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September 28, 1987

Mr. James A. Huff
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Reference: Marine Habitat Research and Restoration Program, MML Project #310.209; FDNR Contract No. 3928

Dear Alan:

Enclosed please find the Fourth Quarterly Report for the Habitat Restoration Project, covering the period April, May and June, 1987. The report consists of two parts: Part I -- MML's section outlining faunal monitoring and sediment chemistry; and Part II -- Mangrove Systems, Inc. (MSI) section on planting and vegetative monitoring. I have also included a copy of the invoice for the fourth quarter.

If you have any questions concerning the report, please contact me.

Sincerely,

James K. Culter
Senior Biologist
Project Coordinator

JKC:lef
Enclosure

MARINE HABITAT RESEARCH AND RESTORATION PROGRAM

Fourth Quarterly Report

Covering the Months of April, May, June 1987

Mote Marine Laboratory Project #310.209

Florida Department of Natural Resources Contract No. 3928

Submitted to:
Florida Department of Natural Resources
100 Eighth Avenue Southeast
St. Petersburg, Florida 33701

Submitted by:
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September 28, 1987

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INTRODUCTION

The Marine Habitat Research and Restoration Program initiated by the Florida Department of Natural Resources (FDNR) commenced with the contract finalization on July 15, 1986. Mote Marine Laboratory (MML) and Mangrove Systems, Inc. (MSI) then began implementation of the program. The first quarter of the project covered the months of July, August, and September 1986. The second quarter covered the months of October, November, and December 1986. The Third Quarterly Report covered the months January, February and March 1987. This report summarizes the events which were conducted for each task during the fourth quarter (April, May, June); the tasks include: Planting and Monitoring; Macroinfauna; Meiofauna; Fisheries; and Tide Gages. In addition to the continuing activities at Pinellas Point and Monitoring of Regatta Point marsh planting was conducted at the Hendry Site (Manatee County) and the seagrass planting program begun at Lassing Park. The report is divided into two parts: Part I consists of Mote Marine Laboratory's report on all tasks, with the exception of planting and monitoring; Part II consists of Mangrove Systems' report on planting and growth monitoring. Methodologies used for each task are detailed in the FDNR/MML contract and will not be reiterated here. The Appendix presents data for the Pinellas Point Tide Gage.

PART I: MOTE MARINE LABORATORY TASK SUMMARIES

I.1. Site Selection

The Hendry site was reopened as a planting possibility due to reconsideration of actual ownership of accreted lands in this area. The issue was finally resolved by the state during Quarter IV, and the Hendry site was agreed upon as the Manatee County Planting Site. Subsequently, baseline data collections for sediment chemistry, meiofauna, macrofauna and fisheries were conducted in June prior to planting activities.

I.2. Task Summaries

Summaries on the events conducted for each task are presented below. Locations of the sampling stations are diagrammed in Figures 1 and 2 for the Pinellas Point site, Figures 3 and 4 for the Hendry site, and Figures 5 and 6 for the Lassing Park site. The sampling grid design used to randomly locate each sample is illustrated in Figure 7. Upper and lower marsh designations are applicable only to the macroinfaunal task at the Pinellas Point site.

I.2.1. Sampling Sites

Revegetation efforts have now been conducted at four sites, two in Pinellas County and two in Manatee County. The two sites in Pinellas County consist of the Pinellas Point Spartina and mangrove planting site and the Lassing Park seagrass planting site. The Manatee County sites consist of the Regatta Point Spartina planting site and the Hendry marsh planting site. Only vegetative monitoring is being conducted at the Regatta Point site. The other three sites involve various biological sediment and water quality monitoring programs. Figures 1 and 2 exhibit the location of the Pinellas Point sampling locations. Figures 3 and 4 illustrate the Hendry site, and Figures 5 and 6 illustrate Lassing Park. Figure 7 diagramatically illustrates the type of methodology used to sample the planted plots.

I.2.2. Chemistry, Sediments, Water Quality

Sampling dates for chemistry, sediments, and water quality for each revegetation site are outlined in Table 1. The Quarter IV activity consisted of sediment chemistry at the Lassing Park and Hendry sites and an intensive, low semidiurnal water quality sampling at Lassing Park. Both the sediment chemistry and water quality were pre-planting baseline events. Parameters measured for the Lassing Park water quality study are presented in Table 2.

Tables 3 and 4 present the qualitative descriptions of the morphological sediment cores taken as part of the June pre-planting baseline at Lassing Park (Table 3) and the Hendry site (Table 4). Figures 8-15 consist of photographs of sectioned morphological cores from

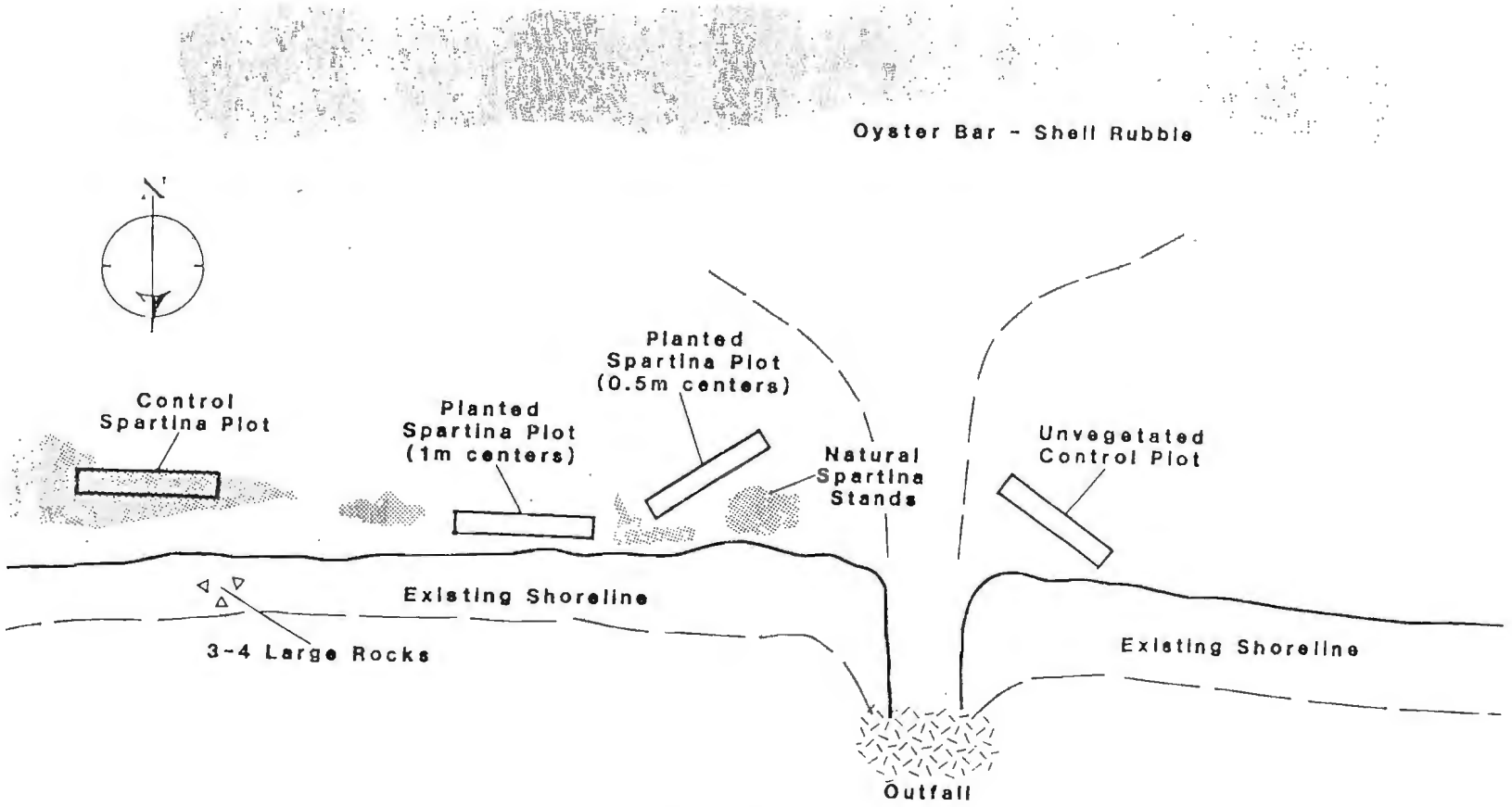


Figure 1. Location of Spartina planting plots at the west end of Pinellas Point Park. Drawing modified from sketch provided by Mangrove Systems, Inc. (MSI) and is not to scale.

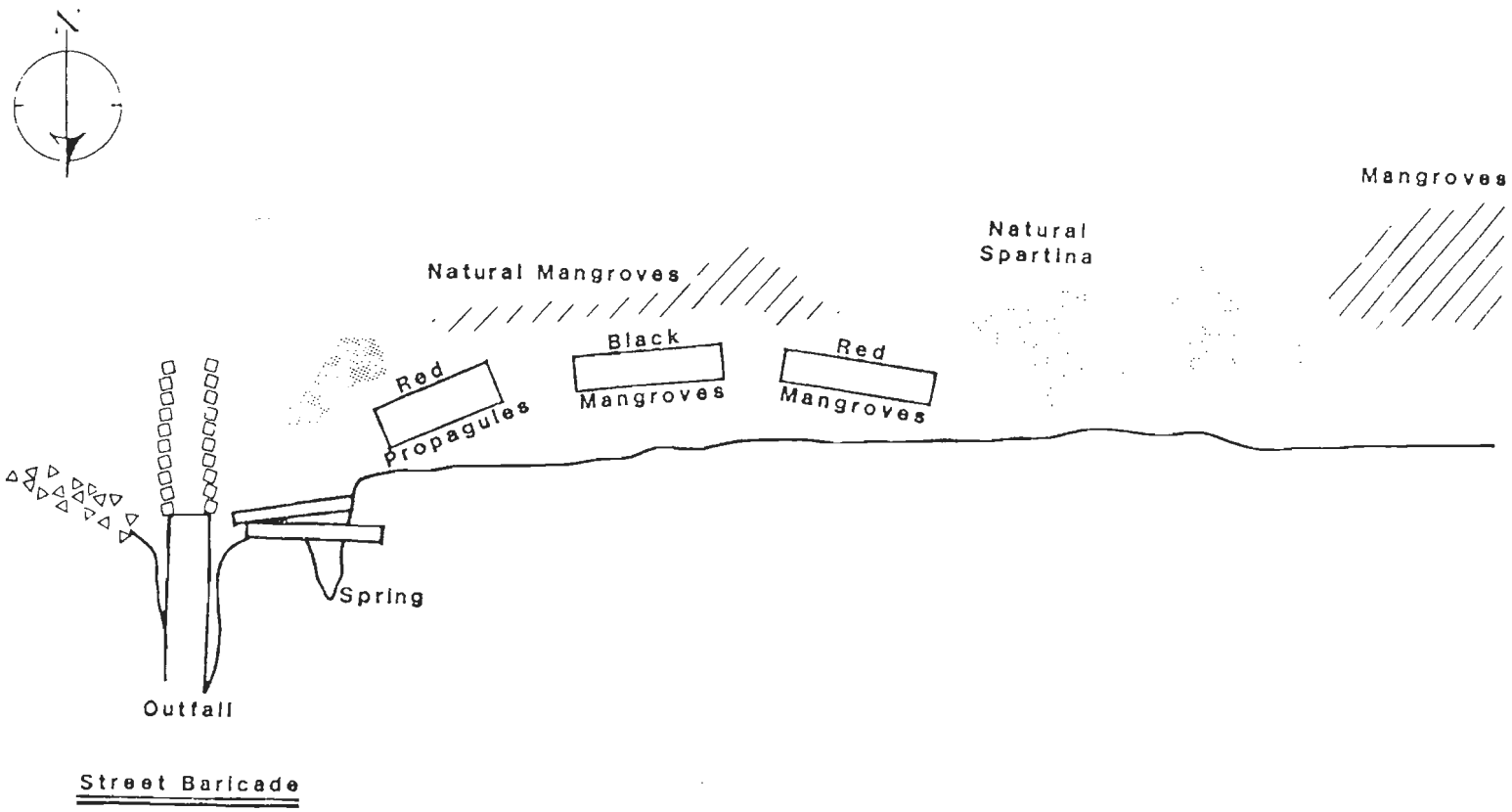


Figure 2. Location of mangrove planting plots at east end of Pinellas Point Park. Drawing modified from sketch provided by Mangrove Systems, Inc. (MSI) and is not to scale.

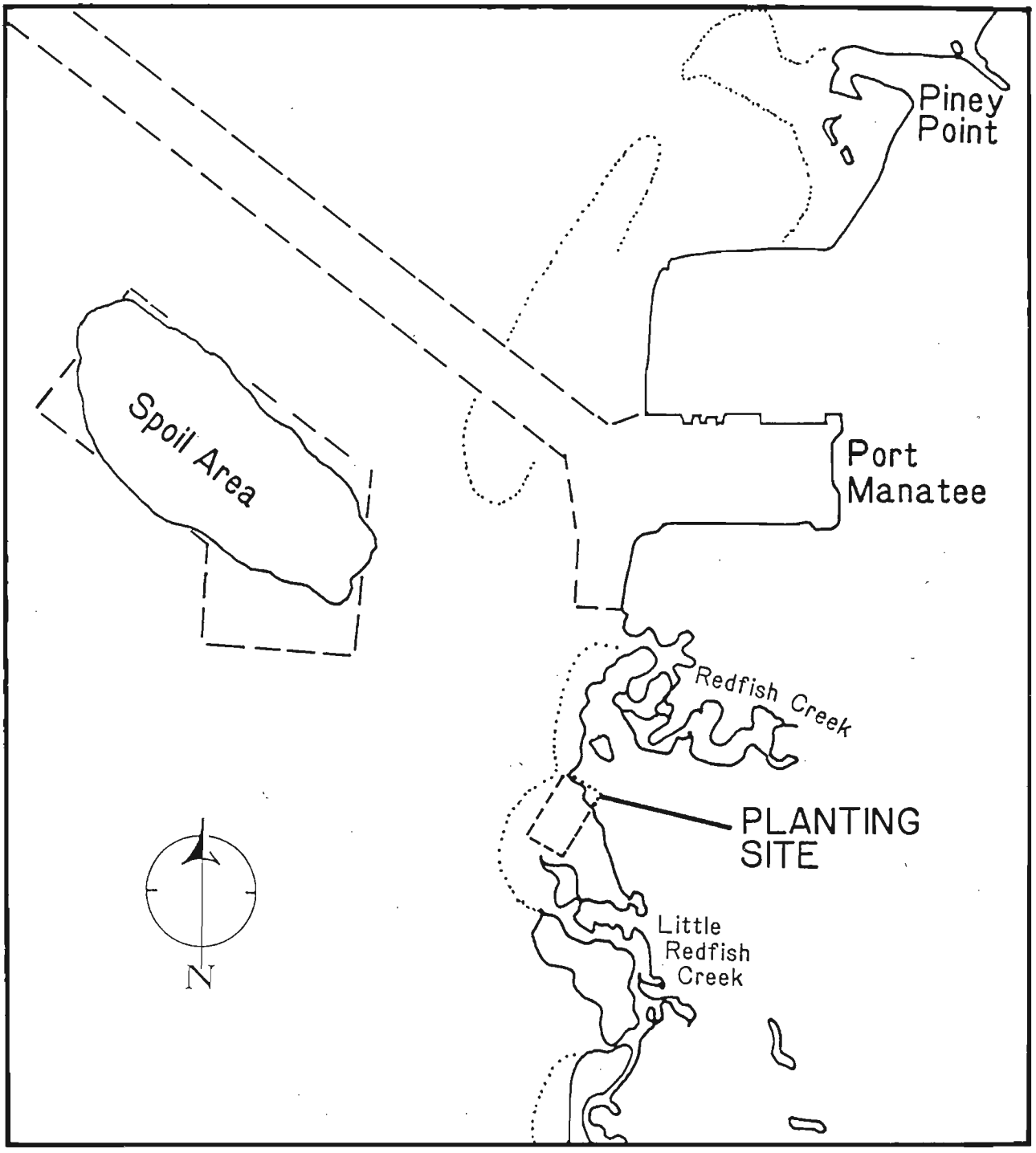


Figure 3. Location of the Hendry marsh planting site in Manatee County.

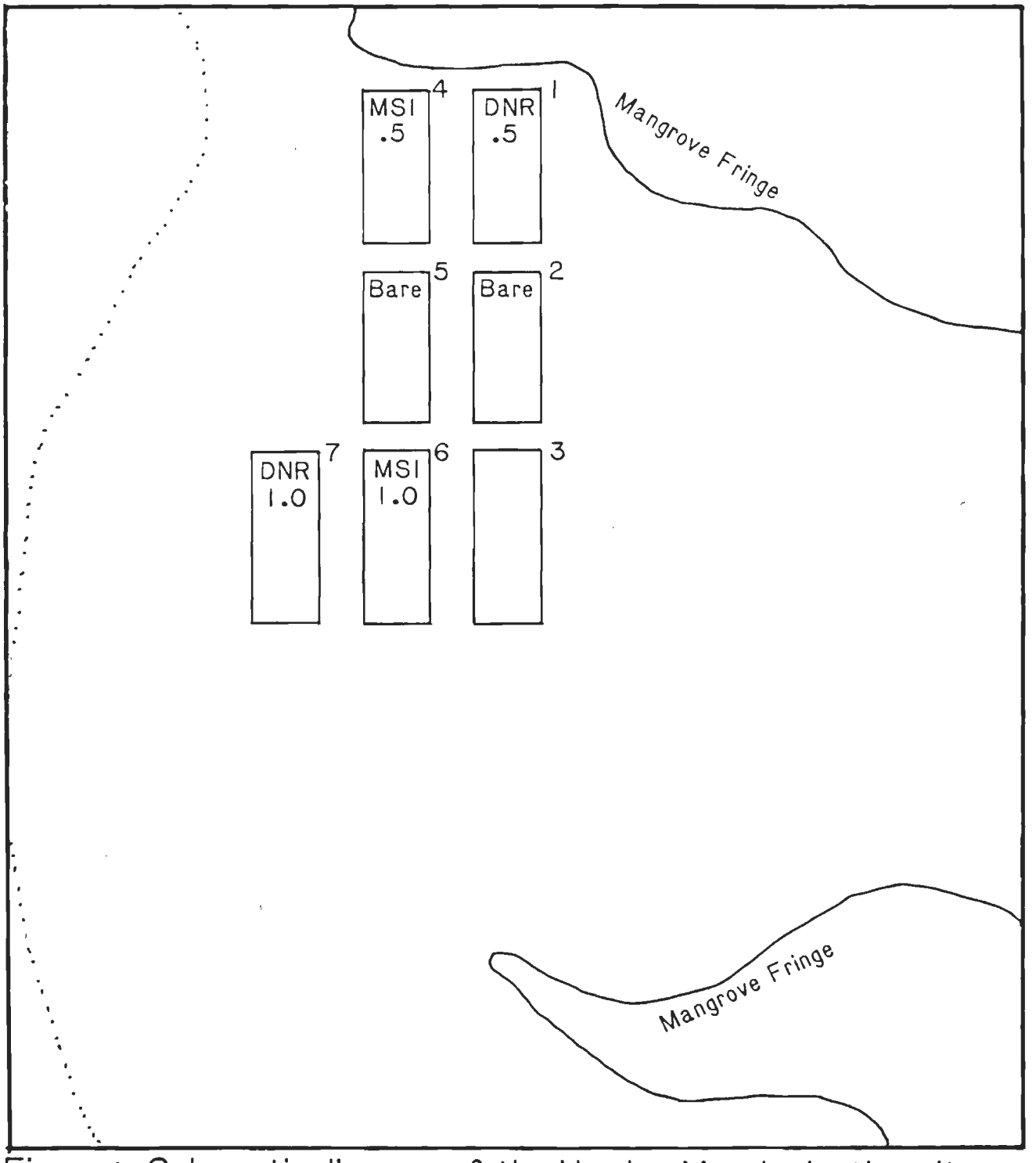


Figure 4. Schematic diagram of the Hendry Marsh planting sites.

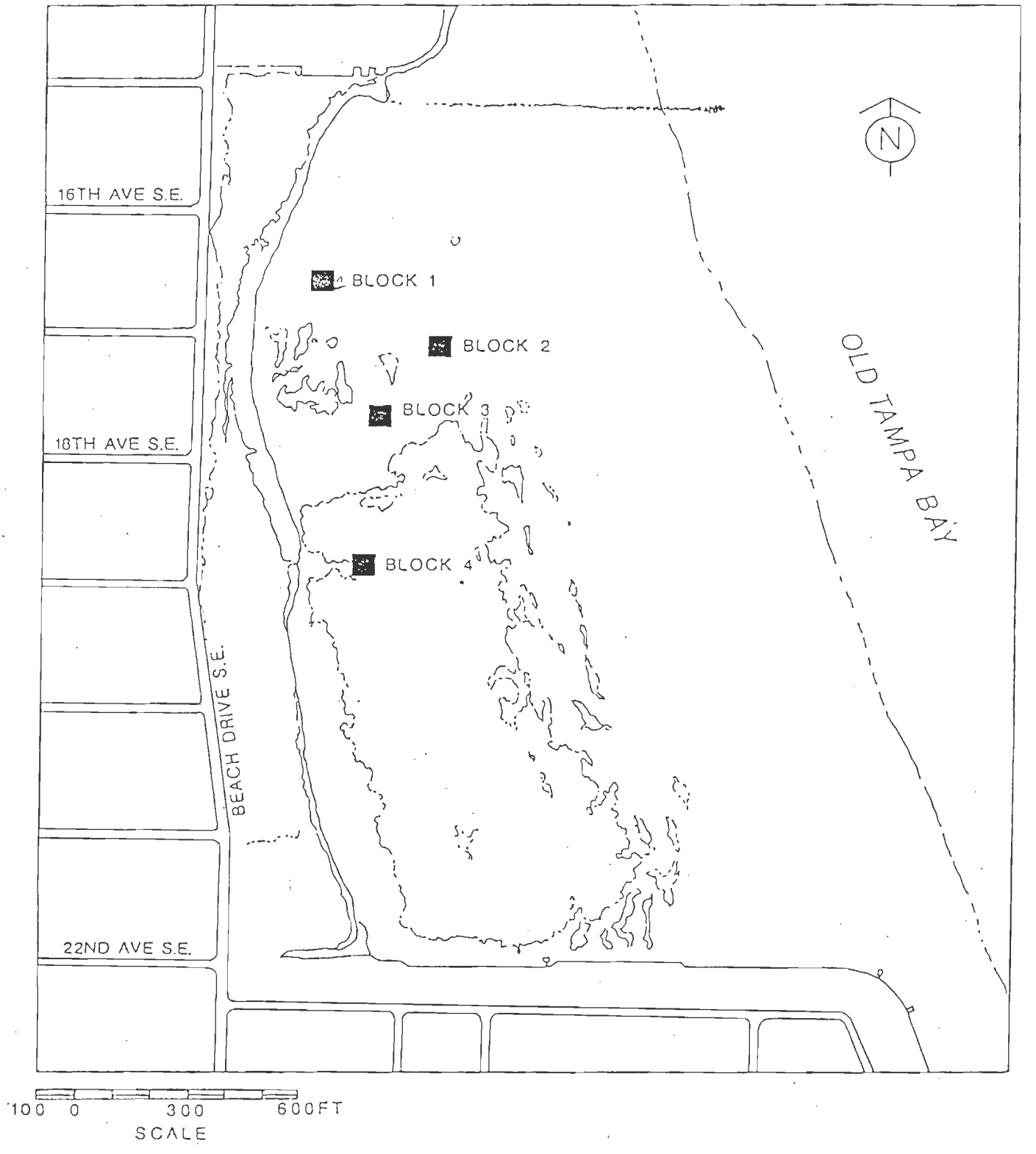


Figure 5. Locations of planting and control blocks at Lassing Park. Each block consists of four 10 m x 20 m plots.
(From Mangrove Systems, Inc.)

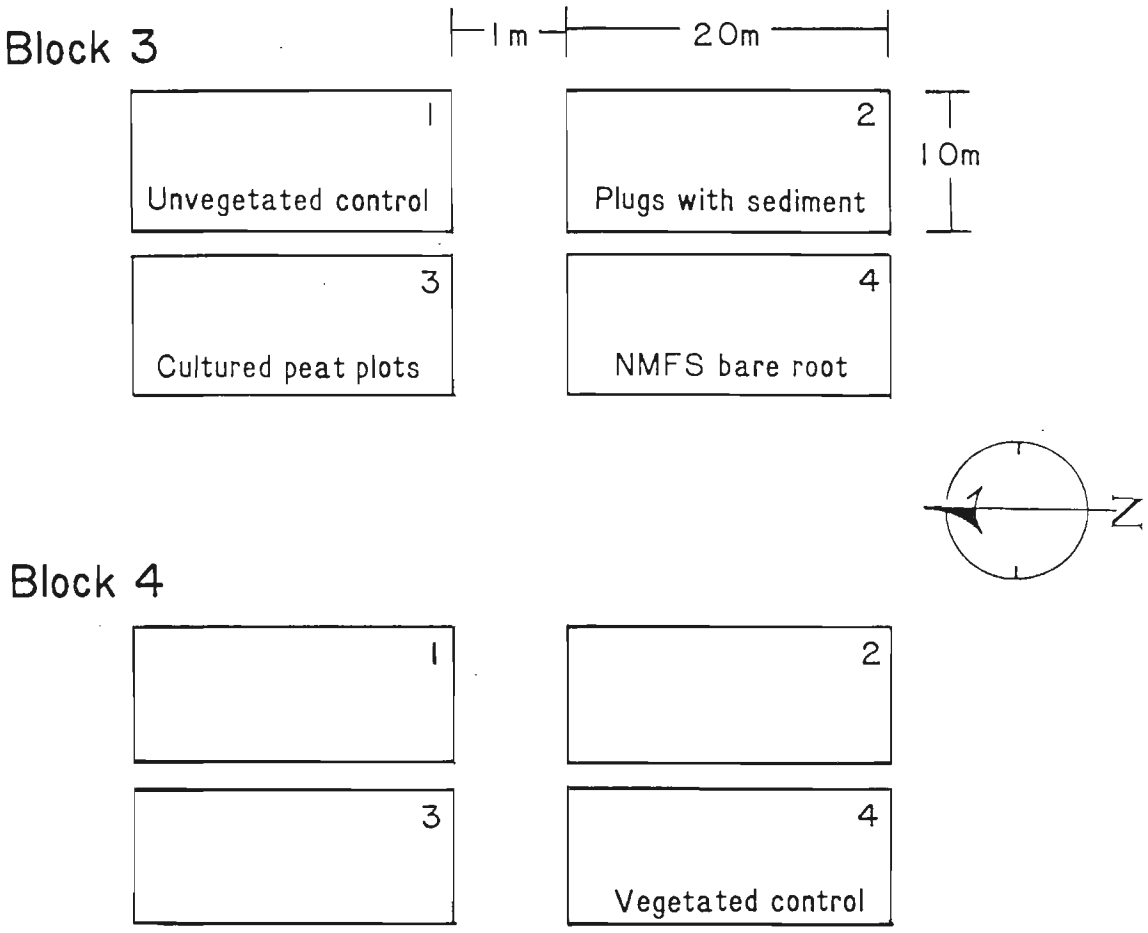


Figure 6. Location of experimental plots at the Lassing Park revegetation site.

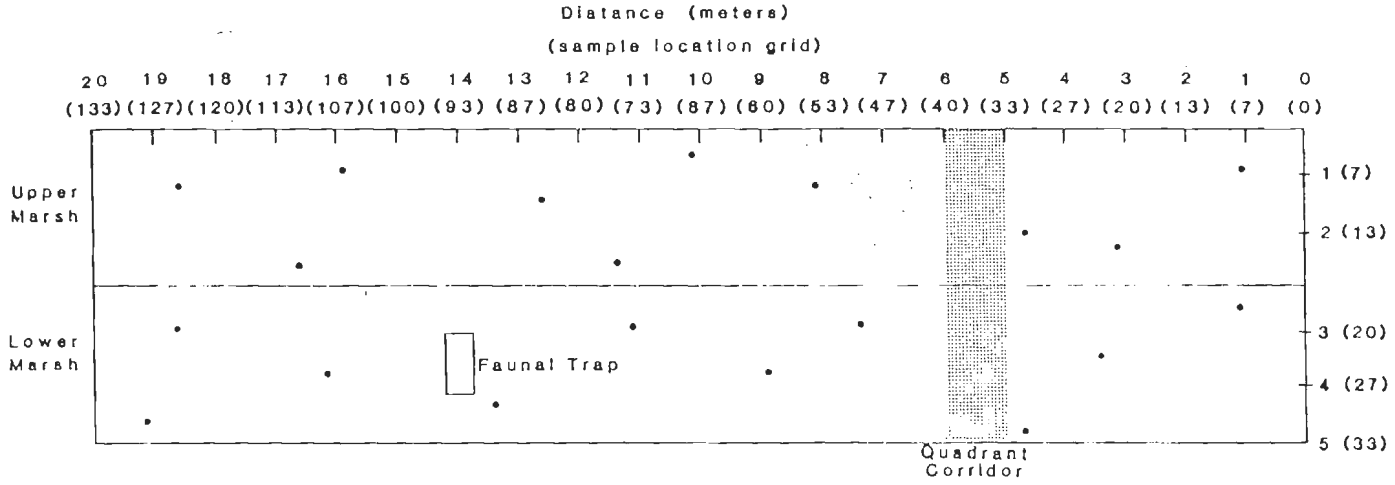


Figure 7. Diagramatic illustration of sampling grid used to locate sampling points. Numbers in parentheses are x (0-33) and y (0-133) sampling coordinates. Point 0,0 would be the left hand corner of a grid for an observer standing on shore facing the water.

Table 1. Summary of sediment chemistry and water quality sampling activity for the Pinellas Point, Lassing Park and Hendry restoration sites through Quarter IV (June 1987).

Site	Date	Activity
Pinellas Point	August 20, 21, 1986	Pre-planting sediment chemistry at 6 sites (bare, 0.5m site, 1.0 m site, vegetated control, black mangrove and red mangrove).
Pinellas Point	March 30, 1987	Pre-second planting sediment chemistry at 6 sites (same as above).
Lassing Park	June 8, 1987	Pre-planting sediment chemistry at 5 sites (bare, bare root planting quadrat, plug quadrat, peat pot quadrat and vegetated control).
Lassing Park	June 4, 1987	Water quality, intensive, low, semidiurnal pre-planting for three stations (bare site, planted area, and vegetated control).
Hendry Site	June 9, 23, 1987	Pre-planting for sediment chemistry for 7 quadrats.

Table 2. Water quality parameters for Lassing Park for a semidiurnal low tide, June 4, 1987.

TIME HHMM EST	SALINITY SURF o/oo	SALINITY BOT o/oo	TEMP SURF DEG C	TEMP BOT DEG C	PH SURF SU	PH BOT SU	DISS OXY SURF MG/L	DISS OXY BOT MG/L	% SAT D.O. SURF	% SAT D.O. BOT	OX-RED POTN SURF MV	OX-RED POT BOT MV	DEPTH M
** STATION BARE													
1214	25.10	25.10	29.59	29.62	8.39	8.38	9.2	9.4	139.6	142.3	118	115	0.76
1257	25.30	25.10	29.85	29.85	8.39	8.39	9.6	9.7	145.0	146.9	100	98	0.84
1337	25.00	25.00	30.23	30.24	8.45	8.44	10.5	10.6	159.8	162.5	88	87	0.70
1415	25.00	25.00	30.65	30.59	8.48	8.48	11.6	12.0	178.4	185.0	77	78	0.70
** STATION PLANTED													
1228	24.80	24.80	29.95	29.93	8.58	8.58	13.5	13.6	205.5	206.7	109	104	0.82
1310	25.00	25.20	30.01	29.48	8.60	8.49	13.9	13.1	212.3	198.5	95	65	0.79
1351	25.00	25.10	30.57	30.25	8.55	8.55	13.2	13.7	202.3	209.2	87	88	0.73
1427	25.00	25.00	30.81	30.71	8.59	8.55	14.6	14.1	226.0	217.6	79	77	0.82
** STATION VEGCONTROL													
1241	25.00	25.00	29.63	29.64	8.65	8.64	15.0	16.1	226.7	243.9	105	104	0.61
1324	24.90	25.00	29.97	29.99	8.68	8.68	15.7	15.9	238.7	241.4	86	85	0.85
1400	24.90	24.90	30.52	30.40	8.74	8.74	17.2	17.4	263.7	267.2	85	32	0.61
1438	24.80	24.90	30.75	30.80	8.73	8.77	17.4	17.4	267.4	269.0	77	61	0.58

TIME HHMM(EST)	TURBIDITY NTU	NH4-4 MG/L	NH3-N MG/L	NO2+3-N MG/L	PO4-P DISS MG/L	EXT COEFF (M)-1	WIND DIR DEG M	WIND VEL MPH
** STATION BARE								
1214	1.3	0.006	0.001	0.009	0.351	0.76	145	5
1257	1.4	0.019	0.002	0.009	0.345	0.48	145	<5
1337	1.5	0.007	0.001	0.009	0.327	0.82	160	5
1415	1.3	0.010	0.001	0.009	0.325	0.59	205	5-10
** STATION PLANTED								
1228	1.2	0.020	0.003	0.009	0.334	0.64	145	5
1310	1.2	0.015	0.002	0.008	0.342	0.69	160	5
1351	1.4	0.015	0.002	0.008	0.335	0.61	205	5
1427	1.2	0.016	0.003	0.010	0.334	0.61	205	5-10
** STATION VEGCONTROL								
1241	1.5	0.020	0.004	0.009	0.335	0.59	145	<5
1324	1.3	0.017	0.003	0.010	0.331	0.48	160	5
1400	1.2	0.011	0.003	0.008	0.333	0.53	205	5
1438	1.5	0.006	0.001	0.010	0.317	0.83	205	5

Table 3. Sediment profile core description for Lassing Park seagrass revegetation sites for June, pre-planting baseline.

Station	Core Penetration (cm)	Sediment Length (cm)	Compression (cm)	Core Description
Bare Control	50	23	27	0-8 cm medium grey in color with dark grey mottling.
Vegetated Control	50	35	15	0-2 cm seagrasses and rhizomes. 2-21 cm medium brown sand, 21-35 medium grey sand with some dark mottlings and shell hash.
Bare Root	50	27	23	0-9 cm light to medium grey sand; 9-22 cm light grey sand with some shell hash; 22-27 cm dense shell hash.
Plugs	50	28	22	0-8 cm medium sand, light grey mottled with dark grey; 8-25 cm light grey with slight shell hash; 25-28 dense shell hash.
Peat Pots	50	34	17	0-26 cm medium sand, light grey with dark clay lumps; 26-34 cm light grey sand.

Table 4. Sediment profile core description for the Hendry marsh revegetation site, for June 1987 pre-planting baseline.

Station	Core Penetration (cm)	Sediment Length (cm)	Compression (cm)	Core Description
Upper Bare Site 2	50	49	1	Fine sandy sediment distinct brown color to 19 cm. 19-31 cm transitional to a grey clay layer. No evidence of a redox layer. Upper sand layer very compacted, hard, underlying clay very fluid.
Lower Bare Site 5	50	46	4	0-22 cm compacted medium grey sand with brown (rusty) mottling, 22-46 cm medium grey sand with light grey clay bands and mottlings black mark, possible redox indication at 7 cm.
Upper 0.5 m Planted, Site 1	50	48	2	0-26 medium brown/grey compacted sand, no indication of a redox layer. 26-48 cm light grey fluid clay mixed with some sand.
Lower 0.5 m Planted, Site 4	56	55	1	0-24 medium grey/brown sand with dark brown nottlings, 24-55 medium grey color with lighter grey clay bands and mottlings; grey clay band at about 33-35 cm.
Lower 1.0 m Site 7	50	48	2	0-27 cm uniform grey color sand w/ black particulates; notably more clay 27-48 cm; brown rust like mottles throughout core.
Upper 1.0 m Site 6	50	48	2	0-30 cm compacted medium grey/brown sand with a darker band about 21-24 cm; 30-33 cm dark grey sand; 33-48 cm grey clay layer.
Unplanted/Site 3	50	46	4	0-27 brown/grey compacted sand with reddish brown (rusty) areas about 11-12 cm, and black band at 16 cm. 27-46 grey clay/sand mixture.

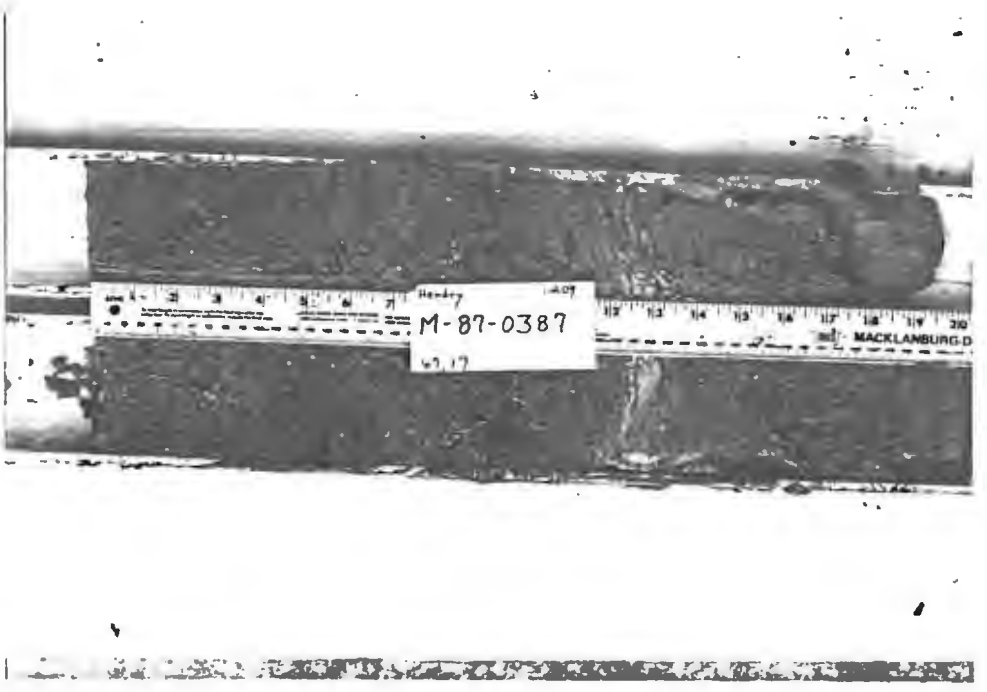


Figure 8. Hendry. Upper bare Site (2) sectioned core A and close up of clay band B at 32-33 cm.

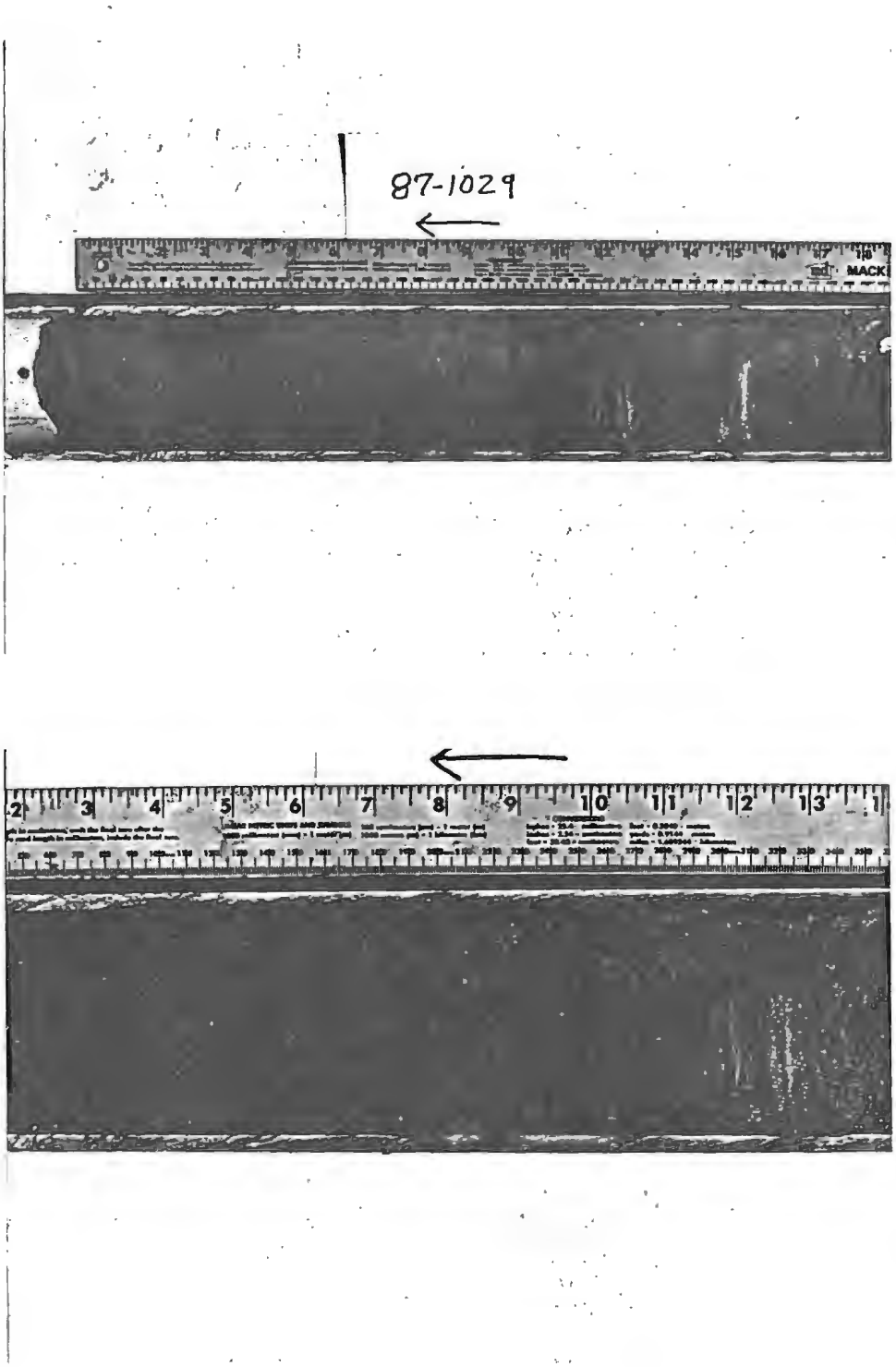


Figure 9. Hendry. Lower bare Site (5). Top photo A illustrates sectioned core, lower photo B is a close up of core.

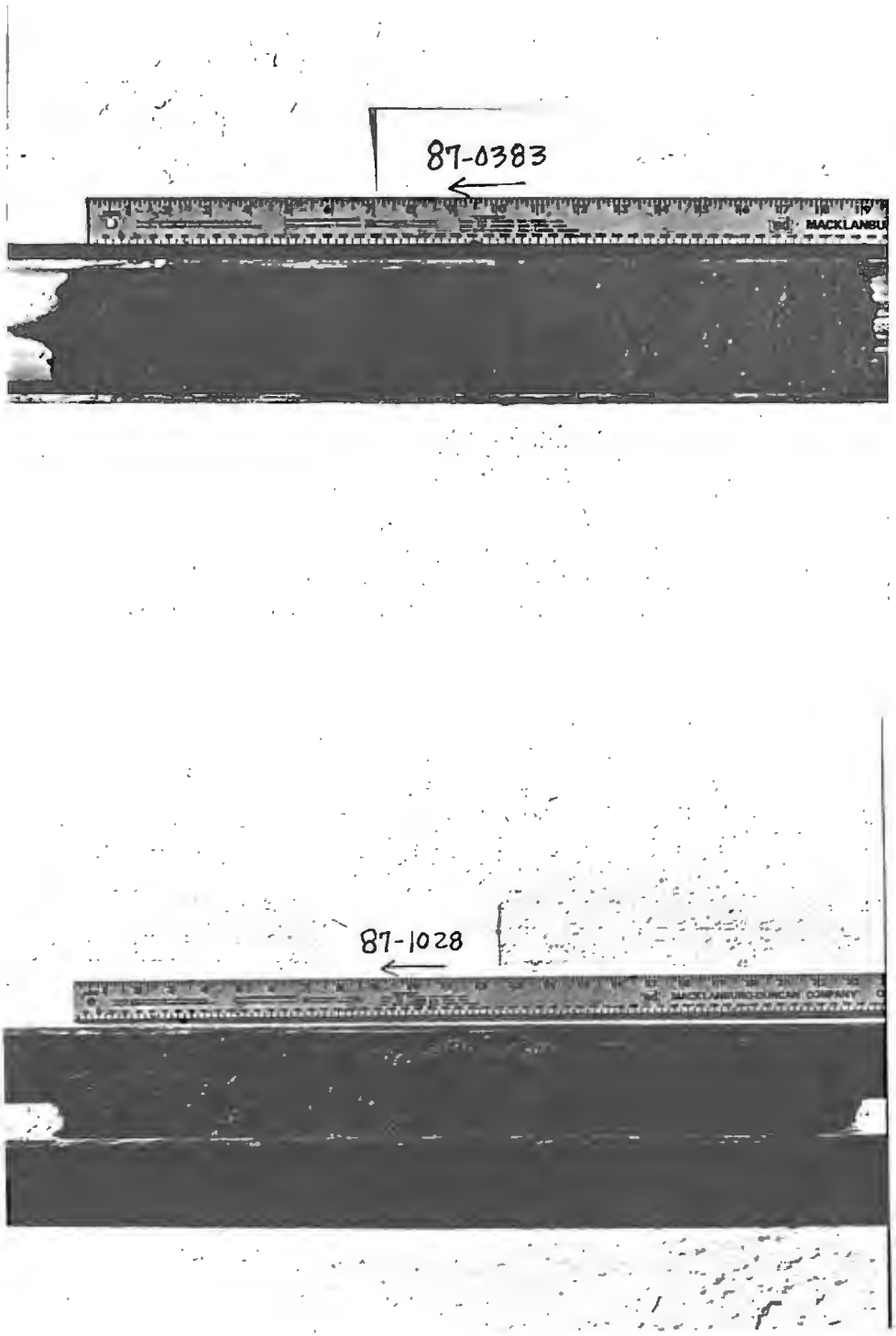


Figure 10. Hendry. Photo A, upper 0.5 m Site (1) planting plot sectioned core. Photo B, lower 0.5m Site (4) planting plot, sectioned core.

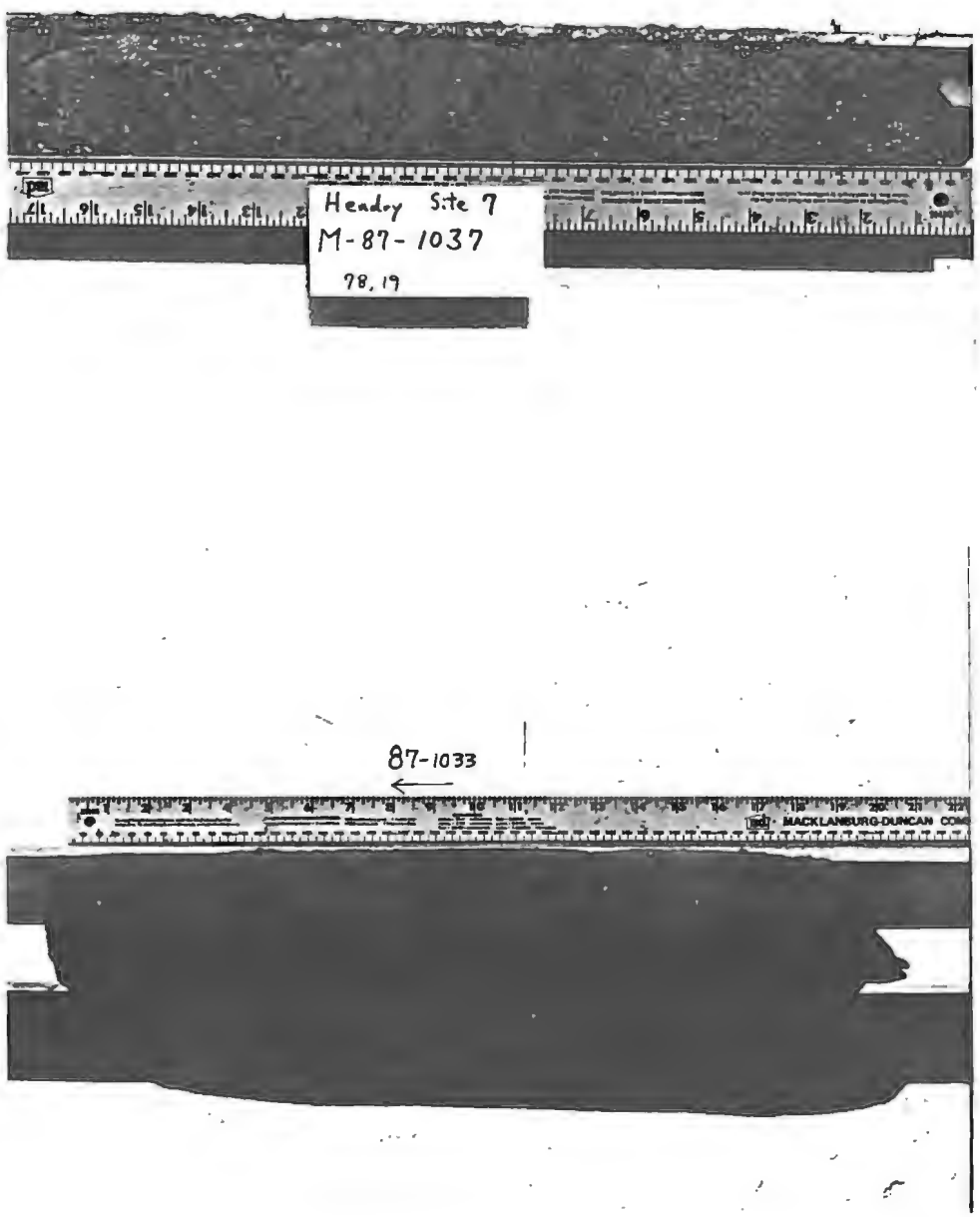
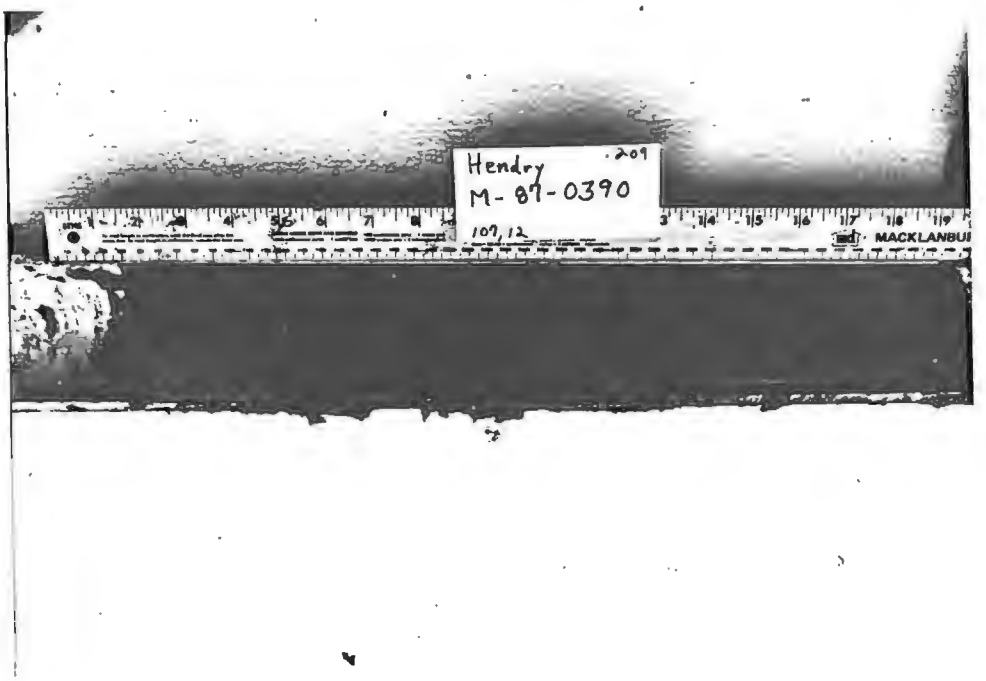


Figure 11. Hendry. Photo A, lower 1.0m Site (7) planting plot, sectioned core. Photo B, upper 1.0 m Site (6) planting plot, entire core.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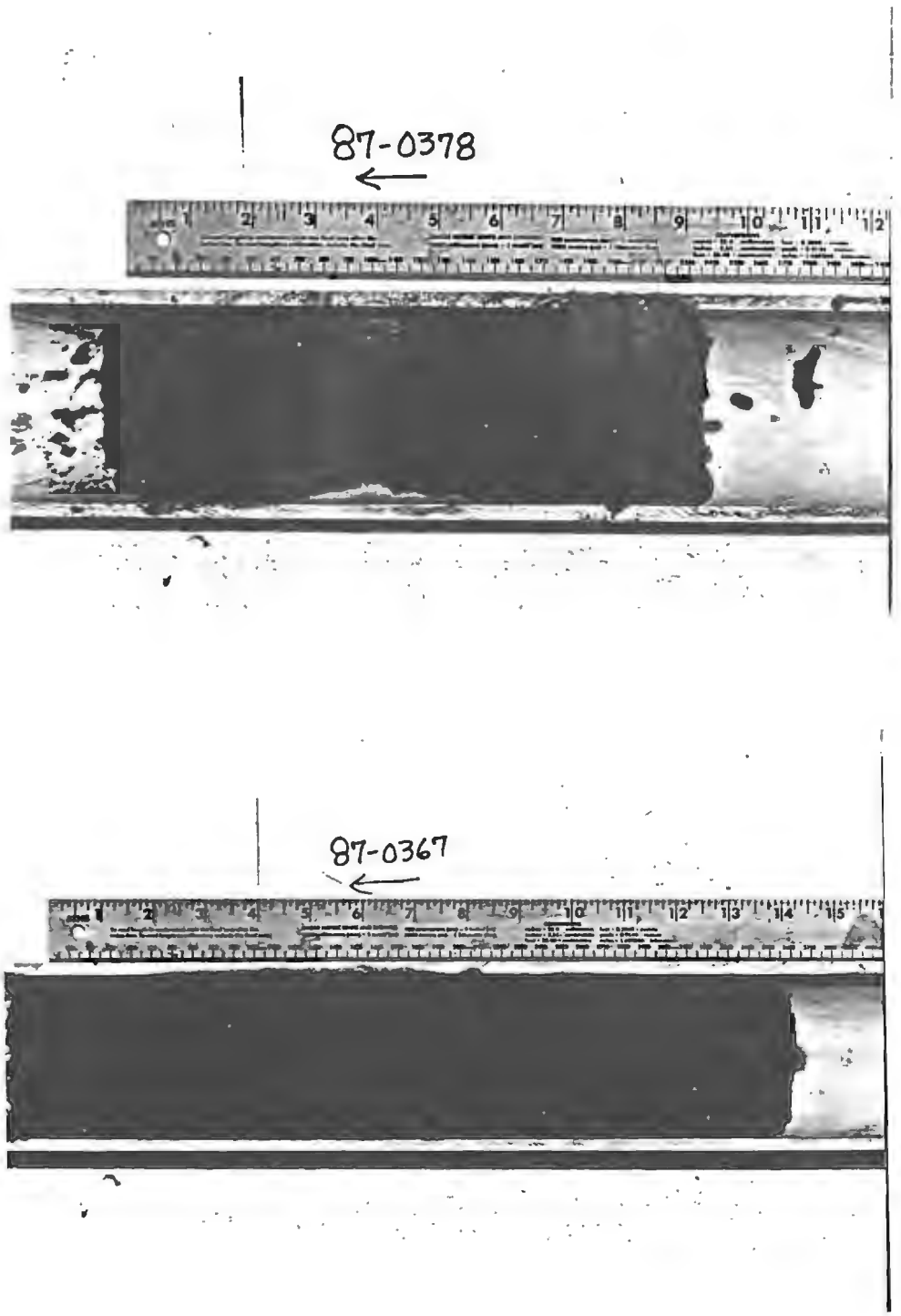

Figure 13. Lassing Park. Photo A bare control quadrat, sectioned core. Photo B, vegetated control, sectioned core.

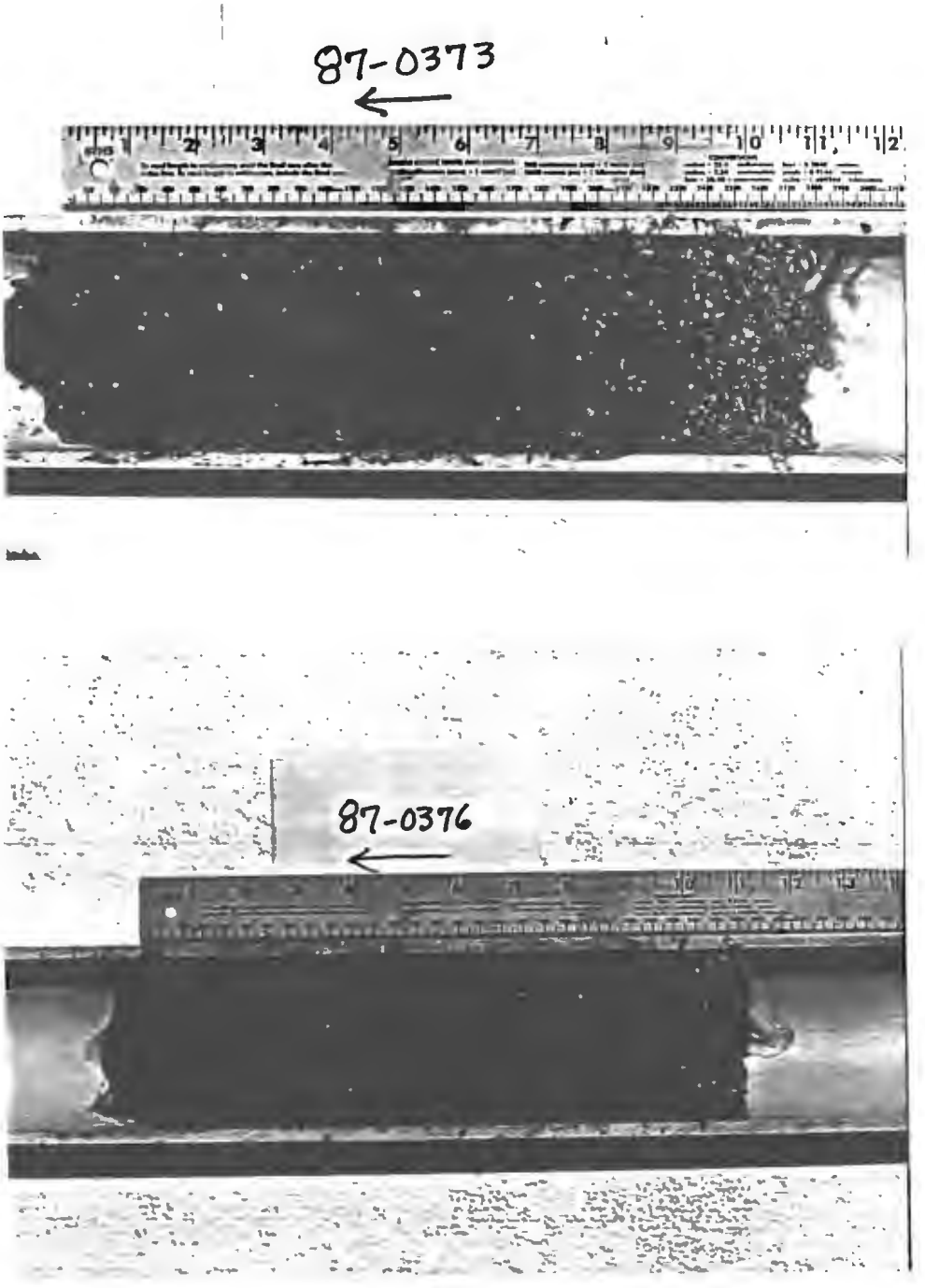

Figure 14. Lassing Park. Photo A bare root quadrat, sectioned core. Photo B, plug quadrat, sectioned core.

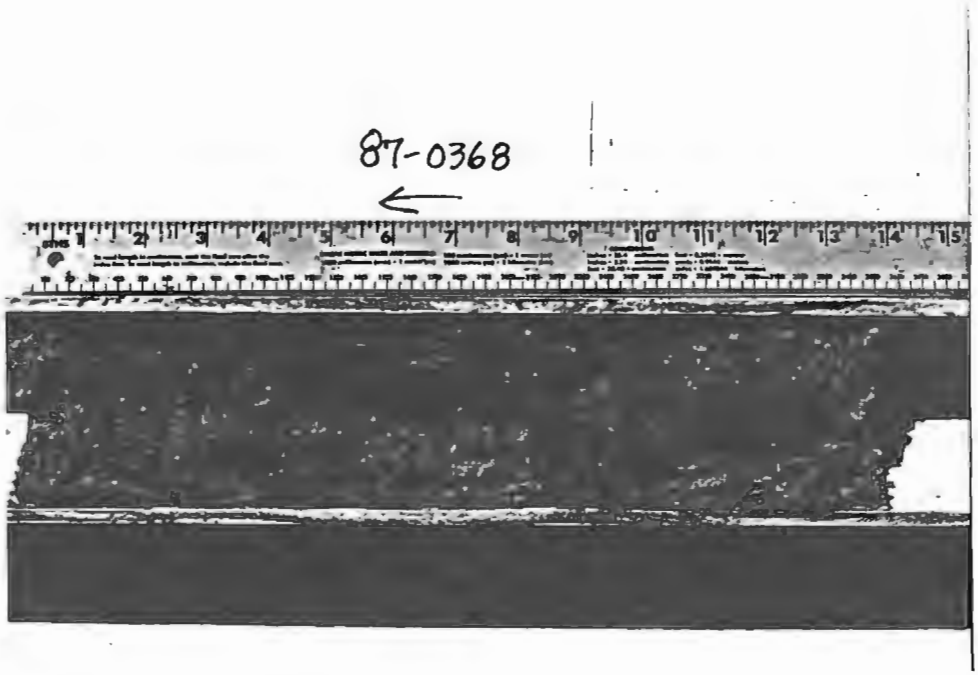

Figure 15. Lassing Park. Peat pot quadrat sectioned core.

each of the sites described in Tables 3 and 4. Locations of the quadrats from which each of the morphological cores were taken can be found in Figures 4 (Hendry) and 6 (Lassing Park). A synthesis of all data collected for Year I will be presented in the final Year I report.

I.2.3. Benthic Fauna

A. Macrofauna

A summary of the benthic macrofaunal sampling events through Quarter IV is presented in Table 5. In addition to the Pinellas Point collections, benthic collections for Lassing Park and the Hendry site were begun in Quarter IV. Identification of the fauna collected by the epibenthic traps has been completed for the August through January samplings. The results were presented in the Quarter III report. Initial processing of benthic macrofaunal samples was delayed due to the failure of the first planting at Pinellas Point. Processing of samples from all sites has subsequently been initiated.

B. Meiofauna

A summary of meiofaunal core collections conducted by Dr. Susan Bell is presented in Table 6. For Pinellas Point, eight replicate core samples were obtained from the vegetated control, bare and 0.5 m planted site. The May 4, 1987 date represented samples from the newly planted site. All samples were collected when sampling areas were exposed. All samples from the April and May 1987 collection dates have been processed and enumerated and are summarized in Table 7. Lassing Park pre-planting samples were collected on June 5. Eight cores were taken at the bare quadrat plugs quadrat, peat pot quadrat, and the vegetated control. Core samples were obtained at three quadrats of the Hendry Site, bare site (2), bare site (5), and the 0.5 m planting site (4).

Data summaries for the Lassing Park and Hendry Site meiofaunal collections are exhibited in Tables 7, 8, and 9. Data for all of Year I meiofaunal collections will be presented in the Year I report.

Table 5. Summary of benthic macrofaunal sampling activities through Quarter IV (July 1987) at the Pinellas Point Restoration Site.

Sampling Date	Sample Location	Number of Samples: Quadrat[1] Counts	Traps	Cores
August 21	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
September 3	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
September 26	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
November 25	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted	*	*	*
January 21	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
March 31	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted (baseline)			
	Upper	--	--	12
	Lower	5	1	12

Table 5. Continued.

Sampling Date	Sample Location	Number of Samples: Quadrat[1] Counts	Traps	Cores
April 13	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
May 6	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
July 7	Bare Control	5	1	12
	Spartina Control:			
	Upper	--	--	12
	Lower	5	1	12
	Spartina Planted:			
	Upper	--	--	12
	Lower	5	1	12
TOTAL:		125	25	492

[1]Counts conducted in transect across both upper and lower.
*Sampling discontinued due to planting failure.

Table 6. Summary of benthic meiofaunal sampling activities through Quarter IV (July 1987) at the Pinellas Point Restoration Site.

Sampling Date	Sample Location	No. of Samples Collected
August 21	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
September 4	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
September 18	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
October 7	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
December 2	Bare Control	8
	Spartina Control	8
January 4	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
April 1	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
May 4	Bare Control	8
	Spartina Control	8
	Spartina Planted	8
TOTAL:		200

Table 7. Mean # of major taxa at three treatment sites at Pinellas Point on 1 April 1987 and 4 May 1987. (n = 8 samples)

1 April 1987

Taxa	Bare	Control Marsh	Planted
Nematodes	539.8	474.75	770.0
Copepods	14.0	15.8	9.3
Polychaetes (juveniles)	21.1	33.0	31.0
Ostracods	8.0	5.3	6.3
Total all fauna	645.0	524.1	835.2

4 May 1987

	Bare	Control Marsh	Planted
Nematodes	775.1	330.3	355.6
Copepods	24.5	55.1	74.
Polychaetes (juveniles)	12.5	18.2	14.7
Ostracods	11.7	7.1	8.1
Total all fauna	825.5	416.3	586.7

Table 8. Mean densities of dominant meiofaunal organisms in preplanting treatments at Lassing Park on 5 June 1987.

Treatment	Taxa			
	Nematodes	Copepods	Polychaetes	Amphipods
Bare Preplant (n=8)	606	194	4.4	0.8
Bare Plot #2 (n=7)	432.7	63.8	5.7	.57
Bare Plot #4 (n=8)	485.7	90	8.1	1.6
Natural Grass (n=7)	500	114.8	21.5	6.8

Table 9. Mean densities of dominant meiofaunal taxa in preplanting treatments at the Hendry Site on 18 June 1987.

Treatment	Taxa		
	Nematodes	Copepods	Polychaetes
Bare I (n=8)	421.1	3.5	0.3
Bare II (n=8)	499.2	4.3	0.3
0.5m I (n=8)	404.8	5.0	1.0
0.5m II (n=8)	490	5.5	6.0
1.0 I (n=8)	179	4.6	0.7

Table 10. Mean densities of dominant meiofaunal organisms in post-planting treatment at the Hendry siet on 6 July 1987.

Treatment	Nematodes	Copepods	Polychaetes
Bare I (n=8)	442.7	1.3	0
Bare II (n=8)	426.3	0.4	0
.5 m I (n=8)	454.3	1.5	2.0

I.2.4. Fisheries

For the Pinellas Point site ichthyofauna samples have been collected for August (pre-planting) and September 22 (one month post-planting), December 9-11 (three months post-planting), January 21, February 16, and March 16 and 24 (pre-planting baseline) May 13, 21, and July 21 and 23. For Lassing Park baseline fisheries collections were conducted on June 16; the baseline collection for the Hendry site was conducted on June 22. Collections for August, September, November, and December 1986 for Pinellas Point have been analyzed, and the data is summarized in Tables 11, 12, 13, and 14. The fisheries task has encountered problems at the Pinellas Point site due to inadequate innundation of the site by bay waters during predicted high tides. This has resulted in the rescheduling of the fisheries task on several occasions. Analysis of the tide gage data has begun and may enable more accurate predictions of tide stages for future samplings.

I.2.5. Tide Gage

Two Leopold Stevens ADR tide gages have been installed and are being maintained for this study. One gage was installed August 26, 1986 on a privately owned dock at Pinellas Point. The second gage was installed June 29-30, 1987 at Port Manatee. The gages are routinely inspected and maintained by MML. An arrangement is being prepared with Port Manatee staff to assist in a daily maintenance program for the gage recently installed there. Tide gage punch tape data are entered into a computer data bank after monthly collection.

The Pinellas Point gage was surveyed by surveyors from Dohm Company, Inc., St. Petersburg, on February 11, 1987. Arrangements are being made to survey the tide gage at Port Manatee during the month of July.

The tide gage at Pinellas Point is scheduled for removal in October 1987 after approval by DNR staff. Analysis of the tide data is presented as Appendix Figure 1 and Appendix Table 1. Figure 16 presents the mean weekly tide height at Pinellas Point from September 1986 through August 1987.

Table 11. Fisheries data for Pinellas Point experimental plots for August, 1986 (pre-planting) including number of individuals, mean standard length (mm), size range (mm), total biomass (g), and number of individuals weighed in parentheses.

Species		STATION Bare Control	Veg. Control	1.0 m Planted	Red Mangrove
Strongylura marina					
	No.	1	--	--	--
	Mean SL	58.0			
	Size Range	58.0			
	Total Biomass	0.4			
Cyprinodon variegatus					
	No.	1400	147	1056	713
	Mean SL	28.8	34.9	35.6	367
	Size Range	11.0-46.0	14.0-48.0	13.0-47.0	30.0-42.0
	Total Biomass	240.9(200)	244.7(147)	165.3(83)	230.0(92)
Floridichthys carpio					
	No.	--	--	1	--
	Mean SL			38.0	
	Size Range			38.0-38.0	
	Total Biomass			1.4	
Fundulus grandis					
	No.	--	5	--	--
	Mean SL		64.0		
	Size Range		53.0-79.0		
	Total Biomass		29.4(5)		
Fundulus similis					
	No.	441	9	495	149
	Mean SL	29.2	31.8	44.2	44.0
	Size Range	15.0-54.0	14.0-60.0	33.0-59.0	39.0-50.0
	Total Biomass	29.2(63)	9.2(9)	62.0(42)	32.3(21)
Poecilia latipinna					
	No.	--	55	2	--
	Mean SL		17.5	42.5	
	Size Range		7.0-36.0	42.0-43.0	
	Total Biomass		9.3(55)	8.2(2)	
Trachinotus falcatus					
	No.	--	--	--	1
	Mean SL				23.0
	Size Range				23.0-23.0
	Total Biomass				0.9

Table 11. Continued.

Species		STATION Bare Control	Veg. Control	1.0 m Planted	Red Mangrove
Eucinostomus sp.					
	No.	--	--	12	--
	Mean SL			31.3	
	Size Range			23.0-39.0	
	Total Biomass			8.2(12)	
Mugil cephalus					
	No.	5	--	--	--
	Mean SL	15.6			
	Size Range	13.0-21.0			
	Total Biomass	0.5(5)			

Table 12 Fisheries data for Pinellas Point experimental plots for September 1986* including number of individuals, mean standard length (mm), size range (mm), total biomass (g), and number of individuals measured in parentheses.

Species		STATION Bare Control	0.5 m Planted	Red Mangrove
Cyprinodon variegatus				
	No.	364	94	24
	Mean SL	40.0	36.4	44.1
	Size Range	36.0-47.0	22.0-47.0	39.0-50.0
	Total Biomass	100.7(30)	43.8(19)	98.3(24)
Floridichthys carpio				
	No.	1	3	10
	Mean SL	47.0	42.3	42.1
	Size Range	47.0	38.0-46.0	36.0-49.0
	Total Biomass	4.4(1)	7.4(3)	29.9(10)
Fundulus grandis				
	No.	--	1	--
	Mean SL		71.0	
	Size Range		71.0	
	Total Biomass		7.0(1)	
Fundulus similis				
	No.	7	574	12
	Mean SL	49.0	44.6	74.7
	Size Range	38.0-60.0	14.0-64.0	59.0-110.0
	Total Biomass	5.3(2)	81.3(49)	94.1(12)
Eucinostomus sp.				
	No.	4**	3	1
	Mean SL	--	33.3	53.0
	Size Range	--	29.0-36.0	53.0-53.0
	Total Biomass	--	2.5(3)	3.4(1)

*Sample lost.
**Not preserved.

Table 13. Fisheries data for Pinellas Point experimental plots for November 1986* including number of individuals, mean standard length (mm), size range (mm), total biomass (g), and number of individuals weighed in parentheses.

Species		STATION Bare Control	Veg. Planted
Cyprinodon variegatus			
	No.	1090	45
	Mean SL	21.7	35.5
	Size Range	9.0-50.0	20.0-48.0
	Total Biomass	90.6(218)	6.2(9)
Fundulus similis			
	No.	400	110
	Mean SL	21.4	56.2
	Size Range	11.0-32.0	43.0-83.0
	Total Biomass	14.9(80)	68.9(22)
Menidia sp.	No.	125	45
	Mean SL	25.7	26.2
	Size Range	19.0-31.0	24.0-29.0
	Total Biomass	5.8(25)	2.1(9)
Eucinostomas sp.	No.	80	65
	Mean SL	17.9	26.4
	Size Range	14.0-24.0	16.0-36.0
	Total Biomass	2.0(16)	5.5(13)
Mugil cephalus	No.	4160	10
	Mean SL	18.8	28.0
	Size Range	15.0-24.0	17.0-39.0
	Total Biomass	160.9(832)	1.5(2)

*Red mangrove and planted plots not sampled.

Table 14. Fisheries data for Pinellas Point experimental plots for December 1986 including number of individuals, mean standard length (mm), size range (mm), total biomass (g), and number of individuals weighed in parentheses.

Species		STATION Bare Control	Veg. Control	Red Mangrove
Cyprinodon variegatus				
	No.	1	83	51
	Mean SL	8.0	24.0	42.4
	Size Range	8.0	14.0-44.0	27.0-50.0
	Total Biomass	0.1(1)	38.7(83)	165.1(51)
Floridichthys carpio				
	No.			8
	Mean SL	--	--	45.6
	Size Range			43.0-51.0
	Total Biomass			24.5(8)
Fundulus grandis				
	No.	--	2	--
	Mean SL		114.0	
	Size Range		92.0-136.0	
	Total Biomass		62.2(2)	
Fundulus similis				
	No.	--	508	2.3
	Mean SL		31.9	64.8
	Size Range		18.0-69.0	50.0-78.0
	Total Biomass		194.1(508)	114.6(23)
Lucania parva				
	No.	--	1	--
	Mean SL		19.0	
	Size Range		19.0-19.0	
	Total Biomass		0.1(1)	
Menidia sp.				
	No.	11	--	--
	Mean SL	15.4		
	Size Range	8.0-26.0		
	Total Biomass	0.7(11)		
Poecilia latipinna				
	No.	--	3	--
	Mean SL		43.0	
	Size Range		42.0-44.0	
	Total Biomass		5.8(3)	

Table 14. Continued.

Species		STATION Bare Control	Veg. Control	Red Mangrove
Eucinostomus sp.				
	No.	6	14	--
	Mean SL	18.7	19.0	
	Size Range	13.0-24.0	16.0-22.0	
	Total Biomass	1.0(6)	2.2(14)	
Sciaenops ocellatus				
	No.	1	1	--
	Mean SL	25.0	26.0	
	Size Range	25.0-25.0	26.0-26.0	
	Total Biomass	0.3(1)	0.3(1)	
Leiostomus xanthurus				
	No.	1	--	--
	Mean SL	12.0		
	Size Range	12.0-12.0		
	Total Biomass	0.1(1)		
Mugil sp.				
	No.	16	1526	--
	Mean SL	16.8	17.3	
	Size Range	14.0-20.0	13.0-27.0	
	Total Biomass	2.6(16)	192.8(1526)	

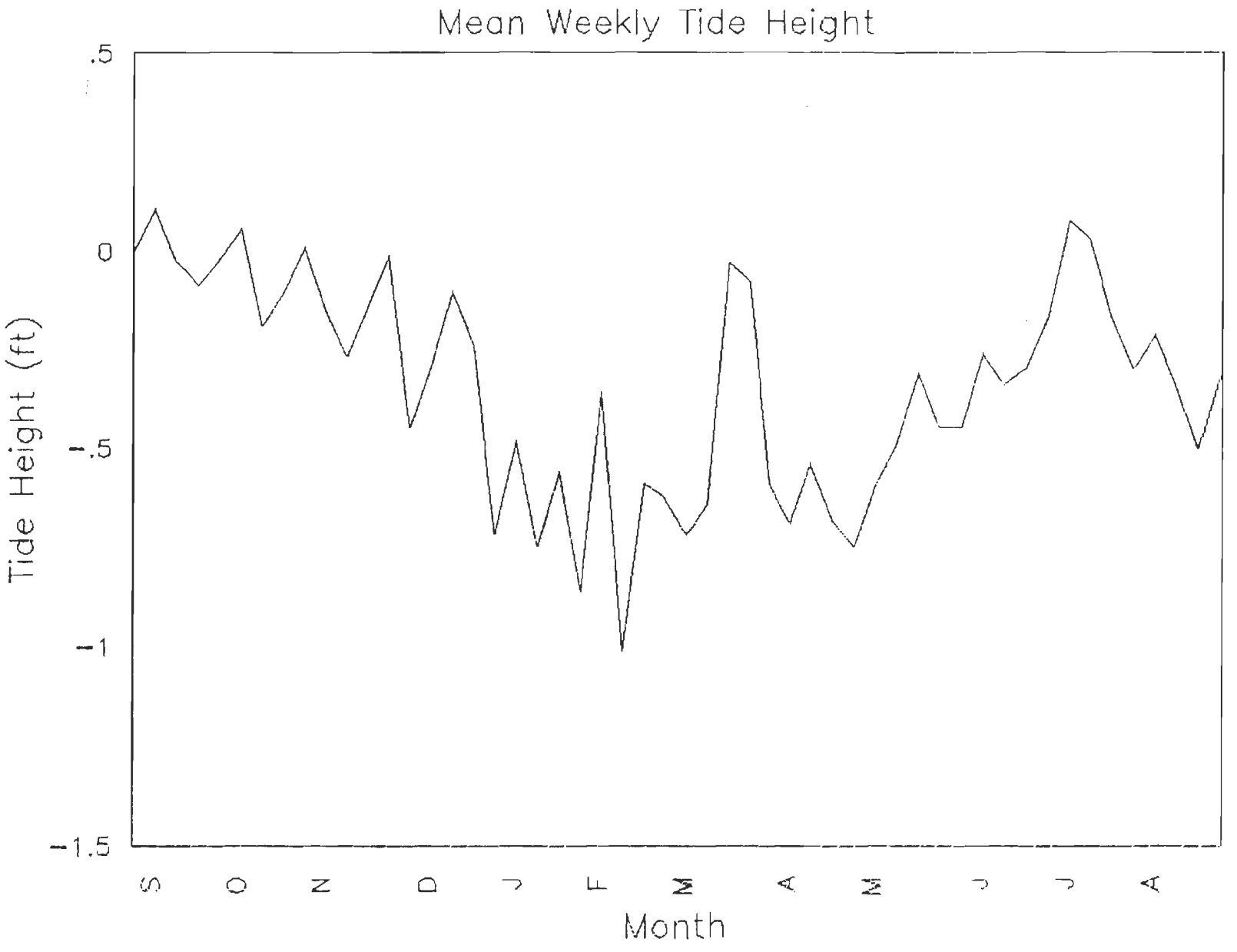

Figure 16. Mean weekly tide height at Pinellas Point, St. Petersburg from September 1986 through August 1987. Tide height represented as NGVD.

Appendix Figure 1 consists of 52 weeks of tide plots based on the gage data and corrected to NGVD. Also plotted are the high and low predicted tides from the NOAA tide tables, with the points connected by straight lines. Each weekly plot was generated from 1,680 data points. Appendix Table 1 presents the percentage of time that relative elevations at Pinellas Point would be submerged based upon 0.2 ft increments relative to NGVD.

PART II

PLANTING AND PLANT MONITORING TASK

FOURTH QUARTER SUMMARY
PLANT MONITORING TASK

FLA. DEPT. OF NATURAL RESOURCES
MARINE HABITAT RESTORATION PROGRAM
DNR 240-85/86

prepared for
FLA. DEPT. OF NATURAL RESOURCES
Bureau of Marine Research
100 8th Ave. SE
St. Petersburg, FL 33701

by
MANGROVE SYSTEMS, INC.
Post Office Box 290197
Tampa, FL 33687

a subcontractor to
MOTE MARINE LABORATORY
1600 City Island Park
Sarasota, FL 33577

September 1987

INTRODUCTION

This report summarizes the results of the May and June 1987 monitoring activities at Pinellas Point (Pinellas County) and Regatta Point (Manatee County). Data from the Hendry site (the second Manatee County Spartina planting site) are also reported here.

MATERIALS AND METHODS

Monitoring methods remained unchanged from the scope noted in the third monitoring report. The Spartina plots at Pinellas Point were replanted with 500 units of plant material on April 3, 1987. Material was harvested with post-hole diggers (to produce plugs of Spartina with attached sediment) from the U.S. 41 site described in the first quarterly monitoring report (per contract requirements), and monitoring of the Pinellas Point Spartina plots was initiated again. The positions of the 0.5 m planting and unvegetated control plots were moved slightly seaward prior to planting to subject all plots to a similar tidal regime. These two plots were surveyed on April 2, 1987 and were found to be at appropriate elevations for planting. At Pinellas Point, vegetation monitoring was also initiated in the vegetated Spartina cotnrol site. Monitoring consisted of shoot counts and estimates of percent cover in ten randomly placed 0.25 m^2 quadrats.

Additional Spartina (164 bare root units) was planted at Regatta Point on May 6, 1987. These units will be monitored for planting unit survival only, by counting the total number of units present at each monitoring inspection.

During this quarter, a second Spartina site in Manatee County was selected. This is a spoil delta, called the Hendry site, south of Port Manatee

(Figure 1). Three 5 m x 20 m plots were established on this site (two planted, one unvegetated control). The vegetated control plot at Pinellas Point will service as the Spartina control for this Manatee County site as well as for Pinellas Point. The site was planted with 500 units of Spartina alterniflora on June 25, 1987. Planting material for this site came from Spartina areas scheduled for destruction by fill on the east half of the Courtney Campbell Causeway. Material was harvested with post-hole diggers and shovels to yield plugs of grass with attached sediment, but due to the sandy nature of the sediment most of it was lost during transport to the planting site, so that essentially bare root units were planted. Two plots of marsh grass were planted, one on 0.5 m centers and the other on 1.0 m centers, per contract requirements. The planting and control areas were surveyed prior to planting.

Finally, the seagrass plots at Lassing Park were established and surveyed. Three blocks of four 10 m x 20 m plots each were established on the filled area (Fig. 2). Three of the four plots will be planted within each block, with the fourth plot serving as an unvegetated control. A fourth block of four 10 m x 20 m plots was established in the adjacent seagrass-vegetated area to serve as a vegetated control site. Seagrass planting was initiated on June 30th, so the time zero seagrass monitoring data will be included in the next quarterly monitoring report.

RESULTS AND DISCUSSION

Regatta Point monitoring data are shown in Table 1. Figure 3 illustrates the site following the supplemental planting and at the May monitoring. Survival of initially planted (1986) Spartina has stabilized, with no further loss of

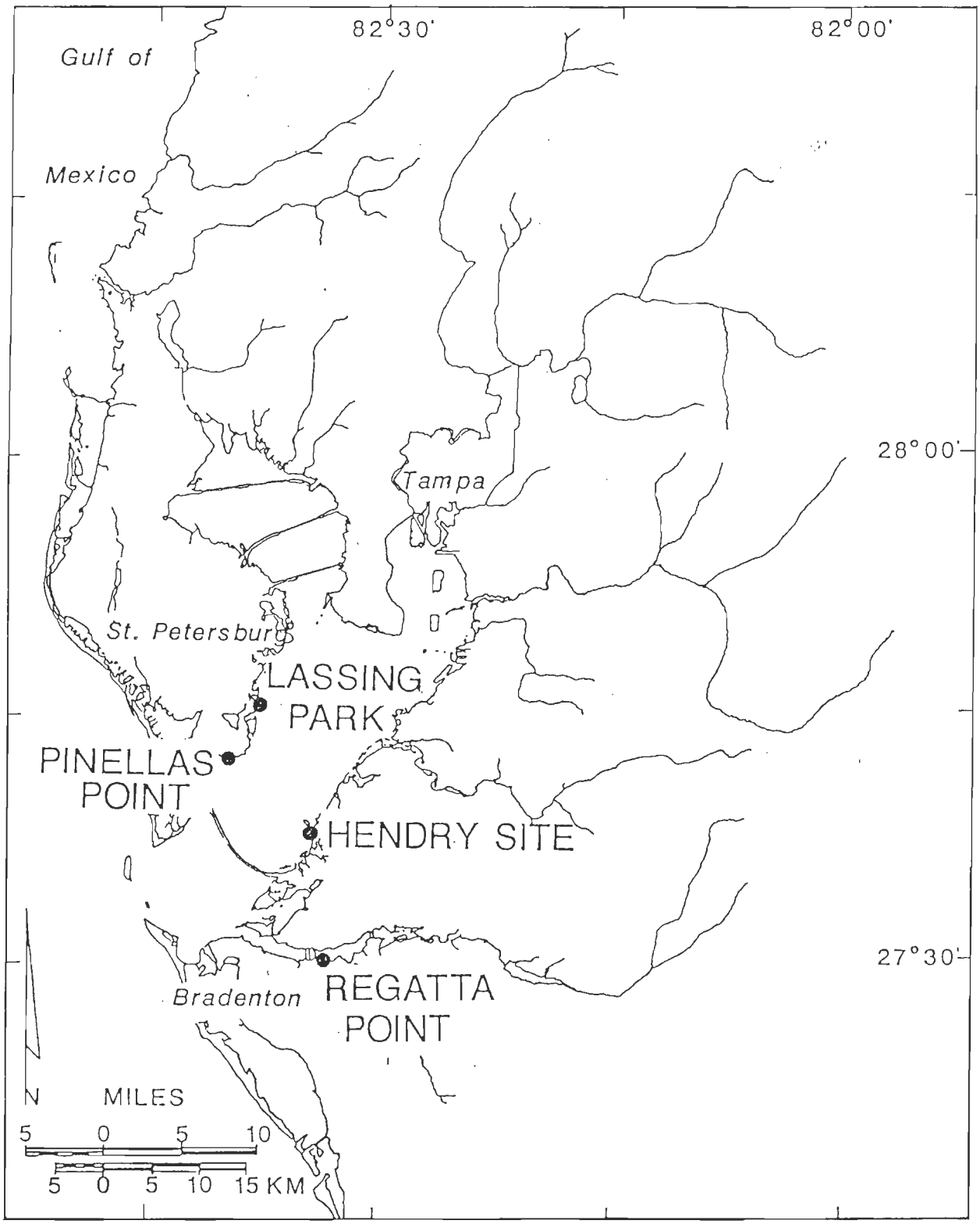

Figure 1. Locations of all planting sites in the FDNR Habitat Restoration project.

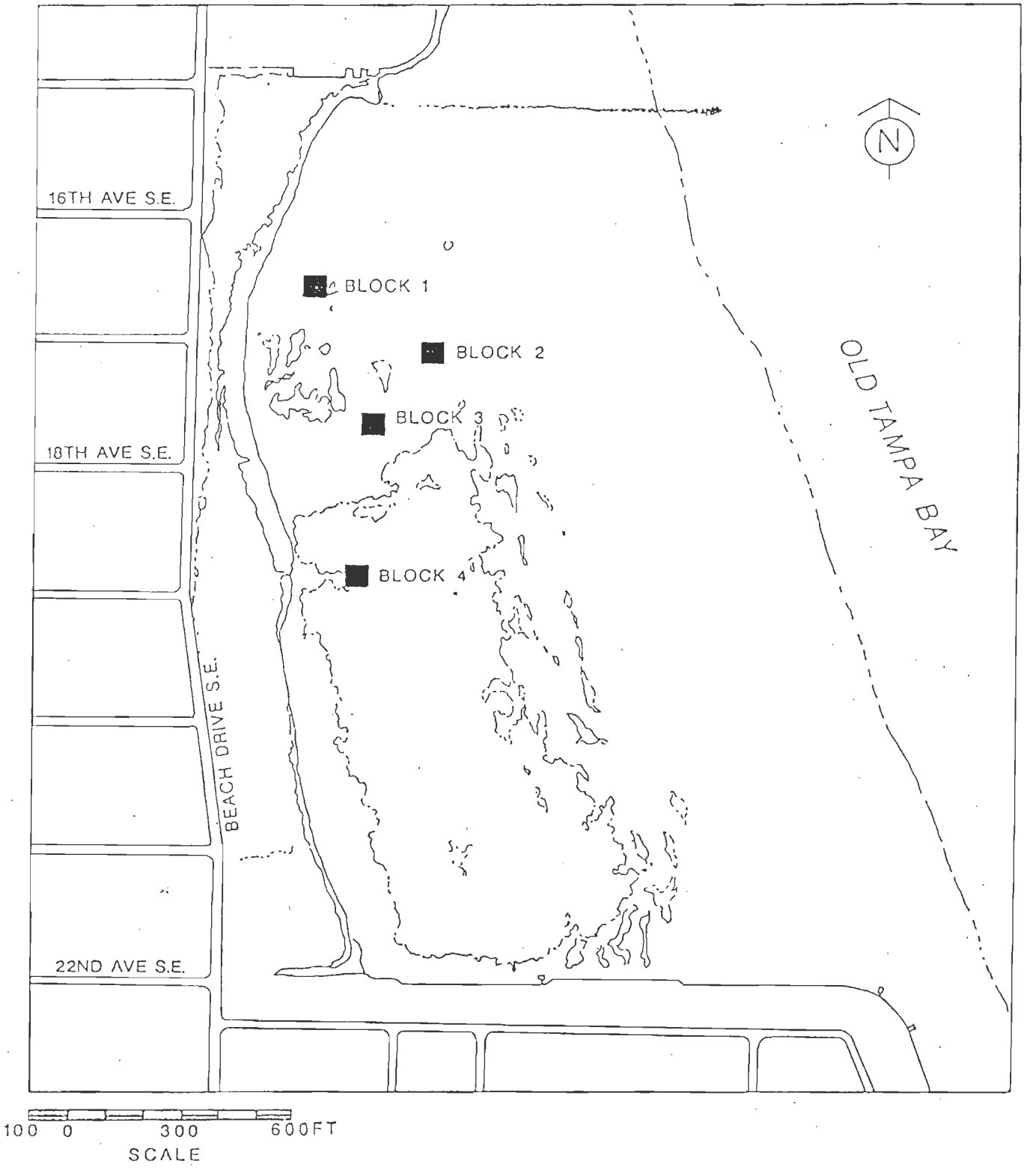

Figure 2. Locations of planting and control blocks at Lassing Park. Each block consists of four 10 m x 20 m plots.

Table 1. *Spartina alterniflora* vegetation monitoring data at Regatta Point Park. PU = planting unit; - = not measured. Only live units are reported. Variability about the mean is expressed as ± 1 S.E.

DATE	SPACING (m)	TOTAL NO. PU	MEAN NO. SHOOTS/PU	MEAN NO. SHOOTS/0.25 M^2	MEAN AREA (sq. m)/PU	MEAN PERCENT COVER/0.25 M^2
23 AUG 86	0.5	403	8.40 ± 1.06	-	0.0062 ± 0.0018	-
	1.0	100	9.10 ± 1.19	-	0.0027 ± 0.0004	-
30 SEP 86	0.5	179	1.90 ± 0.52	-	0.0021 ± 0.0003	-
	1.0	64	3.50 ± 1.42	-	0.0017 ± 0.0005	-
21 NOV 86	0.5	121	1.00 ± 0.80	-	0.0003 ± 0.0002	-
	1.0	44	5.80 ± 1.92	-	0.0041 ± 0.0013	-
28 JAN 87	0.5	92	3.40 ± 1.58	-	0.0180 ± 0.0115	-
	1.0	39	4.00 ± 1.29		0.0272 ± 0.0120	-
21 APR 87	0.5	-	-	3.30 ± 1.51	-	2.10 ± 1.09
30 MAR 87	1.0	32	4.10 ± 1.53	-	0.0271 ± 0.0129	-
27 MAY 87	0.5	-	-	2.40 ± 1.33	-	2.0 ± 3.5
	1.0	29	9.30 ± 4.55	-	0.0597 ± 0.0335	-
Additional Planting:						
6 MAY 87	-	164				
27 MAY 87	-	159				

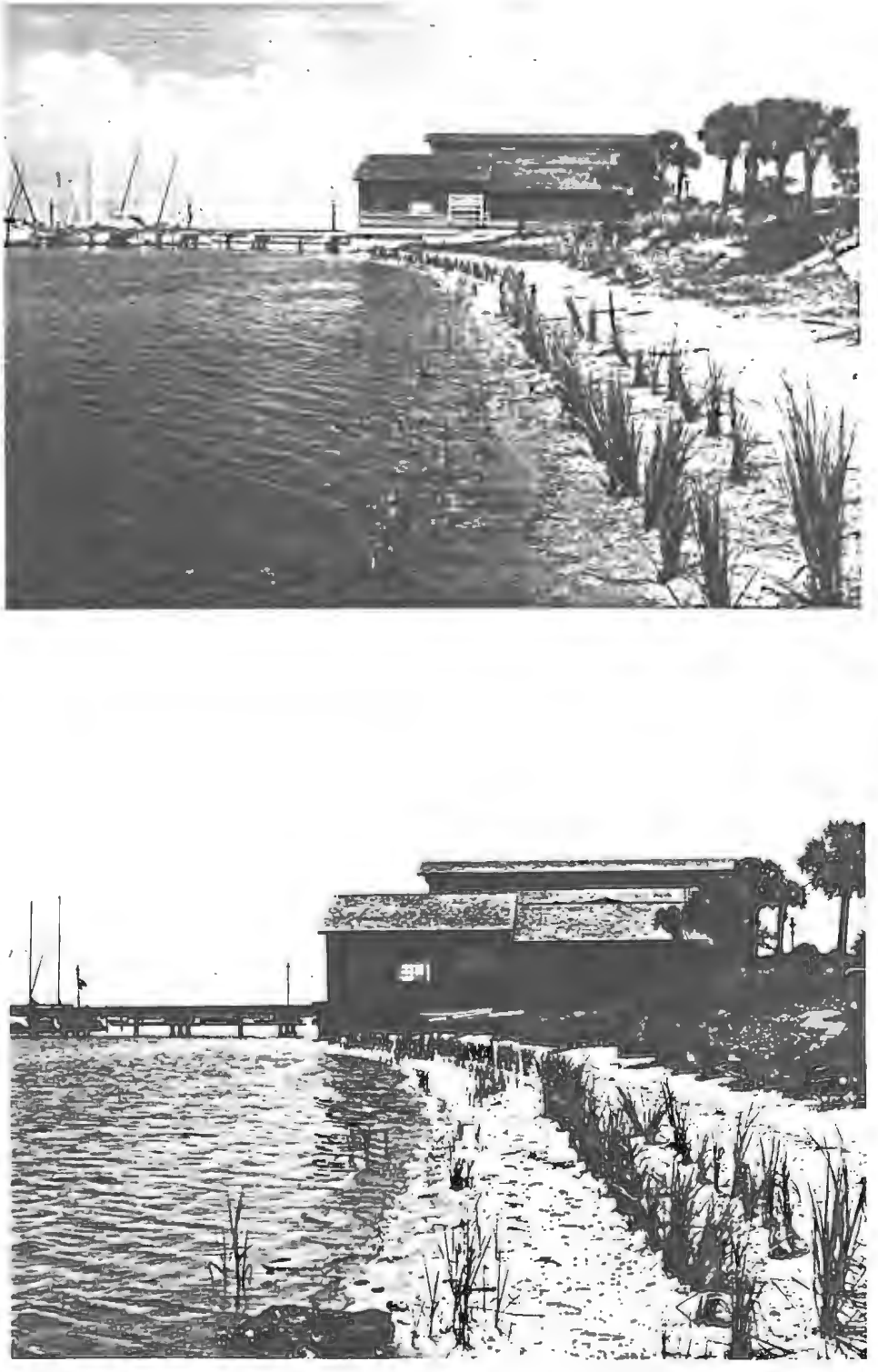

Figure 3. Spartina plots at Regatta Point. TOP - 6 May 1987, immediately following the supplemental planting; BOTTOM - 27 May 1987 monitoring.

plant material. Spring growth of the plants has begun, with numerous new shoots observed. Survival of the supplemental bare root material has been good (97%). Loss of these units is confined to the west end of the site, adjacent to the seawall. No Spartina patens were observed, and data on these plants will no longer be reported.

Pinellas Point monitoring data are shown in Table 2. Figure 4 illustrates the Spartina plots following planting and Figure 5 shows them at the May monitoring. Survival in both Spartina planting plots has been generally good since planting (76% in the 0.5 m spacing plot, 91% in the 1.0 m spacing plot), with survival better in the 1.0 m spacing plot. Growth of surviving black mangroves is sporadic, with units at higher elevations generally exhibiting better growth. Two black mangroves have flowered. Loss of mangroves in both plots is continuing. Red mangrove growth rates are generally slower than black mangrove growth rates.

The Hendry site planting plots are illustrated in Figure 6. Table 3 presents the pre-planting survey data; Table 4 presents the time zero (immediately post-planting) monitoring data. Elevations in the planting plots were suitable for planting of Spartina, and loss of sediment from the roots of the harvested plants is not expected to result in any decrease in plant survival and growth. Culter (pers. comm.) has noted that the sediment nutrient content on this delta is very low. This may be expected to reduce growth rates of the Spartina following establishment (per results obtained by Barko et al. 1977).

Table 2. Vegetation monitoring data at Pinellas Point Park. *Spartina* plots were replanted. PU = planting unit; - = not measured. Only live units are reported. Variablity about the means is expressed as ± 1 S.E.

Black Mangroves:

DATE	TOTAL NO.	MEAN HEIGHT (cm)	MEAN NO. LEAVES	MEAN AREA PNEUMATOPHORE COVER (m2)
27 AUG 86	100	21.80 ± 1.34	18.00 ± 2.43	0.0001 ± 0.0001
25 SEP 86	75	16.65 ± 3.83	7.60 ± 1.90	<0.0001
21 NOV 86	26	13.91 ± 4.99	5.70 ± 2.53	0.0001 ± 0.0001
2 FEB 87	17	6.27 ± 4.42	3.50 ± 2.81	0.0007 ± 0.0007
30 MAR 87	12*	32.29 ± 1.85	25.70 ± 5.79	0.002 ± 0.001
27 MAY 87	10	37.6 ± 2.97	33.2 ± 8.85	0.0042 ± 0.0002

Red Mangroves, Nursery-grown:				MEAN NO. PROP ROOTS
27 AUG 86	370	19.15 ± 1.34	7.90 ± 1.27	0 ± 0
25 SEP 86	308	21.20 ± 2.96	3.30 ± 0.75	0 ± 0
21 NOV 86	232	19.41 ± 3.56	3.20 ± 1.03	0 ± 0
2 FEB 87	122	7.36 ± 3.93	1.70 ± 0.92	0 ± 0
30 MAR 87	81	10.68 ± 4.41	2.30 ± 1.20	0 ± 0
27 MAY 87	60	15.09 ± 5.16	4.2 ± 1.90	0 ± 0

Spartina alterniflora:

DATE	SPACING (m)	TOTAL NO. PU	MEAN NO. SHOOTS/PU	MEAN NO. SHOOTS/0.25 M^2	MEAN AREA (sq. m)/PU	MEAN PERCENT $COVER/0.25\ M^2$
4 APR 87	0.5	398	5.00 ± 0.85	-	0.0031 ± 0.0011	-
	1.0	100	5.50 ± 1.36	-	0.0033 ± 0.0010	-
27 MAY 87	0.5	301	6.30 ± 2.31	-	0.0047 ± 0.0016	-
	1.0	91	6.60 ± 1.58	-	0.0027 ± 0.0009	-
	vegetated control	-	-	70.60 ± 30.60	-	57.50 ± 25.00

*mean and standard error calculated using the remaining 12 planting units.

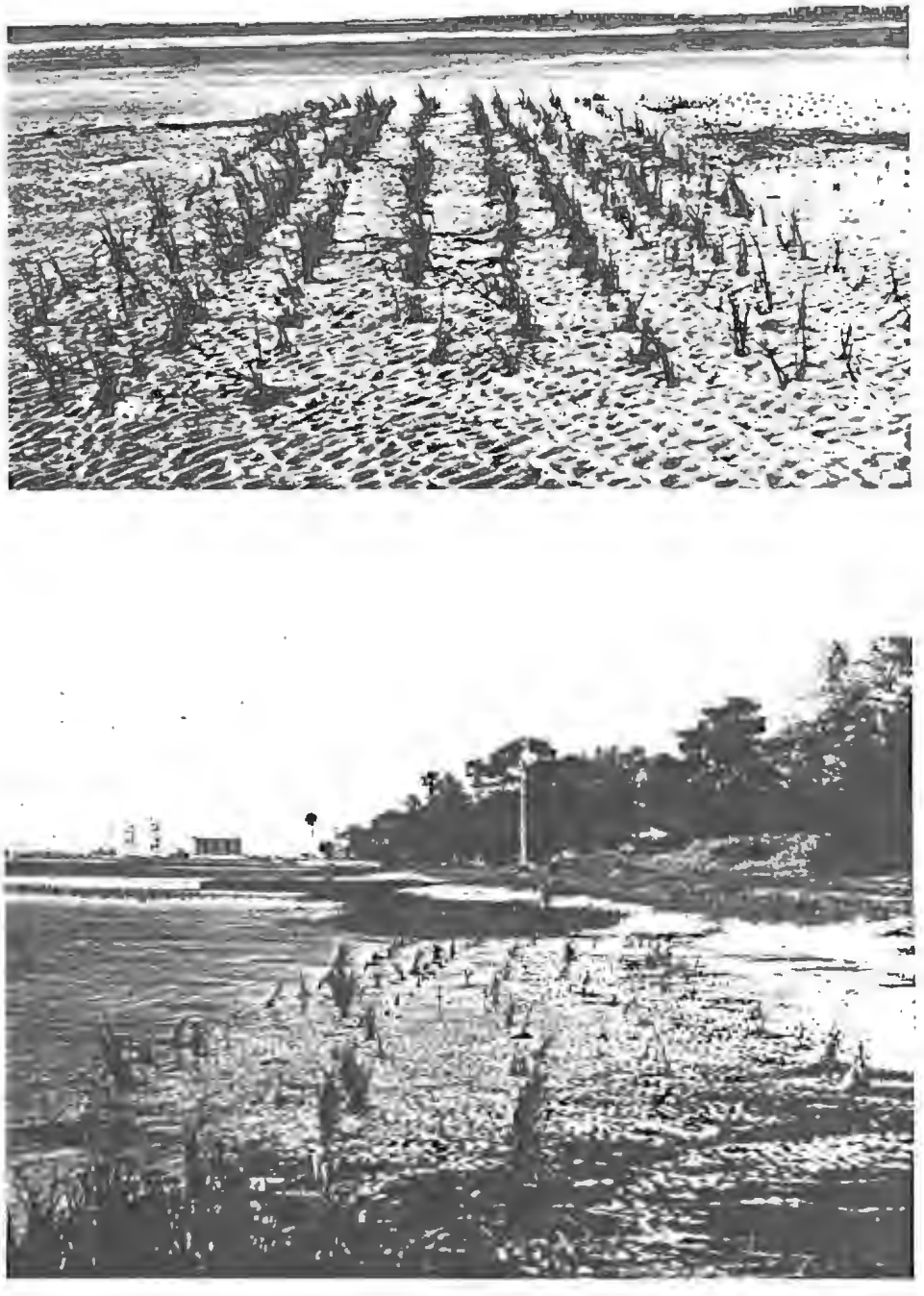

Figure 4. Replanted Spartina plots at Pinellas Point, one day after planting, 4 April 1987. TOP - 0.5 m spacing; BOTTOM - 1.0 m spacing.

Figure 5. Spartina plots at Pinellas Point, 27 May 1987. TOP - 0.5 m spacing; BOTTOM - 1.0 m spacing.

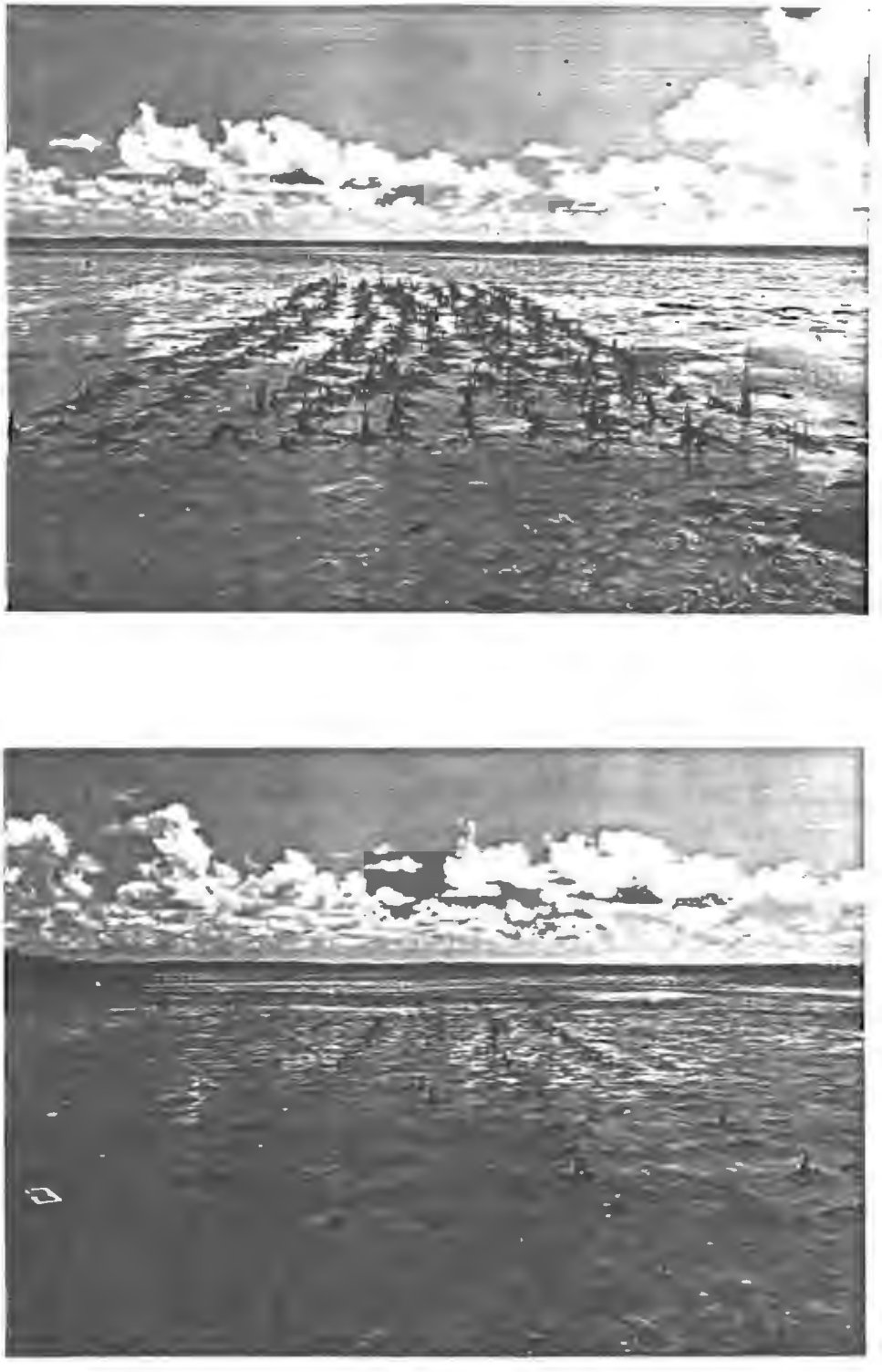

Figure 6. Spartina plots immediately after planting at the Hendry site (Manatee County site 2), 25 June 1987. TOP - 0.5 m spacing; BOTTOM - 1.0 m spacing.

Table 3. Pre-planting survey data, Hendry site (Manatee County Spartina site 2). Date are feet relative to the NGVD. Survey performed 19 June 1987.

SPOT READING	PLANTED 0.5 m O.C.	BARE CONTROL	PLANTED 1.0 m O.C.
1	+1.23	+1.34	+1.50
2	+1.26	+1.37	+1.49
3	+1.33	+1.33	+1.46
4	+1.31	+1.35	+1.35
5	+1.35	+1.45	+1.52
6	+1.38	+1.40	+1.54
7	+1.32	+1.40	+1.45
8	+1.33	+1.41	+1.38
9	+1.35	+1.45	+1.51
10	+1.36	+1.38	+1.51
11	+1.35	+1.48	+1.49
12	+1.31	+1.46	+1.40

Spot elevations of test Spartina planted November 1987:

READING	ELEVATION
1	+0.71
2	+0.70
3	+0.65

Table 4. Vegetation monitoring data, Hendry site (Manatee County site 2). PU = planting unit; - = not measured. Only live units reported. Variability about the mean expressed at ±1 S.E.

DATE	SPACING (m)	TOTAL NO. PU	MEAN NO. SHOOTS/PU	MEAN AREA (sq. m)/PU
25 JUN 87	0.5	390	6.80 ± 0.95	0.0005 ± 0.0001
	1.0	101	4.60 ± 0.35	0.0006 ± 0.0001

Subtidal elevations at the Lassing Park seagrass plots all appeared suitable for planting of Halodule wrightii (Table 5), as these elevations were within the range at which Halodule occurs naturally at Lassing Park (see Mangrove Systems, Inc. 1987, the Lassing Park preliminary survey report). The control vegetated block is more shallow than the planting and unvegetated control blocks, but the difference is not sufficient to consider these sites different with respect to the tidal regime experienced. These is much natural colonization by Halodule throughout the north half of the park, indicating that this is an excellent site for attempting a seagrass planting project.

Table 5. Subtidal elevations at the seagrass planting and control areas, Lassing Park. Elevations were taken at the center and the four corners of each block of plots and are in feet relative to NGVD.

	Planting and Unvegetated Controls:			Vegetated Control
	BLOCK 1	BLOCK 2	BLOCK 3	BLOCK 4
Center	-1.39	-1.96	-1.55	-0.97
NE corner	-1.16	-1.34	-1.19	-1.10
SE corner	-2.51	-1.44	-1.78	-0.94
SW corner	-4.10	-2.12	-1.65	-0.83
NW corner	-1.18	-1.69	-2.54	-1.04

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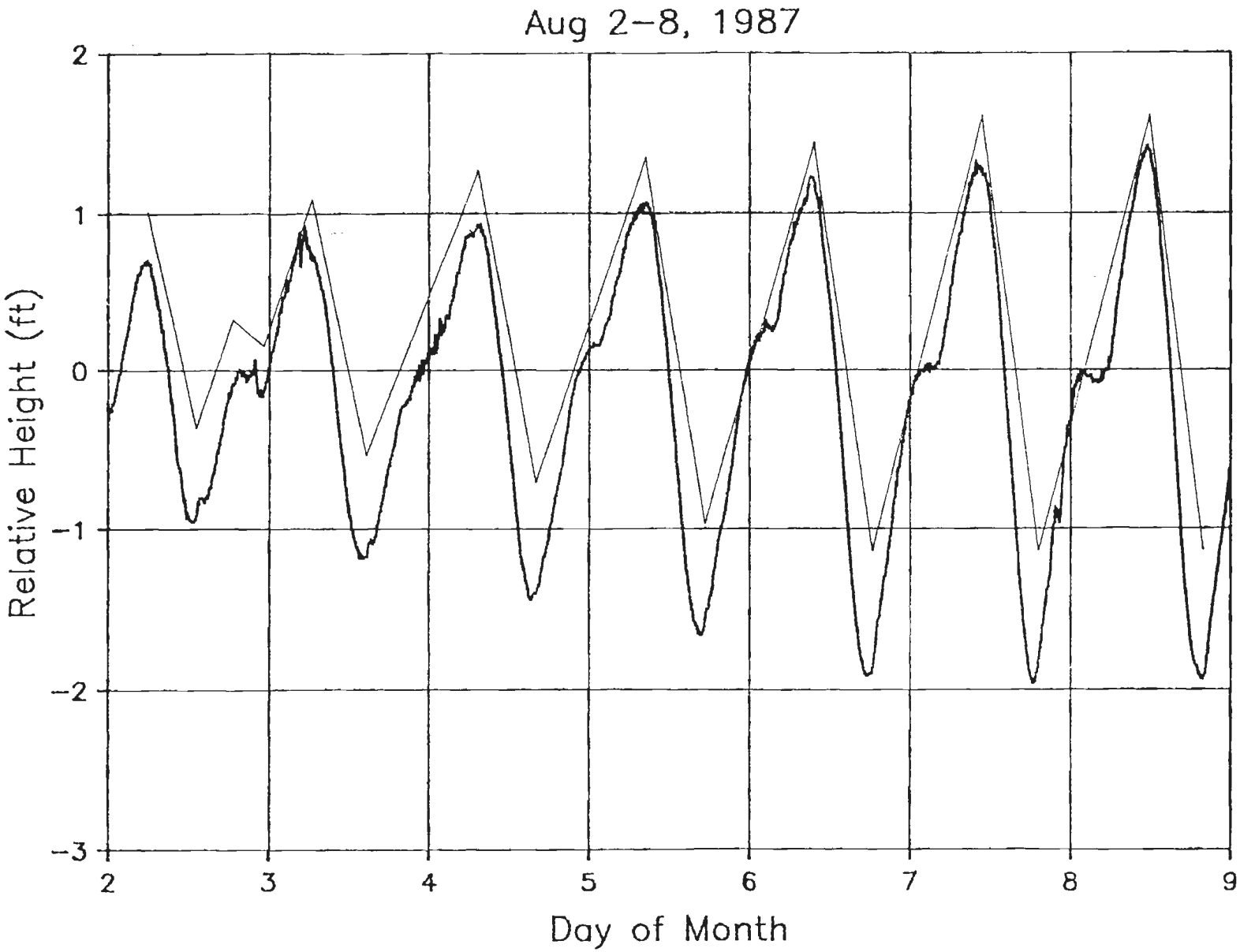
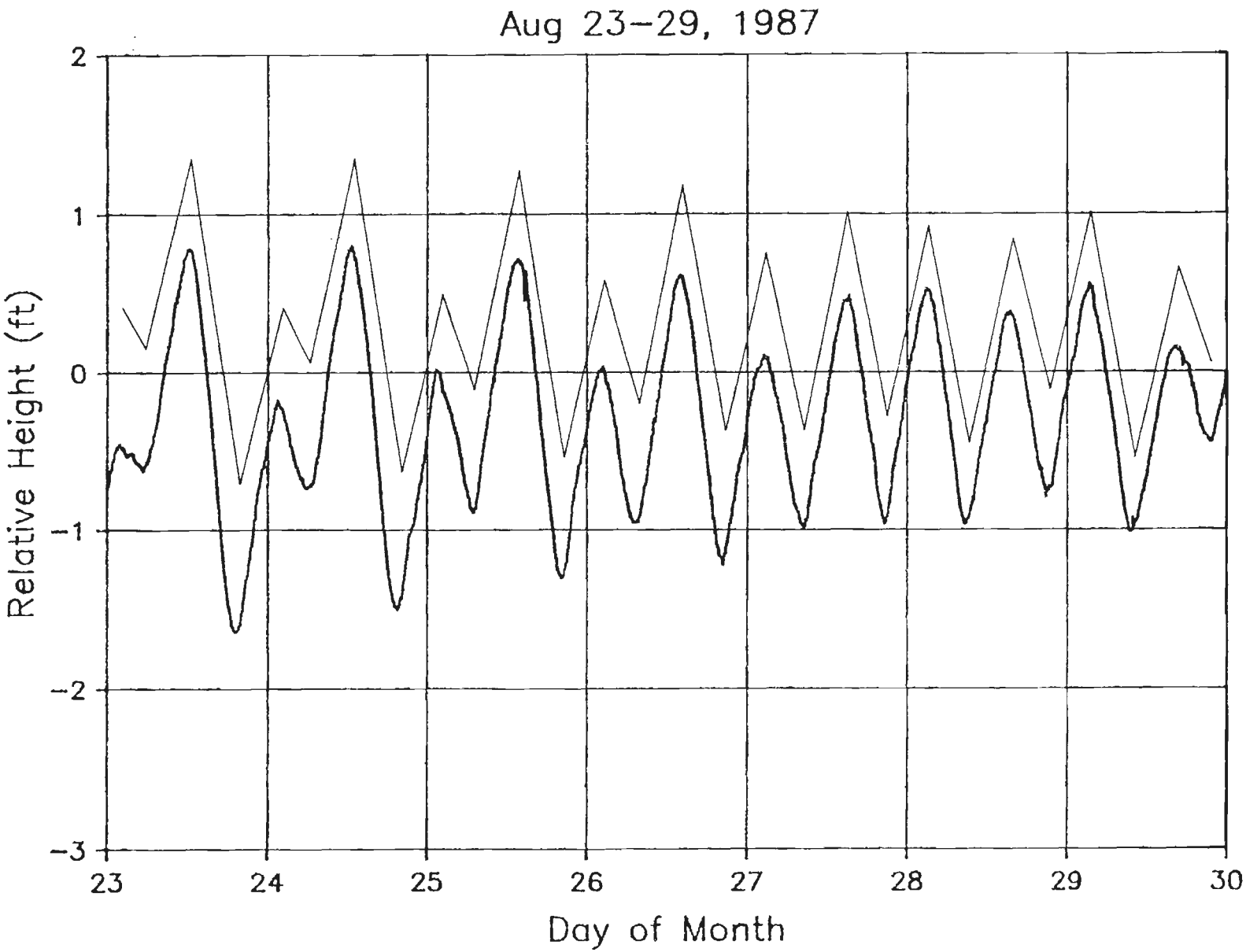
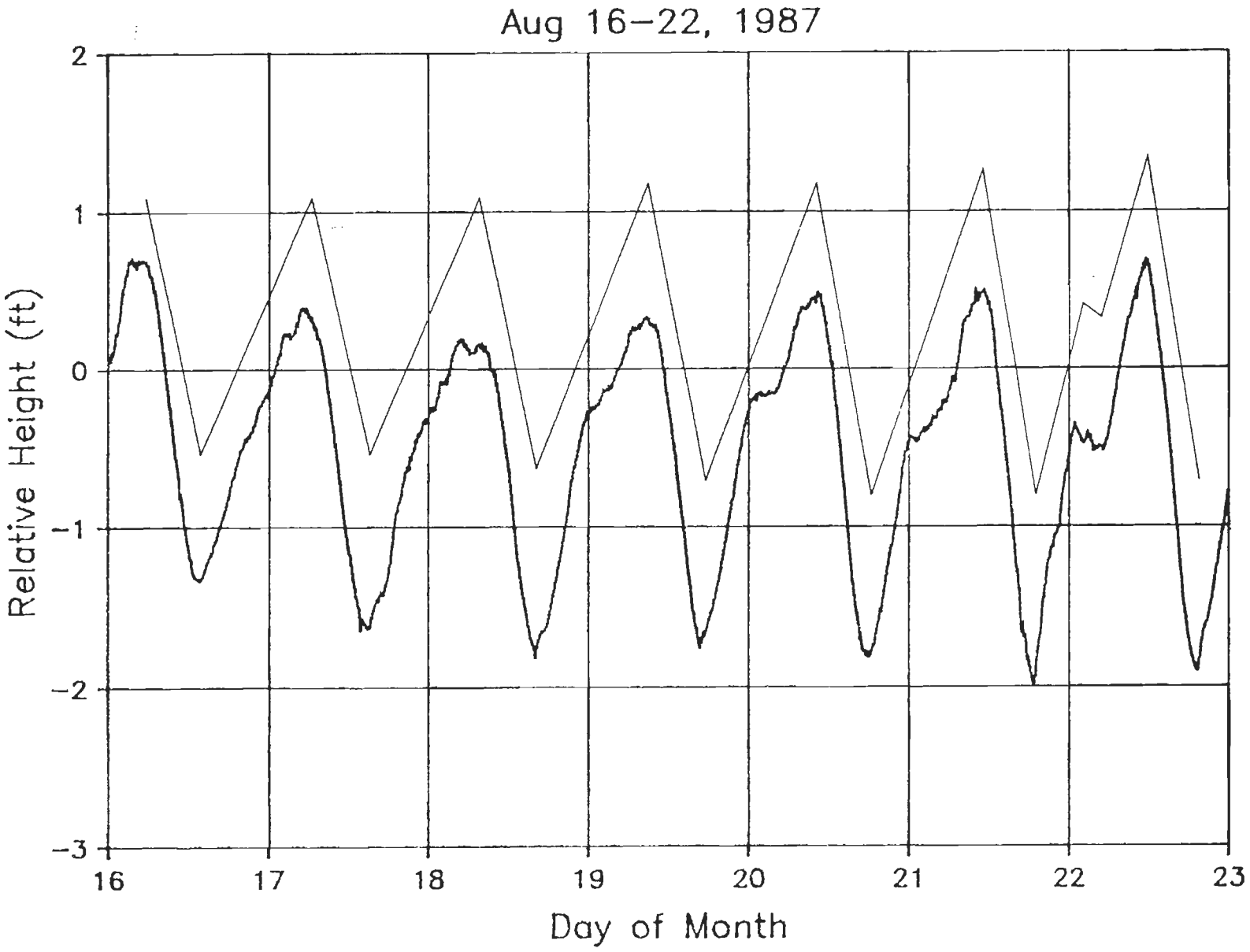
Barko, J. W, R. M. Smart, C. R. Lee, M. C. Landin, T. C. Sturgis and R. N. Gordon. 1977. Establishment and growth of selected freshwater and coastal marsh plants in relation to characteristics of dredged sediments. U.S. Army Corps of Engineers Waterways Experiment Station, Dredged Material Research Program Technical Report D-77-2. 41 pp.

Mangrove Systems, Inc. 1987. Results of the preliminary site survey, Lassing Park, St. Petersburg. Report submitted to Mote Marine Laboratory and Fla. Dept. of Natural Resources, February 1987. 12 pp. + app.

Appendix Figure 1. Weekly tide heights (NGVD) at Pinellas Point, St. Petersburg for the period August 1987 through September 1987. The heavy line represents the recorded data. The thin line represents the predicted high and low tides (NOAA Tables 1987) converted to NGVD.


Aug 2–8, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
2
3
4
5
6
7
8
9
Day of Month


Aug 23–29, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
23
24
25
26
27
28
29
30
Day of Month


Aug 16–22, 1987
Relative Height (ft)
2
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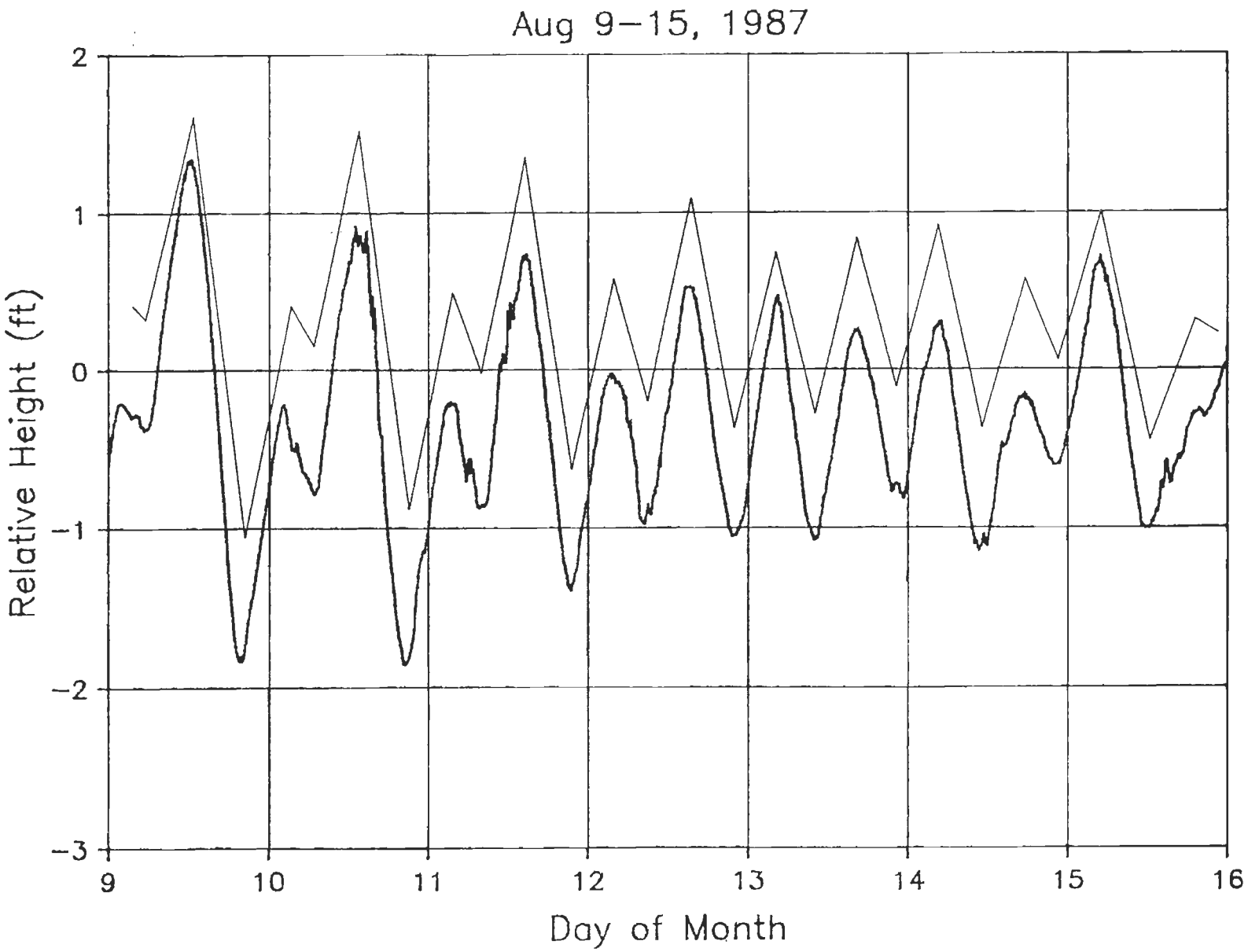
−2
−3
16
17
18
19
20
21
22
23
Day of Month


Aug 9–15, 1987
Relative Height (ft)
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0
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−2
−3
9
10
11
12
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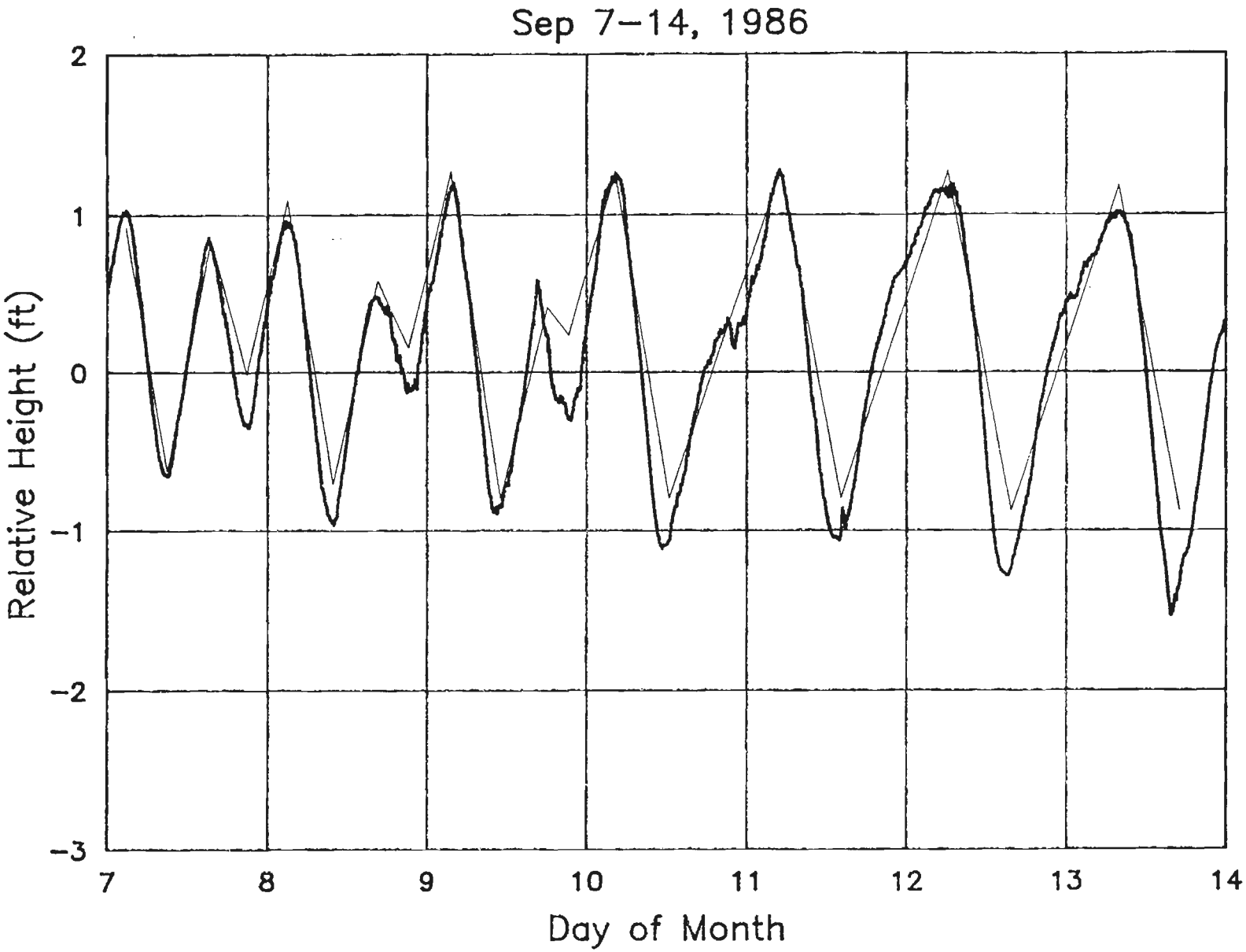
15
16
Day of Month


Sep 7–14, 1986
Relative Height (ft)
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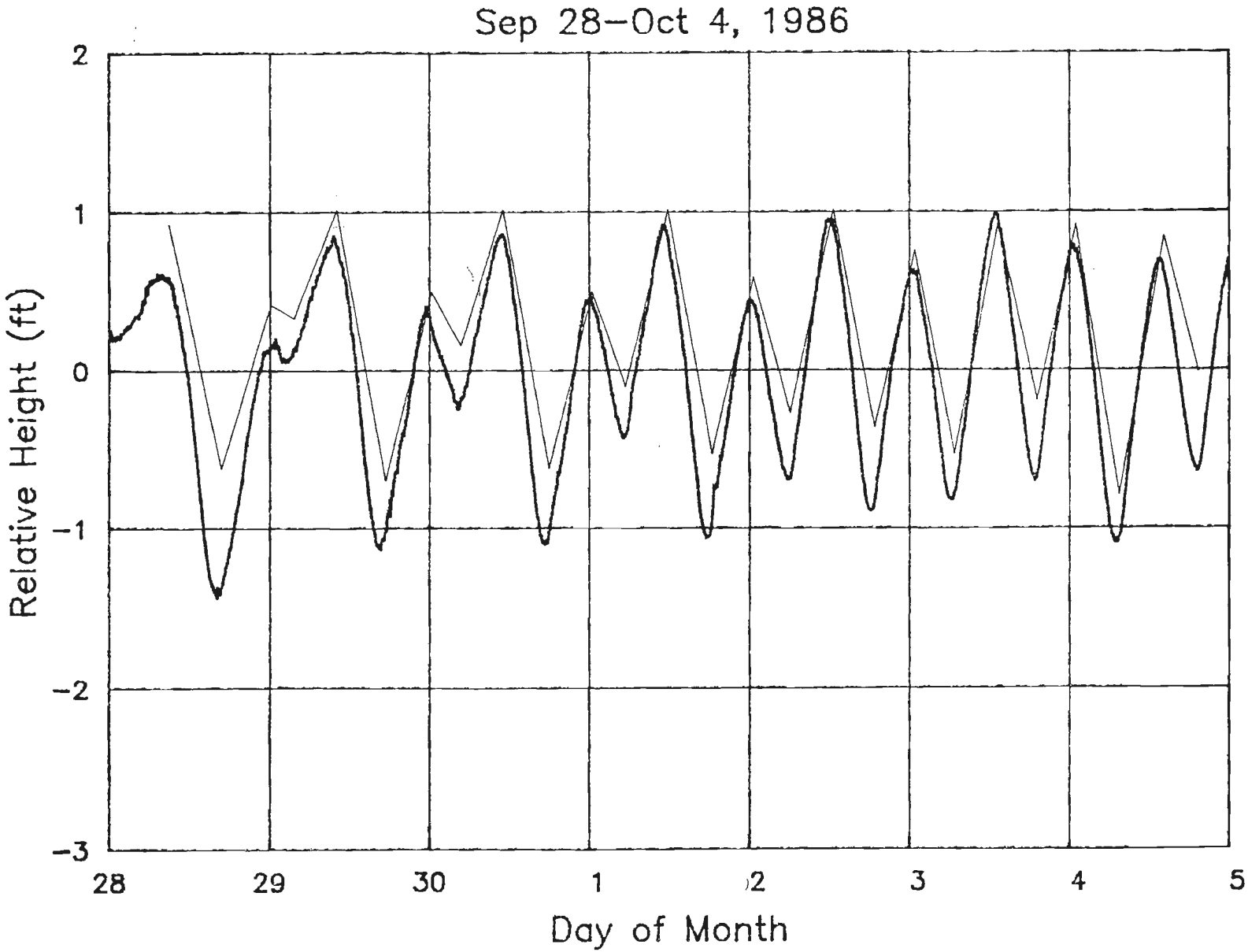
1
0
−1
−2
−3
7
8
9
10
11
12
13
14
Day of Month


Sep 28–Oct 4, 1986
Relative Height (ft)
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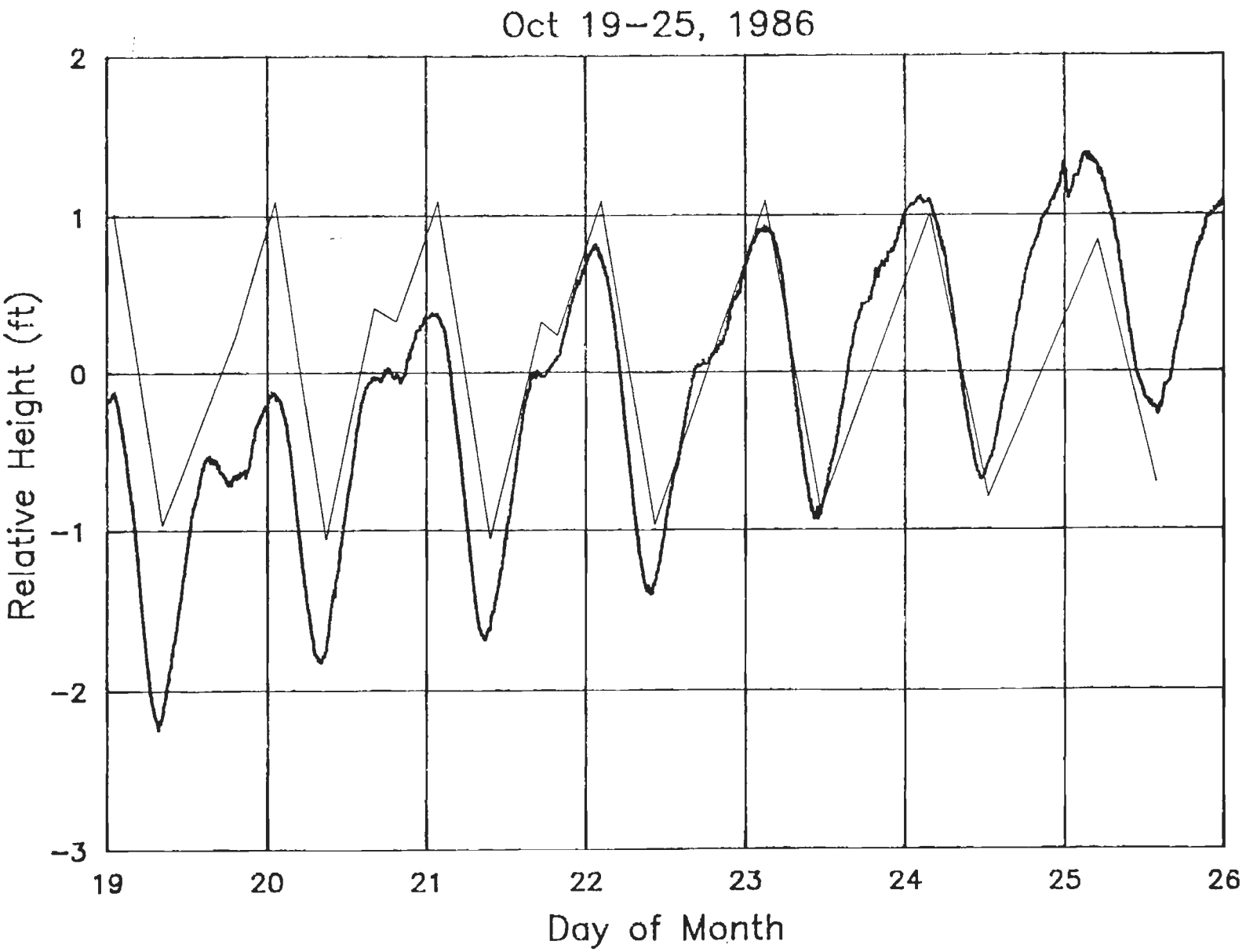
−1
−2
−3
28
29
30
1
2
3
4
5
Day of Month


Oct 19–25, 1986
Relative Height (ft)
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1
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−1
−2
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21
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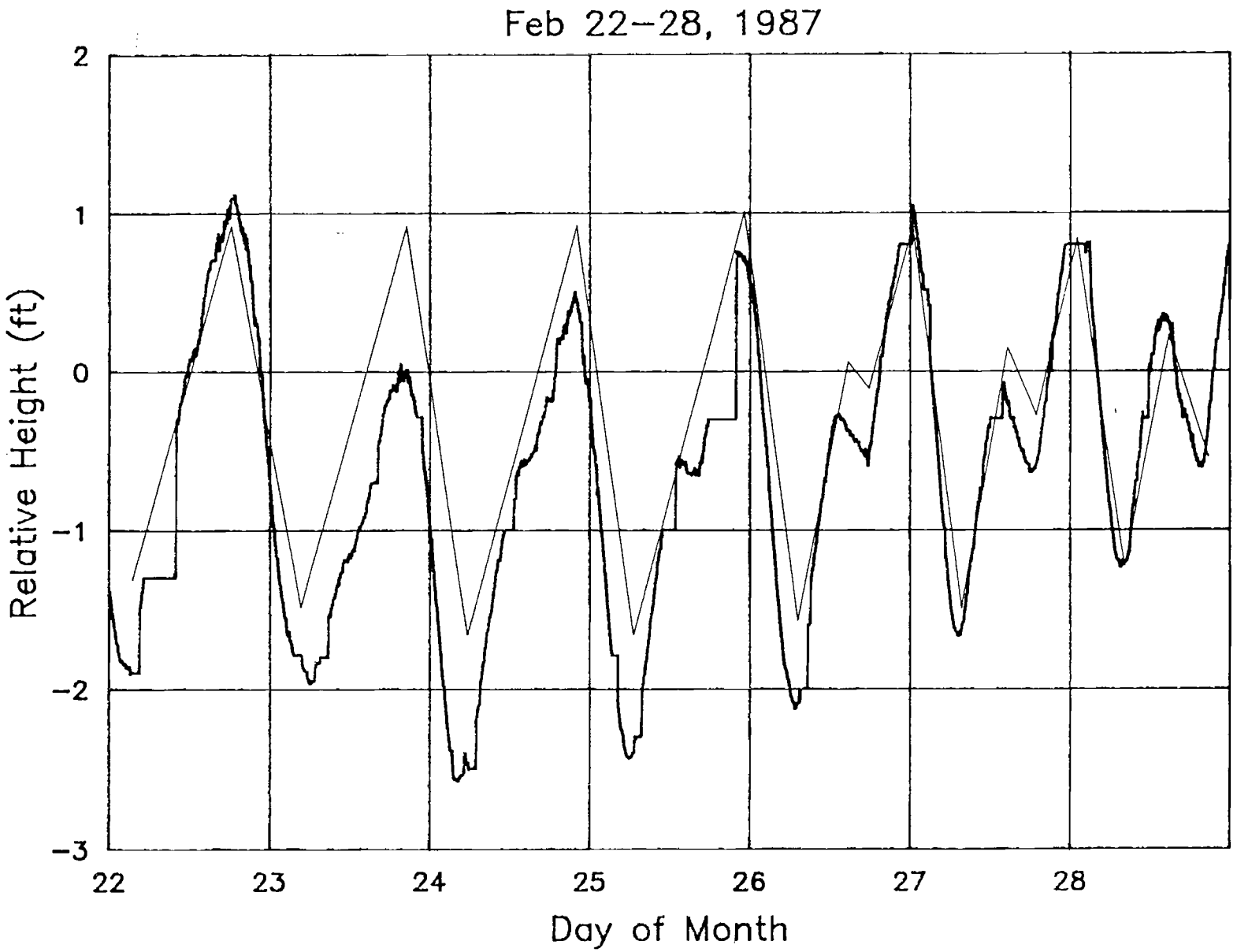
23
24
25
26
Day of Month


Feb 22–28, 1987
Relative Height (ft)
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−3
22
23
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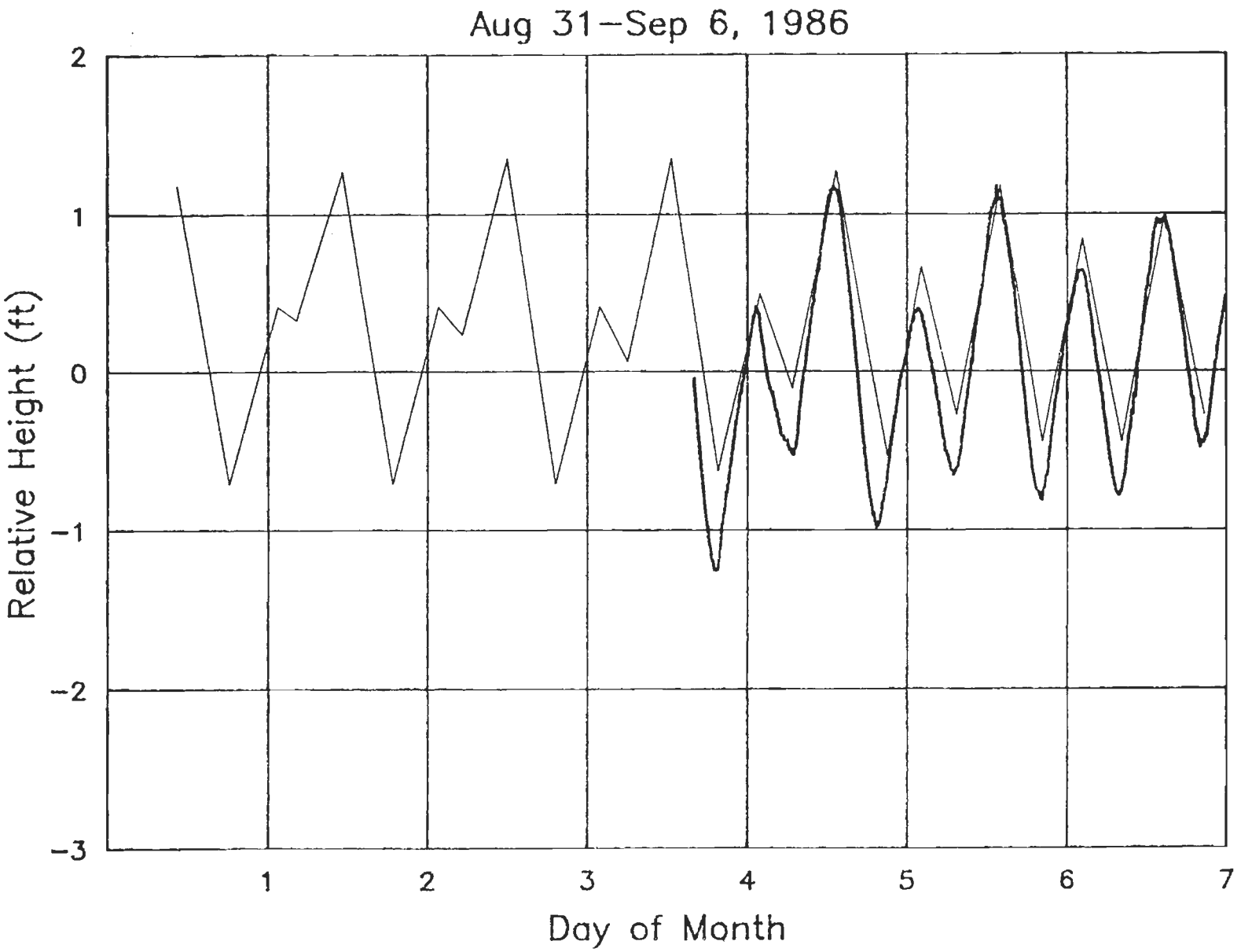
26
27
28
Day of Month


Aug 31–Sep 6, 1986
Relative Height (ft)
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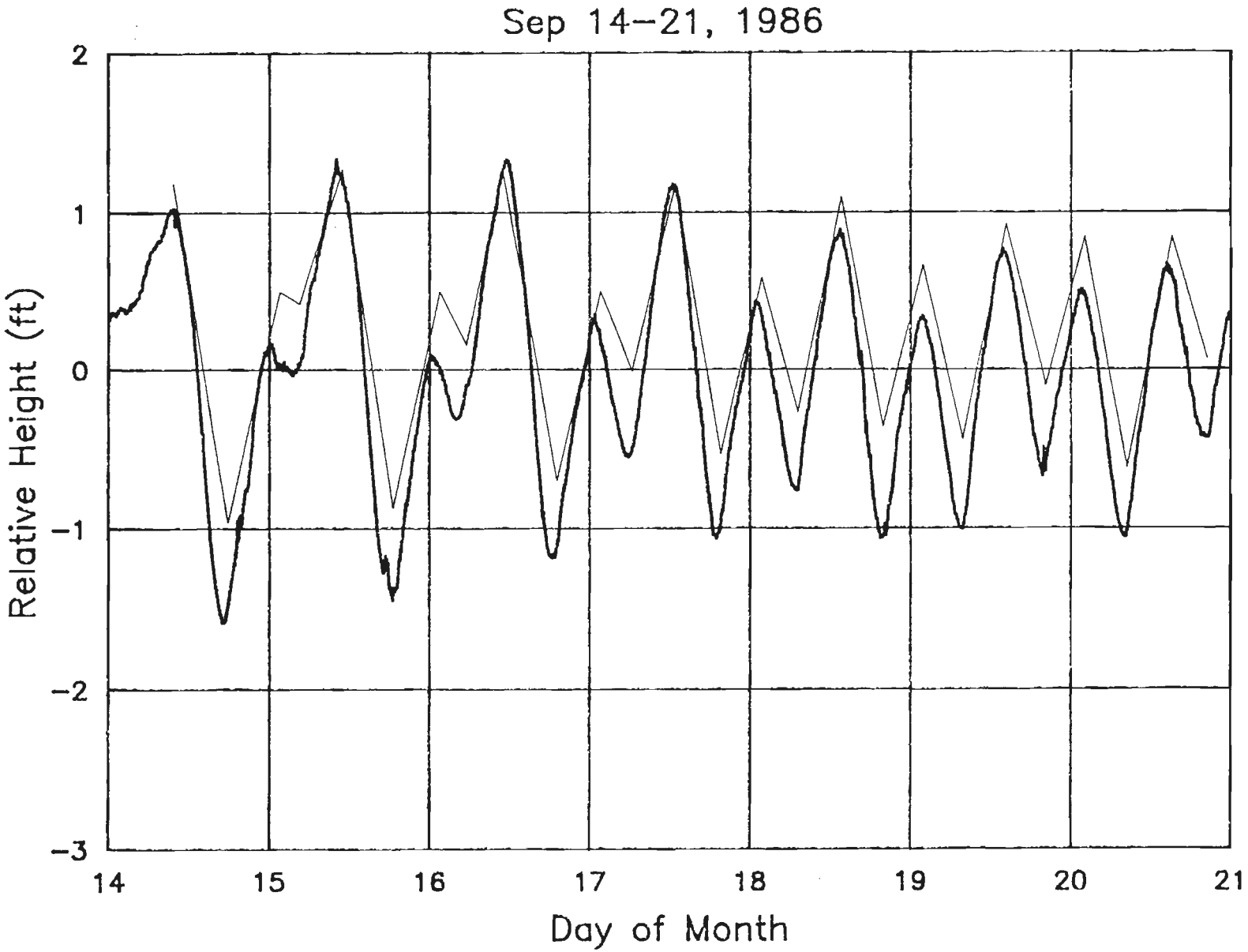
−2
−3
1
2
3
4
5
6
7
Day of Month


Sep 14–21, 1986
Relative Height (ft)
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1
0
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−2
−3
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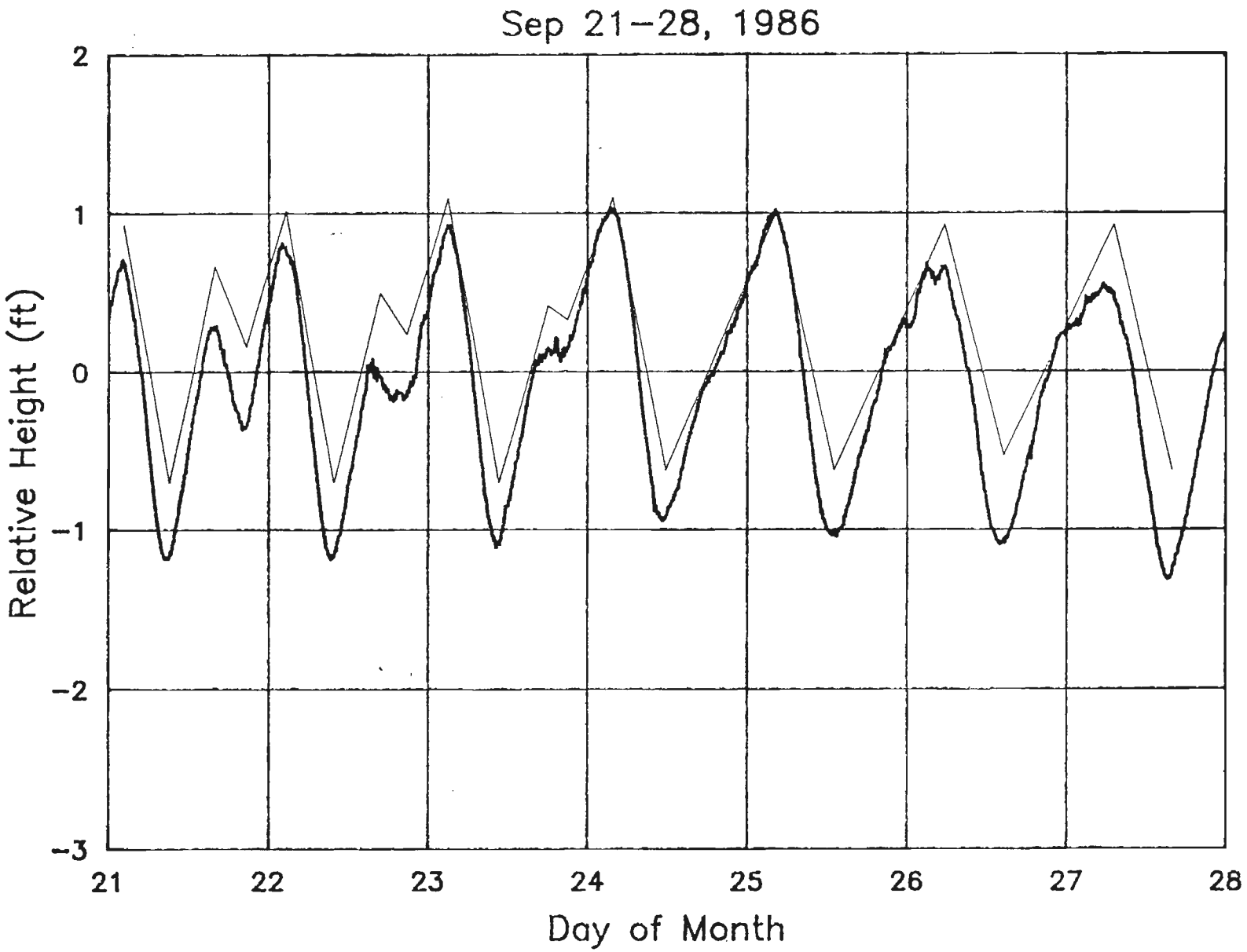
16
17
18
19
20
21
Day of Month


Sep 21–28, 1986
Relative Height (ft)
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−2
−3
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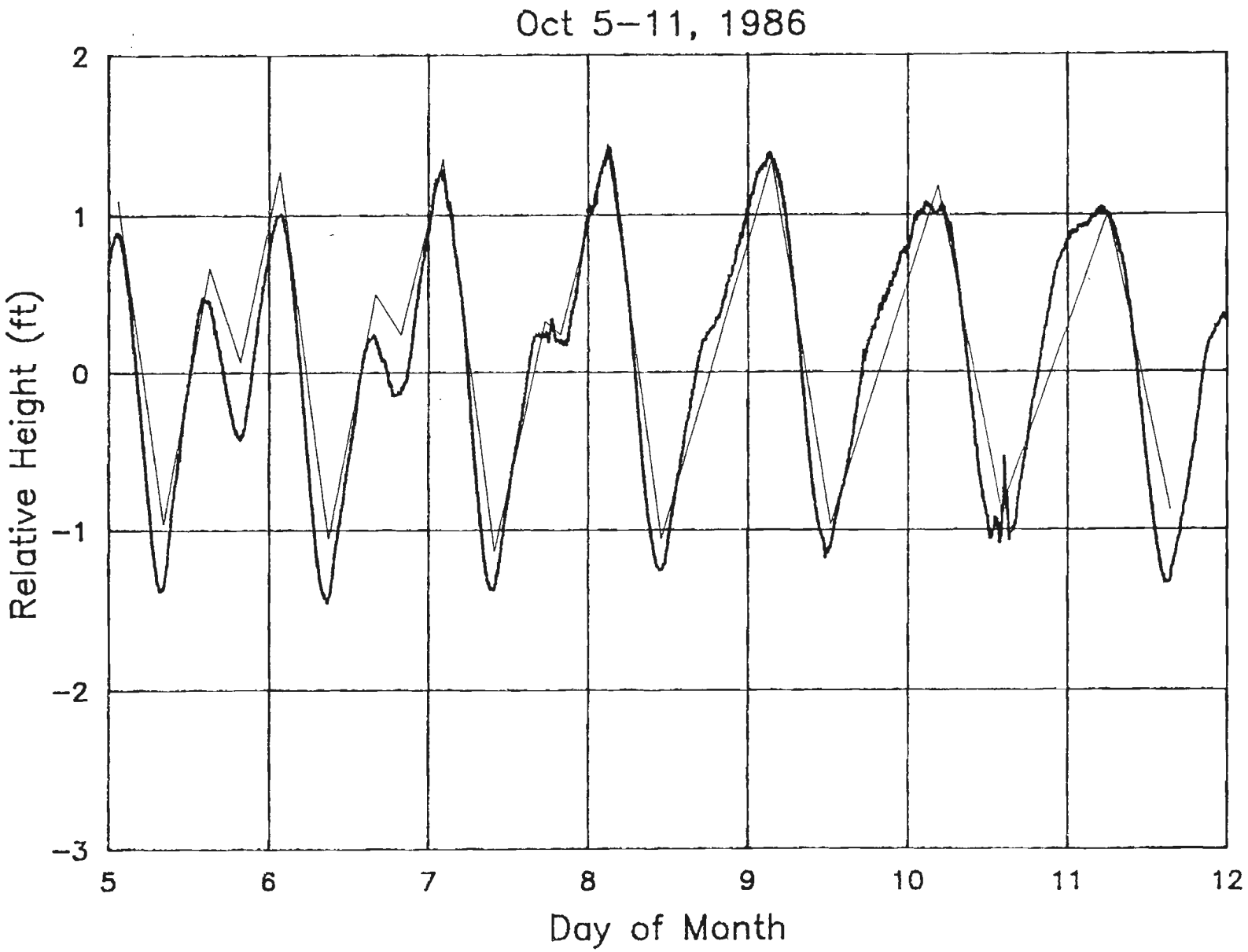
22
23
24
25
26
27
28
Day of Month


Oct 5–11, 1986
Relative Height (ft)
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1
0
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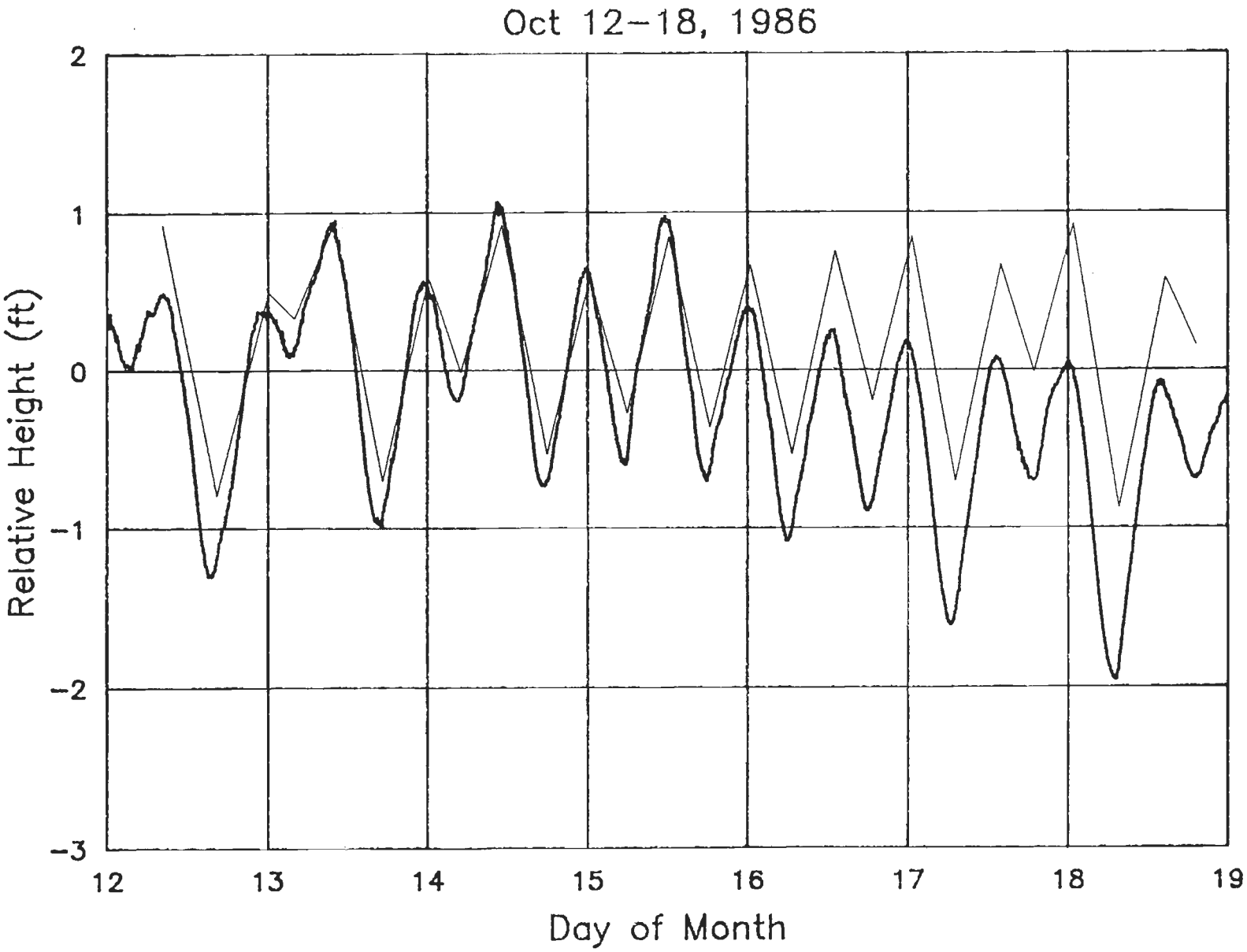
−2
−3
5
6
7
8
9
10
11
12
Day of Month


Oct 12–18, 1986
Relative Height (ft)
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1
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-1
-2
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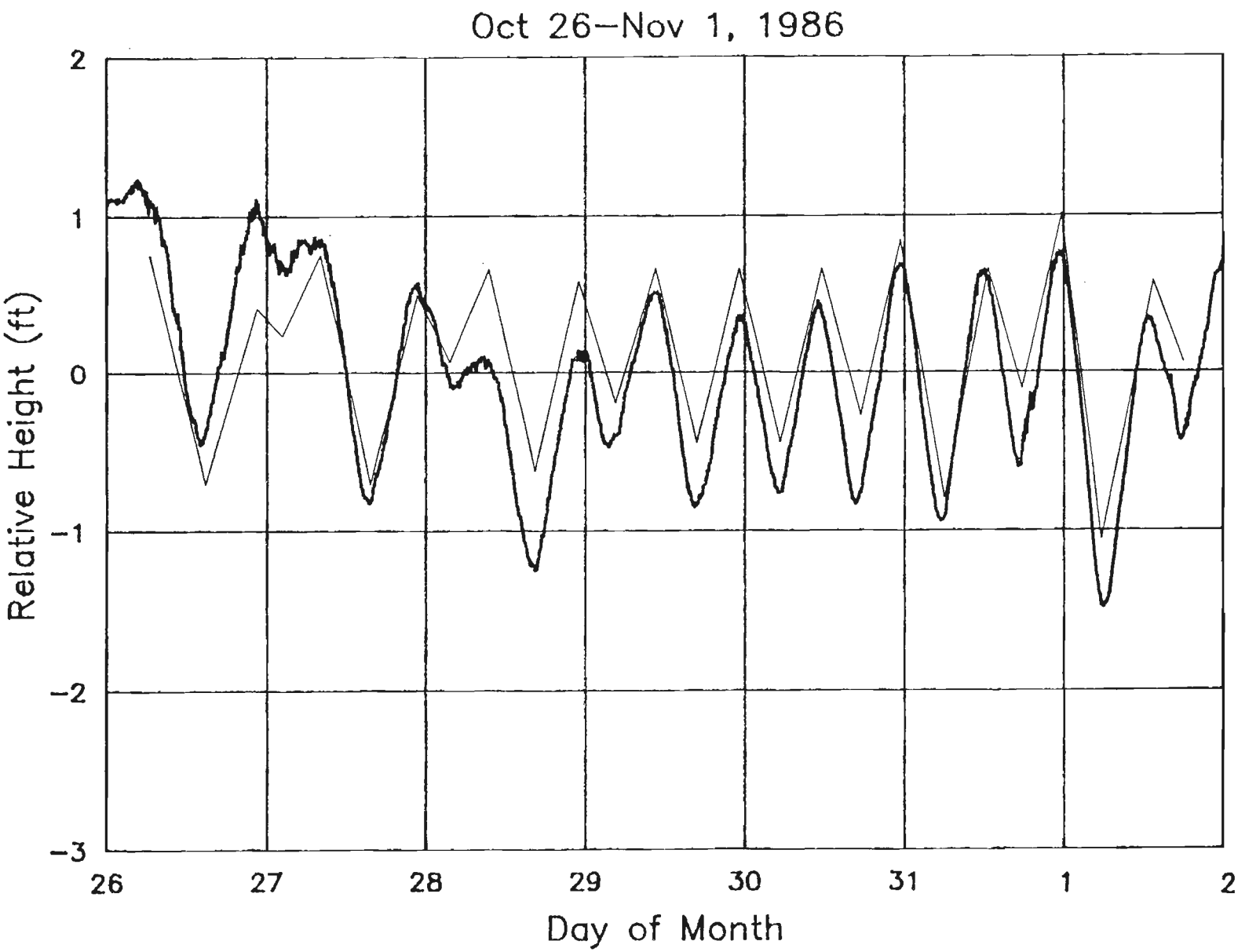
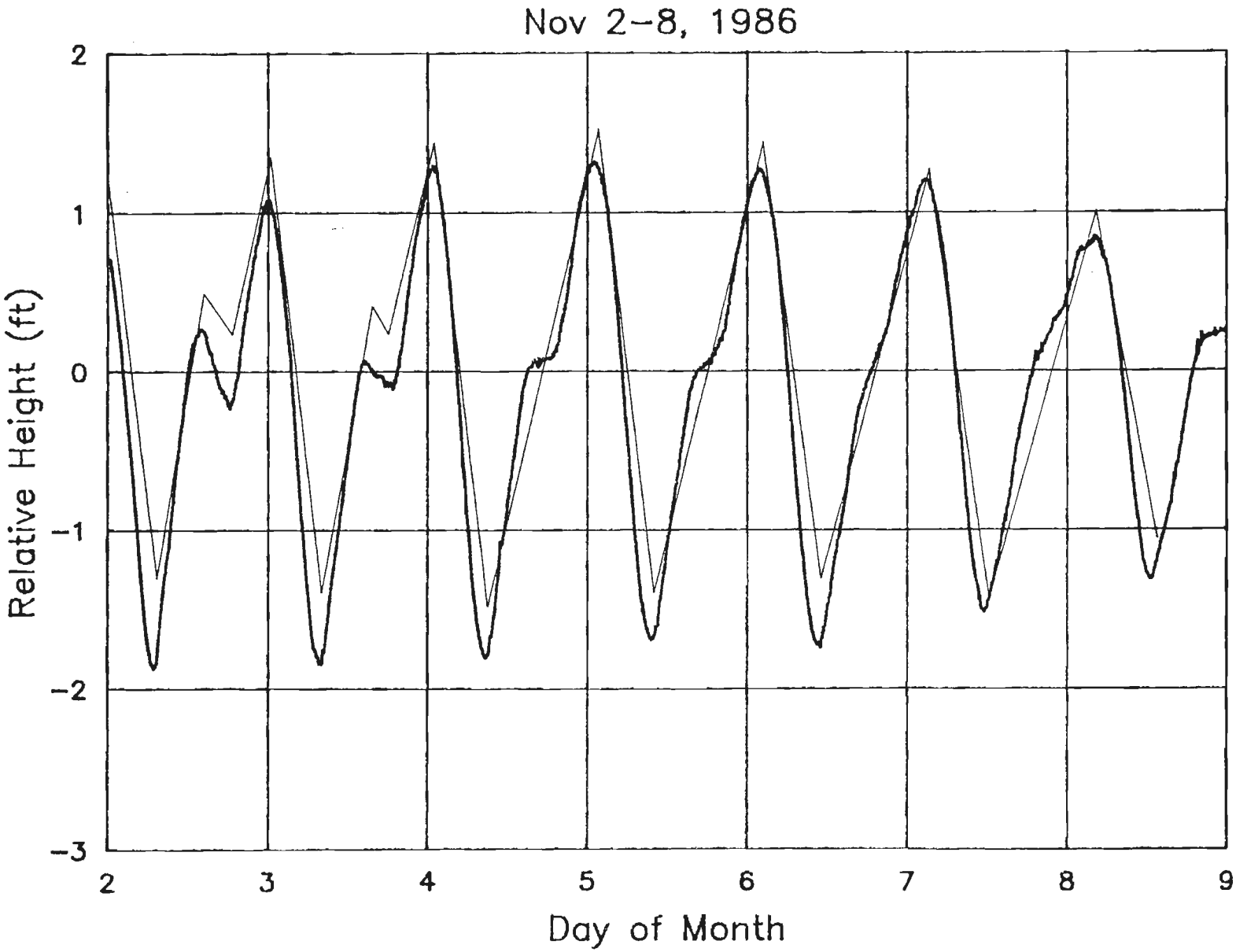
12
13
14
15
16
17
18
19
Day of Month


Oct 26–Nov 1, 1986
Relative Height (ft)
2
1
0
−1
−2
−3
26
27
28
29
30
31
1
2
Day of Month


Nov 2–8, 1986
Relative Height (ft)
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0
−1
−2
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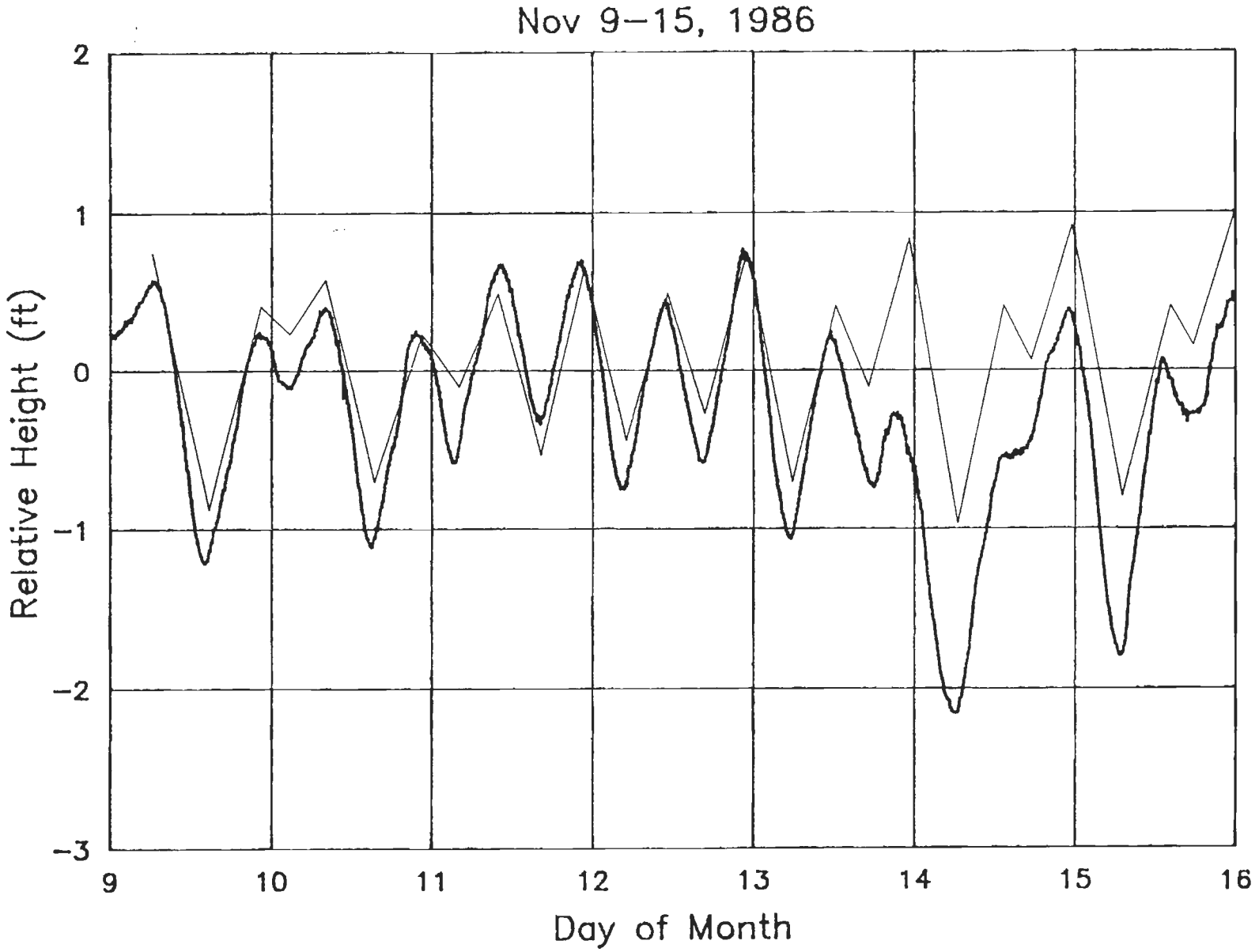
2
3
4
5
6
7
8
9
Day of Month


Nov 9–15, 1986
Relative Height (ft)
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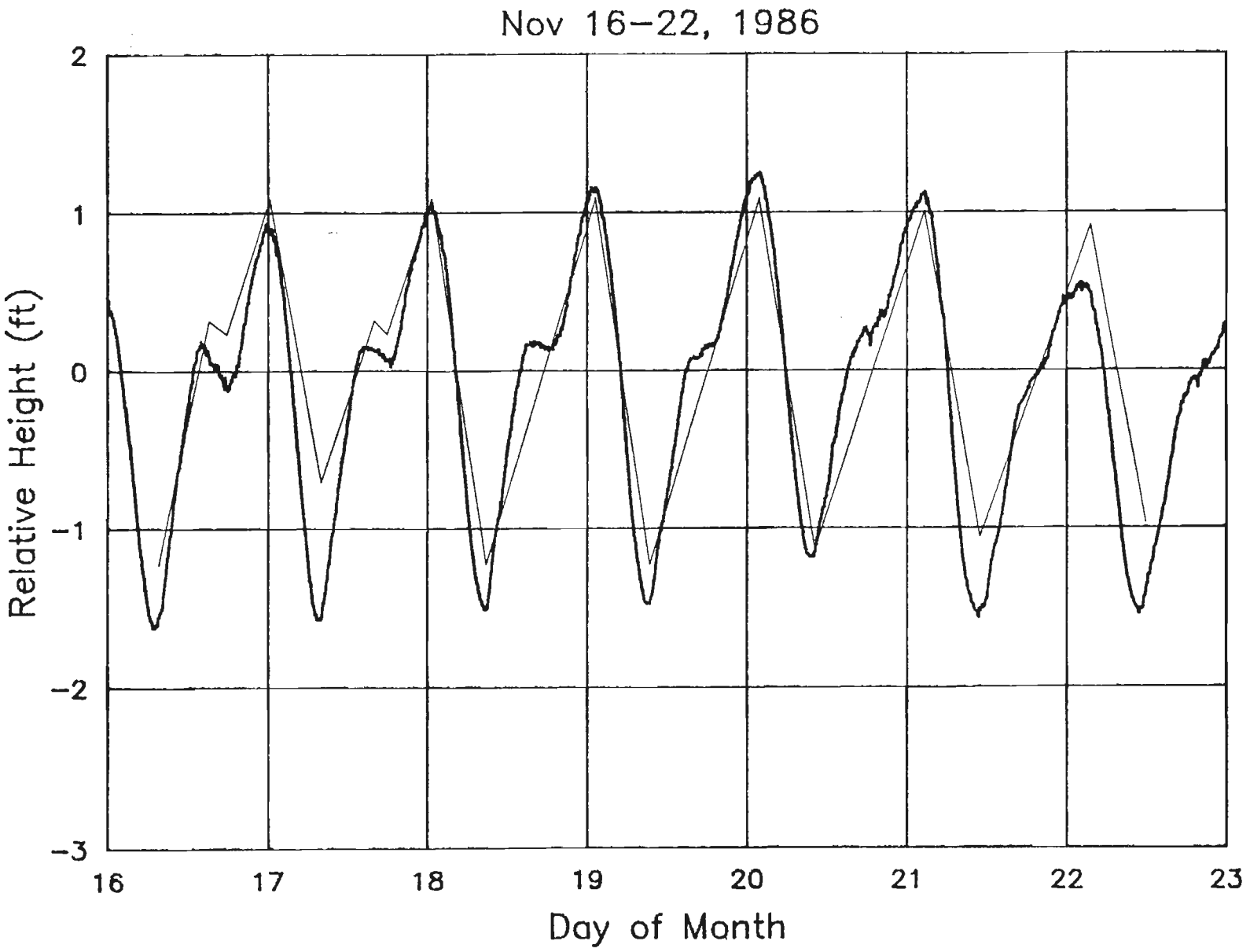
1
0
−1
−2
−3
9
10
11
12
13
14
15
16
Day of Month


Nov 16–22, 1986
Relative Height (ft)
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1
0
−1
−2
−3
16
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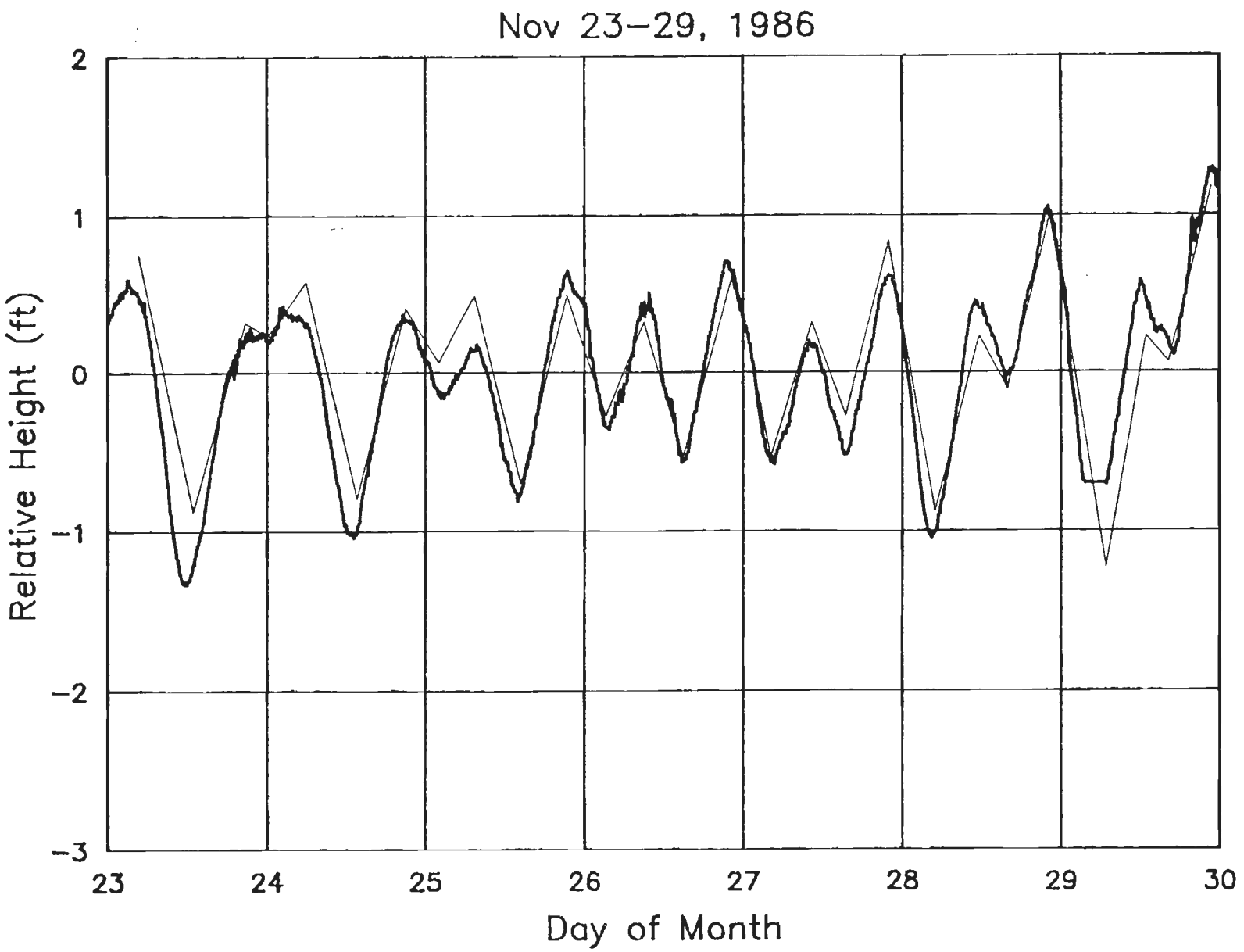
18
19
20
21
22
23
Day of Month


Nov 23–29, 1986
Relative Height (ft)
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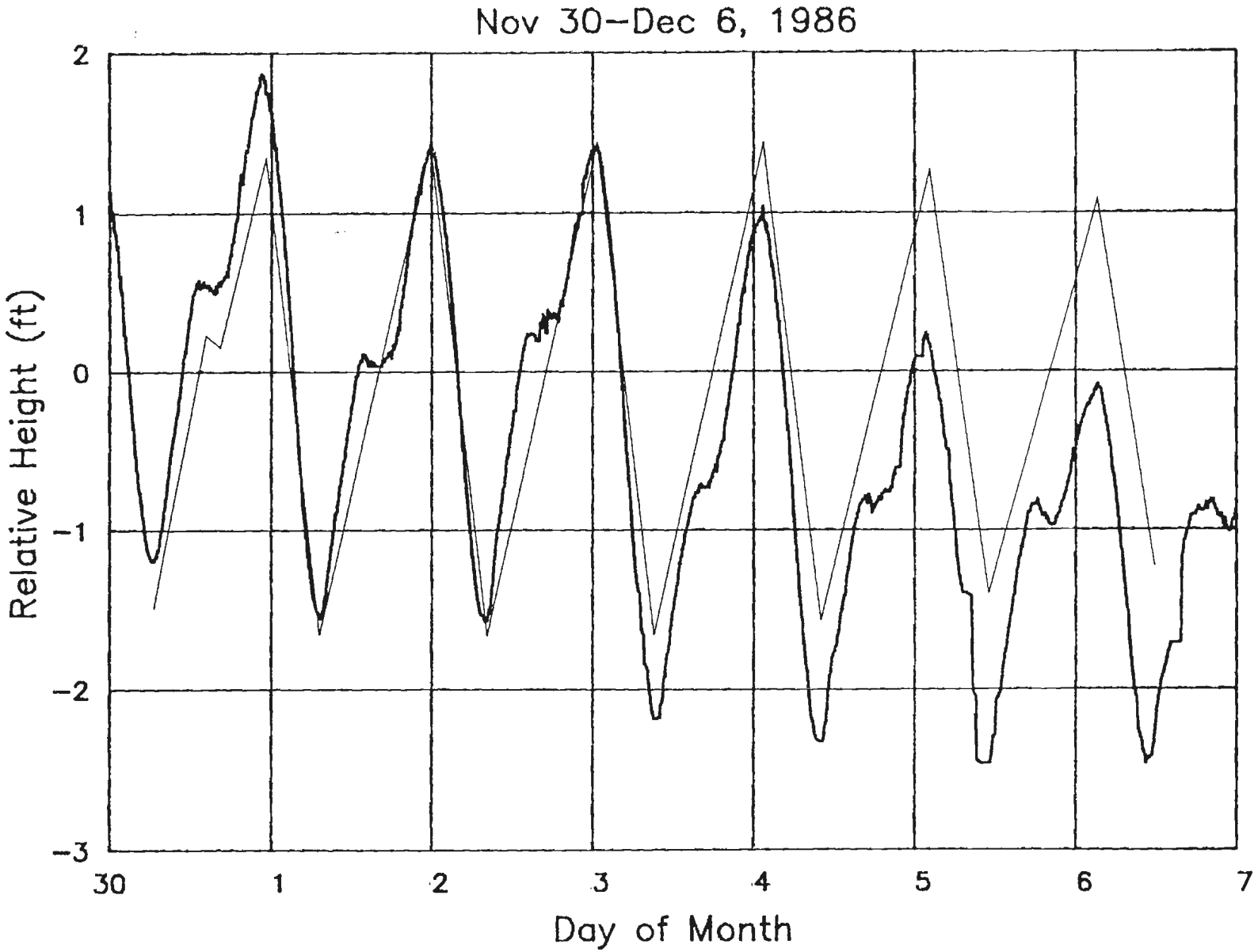
0
−1
−2
−3
23
24
25
26
27
28
29
30
Day of Month


Nov 30–Dec 6, 1986
Relative Height (ft)
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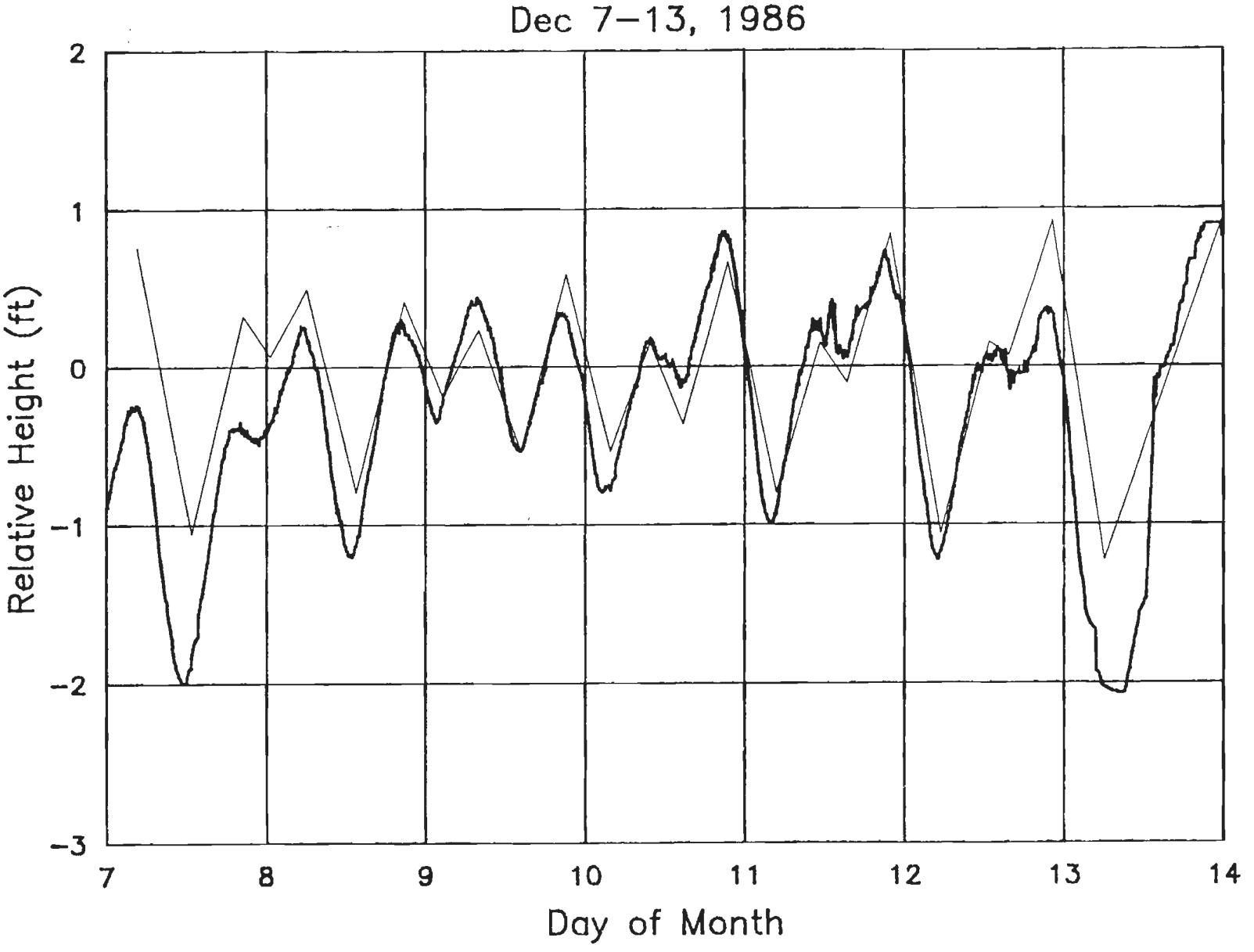
1
0
−1
−2
−3
30
1
2
3
4
5
6
7
Day of Month


Dec 7–13, 1986
Relative Height (ft)
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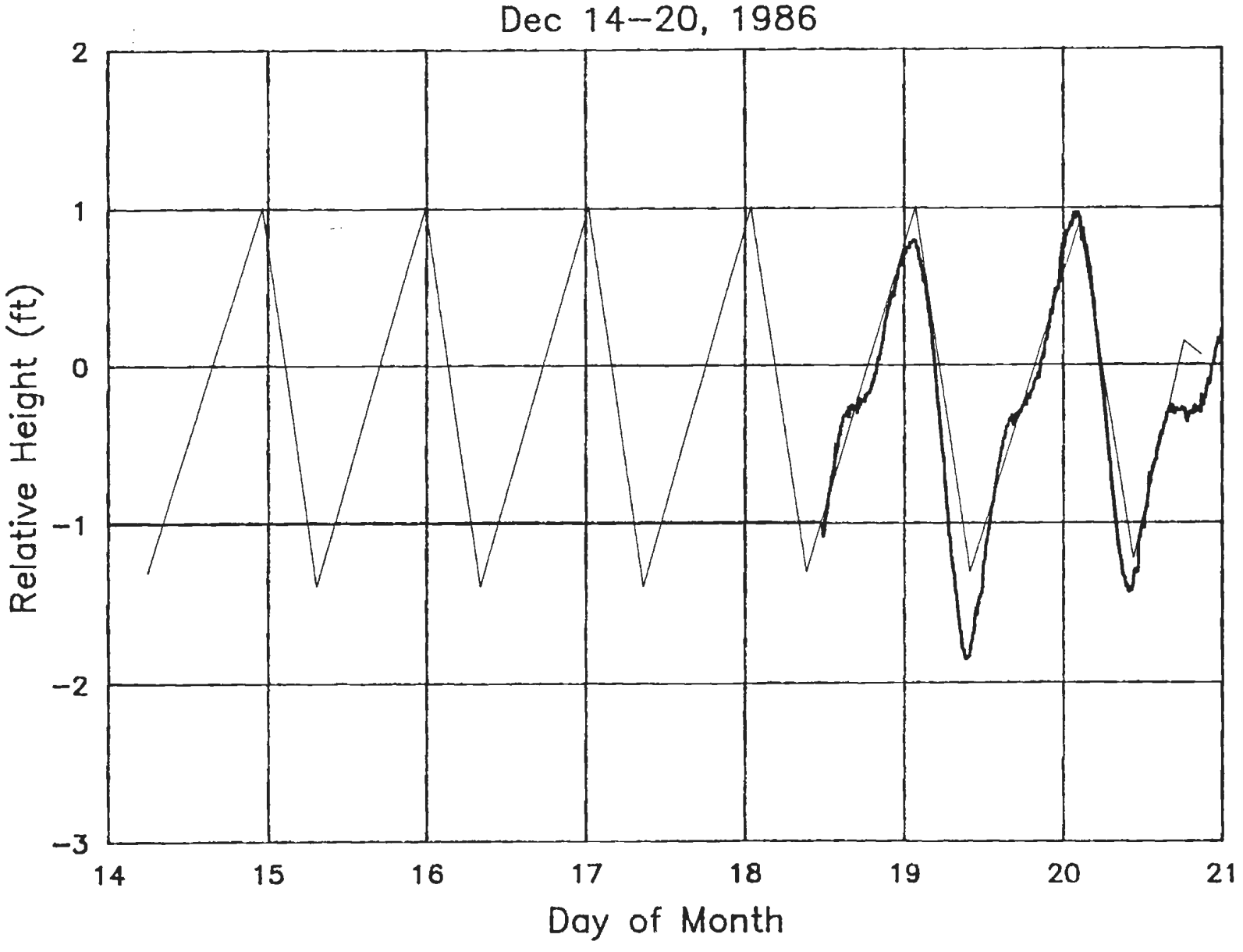
1
0
−1
−2
−3
7
8
9
10
11
12
13
14
Day of Month


Dec 14–20, 1986
Relative Height (ft)
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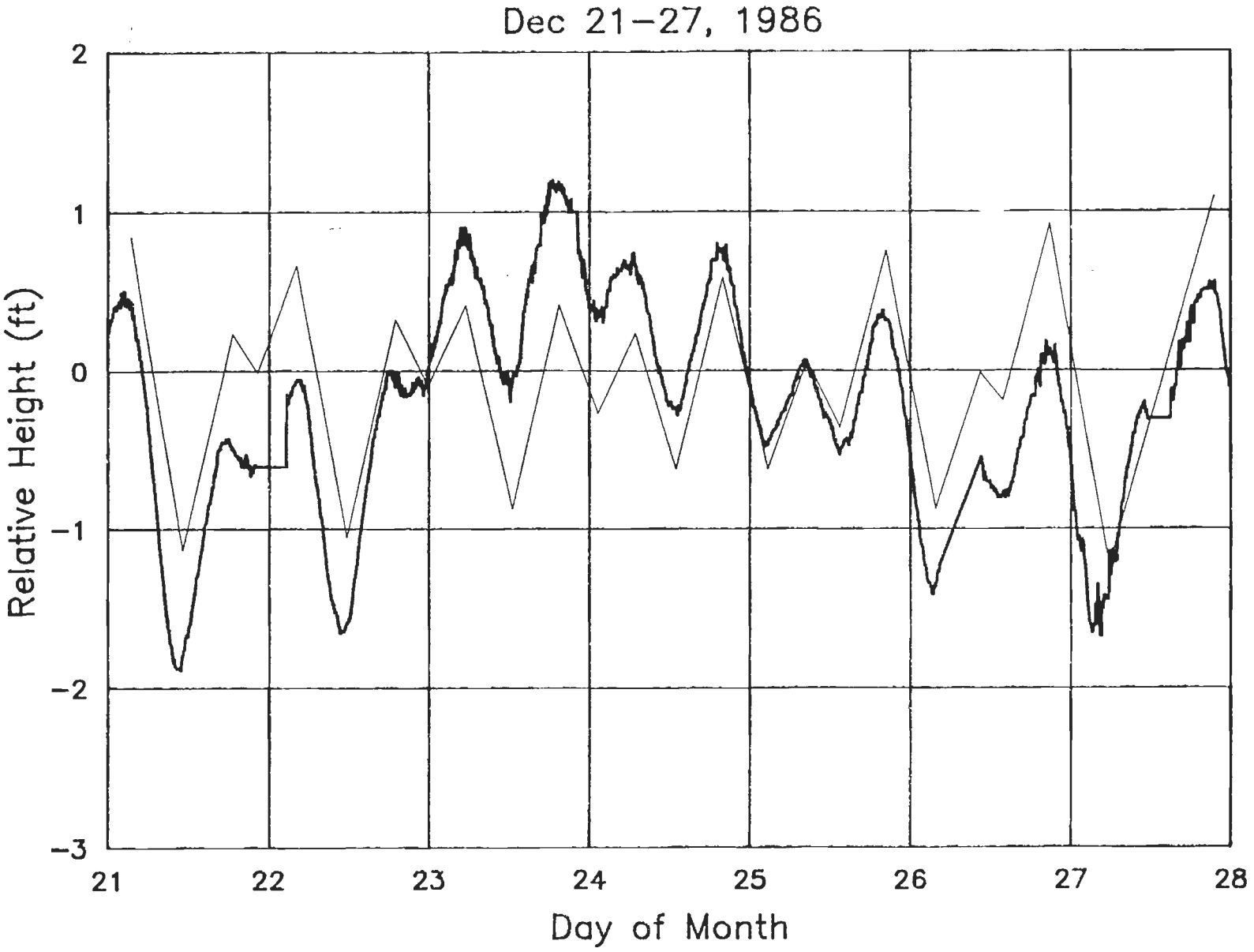
1
0
-1
-2
-3
14
15
16
17
18
19
20
21
Day of Month


Dec 21–27, 1986
Relative Height (ft)
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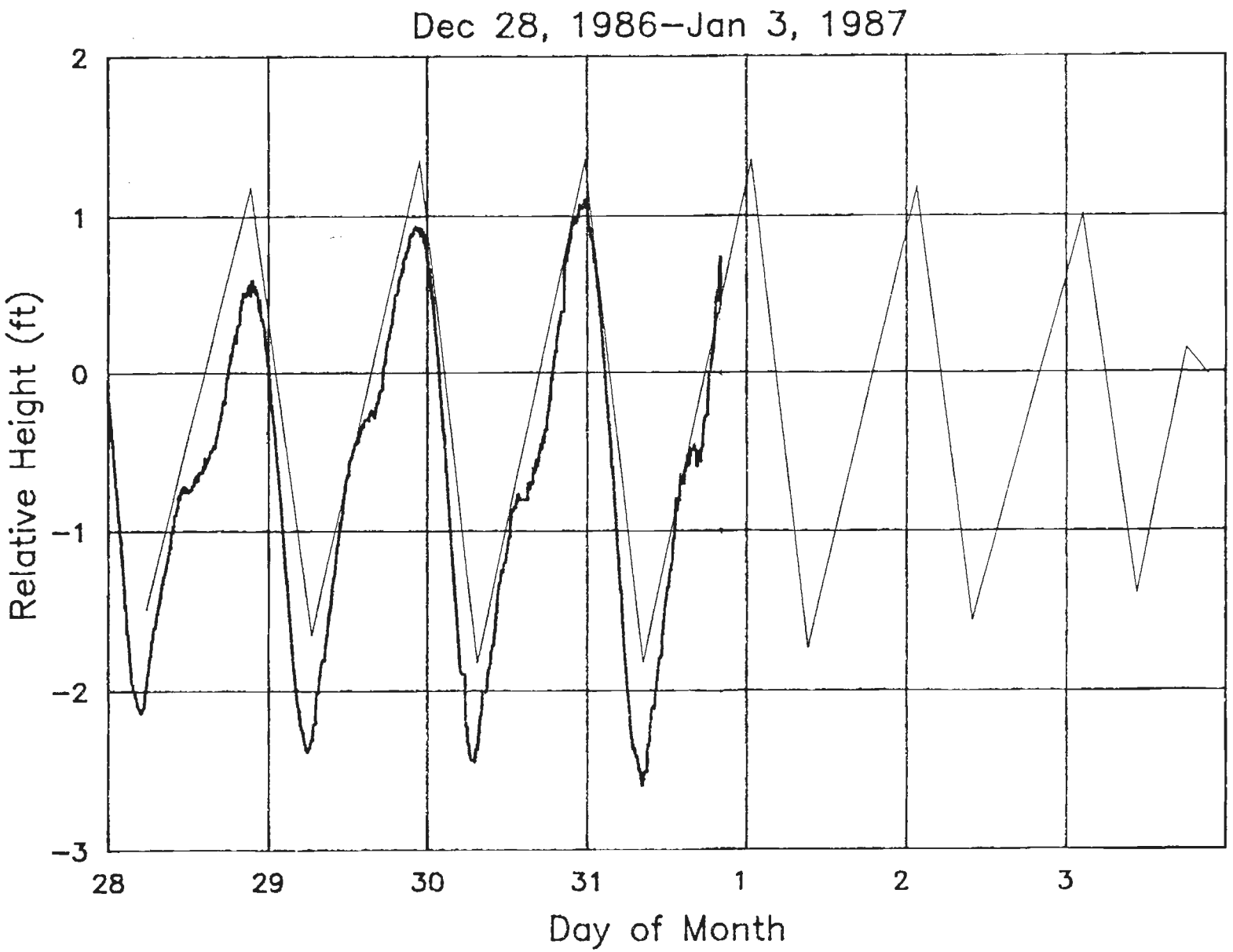
1
0
−1
−2
−3
21
22
23
24
25
26
27
28
Day of Month


Dec 28, 1986–Jan 3, 1987
Relative Height (ft)
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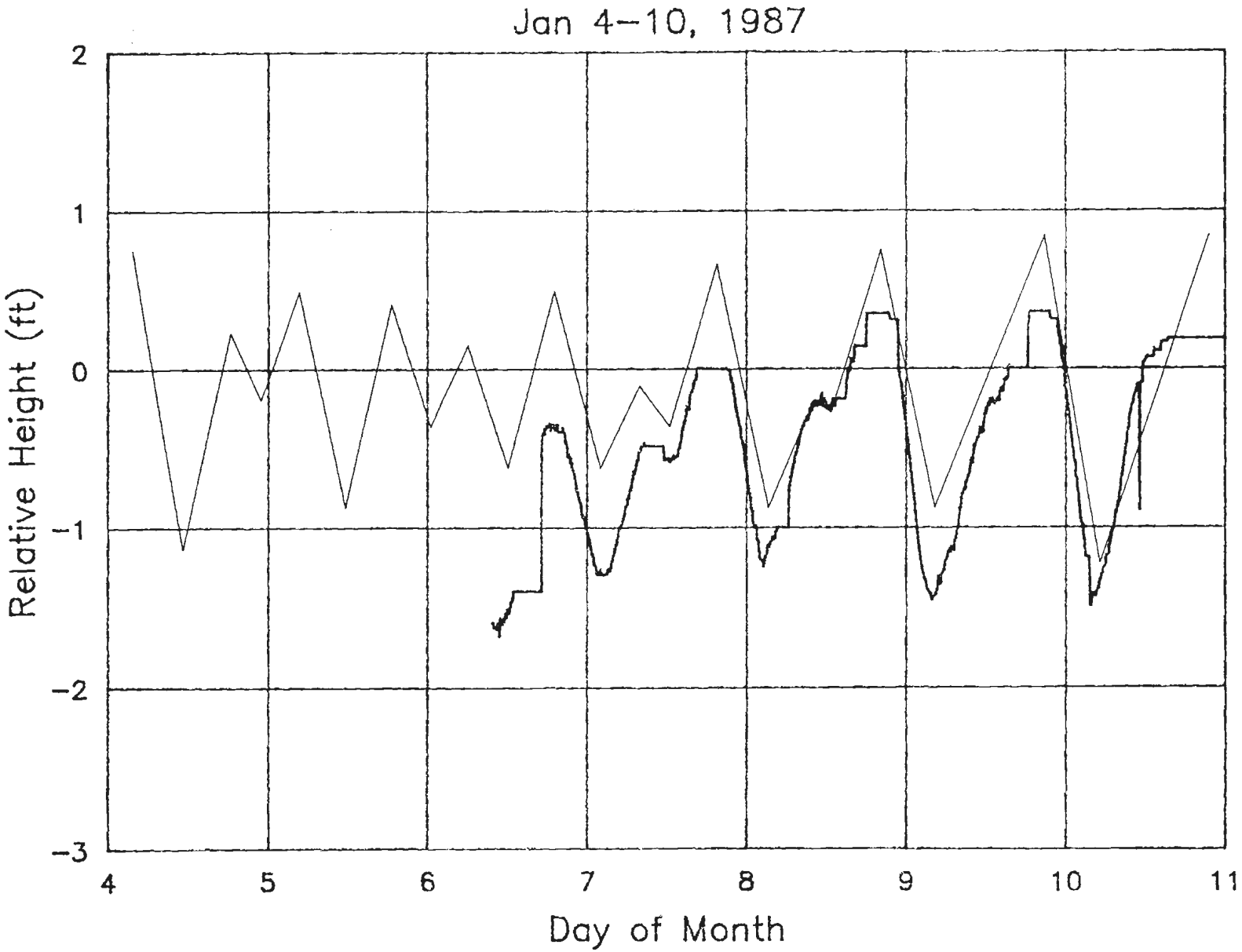
1
0
−1
−2
−3
28
29
30
31
1
2
3
Day of Month


Jan 4–10, 1987
Relative Height (ft)
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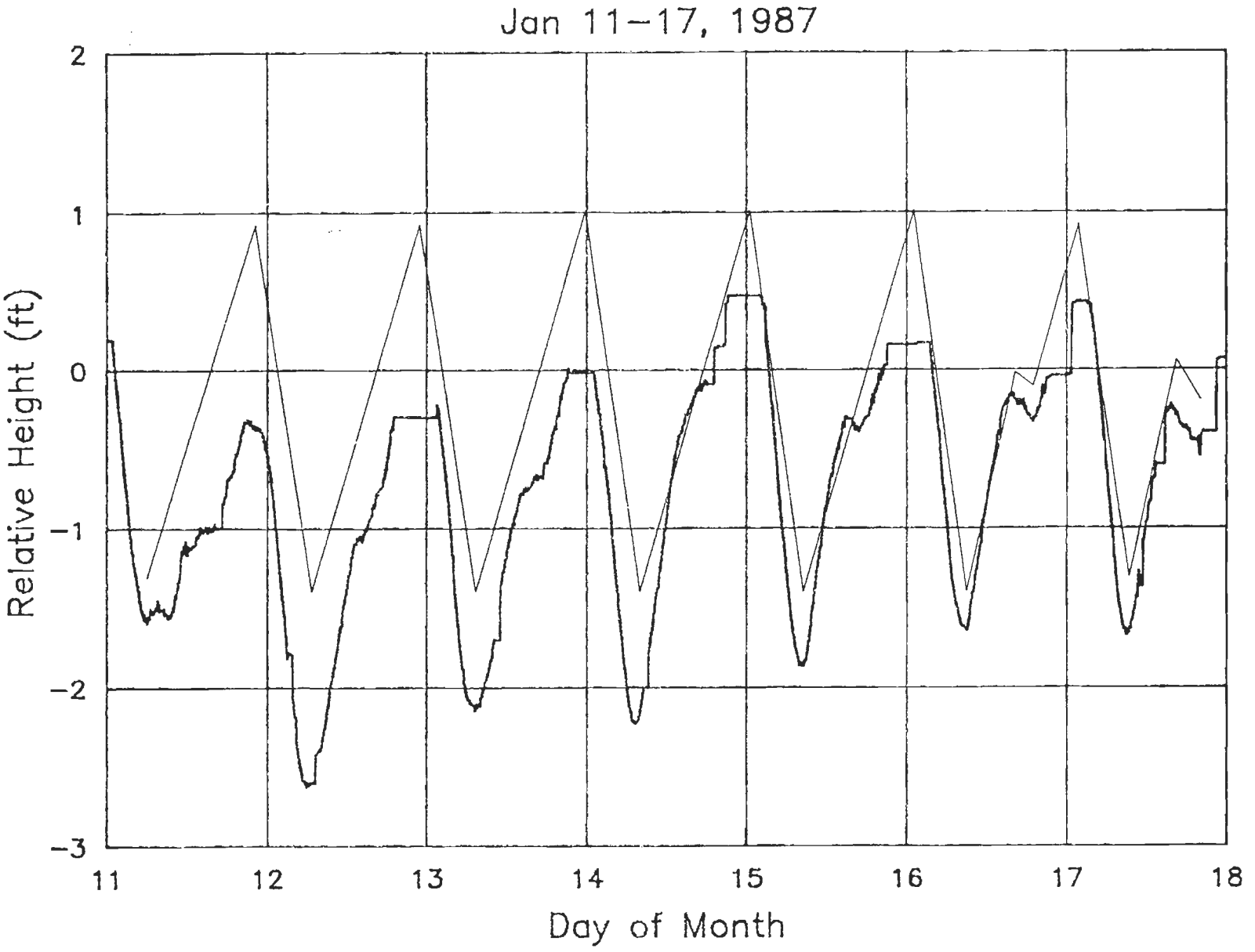
1
0
−1
−2
−3
4
5
6
7
8
9
10
11
Day of Month


Jan 11–17, 1987
Relative Height (ft)
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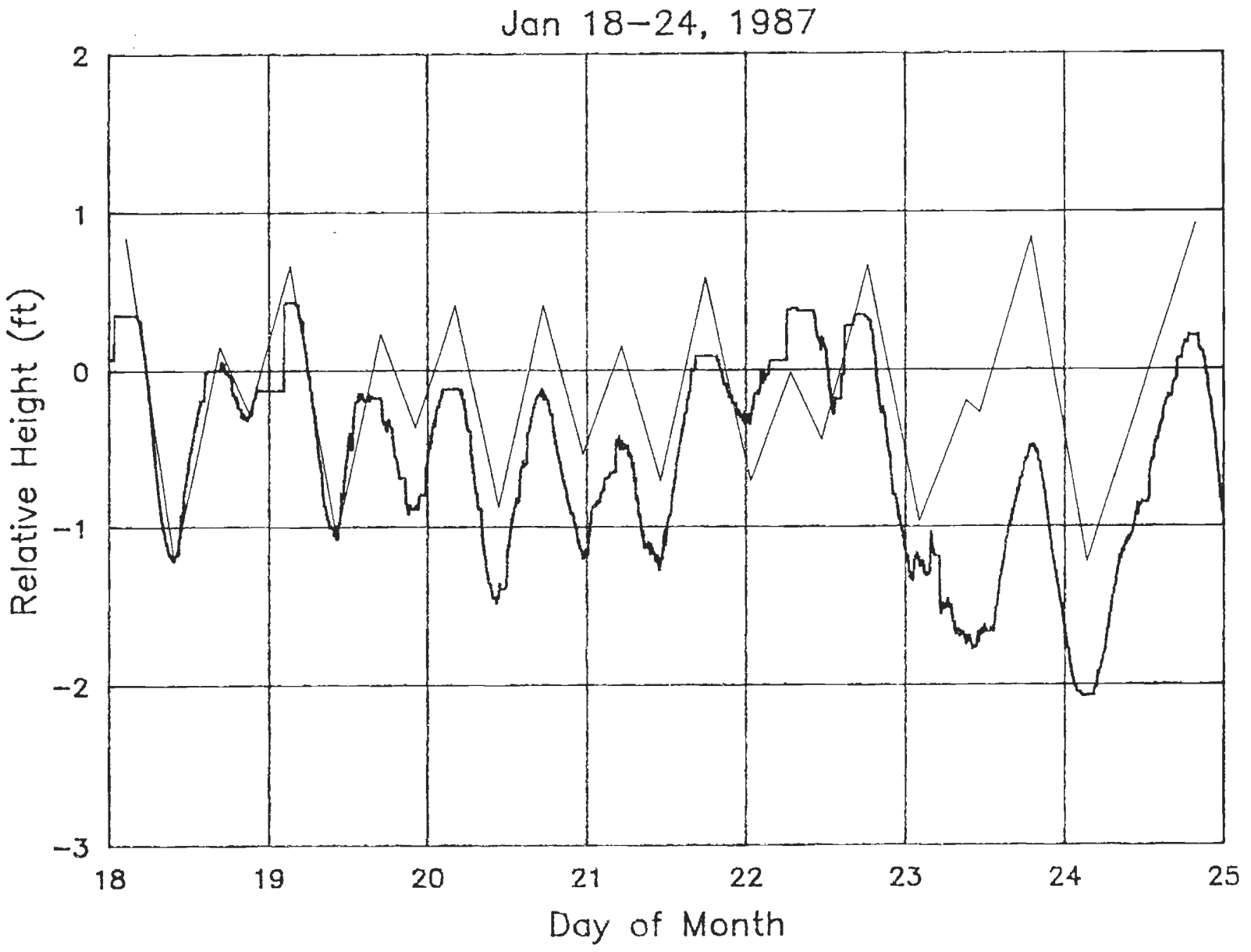
1
0
−1
−2
−3
11
12
13
14
15
16
17
18
Day of Month


Jan 18–24, 1987
Relative Height (ft)
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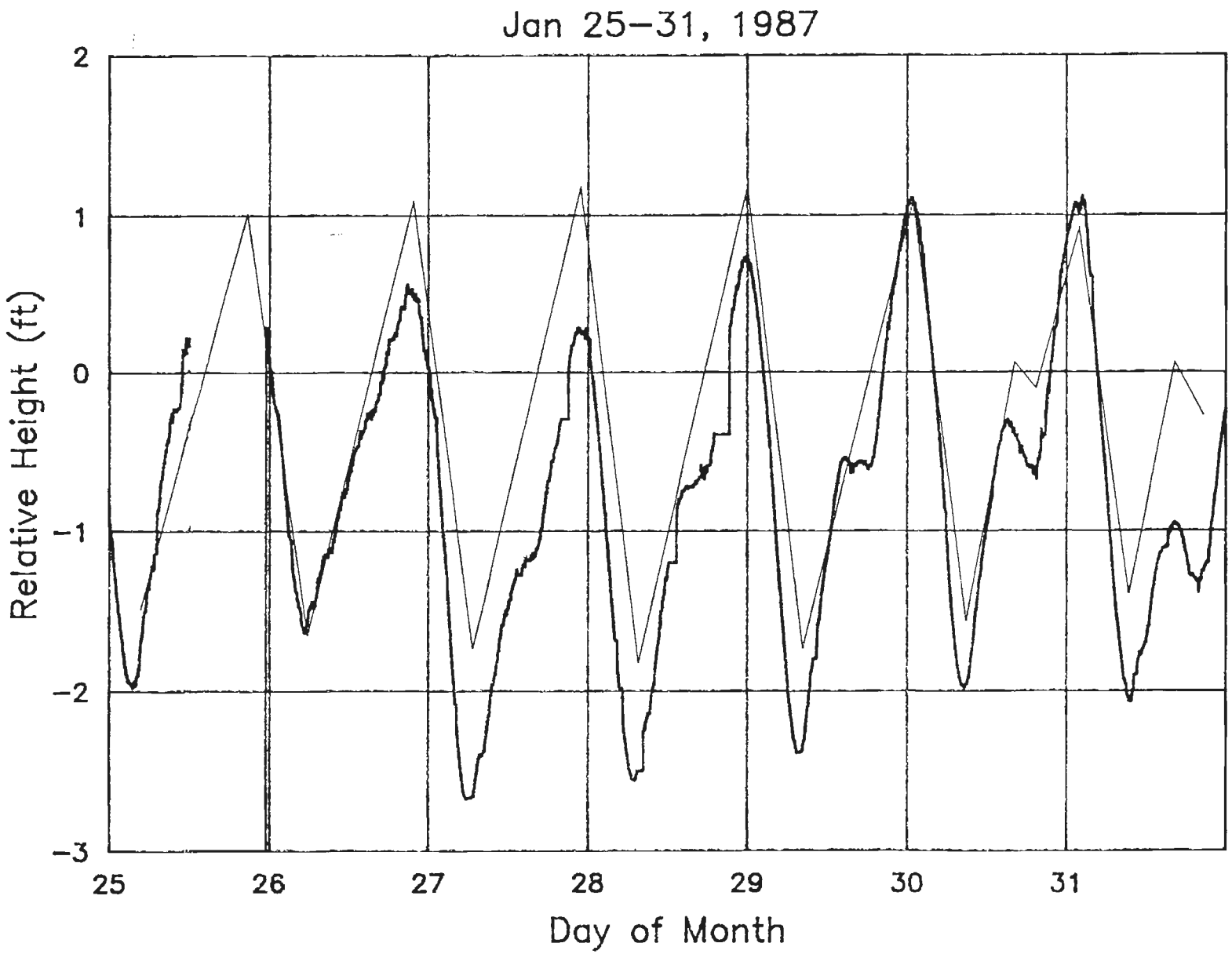
1
0
−1
−2
−3
18
19
20
21
22
23
24
25
Day of Month


Jan 25–31, 1987
Relative Height (ft)
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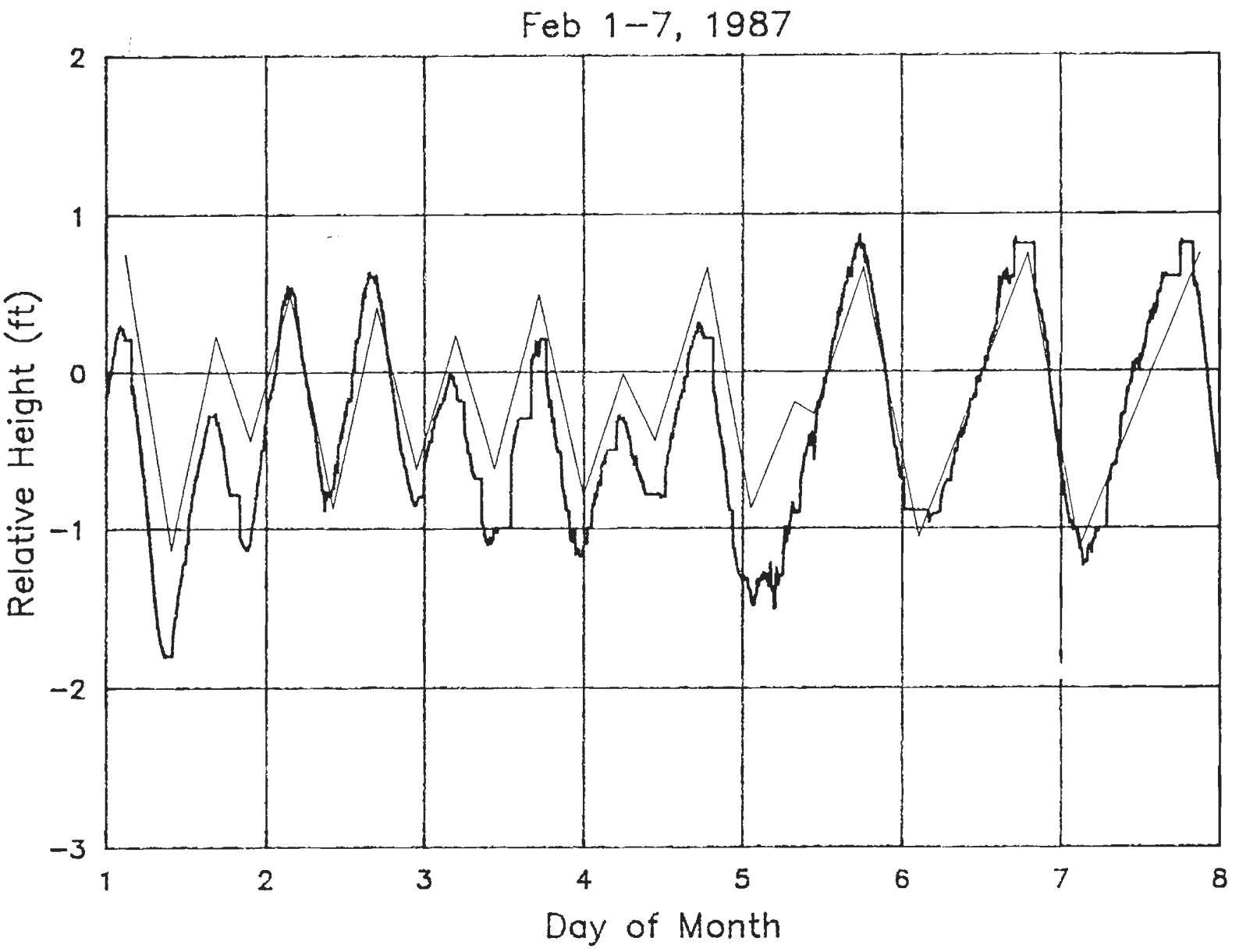
1
0
−1
−2
−3
25
26
27
28
29
30
31
Day of Month


Feb 1–7, 1987
Relative Height (ft)
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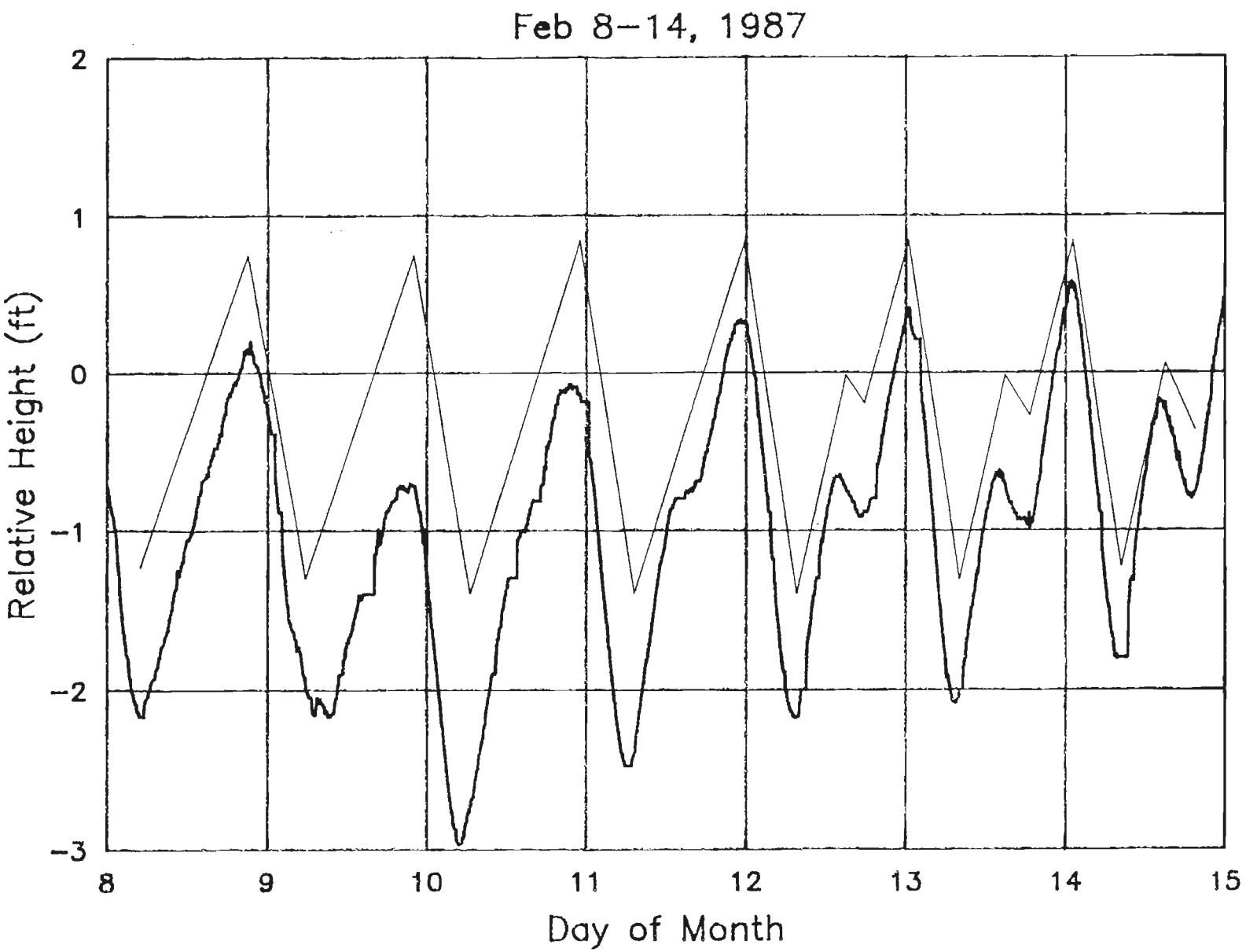
1
0
−1
−2
−3
1
2
3
4
5
6
7
8
Day of Month


Feb 8–14, 1987
Relative Height (ft)
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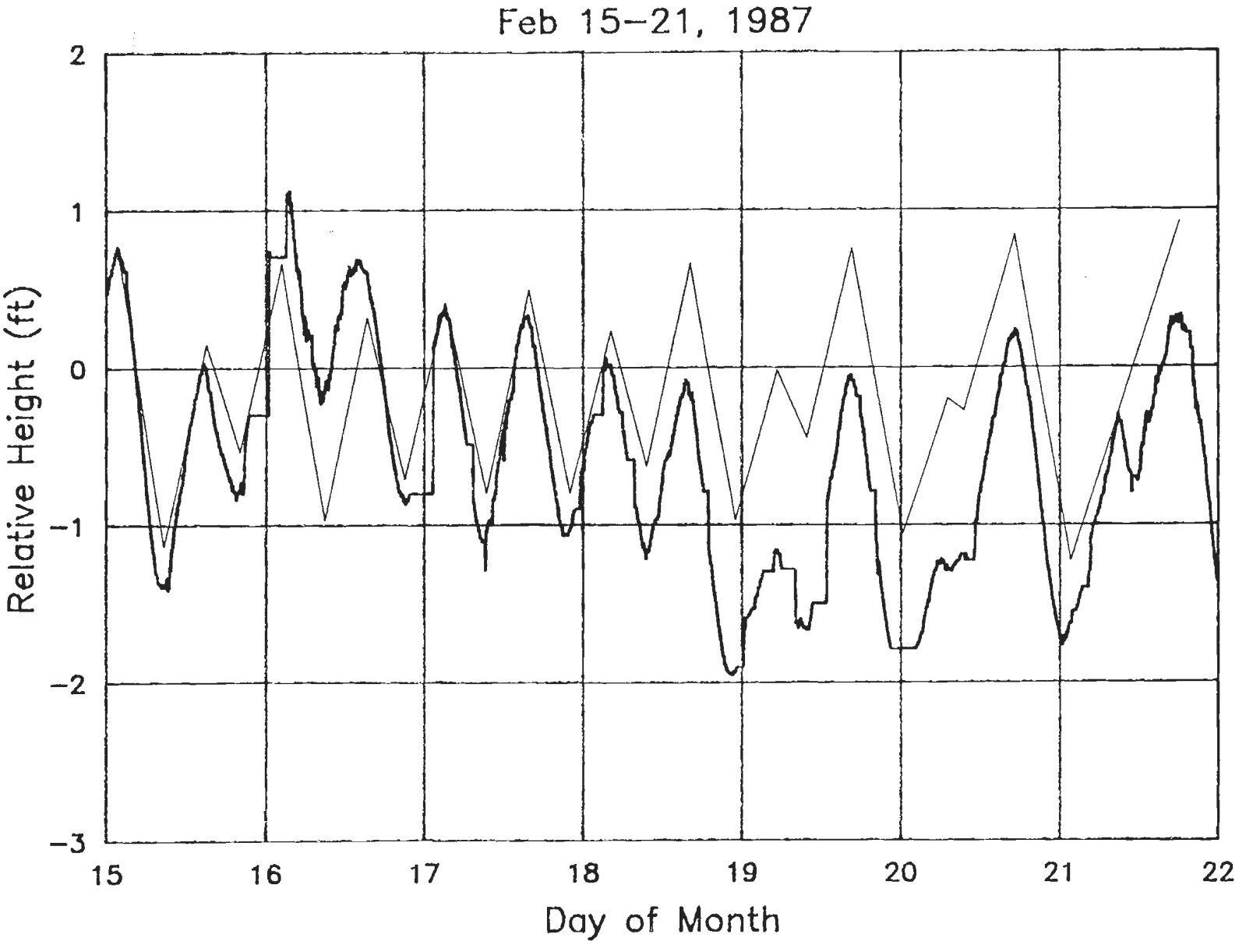
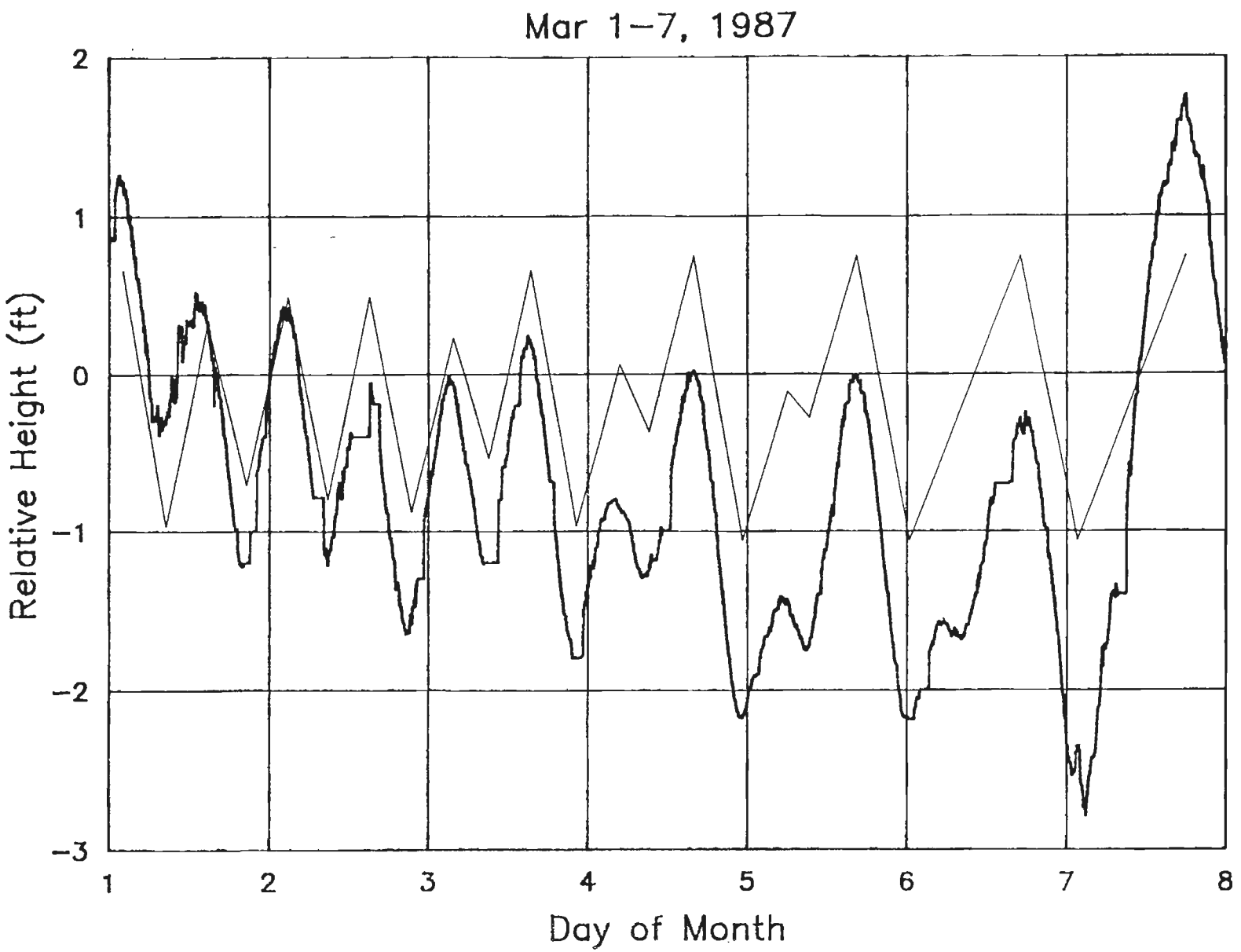
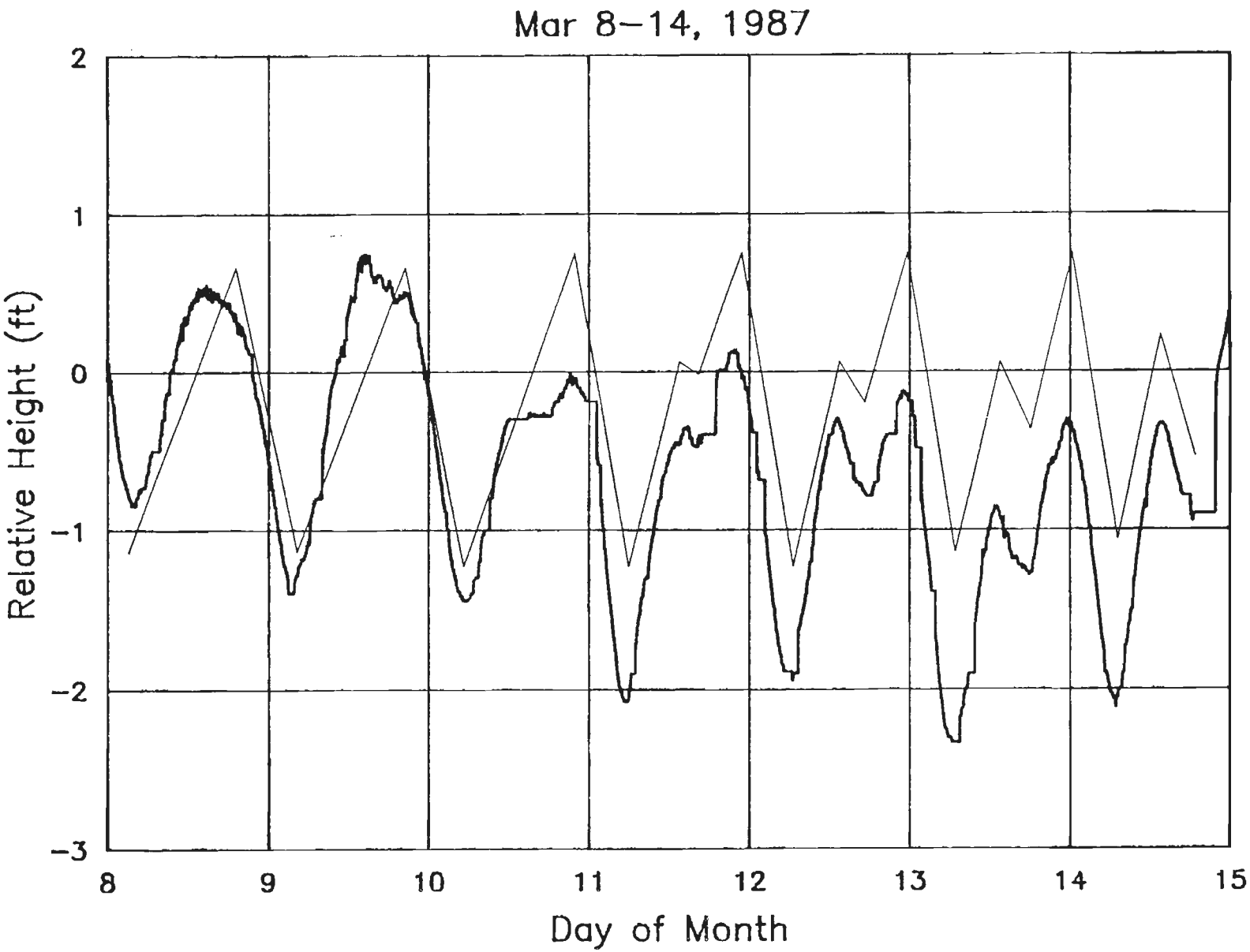
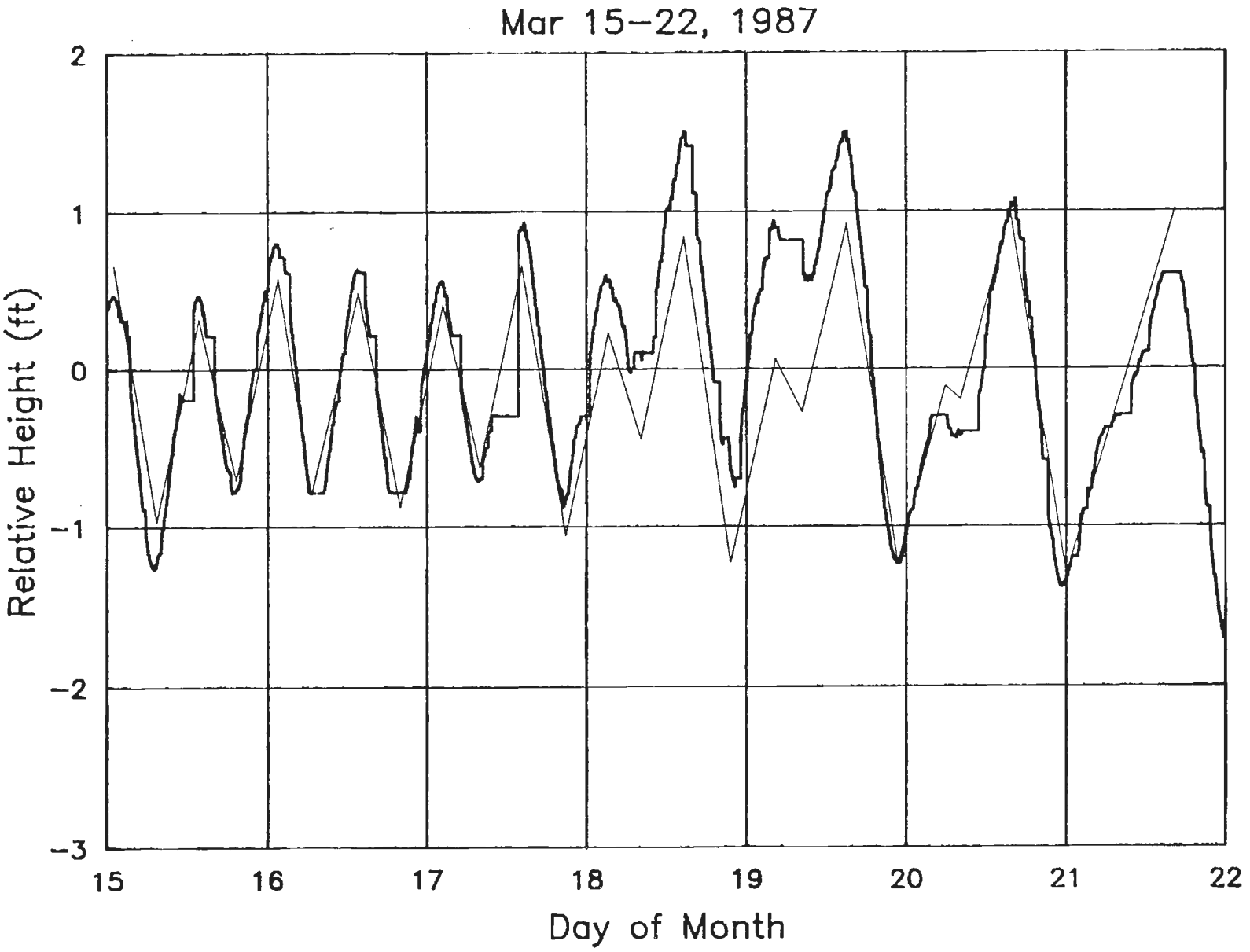
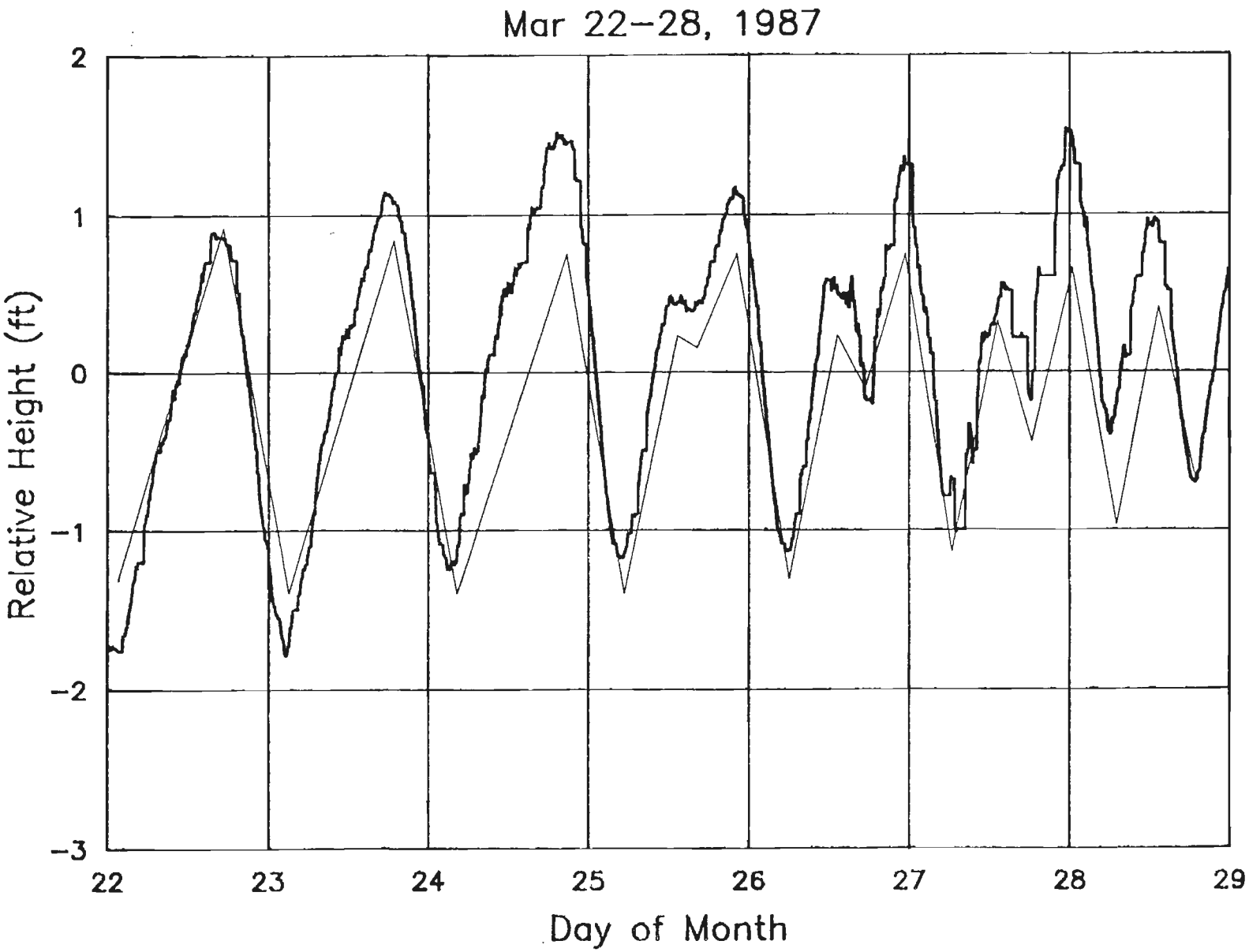
0
−1
−2
−3
8
9
10
11
12
13
14
15
Day of Month

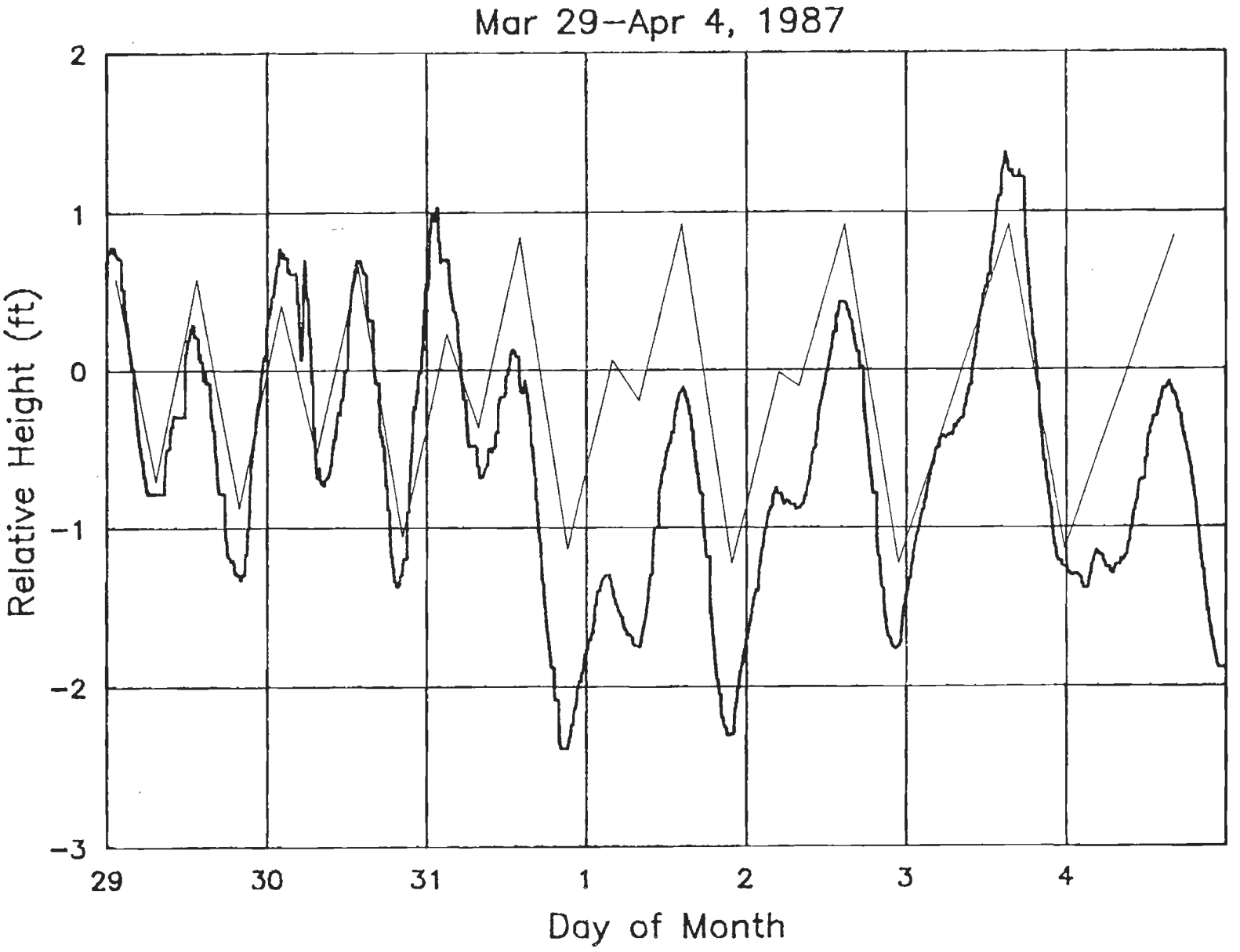

Feb 15–21, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
15
16
17
18
19
20
21
22
Day of Month

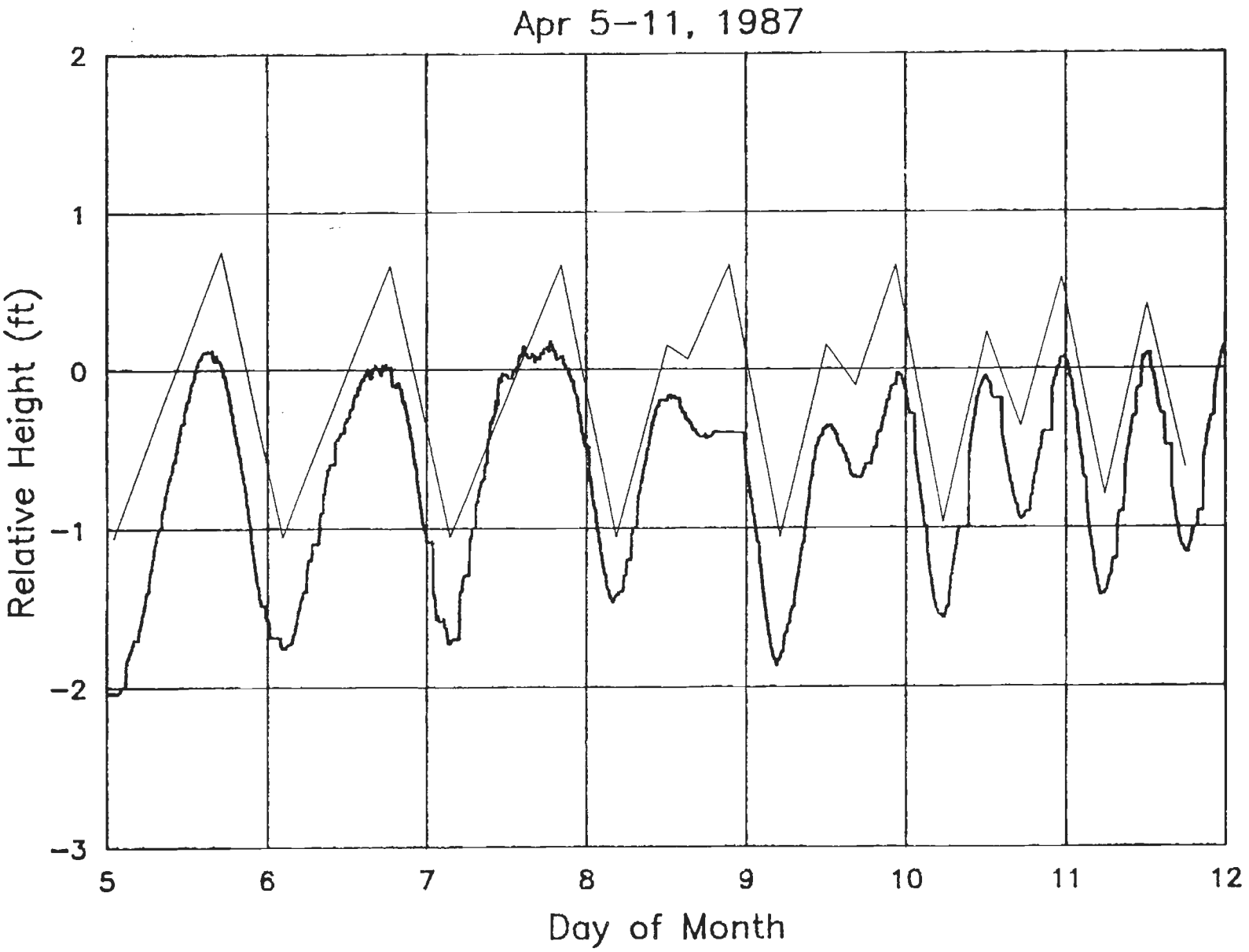

Mar 1–7, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
1
2
3
4
5
6
7
8
Day of Month

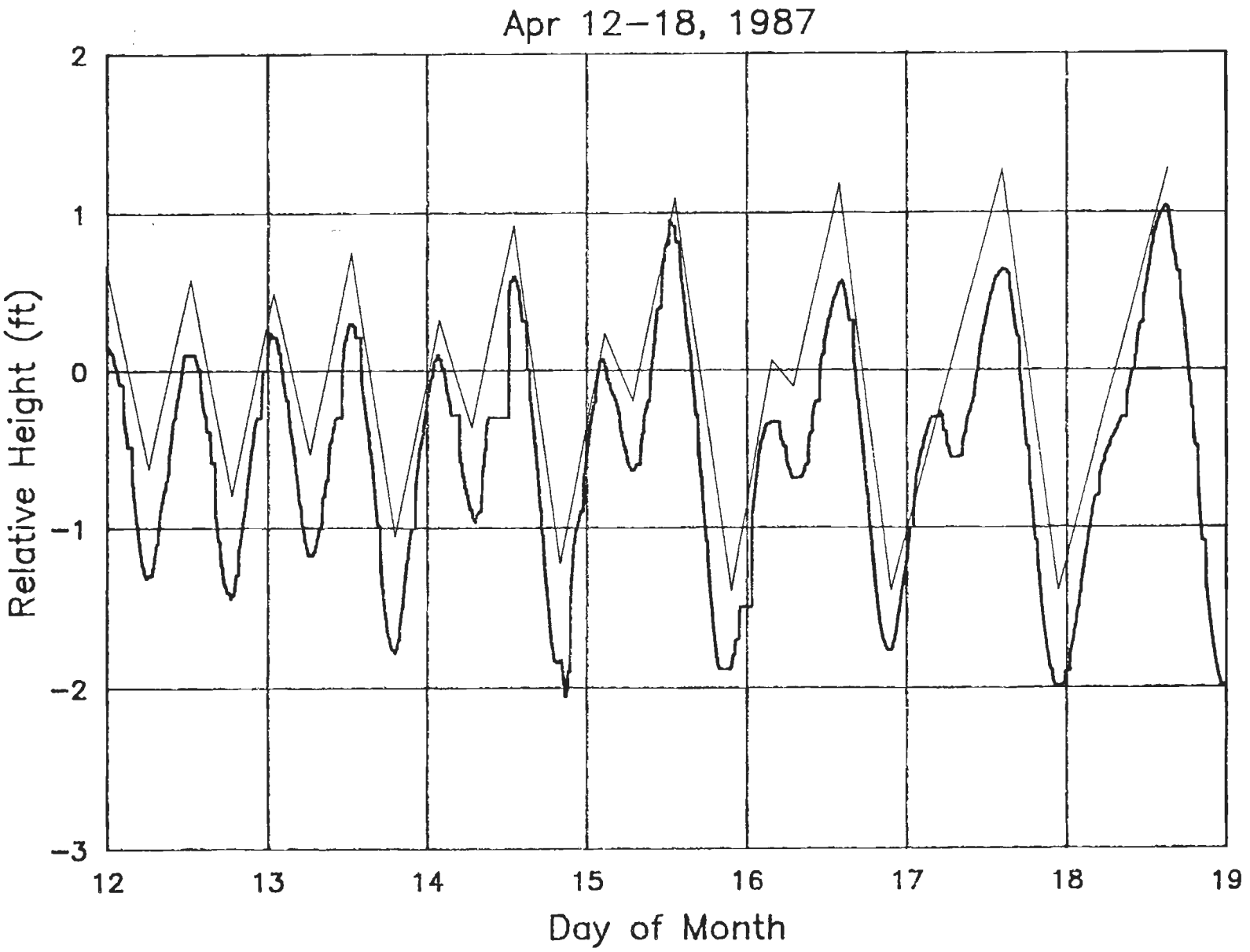

Mar 8–14, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
8
9
10
11
12
13
14
15
Day of Month

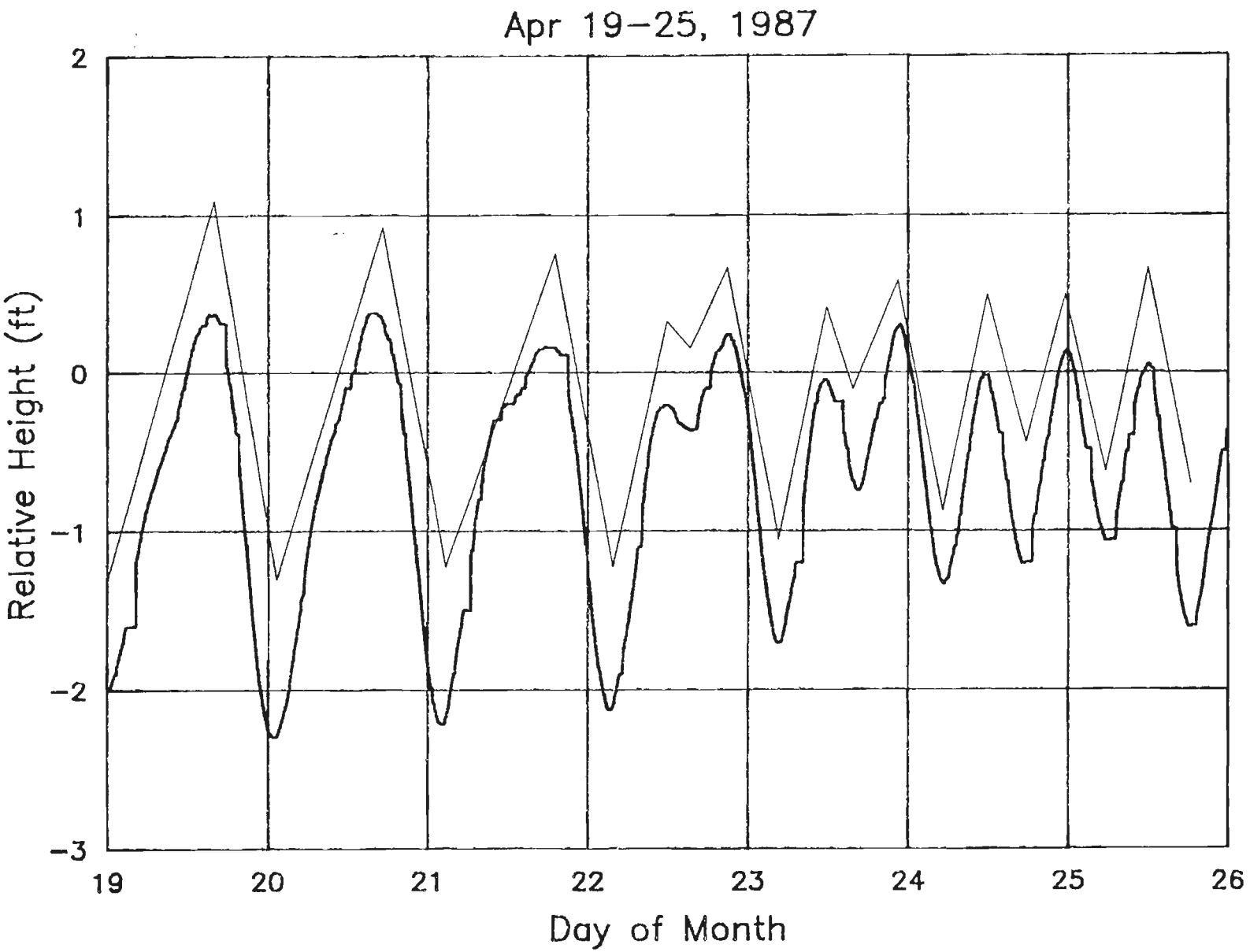

Mar 15–22, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
15
16
17
18
19
20
21
22
Day of Month


Mar 22–28, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
22
23
24
25
26
27
28
29
Day of Month


Mar 29–Apr 4, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
29
30
31
1
2
3
4
Day of Month


Apr 5–11, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
5
6
7
8
9
10
11
12
Day of Month


Apr 12–18, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
12
13
14
15
16
17
18
19
Day of Month


Apr 19–25, 1987
Relative Height (ft)
2
1
0
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−2
−3
19
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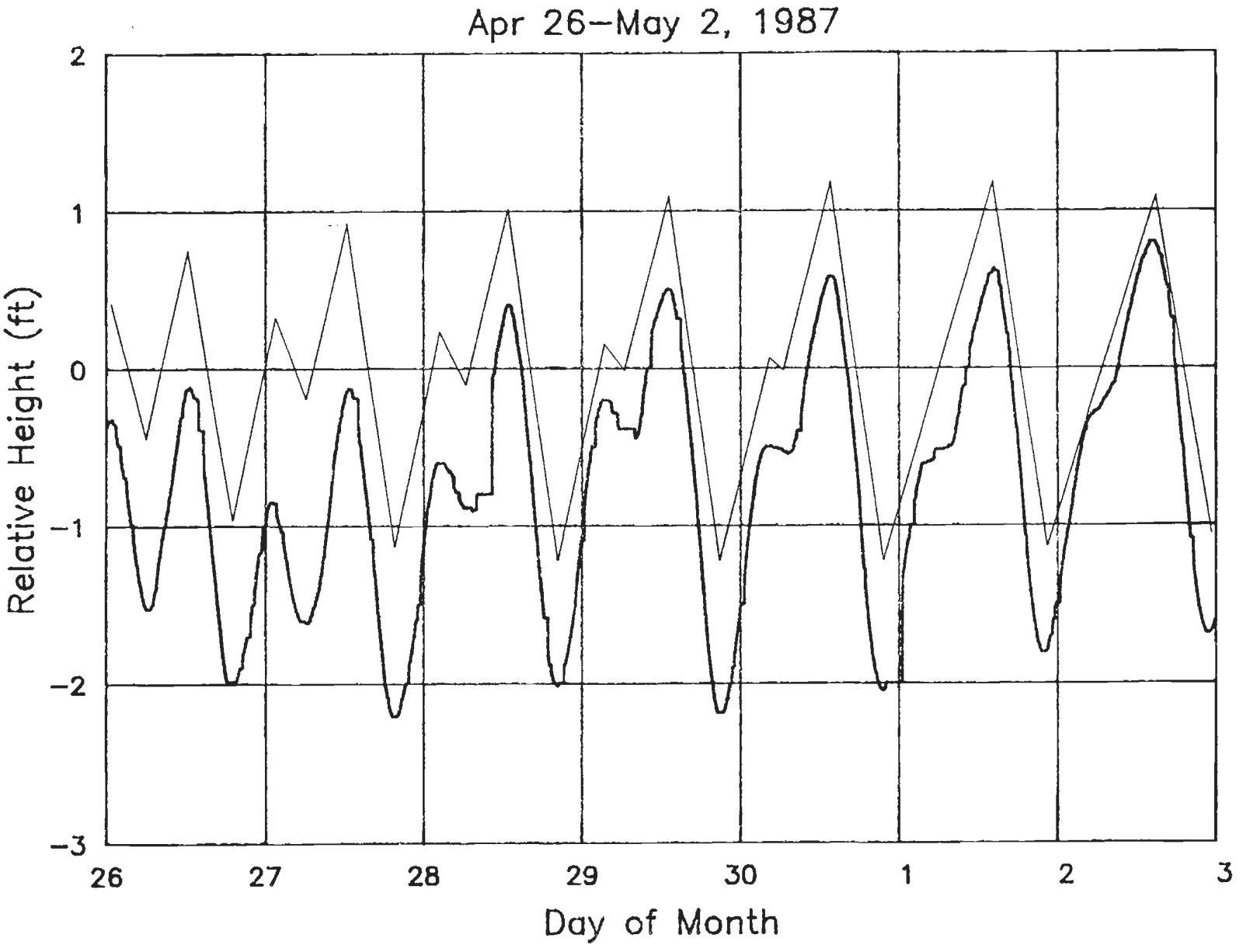
21
22
23
24
25
26
Day of Month


Apr 26–May 2, 1987
Relative Height (ft)
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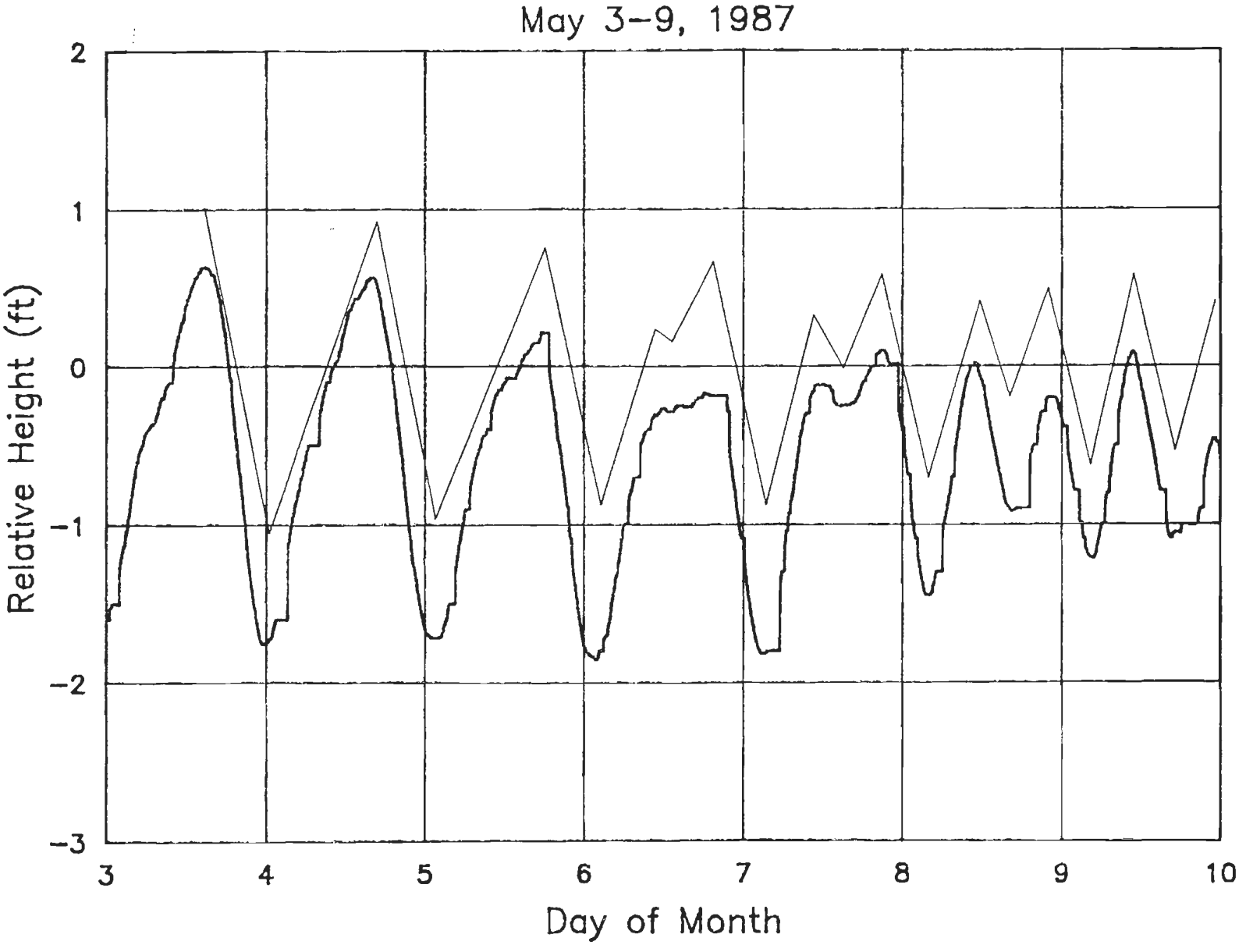
1
0
−1
−2
−3
26
27
28
29
30
1
2
3
Day of Month


May 3–9, 1987
Relative Height (ft)
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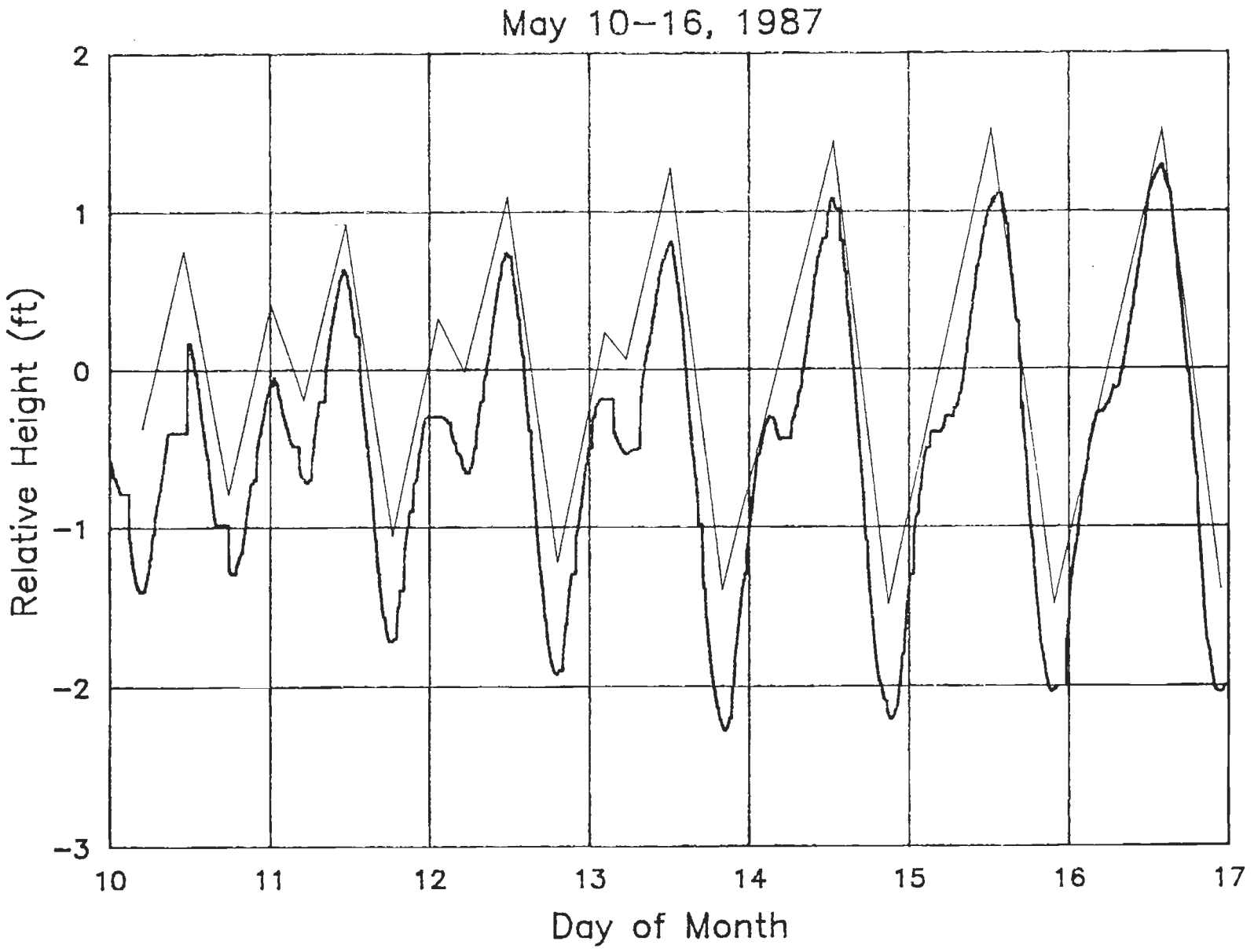
1
0
−1
−2
−3
3
4
5
6
7
8
9
10
Day of Month


May 10–16, 1987
Relative Height (ft)
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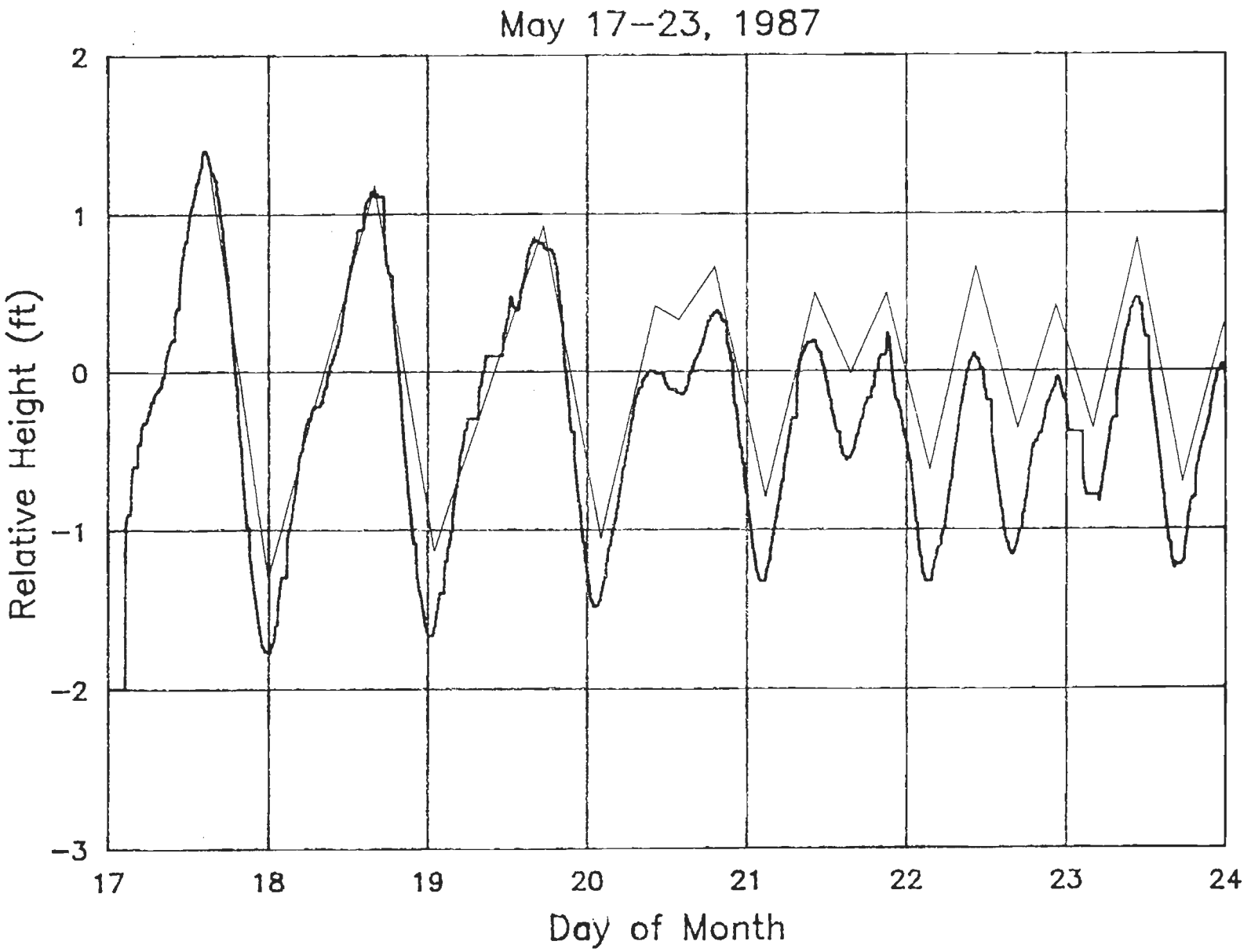
1
0
−1
−2
−3
10
11
12
13
14
15
16
17
Day of Month


May 17–23, 1987
Relative Height (ft)
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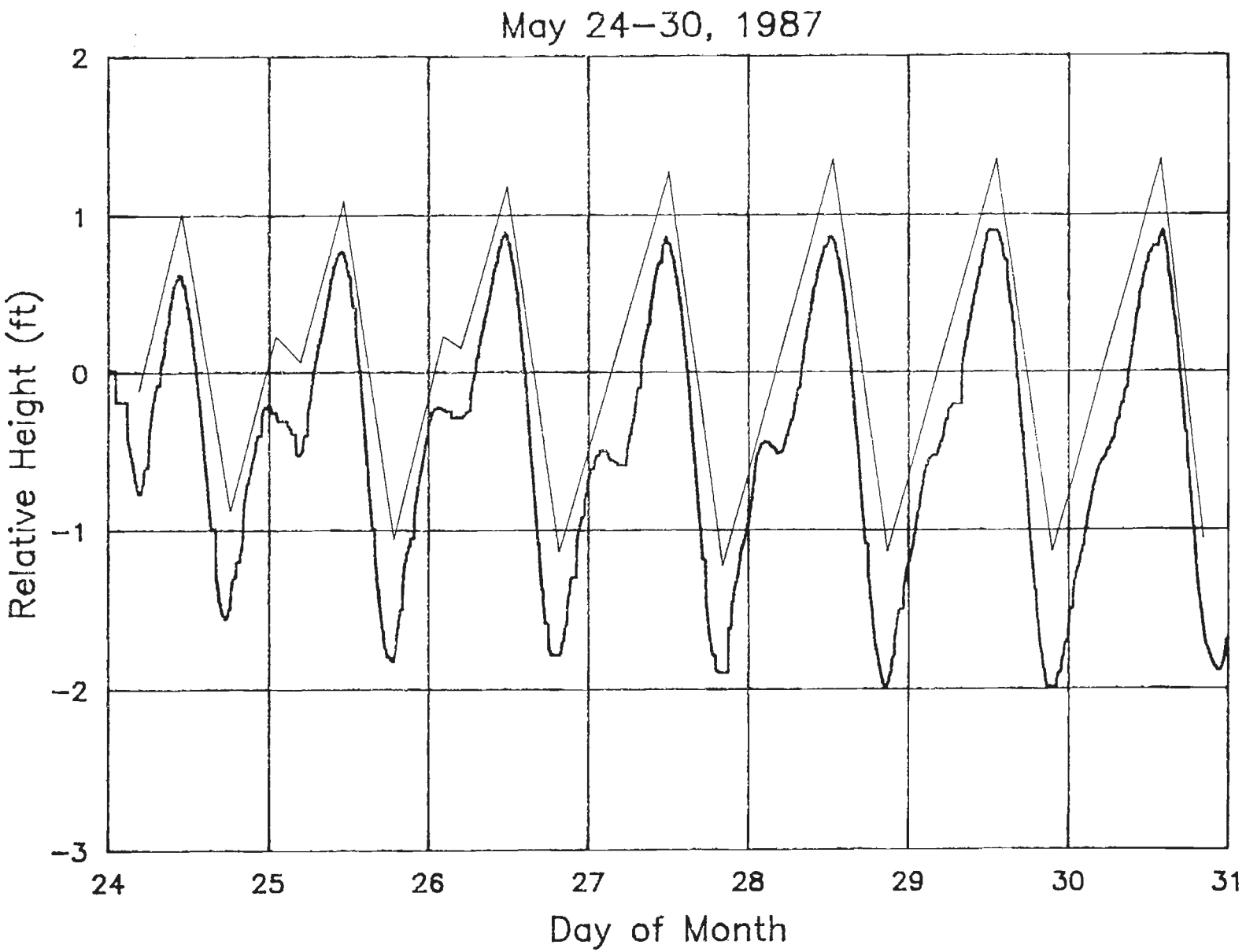
−1
−2
−3
17
18
19
20
21
22
23
24
Day of Month


May 24–30, 1987
Relative Height (ft)
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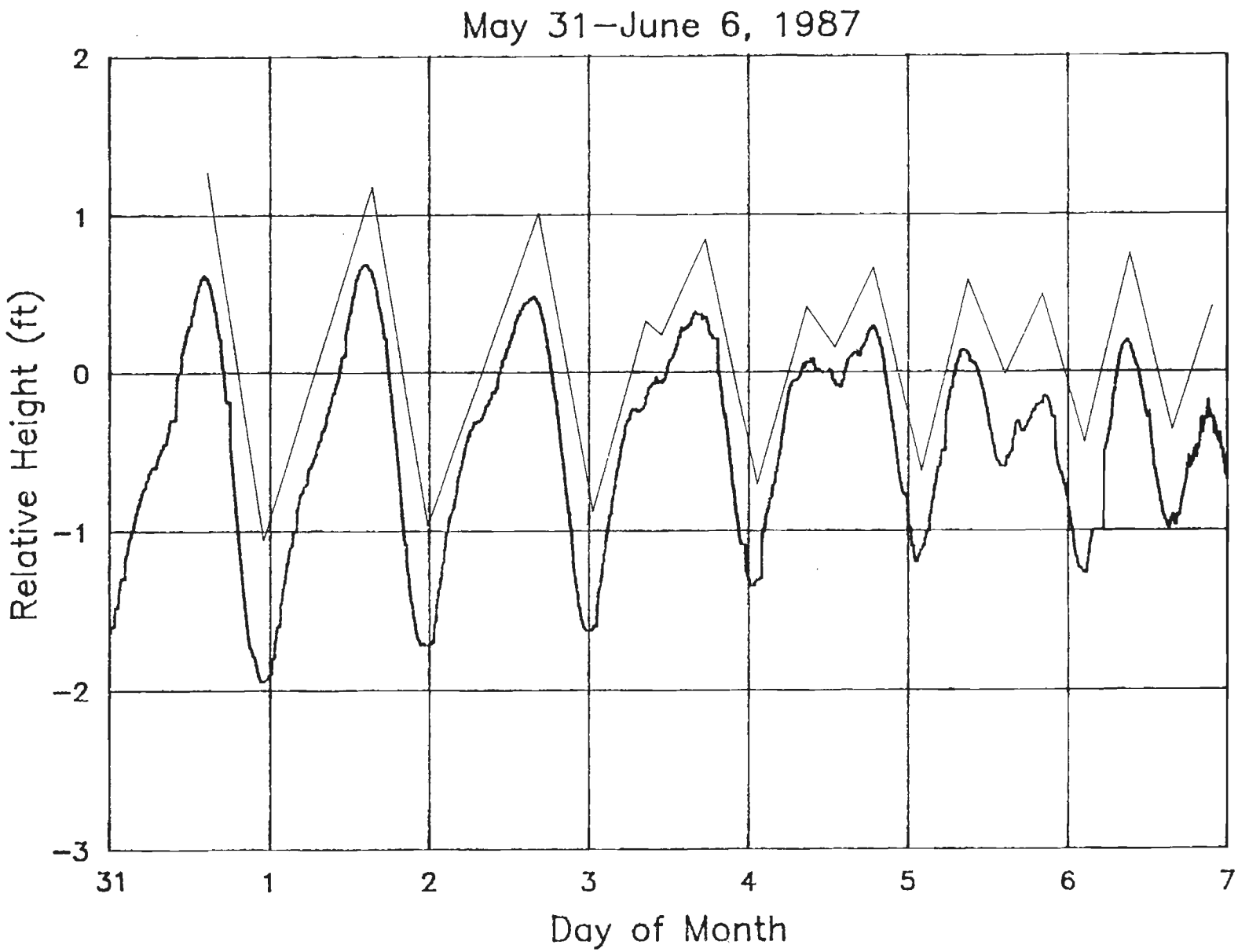
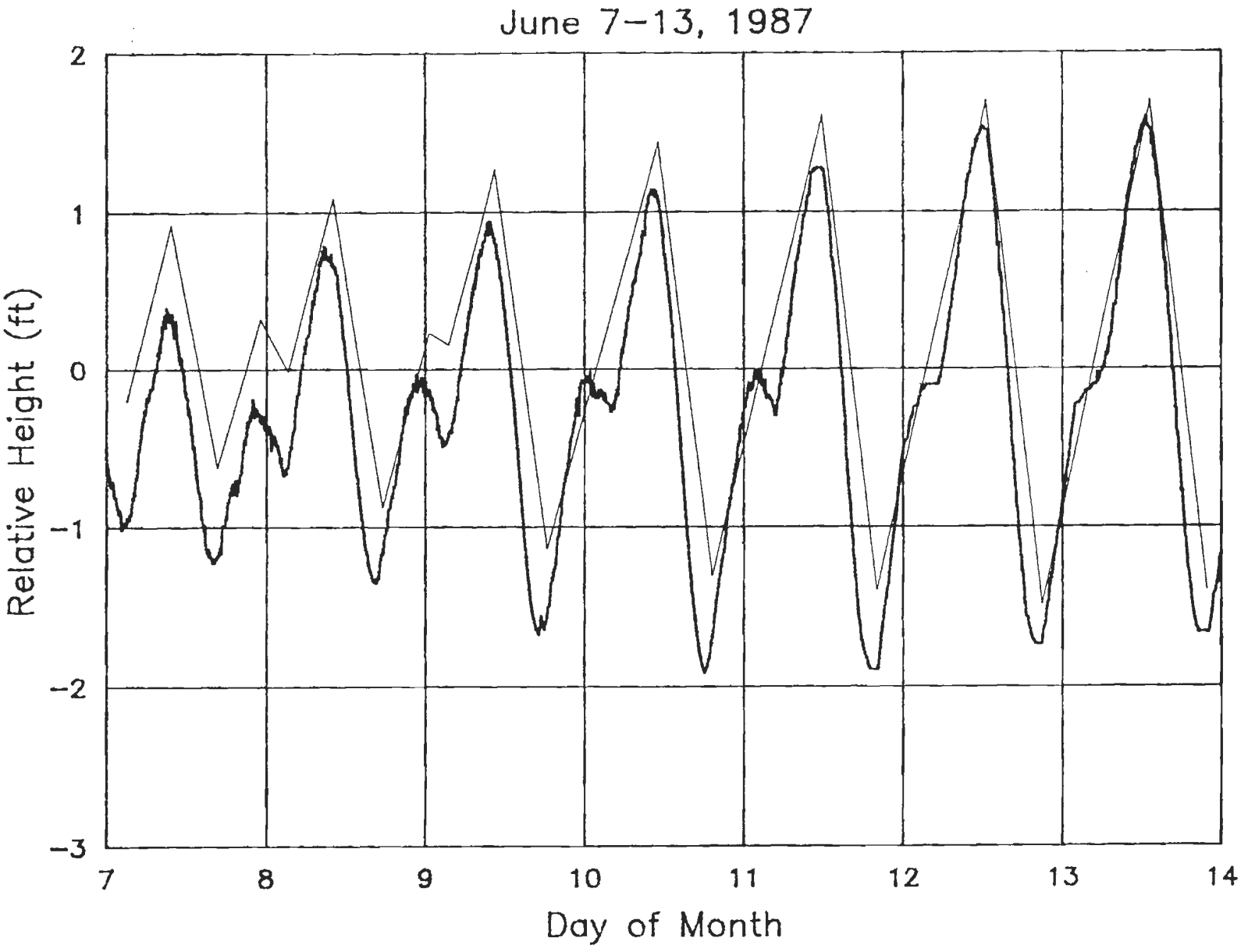
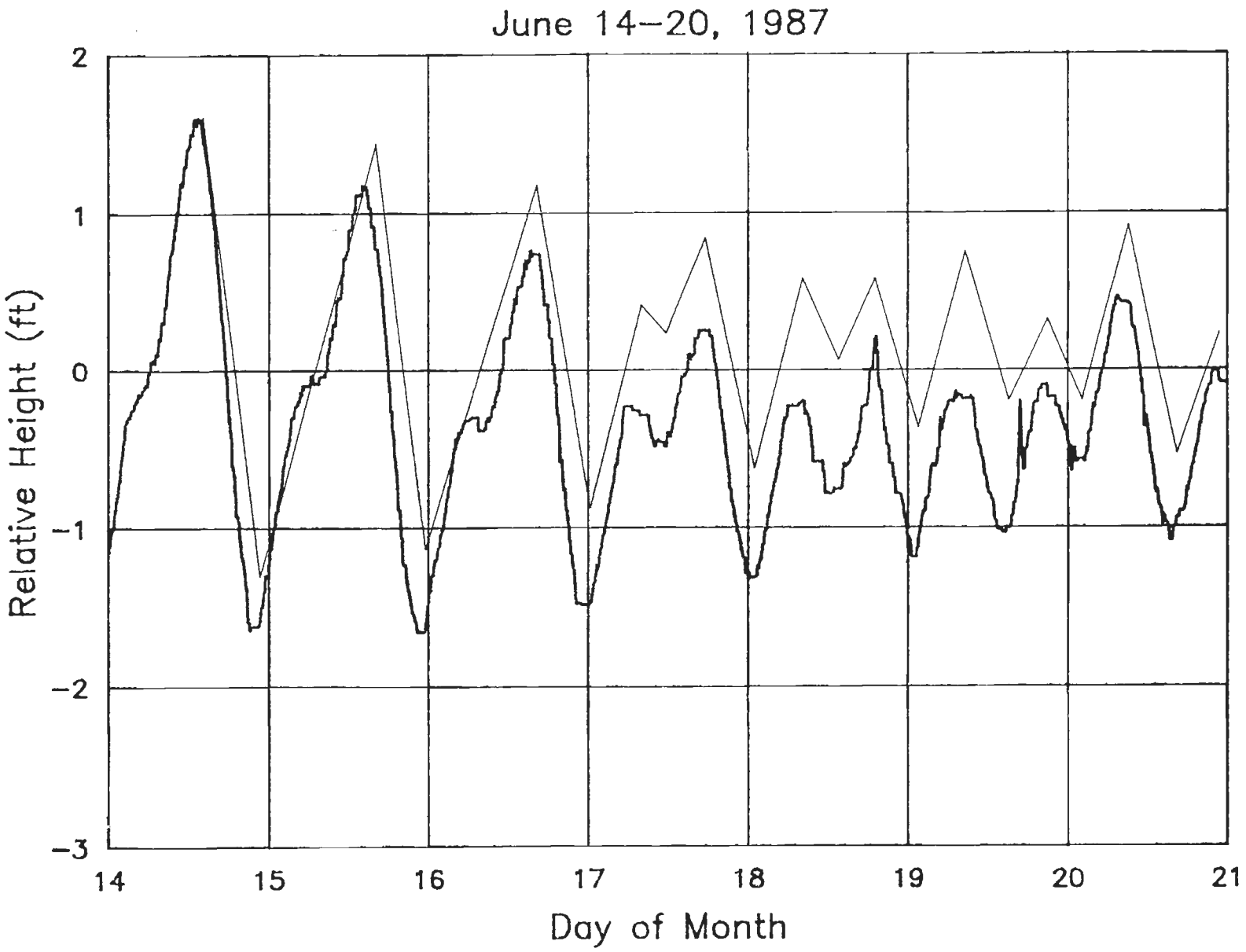
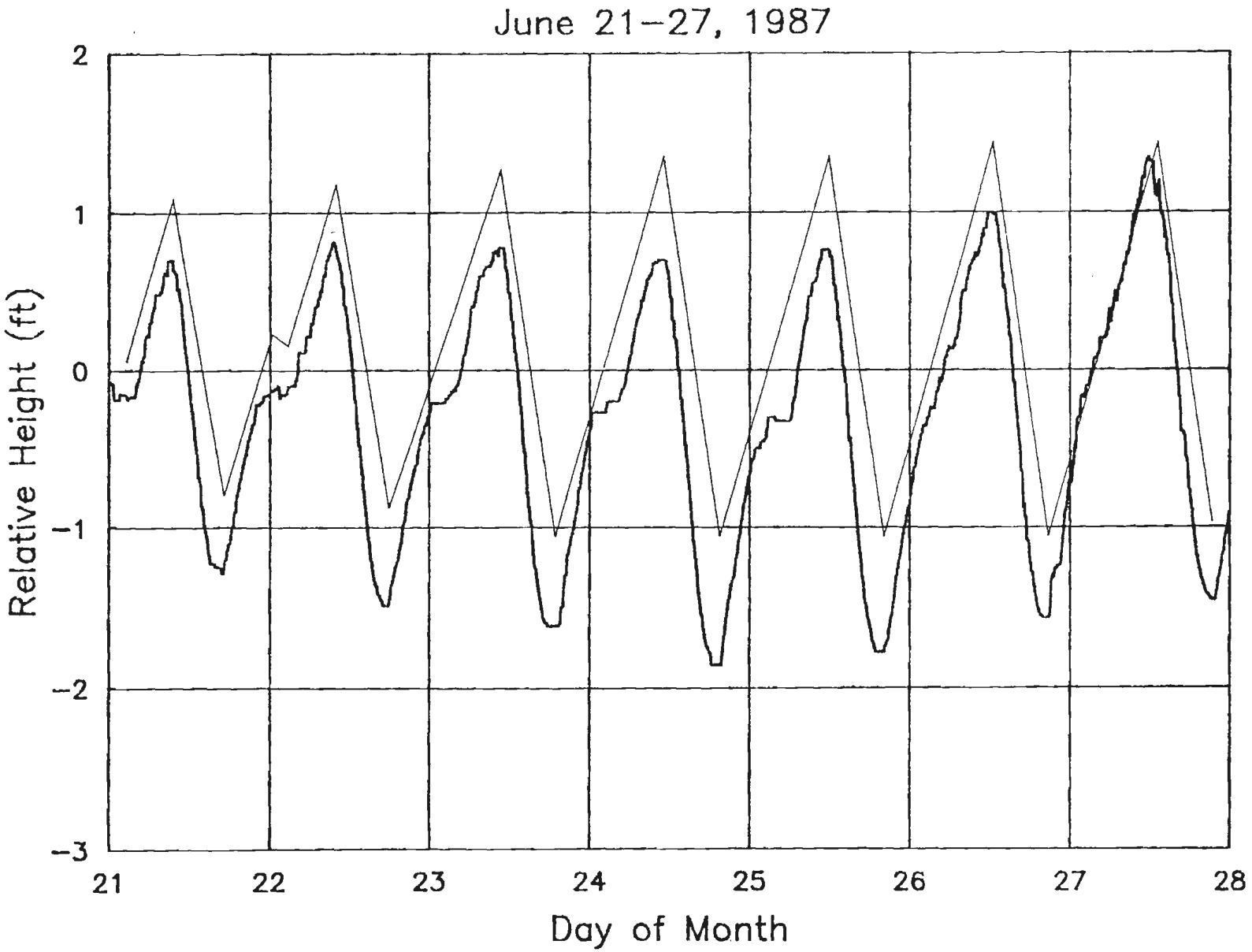
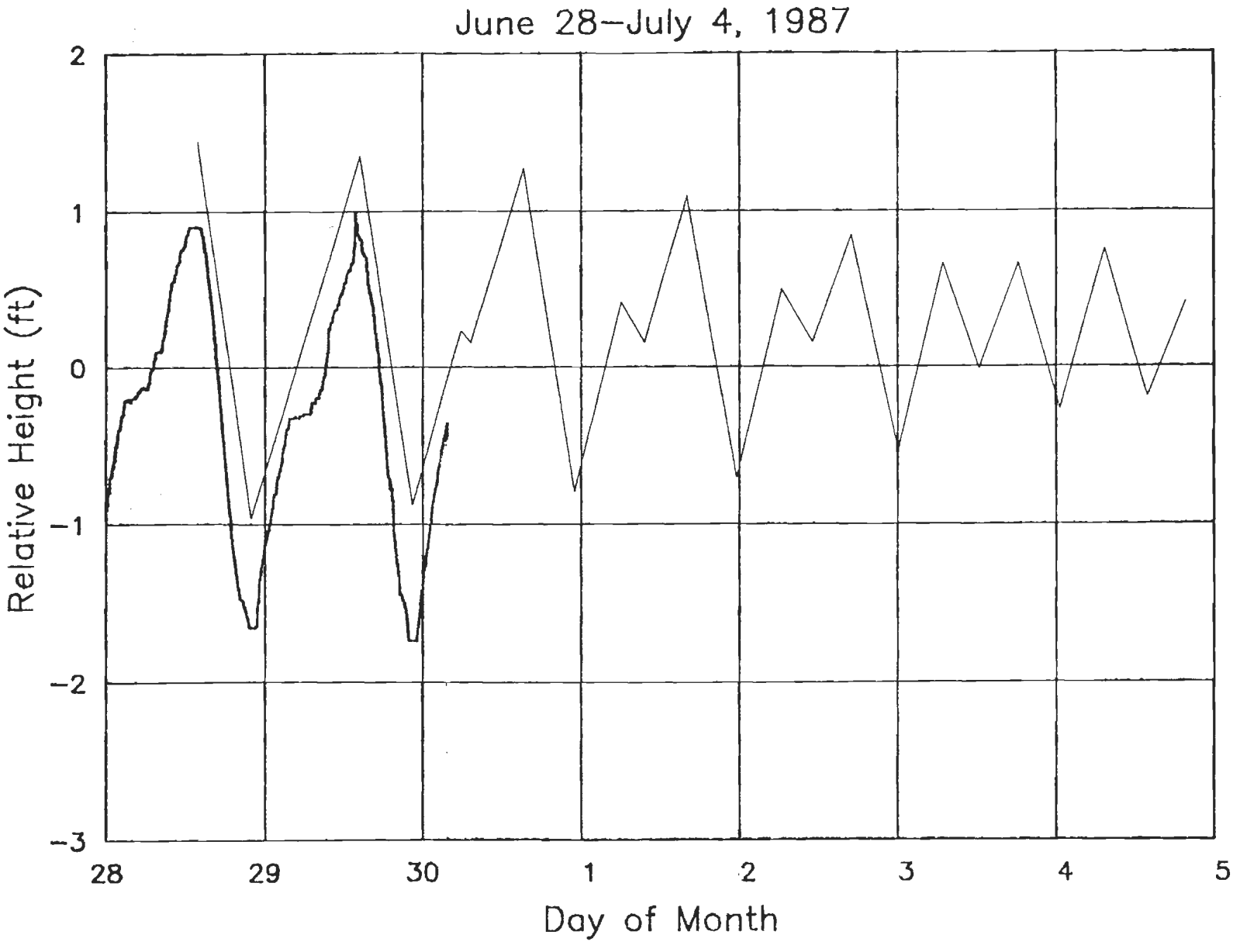
−1
−2
−3
24
25
26
27
28
29
30
31
Day of Month

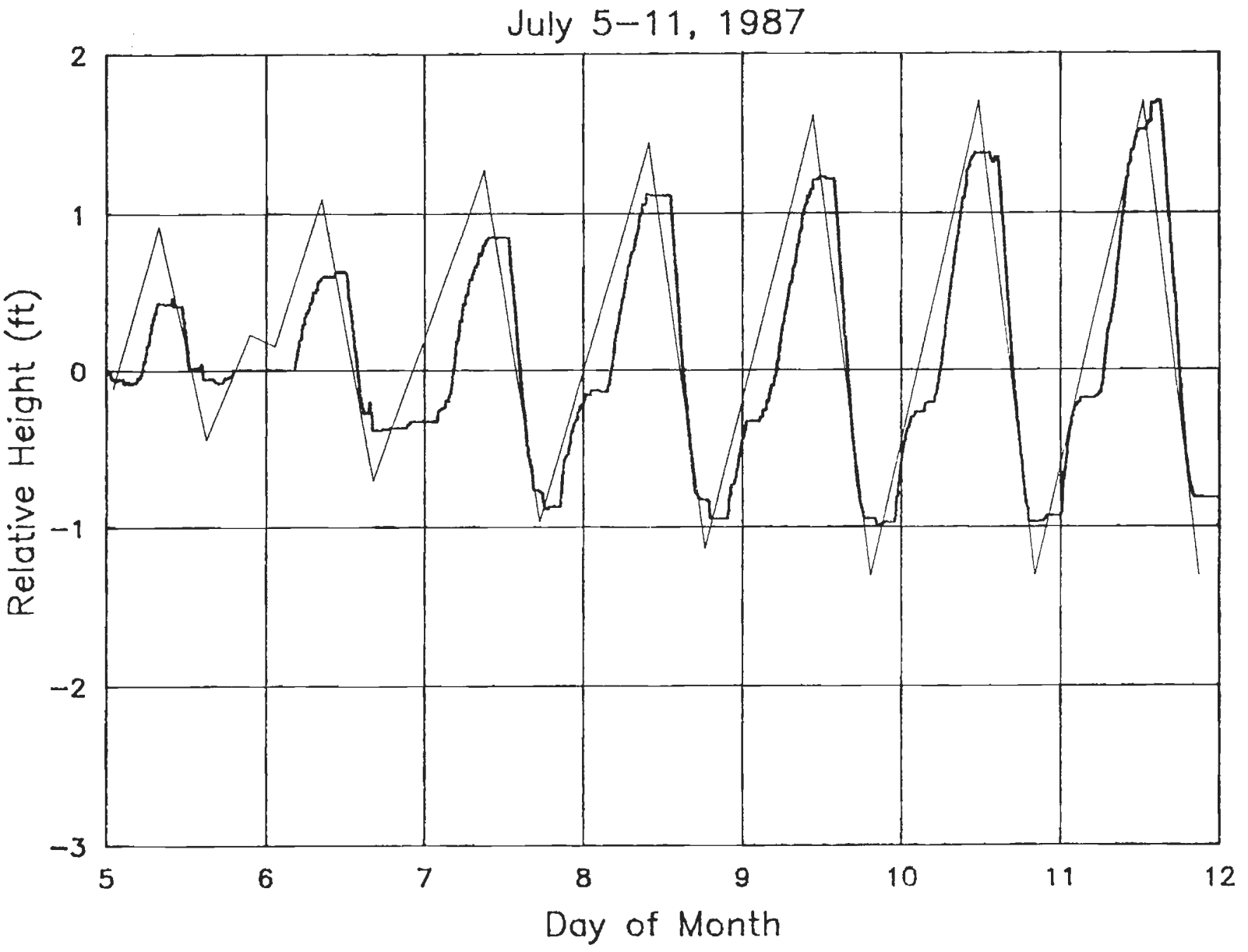

May 31–June 6, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
31
1
2
3
4
5
6
7
Day of Month

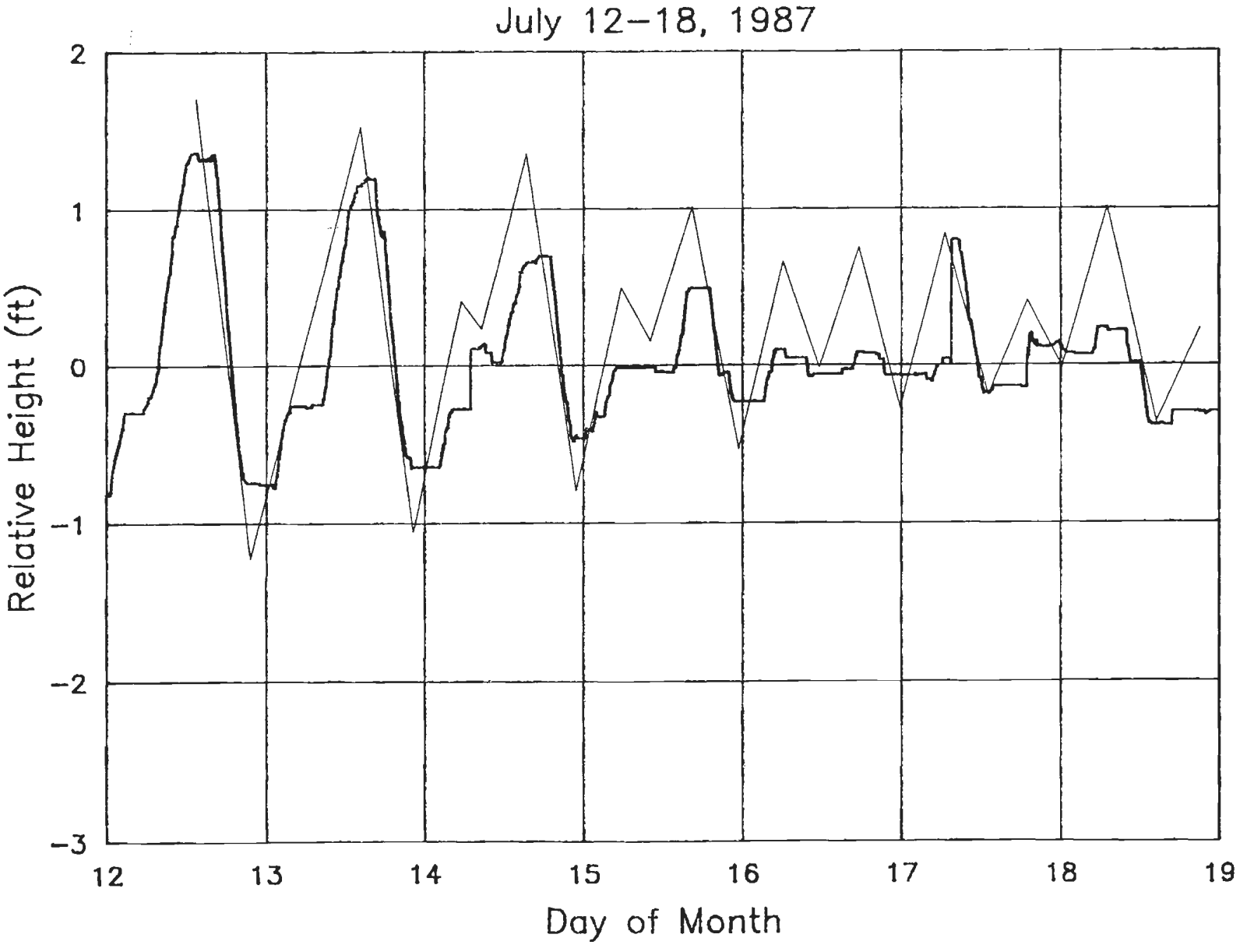

June 7–13, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
7
8
9
10
11
12
13
14
Day of Month

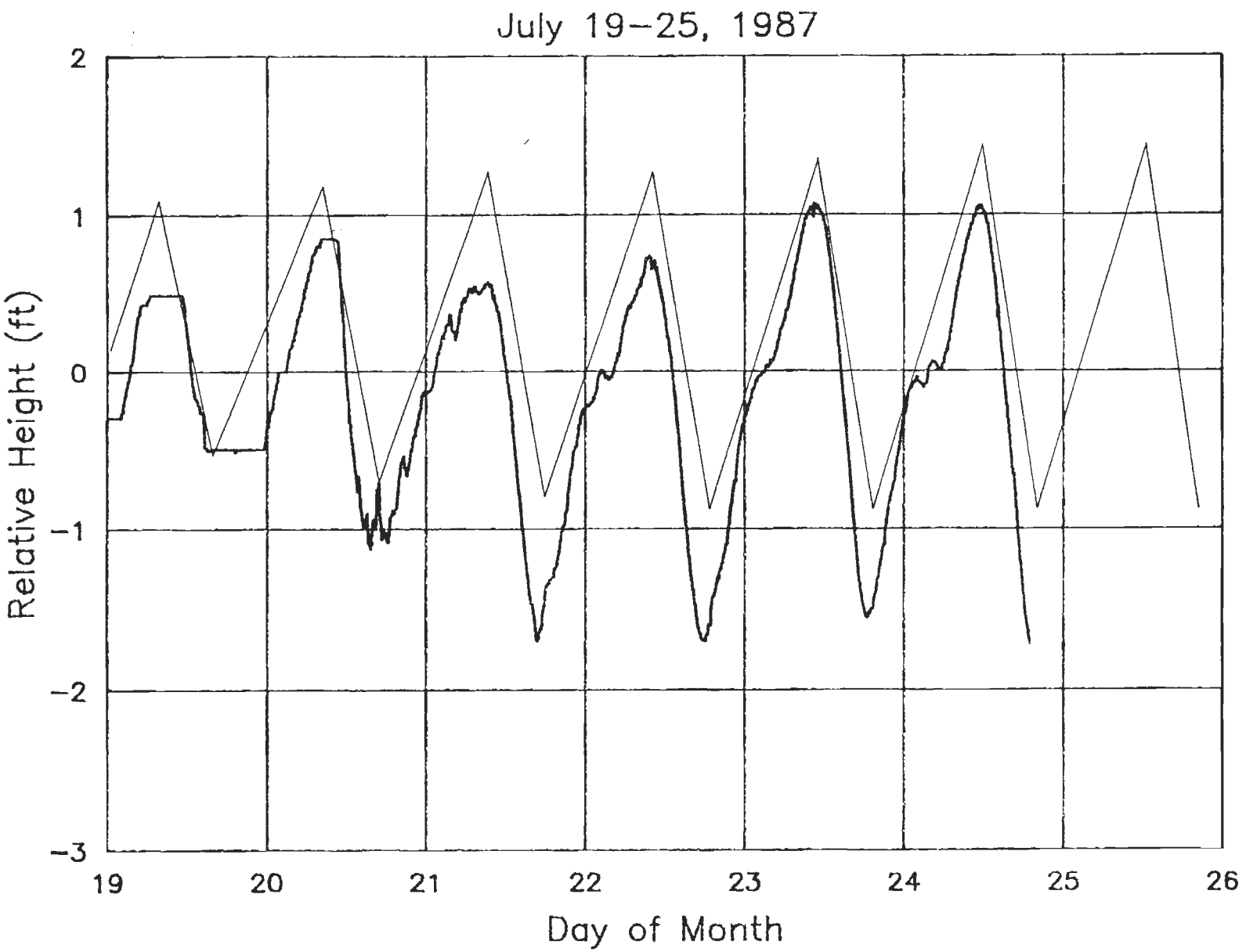

June 14–20, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
14
15
16
17
18
19
20
21
Day of Month

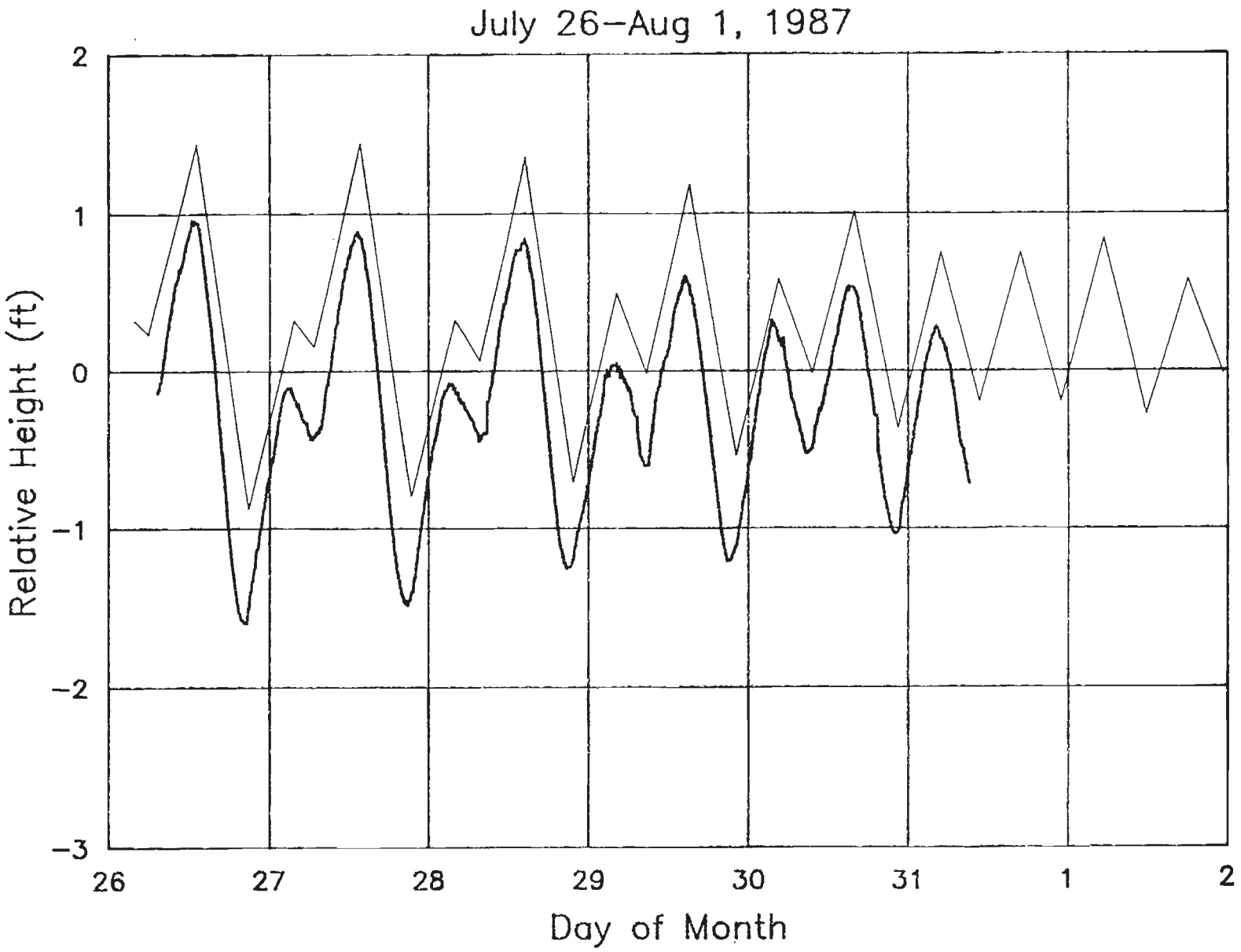

June 21–27, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
21
22
23
24
25
26
27
28
Day of Month


June 28–July 4, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
28
29
30
1
2
3
4
5
Day of Month


July 5–11, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
5
6
7
8
9
10
11
12
Day of Month


July 12–18, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
12
13
14
15
16
17
18
19
Day of Month


July 19–25, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
19
20
21
22
23
24
25
26
Day of Month


July 26–Aug 1, 1987
Relative Height (ft)
2
1
0
−1
−2
−3
26
27
28
29
30
31
1
2
Day of Month

Appendix Table 1. Representation of percentage relative submergence for specific elevations in 0.2 ft increments (NGVD) for the Pinellas Point revegetation site. Mean represents the average tide height for the presented week of data.

Date: Aug 2-8, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.2	3.4	8.0	14.9	22.3	28.5	36.6	46.8	59.2	64.4	68.9	74.2	80.7	86.1	90.1	94.0	96.6	100.0	100.0

Mean: -.21

Date: Aug 9-15, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	1.3	2.0	3.8	7.5	12.6	19.5	26.6	36.5	53.7	66.5	78.3	87.7	93.4	95.9	97.3	98.9	100.0	100.0

Mean: -.34

Date: Aug 16-22, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	3.0	8.1	19.1	29.2	40.0	50.4	61.0	66.2	71.6	77.9	84.9	91.4	98.1	100.0	100.0

Mean: -.50

Date: Aug 23-29, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.1	4.5	11.6	19.2	30.4	42.7	55.2	70.0	81.5	91.7	95.1	97.5	99.3	100.0	100.0	100.0

Mean: -.31

Appendix Table 1. continued.

Date: Sep 3-6, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	5.3	12.0	18.0	25.9	38.5	48.9	60.7	71.1	83.4	93.0	97.4	98.9	100.0	100.0	100.0	100.0	100.0

Mean: .00

Date: Sep 7-13, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	1.7	9.5	19.3	28.7	38.8	49.9	58.8	68.3	75.8	80.5	86.7	92.9	97.3	99.2	100.0	100.0	100.0	100.0

Mean: .11

Date: Sep 14-20, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	2.0	5.8	11.1	18.1	26.0	37.4	50.7	61.4	71.3	79.7	85.9	91.6	96.7	98.7	100.0	100.0	100.0	100.0

Mean: -.03

Date: Sep 21-27, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.8	5.9	14.3	24.4	37.0	49.3	61.0	69.1	75.3	82.1	90.9	98.7	100.0	100.0	100.0	100.0	100.0

Mean: -.09

Date: Sep 28-Oct 4, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.1	4.8	13.7	26.6	41.3	54.4	64.3	72.8	80.7	88.4	93.4	98.2	99.6	100.0	100.0	100.0	100.0

Mean: -.02

Date: Oct 5-11, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.2	4.8	12.2	22.4	29.8	37.1	49.0	57.2	64.6	70.5	75.9	81.4	88.1	94.0	99.5	100.0	100.0	100.0	100.0

Mean: .06

Appendix Table 1. continued.

Date: Oct 12-18, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.7	4.6	8.0	15.4	28.1	41.8	54.6	65.0	75.3	85.2	90.6	93.6	95.9	97.9	98.9	100.0	100.0

Mean: -.19

Date: Oct 19-25, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	3.5	10.0	16.8	24.4	30.3	37.9	46.3	58.7	65.8	72.5	80.7	85.2	88.1	91.9	94.3	97.4	98.6	99.7

Mean: -.10

Date: Oct 26-Nov 1, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.7	5.2	10.4	18.1	26.7	37.0	51.5	64.0	74.8	83.8	91.6	95.9	97.8	99.2	100.0	100.0	100.0	100.0

Mean: .01

Date: Nov 2-8, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	3.9	10.0	15.7	22.6	27.6	36.6	50.3	60.0	65.1	69.6	73.9	78.7	83.9	89.1	93.5	98.8	100.0	100.0

Mean: -.15

Date: Nov 9-15, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	3.6	11.0	24.9	38.9	51.2	63.5	75.8	83.1	87.5	92.3	94.0	95.2	97.4	98.3	100.0

Mean: -.27

Date: Nov 16-22, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	1.0	6.2	12.6	17.4	24.8	33.8	52.1	61.0	66.4	71.2	75.8	81.2	87.3	92.2	99.5	100.0	100.0	100.0

Mean: -.14

Appendix Table 1. continued.

Date: Nov 23-29, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.9	2.3	4.2	7.8	20.2	39.1	55.0	67.7	77.4	86.2	92.9	96.0	98.6	100.0	100.0	100.0	100.0	100.0

Mean: -.01

Date: Nov 30-Dec 6, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	1.3	2.6	6.3	8.6	13.3	16.5	22.3	27.9	35.3	40.3	45.4	49.6	57.3	70.6	76.4	80.5	85.6	89.0	91.8	94.9

Mean: -.45

Date: Dec 7-13, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	3.1	6.3	10.7	23.1	41.0	54.3	65.2	74.2	80.5	85.2	89.3	90.8	92.8	94.9	97.7	100.0

Mean: -.29

Date: Dec 14-20, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	7.4	9.2	13.4	25.8	31.4	36.4	39.2	46.6	66.9	72.3	81.6	87.9	90.8	94.5	97.2	99.0	100.0	100.0

Mean: -.10

Date: Dec 21-27, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.1	2.6	4.2	10.7	20.6	28.4	38.0	52.3	63.4	71.6	80.4	83.3	86.0	93.3	96.8	99.2	100.0	100.0

Mean: -.24

Date: Dec 28, 1986-Jan 3, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	2.0	6.8	10.6	16.4	21.5	26.2	30.1	37.5	47.3	56.6	62.9	67.3	72.5	76.4	80.9	86.5	91.9

Mean: -.72

Appendix Table 1. continued.

Date: Jan 4-10, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	.0	11.0	11.0	21.5	37.0	52.9	60.5	69.6	80.1	94.0	99.1	100.0	100.0	100.0

Mean: -.48

Date: Jan 11-17, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	5.2	5.7	13.3	24.6	43.0	50.5	58.4	65.0	72.7	77.7	85.1	90.1	93.5	96.8

Mean: -.75

Date: Jan 18-24, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	1.3	11.0	20.6	37.3	47.9	56.5	64.4	74.4	83.9	89.0	92.2	96.9	98.0	100.0

Mean: -.56

Date: Jan 25-31, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	2.5	4.3	7.2	11.1	16.5	20.5	24.1	33.7	44.3	51.9	57.3	65.8	74.0	79.9	84.9	91.0	93.5

Mean: -.86

Date: Feb 1-7, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	3.6	8.2	14.2	23.0	29.9	39.5	49.9	61.9	74.5	85.7	92.3	97.2	98.5	99.9	100.0	100.0

Mean: -.36

Date: Feb 8-14, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	1.7	6.2	10.9	19.1	24.8	30.3	44.4	56.8	62.0	68.1	73.4	80.6	86.4	94.2

Mean: -1.01

Appendix Table 1. continued.

Date: Feb 15-21, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.5	.8	5.7	7.9	15.2	21.3	30.9	42.2	51.8	63.4	70.3	76.1	86.0	91.5	98.1	100.0	100.0

Mean: -.59

Date: Feb 22-28, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	1.0	6.5	10.5	14.3	20.2	24.4	31.7	44.3	55.0	60.7	66.3	71.7	78.5	82.7	88.0	93.7	95.5

Mean: -.63

Date: Mar 1-7, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	1.0	2.1	4.3	6.0	7.5	8.5	10.8	15.4	19.3	28.2	37.5	43.7	51.6	59.9	68.0	74.7	82.3	90.4	93.3	97.2

Mean: -.72

Date: Mar 8-14, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	1.8	9.1	12.9	18.5	27.0	41.0	52.7	63.2	72.2	78.8	85.9	89.7	91.8	96.2	98.6

Mean: -.64

Date: Mar 15-21, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	2.1	3.6	6.4	13.2	20.7	31.3	41.4	48.2	54.6	69.7	78.5	89.3	92.7	96.0	99.3	99.6	100.0	100.0	100.0

Mean: -.03

Date: Mar 22-28, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	3.4	6.7	11.9	20.3	28.6	42.6	52.4	59.8	66.1	71.5	77.5	83.0	87.3	93.2	95.4	97.3	100.0	100.0	100.0

Mean: .08

Appendix Table 1. continued.

Date: Mar 29-Apr 5, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	2.0	2.7	4.0	10.0	13.9	19.0	24.7	33.1	41.7	51.0	61.5	67.4	73.3	84.2	87.7	93.4	96.2	97.7

Mean: -.59

Date: Apr 5-11, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	.0	.0	11.3	26.4	40.9	53.7	61.6	70.8	78.3	84.5	91.4	97.4	98.7	100.0

Mean: -.69

Date: Apr 12-18, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.7	3.0	5.9	10.6	17.1	25.3	32.6	47.9	59.0	66.8	73.4	79.5	84.2	88.8	94.2	99.8	100.0

Mean: -.54

Date: Apr 19-25, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	.0	.0	7.6	18.6	31.9	45.4	53.8	62.1	68.6	75.8	80.7	86.6	90.9	94.6	98.0

Mean: -.68

Date: Apr 26-May 2, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.5	3.3	9.0	14.7	18.6	26.0	35.8	46.8	55.4	63.3	69.1	74.3	82.0	88.1	95.7	99.6

Mean: -.75

Date: May 3-9, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	1.1	5.7	9.0	17.3	31.5	46.4	56.3	64.4	73.7	80.5	84.9	91.0	98.3	100.0	100.0

Mean: -.59

Appendix Table 1. continued.

Date: May 10-16, 1986

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	1.2	4.9	7.6	12.7	17.1	21.9	26.4	34.3	48.9	60.6	68.7	74.0	78.0	83.7	86.8	90.6	95.1	98.9

Mean: -.492

Date: May 17-23, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.1	1.8	4.5	7.4	11.2	14.7	20.8	33.0	47.0	59.3	68.1	74.8	81.2	87.7	93.6	96.2	98.5	100.0	100.0

Mean: -.31

Date: May 24-30, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	5.5	13.3	20.1	25.3	30.8	37.5	50.2	63.3	69.4	73.9	78.7	83.2	88.3	94.1	100.0	100.0

Mean: -.45

Date: May 31-June 6, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	.0	1.9	6.4	15.3	28.2	40.0	53.2	64.2	72.1	80.8	86.4	91.5	94.8	98.5	100.0	100.0

Mean: -.45

Date: June 7-13, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.1	3.2	6.1	9.6	13.2	18.6	22.9	28.4	33.6	49.1	59.3	66.3	72.7	78.7	83.8	88.7	92.8	97.9	100.0	100.0

Mean: -.26

Date: June 14-20, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.3	1.7	2.5	4.9	6.2	9.6	13.8	19.2	24.0	37.3	55.3	67.5	76.3	84.7	91.0	95.1	98.4	100.0	100.0	100.0

Mean: -.34

Appendix Table 1. continued.

Date: June 21-27, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	1.1	2.6	5.3	16.1	23.8	30.4	37.1	50.2	60.3	66.3	71.2	76.0	81.6	88.8	95.1	99.0	100.0	100.0

Mean: -.30

Date: June 28-July 4, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.1	4.9	13.3	17.1	22.3	38.1	61.0	67.7	69.9	91.7	93.2	94.7	96.1	98.0	100.0	100.0	100.0

Mean: -.17

Date: July 5-11, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	1.0	2.7	8.5	13.6	18.6	24.7	32.2	37.7	49.0	63.1	78.6	82.2	86.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Mean: .08

Date: July 12-18, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	3.3	6.3	8.7	13.1	18.0	24.2	44.7	68.3	88.7	93.1	99.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Mean: .03

Date: Jul 19-25, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	2.8	8.1	12.9	26.6	34.8	44.5	55.7	64.2	75.3	79.8	85.2	89.3	93.7	97.7	100.0	100.0	100.0

Mean: -.17

Date: July 26-Aug 1, 1987

Height:	1.6	1.4	1.2	1	.8	.6	.4	.2	0	-.2	-.4	-.6	-.8	-1	-1.2	-1.4	-1.6	-1.8	-2	-2.2
Submerged Time (%):	.0	.0	.0	.0	3.0	6.7	14.1	21.2	32.4	47.6	61.8	72.8	80.9	86.2	90.7	93.5	95.7	100.0	100.0	100.0

Mean: -.30