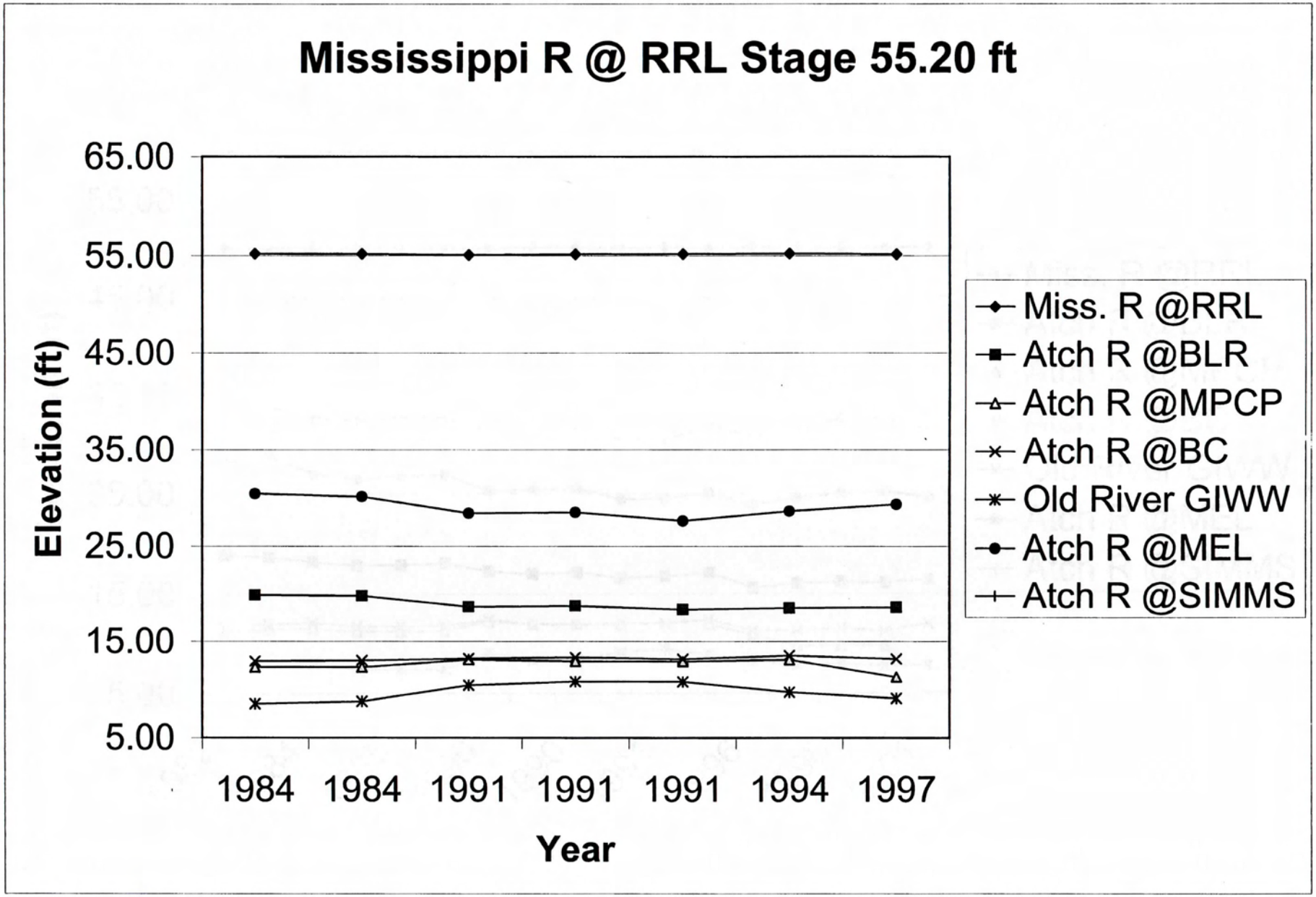
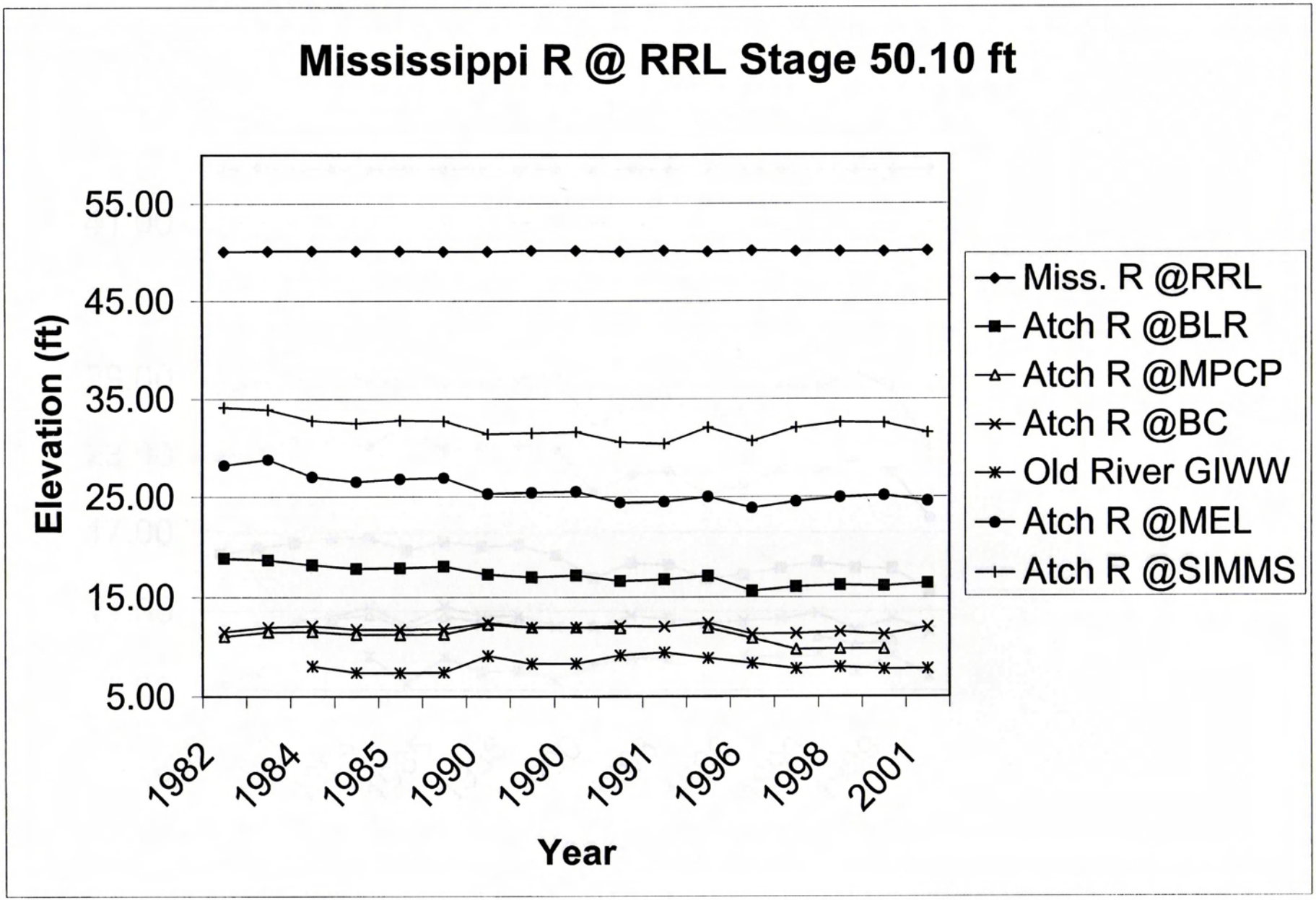
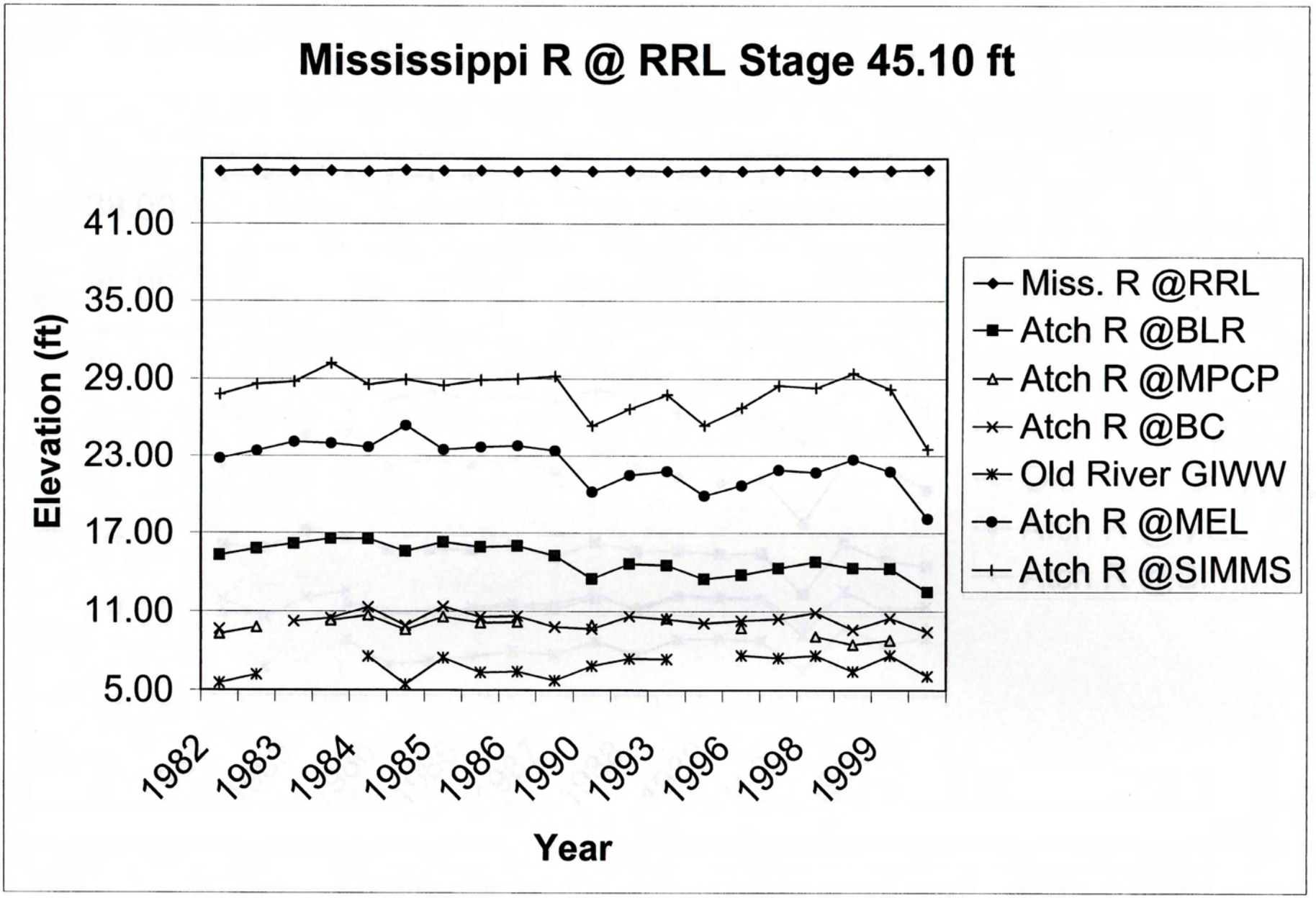
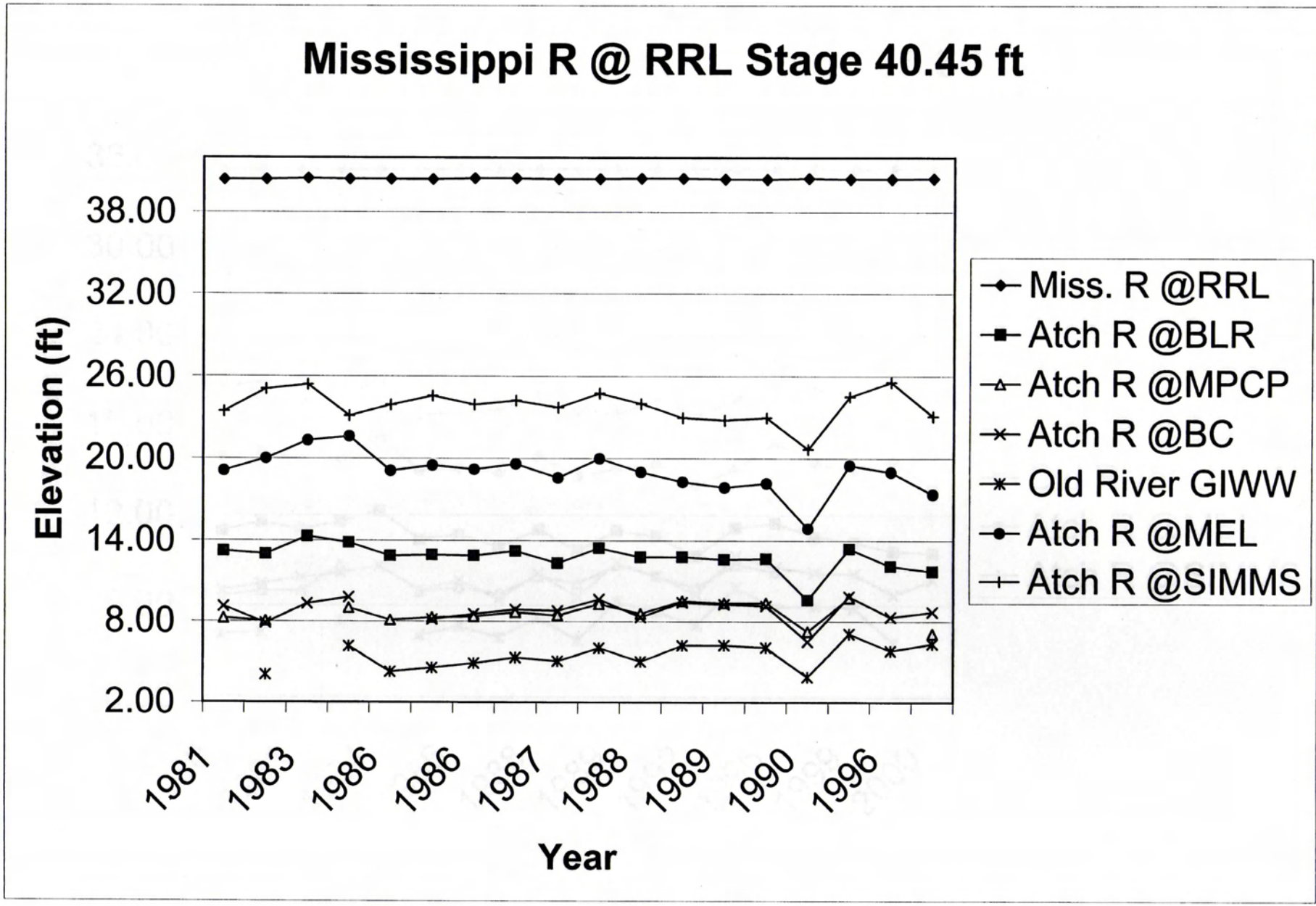
1999	70.0	30.0
2000	70.0	30.0

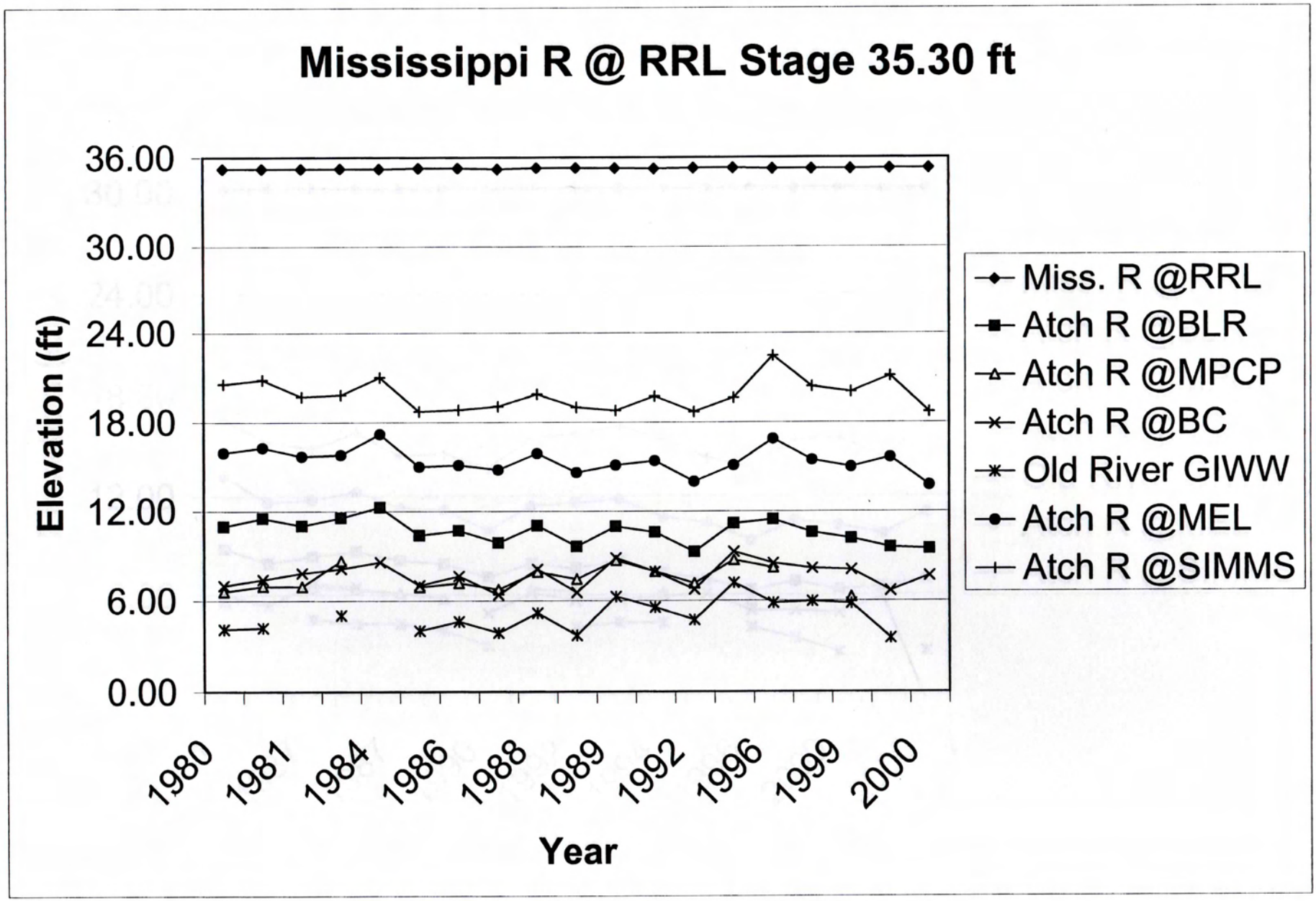

Mississippi R @ RRL Stage 60.20 ft
70.00
60.00
50.00
40.00
30.00
20.00
10.00
Elevation (ft)
1983
1983
1997
1997
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

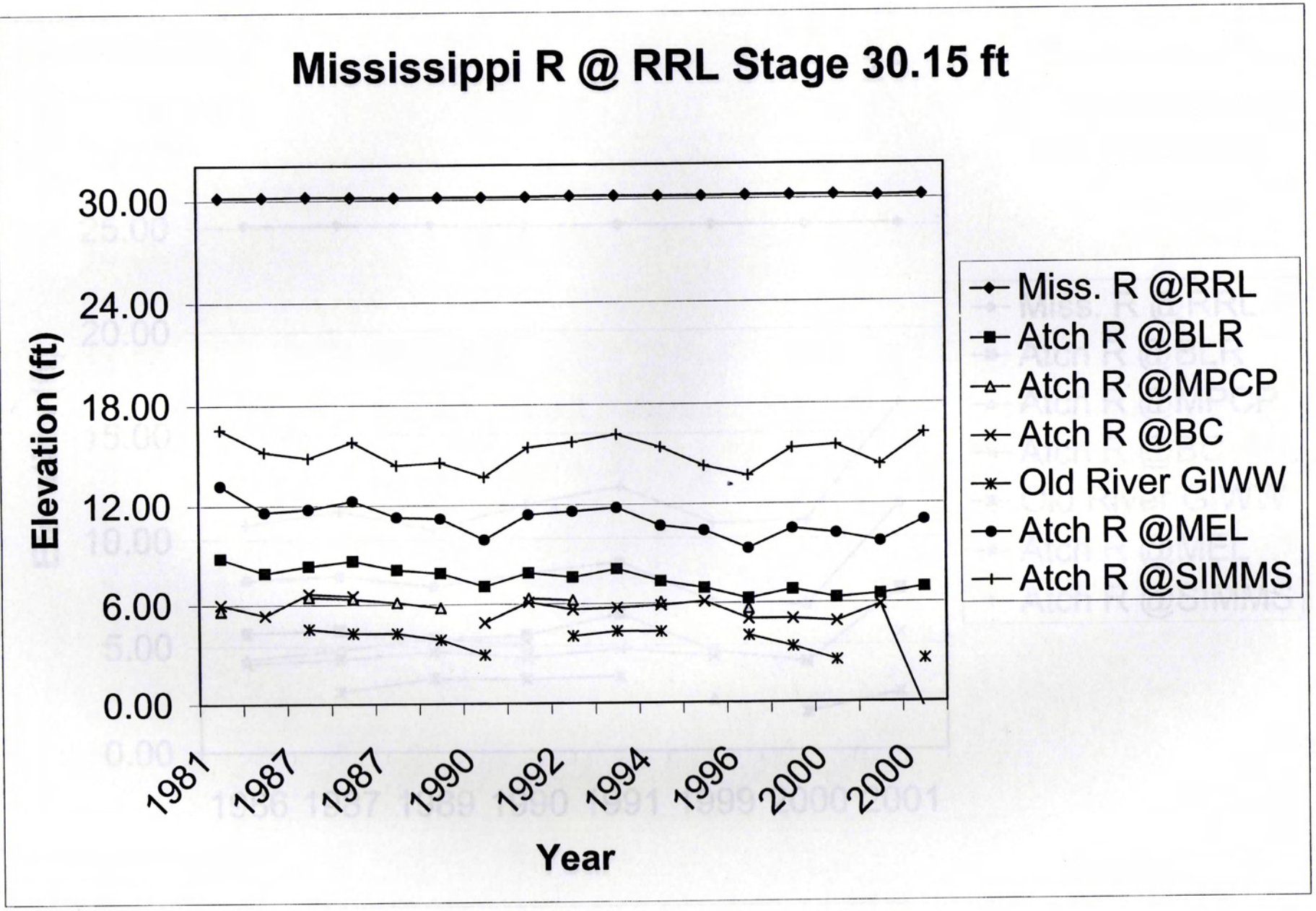

Mississippi R @ RRL Stage 55.20 ft
65.00
55.00
45.00
35.00
25.00
15.00
5.00
Elevation (ft)
1984
1984
1991
1991
1991
1994
1997
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

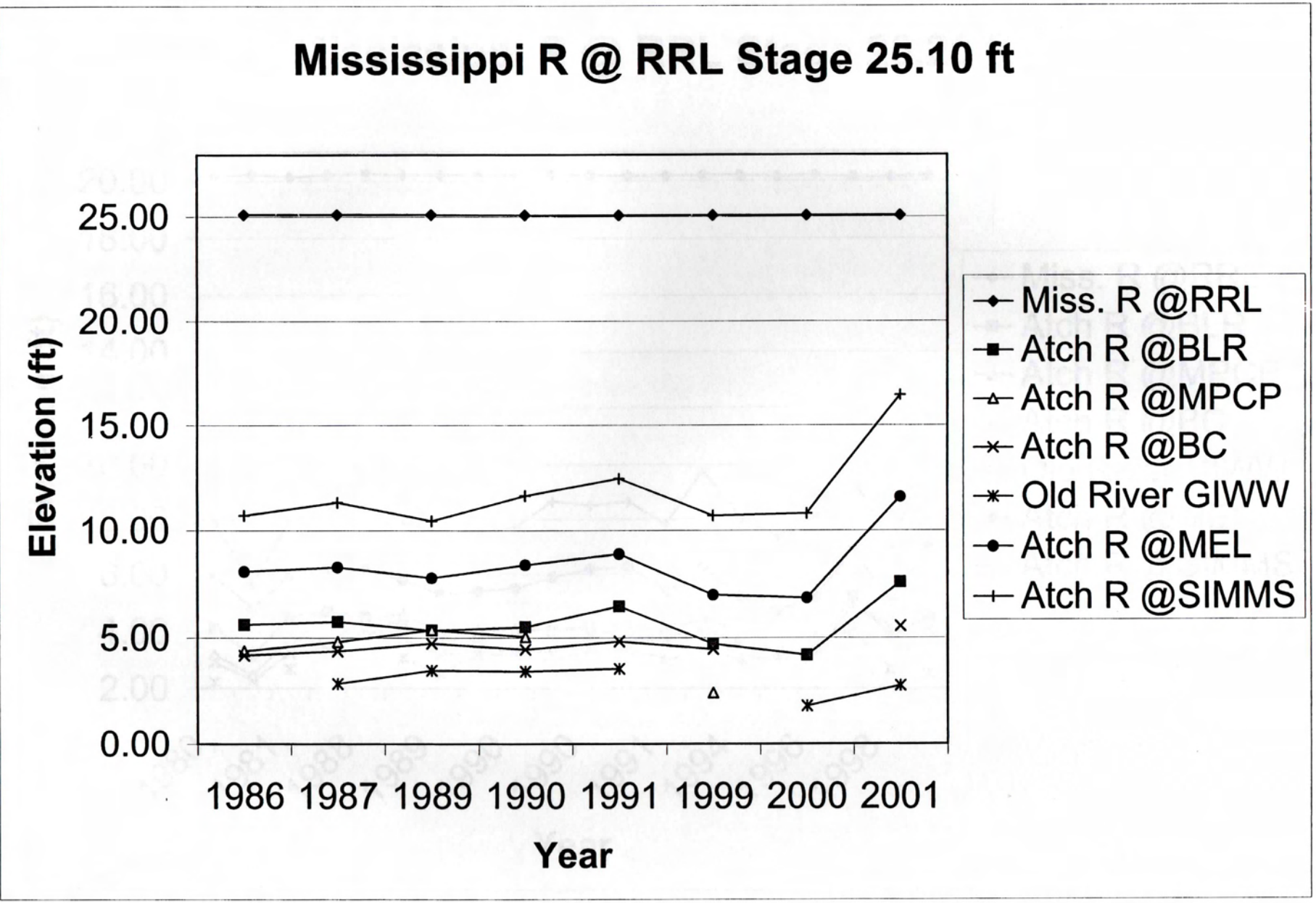

Mississippi R @ RRL Stage 50.10 ft
Elevation (ft)
55.00
45.00
35.00
25.00
15.00
5.00
1982
1984
1985
1990
1990
1991
1996
1998
2001
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

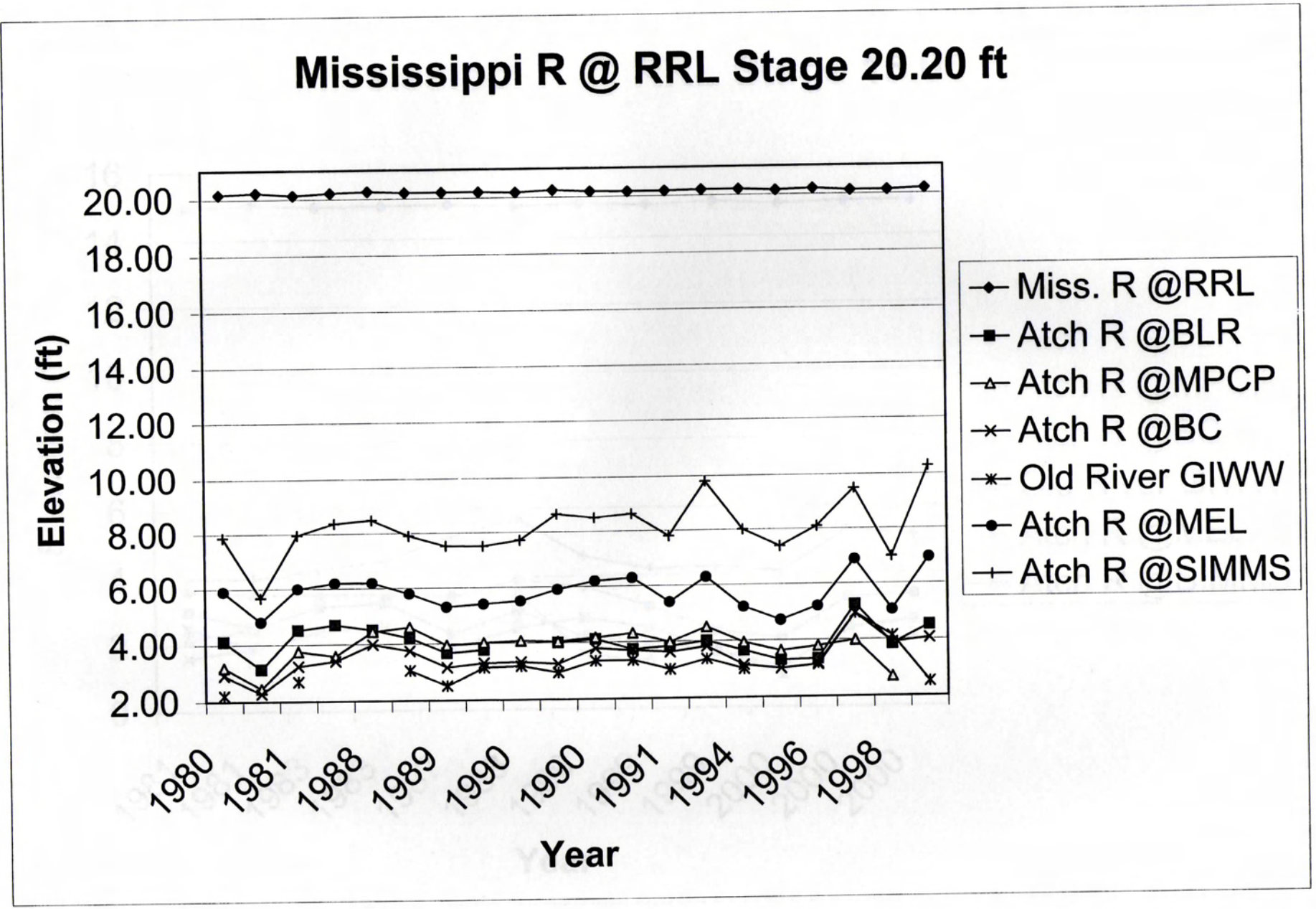

Mississippi R @ RRL Stage 45.10 ft
Elevation (ft)
41.00
35.00
29.00
23.00
17.00
11.00
5.00
1982
1983
1984
1985
1986
1990
1993
1996
1998
1999
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

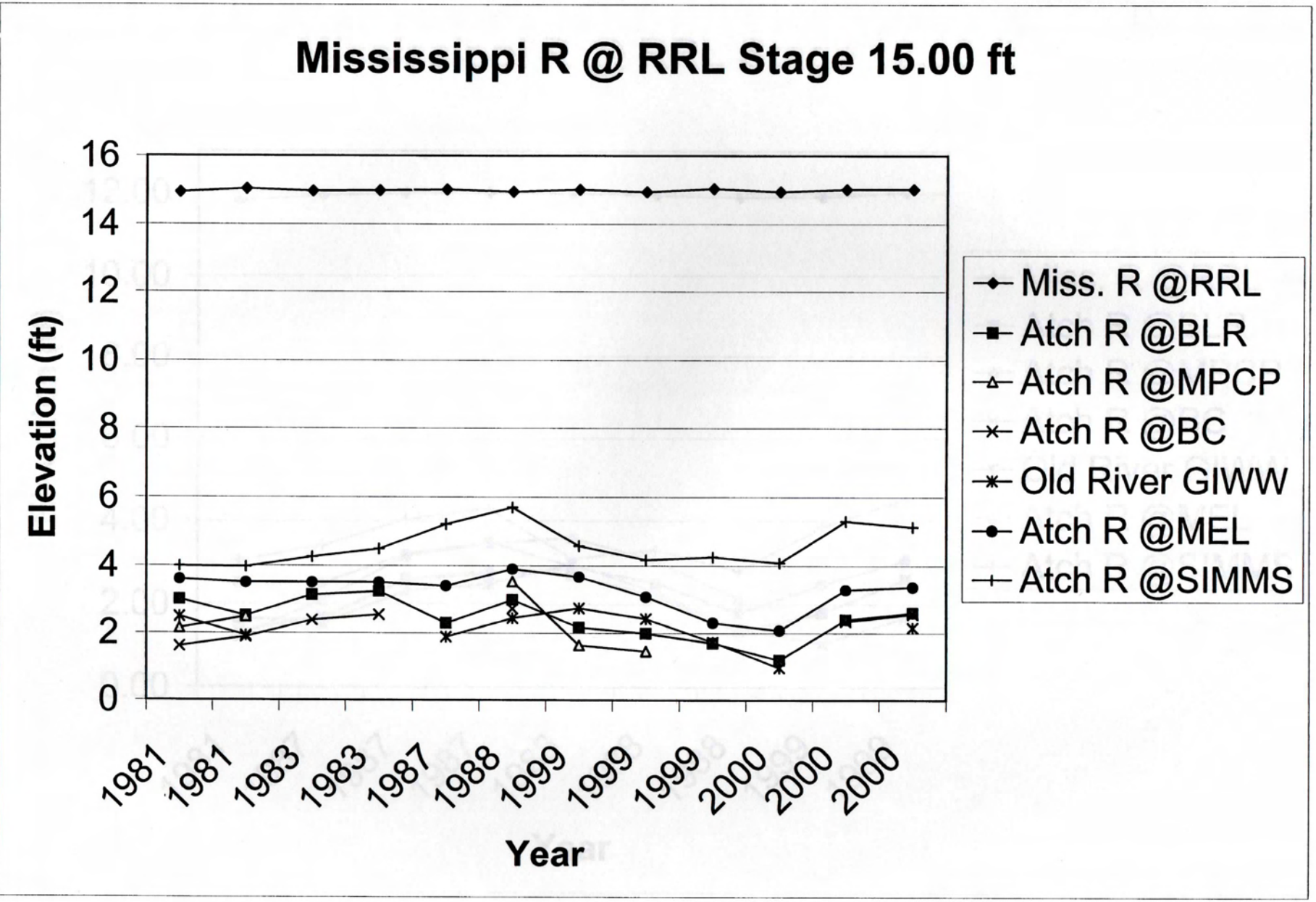

Mississippi R @ RRL Stage 40.45 ft
Elevation (ft)
38.00
32.00
26.00
20.00
14.00
8.00
2.00
1981
1983
1986
1986
1987
1988
1989
1990
1996
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

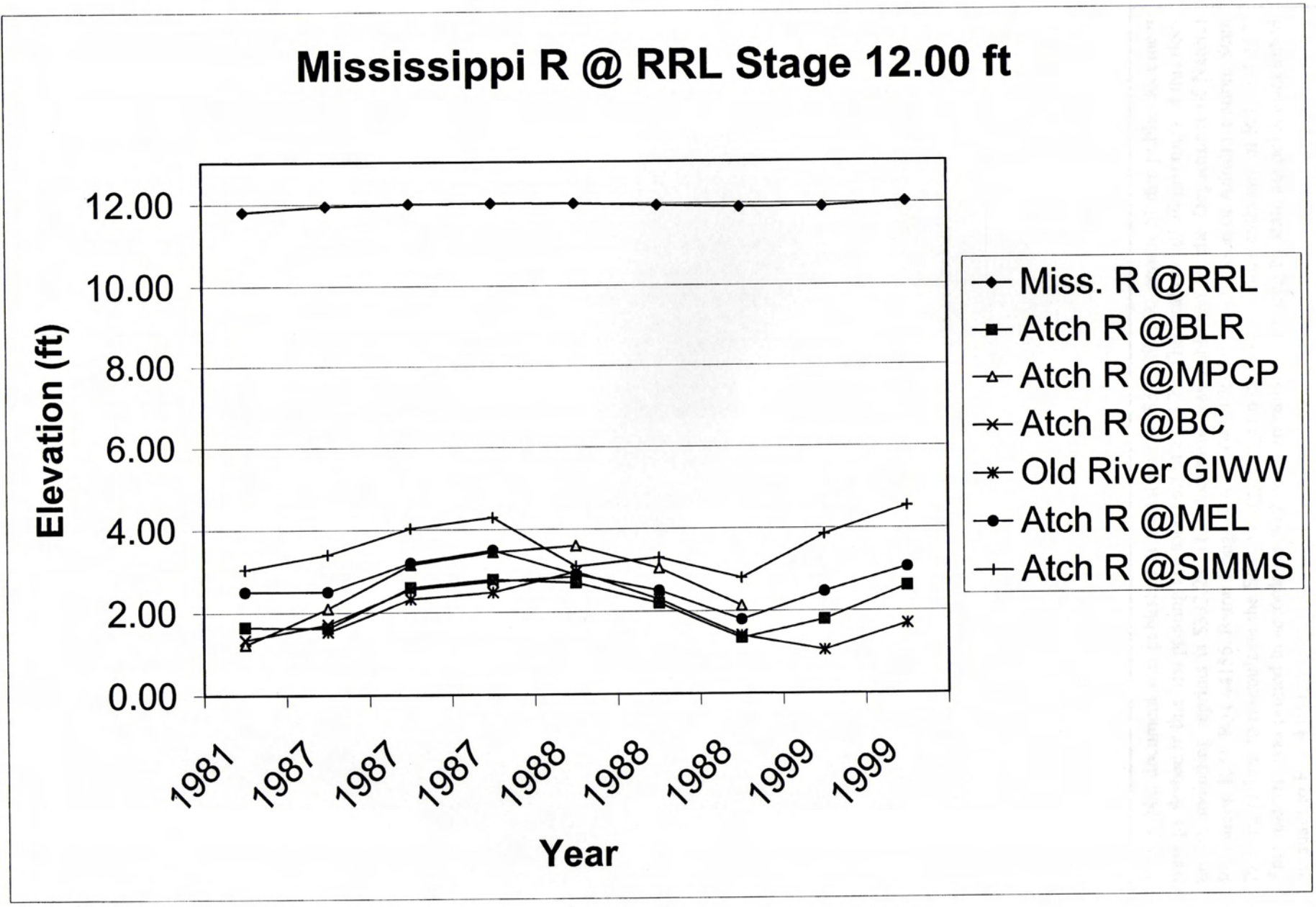

Mississippi R @ RRL Stage 35.30 ft
36.00
30.00
24.00
18.00
12.00
6.00
0.00
Elevation (ft)
1980
1981
1984
1986
1988
1989
1992
1996
1999
2000
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS


Mississippi R @ RRL Stage 30.15 ft
Elevation (ft)
30.00
24.00
18.00
12.00
6.00
0.00
1981
1987
1987
1990
1992
1994
1996
2000
2000
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS


Mississippi R @ RRL Stage 25.10 ft
Elevation (ft)
25.00
20.00
15.00
10.00
5.00
0.00
1986 1987 1989 1990 1991 1999 2000 2001
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS


Mississippi R @ RRL Stage 20.20 ft
Elevation (ft)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
1980
1981
1988
1989
1990
1990
1991
1994
1996
1998
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS


Mississippi R @ RRL Stage 15.00 ft
Elevation (ft)
16
14
12
10
8
6
4
2
0
1981
1981
1983
1983
1987
1988
1999
1999
1999
2000
2000
2000
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS


Mississippi R @ RRL Stage 12.00 ft
Elevation (ft)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1981
1987
1987
1987
1988
1988
1988
1999
1999
Year
Miss. R @RRL
Atch R @BLR
Atch R @MPCP
Atch R @BC
Old River GIWW
Atch R @MEL
Atch R @SIMMS

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