BA-20
Jonathan Davis Wetland Protection
Summary Data and Graphics

September 22, 2003

Rodrigue, D. 2003. *BA-20 Jonathan Davis Wetland Protection Summary Data and Graphics. Louisiana Department of Natural Resources, Coastal Restoration Division, Baton Rouge, LA. 29pp.*

Jonathan Davis Wetland Protection (BA-20)

Project Area Description

- Totals 7,368 ac (2,982 ha) of wetlands classified as intermediate marsh in the 1994 habitat analysis.
- Located in Jefferson Parish within the Barataria Basin, the project area is bounded on the north by the Pailet Canal, on the east by La. Hwy. 301, on the south by Bayous Perot and Rigolettes, and on the west by the Gulf Intracoastal Waterway (GIWW) (figure 1).
- 1,393 ac (557 ha) of land have been converted to open water between 1945 and 1989.
- Major factors influencing wetland loss within the project area:
    - Increased water exchange
    - Saltwater intrusion
    - Tidal scour
    - Shoreline erosion caused by high wave energy
- Construction of oil field canals in the 1940s increased the impact of the above factors.

Reference Area Description

- The evaluation of reference area sites was based on the criteria that both project and reference areas have similar vegetative community, soil, hydrology, and salinity characteristics.
- Reference area 1, southeast of the project area, is used in the evaluation of all monitoring elements (see monitoring elements) (figure 1).
- Reference area 2, to the northwest above the GIWW, is used as a reference site for vegetation and habitat mapping components of monitoring.
- Three continuous hydrographic recorders, to the north and southwest and southeast are used in the evaluation of salinity and water level monitoring elements (figure 2).

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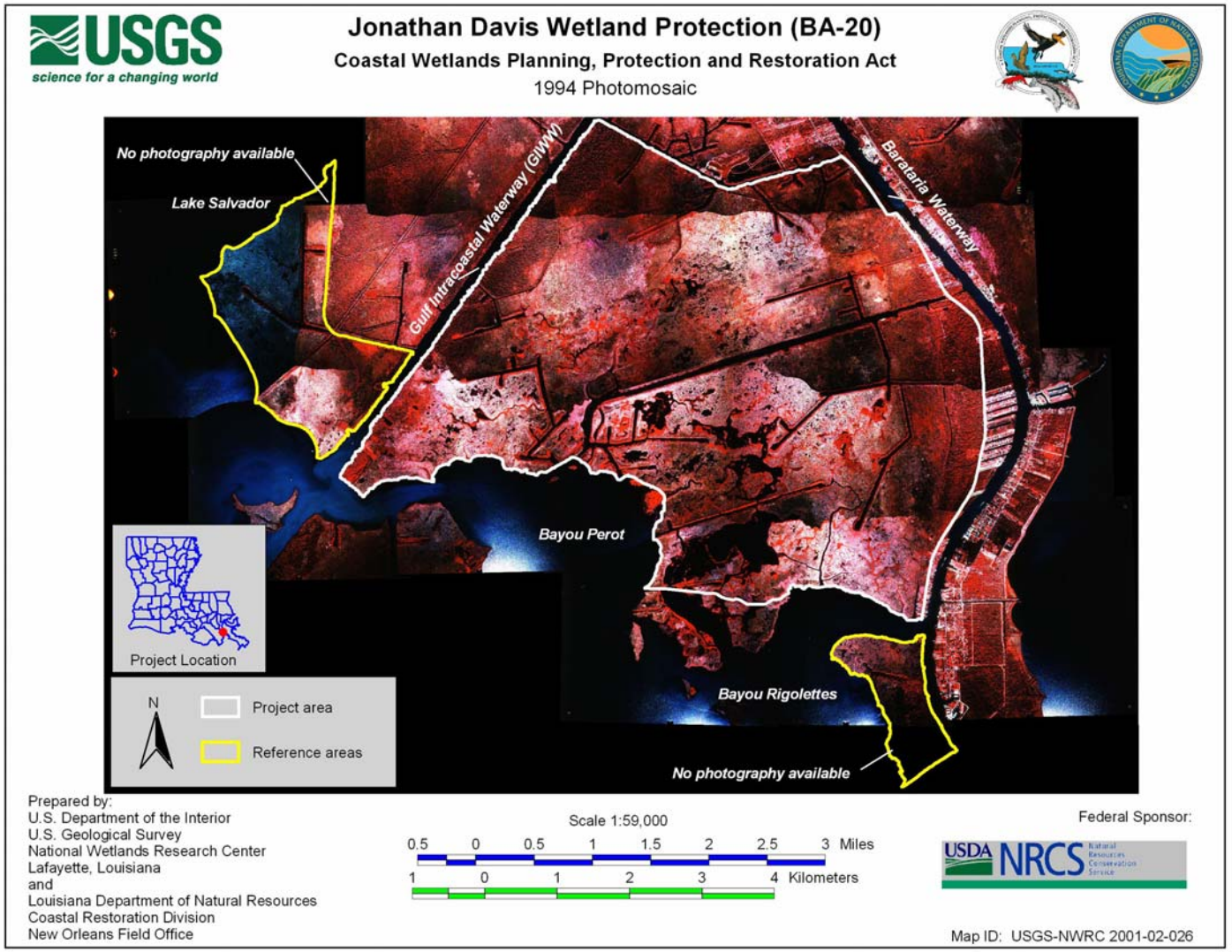

Figure 1. Jonathan Davis Wetland Protection (BA-20) 1994 photomosaic showing project and reference areas.

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Project Objectives

1. Use structural measures to restore hydrologic conditions that reduce water level and salinity fluctuations, and allow greater freshwater retention to increase quantity and quality of emergent vegetation.
2. Reduce wetland loss through hydrologic restoration and shoreline protection.

Specific Goals

1. Reduce existing rate of loss of emergent marsh.
2. Decrease variability in salinity within the project area.
3. Decrease variability in water level within the project area.
4. Reduce marsh edge erosion rate along southern project boundary.
5. Stabilize or increase relative abundance of intermediate-to-fresh marsh type plant species.

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Project Features

Project features consist of shoreline protection, rock armored plugs, rock weirs, and weirs with boat bays. Construction unit 1, which consists of project features 12, 13, 14, 15, 16, 17, 19, 20, and 21 was completed in September 1998 (figure 2). Construction unit 2 was completed in May 2001. It encompassed installing a rock armored plug at site 20, a weir at site 22, and shoreline protection from site 20 to 22. Construction unit 3, which consists of shoreline protection extending from project feature 12 west to the Gulf Intracoastal Waterway was completed on July 7,2003. Construction of features 1, 2, 3, 6, 8, 9, 10, and 11 in the northern project area has been deferred due to lack of funding, and land rights issues. A map showing the locations of these structures is currently being created.

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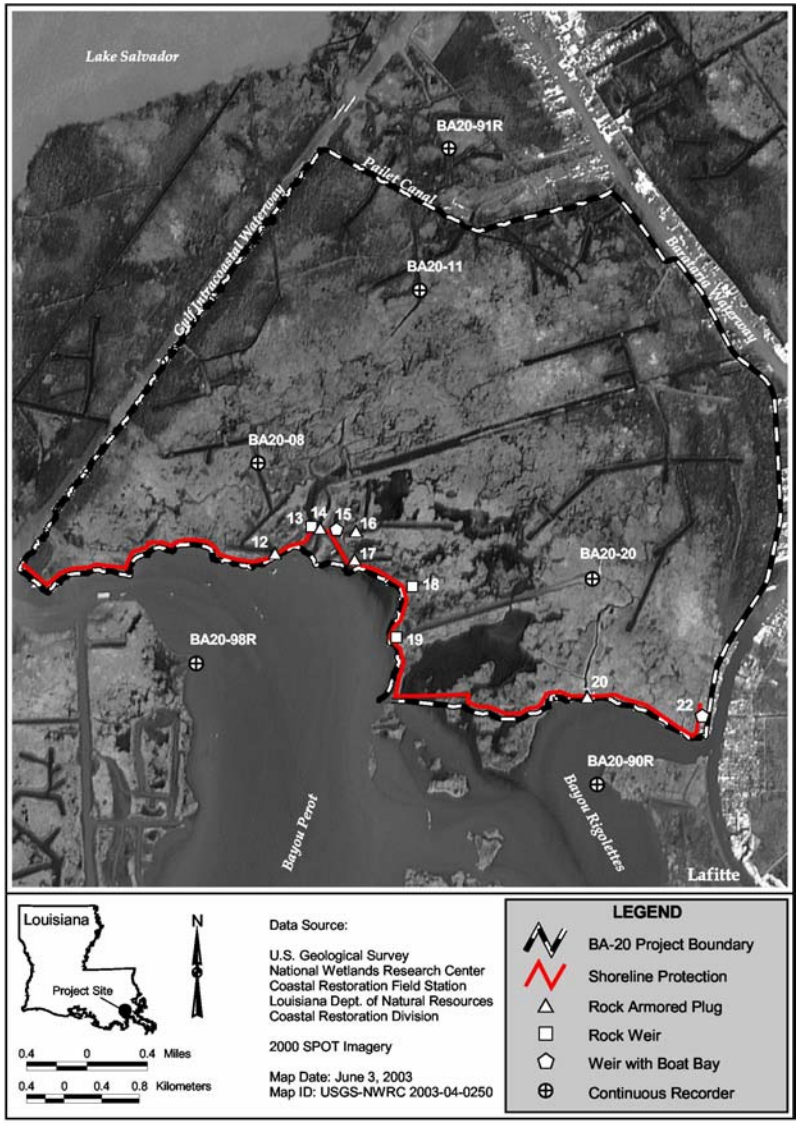

Figure 2. Constructed project features and continuous recorder stations for the Jonathan Davis Wetland Protection (BA-20) project.

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Monitoring Elements

- **Habitat Mapping:** To document marsh to open-water ratios and marsh loss rates as well as changes in vegetative community type, color-infrared aerial photography (1:12,000 scale, with ground control markers) is obtained for both project and reference areas. Photography was taken in 1994 and 1997, and will also occur in 2003 and 2015.
- **Salinity:** Sampled hourly at 3 continuous recorders located within the project area and 3 located in reference sites (figure 3). Salinity is also sampled monthly at 17 discrete stations using a salinometer (figure 4). Discrete data are used to characterize the spatial variation of salinity throughout the project and reference areas, and will be used in concert with data collected from the continuous recorders to statistically model the system. Preconstruction monitoring for unit 1 began in December 1995 and ended in October 1998; and postconstruction monitoring will occur between October 1998 to October 2003. Preconstruction monitoring for unit 2 began in March 1996 and ended in July 2001; and postconstruction monitoring will occur between August 2001 to August 2006.
- **Water Level:** Sampled monthly at 3 continuous recorders inside the project area and 3 in the reference areas. One staff gauge is located next to each continuous recorder to tie recorder water levels to a known datum. Staff gauges and continuous recorders are surveyed to the North American Vertical Datum 1988 (NAVD 88). Marsh elevation was surveyed near each station to determine duration and frequency of flooding. Preconstruction monitoring for unit 1 began in December 1995 and ended in October 1998; and postconstruction monitoring will occur between October 1998 to October 2003. Preconstruction monitoring for unit 2 began in March 1996 and ended in July 2001; and postconstruction monitoring will occur between August 2001 to August 2006.
- **Shoreline Change:** To evaluate shoreline change, a DGPS will be used to document marsh edge position. Several discrete stations will be established along the 34,000 ft (10.4 km) of the rock riprap shoreline protection structure. Points will be established on the actual structure as well as on the marsh edge adjacent to and behind the structure at maximum intervals of 50 ft (15.2 m). Stations will also be established at 50 ft intervals along the marsh edge located on the reference area to the southeast of the project area. In addition, historical rates (as ft/yr loss) of erosion will be obtained and compared to erosion rates after project implementation. As shoreline protection features are constructed, surveys will be conducted once as built, and then in years 3, 6, 9, 12, 15, and 18.
- **Vegetation:** Species composition and relative abundance is evaluated in the project and reference areas using the Braun-Blanquet method. Vegetation sampling plots (stations) are established along 5 transects that lie parallel to the GIWW spanning the project area (figure 5). Surveys have been conducted in 1996, 1999, and 2002, and will occur in 2005, 2008, 2011, and 2014. Plot sizes are 2 X 2 m, and are sampled at 0.8 km increments for a total of 28 stations within the project area. Four transects are established in two reference areas yielding 10 stations.

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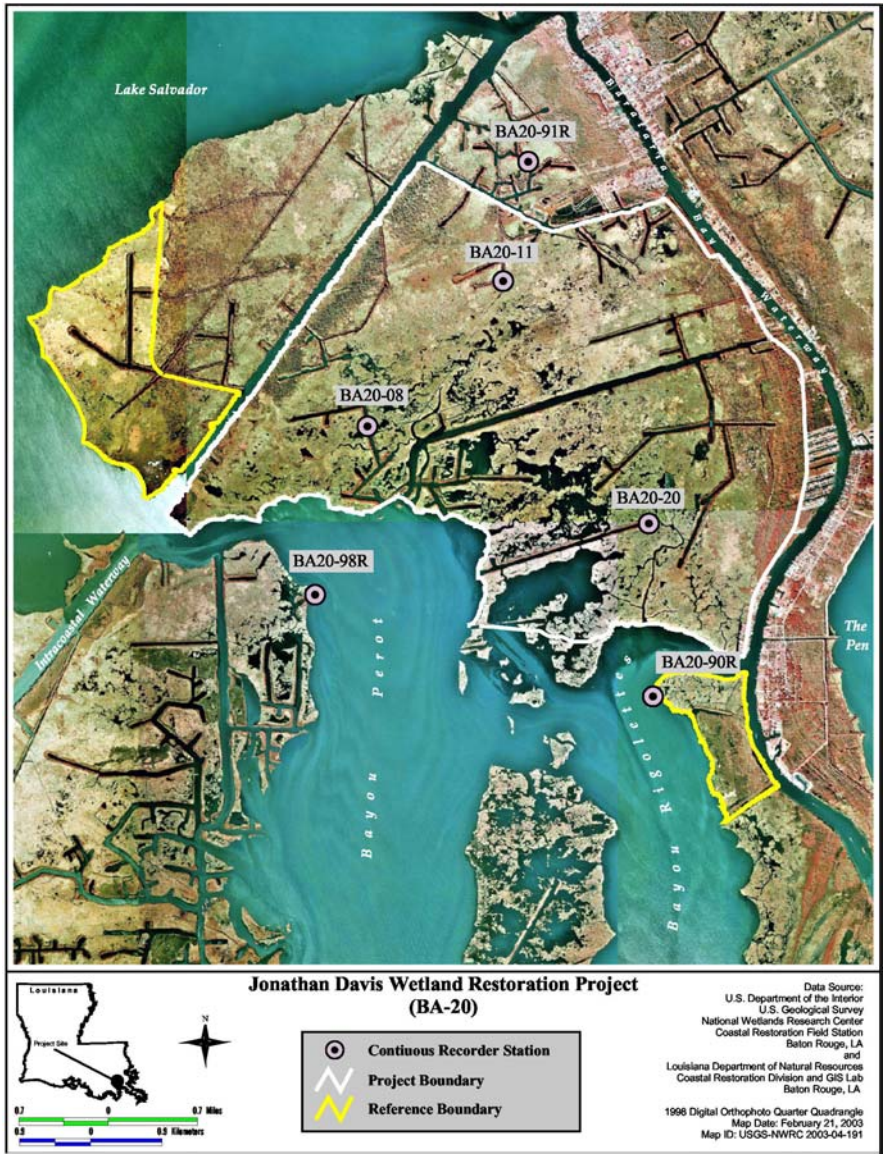

Figure 3. Continuous hydrographic recorder station locations.

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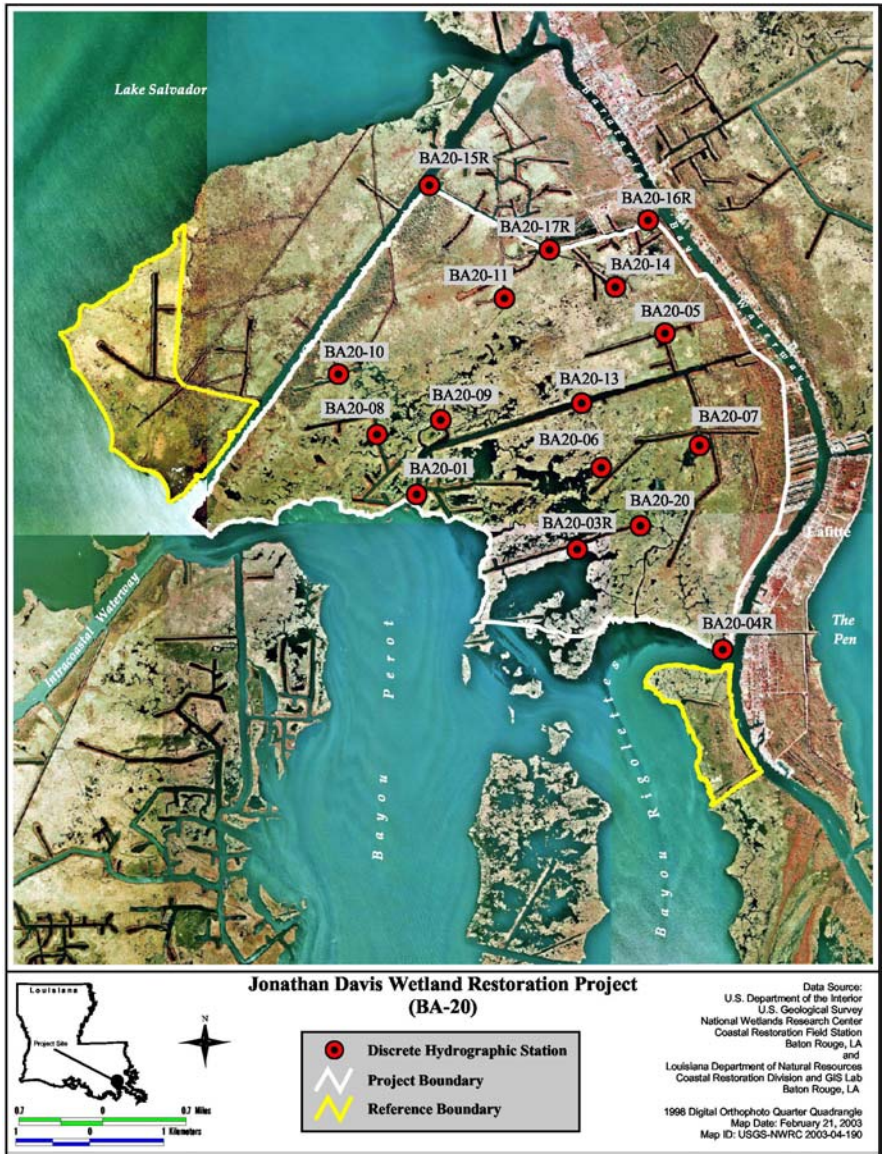

Figure 4. Discrete salinity station locations.

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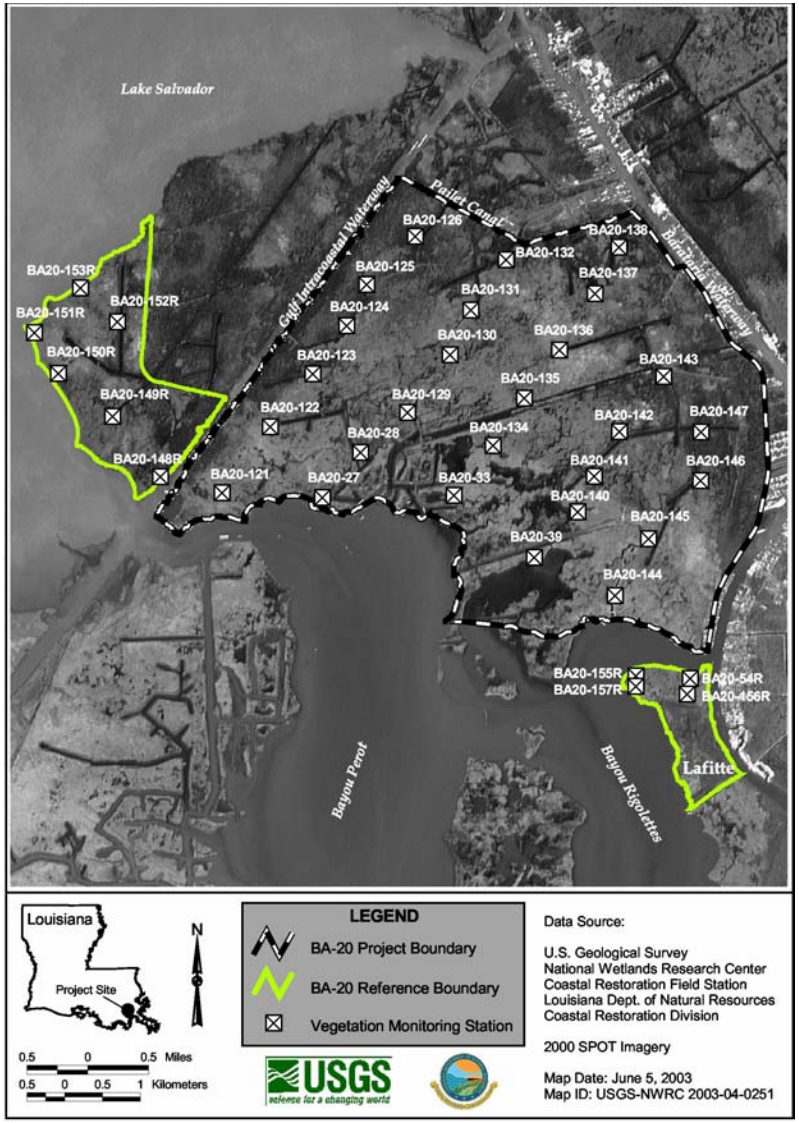

Figure 5. Vegetation sampling stations in the BA-20 project and reference areas.

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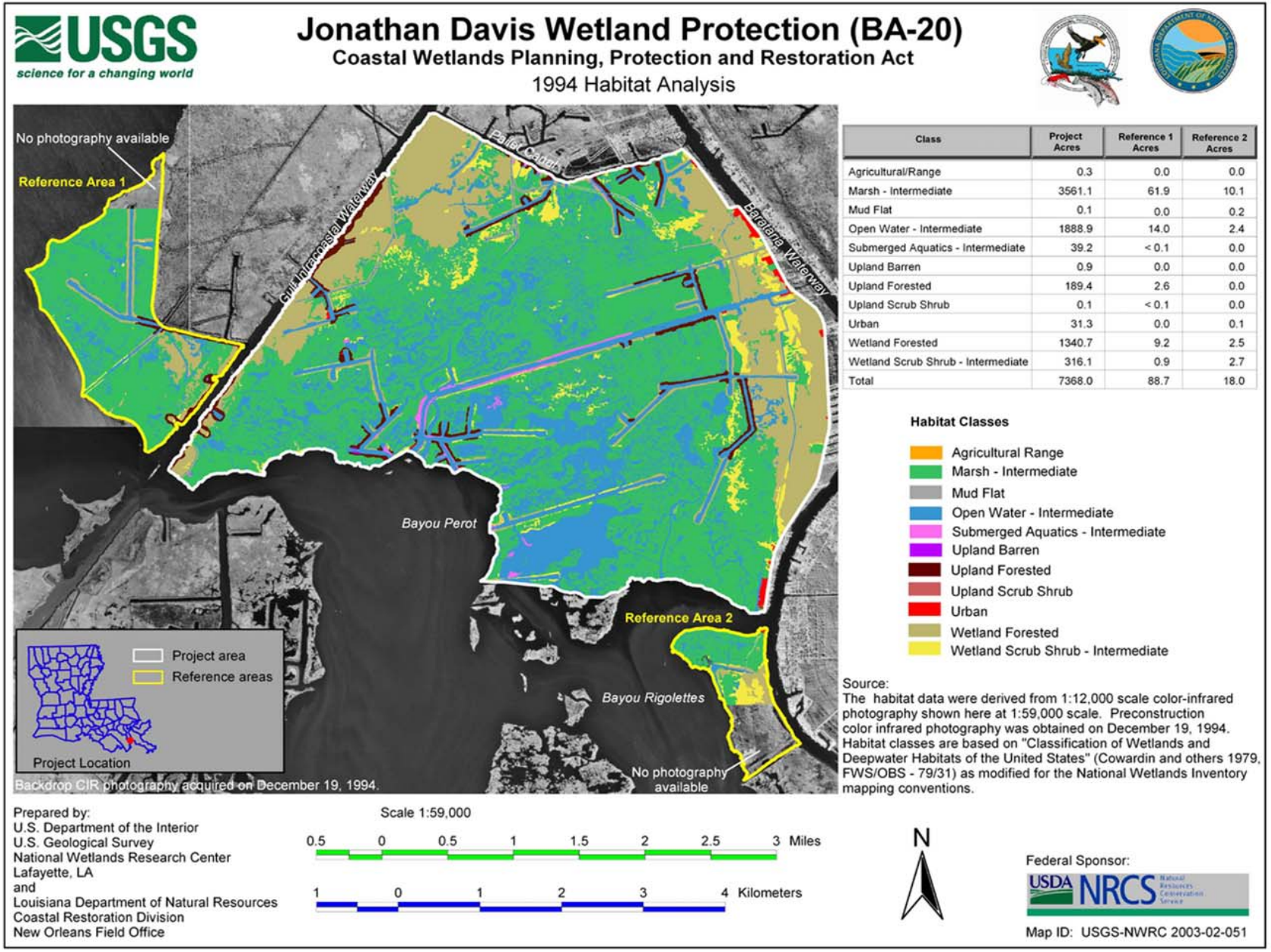
Habitat Mapping

Preconstruction color infrared photography at 1:12,000 scale was obtained on December 19, 1994 and the habitat analysis was done (figure 6). Intermediate marsh comprised most of the project and reference areas. Forested wetlands occurred in the northwestern and eastern portions of the project area with intermediate wetland scrub shrub adjacently located. Forested uplands occurred along spoil banks of oil navigation canals. Vegetative community type changes will be addressed as later habitat analyses are available. Photography has been obtained from December 18, 1997, and a photomosaic of the project and reference areas has been created (figure 7). The 1997 habitat analysis is currently being processed.



Class	Project Acres	Reference 1 Acres	Reference 2 Acres
Agricultural/Range	0.3	0.0	0.0
Marsh - Intermediate	3561.1	61.9	10.1
Mud Flat	0.1	0.0	0.2
Open Water - Intermediate	1888.9	14.0	2.4
Submerged Aquatics - Intermediate	39.2	< 0.1	0.0
Upland Barren	0.9	0.0	0.0
Upland Forested	189.4	2.6	0.0
Upland Scrub Shrub	0.1	< 0.1	0.0
Urban	31.3	0.0	0.1
Wetland Forested	1340.7	9.2	2.5
Wetland Scrub Shrub - Intermediate	316.1	0.9	2.7
Total	7368.0	88.7	18.0

Figure 6. Jonathan Davis Wetland Protection (BA-20) 1994 habitat analysis.

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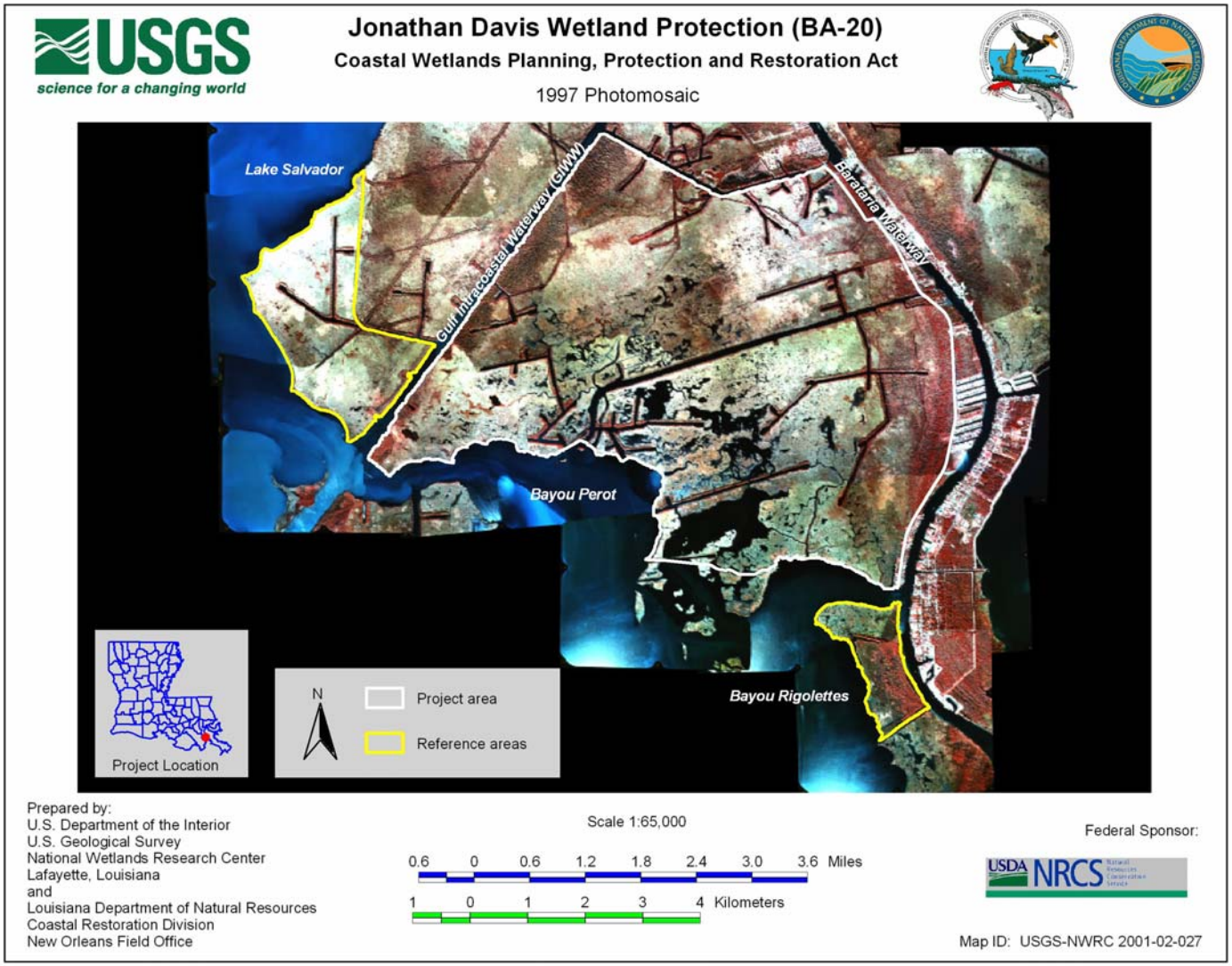

Figure 7. Jonathan Davis Wetland Protection (BA-20) 1997 photomosaic showing project and reference areas.

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Salinity

Continuous recorder stations followed the same general pattern from 1995 through 2002. A salinity spike occurred in October 1996 and September 1998, resulting from an influx of seawater caused by Hurricane Josephine and Hurricane Georges, respectively. A prolonged drought, declared by the National Weather Service, occurred from August 1999 to November 2000. Salinities peaked during the middle and end of this period. Above average rainfall amounts caused a rapid salinity decrease during the winter of 2000-2001. In early June 2001, large rainfall amounts associated with Tropical Storm Allison further decreased salinities, creating almost freshwater conditions. Mean salinities increased from the northern project area southward (down the estuary).

Salinity data from inside the project area near each construction unit were compared to data from it's adjacent reference recorder to determine the efficacy of project construction units. Salinity was significantly higher at station BA20-08 than BA20-98R during preconstruction and postconstruction (for both pre and postconstruction $p < 0.001$). For the preconstruction period, the mean salinity at BA20-08 was 1.32 ppt, and the mean salinity at BA20-98R was 1.18 ppt. For the postconstruction period, the mean salinity at BA20-08 was 2.66 ppt, and the mean salinity at BA20-98R was 2.34 ppt.

Salinity was significantly higher at station BA20-90R than BA20-20 during preconstruction and postconstruction (for both pre and postconstruction $p < 0.001$). For the preconstruction period, the mean salinity at BA20-90R was 3.18 ppt, and the mean salinity at BA20-20 was 2.67 ppt. For the postconstruction period, the mean salinity at BA20-90R was 2.18 ppt, and the mean salinity at BA20-20 was 1.71 ppt Although these data are significantly different, there were no real project or ecological effects.

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Figure 9. Mean monthly salinities (ppt) for continuous recorder station BA20-11 from 12/1995 through 12/2002.

Figure 10. Mean monthly salinities (ppt) for continuous recorder station BA20-20 from 3/1996 through 12/2002.

Figure 11. Mean monthly salinities (ppt) for continuous recorder station BA20-90R from 3/1996 though 12/2002.

Figure 12. Mean monthly salinities (ppt) for continuous recorder station BA20-91R from 3/1996 through 8/2002.

Figure 13. Mean monthly salinities (ppt) for continuous recorder station BA20-98R from 12/1995 through 12/2002.

Figure 14. Mean monthly salinities at continuous recorder stations BA20-08 (in project area) and BA20-98R (in reference area) from 12/1995 to 12/2002.

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List of Salinity Tables and Figures (continued)

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Table 2. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-08 (project area) and BA20-98R (reference area) from October 1998 through December 2002 (postconstruction phase of unit 1).

Figure 15. Mean monthly salinities at continuous recorder stations BA20-20 (in project area) and BA20-90R (reference area) from 3/1996 to 12/2002.

Table 3. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-20 (project area) and BA20-90R (reference area) from March 1996 through May 2001 (preconstruction phase of unit 2).

Table 4. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-20 (project area) and BA20-90R (reference area) from June 2001 through December 2002 (postconstruction phase of unit 2).

Figure 16. Mean monthly discrete salinities in the BA20 project and reference areas from 12/1994 through 12/2002.

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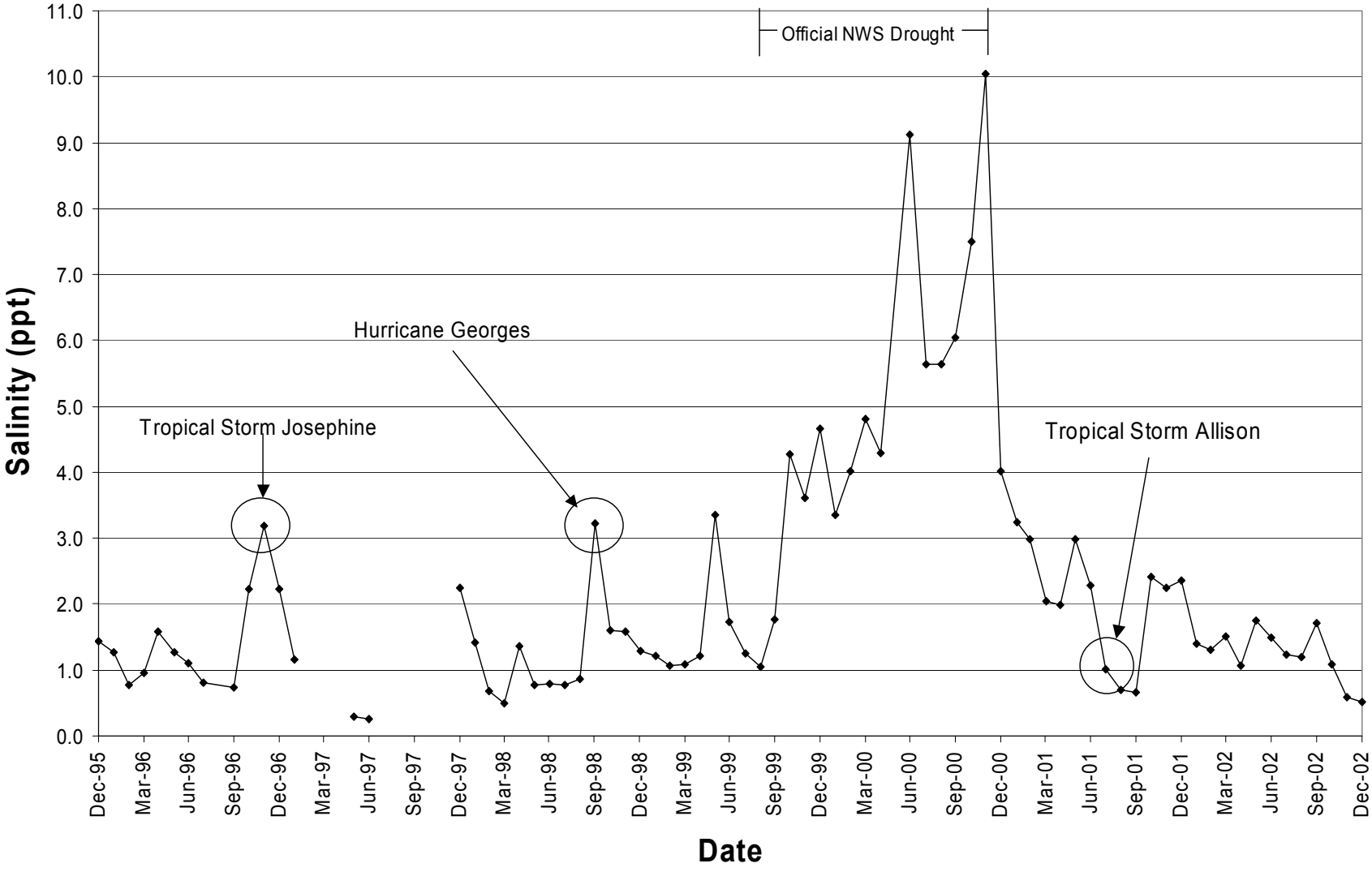

Figure 8. Mean monthly salinities (ppt) for continuous recorder station BA20-08 from 12/1995 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

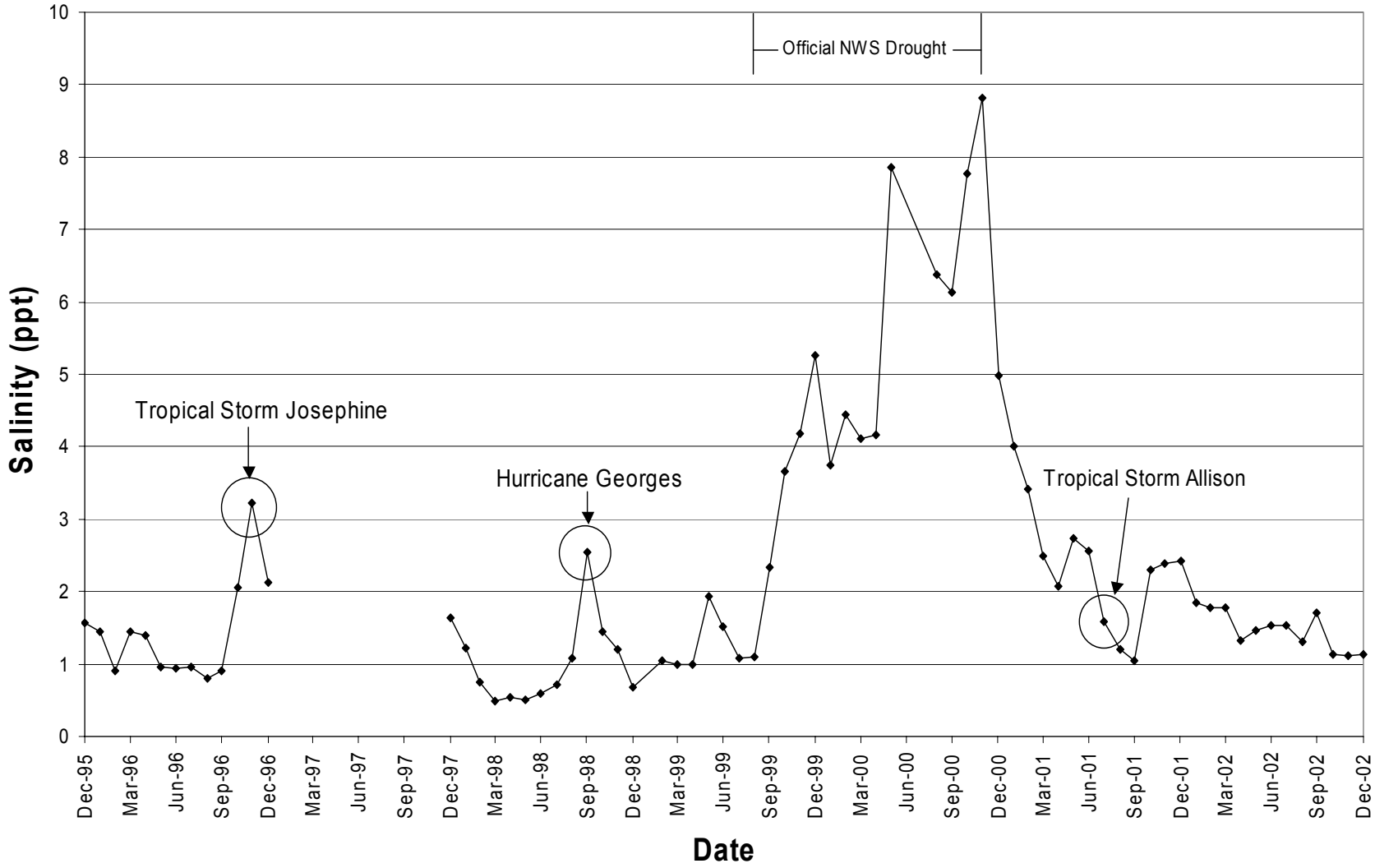

Figure 9. Mean monthly salinities (ppt) for continuous recorder station BA20-11 from 12/1995 through 12/2002.

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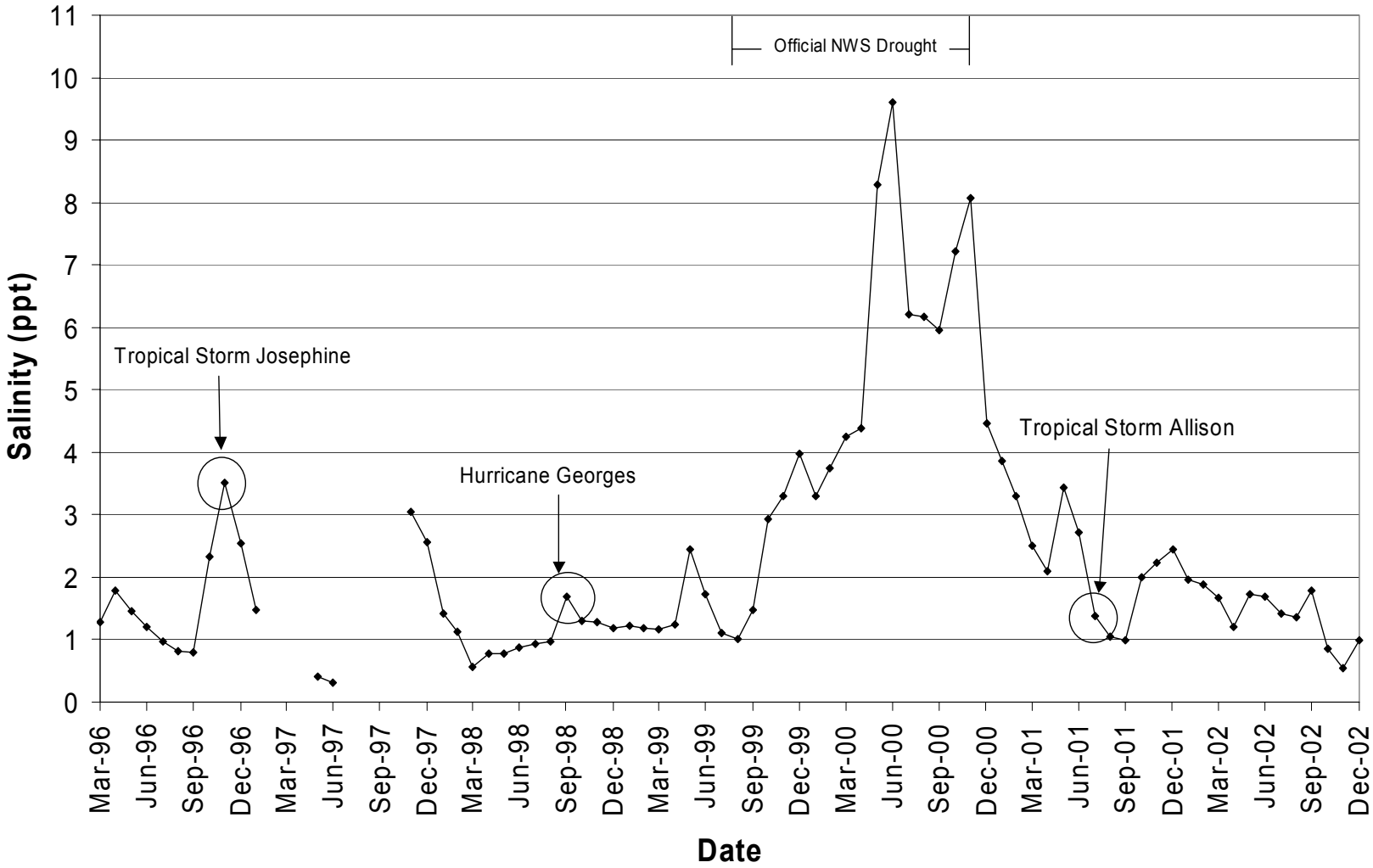

Figure 10. Mean monthly salinities (ppt) for continuous recorder station BA20-20 from 3/1996 through 12/2002.

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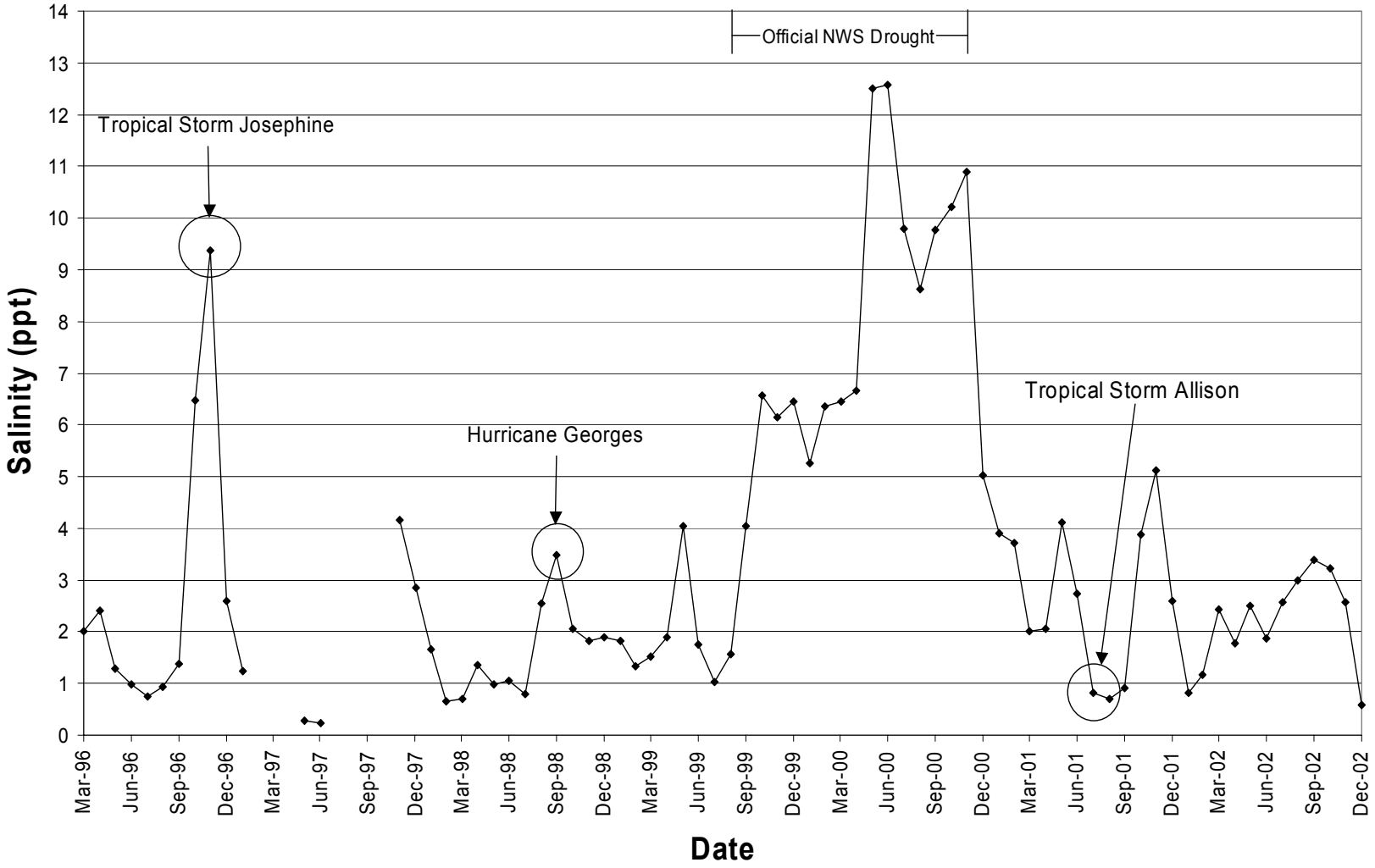

Figure 11. Mean monthly salinities (ppt) for continuous recorder station BA20-90R from 3/1996 though 12/2002.

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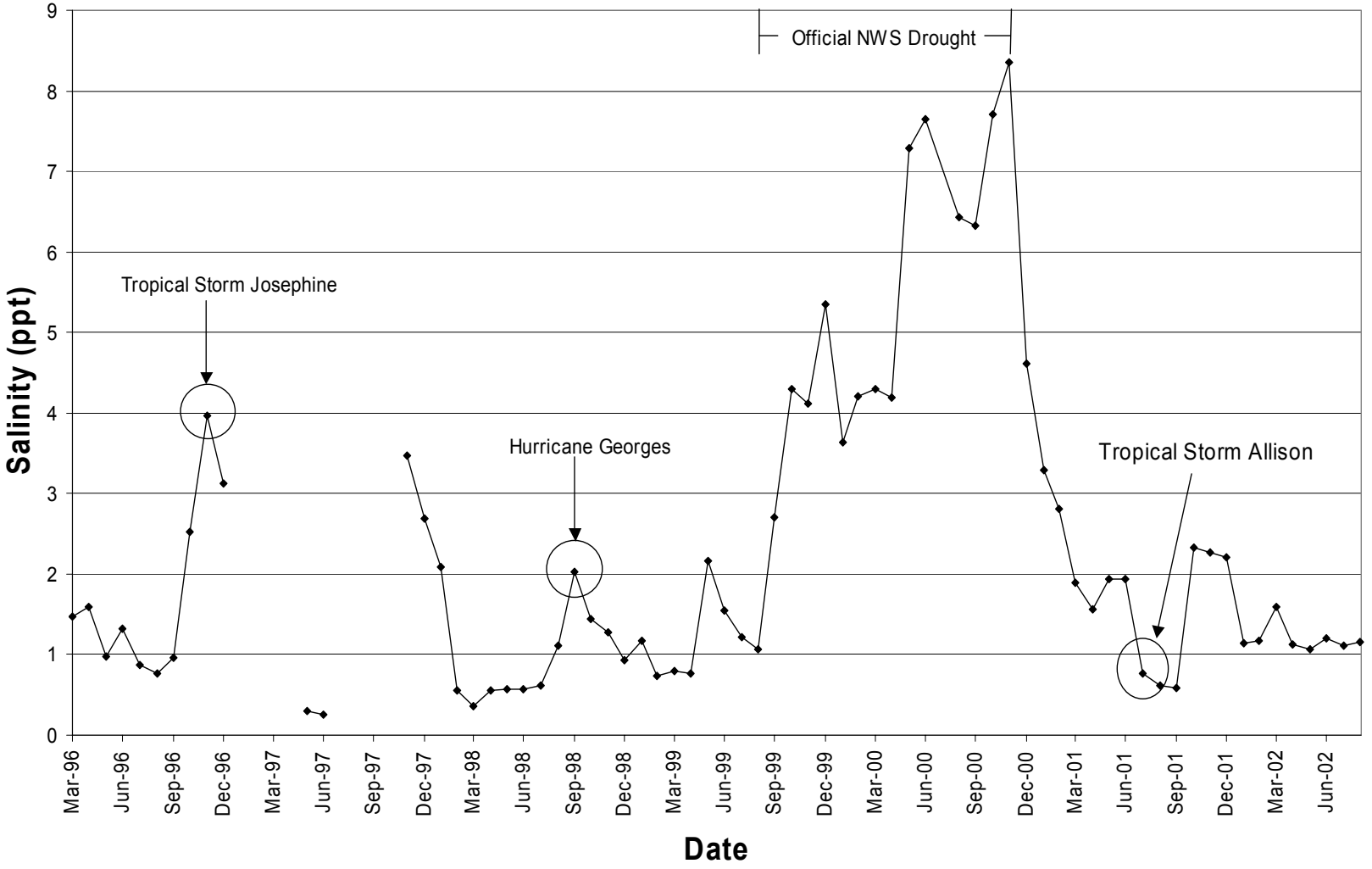

Figure 12. Mean monthly salinities (ppt) for continuous recorder station BA20-91R from 3/1996 through 8/2002.

Jonathan Davis Wetland Protection (BA-20)

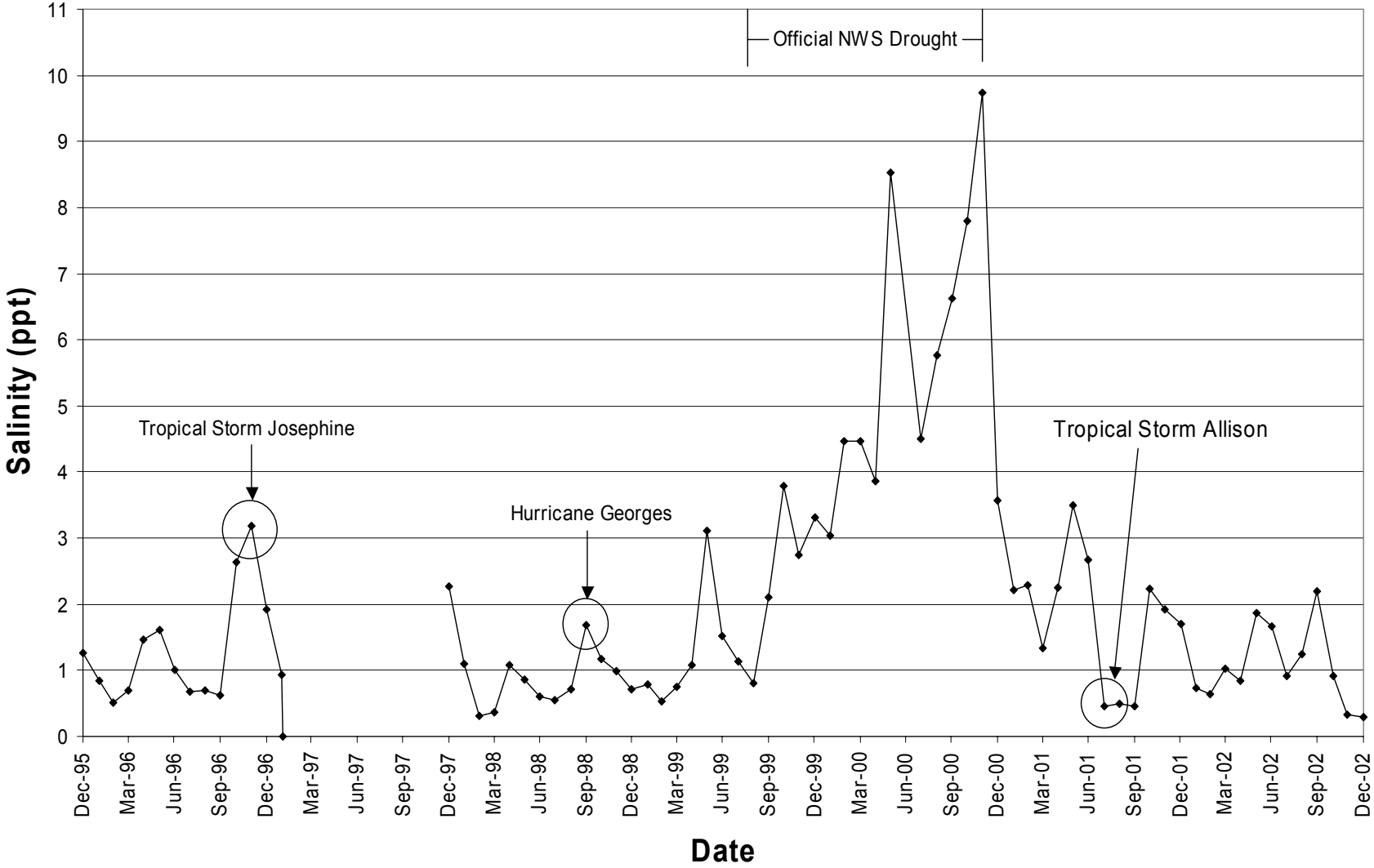

Figure 13. Mean monthly salinities (ppt) for continuous recorder station BA20-98R from 12/1995 through 12/2002

Jonathan Davis Wetland Protection (BA-20)

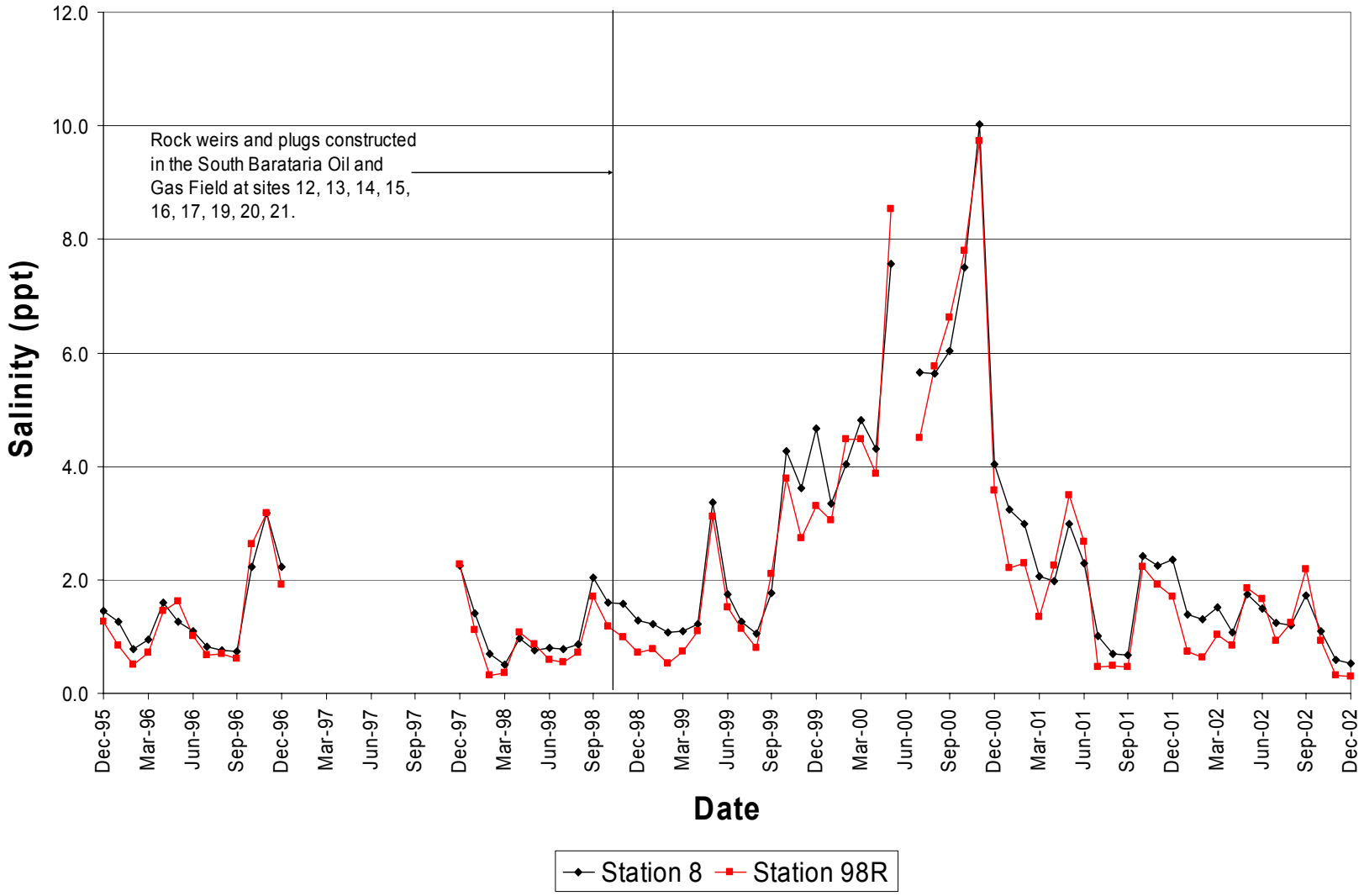

Figure 14. Mean monthly salinities at continuous recorder stations BA20-08 (in project area) and BA20-98R (in reference area) from 12/1995 to 12/2002.

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Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Salinity (ppt) at BA20-08 (project area)	17,076	0.21	8.53	1.32	0.95
Salinity at BA20-98R (reference area)	16,294	0	10.66	1.18	1.11

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.14	0.57	0.004	0.11	0.12	25.17	15,439	< 0.001

Table 1. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-08 (project area) and BA20-98R (reference area) from December 1995 through September 1998 (preconstruction phase of unit 1).

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Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Salinity (ppt) at BA20-08 (project area)	35,701	0.27	19.58	2.66	2.3
Salinity at BA20-98R (reference area)	34,468	0.16	22.70	2.34	2.47

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.22	0.90	0.00	0.21	0.23	45.43	33,509	< 0.001

Table 2. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-08 and BA20-98R from October 1998 through December 2002 (postconstruction phase of unit 1).

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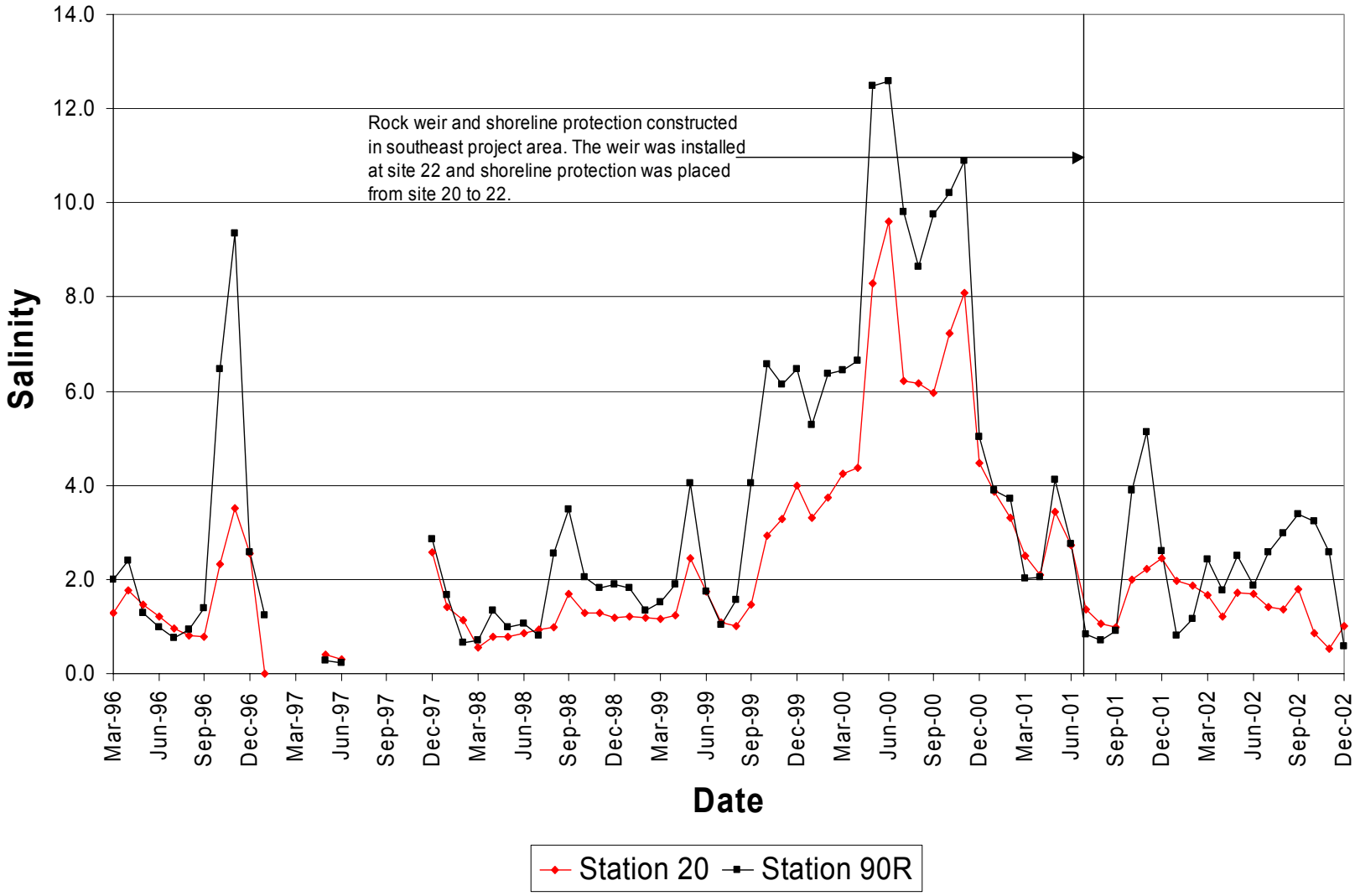

Figure 15. Mean monthly salinities at continuous recorder stations BA20-20 (in project area) and BA20-90R (reference area) from 3/1996 to 12/2002.

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Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Salinity (ppt) at BA20-20 (project area)	40,579	0.24	17.83	2.67	2.28
Salinity at BA20-90R (reference area)	38,966	0.2	24.61	3.81	3.8

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	-1.16	2.13	0.010	-1.18	-1.14	-107.61	38,845	< 0.001

Table 3. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-20 (project area) and BA20-90R (reference area) from March 1996 through May 2001 (preconstruction phase of unit 2).

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Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Salinity (ppt) at BA20-20 (project area)	8,012	0.49	8.88	1.71	0.67
Salinity at BA20-90R (reference area)	8,014	0.2	16.44	2.18	1.92

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	-0.47	1.72	0.020	-0.51	-0.44	-24.709	8,009	< 0.001

Table 4. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded salinities (ppt) at continuous recorder stations BA20-20 and BA20-90R from June 2001 through December 2002 (postconstruction phase of unit 2).

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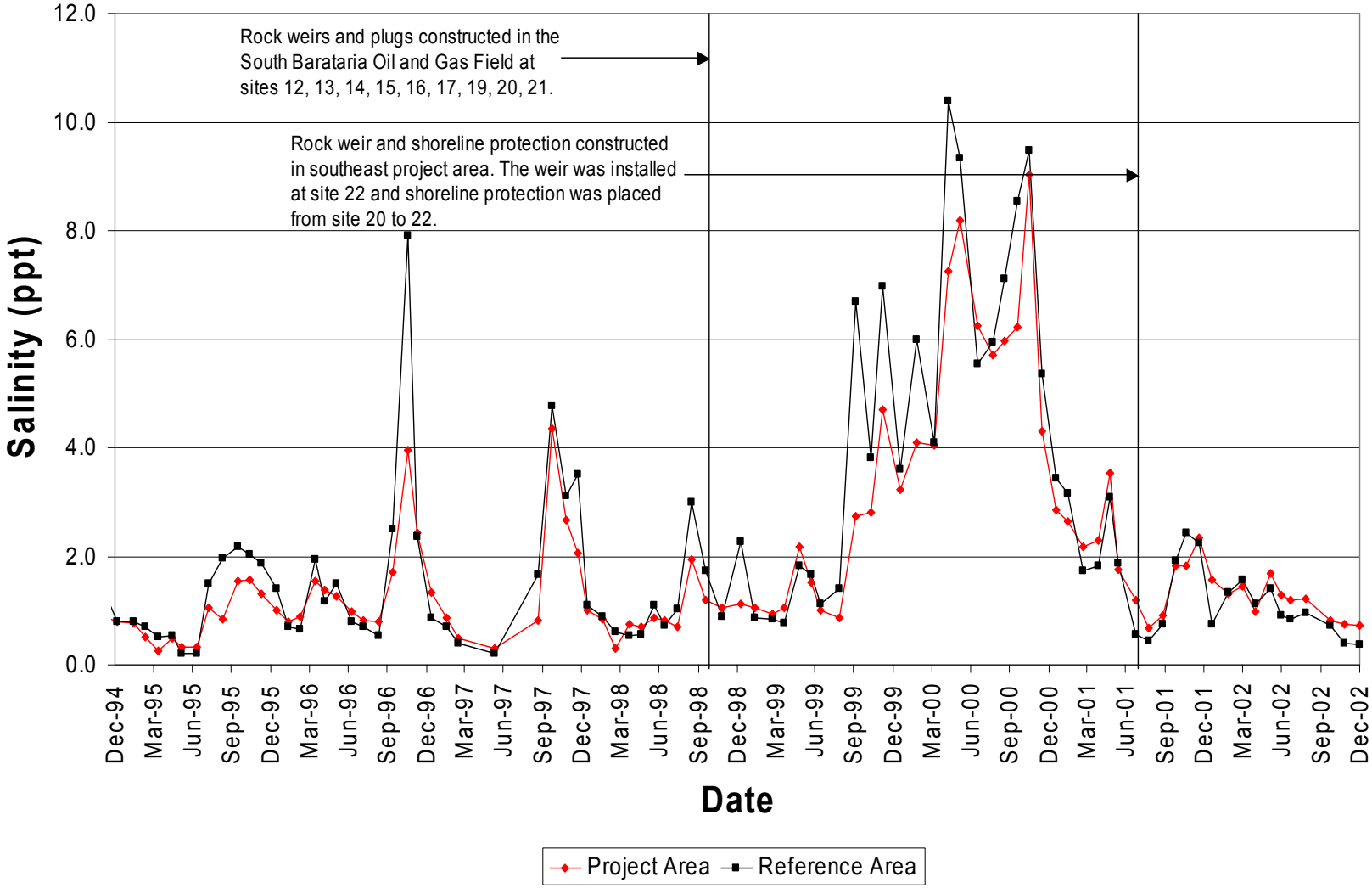

Figure 16. Mean monthly discrete salinities in the BA20 project and reference areas from 12/1994 through 12/2002.

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Water Elevation

Water elevation at each continuous recorder station followed the same general pattern from 1997 through 2002. Water elevations were higher in spring, early summer, and fall, while lower levels occurred in late summer and winter. Rain and storm surges, associated with Hurricane Georges, increased water elevations in September and October 1998. Hurricanes Isodore and Lili caused similar increases in September and October 2002.

Because continuous recorder stations 8 (project area) and 98R (reference area) are separated by the southwestern structures, and 20 (project area) and 90R (reference area) are separated by the southeastern structures, mean monthly water elevations were compared between stations 8 and 98R, and stations 20 and 90R. Construction of the southwestern structures was completed in October 1998, and the southeastern structures were built by May 2001. Stations 11 (project area) and 91R (reference area), located in the northern area, were not compared because it was decided that the northern structures would not be built.

Elevations at stations 8 and 98R were similar except in September 1998 when Hurricane Georges caused mean water elevation at station 98R to be 1.04 ft (0.317 m) NAVD 88 higher than station 8 (figure 28). Construction of the southwestern structures was almost complete at the time. It is possible that they may have reduced elevation increases caused by storm surge in the southwestern project area. Stations 20 and 90R also had similar elevations except for in May 1998 and November 2000. In May 1998, station 20 had a mean elevation of 1.69 ft (0.517 m) NAVD 88 while station 90R had 1.29 ft (0.374 m) NAVD 88. In November 2000, station 20 had a mean elevation of 1.43 ft (0.437 m) NAVD 88 and station 90R had 0.95 ft (0.290) NAVD 88. During high water periods, southeastern project area water levels are sometimes higher than in the associated reference area.

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Figure 18. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-08 from 12/1997 through 12/2002.

Figure 19. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-11 from 12/1997 through 12/2002.

Figure 20. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-11 from 12/1997 through 12/2002.

Figure 21. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-20 from 12/1997 through 12/2002.

Figure 22. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-20 from 12/1997 through 12/2002.

Figure 23. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-90R from 12/1997 through 12/2002.

Figure 24. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-90R from 12/1997 through 12/2002.

Figure 25. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-91R from 12/1997 through 8/2002.

Figure 26. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-91R from 12/1997 through 8/2002.

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List of water elevation figures and tables (continued)

Figure 27. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-98R from 12/1997 through 12/2002.

Figure 28. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-98R from 12/1997 through 12/2002.

Figure 29. Mean Monthly Water Elevations NAVD 88 (ft) for Continuous Recorders BA20-8 (inside project area) and BA20-98R (reference area) From 12/1997 to 12/2002.

Figure 30. Mean Monthly Water Elevations NAVD 88 (m) for Continuous Recorders BA20-8 (inside project area) and BA20-98R (reference area) From 12/1997 to 12/2002.

Table 5. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft) at continuous recorder stations BA20-08 and BA20-98R from December 1997 through September 1998 (preconstruction phase of unit 1).

Table 6. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-08 and BA20-98R from December 1997 through September 1998 (preconstruction phase of unit 1).

Table 7. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft) at continuous recorder stations BA20-08 and BA20-98R from September 1998 through December 2002 (postconstruction phase of unit 1).

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List of water elevation figures and tables (continued)

Table 8. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-08 and BA20-98R from September 1998 through December 2002 (postconstruction phase of unit 1).

Figure 31. Mean monthly water elevations NAVD 88 (ft) for continuous recorders BA20-20 (inside project area) and BA20-90R (reference area) from 12/1997 to 12/2002.

Figure 32. Mean monthly water elevations NAVD 88 (m) for continuous recorders BA20-20 (inside project area) and BA20-90R (reference area) from 12/1997 to 12/2002.

Table 9. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft) at continuous recorder stations BA20-20 and BA20-90R from December 1997 through May 2001 (preconstruction phase of unit 2).

Table 10. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-20 and BA20-90R from December 1997 through May 2001 (preconstruction phase of unit 2).

Table 11. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft) at continuous recorder stations BA20-20 and BA20-90R from May 2001 through December 2002 (postconstruction phase of unit 2).

Table 12. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-20 and BA20-90R from May 2001 through December 2002 (postconstruction phase of unit 2).

Jonathan Davis Wetland Protection (BA-20)

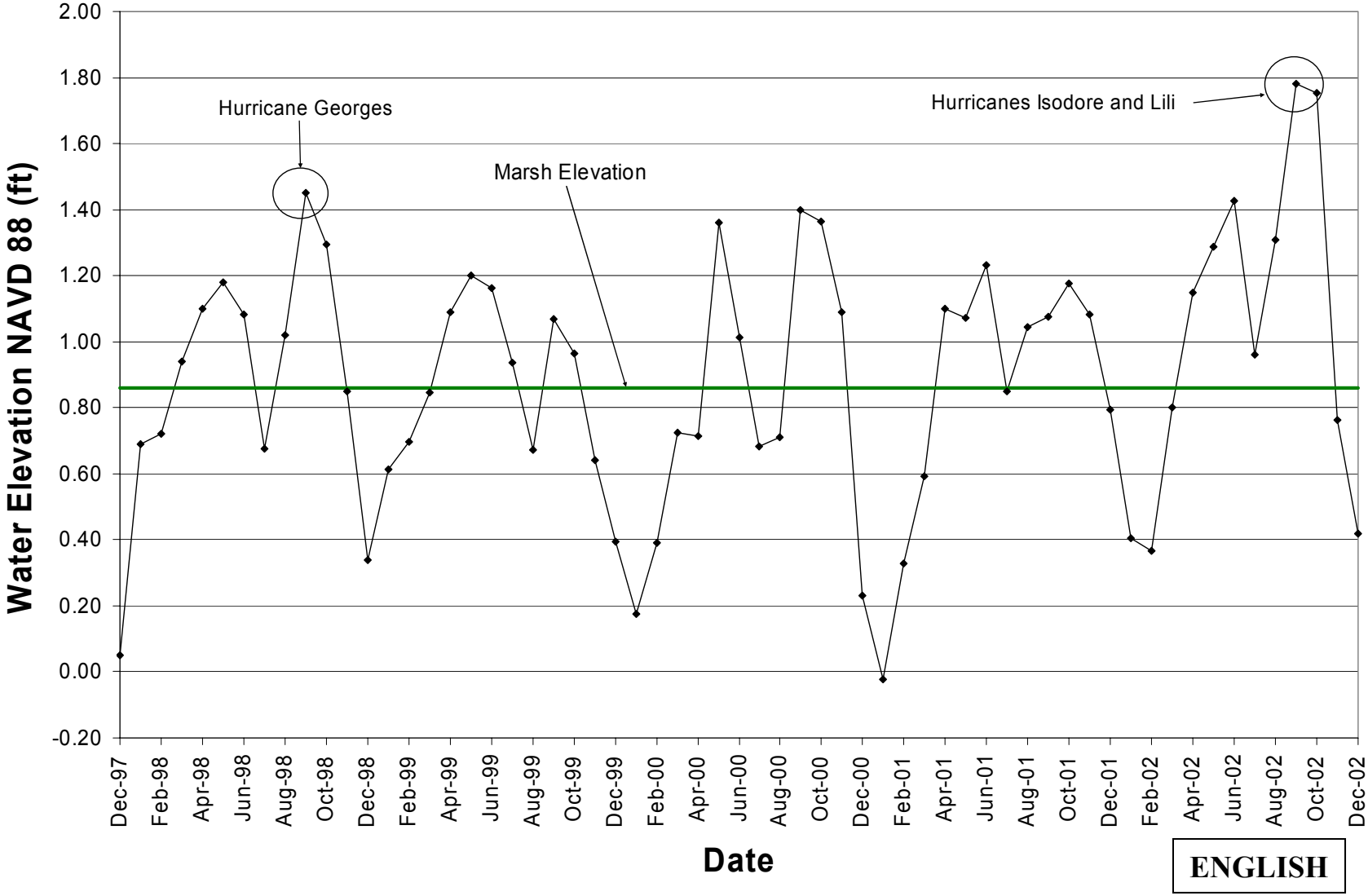

Figure 17. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-08 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

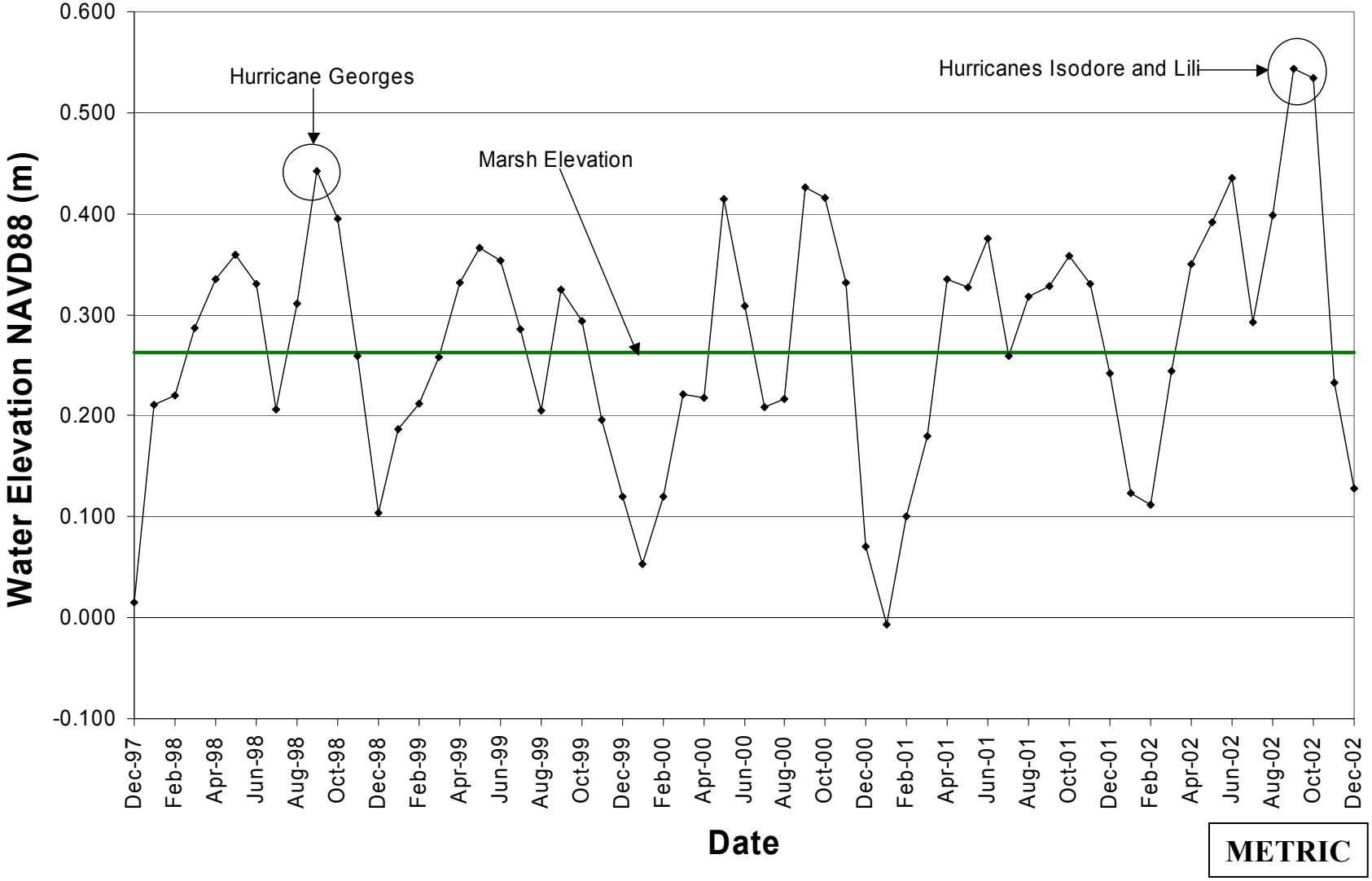

Figure 18. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-08 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

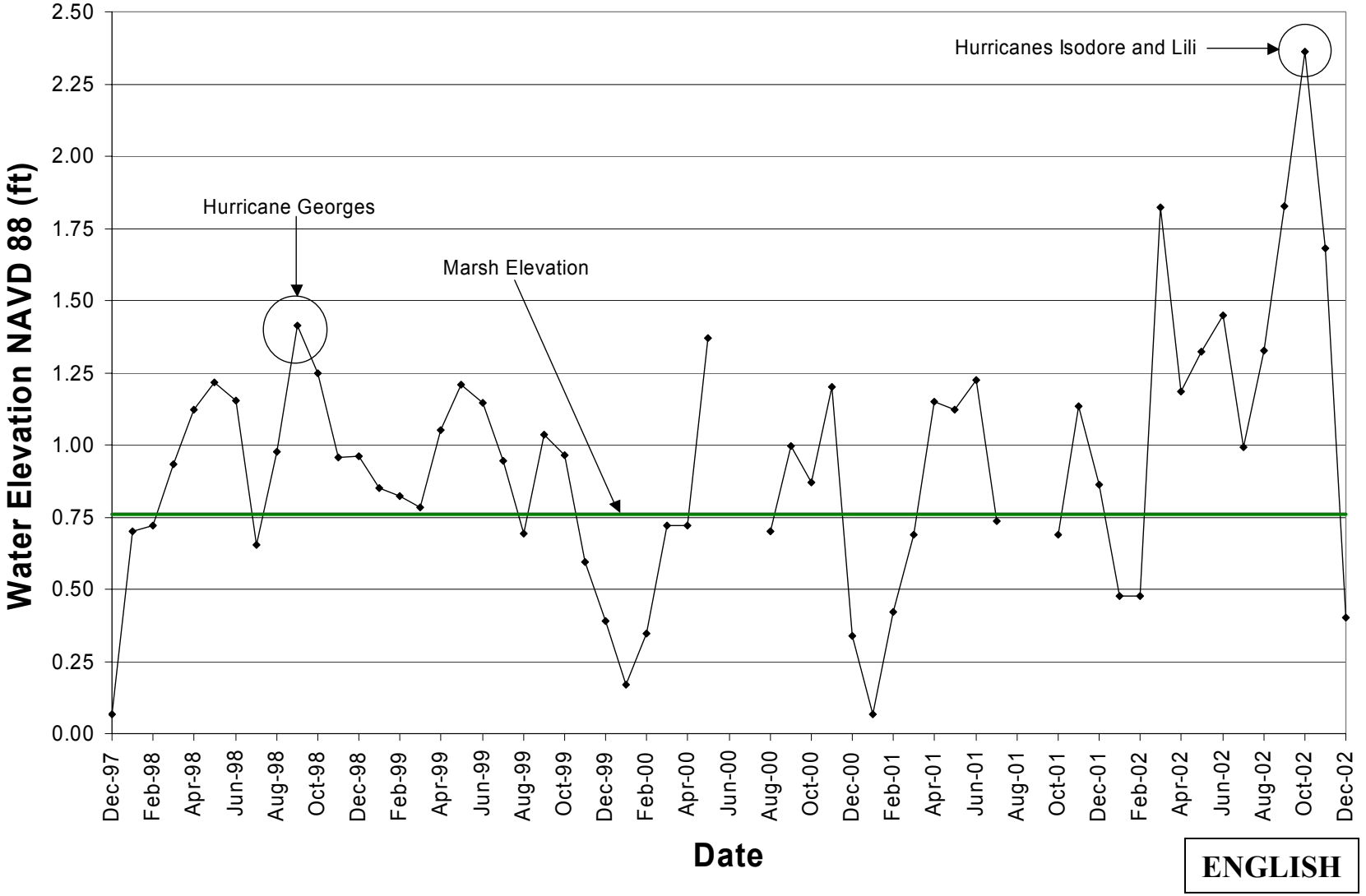

Figure 19. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-11 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

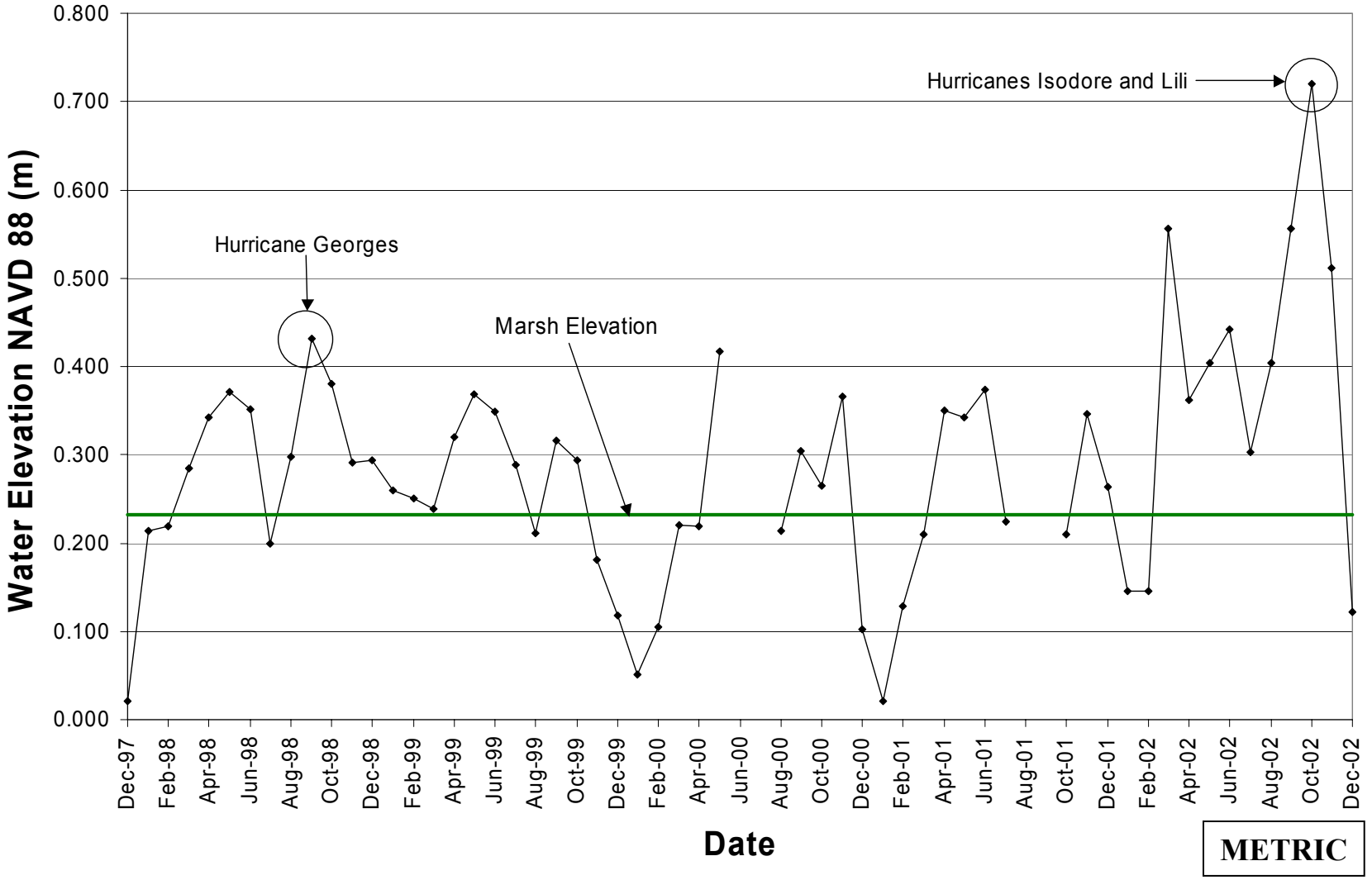

Figure 20. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-11 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

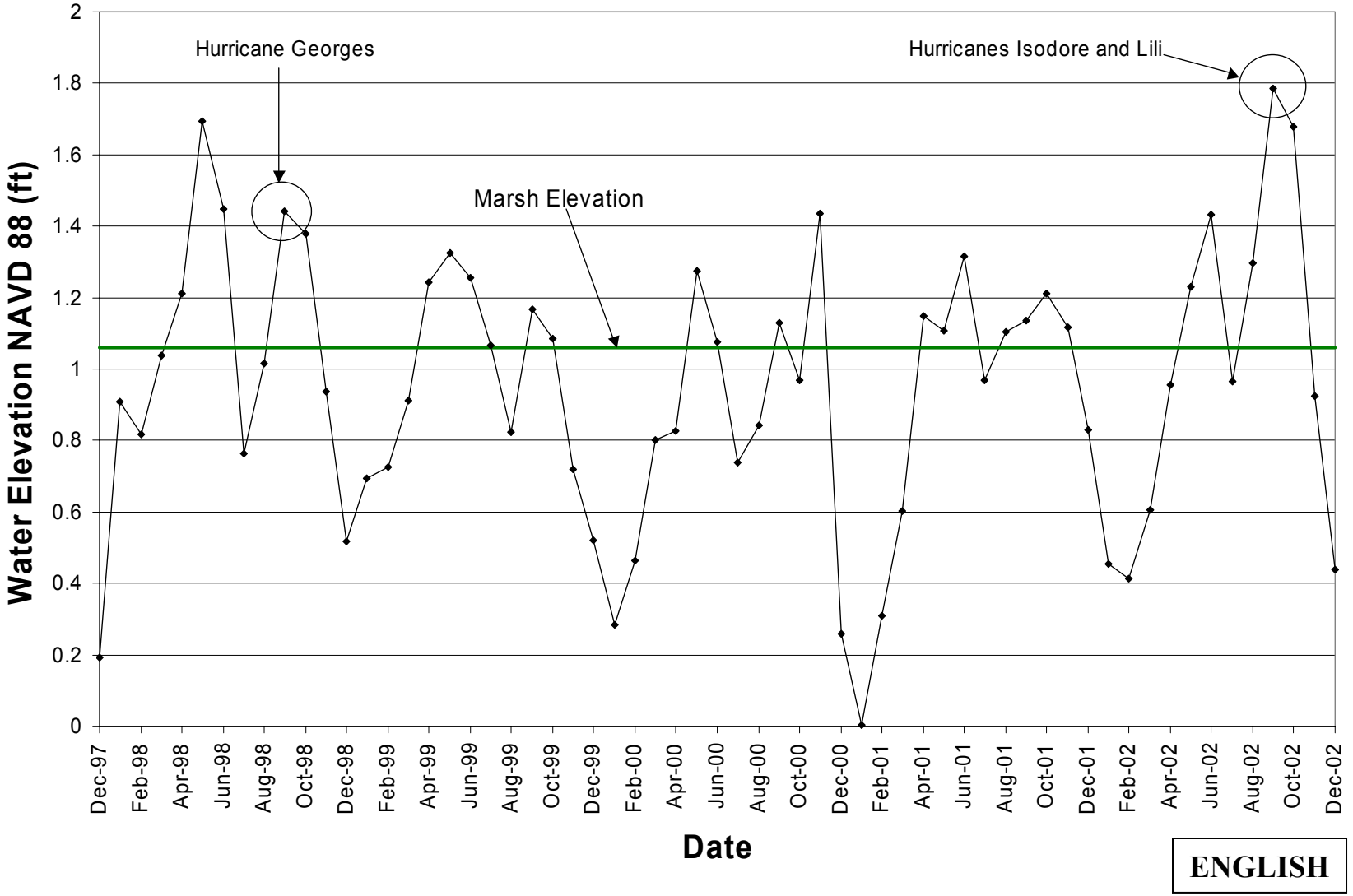

Figure 21. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-20 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

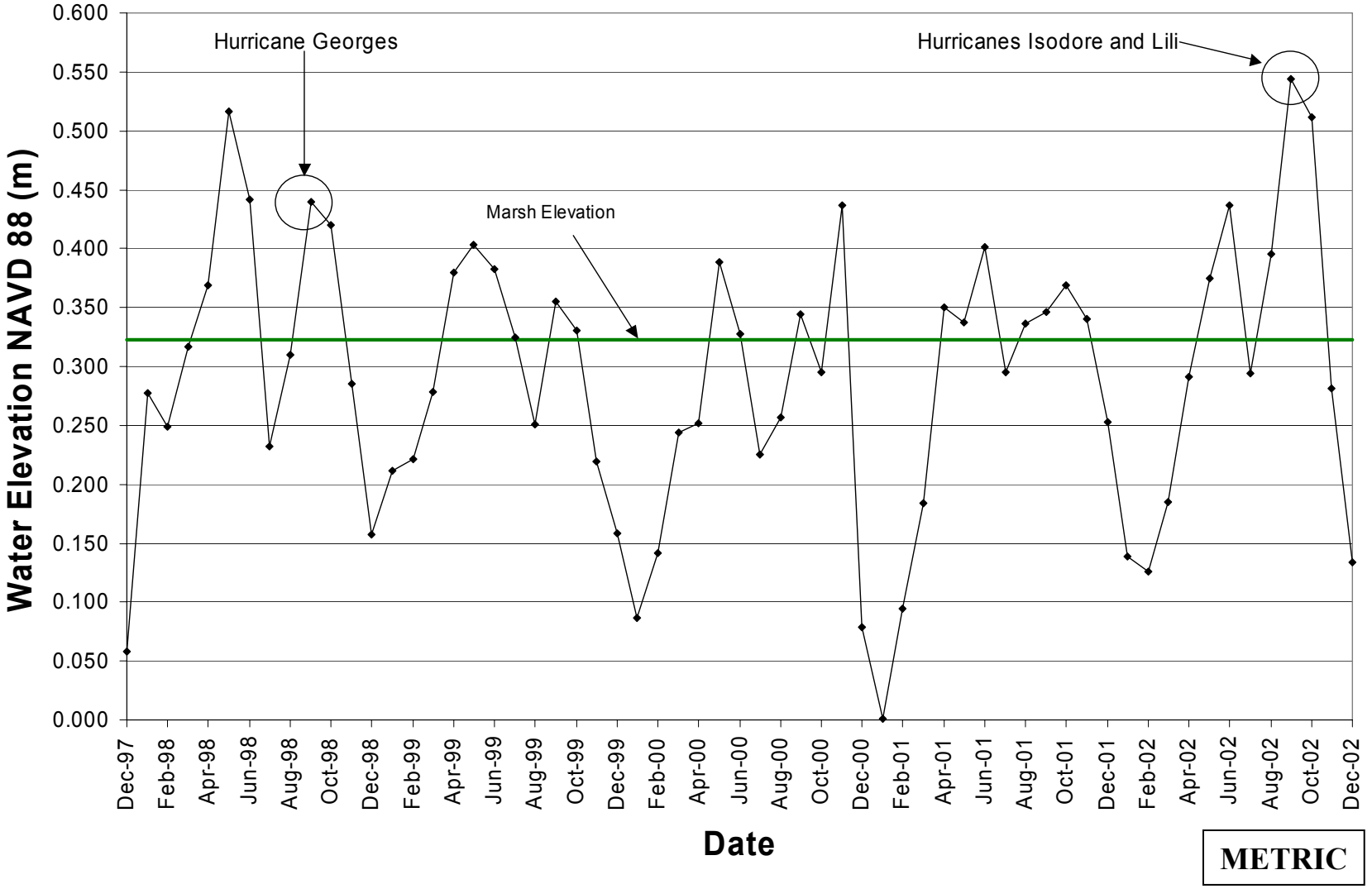

Figure 22. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-20 from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

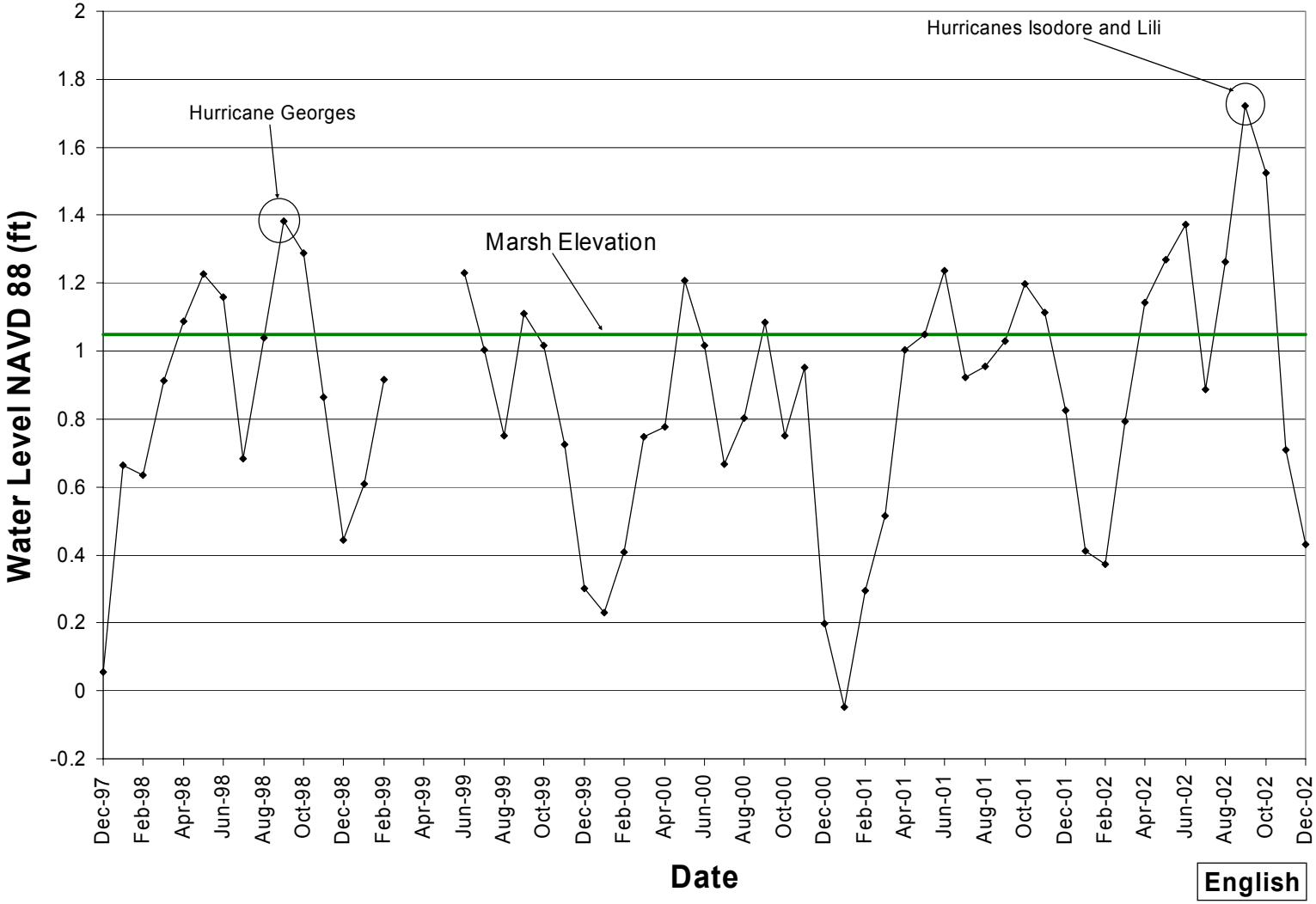

Figure 23. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-90R from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

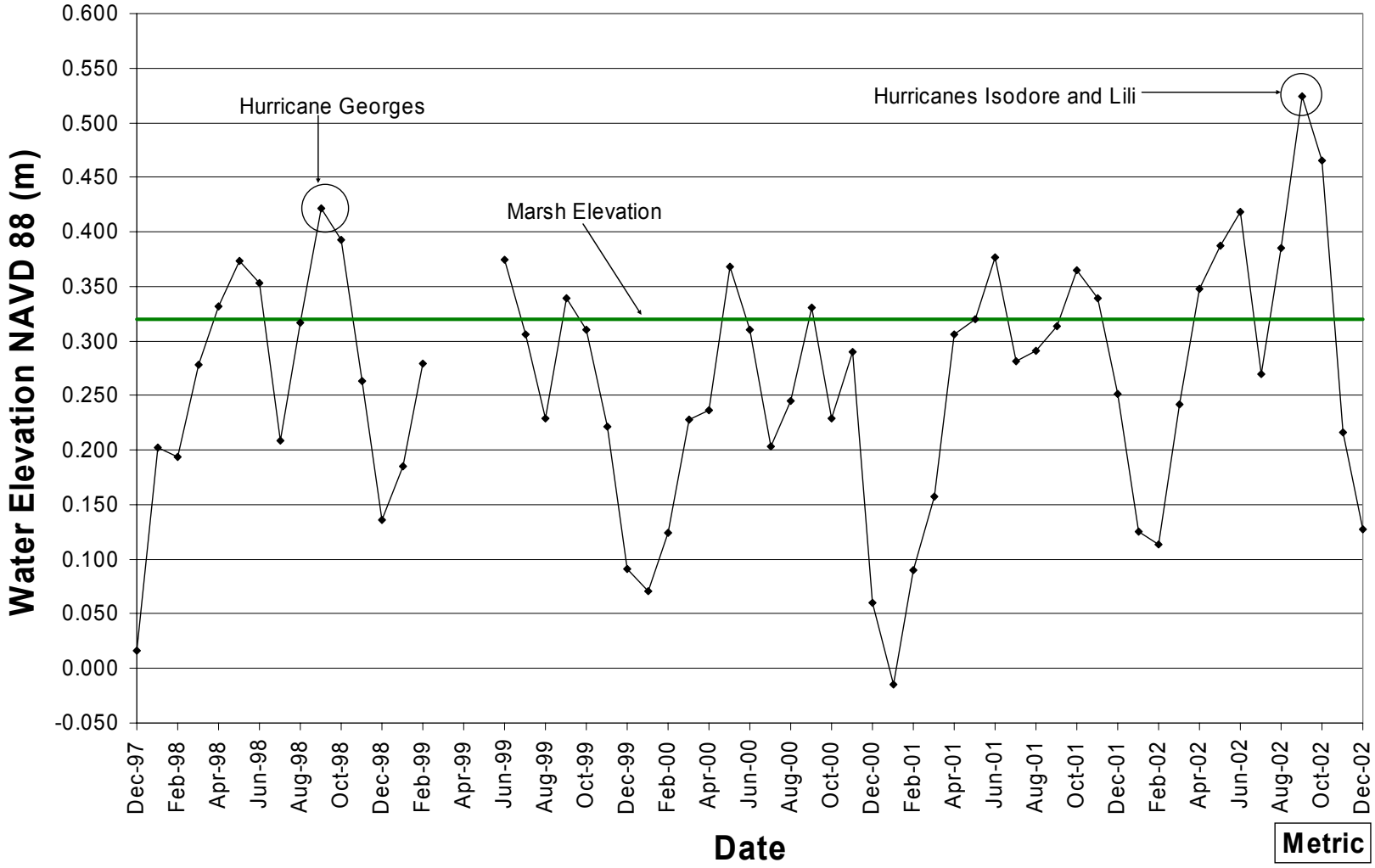

Figure 24. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-90R from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

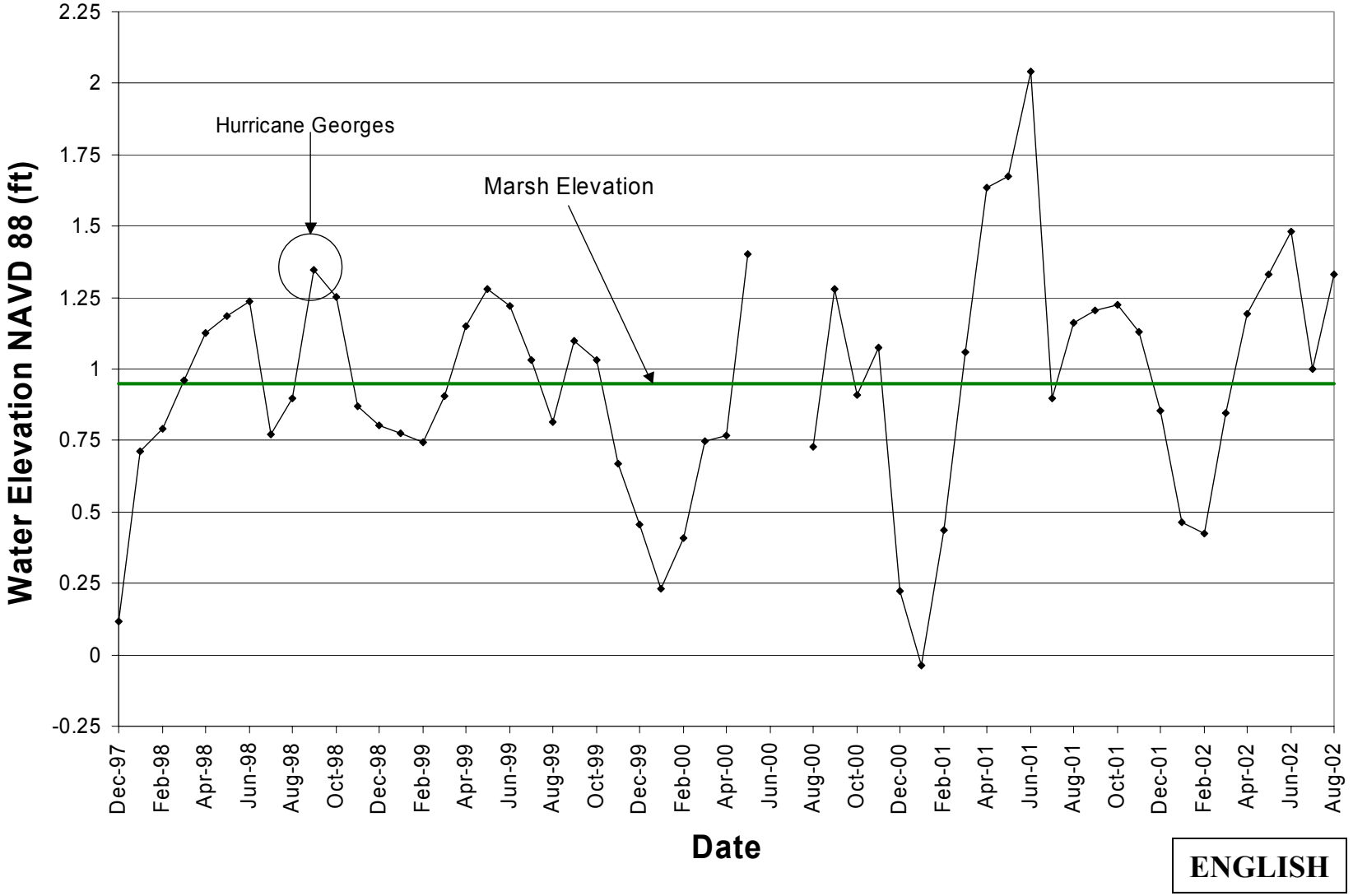

Figure 25. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-91R from 12/1997 through 8/2002.

Jonathan Davis Wetland Protection (BA-20)

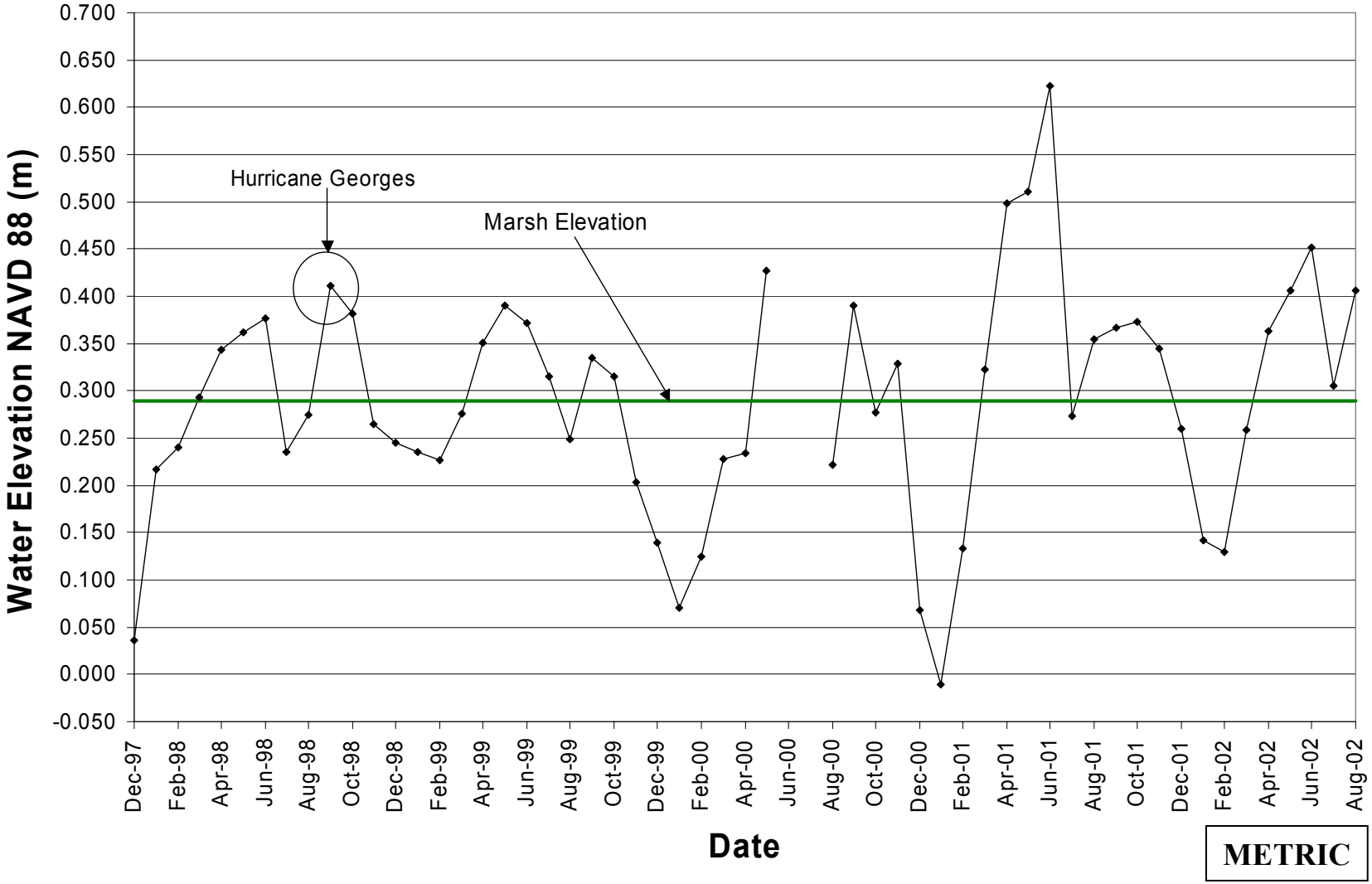

Figure 26. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-91R from 12/1997 through 8/2002.

Jonathan Davis Wetland Protection (BA-20)

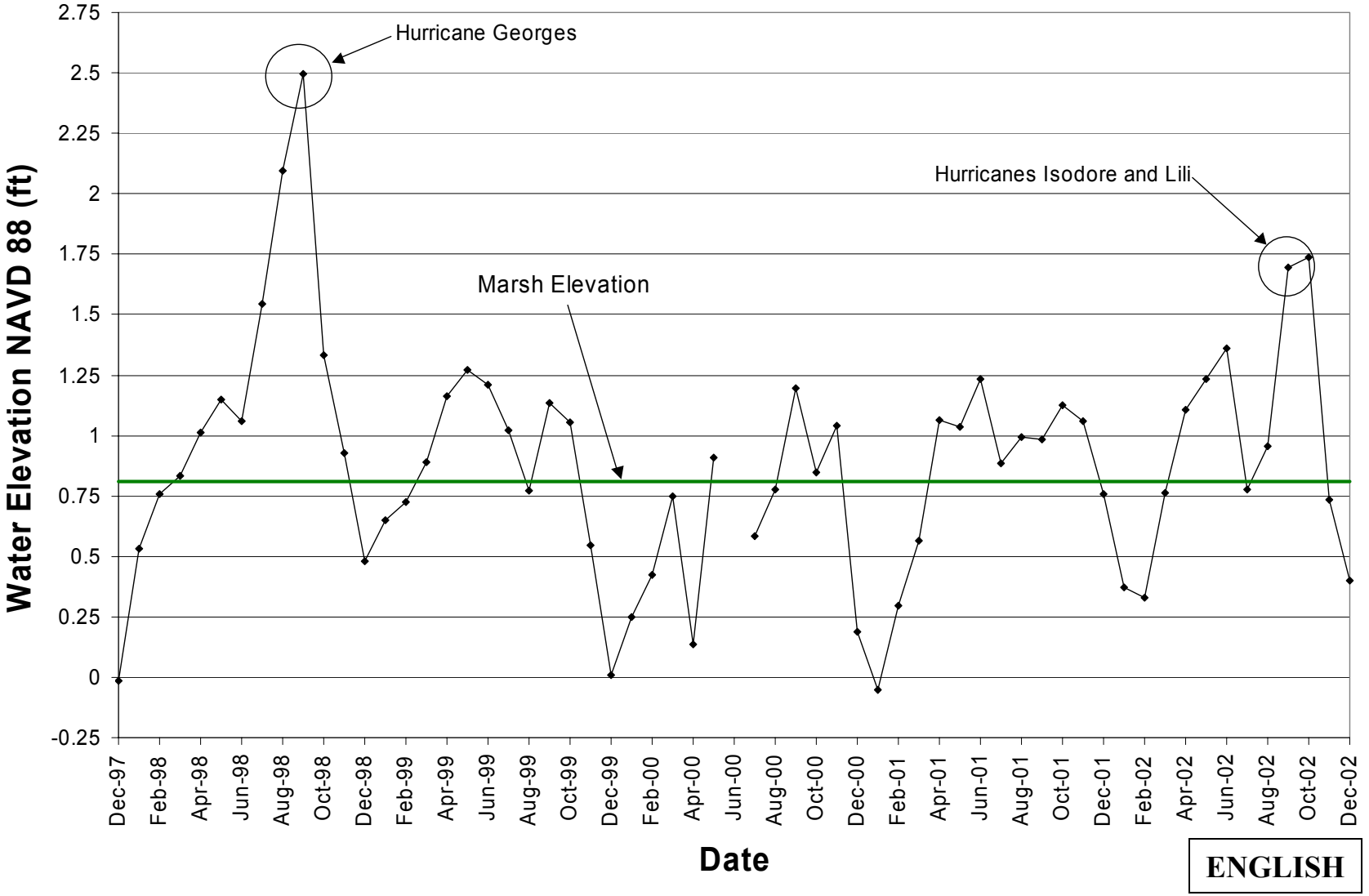

Figure 27. Mean monthly water elevations NAVD 88 (ft) for continuous recorder station BA20-98R from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

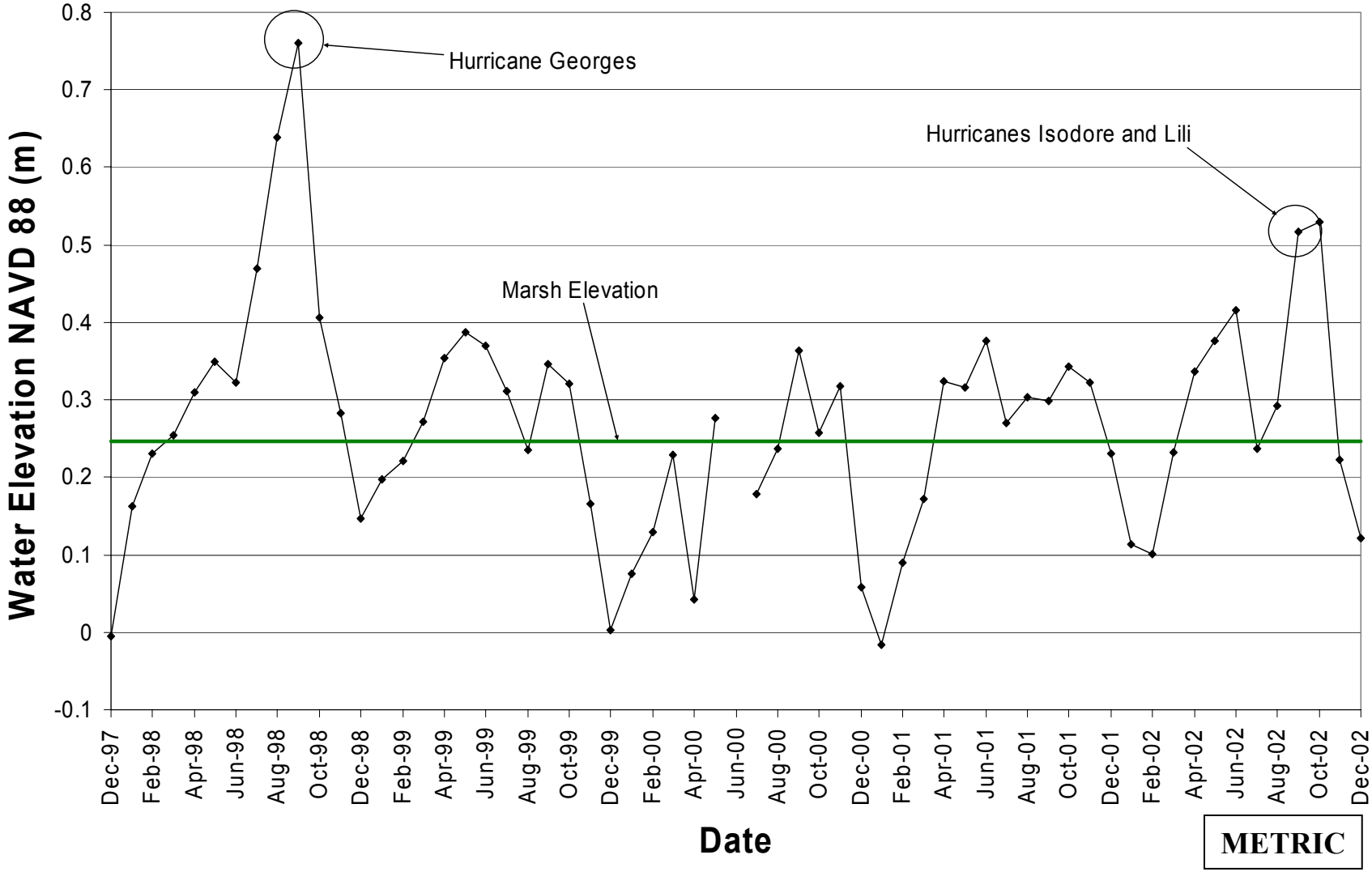

Figure 28. Mean monthly water elevations NAVD 88 (m) for continuous recorder station BA20-98R from 12/1997 through 12/2002.

Jonathan Davis Wetland Protection (BA-20)

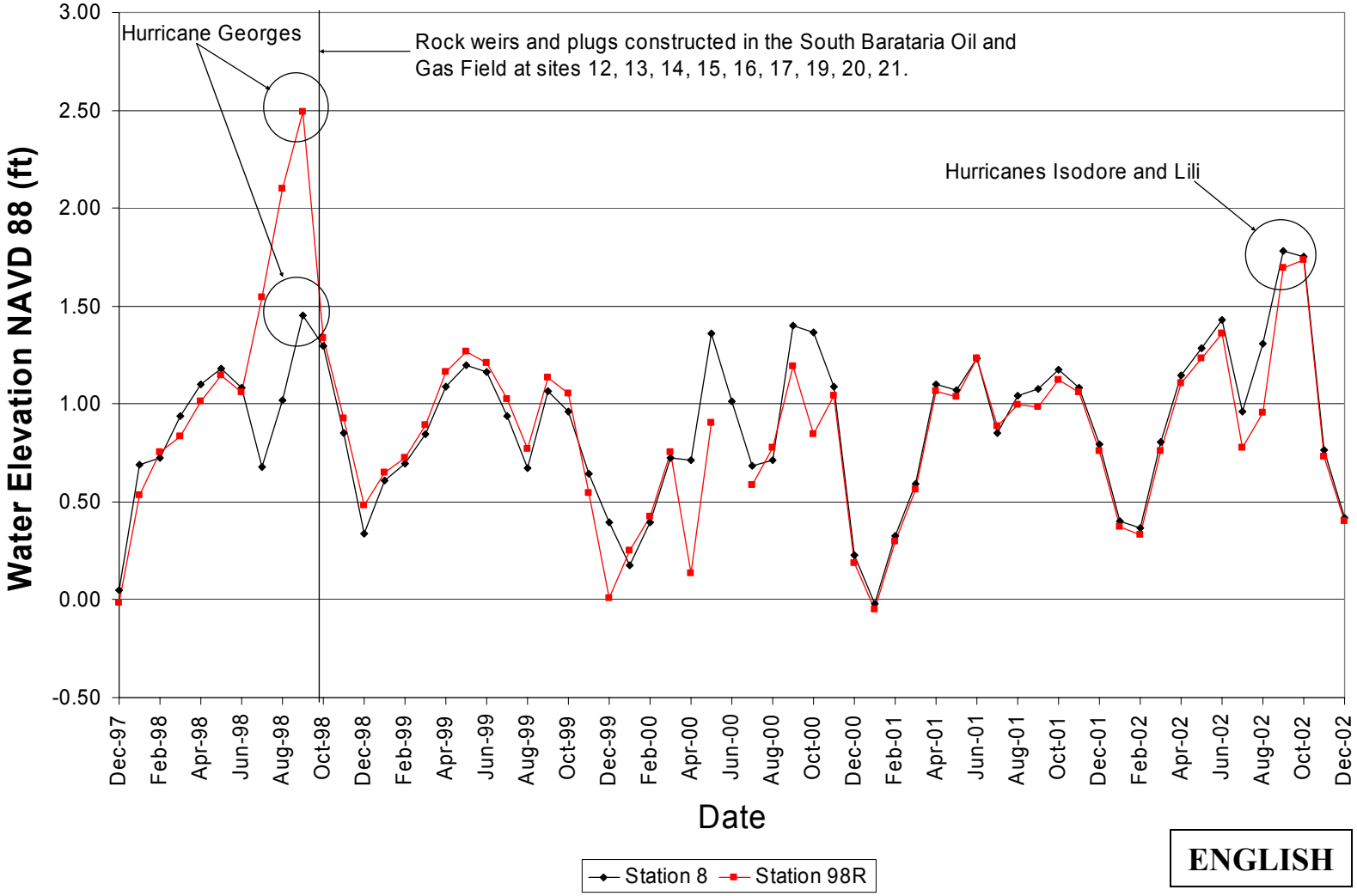

Figure 29. Mean monthly water elevations (NAVD 88 ft) for continuous recorders BA20-8 (inside project area) and BA20-98R (reference area) from 12/1997 to 12/2002.

Jonathan Davis Wetland Protection (BA-20)

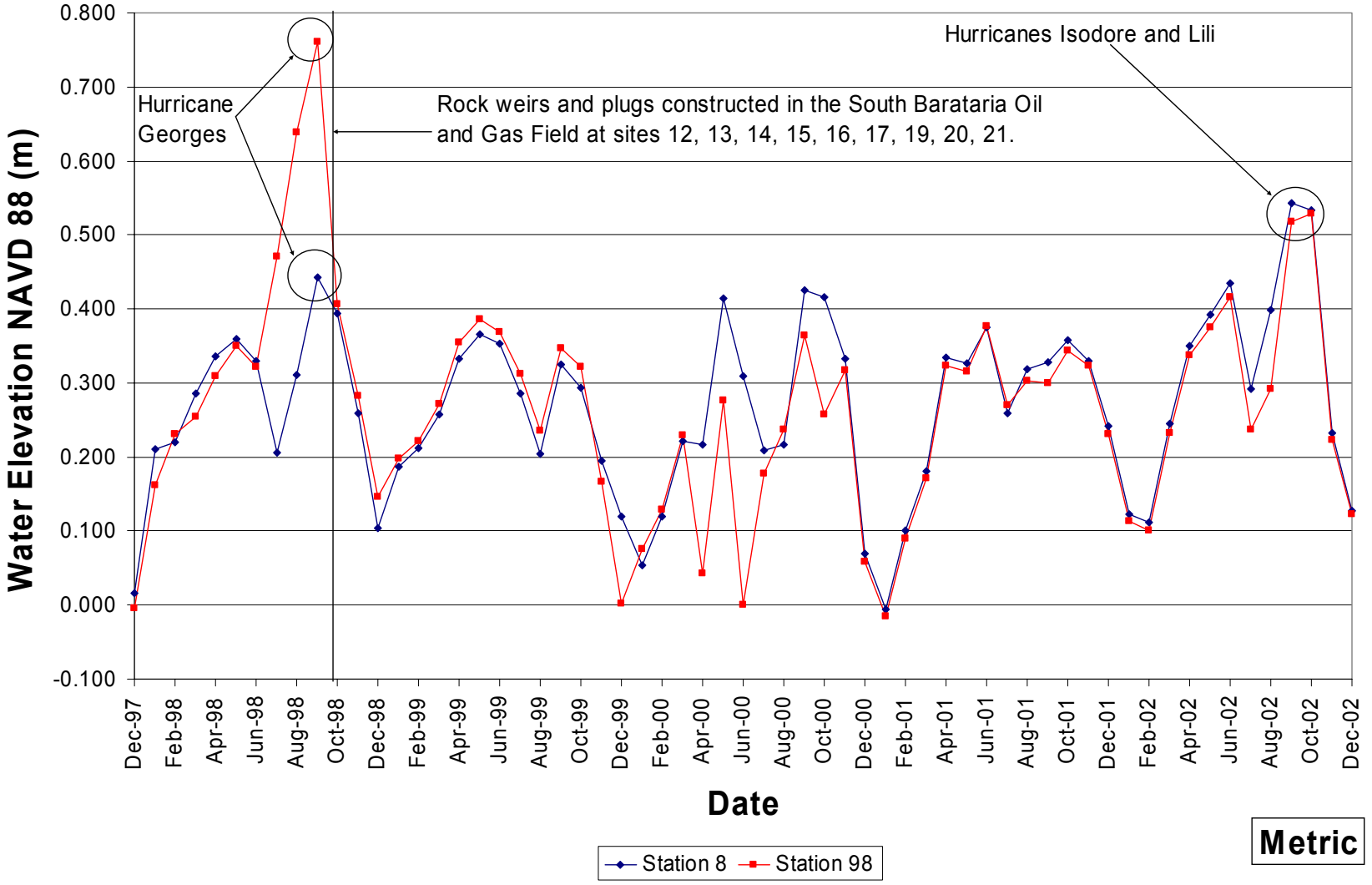

Figure 30. Mean Monthly Water Elevations (NAVD 88 m) for Continuous Recorders BA20-8 (inside project area) and BA20-98R (reference area) From 12/1997 to 12/2002.

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-08 (project area)	7,289	-0.79	3.58	0.93	0.62
Water level at BA20-98R (reference area)	6,877	-0.82	4.65	1.13	0.86

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	-0.24	0.65	0.010	-0.25	-0.22	-30.54	6,870	< 0.001

English

Table 5. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft.) at continuous recorder stations BA20-08 and BA20-98R from December 1997 through September 1998 (preconstruction phase of unit 1).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-08 (project area)	7,289	-0.24	1.09	0.28	0.19
Water level at BA20-98R (reference area)	6,877	-0.25	1.42	0.34	0.26

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	-0.07	0.20	0.002	-0.080	-0.070	-30.40	6,870	< 0.001

Metric

Table 6. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-08 and BA20-98R from December 1997 through September 1998 (preconstruction phase of unit 1).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-08 (project area)	35,057	-0.75	3.84	0.89	0.53
Water level at BA20-98R (reference area)	31,980	-0.77	3.80	0.85	0.53

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.03	0.26	0.001	0.03	0.03	30.525	31,278	< 0.001

English

Table 7. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft.) at continuous recorder stations BA20-08 and BA20-98R from October 1998 through December 2002 (postconstruction phase of unit 1).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-08 (project area)	35,057	-0.23	1.17	0.27	0.16
Water level at BA20-98R (reference area)	31,980	-0.23	1.16	0.26	0.16

Paired Samples Test								
	Paired Differences							
BA20-08 vs. BA20-98R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.01	0.08	0.001	0.01	0.01	20.60	31,278	< 0.001

Metric

Table 8. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-08 and BA20-98R from October 1998 through December 2002 (postconstruction phase of unit 1).

Jonathan Davis Wetland Protection (BA-20)

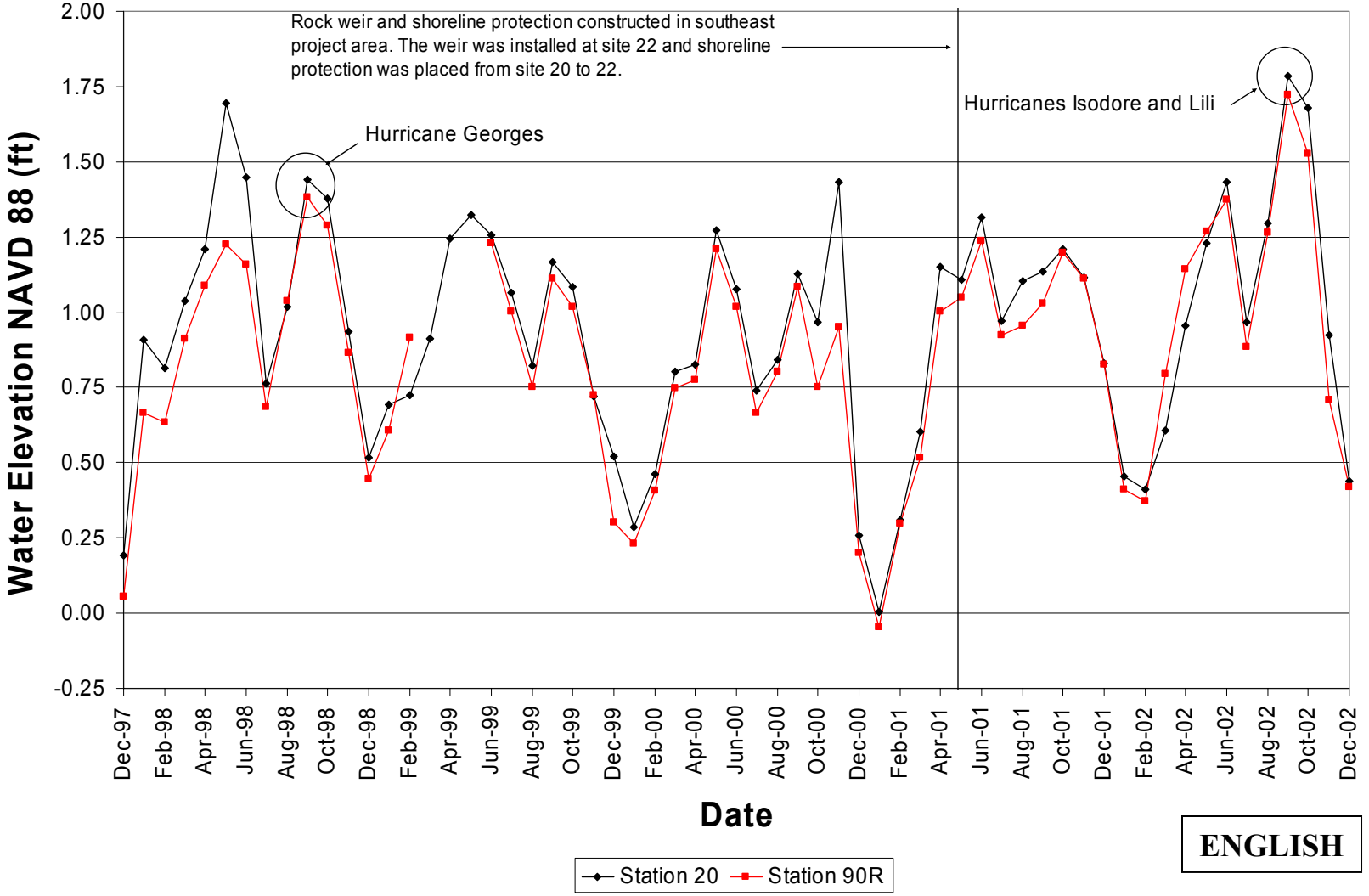

Figure 31. Mean monthly water elevations NAVD 88 (ft) for continuous recorders BA20-20 (inside project area) and BA20-90R (reference area) from 12/1997 to 12/2002.

Jonathan Davis Wetland Protection (BA-20)

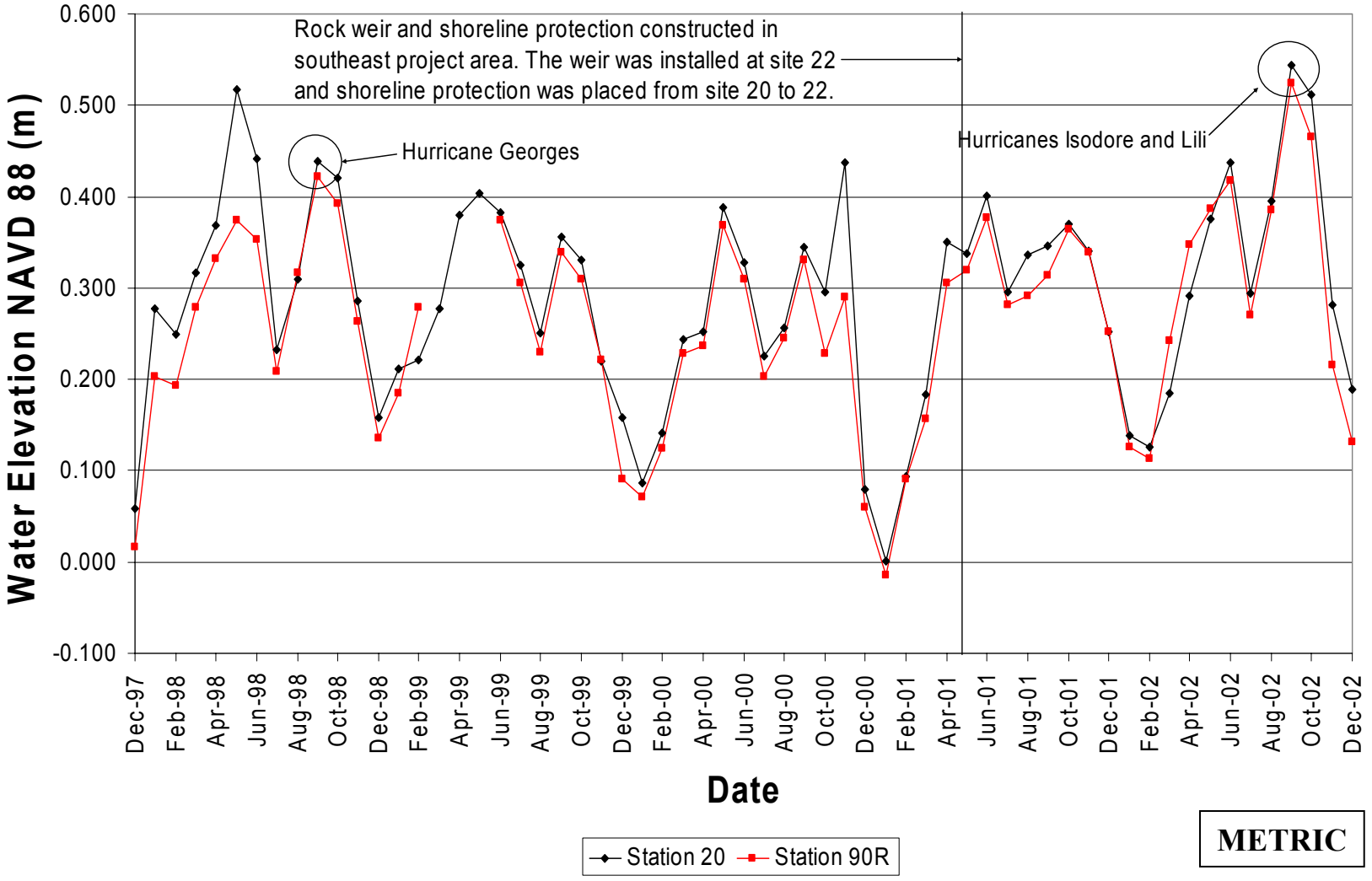

Figure 32. Mean monthly water elevations NAVD 88 (m) for continuous recorders BA20-20 (inside project area) and BA20-90R (reference area) from 12/1997 to 12/2002.

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-20 (project area)	29,091	-0.73	3.55	0.91	0.54
Water level at BA20-90R (reference area)	26,560	-0.86	3.39	0.81	0.53

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.10	0.13	0.001	0.09	0.10	120.028	25,650	< 0.001

English

Table 9. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft.) at continuous recorder stations BA20-20 and BA20-90R from December 1997 through May 2001 (preconstruction phase of unit 2).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-20 (project area)	29,092	-0.22	1.08	0.28	0.17
Water level at BA20-90R (reference area)	26,564	-0.26	1.03	0.24	0.16

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.03	0.04	0.0002	0.03	0.03	118.79	25,655	< 0.001

Metric

Table 10. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-20 and BA20-90R from December 1997 through May 2001 (preconstruction phase of unit 2).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-20 (project area)	12,891	-0.31	4.13	1.10	0.51
Water level at BA20-90R (reference area)	13,687	-0.46	4.02	1.02	0.51

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.06	0.13	0.001	0.06	0.07	56.52	12,887	< 0.001

English

Table 11. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 ft.) at continuous recorder stations BA20-20 and BA20-90R from June 2001 through December 2002 (postconstruction phase of unit 2).

Jonathan Davis Wetland Protection (BA-20)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Water level at BA20-20 (project area)	12,891	-0.09	1.26	0.33	0.16
Water level at BA20-90R (reference area)	13,687	-0.14	1.22	0.31	0.15

Paired Samples Test								
	Paired Differences							
BA20-20 vs. BA20-90R	Mean	Standard Deviation	Standard Error Mean	95% Confidence Interval of the Difference		t	Degrees of Freedom	Significance (2-tailed)
				Lower	Upper			
	0.02	0.04	0.0004	0.02	0.02	56.17	12,887	< 0.001

Metric

Table 12. Descriptive statistics and paired samples T-test results of a comparison of hourly recorded water levels (NAVD 88 m) at continuous recorder stations BA20-20 and BA20-90R from June 2001 through December 2002 (postconstruction phase of unit 2).

Jonathan Davis Wetland Protection (BA-20)

Shoreline Change

An as-built shoreline survey was conducted in July 2001 of the shoreline protection placed on the southeastern border of the project area as part of construction unit 2. A postconstruction survey is scheduled to occur in 2004. More as-built and postconstruction surveys will be conducted as future shoreline protection features are installed.

Jonathan Davis Wetland Protection (BA-20)

Vegetation

Project and reference area vegetation mean percent cover changed similarly from 1996 to 1999. 2002 survey results are not yet available. With decreases in *Sagittaria lancifolia* and *Eleocharis sp.,* and increases in *Spartina patens*, *Vigna luteola*, and *Polygonum punctatum* from 1996 to 1999, both project and reference areas reflected a trend towards a higher percent cover of salt tolerant vegetation. This was most likely due to a drought from August 1999 to November 2000. It is too early to see if the project features are working towards promoting higher percentages of fresh water emergent vegetation. The southwestern structures were the only ones built during this time period. As future survey data become available, the effectiveness of project features can be further evaluated.

Jonathan Davis Wetland Protection (BA-20)

Vegetation Tables and Figures

Table 13. Mean percent of vegetative coverage at project and reference area vegetation stations in 1996 and 1999.

Figure 33. 1996 mean % cover across all vegetation stations in the project and reference areas.

Figure 34. 1999 mean % cover across all vegetation stations in the project and reference areas.

Figure 35. 1996 and 1999 mean % cover across all vegetation stations within the project area.

Figure 36. 1996 and 1999 mean % cover across all vegetation stations within the reference area.

Jonathan Davis Wetland Protection (BA-20)

		Mean % Coverage (project area)		Mean % Coverage (reference area)	
Scientific Name	Common Name	1996	1999	1996	1999
Acer rubrum var. drummondii	Drummond's maple	0.0	0.3	0.0	0.4
Alternanthera philoxeroides	alligatorweed	14.8	4.8	6.0	0.5
Amaranthus australis	southern amaranth	0.1	0.8	0.1	0.2
Symphyotrichum tenuifolium	perennial saltmarsh aster	7.2	5.4	11.0	5.0
Baccharis halimifolia	eastern baccharis	1.0	0.7	5.3	0.0
Bacopa monnieri	herb of grace	2.2	0.9	1.0	1.0
Buchloe dactyloides	buffalograss	1.7	0.0	0.0	0.0
Cirsium sp.	thistle	0.2	0.0	0.0	0.0
Colocasia esculenta	coco yam	1.1	0.1	0.0	0.0
Commelina virginica	virginia dayflower	0.1	0.0	0.0	0.0
Cuscuta indecora	bigseed alfalfa dodder	0.0	0.0	0.5	4.0
Cyperus compressus	poorland flatsedge	0.0	0.1	0.0	0.0
Cyperus odoratus	fragrant flatsedge	0.0	0.6	0.0	0.3
Cyperus sp.	flatsedge	0.3	0.0	1.0	0.0
Echinochloa walterii	coast cockspur grass	0.0	0.3	0.0	0.0
Eleocharis cellulosa	Gulf Coast spikerush	37.5	29.0	28.5	20.5
Eleocharis parvula	dwarf spikerush	3.0	0.0	3.5	0.3
Eupatorium capillifolium	dogfennel	0.4	0.0	0.0	0.0
Galium obtusm	bluntleaf bedstraw	0.5	0.2	0.3	0.1
Hydrocotyle umbellata	manyflower marshpennywort	6.8	0.7	2.0	1.4
Ipomoea sagittata	saltmarsh morning-glory	8.1	5.0	12.7	11.0
Iris sp.	iris	2.2	0.0	0.0	0.0
Iva frutescens	Jesuit's bark	0.4	0.0	0.0	0.0

Table 13. Mean percent of vegetative coverage across all project and reference area vegetation stations in 1996 and 1999.

Jonathan Davis Wetland Protection (BA-20)

		Mean % Coverage (project area)		Mean % Coverage (reference area)	
Scientific Name	**Common Name**	**1996**	**1999**	**1996**	**1999**
Juncus effusus	common rush	0.6	0.0	0.0	0.0
Kosteletzkya virginica	Virginia saltmarsh mallow	0.3	0.3	1.0	0.7
Lythrum lineare	wand lythrum	1.3	2.3	2.9	8.5
Mikania scandens	climbing hempvine	1.9	0.0	4.5	0.0
Panicum dichotomiflorum	fall panicgrass	2.7	1.3	0.1	0.0
Panicum hemitomon	maidencane	2.6	0.1	0.0	0.0
Panicum repens	torpedo grass	0.0	3.3	0.0	0.0
Phyla lanceolata	lanceleaf frogfruit	2.0	5.6	2.1	0.6
Pluchea camphorata	camphor pluchea	0.0	0.0	0.0	1.5
Polygonum punctatum	dotted smartweed	6.3	9.9	4.3	20.0
Ptilimnium capillaceum	herbwilliam	2.1	0.0	2.8	0.0
Sabatia campestris	Texas star	0.2	0.0	0.3	0.0
Sacciolepis striata	american cupscale	1.3	2.0	0.0	0.3
Sagittaria lancifolia	bulltongue arrowhead	69.1	42.0	64.0	36.5
Schoenoplectus americanus	chairmaker's bulrush	4.2	9.6	1.2	15.0
Schoenoplectus robustus	sturdy bulrush	0.0	0.0	0.0	1.5
Sesbania drummondii	poisonbean	0.0	0.4	0.0	0.0
Setaria parviflora	marsh bristlegrass	0.3	0.1	0.0	0.0
Solidago sempervirens	seaside goldenrod	1.1	0.0	1.0	0.0
Spartina patens	saltmeadow cordgrass	23.8	27.0	29.9	39.5
Taxodium distichum	bald cypress	0.0	0.1	0.0	0.0
Teucrium canadense	Canada germander	0.1	0.0	0.0	0.0
Thelypteris noveboracensis	eastern marsh fern	0.0	1.3	0.0	1.0
Typha sp.	cattail	0.0	0.4	0.0	0.0
Vigna luteola	hairypod cowpea	8.0	26.5	15.1	25.8

Table 13 (continued). Mean percent of vegetative coverage across all project and reference area vegetation stations in 1996 and 1999.

Jonathan Davis Wetland Protection (BA-20)

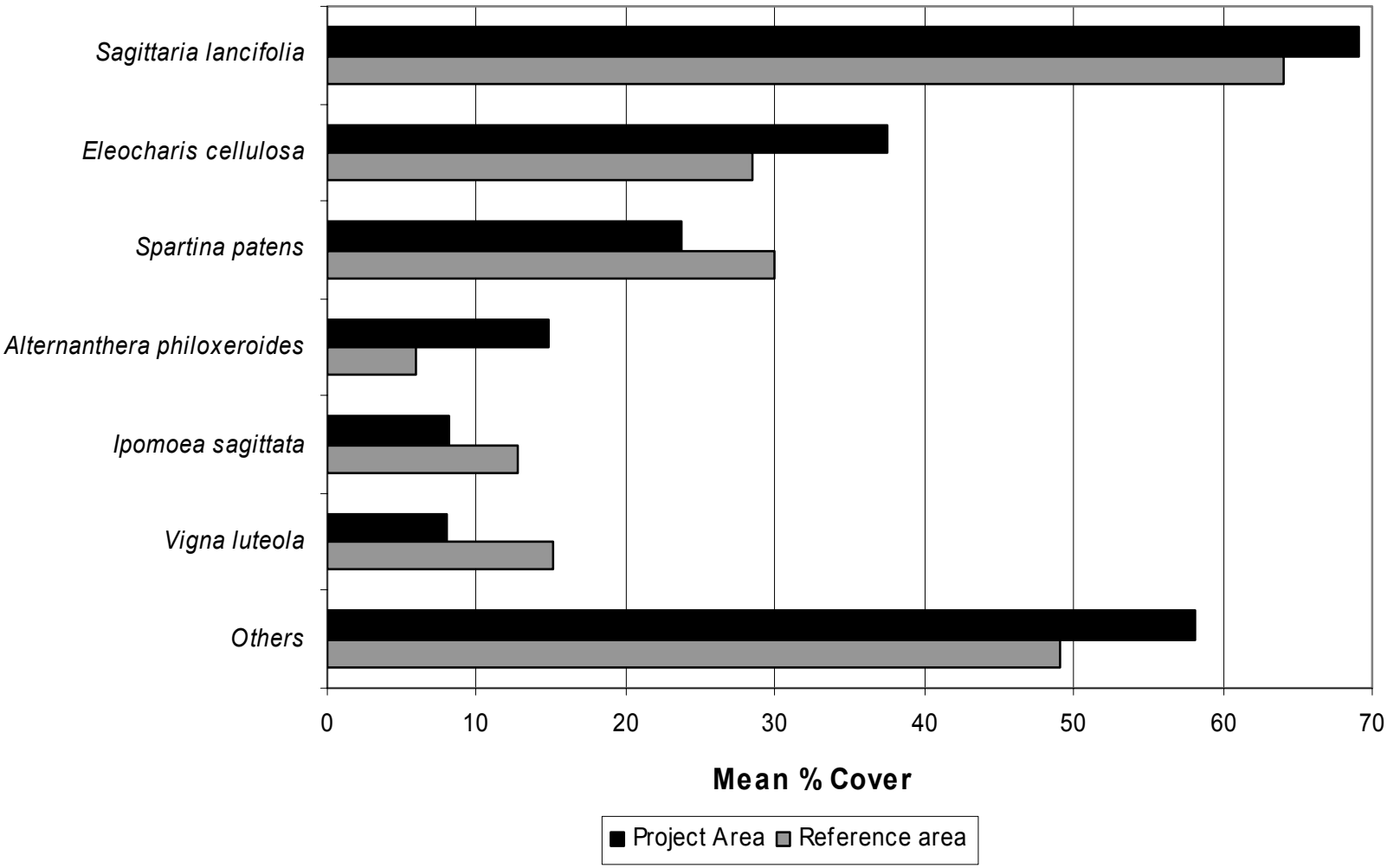

Figure 33. 1996 mean % cover across all vegetation stations in the project and reference areas.

Jonathan Davis Wetland Protection (BA-20)

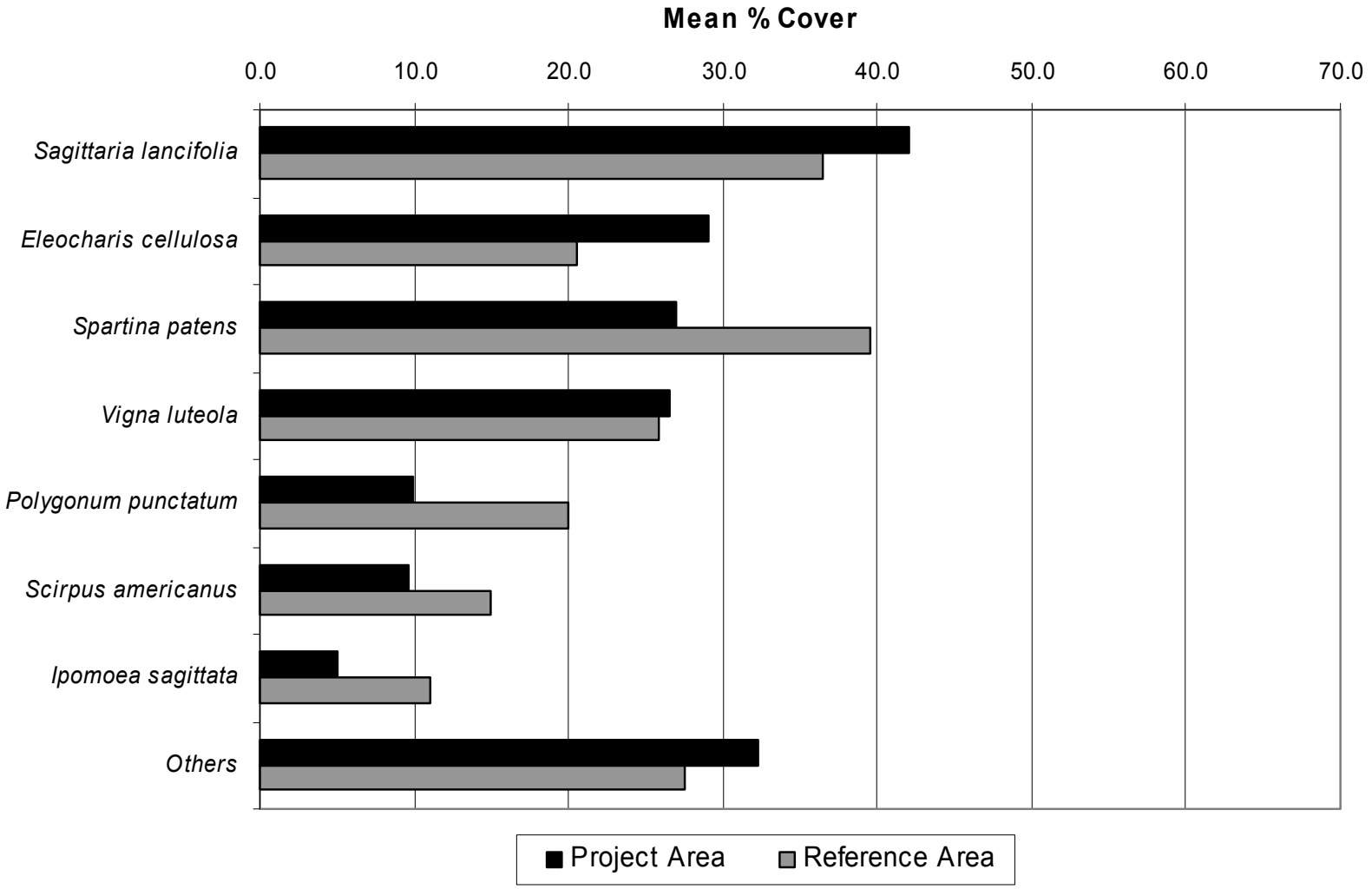

Figure 34. 1999 mean % cover across all vegetation stations in the project and reference areas.

Jonathan Davis Wetland Protection (BA-20)

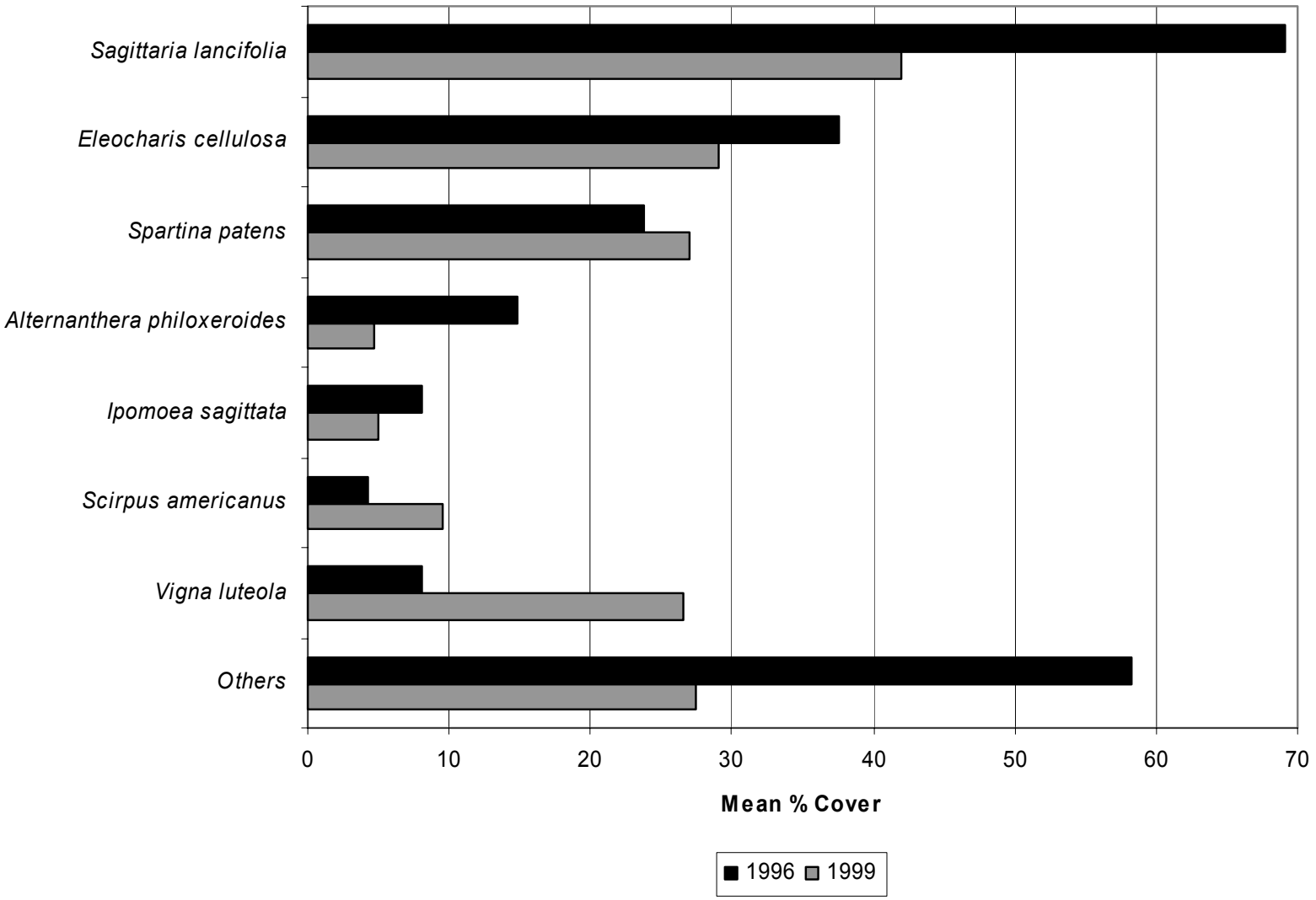

Figure 35. 1996 and 1999 mean % cover across all vegetation stations within the project area.

Jonathan Davis Wetland Protection (BA-20)

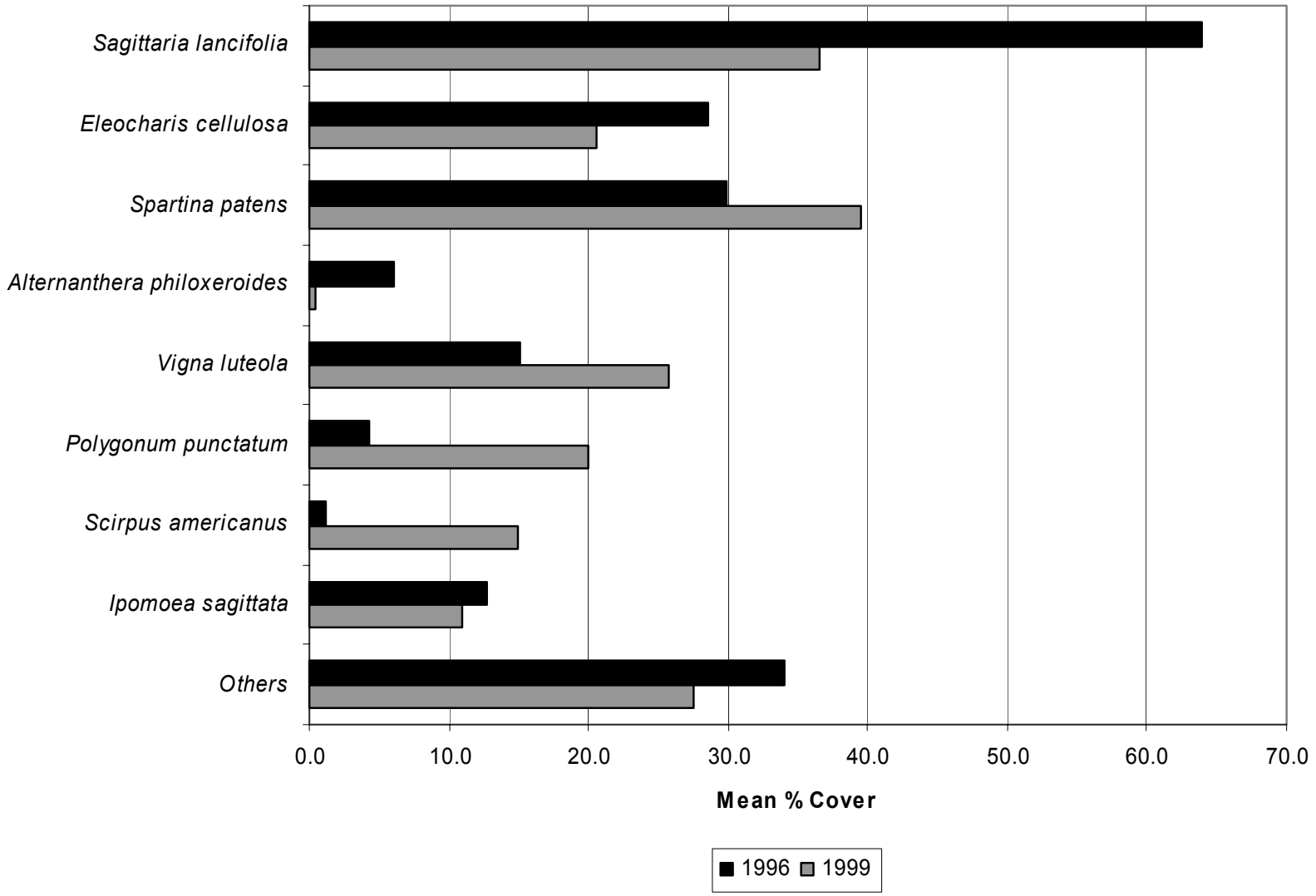

Figure 36. 1996 and 1999 mean % cover across all vegetation stations within the reference area.

Jonathan Davis Wetland Protection (BA-20)

Preliminary Findings

Staggering project feature construction dates over several years makes it difficult to determine if the project is achieving the project goals. It is preferable in this situation to compare data from project and reference monitoring stations that are separated by project features instead of comparing all project area stations to all reference area stations.

Eliminating the northern project features will not significantly affect the benefits originally ascribed to the project. The sites of the proposed northern structures do not appear to be causing any significant marsh erosion due to water exchange, and the Davis Pond Freshwater Diversion (BA-01) project should benefit the BA-20 project area by nourishing the wetlands with fresh water, increased nutrients, and sediment from the Mississippi River.

Tropical storms and drought increased salinities in both the project and reference areas. The southeastern reference area had higher salinities than the southeastern project area during the preconstruction and postconstruction time periods because directly east lies an open connection to the Barataria Waterway. This deep navigation canal channels salt water from the Gulf of Mexico into the upper reaches of the estuary. The southwestern reference area had lower salinities than the southwestern project area during the preconstruction and postconstruction time periods because it has an open connection with the fresher Lake Salvadore to the west. Project features and marsh serve as a buffer between outside waters and inside the project area, therefore making the project area less susceptible to salinity changes caused by changes in adjacent waters than the reference areas. Although postconstruction project and reference area salinities were found to be statistically different, the differences were not great enough to produce ecological change.

Water elevations were mostly influenced by wind velocity and rainfall. These factors changed with season and the occurrence of significant weather events, such as tropical storms and cold fronts. Although there were significant differences when comparing water elevations inside and outside adjacent project features, differences were not large enough to produce ecological change.

Vegetation surveys in 1996 and 1999 revealed a decrease in coverage of freshwater emergent vegetation, and an increase in more salt tolerant species in both project and reference areas. This is most likely due to increased salinities caused by drought.

It is too early to determine if project features are benefiting the project area. It will be possible to determine if the project is achieving the set goals as more project features are constructed, and as more data become available in the future.