BA-03c

Naomi Outfall Management

Summary Data and Graphics

Updated 06/25/2003

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Naomi Outfall Management (BA-03c)

Project Overview

In 1992, the Naomi Lareussite Siphon Construction (BA-03) project was built to re-introduce (or divert) freshwater from the Mississippi River into the adjacent marshes through a set of eight siphons. The freshwater re-introduction was intended to replace some of the ecological functions supported by periodic over-bank flooding that occurred prior to the placement of the flood-control levee system.

To manage freshwater from the diversion and to protect the area marshes from shoreline erosion and saltwater intrusion, the Naomi Outfall Management (BA-03c) project and the Barataria Bay Waterway East Side Shoreline Protection (BA-26) project were built in 2002. Features of these two projects include two fixed-rested weirs with boat bays and 17,600 ft (5366 m) of foreshore rock dike.

Monitoring on the BA-03 project was expanded in 1997 to include the BA-03c and BA-26 project areas. Thus, for reporting purposes all three projects are combined into one project under the name Naomi Outfall Management. Furthermore, all references to “project area” will refer to the unified area of all three projects.

Naomi Outfall Management (BA-03c)

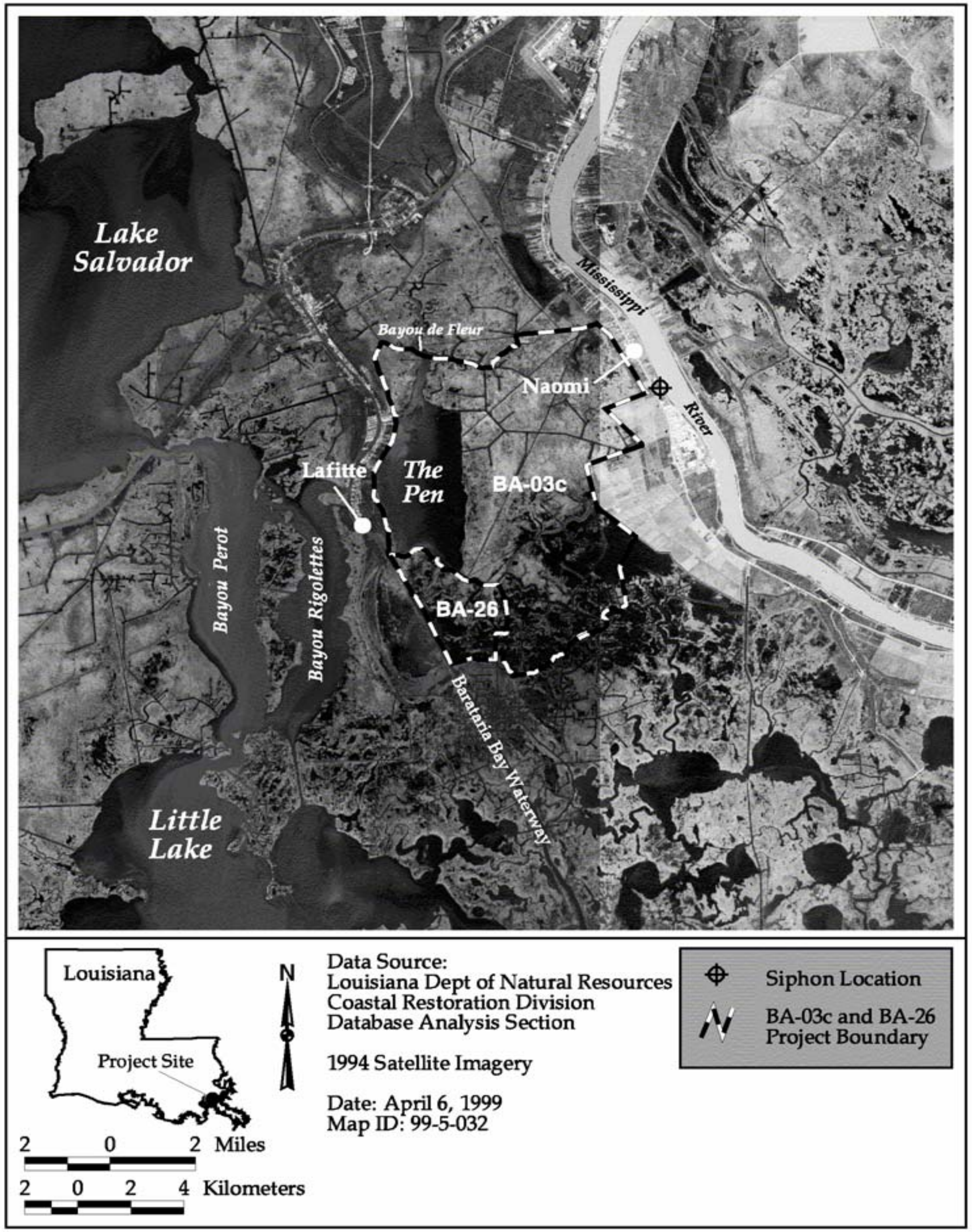
Project Overview (cont.)

The project area is located within the Barataria Basin in Plaquemines and Jefferson Parish, Louisiana and contains approximately 26,956 acres (10,782 ha) of open water and intermediate and brackish marsh. The BA-03c project is owned and operated by the Plaquemines Parish Government. Monitoring, technical advise and some maintenance is provided by the Louisiana Department of Natural Resources, Coastal Restoration Division.

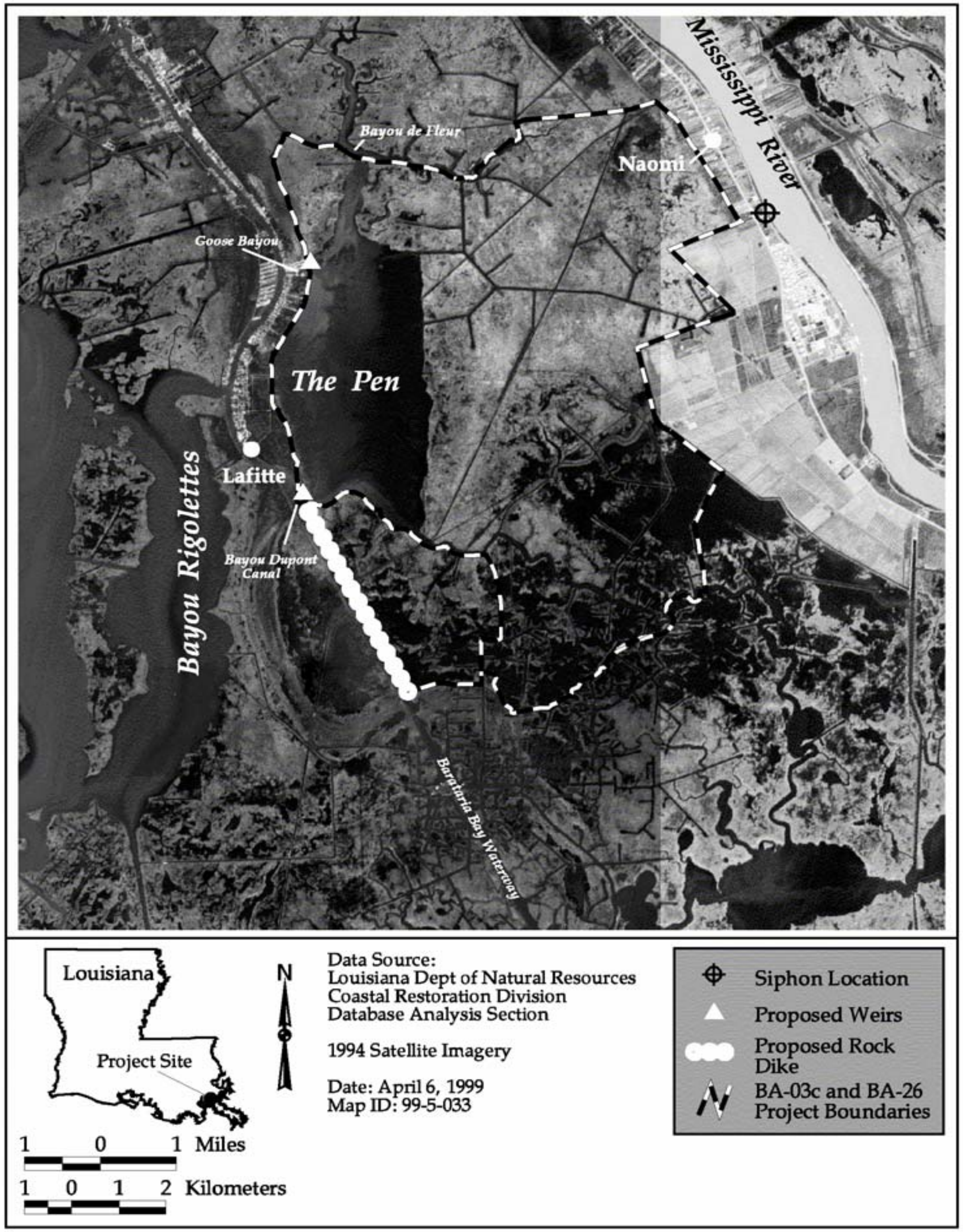
The quantity of water flow passing through the siphons depends on the relative elevation of the Mississippi River. When all siphons are in operation, flow at normal high water exceeds 2,000 cubic feet per second (ft^3s^{-1}) or 56 cubic meters per second (m^3s^{-1}).

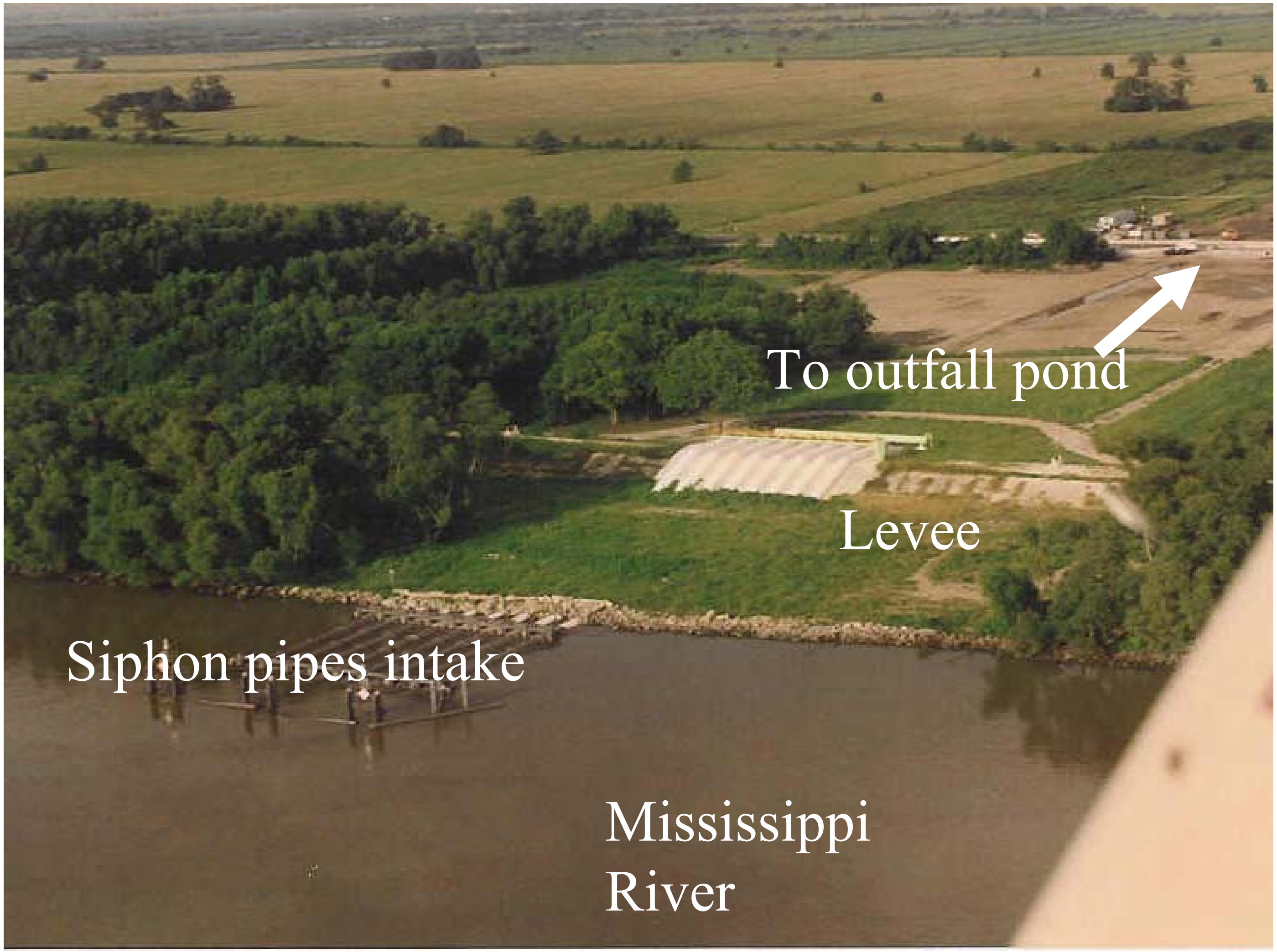
Construction of the siphons was completed in 1992 and included a discharge pond with one outfall channel to distribute the siphoned freshwater into the marshes surrounding the discharge pond. Features of the outfall management were completed in 2002.

BA-03c Naomi Outfall Management Project Boundary.



BA-03c Outfall Management water control structures.





BA-03c Naomi Outfall Management Project Siphons

Naomi Outfall Management (BA-03c)

Project Objectives

- To protect the project area from continued degradation by introducing freshwater from the Mississippi River. In doing so the project also seeks to increase the inflow of sediment and nutrients into the project area.
- To manage the diverted freshwater from the Naomi siphon in the project area via the installation of two water control structures designed to reduce freshwater loss and saltwater intrusion.
- To rebuild the east bank of the Barataria Bay Waterway (BBW) in order to protect the adjacent marsh from erosion due to boat wakes and saltwater intrusion.

Specific Goals

- Reduce mean project area salinity.
- Improve growing conditions and increase relative abundance of fresh-to-intermediate marsh species.
- Increase marsh to open-water ratio.

Naomi Outfall Management (BA-03c)

Monitoring Elements

Salinity: Discrete salinity measurements will be recorded monthly at 24 stations. In addition, hourly salinity measurements will be taken by continuous recorders at 3 stations. Data will be used to characterize the spatial and temporal variation in salinity throughout the project area. Discrete and hourly salinity data will be collected from 1993 – 2008.

Water elevation: While not a goal of the project, hourly water level data will be taken from the three continuous recorder stations and discrete water level measurements will be recorded monthly from nine staff gauges. Data will be used to characterize the spatial and temporal variation in water level throughout the project area. Discrete and hourly water level data will be collected from 1993 - 2008.

Vegetation: Species composition and relative abundance of emergent vegetation will be quantified using techniques described in Steyer et al. (1995). Twenty-one stations will be monitored 1992 (pre-construction) and 1995 post-construction. Forty Plots ($4m^2$) will be monitored in years 1997, 2000, 2003, 2006, 2009.

Habitat Mapping: To document vegetated and non vegetated areas, color-infrared aerial photography (1:12,000 scale with ground controls) will be obtained and analyzed following procedures outlined in Steyer et al. (1995). The photography will be obtained in 1993 (pre-construction) and in 2002, 2008, and 2017 post-construction.

BA-03c Siphon Flow

Daily siphon discharge is estimated from the head differential between the river, the immediate outfall area, and the number of siphons in operation.

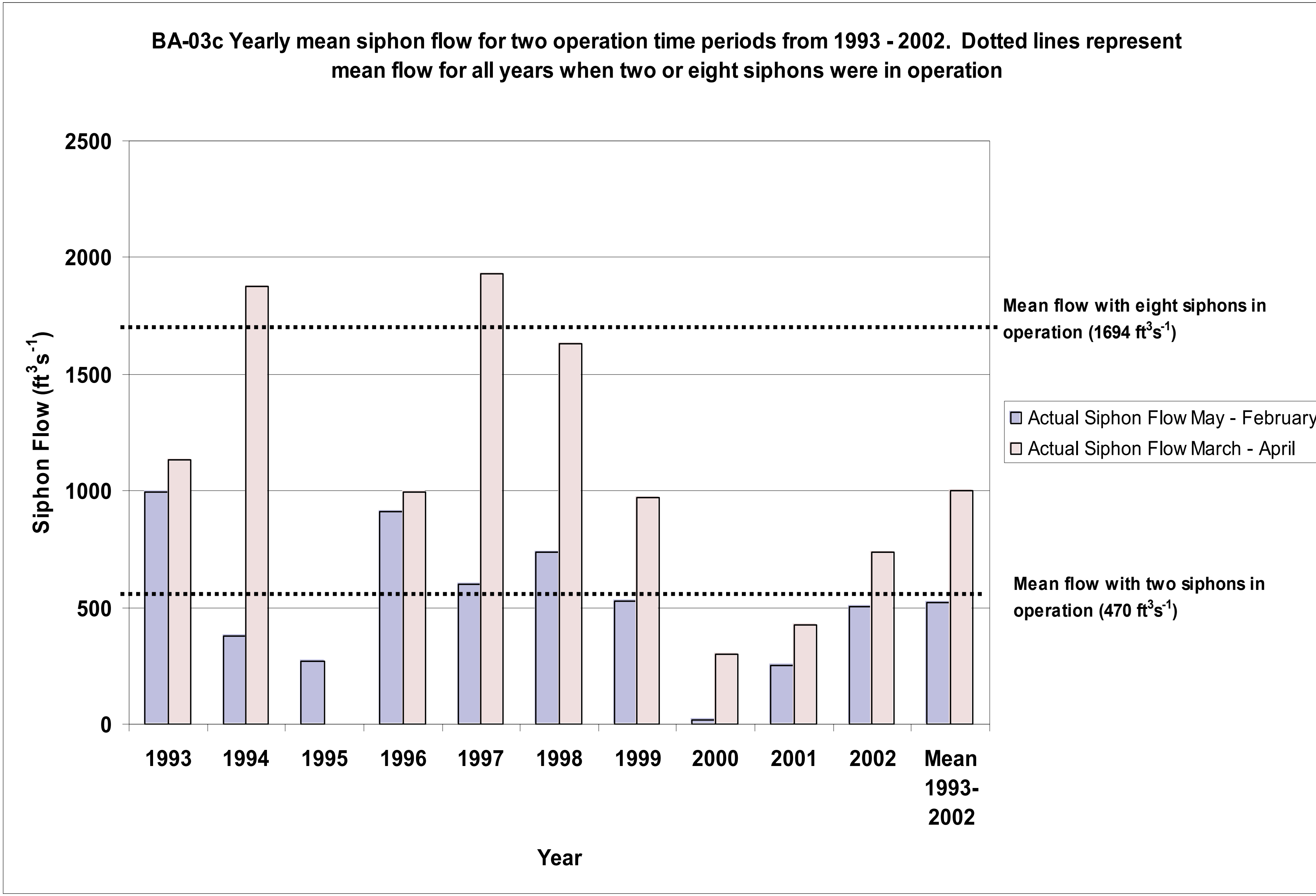
- Table: Monthly mean siphon flow (ft^3s^{-1})
- Table: Monthly mean siphon flow (m^3s^{-1})
- Histogram: Siphon flow by operational category and year (ft^3s^{-1})
- Histogram: Siphon flow by operational category and year (m^3s^{-1})
- Histogram: Yearly mean siphon flow (ft^3s^{-1})
- Histogram: Yearly mean siphon flow (m^3s^{-1})

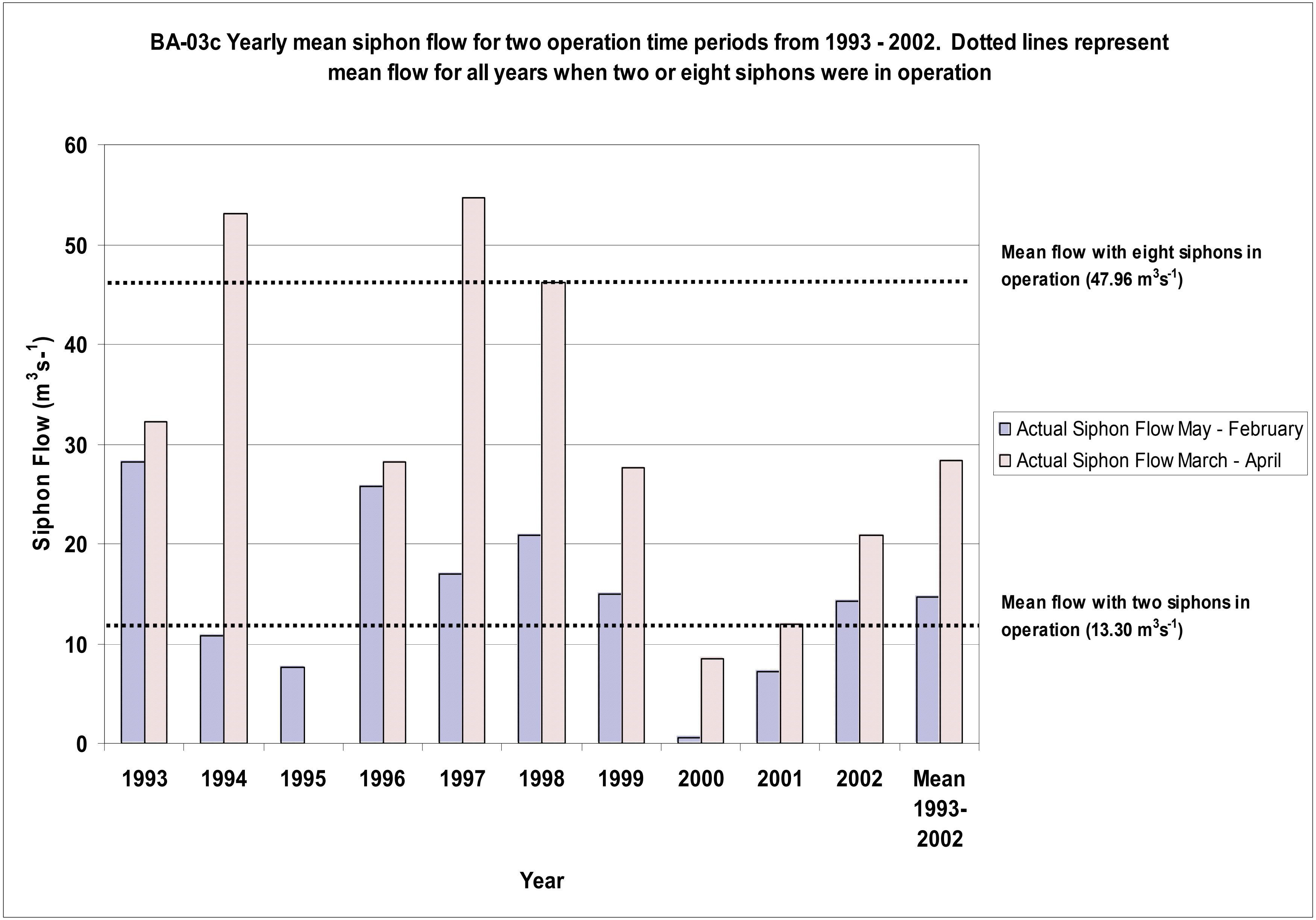
BA-03c Monthly Mean Siphon Flow (ft^3s^{-1}) 1992 - 2002

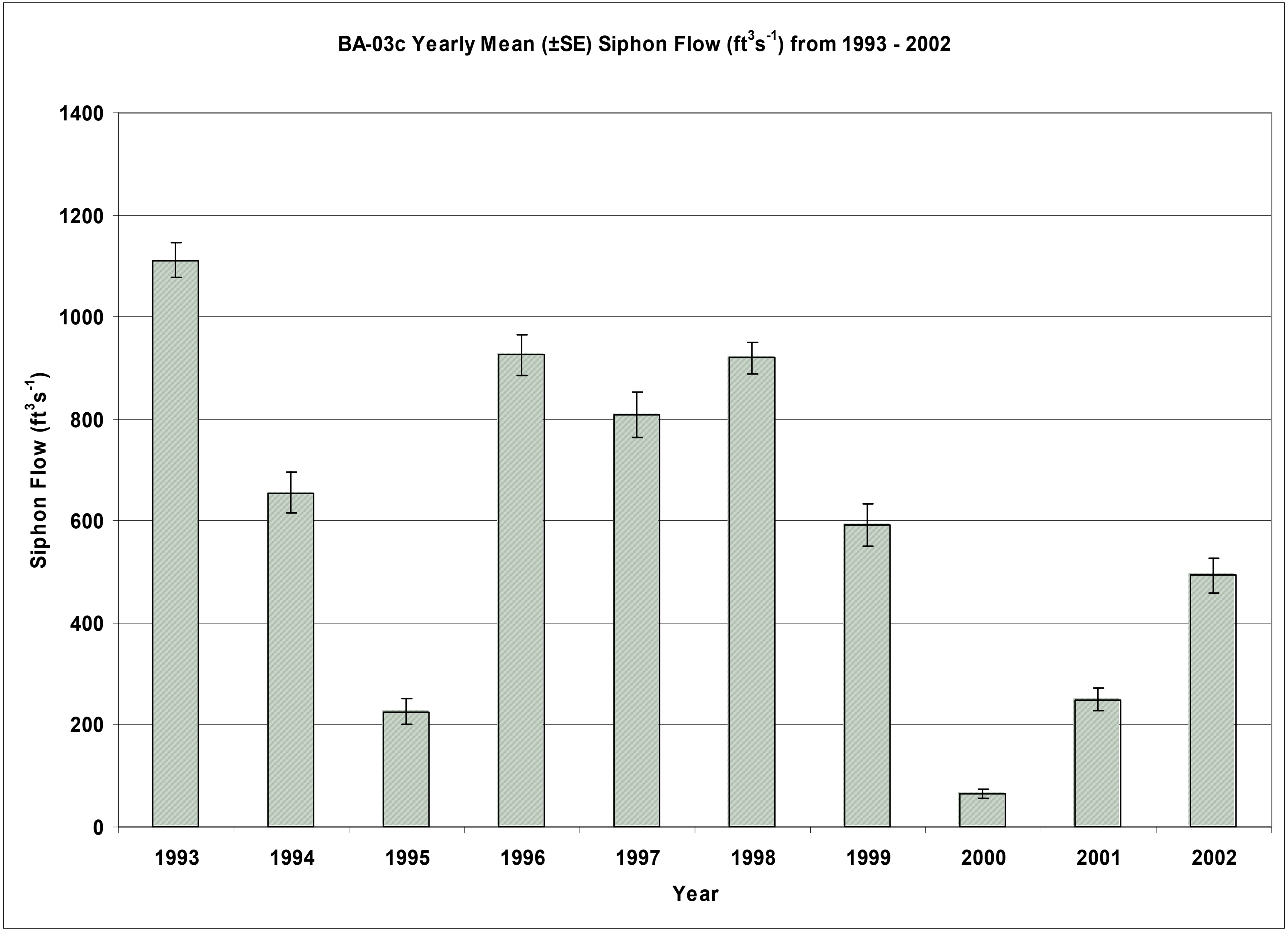
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
January	0	383	0	0	1334	1028	757	0	71	1244
February	1506	994	0	855	1650	1540	1996	0	578	965
March	1821	2001	0	826	1987	1960	493	357	650	657
April	451	1747	0	1169	1874	1306	1454	247	198	816
May	1766	1398	0	1889	773	1105	1690	108	126	1015
June	1512	537	0	2152	1072	833	55	22	537	1685
July	1555	270	1212	1047	1160	818	762	50	357	105
August	934	140	810	865	26	403	1	0	0	0
September	705	64	690	90	0	278	0	0	0	0
October	1138	0	0	0	0	357	0	0	0	0
November	296	0	0	390	0	461	0	0	0	0
December	543	0	0	1821	0	551	0	0	876	0

BA-03c Monthly Mean Siphon Flow (m^3s^{-1}) 1992 - 2002

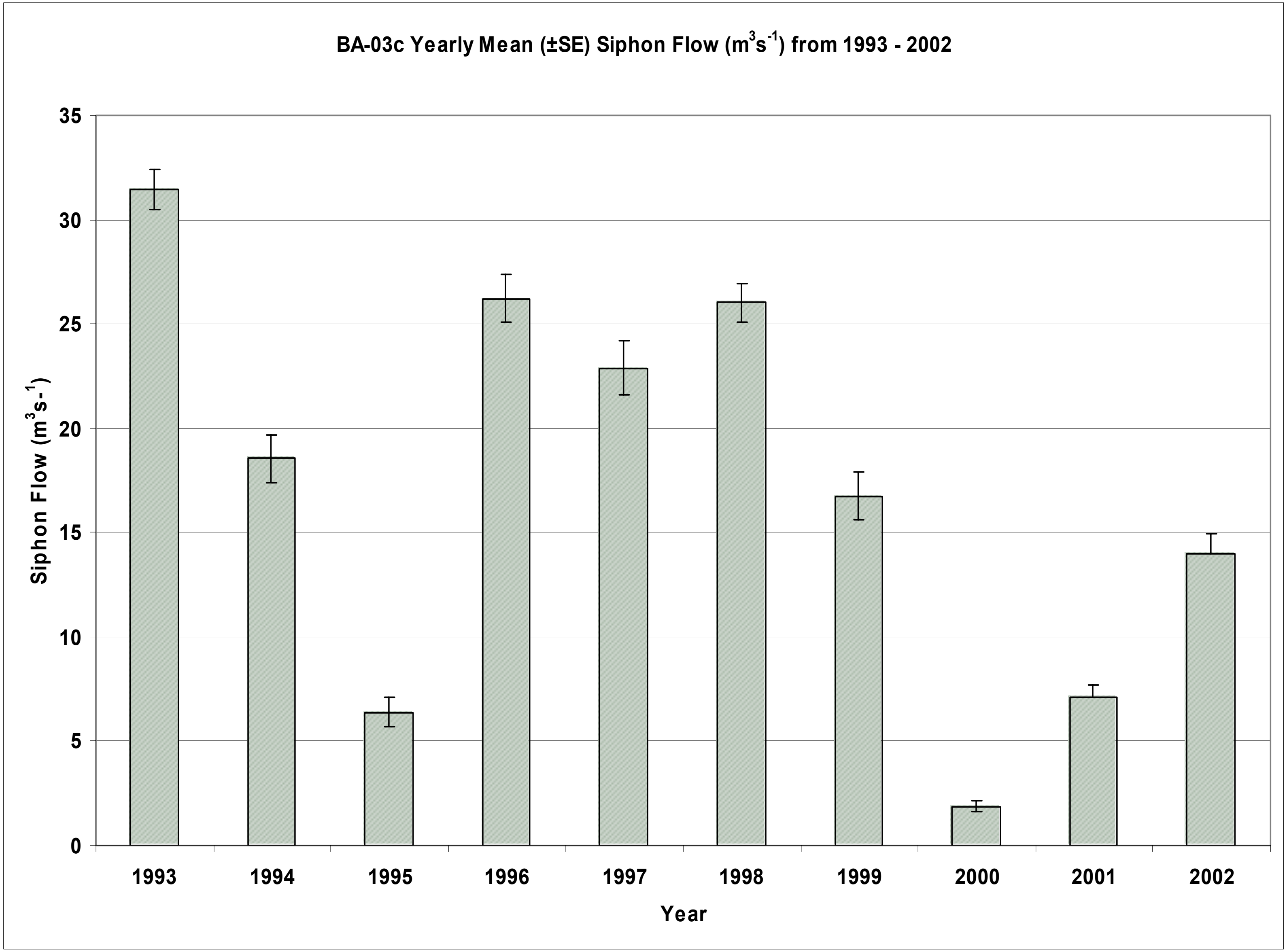
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
January	0	11	0	0	38	29	21	0	2	35
February	43	28	0	24	47	44	57	0	16	27
March	52	57	0	23	56	55	14	10	18	19
April	13	49	0	33	53	37	41	7	6	23
May	50	40	0	53	22	31	48	3	4	29
June	43	15	0	61	30	24	2	1	15	48
July	44	8	34	30	33	23	22	1	10	3
August	26	4	23	25	1	11	0	0	0	0
September	20	2	20	3	0	8	0	0	0	0
October	32	0	0	0	0	10	0	0	0	0
November	8	0	0	11	0	13	0	0	0	0
December	15	0	0	52	0	16	0	0	25	0


BA-03c Yearly mean siphon flow for two operation time periods from 1993 - 2002. Dotted lines represent mean flow for all years when two or eight siphons were in operation
Siphon Flow (ft^3s^{-1})
2500
2000
1500
1000
500
0
Mean flow with eight siphons in operation (1694 ft^3s^{-1})
Actual Siphon Flow May - February
Actual Siphon Flow March - April
Mean flow with two siphons in operation (470 ft^3s^{-1})
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Mean 1993-2002
Year


BA-03c Yearly mean siphon flow for two operation time periods from 1993 - 2002. Dotted lines represent mean flow for all years when two or eight siphons were in operation
Siphon Flow (m3s-1)
0
10
20
30
40
50
60
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Mean 1993-2002
Year
Mean flow with eight siphons in operation (47.96 m3s-1)
Mean flow with two siphons in operation (13.30 m3s-1)
Actual Siphon Flow May - February
Actual Siphon Flow March - April



BA-03c Yearly Mean (±SE) Siphon Flow (ft3s-1) from 1993 - 2002
Siphon Flow (ft3s-1)
0
200
400
600
800
1000
1200
1400
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year


BA-03c Yearly Mean (±SE) Siphon Flow (m^3s^{-1}) from 1993 - 2002
Siphon Flow (m^3s^{-1})
35
30
25
20
15
10
5
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year

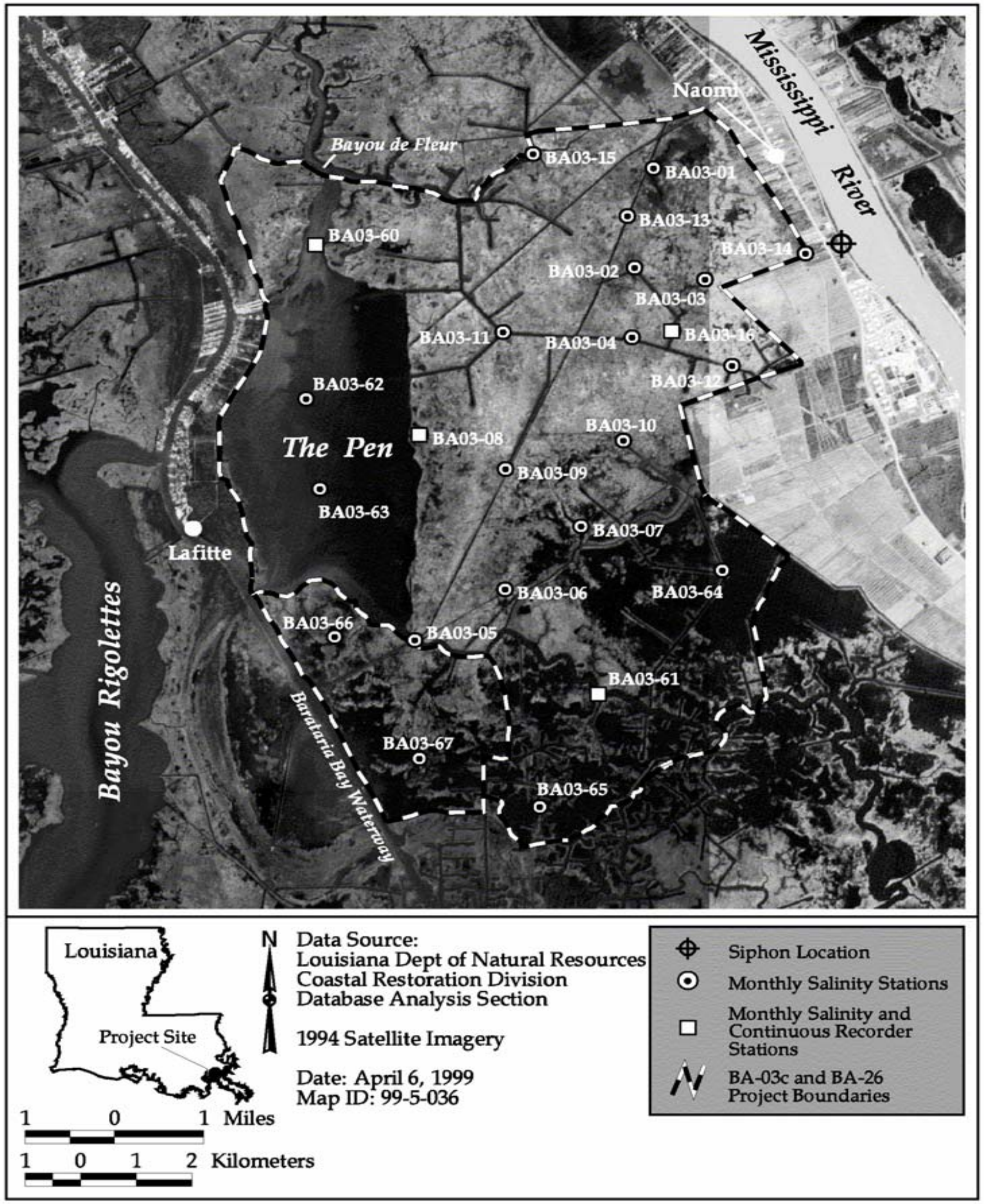
BA-03c Salinity

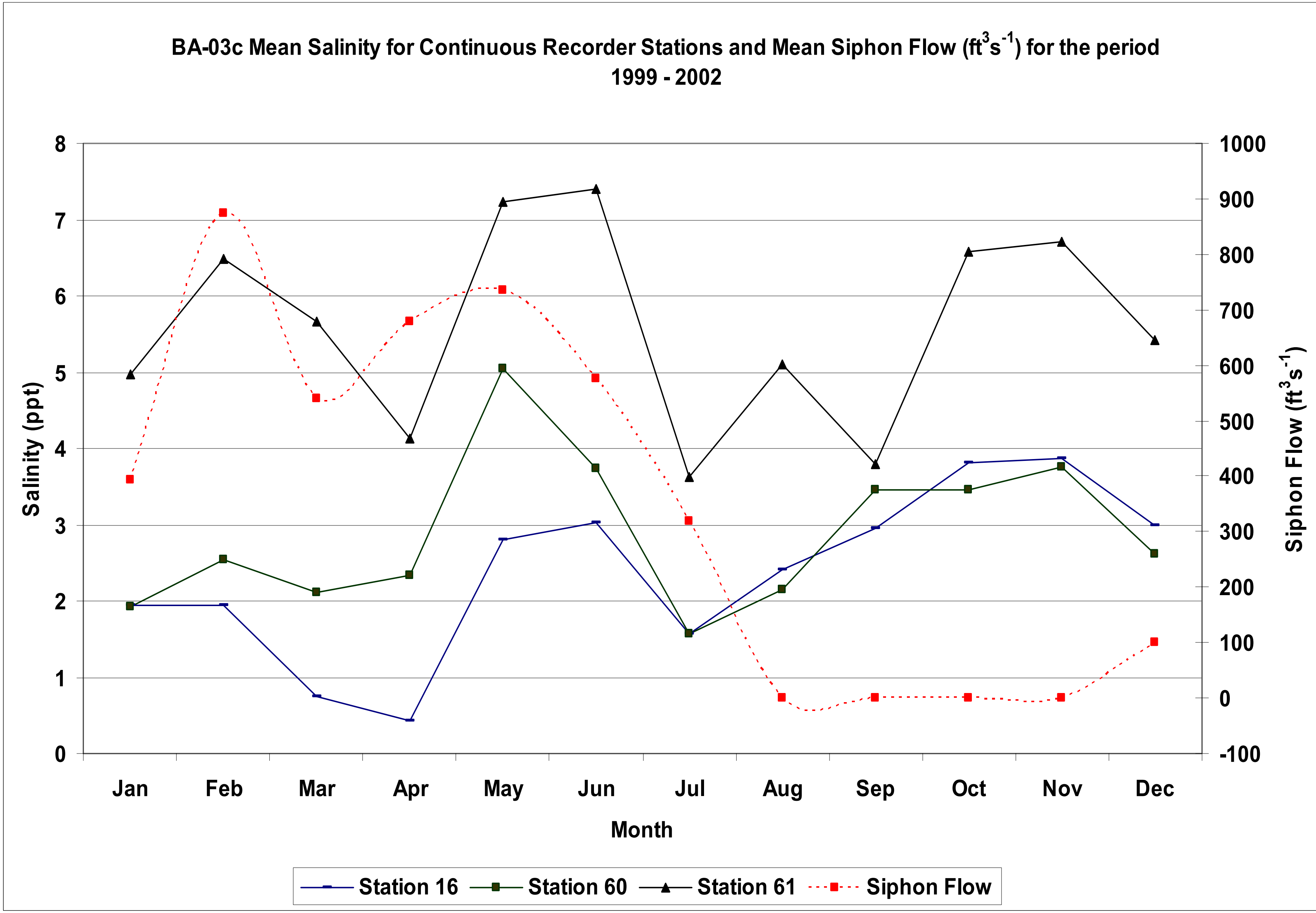
Continuous Data:

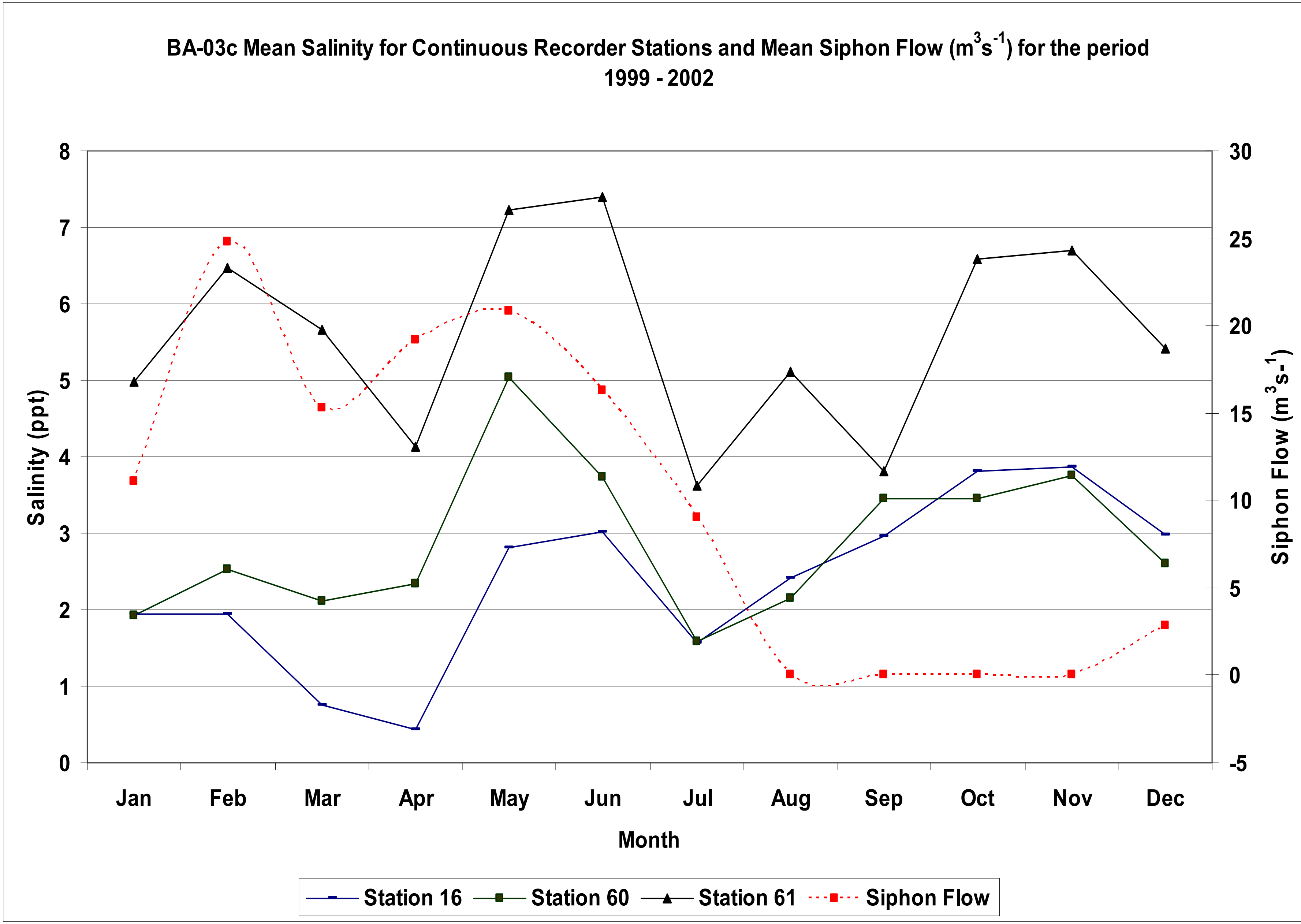
Continuous recorders were not included in the original monitoring of the BA-03 project. However, recorders were added in 1999 as part of the outfall management project. Salinity was monitored hourly at 3 continuous recorder stations from June 1999 – December 2002.

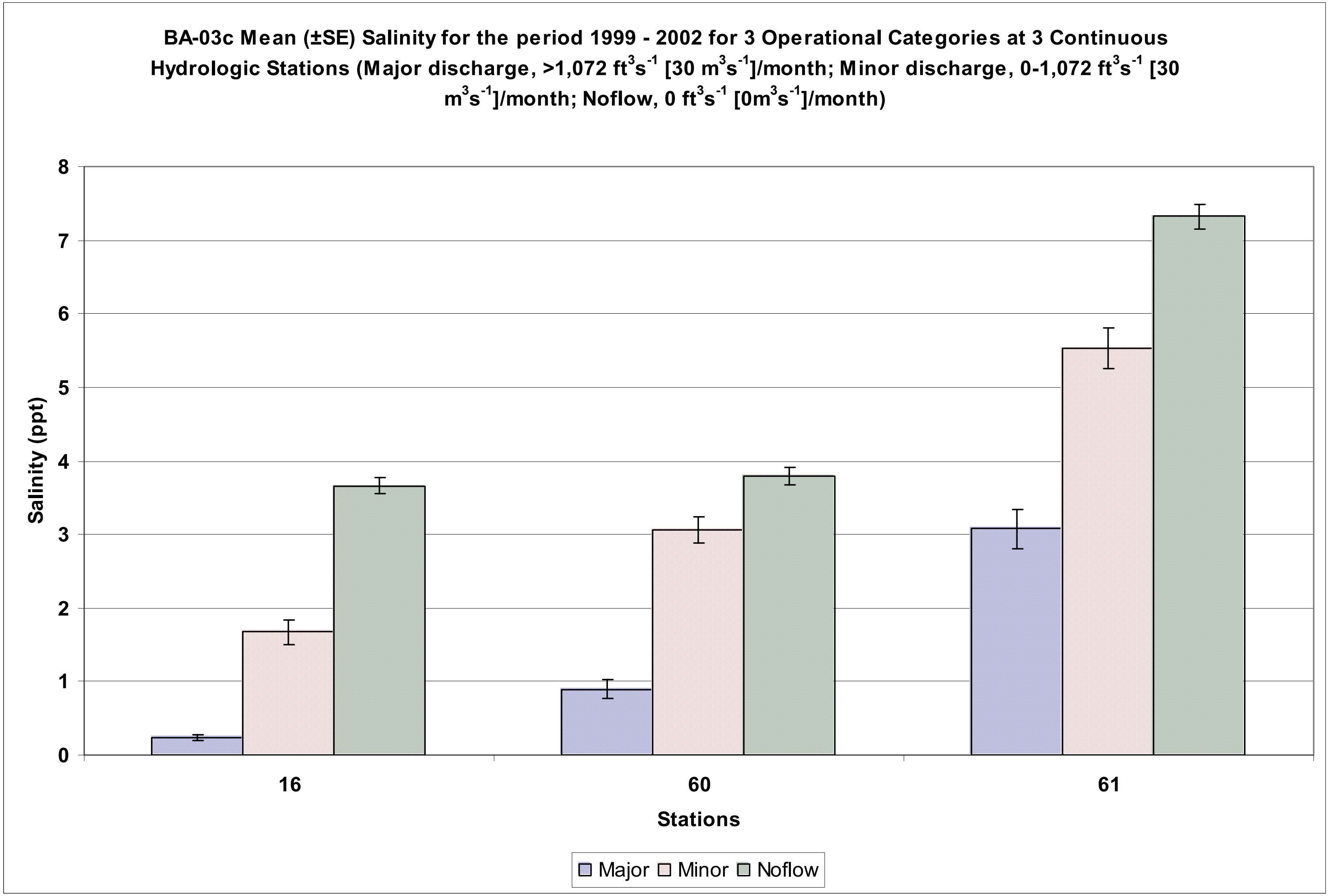
- Map: Continuous recorder stations, discrete monitoring stations, and staff gauge locations
- Graph: Mean station salinity and siphon flow (ft^3s^{-1})
- Graph: Mean station salinity and siphon flow (m^3s^{-1})
- Histogram: Mean salinity during three operational siphon categories by station
- Graph: Yearly mean salinity and siphon flow (ft^3s^{-1})
- Graph: Yearly mean salinity and siphon flow (m^3s^{-1})
- Graph: Linear regression showing siphon flow and salinity for individual stations (ft^3s-1)
- Graph: Linear regression showing siphon flow and salinity for individual stations (m^3s-1)

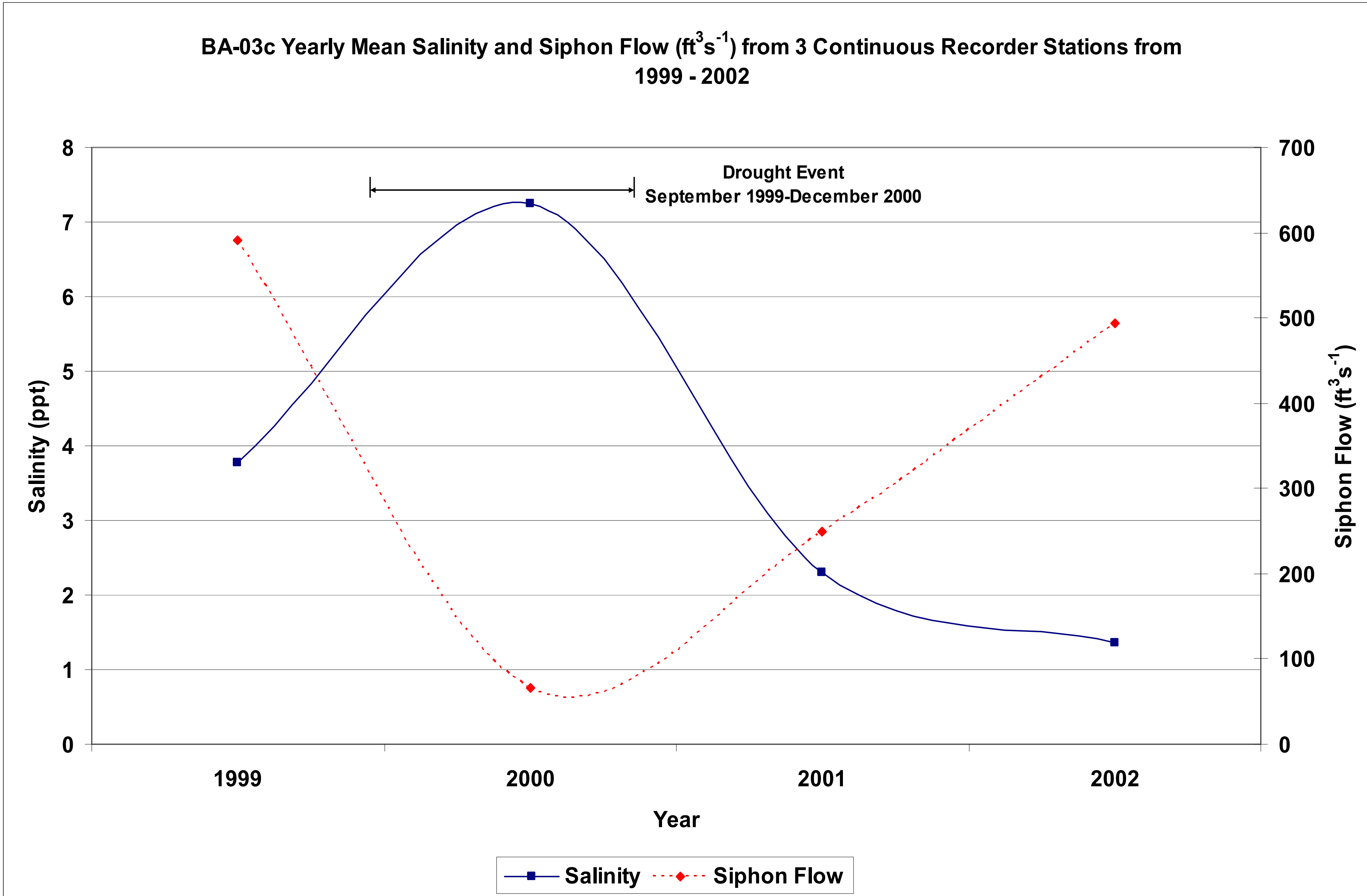
BA-03c Hourly continuous recorder stations, monthly discrete monitoring stations and staff gauge locations 1, 3, 6, 10, 11, 14, 16, 60, and 61.

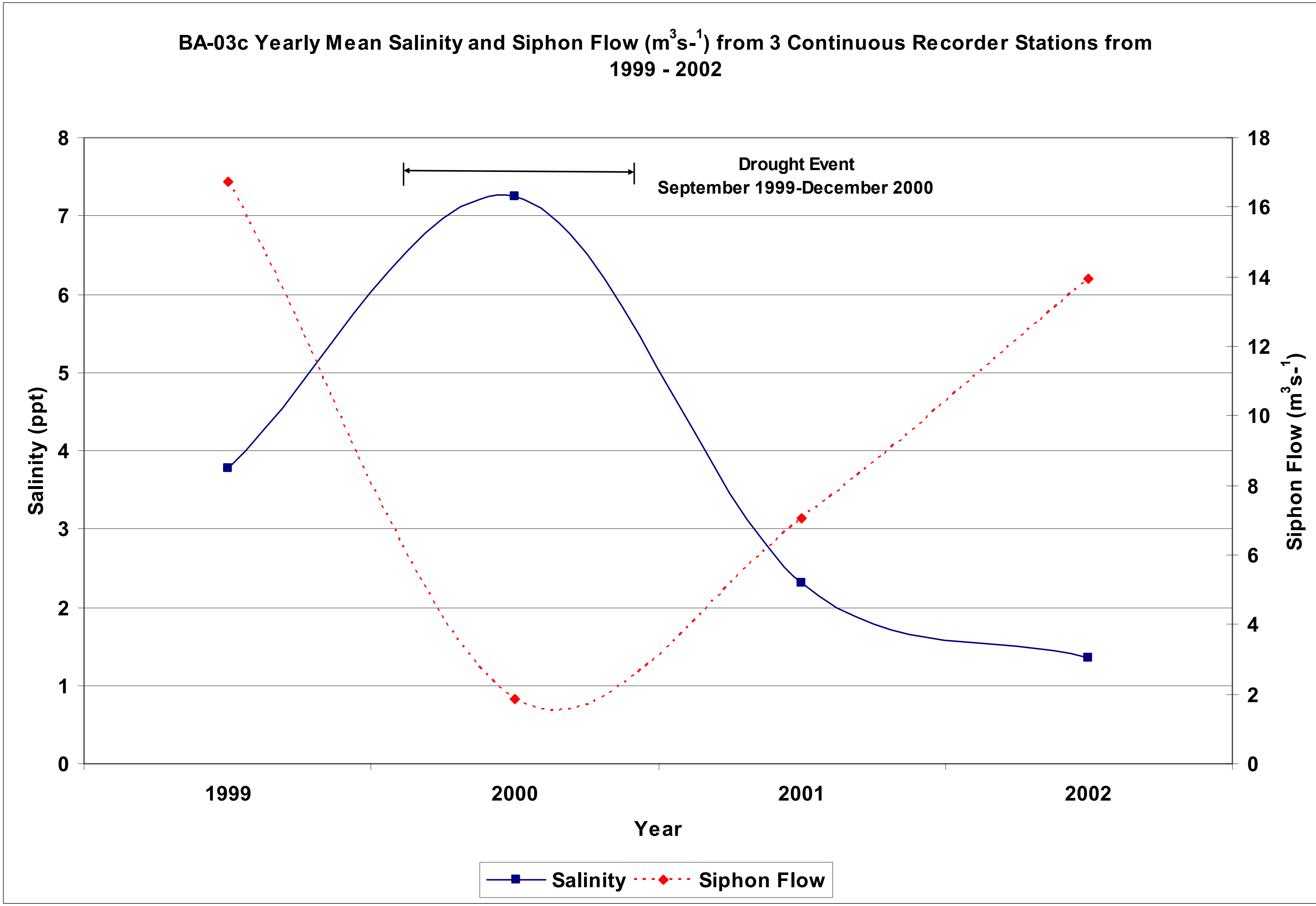



BA-03c Mean Salinity for Continuous Recorder Stations and Mean Siphon Flow (ft3s-1) for the period 1999 - 2002
Salinity (ppt)
Siphon Flow (ft3s-1)
0
1
2
3
4
5
6
7
8
-100
0
100
200
300
400
500
600
700
800
900
1000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Station 16
Station 60
Station 61
Siphon Flow

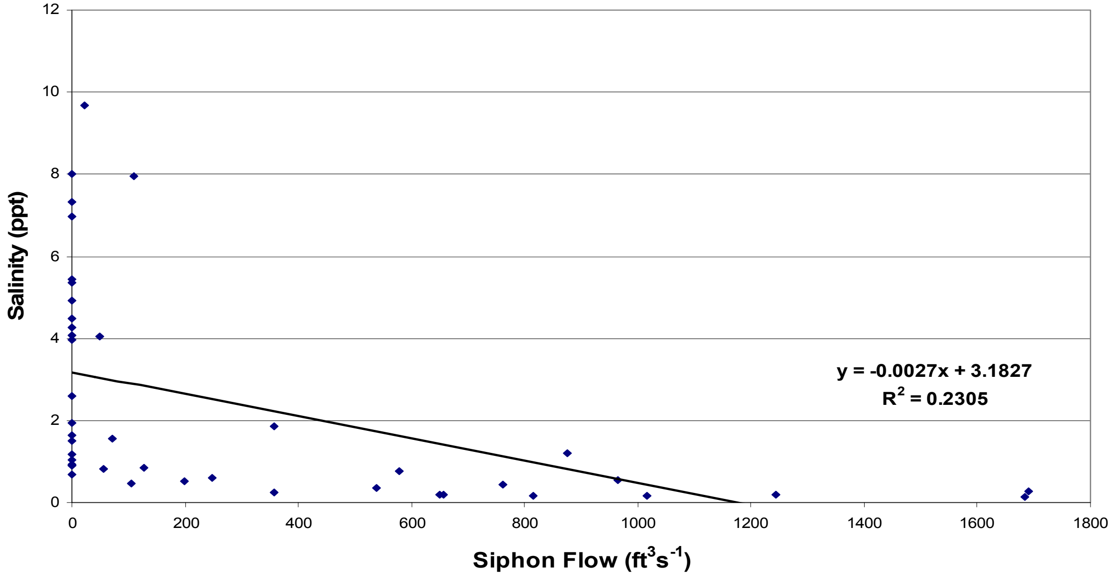

BA-03c Mean Salinity for Continuous Recorder Stations and Mean Siphon Flow (m3s-1) for the period 1999 - 2002
Salinity (ppt)
Siphon Flow (m3s-1)
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Station 16
Station 60
Station 61
Siphon Flow

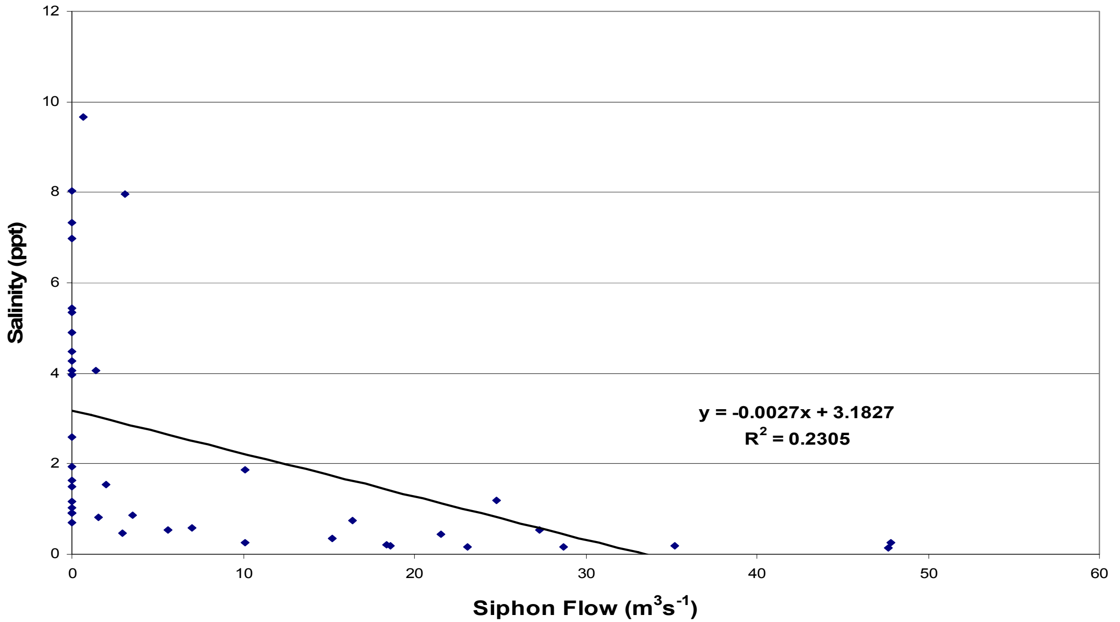

BA-03c Mean (±SE) Salinity for the period 1999 - 2002 for 3 Operational Categories at 3 Continuous Hydrologic Stations (Major discharge, >1,072 ft^{3}s^{-1} [30 m^{3}s^{-1}]/month; Minor discharge, 0-1,072 ft^{3}s^{-1} [30 m^{3}s^{-1}]/month; Noflow, 0 ft^{3}s^{-1} [0m^{3}s^{-1}]/month)
Salinity (ppt)
0
1
2
3
4
5
6
7
8
16
60
61
Stations
Major
Minor
Noflow


BA-03c Yearly Mean Salinity and Siphon Flow (ft3s-1) from 3 Continuous Recorder Stations from 1999 - 2002
Drought Event
September 1999-December 2000
Salinity (ppt)
Siphon Flow (ft3s-1)
0
1
2
3
4
5
6
7
8
0
100
200
300
400
500
600
700
1999
2000
2001
2002
Year
Salinity
Siphon Flow

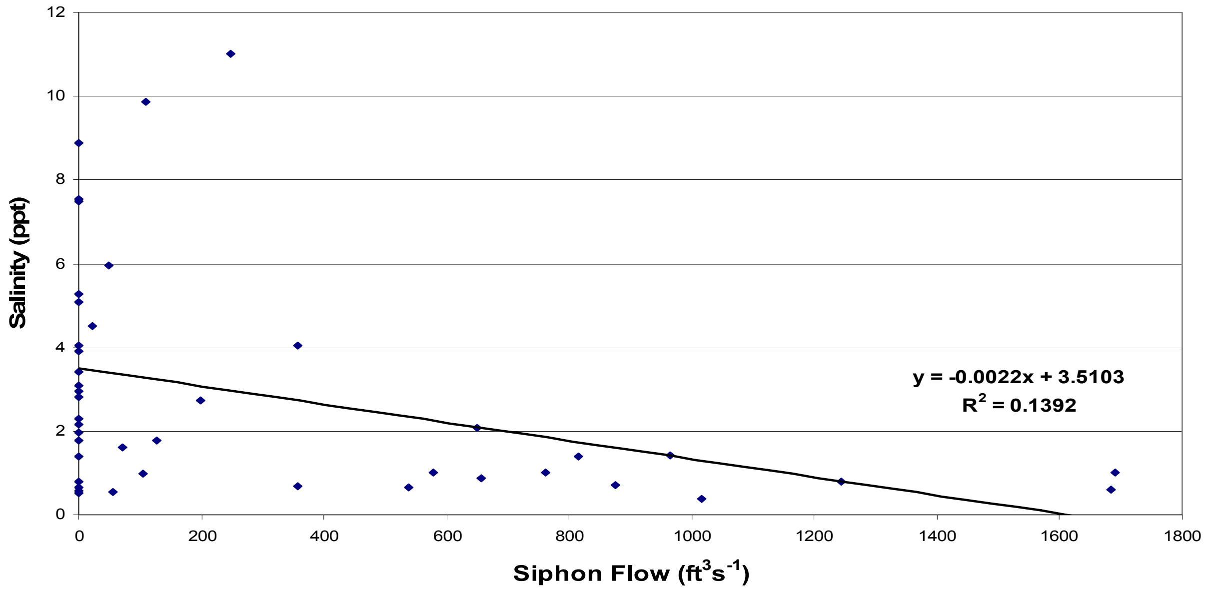

BA-03c Yearly Mean Salinity and Siphon Flow (m^3s^{-1}) from 3 Continuous Recorder Stations from 1999 - 2002
Drought Event
September 1999-December 2000
Salinity (ppt)
Siphon Flow (m^3s^{-1})
Year
1999
2000
2001
2002
0
1
2
3
4
5
6
7
8
0
2
4
6
8
10
12
14
16
18
Salinity
Siphon Flow

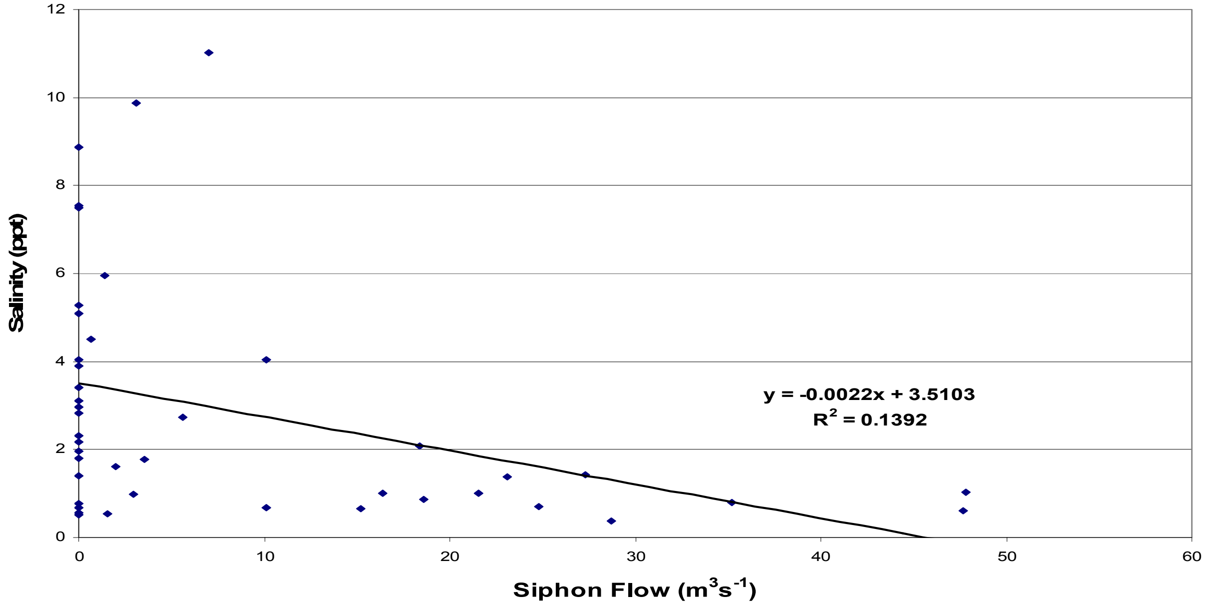
BA03c-16 Monthly Mean Continuous Data Showing The Relationship between Salinity and Diversion Flow for Years 1999-2002



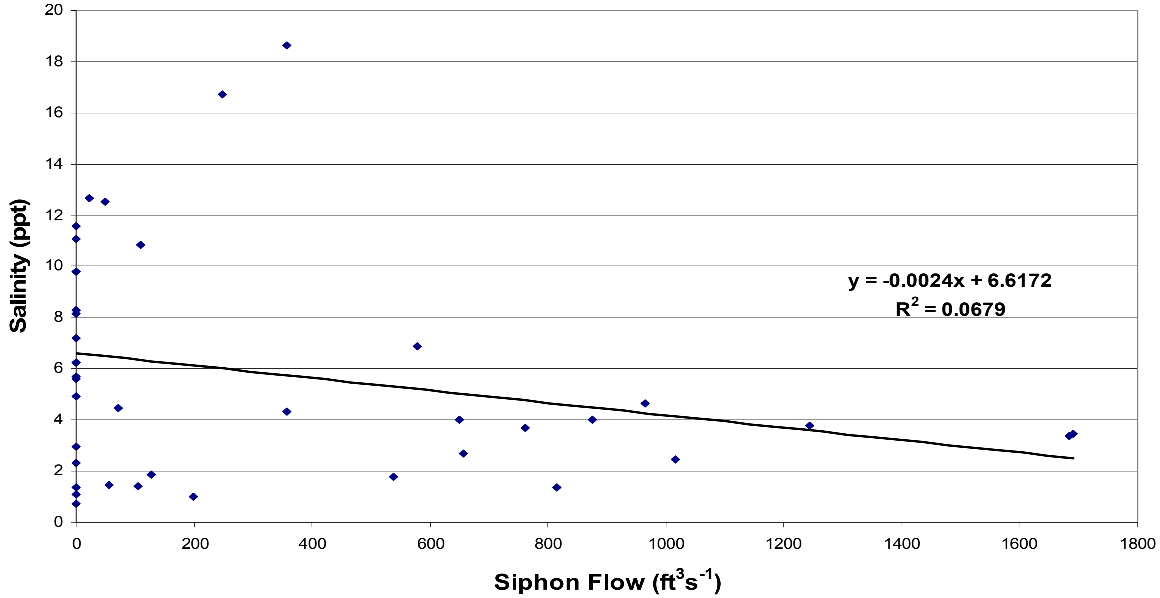


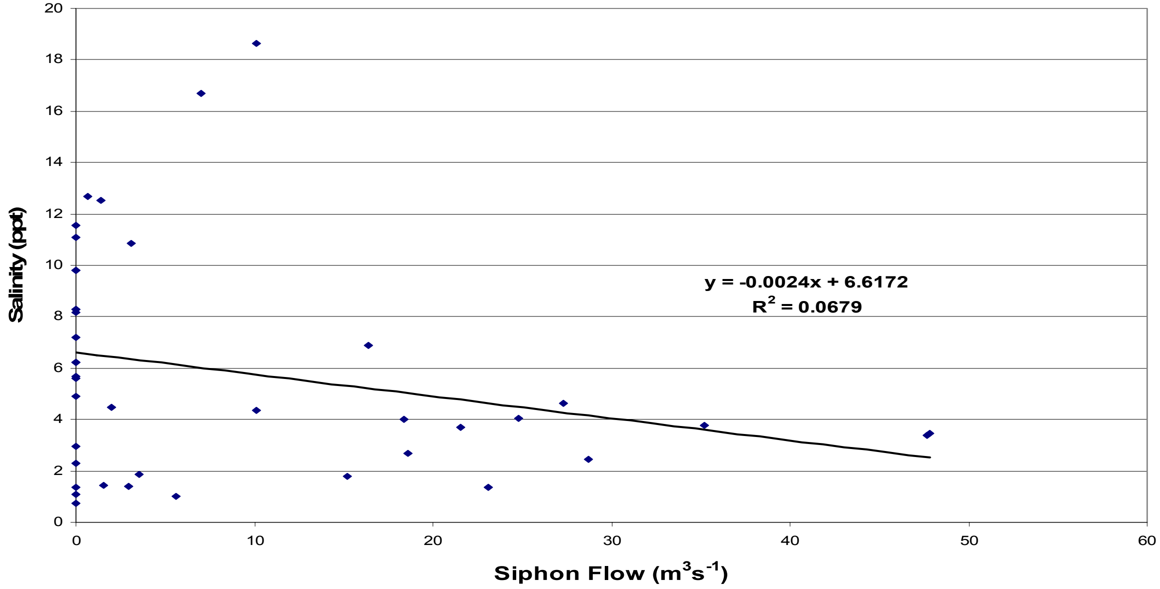
BA03c-60 Monthly Mean Continuous Data Showing The Relationship between Salinity and Diversion Flow for Years 1999-2002





BA03c- 61 Monthly Mean Continuous Data Showing The Relationship between Salinity and Diversion Flow for Years 1999-2002



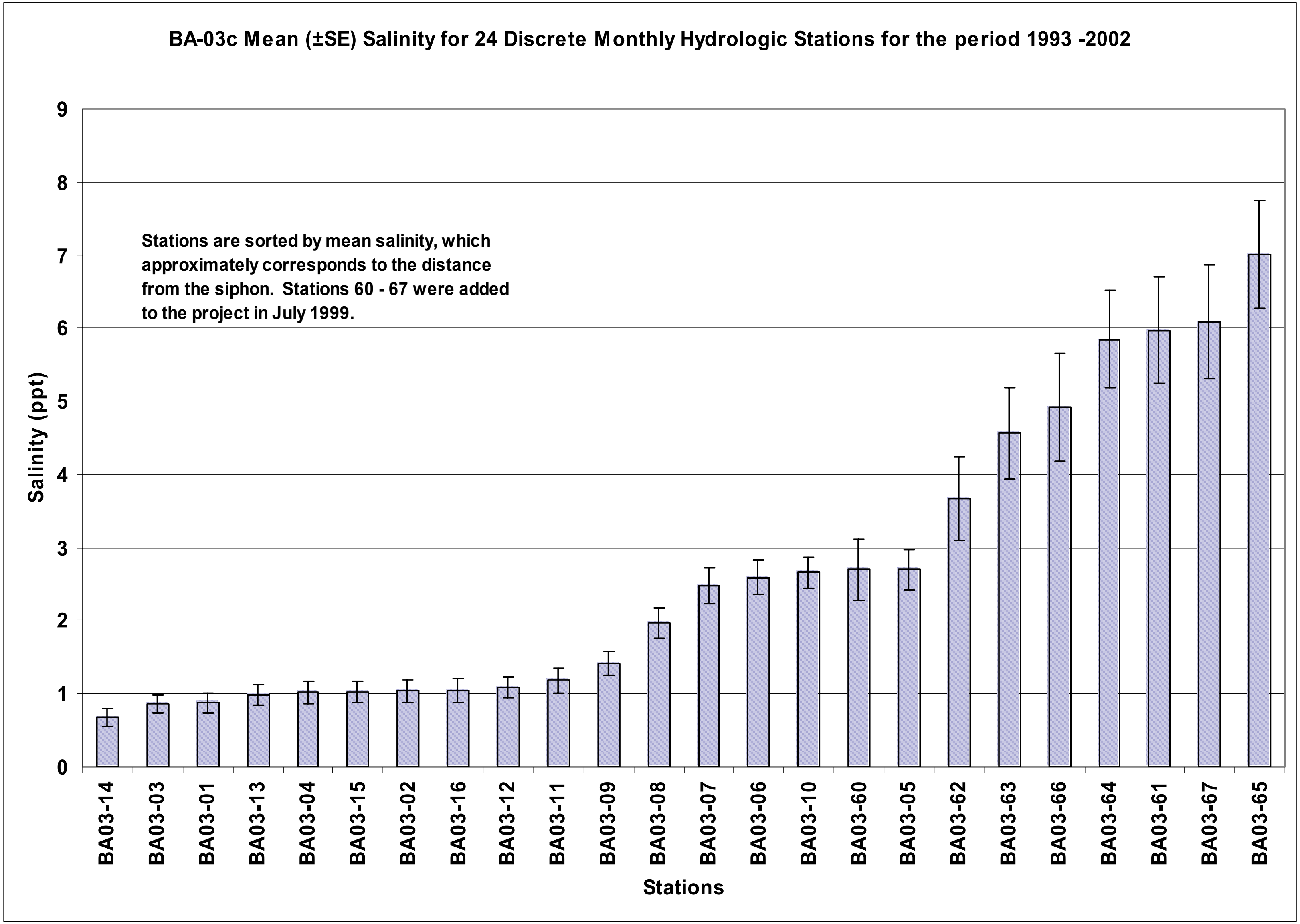


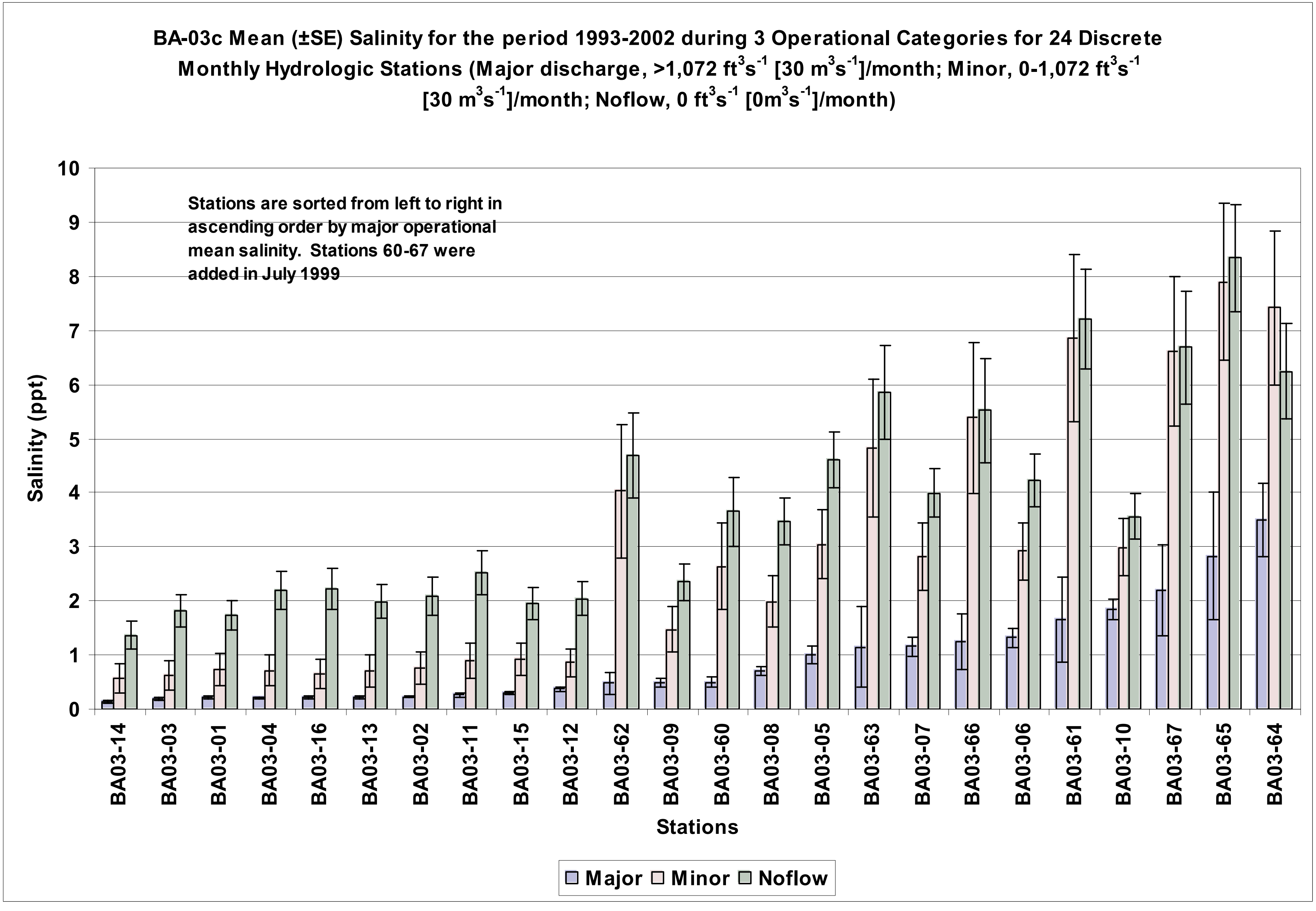
BA-03c Salinity

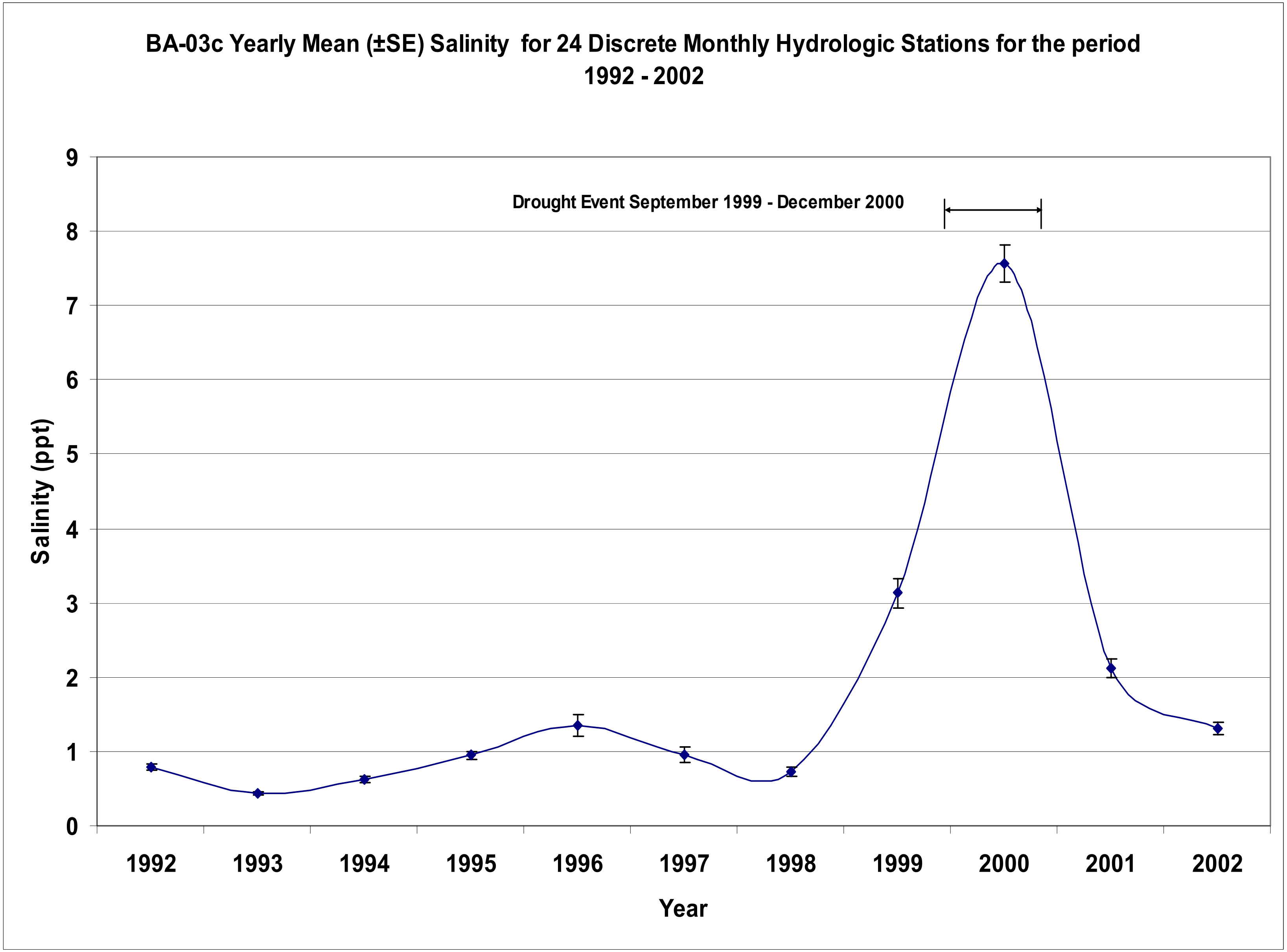
Discrete Data:

Salinity was monitored monthly at 16 stations from 1992 - 1999. Twenty four stations were monitored from 1999 – 2002.

- Histogram: Mean salinity by project stations
- Histogram: Mean salinity during three operational categories by station
- Graph: Yearly mean salinity


BA-03c Mean (±SE) Salinity for 24 Discrete Monthly Hydrologic Stations for the period 1993 -2002
Stations are sorted by mean salinity, which approximately corresponds to the distance from the siphon. Stations 60 - 67 were added to the project in July 1999.
Salinity (ppt)
0
1
2
3
4
5
6
7
8
9
BA03-14
BA03-03
BA03-01
BA03-13
BA03-04
BA03-15
BA03-02
BA03-16
BA03-12
BA03-11
BA03-09
BA03-08
BA03-07
BA03-06
BA03-10
BA03-60
BA03-05
BA03-62
BA03-63
BA03-66
BA03-64
BA03-61
BA03-67
BA03-65
Stations


BA-03c Mean (±SE) Salinity for the period 1993-2002 during 3 Operational Categories for 24 Discrete Monthly Hydrologic Stations (Major discharge, >1,072 ft³s⁻¹ [30 m³s⁻¹]/month; Minor, 0-1,072 ft³s⁻¹ [30 m³s⁻¹]/month; Noflow, 0 ft³s⁻¹ [0m³s⁻¹]/month)
Stations are sorted from left to right in ascending order by major operational mean salinity. Stations 60-67 were added in July 1999
Salinity (ppt)
0
1
2
3
4
5
6
7
8
9
10
BA03-14
BA03-03
BA03-01
BA03-04
BA03-16
BA03-13
BA03-02
BA03-11
BA03-15
BA03-12
BA03-62
BA03-09
BA03-60
BA03-08
BA03-05
BA03-63
BA03-07
BA03-66
BA03-06
BA03-61
BA03-10
BA03-67
BA03-65
BA03-64
Stations
Major
Minor
Noflow

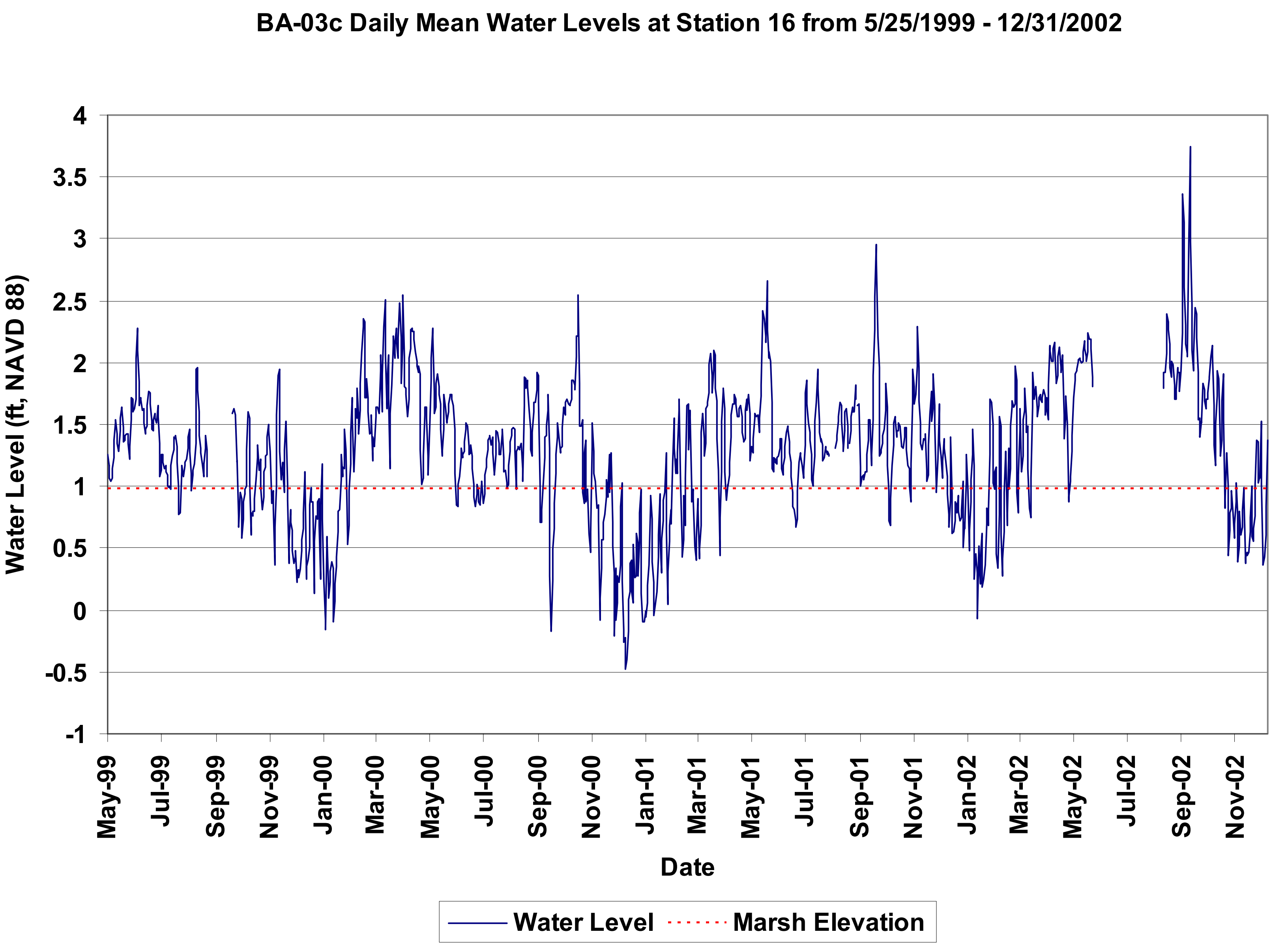


BA-03c Yearly Mean (±SE) Salinity for 24 Discrete Monthly Hydrologic Stations for the period
1992 - 2002
Drought Event September 1999 - December 2000
Salinity (ppt)
0
1
2
3
4
5
6
7
8
9
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year

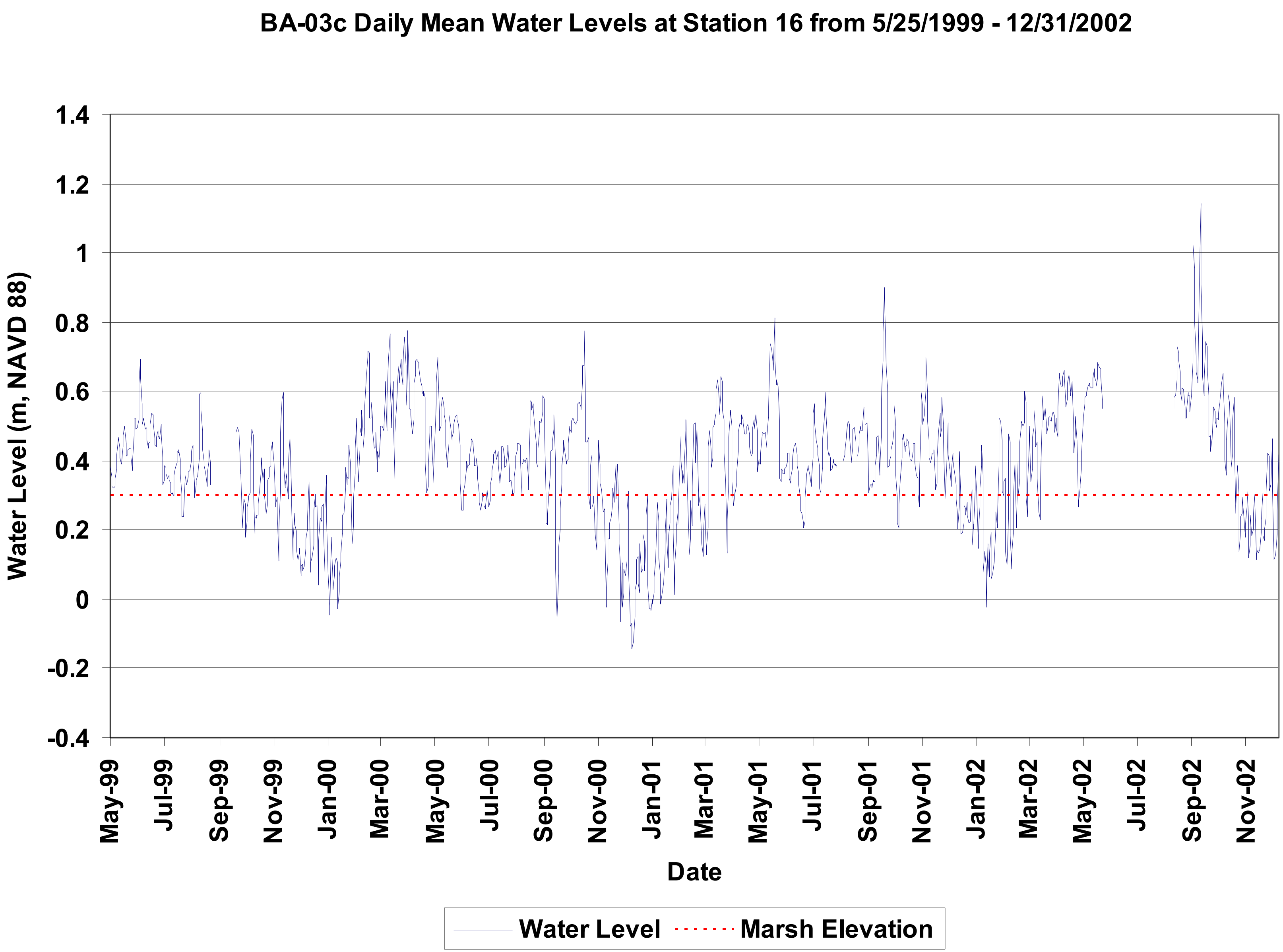
BA-03c Water Level

Water level was recorded at 7 staff-gauges from 1992 – 1999. Nine staff-gauges and 3 continuous recorders were monitored from 1999 – 2002.

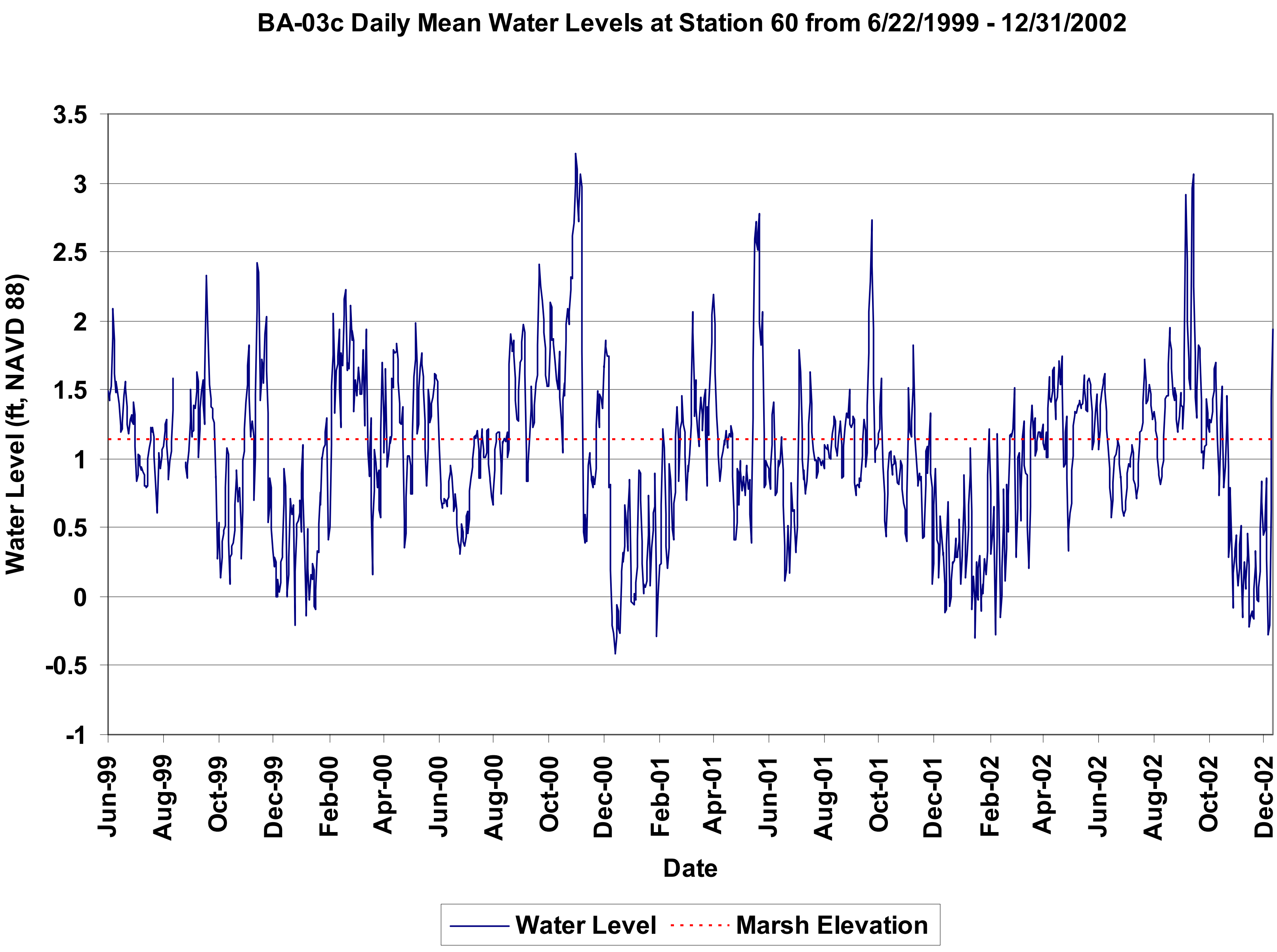
- Hydrographs: Mean Daily Water Level NAVD 88 (feet) at the five continuous recorder stations
- Hydrographs: Mean Daily Water Level NAVD 88 (meters) at the five continuous recorder stations
- Histogram: Water levels during three operational siphon categories (ft^3s^{-1})
- Histogram: Water levels during three operational siphon categories (m^3s^{-1})



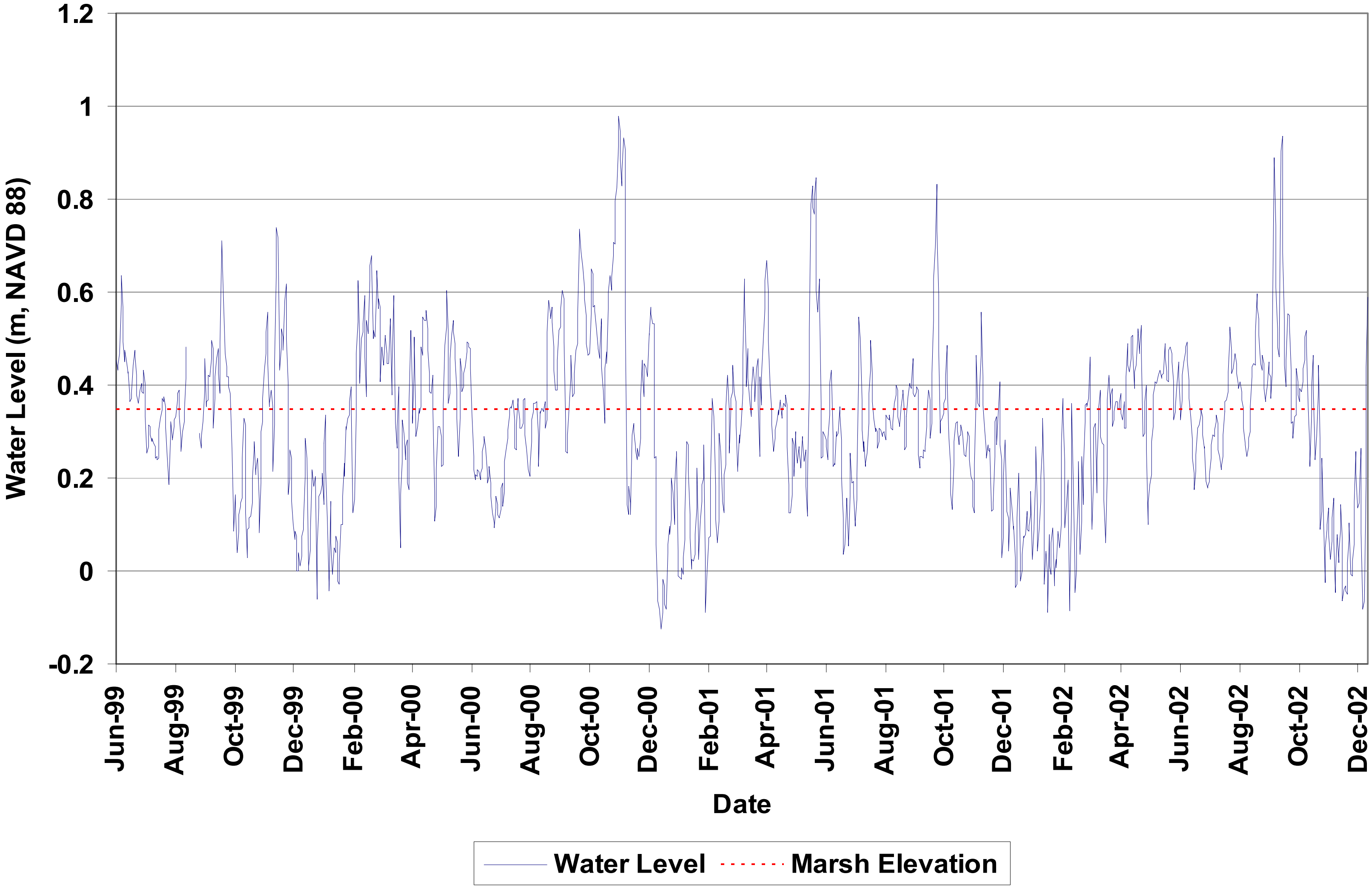
BA-03c Daily Mean Water Levels at Station 16 from 5/25/1999 - 12/31/2002
Water Level (ft, NAVD 88)
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
May-99
Jul-99
Sep-99
Nov-99
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Date
Water Level
Marsh Elevation

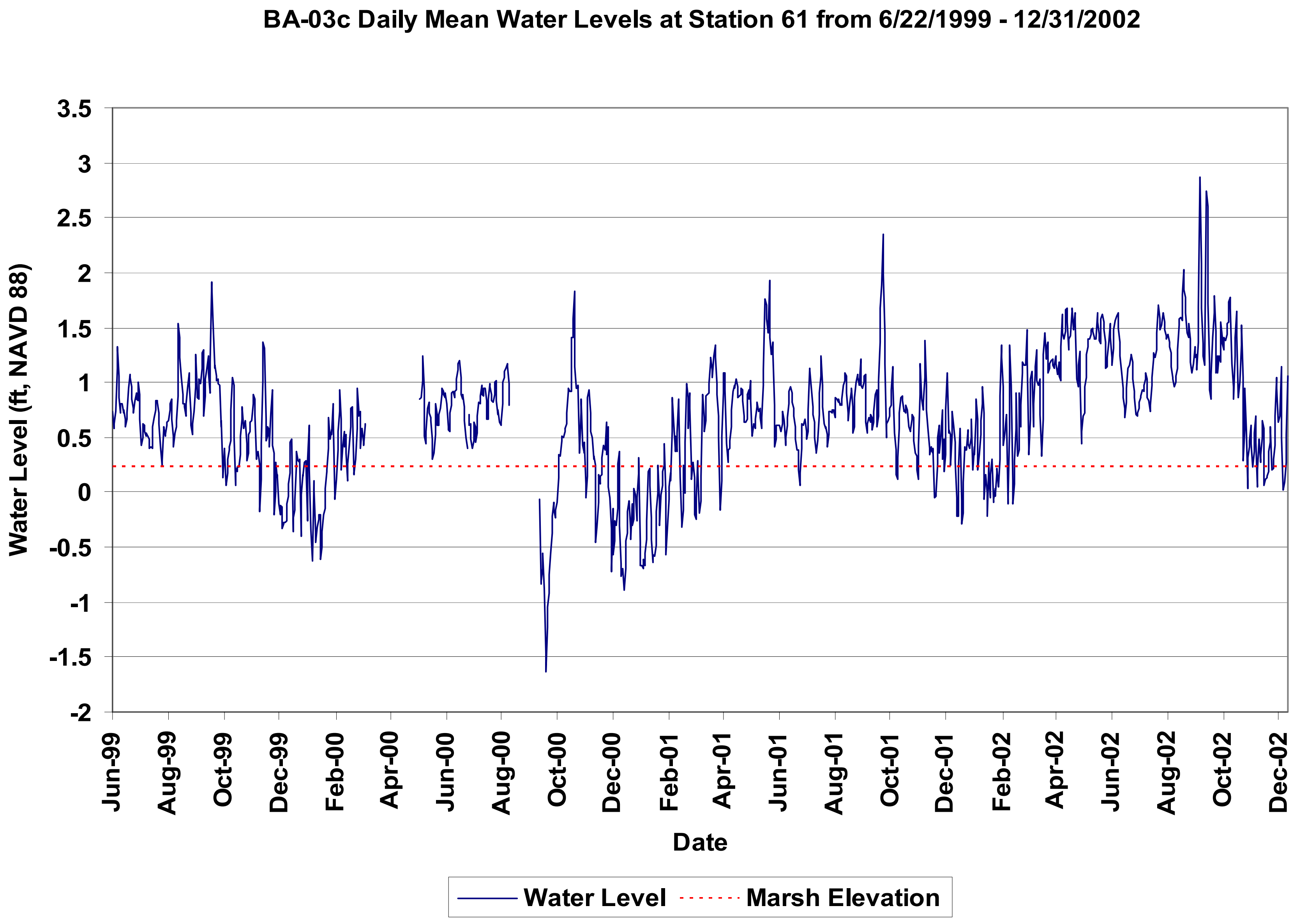


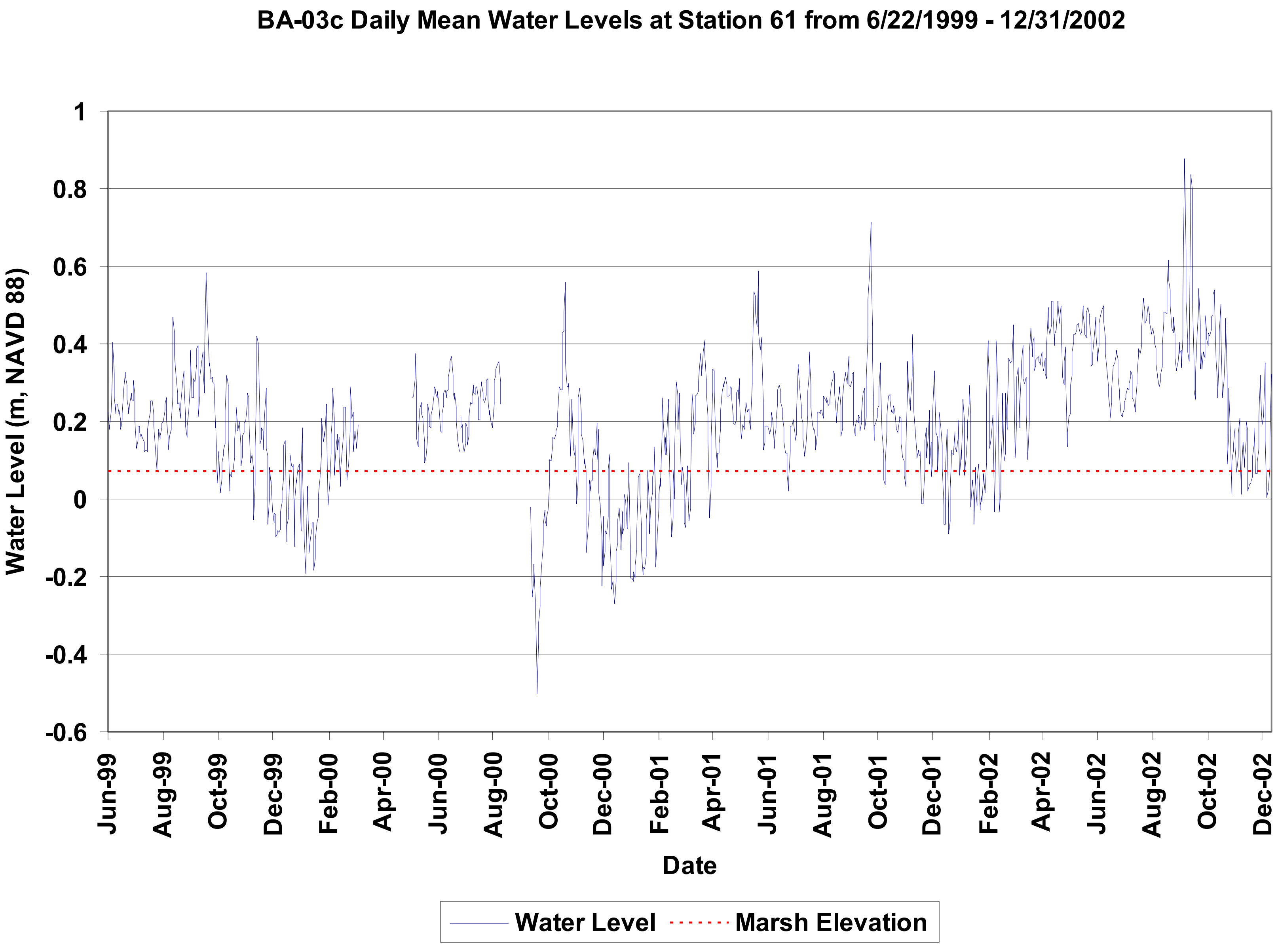
BA-03c Daily Mean Water Levels at Station 16 from 5/25/1999 - 12/31/2002
Water Level (m, NAVD 88)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
May-99
Jul-99
Sep-99
Nov-99
Jan-00
Mar-00
May-00
Jul-00
Sep-00
Nov-00
Jan-01
Mar-01
May-01
Jul-01
Sep-01
Nov-01
Jan-02
Mar-02
May-02
Jul-02
Sep-02
Nov-02
Date
Water Level
Marsh Elevation

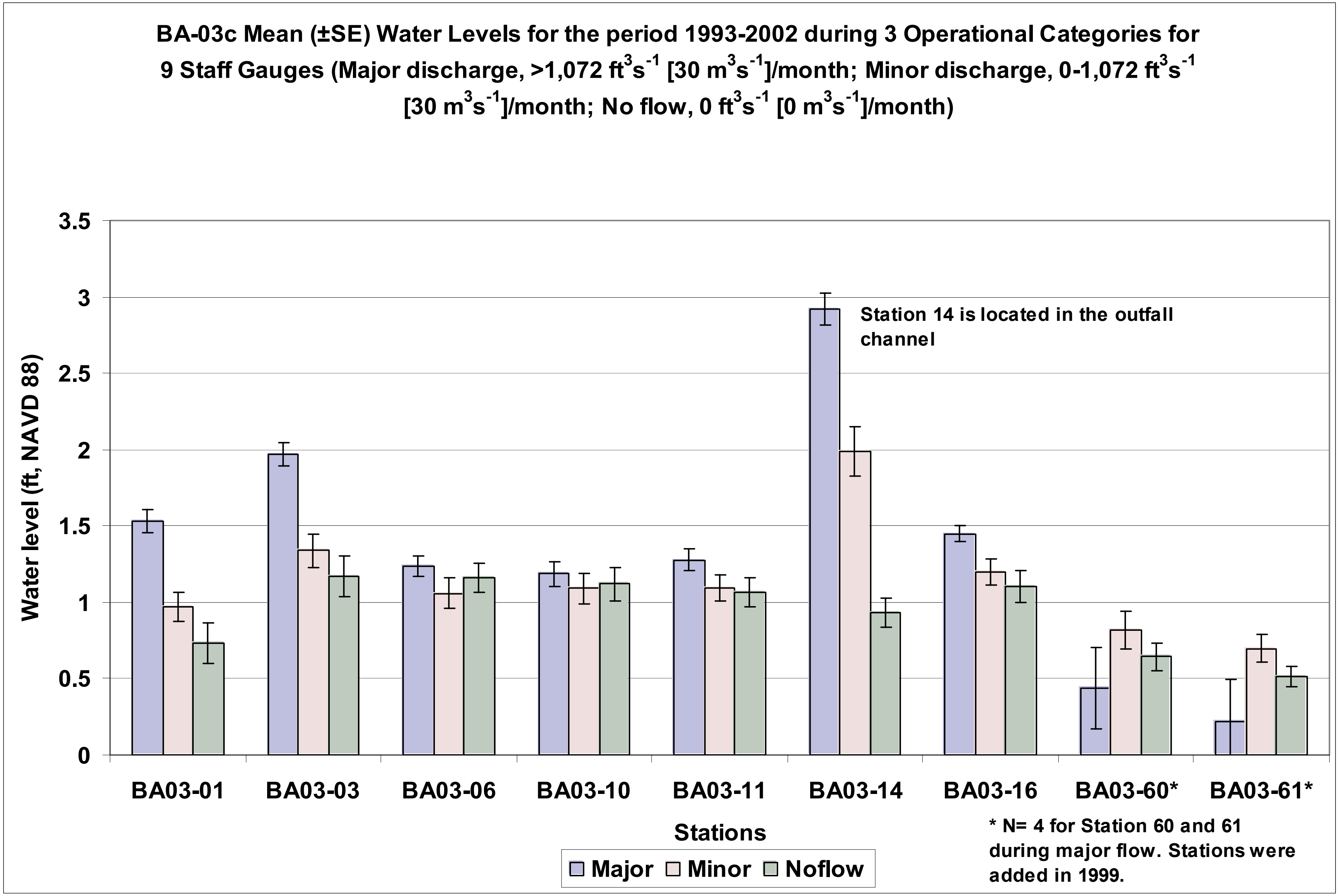

BA-03c Daily Mean Water Levels at Station 60 from 6/22/1999 - 12/31/2002
Water Level (ft, NAVD 88)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
Jun-99
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Date
Water Level
Marsh Elevation

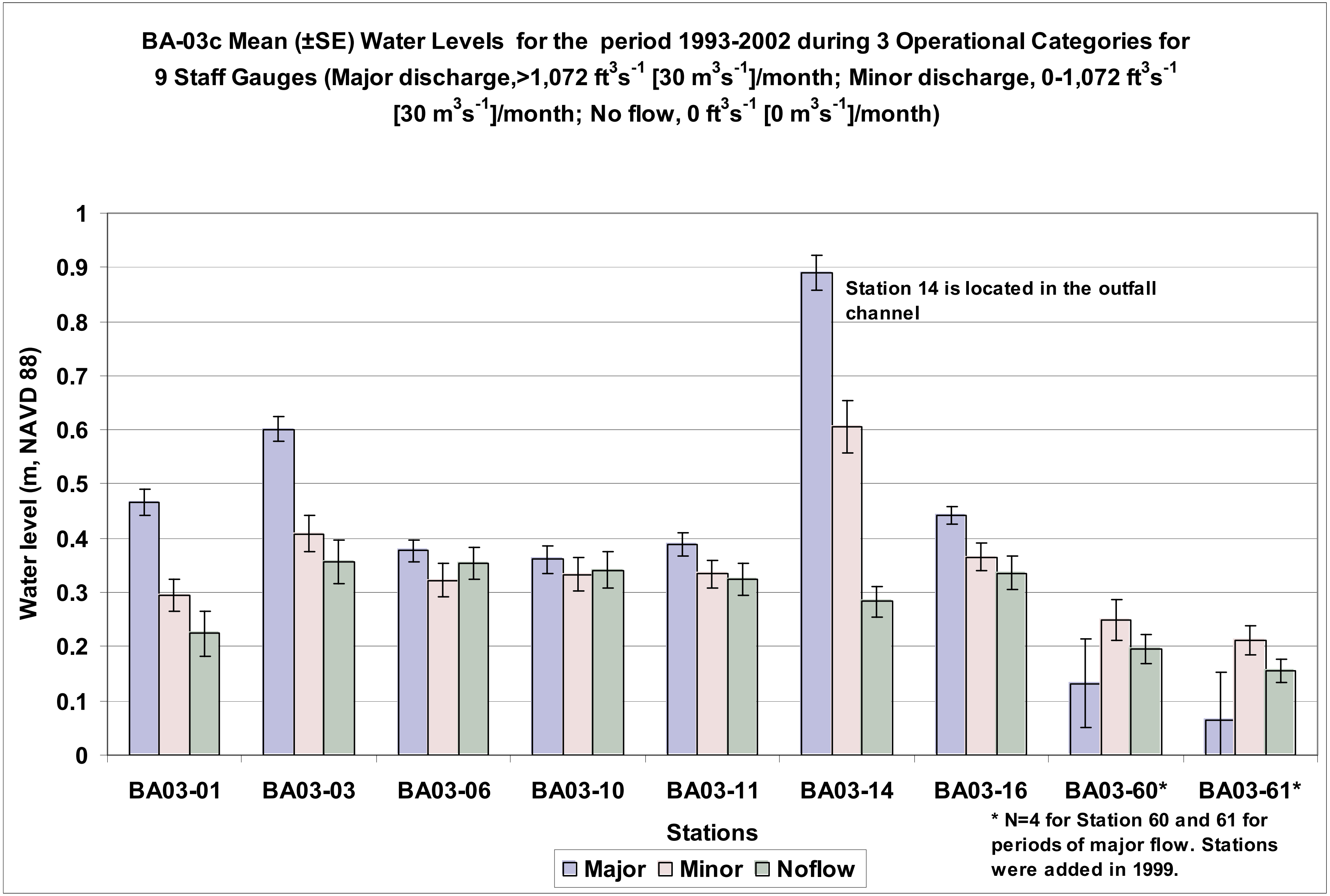
BA-03c Daily Mean Water Levels at Station 60 from 6/22/1999 - 12/31/2002




BA-03c Daily Mean Water Levels at Station 61 from 6/22/1999 - 12/31/2002
Water Level (ft, NAVD 88)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
Jun-99
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Date
Water Level
Marsh Elevation


BA-03c Daily Mean Water Levels at Station 61 from 6/22/1999 - 12/31/2002
Water Level (m, NAVD 88)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Jun-99
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Date
Water Level
Marsh Elevation


BA-03c Mean (±SE) Water Levels for the period 1993-2002 during 3 Operational Categories for 9 Staff Gauges (Major discharge, >1,072 ft3s-1 [30 m3s-1]/month; Minor discharge, 0-1,072 ft3s-1 [30 m3s-1]/month; No flow, 0 ft3s-1 [0 m3s-1]/month)
Water level (ft, NAVD 88)
3.5
3
2.5
2
1.5
1
0.5
0
Station 14 is located in the outfall channel
BA03-01
BA03-03
BA03-06
BA03-10
BA03-11
BA03-14
BA03-16
BA03-60*
BA03-61*
Stations
Major
Minor
Noflow
* N= 4 for Station 60 and 61 during major flow. Stations were added in 1999.

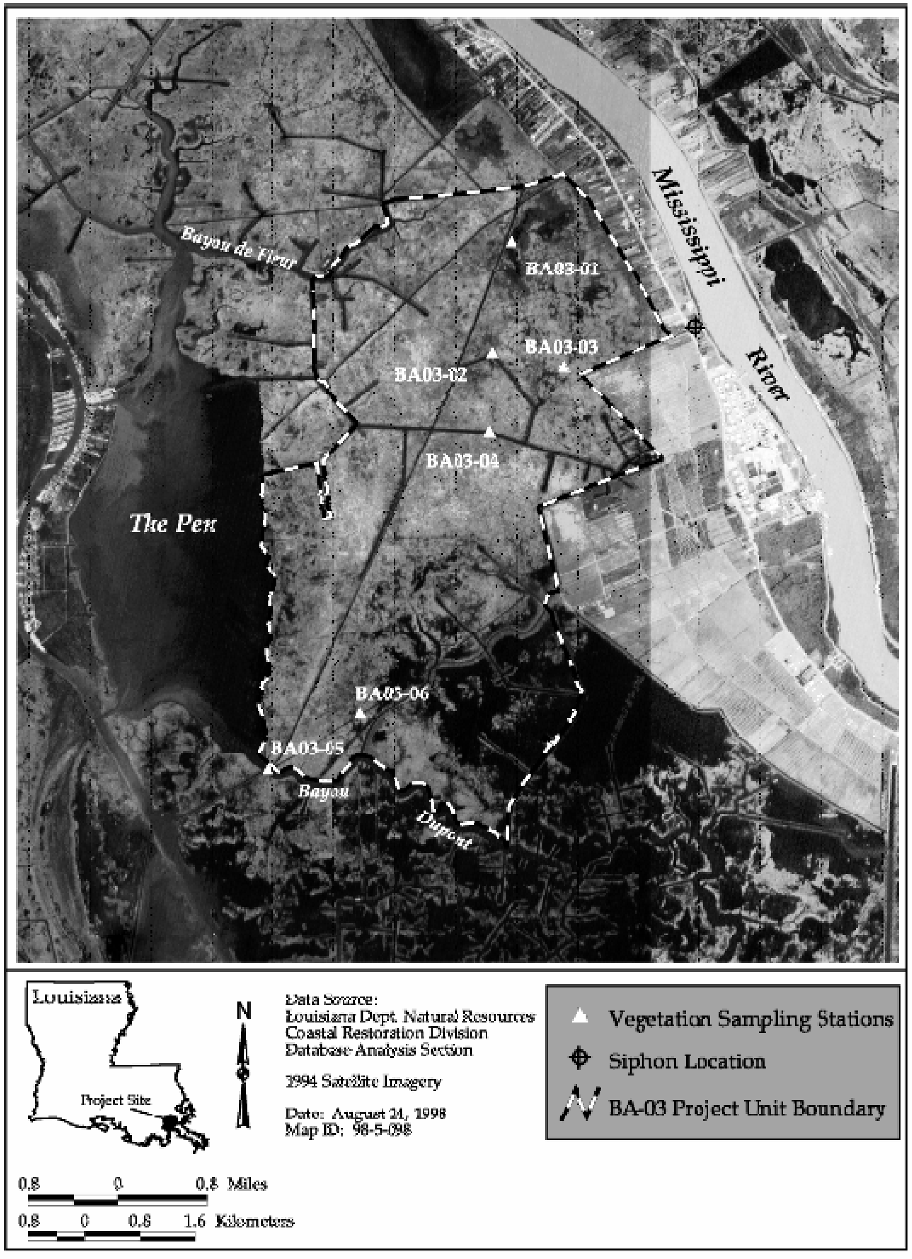

BA-03c Mean (±SE) Water Levels for the period 1993-2002 during 3 Operational Categories for 9 Staff Gauges (Major discharge,>1,072 ft3s-1 [30 m3s-1]/month; Minor discharge, 0-1,072 ft3s-1 [30 m3s-1]/month; No flow, 0 ft3s-1 [0 m3s-1]/month)
Water level (m, NAVD 88)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Station 14 is located in the outfall channel
BA03-01
BA03-03
BA03-06
BA03-10
BA03-11
BA03-14
BA03-16
BA03-60*
BA03-61*
Stations
Major
Minor
Noflow
* N=4 for Station 60 and 61 for periods of major flow. Stations were added in 1999.

BA-03c Vegetation Data

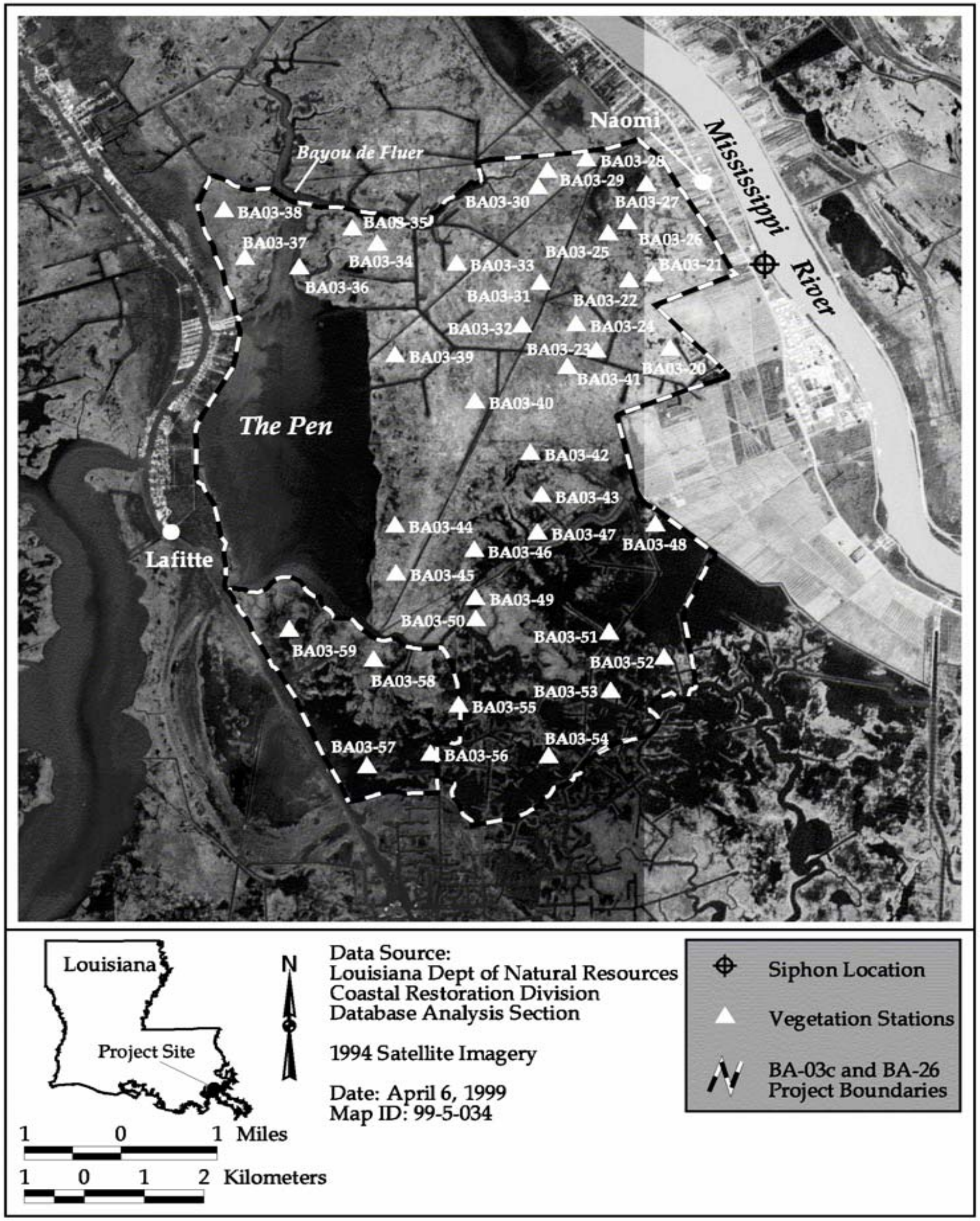
Vegetation surveys were conducted in 1992, 1995, 1997 and 2000 and will be surveyed again in 2003, 2006, 2009 and 2012. Vegetation stations in 1992 and 1995 were area ground surveyed visually. Vegetation in 1997 and 2000 was surveyed using Braun-Blanquet 4-m^2 plots following procedures outlined in Steyer et al. (1995).

- Map: Vegetation station locations for 1992 and 1995
- Map: Vegetation station locations for 1997 and 2001
- Table: Mean % cover for all vegetation species by year
- Histogram: Mean % cover of dominant vegetation species for 1992
- Histogram: Mean % cover of dominant vegetation species for 1995
- Histogram: Mean % cover of dominant vegetation species for 1997
- Histogram: Mean % cover of dominant vegetation species for 2000

BA-03c 1992 and 1995 vegetation station locations



BA-03c 1997 and 2000 vegetation station locations.



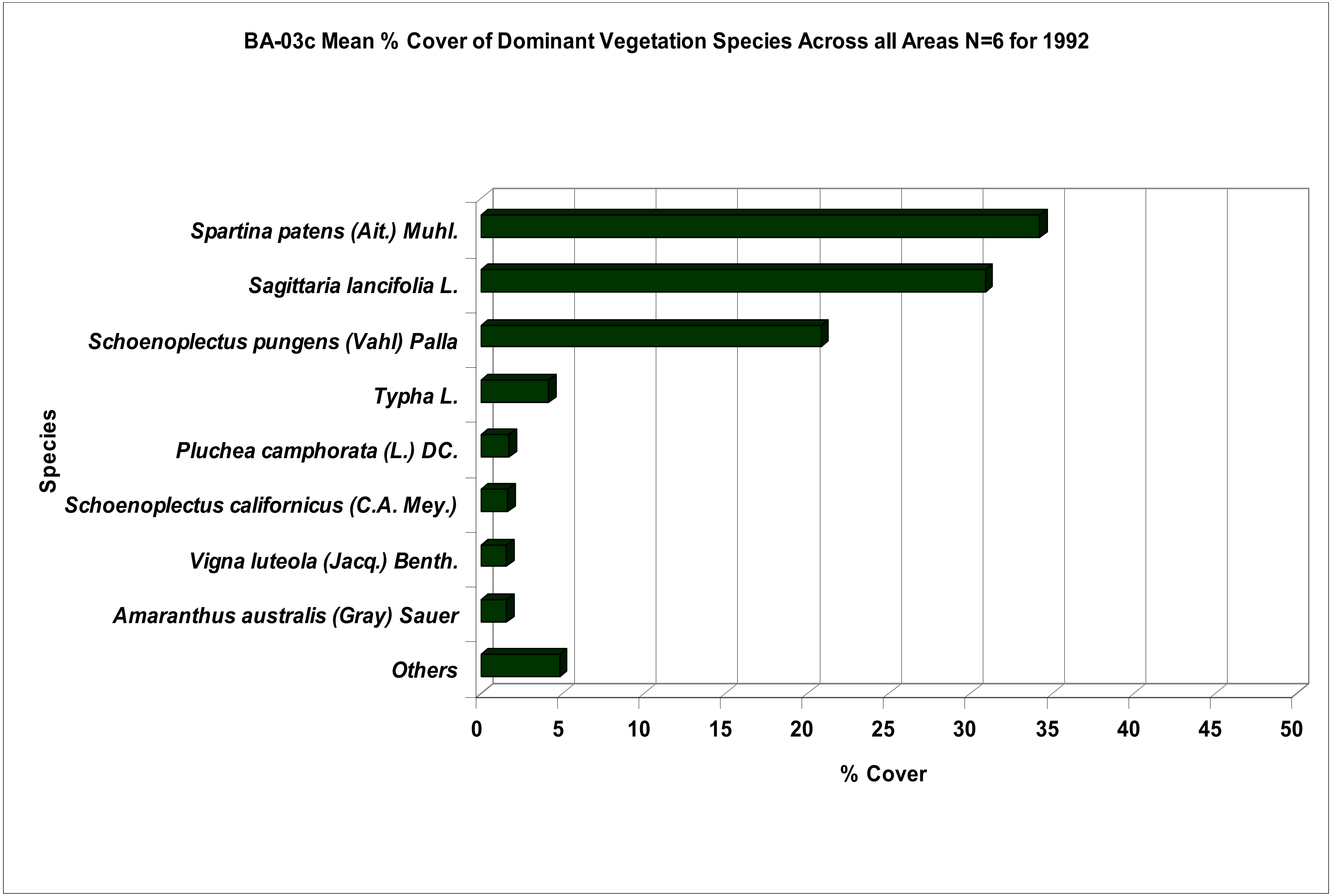
BA-03c Mean % Cover for all Vegetation Species by Year

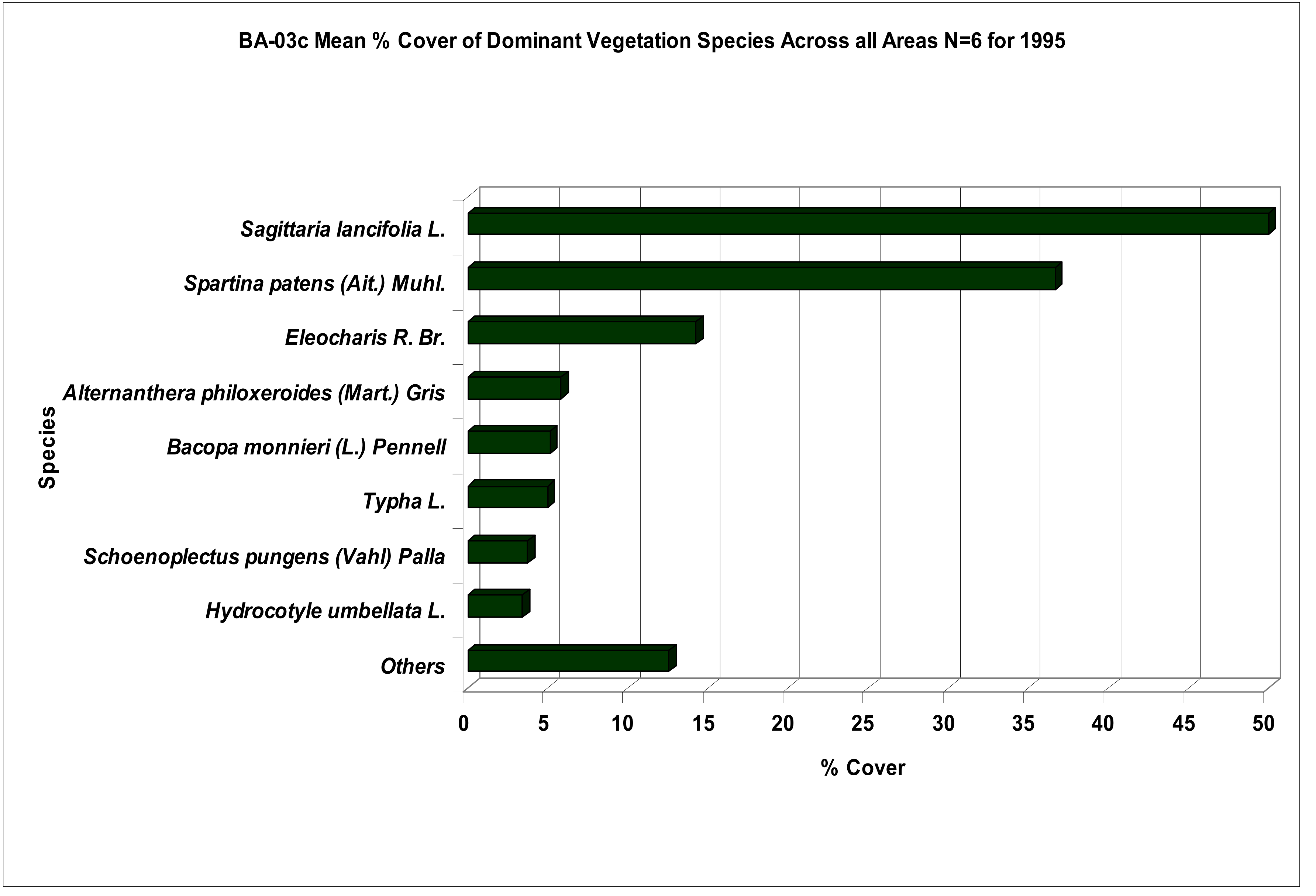
Scientific Name	Common Name	1992	1995	1997	2000
Alternanthera philoxeroides (Mart.) Gris	Aligatorweed	0.08	5.83	1.14	0.44
Amaranthus australis (Gray) Sauer	Southern amaranth	1.58	.	0.25	.
Ammannia coccinea Rottb.	Valley redstem	.	.	.	0.01
Ammannia L.	Redstem	.	.	0.00	.
Andropogon glomeratus (Walt.) B.S.P.	Bushy bluestem	.	.	0.24	0.11
Baccharis halimifolia L.	Eastern baccharis	.	0.75	2.38	2.03
Baccharis L.	Baccharis	.	.	0.00	.
Bacopa monnieri (L.) Pennell	Coastal waterhyssop	0.08	5.17	1.13	2.70
Carex L.	Sedge	0.92	.	.	.
Cuscuta indecora Choisy	Bigseed dodder	.	0.08	.	.
Cyperus L.	Flatsedge	.	.	0.36	0.17
Cyperus odoratus L.	Fragrant flatsedge	.	0.25	0.92	0.10
Distichlis spicata (L.) Greene	Seashore saltgrass	.	0.67	0.00	4.15
Echinochloa crus-galli (L.) Beauv.	Barnyardgrass	.	.	0.01	.
Echinochloa walteri (Pursh) Heller	Coast cockspur	1.00	0.17	.	0.01
Eichhornia crassipes (Mart.) Solms	Water hyacinth	.	.	0.50	.
Eleocharis cellulosa Torr.	Gulf Coast spikerush	.	0.67	11.75	6.36
Eleocharis parvula (Roemer & J.A. Schult	Dwarf spikesedge	1.00	.	0.03	0.63
Eleocharis R. Br.	Spikerush	.	14.25	8.90	.
Hibiscus L.	Rosemallow	.	.	0.02	.
Hibiscus moscheutos L.	Crimsoneyed rosemallow	.	.	0.01	.
Hydrocotyle L.	Hydrocotyle	.	.	1.36	0.16
Hydrocotyle umbellata L.	Manyflower marshpennywort	0.08	3.42	.	.
Ipomoea sagittata Poir.	Saltmarsh morninglory	0.08	1.33	3.13	1.18
Iva frutescens L.	Bigleaf sumpweed	.	.	0.13	2.13
Juncus effusus L.	Common rush	.	.	2.25	.
Juncus roemerianus Scheele	Needlegrass rush	.	.	1.25	1.38
Kosteletzkya virginica (L.) K. Presl ex	Virginia saltmarsh mallow	.	0.25	.	0.25
Lemna minor L.	Common duckweed	.	.	.	0.03
Ludwigia L.	Primrose-willow	.	0.08	0.19	.

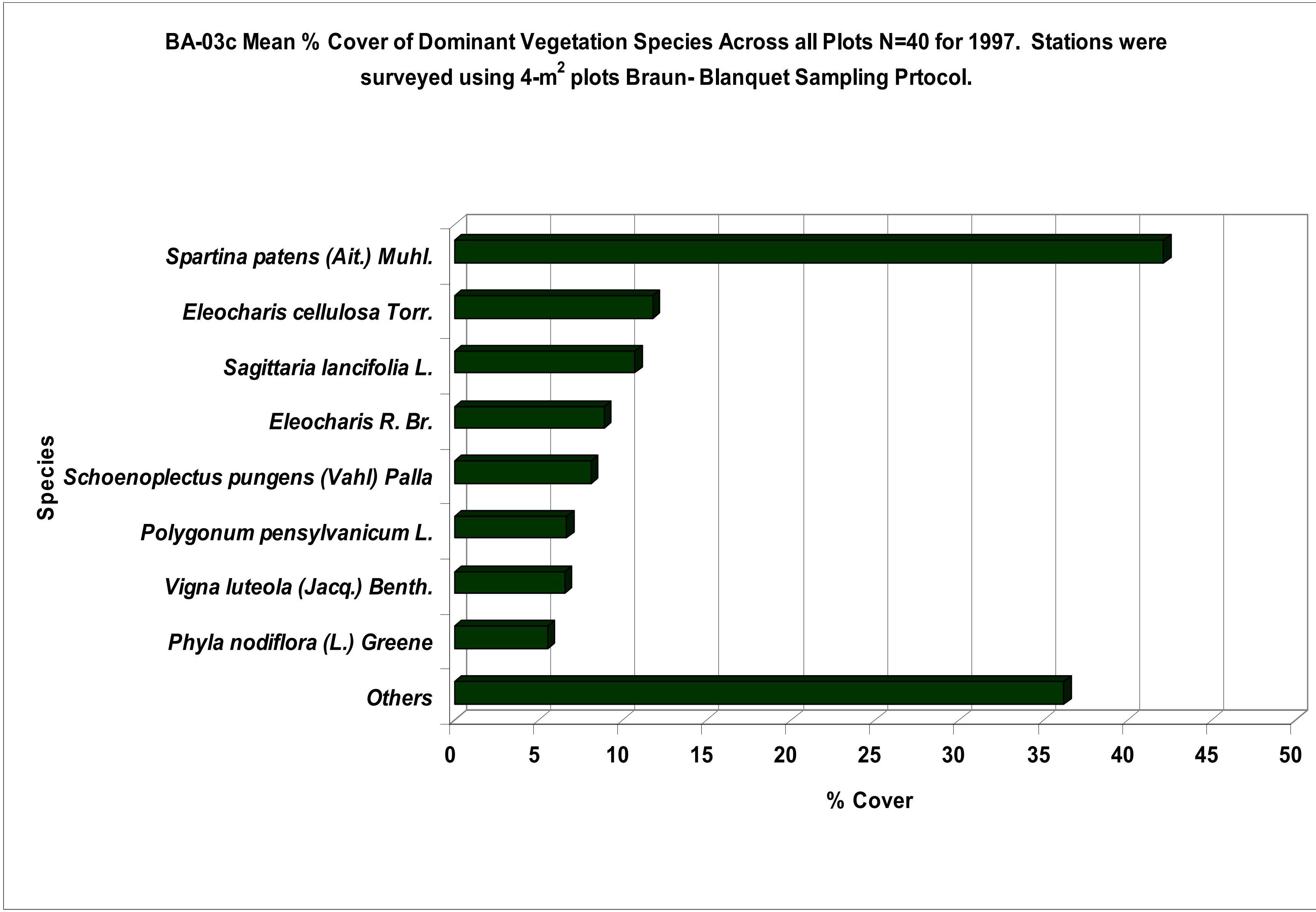
(continued)

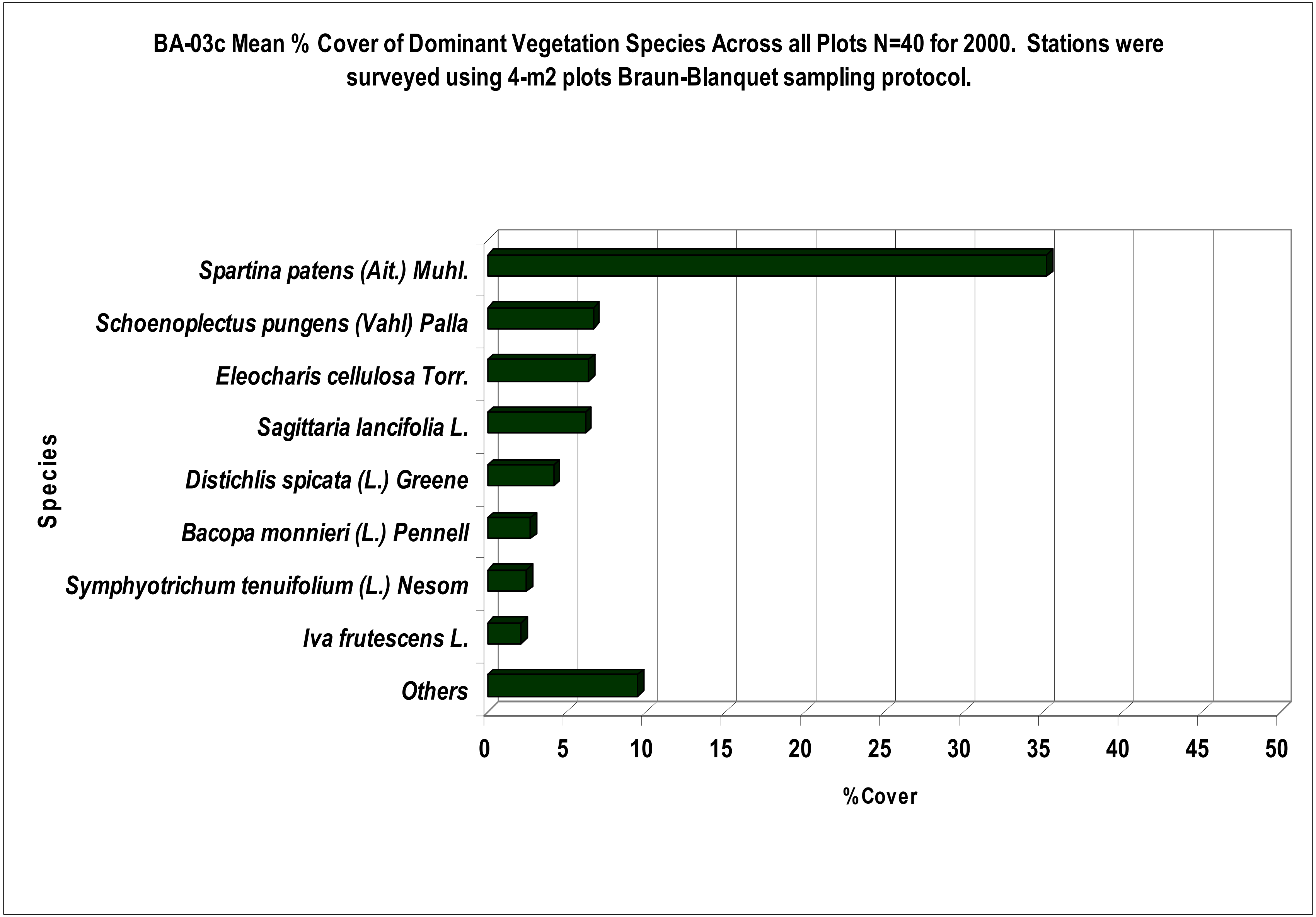
BA-03c Mean % Cover for all Vegetation Species by Year (continued)

Scientific Name	Common Name	1992	1995	1997	2000
Ludwigia microcarpa Michx.	Smallfruit primrose-willow	.	.	0.01	.
Lythrum lineare L.	Wand lythrum	.	0.08	.	.
Mikania scandens (L.) Willd.	Climbing hempvine	.	0.08	2.33	.
Morella cerifera (L.) Small	Wax myrtle	0.08	.	.	.
Panicum repens L.	Torpedograss	.	.	.	0.03
Paspalum dissectum (L.) L.	Mudbank crowngrass	.	1.67	.	.
Phyla lanceolata (Michx.) Greene	Lanceleaf fogfruit	.	0.25	.	.
Phyla nodiflora (L.) Greene	Turkey tangle fogfruit	.	.	5.51	0.68
Pluchea camphorata (L.) DC.	Camphor pluchea	1.75	0.75	1.39	0.23
Pluchea foetida (L.) DC.	Stinking camphorweed	0.67	.	0.00	.
Polygonum L.	Knotweed	0.67	2.83	1.70	.
Polygonum pensylvanicum L.	Pennsylvania smartweed	.	.	6.67	.
Polygonum punctatum Ell.	Dotted smartweed	.	.	0.50	0.03
Sacciolepis striata (L.) Nash	American cupscale	.	.	0.08	0.70
Sagittaria lancifolia L.	Bulltongue	30.92	50.00	10.73	6.18
Sagittaria platyphylla (Engelm.) J.G. Sm	Delta arrowhead	.	.	1.25	.
Salvinia minima Baker	Water spangles	.	.	0.01	0.05
Schoenoplectus californicus (C.A. Mey.)	California bulrush	1.67	0.08	.	.
Schoenoplectus pungens (Vahl) Palla	Common threesquare	20.83	3.75	8.10	6.68
Sesbania drummondii (Rydb.) Cory	Poisonbean	.	0.17	.	.
Sesbania Scop.	Riverhemp	.	0.08	.	.
Setaria Beauv.	Bristlegrass	.	.	1.26	.
Setaria magna Griseb.	Giant bristlegrass	.	.	0.25	.
Setaria parviflora (Poir.) Kerguelen	Knotroot bristlegrass	.	.	0.13	0.05
Solidago sempervirens L.	Seaside goldenrod	.	.	2.48	0.24
Spartina alterniflora Loisel.	Smooth cordgrass	0.17	.	0.00	0.78
Spartina patens (Ait.) Muhl.	Marshay cordgrass	34.25	36.67	42.18	35.21
Sphenoclea zeylanica Gaertn.	Chickenspike	.	0.08	0.75	.
Sporobolus R. Br.	Dropseed	.	.	1.13	.
Symphyotrichum subulatum (Michx.) Nesom	Coastal Waterhyssop	.	.	2.80	.
Symphyotrichum tenuifolium (L.) Nesom	Perennial saltmarsh aster	.	0.08	3.24	2.44
Thelypteris palustris Schott	Eastern marsh fern	.	.	1.68	0.08
Triadica sebifera (L.) Small	Tallowtree	.	0.08	.	.
Typha L.	Cattail	4.17	5.00	.	.
Typha latifolia L.	Broadleaf cattail	.	.	.	0.13
Vigna luteola (Jacq.) Benth.	Hairypod cowpea	1.58	2.08	6.53	.


BA-03c Mean % Cover of Dominant Vegetation Species Across all Areas N=6 for 1992
Species
Spartina patens (Ait.) Muhl.
Sagittaria lancifolia L.
Schoenoplectus pungens (Vahl) Palla
Typha L.
Pluchea camphorata (L.) DC.
Schoenoplectus californicus (C.A. Mey.)
Vigna luteola (Jacq.) Benth.
Amaranthus australis (Gray) Sauer
Others
0
5
10
15
20
25
30
35
40
45
50
% Cover


BA-03c Mean % Cover of Dominant Vegetation Species Across all Areas N=6 for 1995
Species
Sagittaria lancifolia L.
Spartina patens (Ait.) Muhl.
Eleocharis R. Br.
Alternanthera philoxeroides (Mart.) Gris
Bacopa monnieri (L.) Pennell
Typha L.
Schoenoplectus pungens (Vahl) Palla
Hydrocotyle umbellata L.
Others
0
5
10
15
20
25
30
35
40
45
50
% Cover


BA-03c Mean % Cover of Dominant Vegetation Species Across all Plots N=40 for 1997. Stations were surveyed using 4-m2 plots Braun- Blanquet Sampling Prtocol.
Species
Spartina patens (Ait.) Muhl.
Eleocharis cellulosa Torr.
Sagittaria lancifolia L.
Eleocharis R. Br.
Schoenoplectus pungens (Vahl) Palla
Polygonum pensylvanicum L.
Vigna luteola (Jacq.) Benth.
Phyla nodiflora (L.) Greene
Others
0
5
10
15
20
25
30
35
40
45
50
% Cover


BA-03c Mean % Cover of Dominant Vegetation Species Across all Plots N=40 for 2000. Stations were surveyed using 4-m2 plots Braun-Blanquet sampling protocol.
Species
Spartina patens (Ait.) Muhl.
Schoenoplectus pungens (Vahl) Palla
Eleocharis cellulosa Torr.
Sagittaria lancifolia L.
Distichlis spicata (L.) Greene
Bacopa monnieri (L.) Pennell
Symphyotrichum tenuifolium (L.) Nesom
Iva frutescens L.
Others
0
5
10
15
20
25
30
35
40
45
50
%Cover

BA-03c Habitat Mapping

Aerial photography (1:12,000) was obtained in November 1993 pre-construction and in 2000 post-construction. Analyses have not yet been completed.

BA-03c Naomi Outfall Management

Preliminary Findings

Siphon Flow:

- The revised operation plan called for the structure to have all eight pipes operating at just over 1,000 ft^3s^{-1} ($28m^3s^{-1}$) for all months except March and April when only two pipes are to be in operation. Through 2002, the structure was in operation 68% of the time and averaged 829 ft^3s^{-1} ($23m^3s^{-1}$) when operating. Flows were highest in the spring period, which was opposite than planned.
- Low river stage limited operations; loss of prime at low stages rendered siphons inoperable.
- Additional obstacles to operation were: marine fisheries, tropical storms, oil spills, maintenance problems and staffing limitations.

Salinity Data:

- Salinity reduction occurred during periods when all siphons were in either major or minor operation, indicating that the siphons are capable of reducing salinity in the project area. However, during periods of minor and no-flow operations, salinity was influenced by factors other than siphon operation, particularly seasonal variability. Siphon operation is a function of river stage; thus, ability to control salinity during drought or normal low river stages (e.g. late summer and fall) is limited.

BA-03c Naomi Outfall Management

Preliminary Findings

Water Level:

- Monthly discrete staff gauge data collected during siphon operation showed that water level was significantly higher ($P<0.05$) at the monitoring station nearest the outfall structure (station 14) than the remaining stations. Water level at station 14 during major flow conditions (>1,072 ft^3s^{-1}) (30 m^3s-^{1}) was an average of 23.9 inches (60.7cm) above mean water level than during no-flow conditions. However, water surface elevations dissipated with distance from the discharge area.

Vegetation:

- Pre-construction surveys indicated that fresh/intermediate marsh comprised the northeast portion of the project area while brackish marsh dominated the remainder. Post-construction surveys indicated minor changes in vegetation community structure. A large number of species indicative of intermediate or low-salinity brackish marsh was found at the stations in the southern and western areas of the project suggesting that the marsh in this portion of the project area is turning fresher. However the 2001 survey indicated that some of the stations reverted back towards more saline conditions which was likely the effect of drought and little output from the siphons.

BA-03c Naomi Outfall Management

<u>Preliminary Findings</u>

Habitat Mapping:

- 1993 and 2002 aerial photography is currently being analyzed and will be presented in future summary data and graphics.