Marine Environmental Assessment

GULF OF MEXICO

ANNUAL SUMMARY 1982

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CLIMATE IMPACT ASSESSMENT
UNITED STATES

The AISC/Marine Environmental Assessment Division (MEAD), Marine Assessment Branch (MAB), produces periodic assessments of weather impacts on economic sectors of marine environmental activity. From September 1981 through March 1982, MAB issued monthly assessments of Chesapeake Bay in the economic sectors of fisheries, recreation, and transportation. The Chesapeake Bay region served as a prototype for assessment development. We now issue quarterly assessments in order to extend the service to other marine areas such as the Gulf of Mexico within existing resource limitations.

Please send any comments or questions regarding Assessment and Information Services Center marine assessments to the Chief, Marine Assessment Branch, Marine Environmental Assessment Division, NOAA/NESDIS/AISC, E/AI32, 3300 Whitehaven Street, NW, Washington, DC 20235, or call (202) 634-7379.

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September 1983

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SECTION 1
INTRODUCTION

The Gulf of Mexico 1982 Annual Assessment presents a synoptic view of several economic sectors and their direct and indirect relations to the physical and biological marine and atmospheric environment. We attempt to bring into one focus the numerous commercial, social, and scientific activities in the Gulf relative to environmental conditions, especially weather and oceanographic events or trends. Using research results in the fields of physical oceanography, marine biology, meteorology, political science, and economics, the Marine Assessment Branch, Marine Environmental Assessment Division of the Assessment and Information Services Center has presented a multi-disciplinary view of the Gulf during a single calendar year.

Assessment of economic impacts is important to planners, engineers, scientists, and commercial interests because of heavy multiple-use requirements for the coastal zone. Our population relies on the nearshore estuarine and coastal shelf environment for food, recreation, energy, transportation, and industrial and societal waste disposal. Most uses conflict at some level of activity. Furthermore, the relative impacts and conflicts are sensitive to weather and climate in many areas. Impacts or conflicts can be minimized if timely information on impacts is available.

The measurement of impacts is imprecise. Specification of relationships between exogenous variables (weather, oceanography, catch statistics) and economic sector variables (transportation, pollution costs, fishery market dynamics) requires further investigation. In this prototype we bring together data from several economic sectors and four environmental disciplines for a single viewing. No attempt is made to limit data to specific models or preconceived ideas of causal relationships. Only confirmable relationships are presented as definite connections. Where direct relationships are unclear, the presentation of data from several scientific and economic areas has value by displaying the multiple use of the Gulf coastal environment.

By presenting this collection of data, we intend to stimulate further investigation by scientists and provide information to those persons responsible for usage regulations of the Gulf and its tributary estuaries.

1.1 Organization of the Report

The report comprises six sections. In the introductory section we delineate the concept of marine environmental assessment embodied in this report, specify the coverage of the present report, and suggest extensions and future development for the assessment function.

In Section 2 we present a summary of impacts identified for 1982. Only confirmed relationships appear as impacts.

Sections 3 through 6 contain details of the weather and oceanography, fisheries, recreation, transportation safety, and pollution events of the Gulf of Mexico marine environment for 1982. Discussions in these sections cover all information available to the Marine Assessment Branch at this time, but are neither exhaustive nor definitive. The review gives a limited synoptic view of several sectors and their relationships for a single year.

1.2 Scope of the Report

The geographical area considered is that half of the Gulf of Mexico delimited north of a line from Brownsville, Texas, to Key West, Florida.

We present a summary of weather and oceanographic events during 1982 over the region. Coverage is only for calendar year 1982, though environmental cycles vary in different regions of the Gulf. Discussion will indicate where such environmental variability is important. The calendar year serves the assessment function in tracking economic variables. Where discussion of environmental patterns or events requires reference to 1981 or to 1983, we extend coverage at those instances.

Four economic sectors appear in this report: fisheries, recreation, transportation, and industry. The fisheries section covers finfish, shellfish, diseases, and predators. Distribution and abundance of species depends strongly on local and regional salinity and temperature regimes.

These dynamic regimes of salinity and water temperature in turn relate to precipitation and air temperature and to general coastal conditions over a broad span of space and time. Harvest of commercial species varies with climate conditions, fishing effort, and market conditions. Pollution and transportation sectors affect distribution of the fisheries species as well as harvest activity.

Recreation includes park usage, boating, and recreational accident statistics. The recreational sector responds quickly to weather variations, but also correlates with pollution incidents and the presence of annoying or dangerous organisms in the water. The Gulf Coast is used heavily for recreation including swimming, boating, fishing, and tourism.

Transportation includes shipping, navigational aids, dredging, pollution events, and related shore activity. Through most months of the year shipping and related shore activities remain unaffected by climate. Only tropical storms or severe cyclones interrupt normal marine transportation.

Industry in this report appears only as specific events such as spills of oil and hazardous substances and sewage disposal discharge. Tributaries of the Gulf form a large resource for waste disposal for surrounding industry and populations. Heavy use of the Gulf and its tributaries for transportation leads to spills of cargo substances, some harmless, others potentially harmful.

1.3 Future Work

The Assessment and Information Services Center, Marine Environmental Assessment Division recognizes the need for extension of this assessment to other sectors and more detailed and rigorous analyses in those sectors already discussed. The industrial complex surrounding the Gulf includes heavy manufacturing (steel, automobiles), food processing (spices, sugar), refining, shipbuilding, and chemical production. The use of water in each of these industries contributes to the quality of water entering the Gulf coast estuaries.

The fisheries assessment may ultimately treat species-specific problems. The analysis should assess the sensitivity of life stages of individual species to changes in environmental conditions.

Future work in the recreation sector will include assessment of sport fishing, marina usage, tourism, and sales of recreational equipment.

In transportation the detailed distribution of Search and Rescue (SAR) in categories of damage, injury, cost, and geography may enhance the usefulness of the assessment. The costs related to maintenance of navigational aids may be of interest to port authorities and the shipping industry.

The discharge of heated water from power generation loads estuarine systems with waste energy. While local changes to each system can be measured at present, the cumulative impact of heat loading on the integrated ecosytems needs to be assessed.

Finally, the Gulf of Mexico assessment will increase in convenience to each user if sensitivity scales for impacts can be derived. For each sector or resource factor (e.g., streamflow, salinity change, temperature anomaly, wave height, number of rain days) the assessor needs to know not only if the impact is positive or negative, but the degree of impact.

Table 2-1. Climate impact summary, Gulf of Mexico, 1982.

	IMPACT SECTOR																					
	FISHERIES							RECREATION						TRANSPORTATION								
EVENT	Finfish harvest activities (General)	Shellfish harvest activities (General)	Blue crab harvest	Shrimp population (Brown)	Oyster population (LA)	Finfish larval transport	Shellfish larval transport	Park usage	Boating	Tourism	Beach usage	Safety		Port operations	Vessel traffic	Spills						
Low incidence hurricanes	+	+						+	+	+	+	+		+	+							
High precipitation			-					-	-	-	-	-										
Tropical storm activity								-	-	-	-	-										
High winds (November)			-																			
Pleasant June, July weather	+							+	+	+	+	+										
River runoff				-	+																	
Red-tides (Florida)		-																				
Wind-driven currents						+	+															

LEGEND:

[+] Favorable

[-] Unfavorable

[ ] No identifiable effect, data unavailable, or not applicable.

SECTION 2
IMPACT SUMMARY

The Gulf of Mexico region experienced an abnormally low number of hurricanes and tropical storms during 1982, although heavy rainfall caused severe flooding in coastal areas. Only one storm originating in the Gulf of Mexico (Alberto, in early June) reached hurricane strength. Hurricane Alberto was short-lived and caused little damage to coastal areas. A subtropical storm in late June caused extensive damage to the Florida Gulf coast from flooding, high waves, and tornadoes. The storm caused three deaths and extensive beach erosion on the west coast of Florida. Tropical storm Chris in September brought heavy rains, high winds and four tornadoes, causing flooding in Texas-Louisiana coastal areas and boat and property damage. Table 2-1 summarizes impacts of climate events by economic sector.

Fisheries

Menhaden landings in the Gulf of Mexico reached a record high. Factors contributing to the high landings were a large 1981 year class and favorable weather during 1982 harvesting. Fishermen lost little time due to weather during peak harvest months of June and July 1982.

Gulf shrimp landings were down in 1982 compared to 1981. Although Mississippi showed an increase in shrimp landings, all other Gulf state landings showed a decrease.

Lowered salinities from high runoff in March and April in Louisiana provided unfavorable conditions for oyster predators (primarily oyster drills) and diseases.

Red tides on the Florida west coast resulted in closures of some shellfish (clam and oyster) beds and caused some minor fish kills.

Wind-driven currents were generally favorable for moving larvae of certain finfish and shellfish species into estuaries along the Gulf coast.

Recreation

Marine recreation generally was affected more by the economic recession than by weather, although heavy precipitation probably reduced recreational activity in certain coastal areas. High winds in November caused extensive damage to small boats and other property at Port Isabel, Texas.

Transportation

Gulf transportation levels were generally lower in 1982 than in 1981, probably reflecting general economic conditions. The total number of spills of oil and hazardous substances in the Gulf declined for the sixth consecutive year in 1982. A contributing factor to the decline in 1982 was a slowdown in petroleum shipments. An ice storm in January caused property damage and interrupted shipping in central portions of the Gulf coast.

SECTION 3
WEATHER AND OCEANOGRAPHY

During 1982 the Gulf of Mexico coastal region experienced an unusually small number of hurricanes and tropical storms. Only one of the storms originating in the Gulf of Mexico, Alberto, in early June, reached hurricane strength, but lasted only 12 hours. An unnamed subtropical storm, which crossed Florida later in June, caused 3 deaths and damage to coasts. In September tropical storm Chris brought heavy rains and flooding to the Texas - Louisiana coastal area.

Heavy rains and subsequent flooding were frequent in coastal and, especially, inland areas during the year. Flooding occurred in February, April, May, June, September, November, and December in portions of the Gulf coast region.

Temperatures during the year were slightly warmer than normal. March, June, November and December showed generally warmer-than-normal temperatures along the Gulf coast; April cooler-than-normal; and, the remaining months a mixture of warmer-than-normal and cooler-than-normal average temperatures.

3.1 Review of Events

Arctic air in January brought freezing temperatures to southernmost Texas and damaging hard freezes deep into the Everglades of Florida. Temperatures in the teens were recorded on the west coast of Florida, January 11. An ice storm during mid-January caused property damage and interrupted shipping in middle portions of the Gulf Coast.

Heavy downpours in February caused flooding along coastal sections of Texas and around the lower Mississippi Delta region.

After a cool beginning in March, the month's average temperatures around the Gulf were warmer than normal from surges of very warm air. Thunderstorms in the unstable air spawned one tornado near Beaumont, Texas on March 22. Tides, three feet above normal because of strong east winds over the Gulf, caused flooding in the Galveston area on March 29 and 30.

Cooler air in the first half of April followed the warming trend of March. Thunderstorms associated with fronts later in the month produced heavy rain along the central Gulf coast and tornadoes in southern Florida. Local flooding followed four to six inch downpours in the vicinity of Brownsville, Texas on April 30.

Heavy rains and flooding, strong winds, hail, and a tornado occurred in Galveston and neighboring areas of Texas on May 6, and again on the 13th and 17th. Combined damages to vehicles, buildings, and crops exceeded $1 million. Parts of Florida also received heavy rains and several tornadoes during May.

After a brief period with hurricane force winds, tropical storm Alberto drifted past the Florida Keys in the first week of June with heavy rains and winds, but caused only minor damage to boats and buildings. Subtropical storm #1 crossed Florida on June 18 causing extensive damage from winds and waves from Naples to Tampa Bay. The south Texas coastal region was very dry in June, receiving less than 25 percent of normal monthly rainfall. Other areas of the Gulf Coast experienced normal June weather.

No hurricanes or tropical disturbances occurred in the Gulf during July or August. Weather remained warm and clear as a result of summer monsoonal flow from the south onto the mainland. High pressure dominated the coast region during most of the first half of July. Late in July, the coast from Tampa to Mobile experienced heavy rains. The coast of south Texas remained very dry.

Occasional funnel clouds were sighted in the Texas coastal area during August. Showers along the Texas coast early in the month failed to relieve the prolonged dryness experienced in south Texas since May.

Tropical Storm Chris moved onto the Texas - Louisiana coast near Port Arthur on September 11 with 51 mph winds raising tides (normally one to two feet) to five and six feet. The storm sank boats and caused other property damage. Tornadoes and heavy rains inland caused property and crop damage totalling nearly $1 million. No lives were lost. A small local tropical storm on September 9 dumped nearly eight inches of rain in four hours on Apalachicola, Florida closing highways for several hours. A storm with several tornadoes caused minor damage at Fort Myers, Florida on September 26.

October weather remained near normal around the Gulf. Showers and thunderstorms generated by cold fronts during the month brought precipitation to the Texas coastal region relieving the very dry conditions.

November was a wet month along the western Gulf coast. Much of the Texas coast and inland areas received more than twice the normal rainfall for the month. A thunderstorm-induced downburst of wind, reaching over 90 miles per hour, caused extensive damage to boats and other equipment at Port Isabel, Texas (near Brownsville), November 3.

Higher than normal precipitation continued into December. Highest precipitation accumulations shifted from the Texas coast to the central Gulf coast between Port Arthur, Texas and New Orleans, Louisiana. Flooding in Louisiana caused extensive property damage.

3.2 Precipitation

Precipitation among the Gulf coast stations in Figure 3-1 in January averaged almost 50 percent below normal despite ice storms and freezing rain over much of the south. Lower Florida and the southern Texas coast received less than 25 percent of normal precipitation. Table 3-1 lists normal monthly total precipitation and 1982 departures from normal for selected Gulf of Mexico stations.

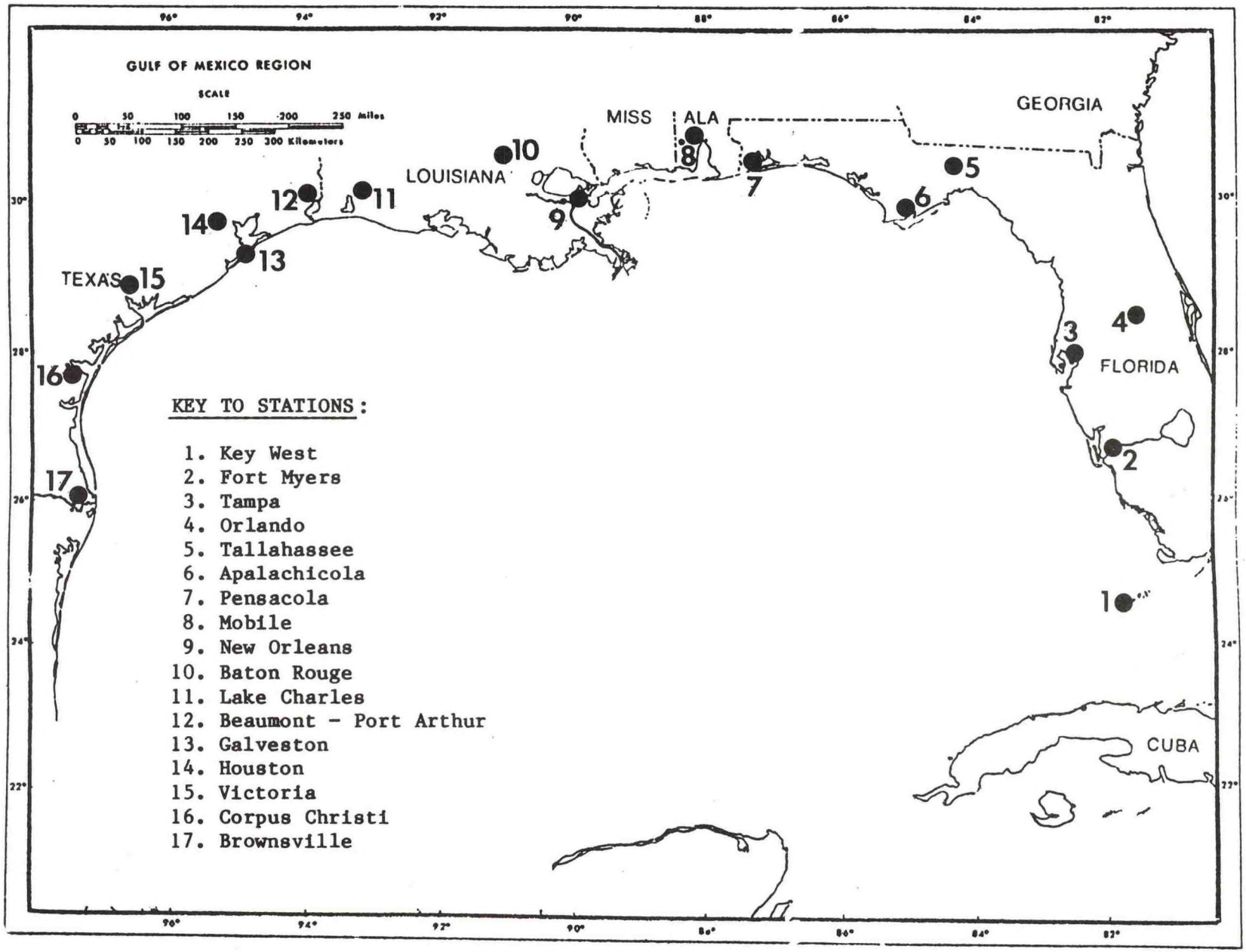


Figure 3-1. Selected National Weather Service meteorological stations, Gulf of Mexico coastal region (Modified U. S. Department of Interior map).

Table 3-1. Normal Monthly Total Precipitation (1941 - 1970) and Departure from Normal, Selected Stations, Gulf of Mexico Region, 1982.

A. Normal monthly total precipitation (inches)

Station	Month												Annual Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West, Florida	1.67	1.85	1.56	2.17	2.51	4.55	4.11	4.47	7.34	5.57	2.67	1.52	39.99
Fort Myers, Florida	1.64	2.03	3.06	2.03	3.99	8.89	8.90	7.72	8.71	4.37	1.31	1.30	53.95
Tampa, Florida	2.33	2.86	3.89	2.10	2.41	6.49	8.43	8.00	6.35	2.54	1.79	2.19	49.38
Orlando, Florida	2.28	2.95	3.46	2.72	2.94	7.11	8.29	6.73	7.20	4.07	1.56	1.90	51.21
Tallahassee, Florida	3.74	4.77	5.93	4.07	4.04	6.62	8.92	6.89	6.64	2.93	2.81	4.22	61.58
Apalachicola, Florida	3.07	3.78	4.70	3.61	2.78	5.30	8.02	8.07	9.00	2.88	2.68	3.32	57.21
Pensacola, Florida	4.37	4.69	6.31	4.99	4.25	6.30	7.33	6.67	8.15	3.13	3.37	4.66	64.22
Mobile, Alabama	4.71	4.76	7.07	5.59	4.52	6.09	8.86	6.93	6.59	2.55	3.39	5.92	66.98
New Orleans, Louisiana	4.53	4.82	5.49	4.15	4.20	4.74	6.72	5.27	5.58	2.26	3.88	5.13	56.77
Baton Rouge, Louisiana	4.40	4.76	5.14	5.10	4.39	3.77	6.51	4.67	3.79	2.65	3.84	5.03	54.05
Lake Charles, Louisiana	4.04	4.47	3.84	4.33	5.06	5.04	6.55	4.75	4.13	3.48	4.08	5.70	55.47
Beaumont-Port Arthur, Texas	4.06	4.74	3.05	4.19	4.94	4.81	5.89	5.69	5.34	3.71	4.26	4.89	55.07
Galveston, Texas	3.02	2.67	2.60	2.63	3.16	4.05	4.41	4.40	5.60	2.83	3.16	3.67	42.20
Houston, Texas	3.57	3.54	2.68	3.54	5.10	4.52	4.12	4.35	4.65	4.05	4.03	4.04	48.19
Victoria, Texas	1.76	2.28	1.89	2.65	3.96	3.31	2.79	3.15	4.61	3.63	2.31	1.95	34.29
Corpus Christi, Texas	1.58	1.95	1.10	2.15	3.17	2.67	1.88	3.20	4.40	2.77	1.63	1.53	28.53
Brownsville, Texas	1.35	1.48	0.69	1.28	2.51	2.80	1.19	2.66	5.23	3.32	1.34	1.24	25.09

Table 3-1 (Continued). Normal Monthly Total Precipitation (1941 - 1970) and Departure from Normal, Selected Stations, Gulf of Mexico Region, 1982.

B. Departure from normal, 1982 (percent of normal)

Station	Month												Annual Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West, Florida	-77	- 9	121	-20	130	97	-53	-42	-13	-59	-55	-80	- 8
Fort Myers, Florida	-52	65	8	93	-48	69	27	37	7	14	-15	-79	22
Tampa, Florida	-20	-27	-23	-11	145	29	24	-10	69	-15	-53	-41	13
Orlando, Florida	-25	-55	40	131	80	-15	42	-25	-3	-82	-66	-47	1
Tallahassee, Florida	- 2	16	-23	- 6	-11	11	32	-40	- 1	-58	-17	30	- 3
Apalachicola, Florida	-14	64	71	- 7	-47	5	35	-44	71	139	-19	48	26
Pensacola, Florida	-35	89	-12	-62	-52	-37	-5	48	-84	-20	-11	106	- 9
Mobile, Alabama	-24	56	- 4	-20	-37	81	48	1	-29	-37	8	39	11
New Orleans, Louisiana	-39	63	-53	41	-72	15	94	-64	- 3	70	40	100	16
Baton Rouge, Louisiana	-24	36	-45	-10	- 8	-23	-20	-16	-35	- 9	-21	217	6
Lake Charles, Louisiana	-48	-47	-29	- 7	11	- 3	-54	50	106	-14	57	89	9
Beaumont-Port Arthur, Texas	-50	-20	2	34	89	93	0	-57	-81	12	75	268	30
Galveston, Texas	-40	50	-52	-31	7	11	-95	-59	-77	-58	109	74	-19
Houston, Texas	-49	-55	-42	-36	35	-76	5	-56	-79	64	121	22	-11
Victoria, Texas	-78	136	-88	-47	117	-98	-97	-43	-76	12	276	-62	- 5
Corpus Christi, Texas	-96	316	-58	-53	32	-73	-99	-80	-89	-39	166	-54	-21
Brownsville, Texas	-97	-49	-72	219	263	-94	-100	-61	-54	-51	132	118	1

Most Gulf coast stations received abundant precipitation in February, causing flooding in some areas from heavy downpours. Four-times-normal precipitation fell in the Corpus Christi, Texas, area, and precipitation ranged 50 to 100 percent above normal over a wide region from central Louisiana to Tallahasse, Florida. Coastal areas in west central Florida and near the Texas - Louisiana border had below normal precipitation, and Brownsville received only 50 percent of its normal rainfall.

March precipitation varied from 88 percent below normal at Victoria, Texas to 121 percent above normal at Key West, Florida. Most of the western Gulf was below normal, and most of the eastern Gulf was above normal.

Precipitation over the region was greater in April than in March, varying between 62 percent below normal at Pensacola, Florida to 219 percent above normal at Brownsville, Texas. Twelve stations showed deficits and five showed excesses. Downpours caused local flooding in Florida and inland areas throughout the Gulf coast.

In May precipitation increased and was above normal at all Gulf areas except the central Gulf coast. Inland and coastal areas of Texas and central Florida received 80 to 100 percent above normal precipitation. Several tornadoes accompanied the heavy rains in parts of Florida.

June precipitation ranged from 0.06 inches at Victoria, Texas (98 percent below normal) to over 15 inches at Fort Myers, Florida (69 percent above normal). The remnant of **Hurricane** Alberto dumped over 6 inches of rain on Key West, but less than 2 1/2 inches on Tampa and Fort Myers, Florida. Rainfalls of 8 inches extended north of Tampa, largely (50-80 percent) due to the subtropical storm crossing Florida from Tampa to Jacksonville on June 18.

Coastal Texas remained very dry in July with Brownsville recording no rain during the month. The drier-than-normal regime extended to western Louisiana. New Orleans, Louisiana, and Mobile, Alabama, received over 13 inches of rain resulting in local flooding. Florida stations from Apalachicola to Fort Myers all reported precipitation amounts above 10 inches for the month.

Heavy thunderstorms in August contributed to local flooding in southern Louisiana and Mississippi. A few showers occurred in southern Texas but coastal Texas had an average of 60 percent below normal precipitation. Only Fort Myers and Pensacola, Florida, and Lake Charles, Louisiana, showed excesses for the month. Throughout the region August was the driest month since January, 1982, averaging 38 percent below normal precipitation.

Early in September Tropical Storm Chris moved onto the Texas-Louisiana coast bringing drenching rains and heavy thunderstorms to coastal regions off the eastern Gulf. Later in the month a cold front triggered heavy thunderstorms and severe weather in eastern Texas. Despite these events, only three stations (Tampa and Apalachicola, Florida, and Lake Charles, Louisiana) showed excessively heavy precipitation. Fort Myers and Tallahassee,

Florida, and New Orleans, Louisiana, received near normal amounts. The south Texas coast remained very dry, averaging 75 percent below normal precipitation in September, normally the region's wettest month.

Cold fronts in October brought showers and thunderstorms to much of the western Gulf coastal region. Much of the Texas coast still recorded precipitation deficits. Except for small coastal stretches near Apalachicola and Fort Myers, Florida, much of the Gulf coast east of New Orleans received below normal rainfall for the month.

A cold air mass behind a front in early November spread freezing temperatures to the Gulf coast of Mississippi and the western Florida panhandle. Heavy rains preceded the front. Warm, clear weather followed the front in coastal and inland Texas. Rainfall associated with another front in mid-November drenched coastal Texas near Victoria and much of Louisiana and Mississippi with over 6 inches of rain, causing local flooding. Nine stations west of Pensacola, Florida showed precipitation excesses ranging from 8 percent (Mobile, Alabama) to 276 percent (Victoria, Texas) above normal. The south Texas coast averaged 170 percent above normal for the month. The eastern Gulf region averaged 31 percent below normal.

During December, heavy precipitation associated with slowly moving or recurring low pressure centers in the central Mississippi Valley caused nearly continuous and widespread flooding in much of the central Gulf coastal region and farther inland along the Mississippi River system. Some coastal sections near Port Arthur, Texas received over 16 inches of rainfall for the month. The region between Corpus Christi and Victoria, Texas and the southeast stations of the Gulf exhibited precipitation deficits between 41 percent at Tampa, Florida and 80 percent at Key West, Florida. All Gulf stations between Galveston, Texas and Tallahasse, Florida reported precipitation excesses for December ranging from 30 percent at Tallahassee to 268 percent at Port Arthur.

3.3 Air Temperatures

January temperatures averaged normal to 2.4 degrees above normal from south Texas to New Orleans, Louisiana and in Florida south of Tampa (Table 3-2). Temperatures at Galveston, Texas and along the Florida panhandle were 0.3 to 2.3 degrees below normal for the month.

February temperatures at western Gulf stations averaged 2 to 4 degrees below normal for the month, near normal along coastal Mississippi to the western Florida Panhandle, and 3 to 7 degrees above normal over most of Florida's west coast.

March temperatures averaged 2 to 5 degrees above normal, punctuated by daily highs as much as 20 degrees above normal in Texas.

April temperatures averaged from near normal to 2.5 degrees below normal over the Gulf coast except for southern Texas and Florida. At Fort Myers, Florida the temperature was 3.2 degrees above normal.

Table 3-2. Normal Monthly Mean Air Temperature (1941 - 1970) and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

A. Normal monthly Air Temperature (Degrees F)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West, Florida	70.7	71.6	74.6	78.1	80.9	83.5	84.6	84.7	83.2	79.6	75.1	71.5	78.2
Fort Myers, Florida	63.5	64.7	68.5	73.3	77.7	81.1	82.5	82.8	81.6	76.4	69.4	64.8	73.9
Tampa, Florida	60.4	61.8	66.0	72.0	77.2	81.0	81.9	82.2	80.8	74.7	66.8	61.6	72.2
Orlando, Florida	60.3	61.5	65.9	71.3	76.4	80.2	81.4	81.8	80.1	74.3	66.6	61.5	71.8
Tallahassee, Florida	52.6	54.8	60.3	67.9	74.8	80.0	81.1	81.1	78.1	69.3	58.9	53.2	67.7
Apalachicola, Florida	53.7	55.8	60.7	68.3	74.9	80.0	81.4	81.5	78.6	70.8	61.1	55.2	68.5
Pensacola, Florida	52.1	54.8	59.9	68.1	75.2	80.6	81.8	81.8	78.3	70.0	59.5	53.8	68.0
Mobile, Alabama	51.2	54.0	59.4	67.9	74.8	80.3	81.6	81.5	77.5	68.9	58.5	52.9	67.4
New Orleans, Louisiana	52.9	55.6	60.7	68.6	75.1	80.4	81.9	81.9	78.2	69.8	60.1	54.8	68.3
Baton Rouge, Louisiana	51.0	53.9	59.7	68.4	74.8	80.3	82.0	81.6	77.5	68.5	58.6	52.9	67.4
Lake Charles, Louisiana	52.3	55.1	60.3	68.9	75.2	80.7	82.4	82.2	78.4	70.0	60.2	54.3	68.3
Beaumont-Port Arthur, Texas	52.0	55.1	60.1	68.9	75.0	80.8	83.0	83.1	78.9	69.9	60.2	54.2	68.4
Galveston, Texas	53.9	56.2	61.0	69.2	75.9	81.3	83.2	83.3	80.0	73.1	63.5	57.1	69.8
Houston, Texas	52.1	55.3	60.8	69.4	75.8	81.1	83.3	83.4	79.2	70.9	61.1	54.6	68.9
Victoria, Texas	53.5	56.8	62.3	70.7	76.6	82.0	84.4	84.5	80.1	72.2	62.6	56.3	70.2
Corpus Christi, Texas	56.3	59.6	64.9	72.8	77.9	82.4	84.8	85.1	81.0	73.9	64.9	59.1	71.9
Brownsville, Texas	60.3	63.4	67.7	74.9	79.3	82.8	84.4	84.4	81.6	75.7	68.1	62.8	73.8

Table 3-2 (Continued). Normal Monthly Mean Air Temperature (1941 - 1970) and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

B. Departure from normal, 1982 (Degrees F)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West, Florida	+0.6	+4.3	+2.5	+2.7	-0.8	-0.4	+0.9	-0.8	-0.9	-0.7	+0.3	+1.9	+0.8
Fort Myers, Florida	+1.4	+7.5	+4.5	+3.2	-1.3	+2.6	+1.8	-0.2	-1.1	-1.0	+2.7	+4.1	+2.0
Tampa, Florida	-0.6	+6.1	+2.1	-0.6	-2.8	+0.5	+0.2	-0.1	-0.6	-0.4	+4.0	+6.0	+1.2
Orlando, Florida	-0.3	+6.4	+4.5	+1.3	-1.1	+1.8	+1.2	+0.4	+0.1	-0.2	+4.2	+5.2	+2.0
Tallahassee, Florida	-1.8	+2.7	+3.0	-1.4	-0.4	+0.6	-0.3	+0.2	-1.6	+0.6	+5.3	+6.5	+1.1
Apalachicola, Florida	-1.1	+3.3	+1.0	-1.5	-1.5	+0.6	-1.0	-0.3	-1.8	-0.6	+2.8	+4.7	+0.4
Pensacola, Florida	-2.3	-0.9	+1.5	-2.3	-2.2	-0.2	-1.7	-1.7	-2.6	-1.1	+1.2	+3.3	-0.8
Mobile, Alabama	-1.5	-0.7	+4.1	-0.8	-0.4	+0.4	-0.6	-0.5	-1.5	-0.4	+1.9	+4.0	+0.3
New Orleans, Louisiana	+1.6	-0.6	+5.2	+1.2	+1.4	+1.1	-0.5	+0.3	-1.4	+0.6	+2.4	+4.6	+1.3
Baton Rouge, Louisiana	+1.7	-2.1	+3.4	-0.5	+1.5	+2.3	+0.3	+0.8	-0.5	+0.1	+2.3	+4.1	+1.1
Lake Charles, Louisiana	0.0	-3.4	+3.2	-2.5	-1.0	-0.3	-0.4	-0.2	-2.0	-1.0	+1.4	+2.9	-0.3
Beaumont-Port Arthur, Texas	+0.8	-2.7	+4.9	-0.9	+0.6	+0.8	-0.3	-0.4	-0.3	+0.1	+1.6	+3.4	+0.6
Galveston, Texas	-0.7	-3.1	+2.3	-1.8	+0.4	+1.1	+1.2	+1.2	+1.0	-1.6	-0.1	+2.0	+0.2
Houston, Texas	-0.8	-3.2	+4.1	-1.6	-0.5	+1.9	+2.1	+0.7	+0.1	-1.4	-0.2	+0.8	+0.3
Victoria, Texas	+0.3	-3.6	+2.9	-1.2	-0.7	+1.2	+1.5	+1.6	+1.7	-0.3	0.0	+1.1	+0.4
Corpus Christi, Texas	+1.1	-3.7	+1.9	-1.7	-1.2	+0.3	-0.2	-0.2	+1.3	0.0	-0.4	-0.7	-0.3
Brownsville, Texas	+2.4	-2.3	+4.0	+1.1	+0.8	+2.9	+2.5	+1.9	+1.8	+1.3	+0.3	-0.4	+1.4

May temperatures averaged within 1 degree of normal along most of the Gulf coast. Exceptions were Tampa and Pensacola, Florida, at 2.8 and 2.2 degrees below normal and New Orleans and Baton Rouge, Louisiana, between 1 and 2 degrees above normal.

June, July, and August temperatures averaged normal to 2.6 degrees above normal along most of the Gulf coast. July temperatures averaged 2 to 3 degrees above normal along the south Texas coast, and nearly 2 degrees below normal at Pensacola for the month.

September temperatures averaged slightly cooler than normal in the central and eastern Gulf coast. Texas stations averaged normal to 2 degrees above normal.

Temperatures along the Gulf coast during October departed about only 1 degree either direction from seasonal normals.

November and December temperatures were above normal along the Gulf coast, except in southern Texas. Tallahassee, Florida, recorded a monthly average of 6.5 degrees above normal in December, the highest anomaly in the region.

3.4 Storm Summary

Heavy rains and flooding affected sections of the coastal Gulf of Mexico region through most months of 1982. Table 3-3 gives a chronological listing of weather events and impacts during 1982.

3.5 Streamflow

Streamflow entering the Gulf of Mexico affects the socioeconomic and physical sectors of the Gulf region, including fisheries, recreation, ecology, water quality, and large scale circulation and nutrient distribution. Rivers of the Gulf Coast drain from a very large inland area. This prevents analysis of total streamflow for the Gulf as a whole. Each river, however, is susceptible to both local and large scale weather patterns. These patterns directly affect the rate and quantity of streamflow entering individual estuaries of the Gulf of Mexico.

Twelve major rivers and locations of corresponding streamflow monitoring stations are shown in Figure 3-2. Streamflow among the stations averaged 20 percent below normal in 1982. Two of the twelve stations (Alabama River and Tombigbee River) have data only through September 1982. The remaining rivers, with the exception of the Mississippi - Atchafalaya system, Pearl River, and Apalachicola, showed cumulative streamflow deficits for the calendar year 1982.

Of the rivers entering estuaries east of the Mississippi River--the Pearl, Pascagoula, Alabama, Escambia, and Apalachicola rivers--showed high streamflow in February. Low spring streamflow dropped the cumulative totals below normal until December 1982.

Table 3-3. Summary of 1982 Storm Events and Impacts, Gulf of Mexico, 1982.

Date	Storm Event	Impacts
January 10 - 11	Severe winter storm, snow, ice, freezing rain across southern states (MS, AL, GA)	Interrupted shipping (LA, MS) High water levels in New Orleans
February 3	Heavy rains NE Gulf	Flash flooding (AL, FL)
February 15	Heavy rains	Flooding, TX (Beaumont)
February 19	Heavy rains	Flooding, TX (Brownsville)
February 20	Heavy rains	Flooding, TX (Corpus Christi)
February 25	Heavy rains	Flooding, TX (Corpus Christi)
March 22 - 23	High winds, hail	Property, crop damages (Beaumont-Port Arthur, TX)
March 29 - 30	Tidal flooding	Flooding (Galveston, Houston TX)
April 4 - 5	Heavy rains	Flooding (Houston, TX)
April 17	Funnel clouds	Minor wind damage (Beaumont-Port Arthur, TX)
April 20	Heavy rains	Flooding, (Houston, TX)
April 24 - 25	Heavy rains	Flooding (Orleans, Jefferson Parish, LA)
April 30	Heavy rains	Flooding (Brownsville, TX)
May 6	Violent thunderstorms, heavy rains	Flooding (Galveston, TX)
May 13	Violent thunderstorms, 3/4" hail Tornadoes inland	Property and crop damages (Galveston, TX and Harris Co, TX)
May 17	90 MPH winds	Minor damage
June 1-6	Hurricane Alberto	Flooding, property damage (South Keys, FL)
June 18	Subtropical storm	Flooding, high waves and tides, beach erosion (FL coast south of Tampa) Tornadoes, flooding, 3 deaths (inland, FL)
September 9	Heavy rains (7.55"/4 hr at Apalachicola, FL)	Flooded highways (Apalachicola, FL)
September 11	Tropical Storm "Chris" - Heavy rains, winds, 4 tornadoes	Boat damage; property and crop damage from flooding, winds and tides (Beaumont, TX to Lake Charles, LA)
September 26	Tropical low pressure system-spawned thunderstorms and tornadoes	Minor damages (Fort Myers, FL)
November 3	91mph downburst of wind in thunderstorms	Heavy damages to boats and Marina
November 14 - 27	Heavy rains	Flooding (vicinity Victoria, TX) Minor flooding (South FL)
December 4 - 5	Heavy rains	Major flooding (Baton Rouge, New Orleans, LA) ($5 to 10 Million Damage)
December 25 - 28	Heavy rains (up to 20" of rain)	Severe flooding (Beaumont, TX to Lake Charles, LA)

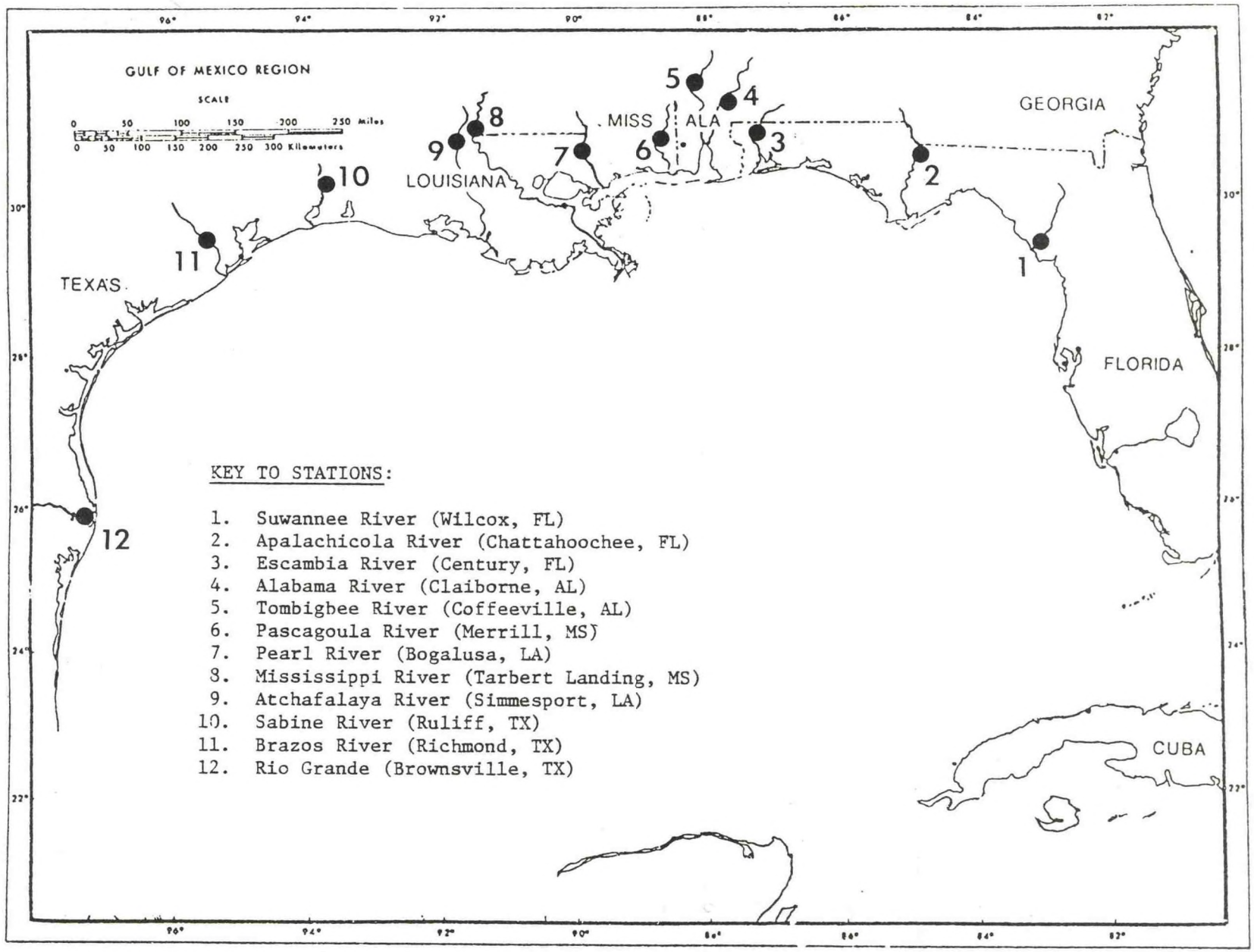


Figure 3-2. Streamflow monitoring stations on major river systems entering the Gulf of Mexico (Modified U.S. Department of Interior map).

Rivers west of the Mississippi--the Sabine, Brazos, and Rio Grande rivers--showed low January streamflow with increased flow in May. The cumulative deficits slowly increased during the remainder of 1982 with all three rivers ending the year with slight deficits.

Monthly data from the twelve selected stations are plotted in Figures 3-3a and 3-3b. Annual mean streamflow in 1982 as percent of normal for each station is listed in Table 3-4.

Table 3-4. Annual Mean Streamflow as Percent of Normal, Selected Stations Gulf of Mexico, 1981-82.

River	Normal Flow (CFS)	1981-1982 Flow (Percent of Normal)	
		1981	1982
Suwannee	10,150	55	80
Apalachicola	22,485	56	85
Escambia	6,170	62	91
Alabama	36,011	52	*
Tombigbee	29,504	54	*
Pascagoula	9,770	66	68
Pearl	9,641	58	66
Mississippi	446,558	78	117
Atchafalaya	200,000	78	118
Sabine	7,219	40	59
Brazos	7,023	72	81
Rio Grande	1,888	115	34

*Data Unavailable

Data from U.S. Geological Survey and U.S. Army Corps of Engineers

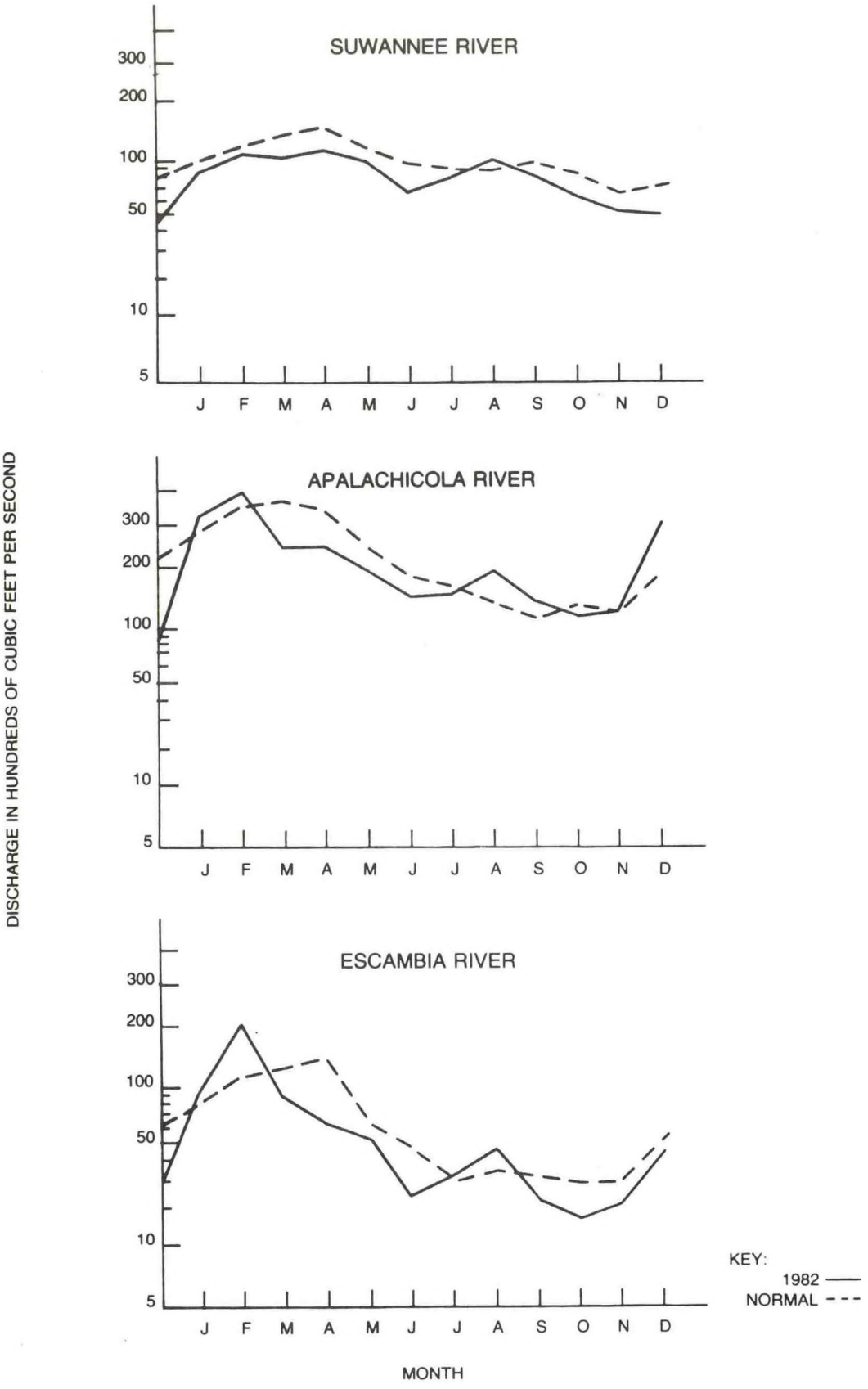


Figure 3-3a. Monthly Streamflow from Major River Systems Entering the Gulf of Mexico During 1982 and Average Monthly Streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

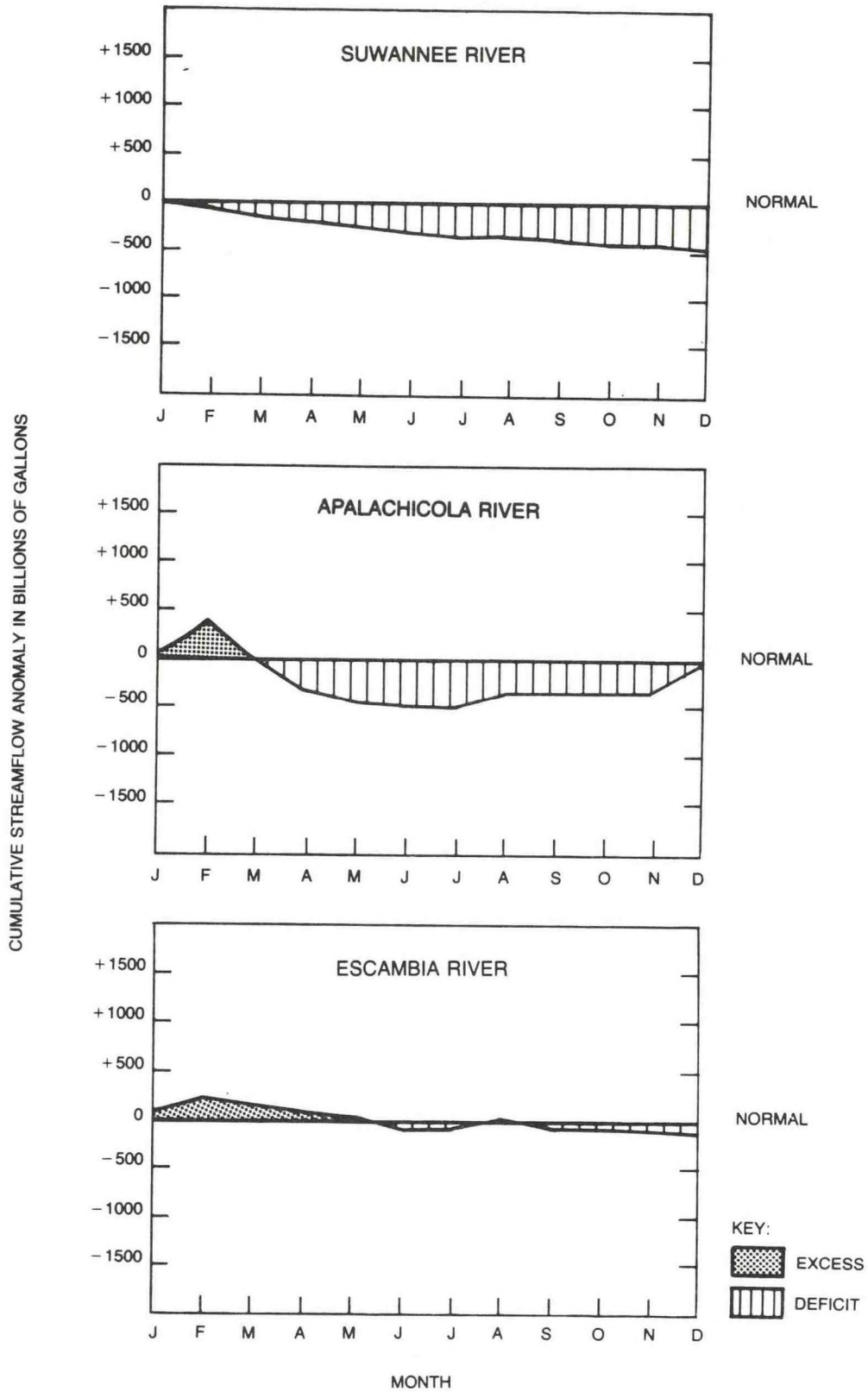


Figure 3-3b. Cumulative Monthly Streamflow Anomaly, Major River Systems Entering the Gulf of Mexico, 1982. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

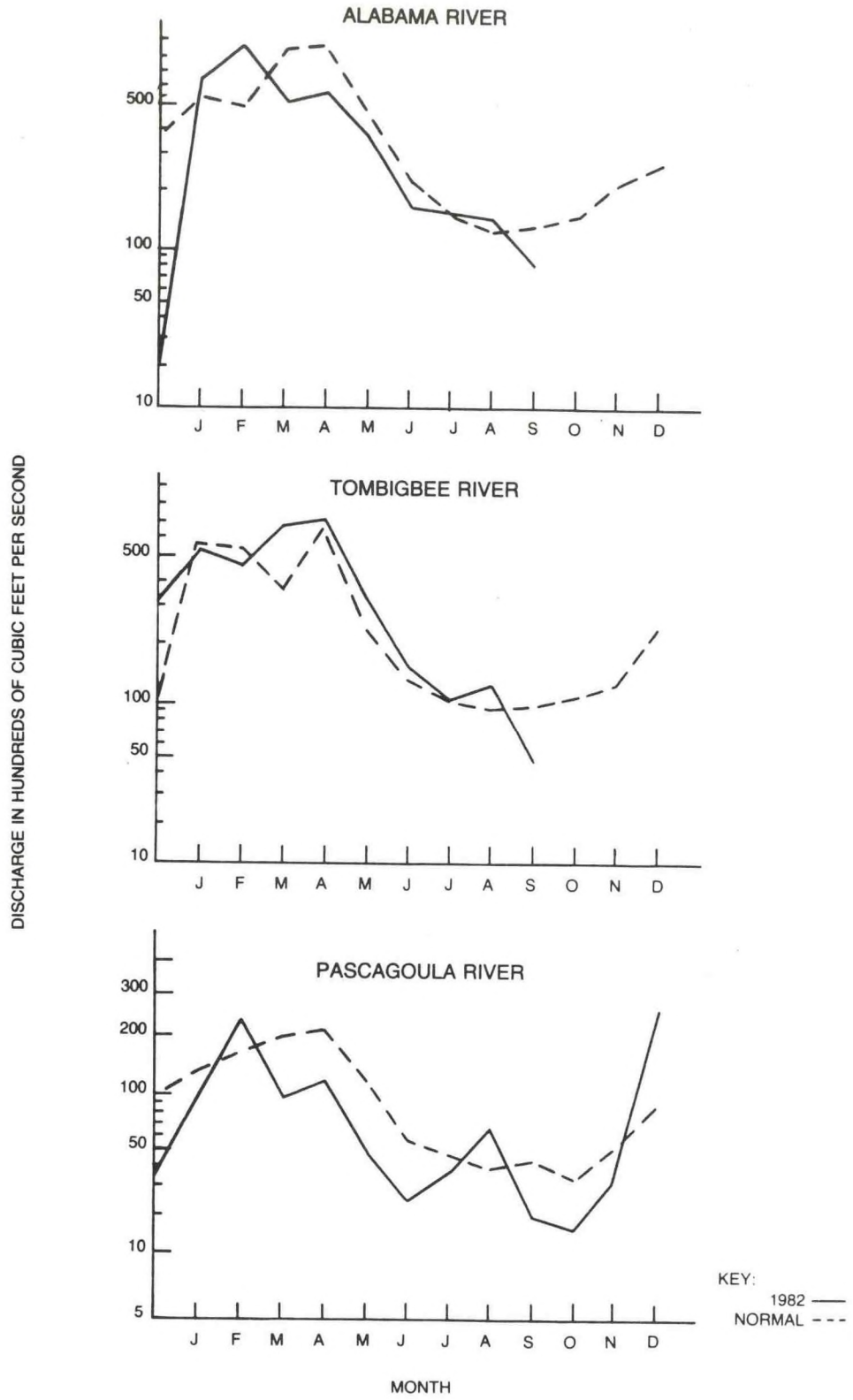


Figure 3-3a (Continued). Monthly Streamflow from Major River Systems Entering the Gulf of Mexico During 1982 and Average Monthly Streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

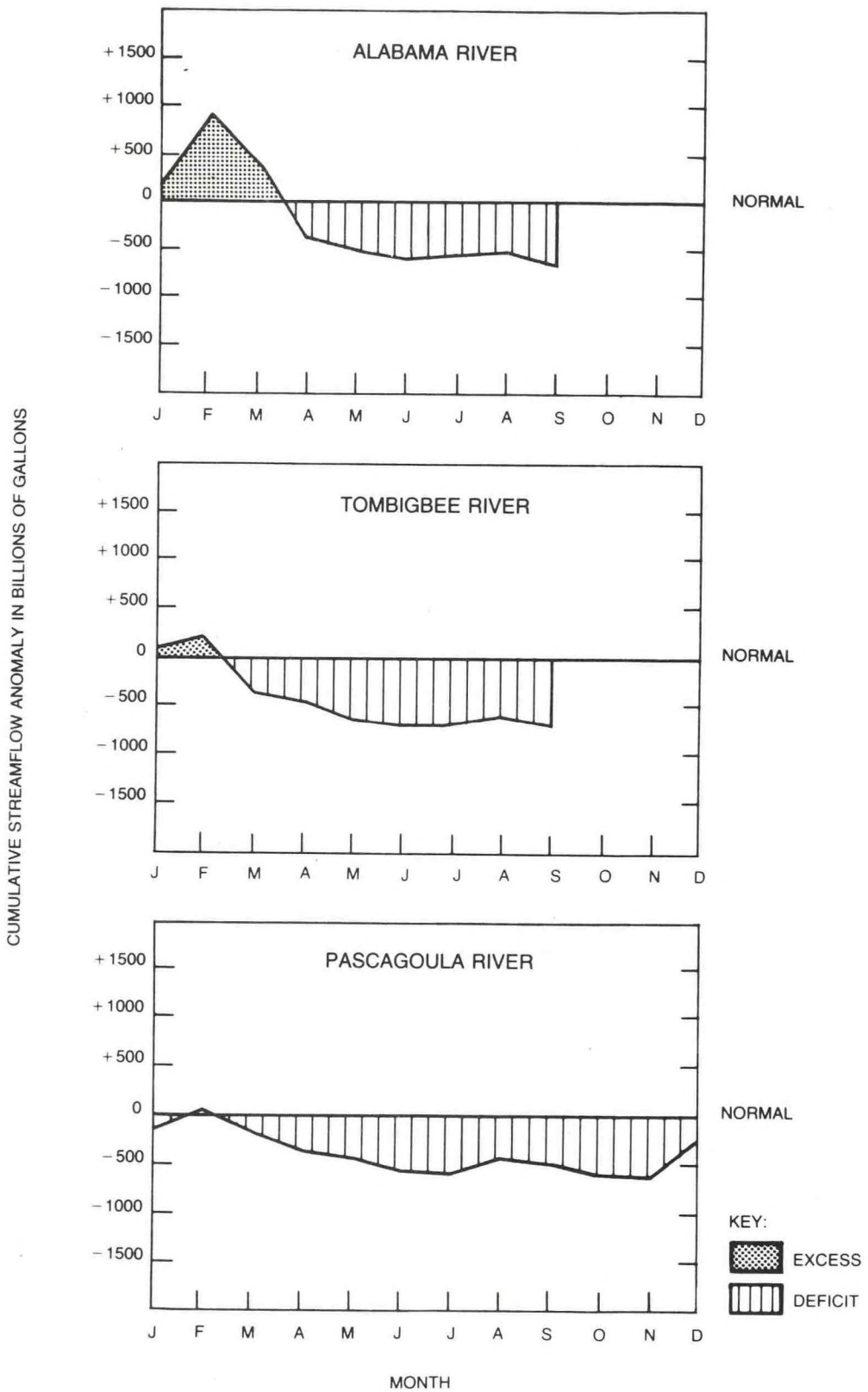


Figure 3-3b (Continued). Cumulative Monthly Streamflow Anomaly, Major River Systems Entering the Gulf of Mexico, 1982. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

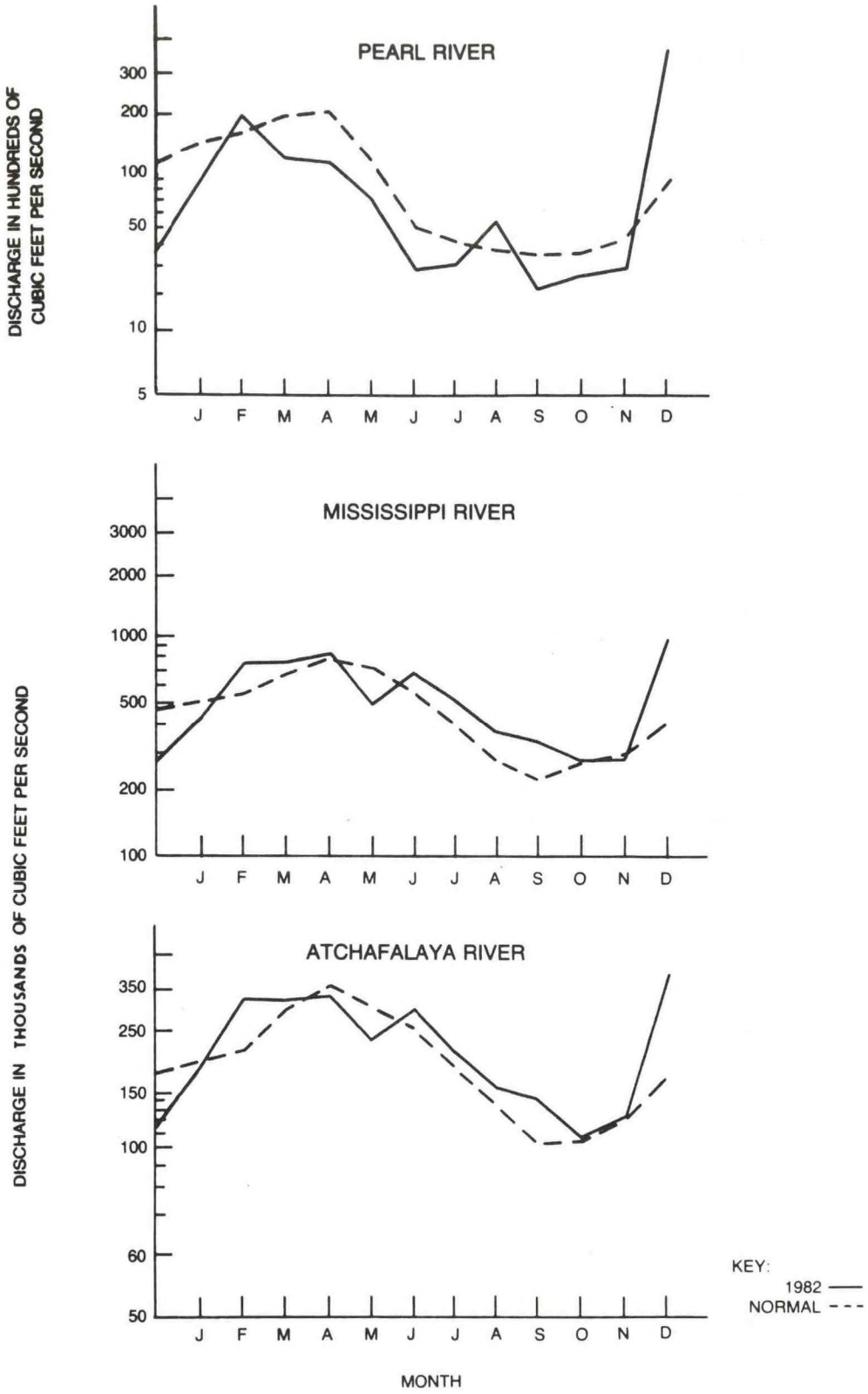


Figure 3-3a (Continued). Monthly Streamflow from Major River Systems Entering the Gulf of Mexico During 1982 and Average Monthly Streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

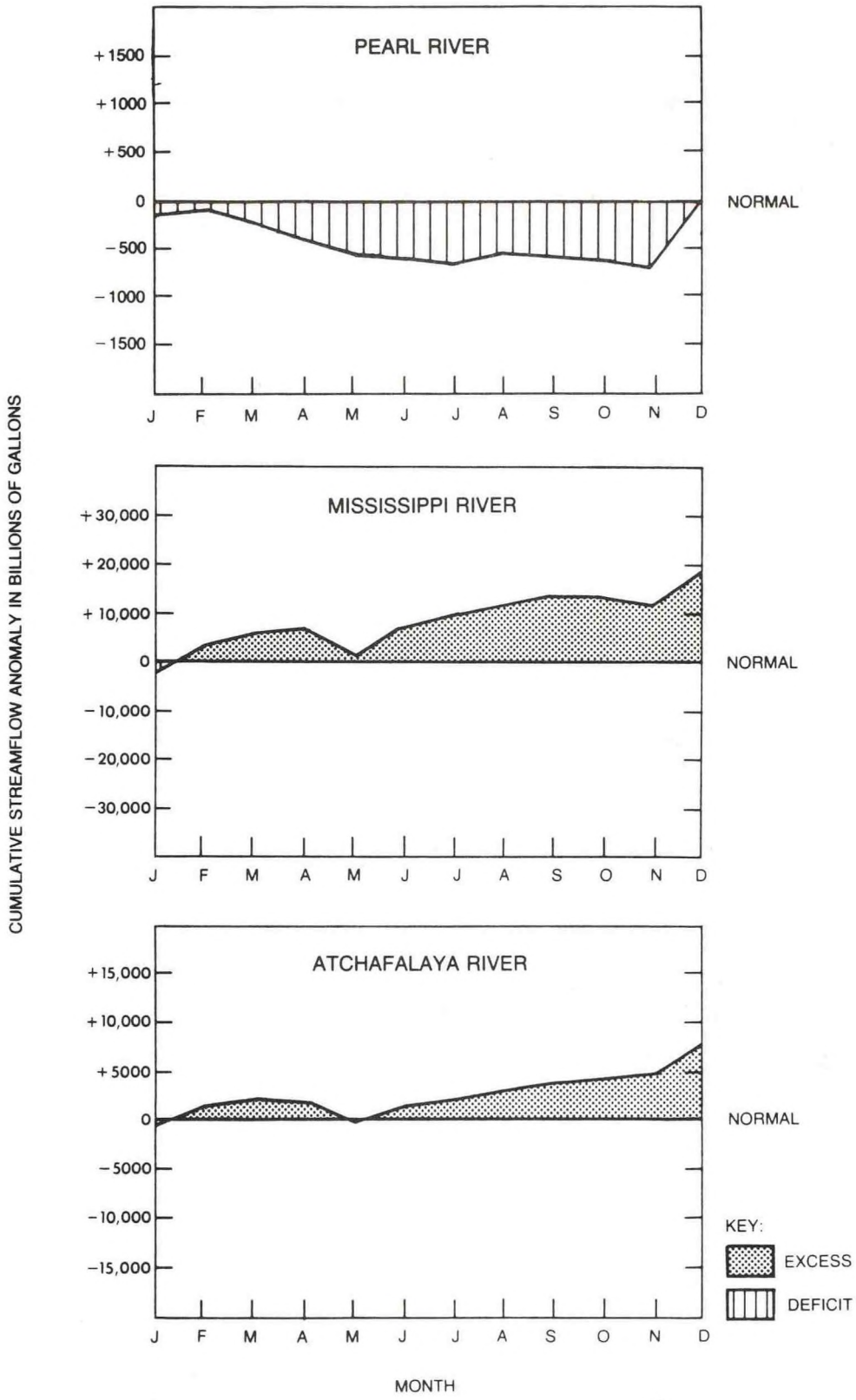


Figure 3-3b (Continued). Cumulative Monthly Streamflow Anomaly, Major River Systems Entering the Gulf of Mexico, 1982. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

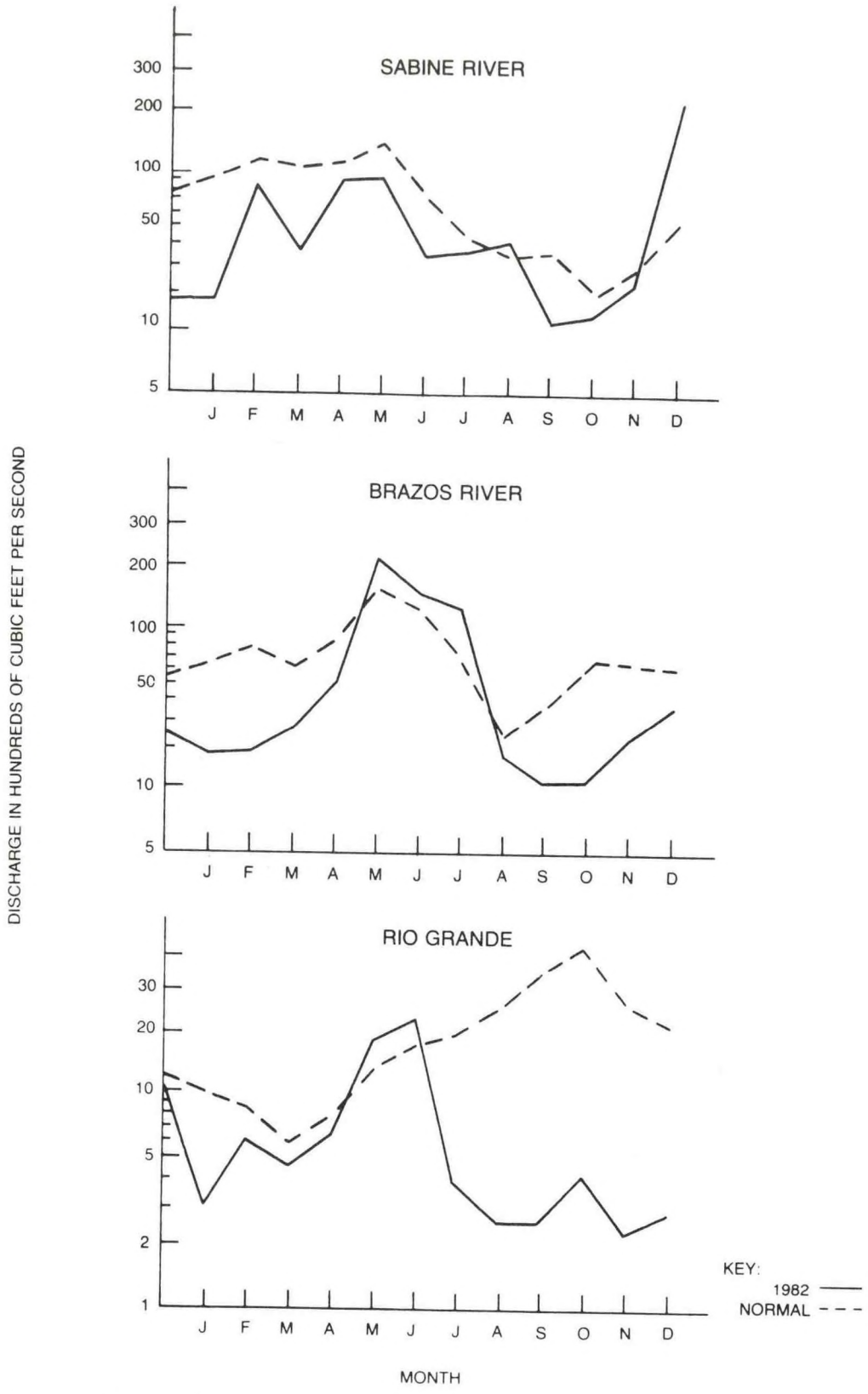


Figure 3-3a (Continued). Monthly Streamflow from Major River Systems Entering the Gulf of Mexico During 1982 and Average Monthly Streamflow. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

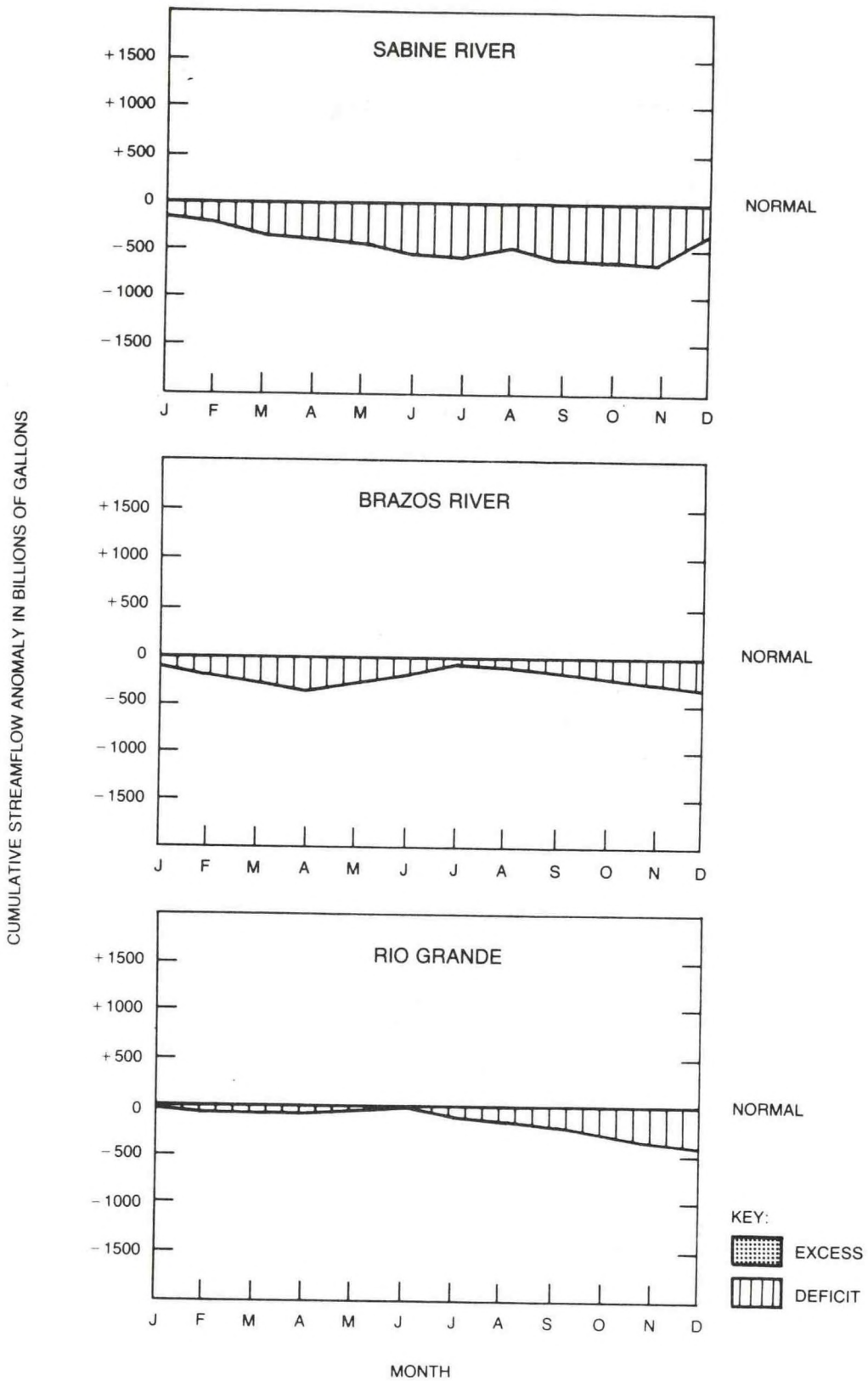


Figure 3-3b (Continued). Cumulative Monthly Streamflow Anomaly, Major River Systems Entering the Gulf of Mexico, 1982. Data from U.S. Geological Survey and U.S. Army Corps of Engineers.

Suwannee River

The Suwannee River flows into an area of the Gulf known as Suwannee Sound. The station located near Wilcox, Florida, showed streamflow deficits for eleven months of the year. Each month of 1982, with exception of March and June, had streamflow greater than 75 percent of the 1952 - 1981 monthly averages. August 1982 flow exceeded the August normal by 17 percent. Cumulative streamflow deficit prevailed over the year, reaching a total of 365 billion gallons in December.

Apalachicola River

The Apalachicola River flows into Apalachicola Bay. The station at Chatahoochee, Florida, showed streamflow deficits for six months of 1982. March through June showed the largest deficits from normal. A cumulative streamflow deficit occurred from March through November. High December 1982 streamflow (83 percent above normal) reduced the cumulative deficit to zero by the end of the year.

Escambia River

The Escambia River flows into Pensicola Bay. The station located near Century, Florida, showed streamflow deficits for eight months of 1982. March through June showed the largest deficits. Low streamflow also occurred from September through December. February streamflow of 20,460 cfs (110 percent above normal) is the second highest February streamflow during the period of record, 1935 - 1982. The only higher February streamflow was 21,160 cfs in 1965.

Alabama River

The Alabama River flows into Mobile Bay. Streamflow data for October, November, and December of 1982 for the Alabama River station at Claiborne Lock and Dam are unavailable. Five of the nine months available showed streamflow deficits, with March and April exhibiting the major reductions from normal. February streamflow of 19,580 cfs (85 percent above normal) is the highest February streamflow during the period of record, 1976 - 1981. September streamflow of 6,973 cfs (41 percent below normal) is the lowest September streamflow on record. Cumulative streamflow excess--January through March--reached a maximum of 950 billion gallons in February. By September, a streamflow deficit of 670 billion gallons had accumulated.

Tombigbee River

The Tombigbee River flows into Mobile Bay and streamflow is monitored at Coffeeville Lock and Dam. Streamflow data for October through December are unavailable. Streamflow volume followed a pattern similar to the Alabama River. Five of the nine months available showed streamflow deficits, particularly March. January and February showed cumulative excesses of less than 300 billion gallons. March through September exhibited deficits bringing the cumulative total deficit to 674 billion gallons in September.

Pascagoula River

The Pascagoula River flows into an area of the Gulf known as Mississippi Sound. The station at Merrill, Mississippi, showed streamflow deficits for nine months of 1982. The largest deficits occurred from March through May. The only month of 1982 with a cumulative excess was February, totaling less than 50 billion gallons. The remaining months showed cumulative deficits with a maximum of 556 billion gallons in November. High December streamflow brought the cumulative total deficit for 1982 to only 250 billion gallons at the end of the year. December streamflow was 170 percent higher than normal and is the third highest December streamflow during the period of record, 1932 - 1982.

Pearl River

The Pearl River flows into Lake Borgne. The station near Bogalusa, Louisiana, showed streamflow deficits for nine months of 1982. Spring months (March - May) showed the most substantial deficits as did other rivers in the Southeast. December 1982 streamflow of 43,860 cfs (375 percent above normal) is the highest December streamflow during the period of record, 1939 - 1982. Streamflow during this month raised the cumulative anomaly from a deficit in November of 600 billion gallons to above normal by the end of the year.

Mississippi River

The Mississippi River station at Tarbert Landing, Mississippi, showed streamflow excesses for eight months of 1982. December streamflow of 910,000 cfs (109 percent above normal) is the highest December streamflow during the period of record, 1964 - 1982. July 1982 streamflow of 514,000 cfs (40 percent above normal) is the second highest July streamflow during the period of record. The only higher July streamflow was 527,000 cfs in 1981. Only January 1982 showed a cumulative streamflow deficit totaling less than 1.8 trillion gallons. The river showed a cumulative total excess for 1982 of over 19.3 trillion gallons following record high December streamflow.

Atchafalaya River

The Atchafalaya River flows into Atchafalaya Bay. The station located at Simmesport, Louisiana, showed streamflow excesses for nine months of 1982, with December having the highest positive departure from normal. December 1982 streamflow of 394,000 cfs (132 percent above normal) is the highest December streamflow during the period of record, 1953 - 1982. January, April, and May were the only months of 1982 with below-normal streamflow. Cumulative total deficits occurred in both January and May, while the remainder of the year showed cumulative streamflow excesses. High December streamflow raised the cumulative excess to greater than 8.3 trillion gallons by the end of 1982.

Sabine River

The Sabine River flows into Sabine Lake and streamflow is monitored near Ruliff, Texas. This station showed streamflow deficits for ten months of 1982. January streamflow of 1,945 cfs (85 percent below normal) is the second lowest January streamflow during the period of record, 1925 - 1982. The only lower January streamflow was 1,422 cfs in 1981. December streamflow of 22,070 cfs (182 percent above normal) is the second highest December streamflow during the period of record. The only higher December streamflow was 47,350 cfs in 1940. The cumulative deficit reached 570 billion gallons in November with the final deficit for the year 270 billion gallons.

Brazos River

The Brazos River flows directly into the Gulf of Mexico. The station at Richmond, Texas, showed below-normal streamflow for nine months of 1982. The cumulative streamflow remained below normal during the entire year, with the total deficit exceeding 300 billion gallons in April and December.

Rio Grande

The Rio Grande flows directly into the Gulf. The station located near Brownsville, Texas, showed streamflow deficits for ten months of 1982. September streamflow of 197 cfs (97 percent below normal) is the second lowest September streamflow during the period of record, 1967 - 1982. The only lower September streamflow was 146 cfs in 1970. The Rio Grande experienced a cumulative deficit throughout the year except in June, when cumulative flow reached normal levels following above-normal May and June streamflow.

3.6 Surface Water Salinity and Temperature

Salinity

Salinity at National Ocean Service stations (Figure 3-4) during 1982 followed the long-term normal seasonal patterns. Stations between Naples and Cedar Key normally experience salinity maxima in May or June and minima in September. Secondary maxima occur in late fall or winter and secondary minima in early spring. Stations from Cedar Key north and west to Grand Isle normally experience salinity maxima in November and minima in spring. Stations farther west experience salinity minima later than stations in the eastern Gulf. Secondary maxima and minima occur at these west Gulf stations in the summer months of some years.

From Galveston to Port Mansfield the salinity patterns show maxima in August and minima in May with secondary maxima in November following slight secondary minima in October. The salinity cycles discussed reflect the general circulation of the Gulf of Mexico and local responses to freshwater runoff.

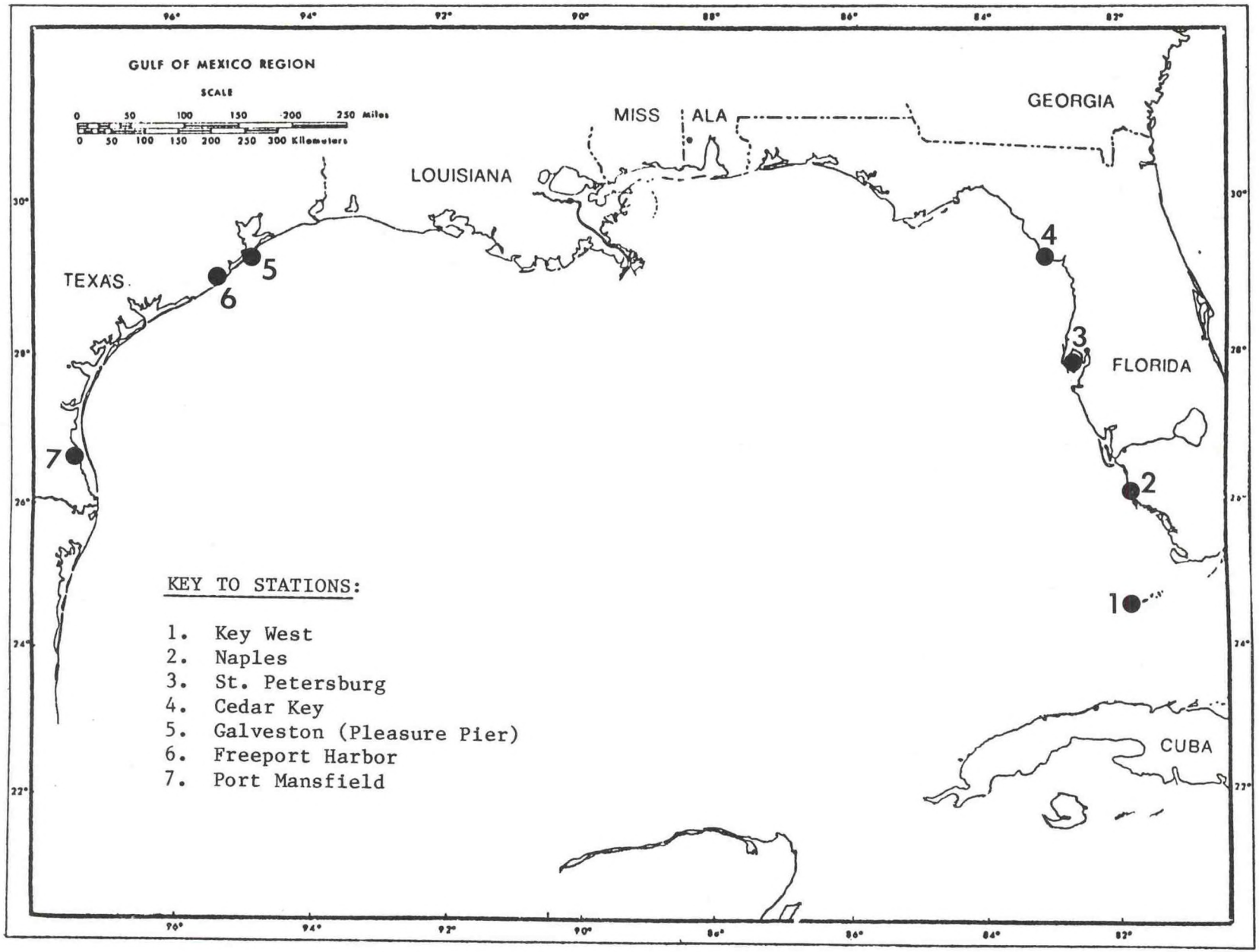


Figure 3-4. Selected National Ocean Service Temperature and Density Stations, Gulf of Mexico.

Station salinity data available for 1982 (Table 3-5 and Figure 3-5) show these patterns with individual months exhibiting various anomalies. Key West and Naples both remained at higher-than-normal salinity throughout most of the year. Key West showed a June Average salinity much lower than normal and remained very near normal in July and August. St. Petersburg and Cedar Key showed higher-than-normal salinity January through May and June, respectively, then lower-than-normal values for the remainder of the year. At Galveston (Pleasure Pier) the salinity remained higher than normal through October. Salinity there returned below normal in November and December. Freeport Harbor showed a negative salinity anomaly in March, April, and May but was near normal or above normal in salinity other months.

Port Mansfield showed the most anomalous salinity pattern for the year. Salinity remained below the long-term average throughout the year, but was especially low in the first six months of the year. In both March and May salinity at Port Mansfield was 15 parts per thousand lower than normal. Only local runoff conditions could account for such a large and persistent anomaly.

No salinity and temperature data are presently available through the National Ocean Service (NOS) between the Cedar Key, Florida, and Galveston (Pleasure Pier), Texas, stations. Any available new station data will be added in future assessments, supplemented where possible with cruise data.

Temperature

Water temperatures at the Gulf stations in 1982 followed the seasonal pattern expected from long-term data records. Eastern Gulf stations show highest temperatures in July, while western Gulf station temperatures peak in August. All stations show minimum water temperatures in January. Generally, the western Gulf stations exhibit cooler minima than those for stations in the eastern Gulf.

Surface water temperature over the year at the National Ocean Services Gulf stations averaged one degree Farenheit above normal (Table 3-6). Only Port Mansfield remained close to the long-term average. Naples exhibited the greatest annual anomaly (+2.0°F). The monthly departures from normal ranged from 4.0°F cooler than normal (Key West in October) to 8.3°F warmer than normal (Naples in March).

Over the region, surface water temperatures were warmer than normal in late winter and spring, cooler than normal in May, and near normal in summer (Figure 3-6). October showed cooler than normal water conditions with a pocket of normal temperatures between Naples and Cedar Key. Water temperatures were above normal in November and December except at Galveston (Pleasure Pier) and Port Mansfield.

3.7 Wind-driven Currents

The Assessment and Information Services Center has computed wind-driven mass tranpsort estimates based upon the National Weather Service Limited Fine Mesh (LFM) - II dataset. The transport values are not intended as a measure of the absolute magnitudes of the transport, but as relative

Table 3-5. Monthly Long-Term Average Surface Salinity and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

A. Monthly long-term average (ppt)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West	36.0	36.2	36.4	36.7	37.0	36.6	36.7	36.7	36.2	35.8	36.3	36.2	36.4
Naples	35.7	35.7	36.2	35.3	36.0	35.8	35.3	34.5	33.7	34.2	34.8	35.0	35.2
St. Petersburg	26.8	26.7	26.4	26.5	27.8	28.8	28.0	25.4	23.4	23.9	25.6	26.5	26.3
Cedar Key	27.1	26.0	24.7	24.7	26.0	27.5	27.1	25.9	25.6	26.1	27.5	27.3	26.3
Galveston (Pleasure Pier)	29.1	29.1	28.4	26.1	24.8	28.2	31.8	33.3	28.6	28.5	29.7	29.5	28.9
Freeport Harbor	24.7	24.1	25.8	25.2	23.3	26.0	30.4	33.1	28.4	25.1	25.9	25.1	26.4
Port Mansfield	34.8	35.0	35.3	35.4	33.6	33.3	36.4	40.3	39.8	37.6	38.6	37.1	36.4

Table 3-5 (Continued). Monthly Long-Term Average Surface Salinity and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

B. Departure from normal, 1982 (ppt)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West	0.4	0.7	0.3	0.8	0.5	-0.9	0.2	-0.1	0.1	0.2	0.2	0.6	0.4
Naples	1.4	1.7	1.5	3.2	2.4	0.7	1.3	0.8	2.3	1.7	1.0	1.2	1.6
St. Petersburg	1.9	2.3	2.0	1.5	1.2	0.5	-1.8	-0.9	-0.3	-1.2	-1.3	-0.2	0.3
Cedar Key	1.4	1.1	1.6	2.4	2.5	1.3	-3.8	-2.3	-2.7	-1.7	-0.4	-0.4	0.6
Galveston (Pleasure Pier)	2.1	1.8	1.4	4.0	6.3	5.6	5.0	3.5	4.2	2.2	-0.4	-0.8	2.9
Freeport Harbor	0.6	1.3	-2.3	-2.6	-7.7	3.2	-0.6	1.8	3.3	3.6	1.9	0.2	0.2
Port Mansfield	-5.3	-8.2	-15.2	-11.8	-14.7	-6.7	-2.1	-3.0	-2.0	-0.4	-2.8	-0.1	-6.0

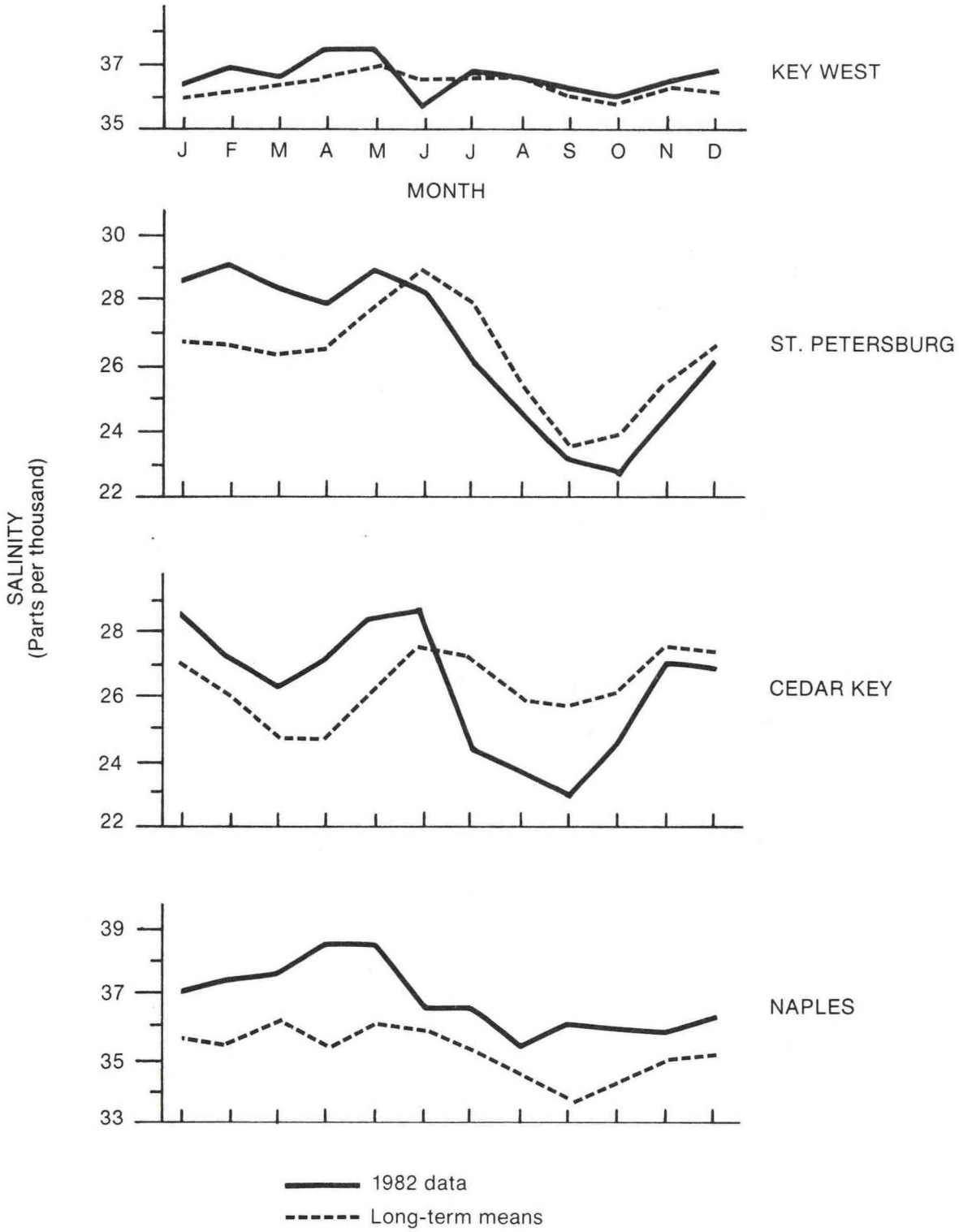


Figure 3-5. Mean Monthly Surface Salinity, Selected Stations, Gulf of Mexico, 1982.

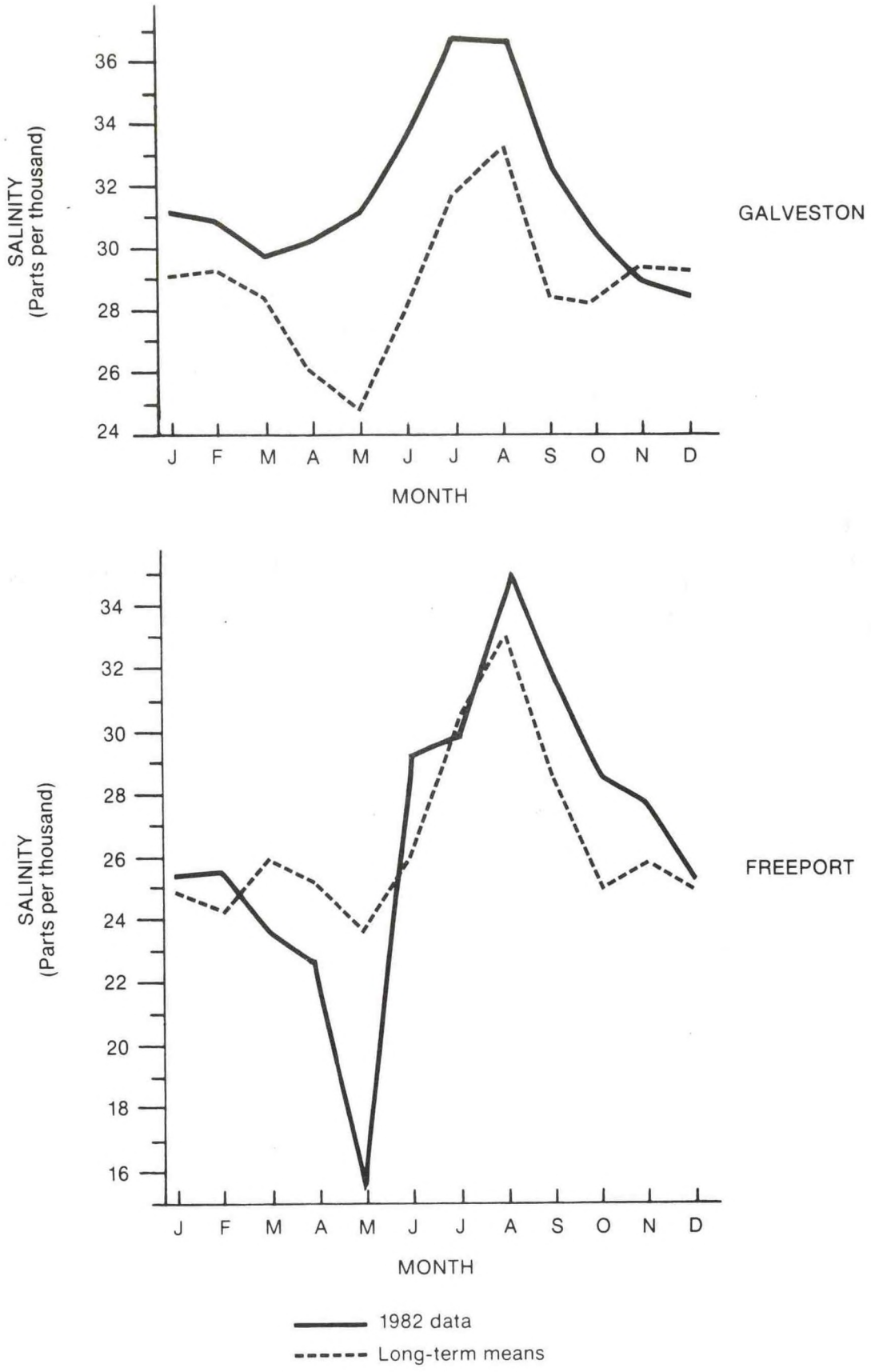


Figure 3-5 (Continued). Mean Monthly Surface Salinity, Selected Stations, Gulf of Mexico, 1982.

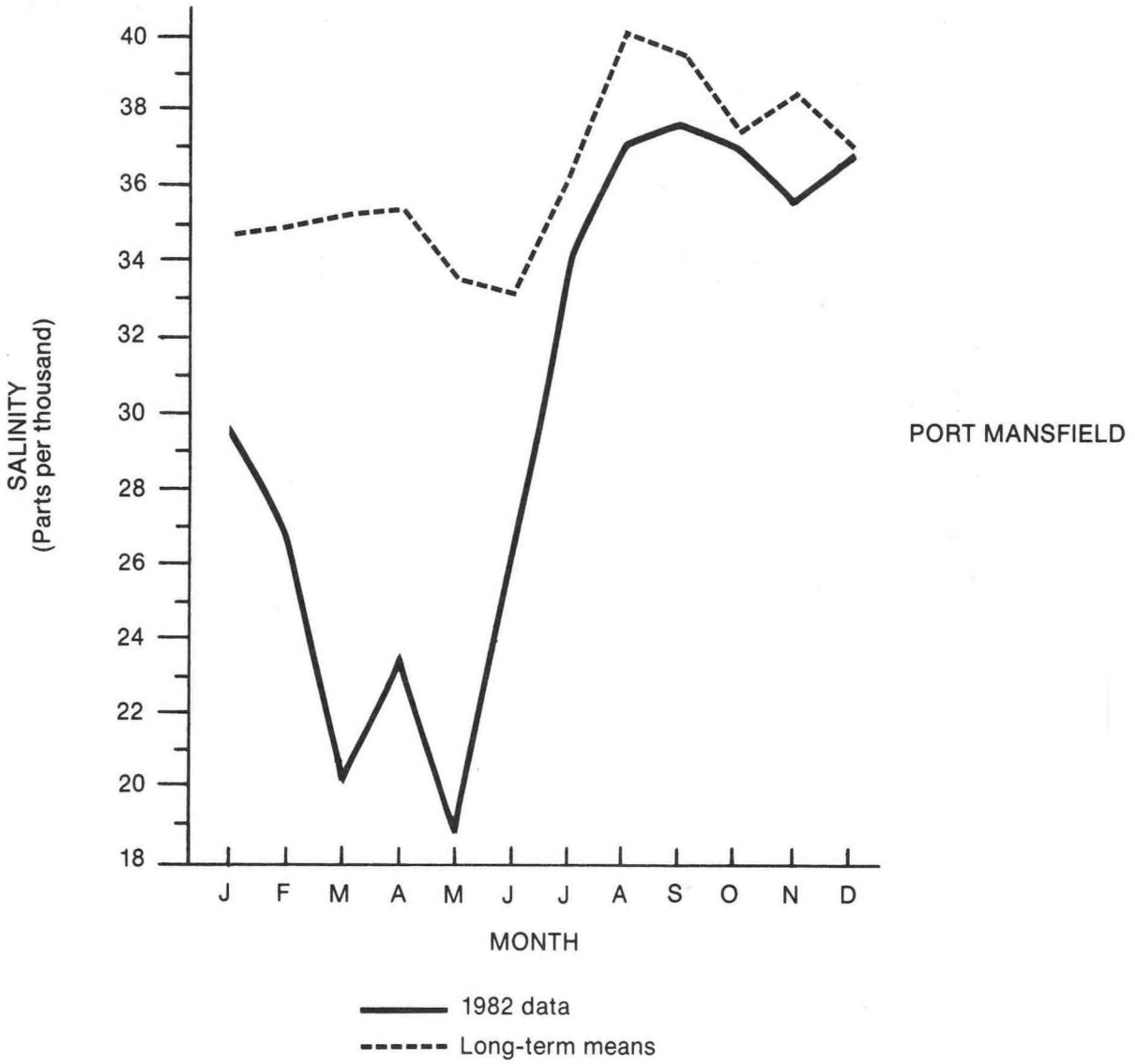


Figure 3-5 (Continued). Mean Monthly Surface Salinity, Selected Stations, Gulf of Mexico, 1982.

Table 3-6. Monthly Long-Term Average Surface Water Temperature and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

A. Monthly long-term average (Degrees F)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West	71.1	71.8	74.7	78.4	82.2	85.3	86.7	87.1	85.5	81.7	75.9	72.1	79.4
Naples	64.6	64.6	67.8	76.6	81.5	85.6	87.3	87.1	84.9	81.7	72.0	67.8	76.8
St. Petersburg	62.1	63.7	67.5	73.6	79.5	83.8	85.5	85.5	83.7	77.7	69.8	63.7	74.7
Cedar Key	57.9	60.3	65.1	73.2	79.5	84.4	85.6	85.6	82.9	75.6	66.2	59.7	73.0
Galveston (Pleasure Pier)	53.4	55.0	60.3	70.5	77.7	82.9	85.5	86.0	82.9	75.9	66.7	58.8	71.3
Freeport Harbor	53.4	56.3	61.2	70.5	77.2	81.9	83.7	84.7	82.2	74.8	66.0	58.8	70.9
Port Mansfield	58.3	61.0	65.5	74.8	79.0	82.9	84.6	84.6	82.9	76.3	69.3	62.1	73.4

Table 3-6 (Continued). Monthly Long-Term Average Surface Water Temperature and 1982 Departure from Normal, Selected Stations, Gulf of Mexico Region.

B. Departure from normal, 1982 (Degrees F)

Station	Month												Annual Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Key West	1.0	3.7	1.8	2.6	-2.6	-1.3	1.1	0.0	1.0	-4.0	1.0	2.1	0.5
Naples	1.4	7.7	8.3	3.9	-2.6	-0.6	0.6	0.1	0.6	-0.8	2.2	3.5	2.0
St. Petersburg	-0.6	4.8	3.2	0.9	-1.8	0.3	0.3	-0.2	-0.4	0.0	1.7	4.8	1.1
Cedar Key	-0.3	5.0	4.9	0.5	0.7	0.7	1.0	-0.3	-0.6	0.2	2.5	4.4	1.6
Galveston (Pleasure Pier)	2.9	1.1	3.1	-0.3	-2.0	0.8	1.1	1.2	0.9	-2.4	-0.7	-0.4	0.4
Freeport Harbor	0.2	-1.2	3.4	1.1	-0.4	0.3	2.4	2.3	1.3	-0.1	0.9	2.3	1.0
Port Mansfield	0.9	0.1	3.0	-0.8	-1.1	0.3	-0.7	-0.1	-0.4	-0.4	0.1	-1.6	-0.1

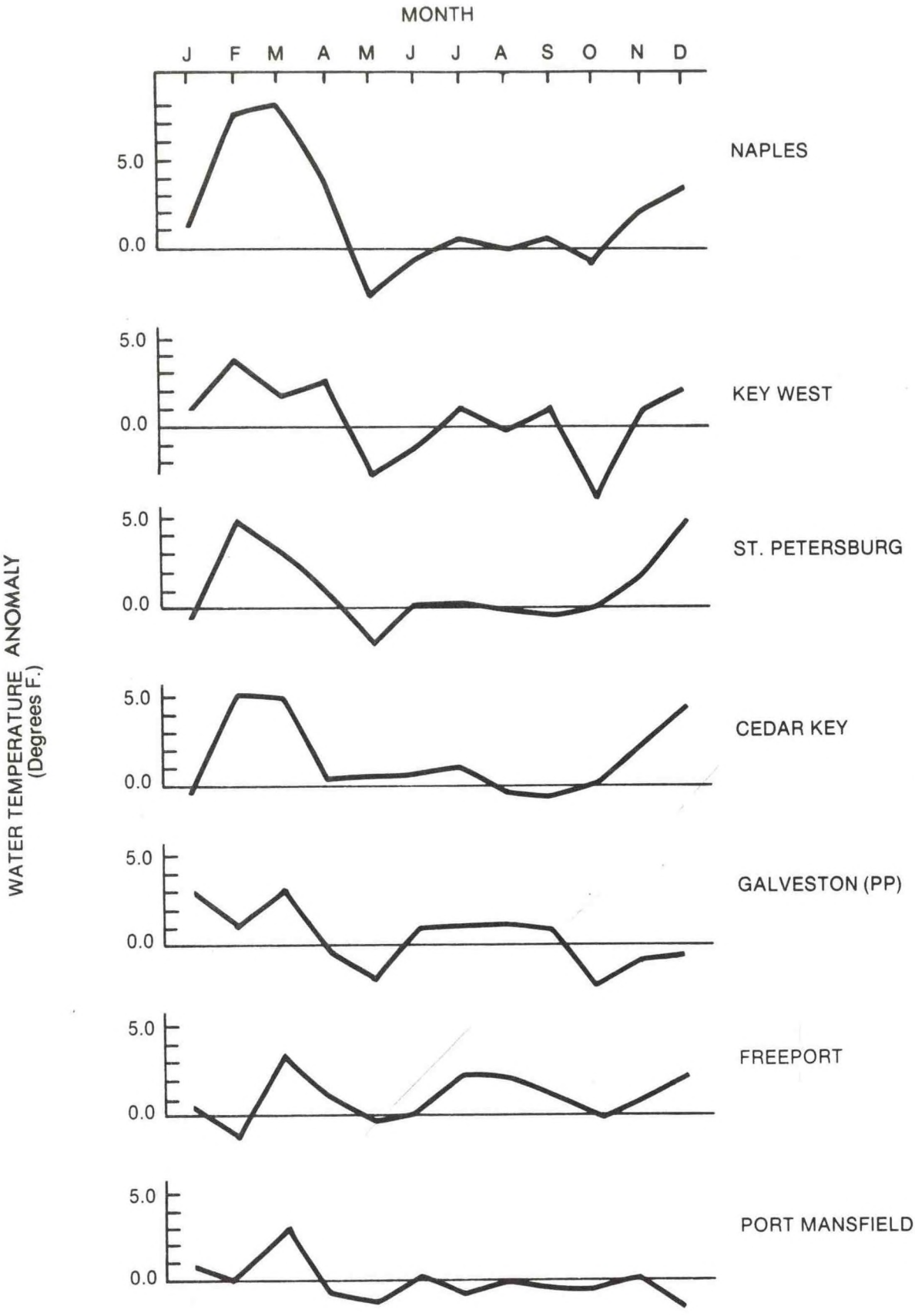


Figure 3-6. Mean Monthly Surface Water Temperature Anomaly, Selected Stations, Gulf of Mexico, 1982.

magnitudes and directions of transport. Since commercial species in the Gulf such as menhaden and shrimp spawn offshore and rely on wind-driven transport to convey larvae into estuarine nursery areas, the patterns of transport at the critical times are important for estimating survival of year classes. In this section we discuss only the relative transport computations. Fisheries impacts appear in Section 4.

Figure 3-7 shows the mean monthly tranports computed for 1982 and for the five-year period 1977-1981. The units are expressed as cubic meters per second per 100 meters of baseline length normal to the wind vector in order to be comparable to previous similar computations in the literature. The transports for individual months for 1982 are stronger than the five-year average in January, February, March, May, November, and December. The months of April, and June-October are similar in magnitude.

The wind-driven transport was reversed from its 1977-81 mean direction at several areas during different times in 1982. In the upper Gulf in January, February, and March 1982 the transport was onshore compared to 1977-81, which shows average transport is offshore. In June 1982 the west coast of Florida experienced onshore drift where 1977-81 averages maintained an offshore set. In November-December 1982 the wind-driven current in the northeast Gulf set onshore, counter to the 1977-81 average which was slightly offshore. The lower Texas and Mexican coast experienced strong southerly and offshore set to the wind-driven transport in November and December of 1982 where the 1977-81 mean transport was strongly onshore.

Regional Patterns of Wind-Driven Transport, 1982

The Gulf circulation divides geographically into six areas for discussion of the transport details; west coast of Florida, northeast Gulf, northwest Gulf, southeast Texas coast, Mexican coast, and deep water center of the Gulf. The discussion following will treat the regional transport picture in time, then examine monthly patterns relative to 1977-81 averages.

Along the west coast of Florida, wind-driven transport is northward with an offshore set January through May 1982. In June and July wind drift remained northerly with an onshore set. In August the current was almost exactly alongshore, and in September through December, the currents again set offshore and northward. In October and November transport was strongly offshore.

In the northeast Gulf region (Florida panhandle to south of the Mississippi) wind-driven currents set onshore and westerly January through May, with an especially dominant westerly alongshore flow in February. Winds in June were near calm and generated only a slight easterly transport at the end of the month. The transport in July set onshore and easterly. By August, the mean transport had shifted slightly westward and strongly onshore. September and October showed little onshore direction but strong westward drift. In November and December the wind-driven transport again set slightly onshore and westward.

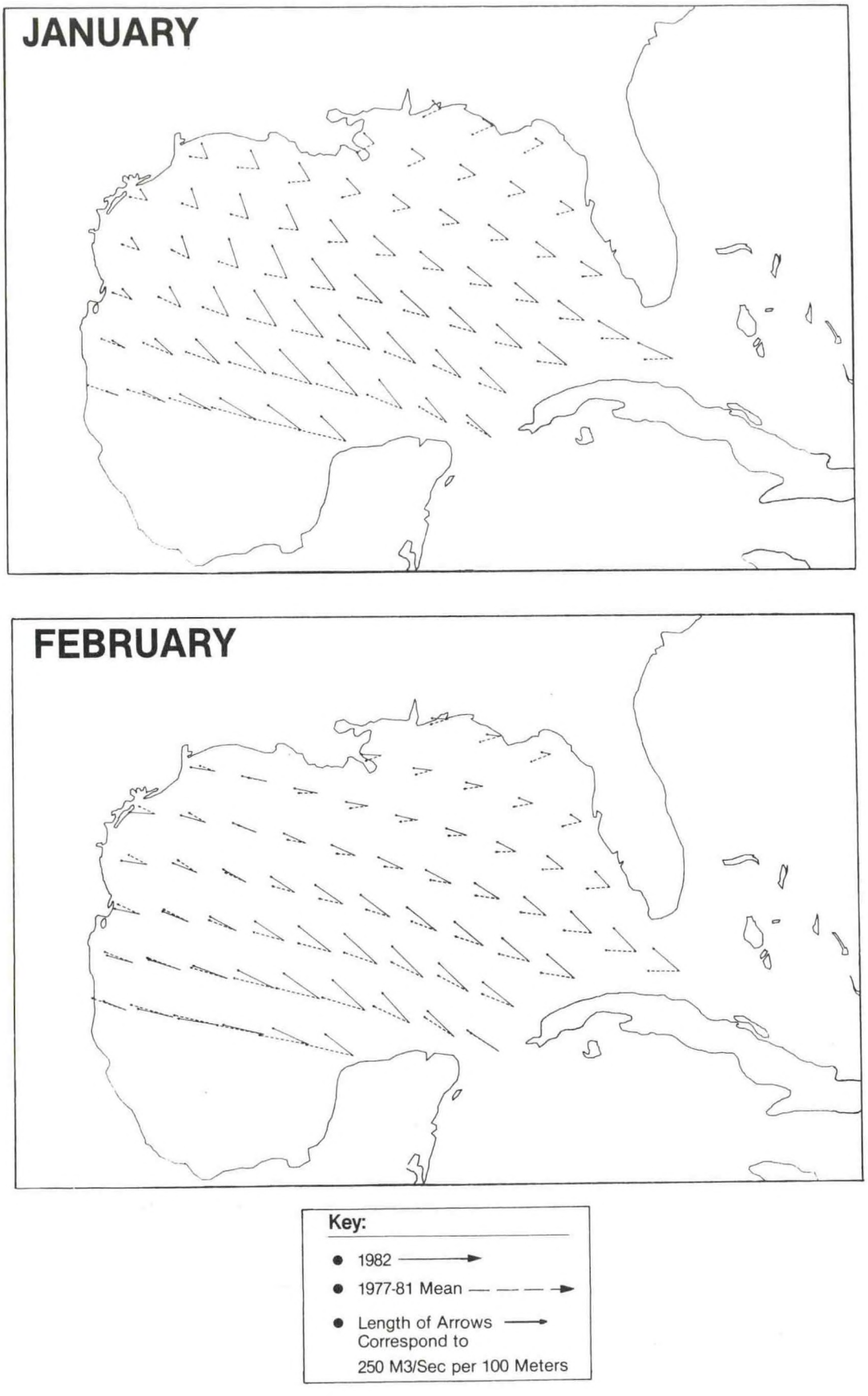
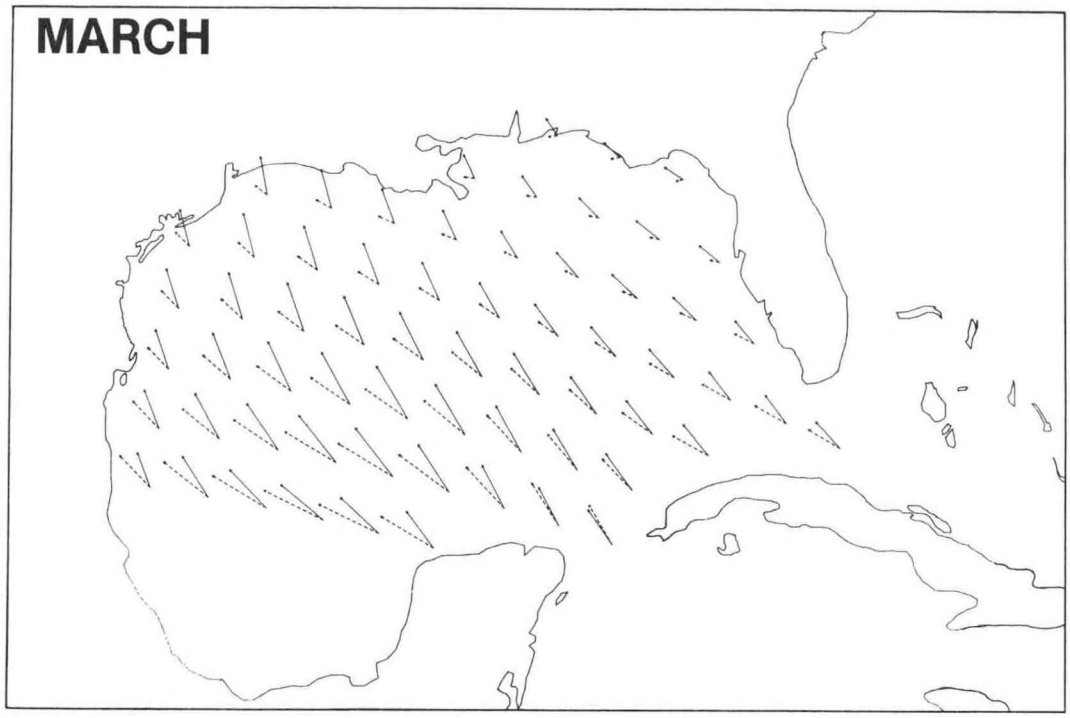
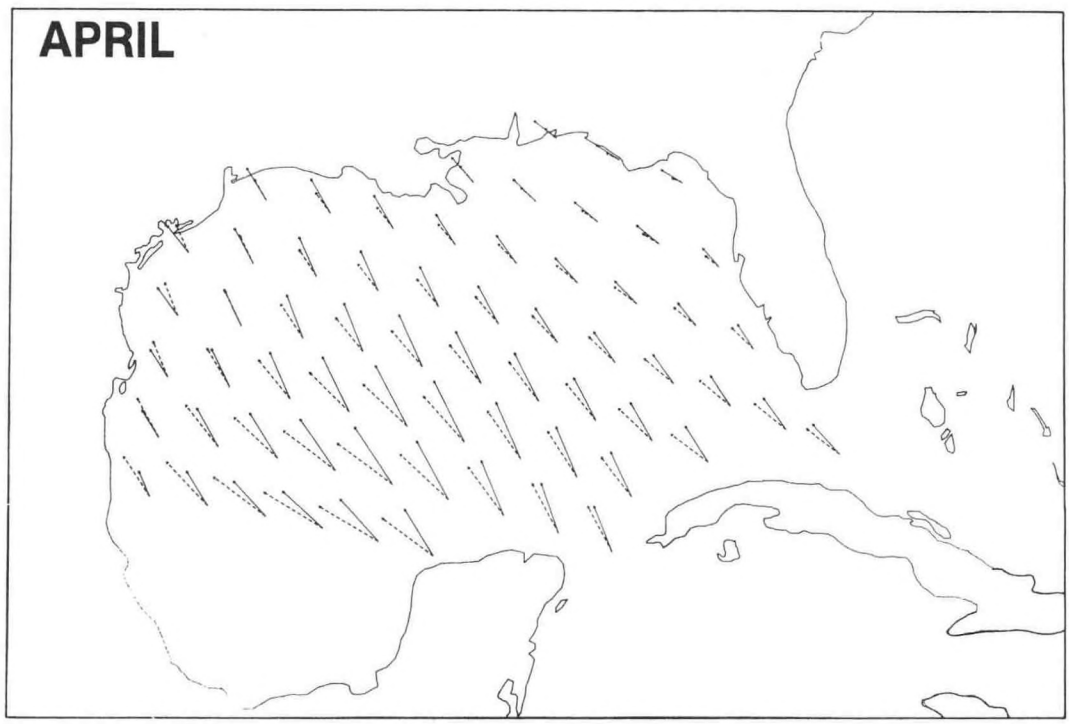


Figure 3-7. Mean Monthly Mass Transport, 1982, and 1977-81.





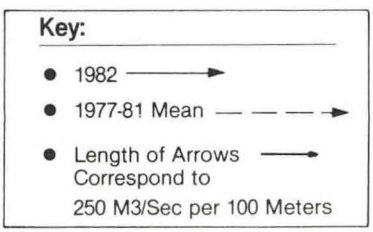
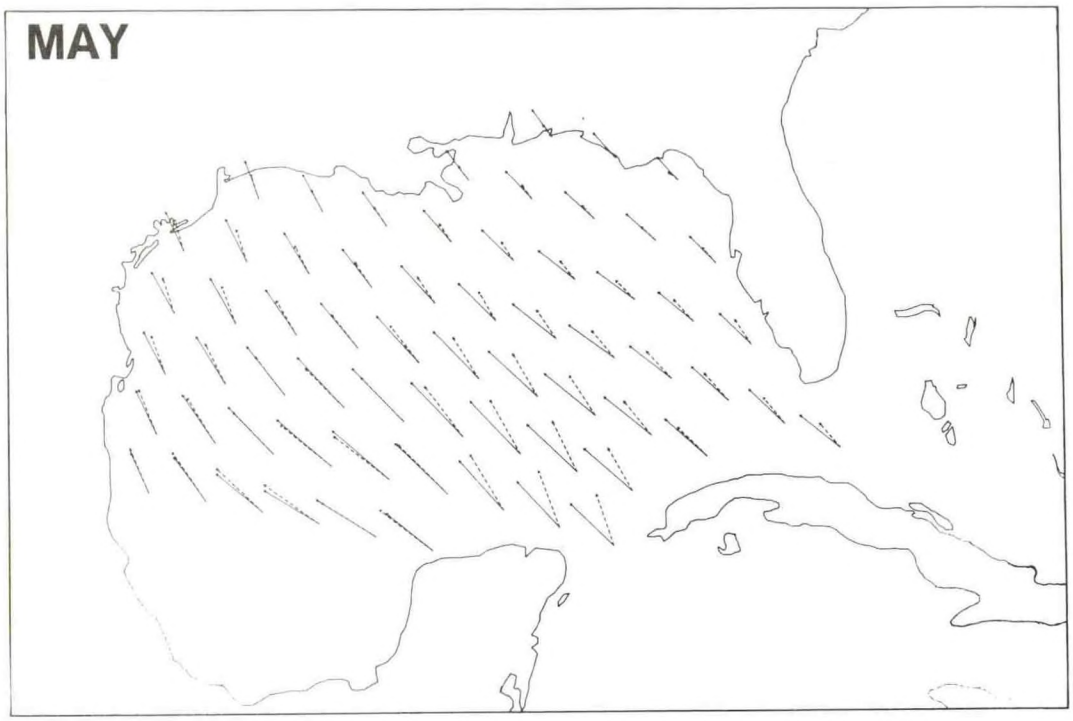
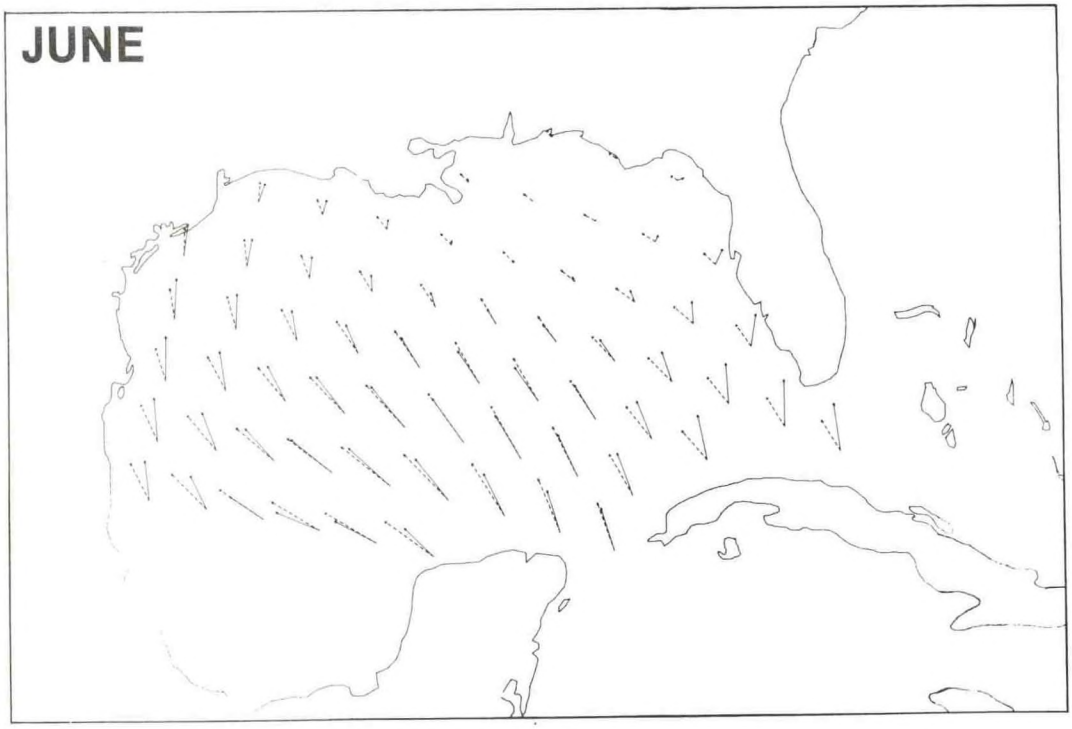


Figure 3-7 (Continued). Mean Monthly Mass Transport, 1982, and 1977-81.





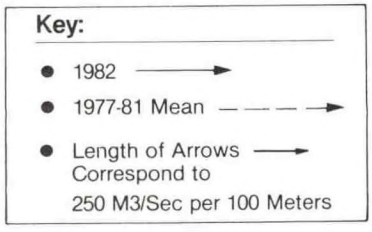
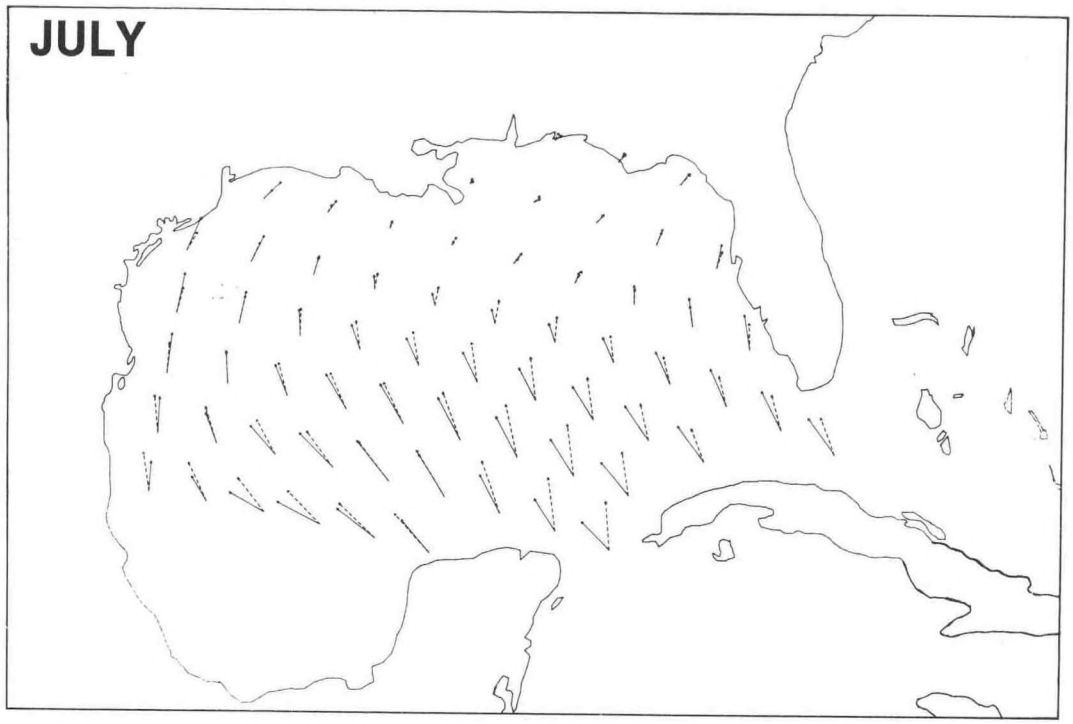
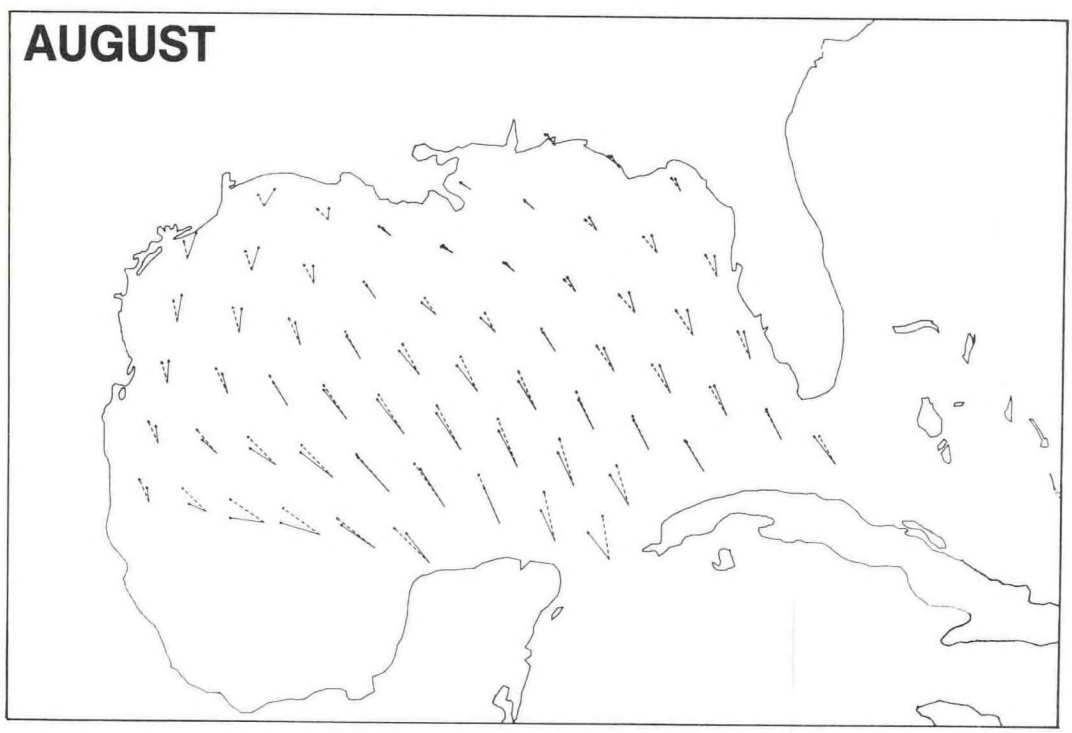


Figure 3-7 (Continued). Mean Monthly Mass Transport, 1982, and 1977-81.





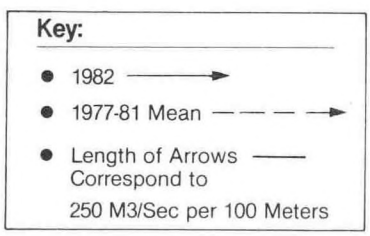


Figure 3-7 (Continued). Mean Monthly Mass Transport, 1982, and 1977-81.

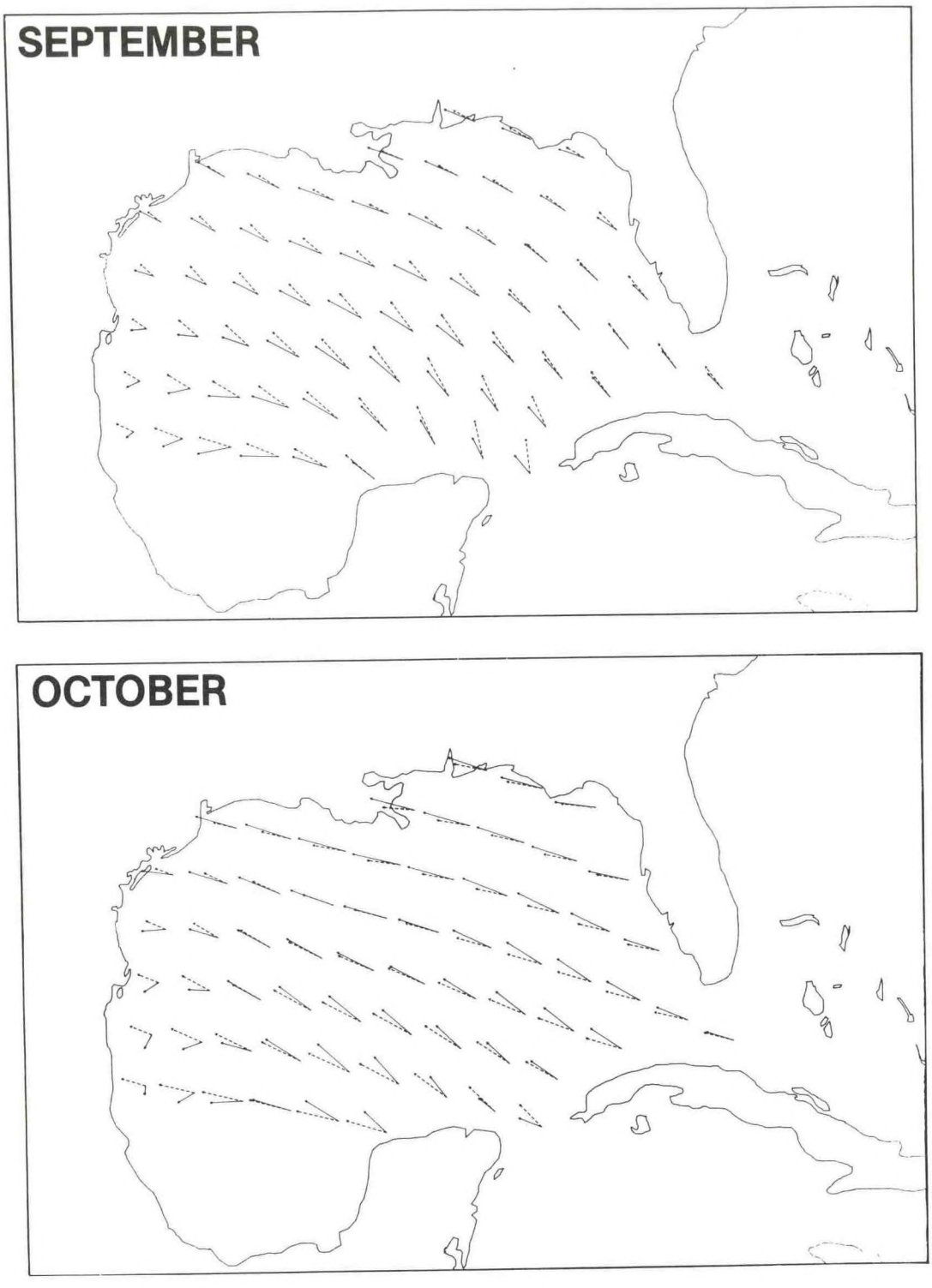


Figure 3-7 (Continued). Mean Monthly Mass Transport, 1982, and 1977-81.

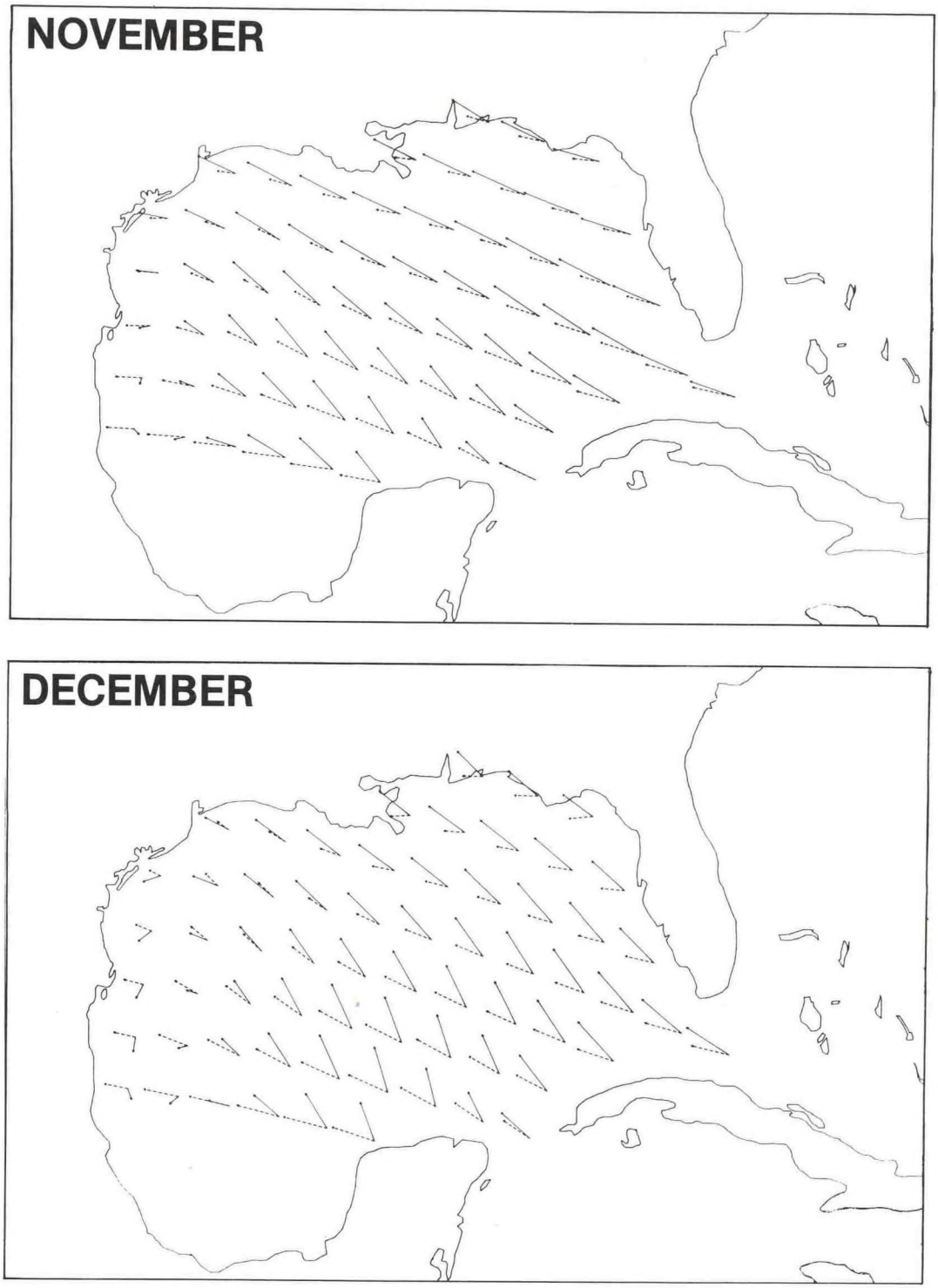


Figure 3-7 (Continued). Mean Monthly Mass Transport, 1982, and 1977-81.

Currents for the northwestern Gulf region in 1982 resembled the regime found in the northeastern Gulf but with no period of calm. Westerly setting onshore drift predominated January-May and September-December with strong westerly movement in February, September, and October. Winds produced onshore easterly drift through June, July, and August.

Along the southeast coast of Texas (Galveston to Brownsville), currents set onshore and northerly January through August. The onshore component dominated in February. Currents again set strongly onshore in September-December with a slight southerly set in December. Currents were onshore in all months except June and July when the current appeared either alongshore or very slightly offshore.

South of the Texas-Mexico border the coastal wind-driven currents set onshore and northerly January through August and onshore and southerly September through December. During October and November of 1982 a divergence between north-setting transport and south-setting tranpsort occurred at Corpus Christi. In December the divergence moves north to near Matagorda. During August there was a divergence of eastward and westward onshore transports near Sabine Pass.

Comparison of 1982 With Five-Year Mean Transport

Wind-driven transport in January 1982 was weaker than the five-year mean in coastal areas and stronger than the five-year mean in the deep-water open areas of the Gulf. At all locations the transport shows a more northerly set in 1982 than earlier averages. In the northern Gulf the 1977-81 mean January transport was directed offshore and westerly, while 1982 data show an onshore and westerly transport.

February 1982 transport data show stronger transport than the 1977-81 means in most areas but notably weaker in the northeast Gulf. In the northeast Gulf the transport for February was onshore where the 1977-81 mean transport is offshore. In the western Gulf the 1977-81 February mean drift shows a northward set but February 1982 transport set directly onshore.

March 1982 transport was stronger and set more northerly than 1977-81 average transport values over the entire Gulf. The onshore transport in the upper Gulf is notably stronger than that for earlier months. On both the Texas coast and Florida west coast transport for March 1982 is northward alongshore, but five-year mean March values on the two coasts set offshore as well as northerly.

Transport calculations for April 1982 were very similar to the five-year average. Values in the central deep-water region show slightly higher transport and a more northward set in 1982.

May transport values were also similar to 1977-81 average values but with slightly higher transport overall and a more westerly set in the central Gulf.

Transport in the central portion of the Gulf remained similar in June 1982 to the most recent five Junes. The western Gulf region along the southeast Texas and Mexico coasts showed a northerly drift in 1982 exactly alongshore, while the previous five years show an onshore transport. In the northeast Gulf, June 1982 experienced much weaker transport and set easterly compared to 1977-81 where data show a westward transport. On the west coast of Florida the transport is offshore.

July and August 1982 transport was similar to July and August transport over the 1977-81 period. Western Gulf locations in August, 1982 showed less onshore set than for the previous five years. September 1982 transport was similar to, but stronger than, 1977-81 averages for the northern and eastern Gulf. The southern and western Gulf experienced noticeably more southerly and westerly transport in September 1982 than previously. Along the Texas and Mexico coast the September 1977-81 mean transport is northerly and onshore. For September 1982 the transport diverges near Corpus Christi, Texas southerly and onshore to the south, and northerly, onshore to the north.

Transport vectors for October 1982 are similar to 1977-81 averages in direction in the entire region except the southwestern area. In the southeast Texas-Mexico area the drift was weaker in 1982 than previously and more southerly. The divergence of northerly and southerly drift moved in October to the Matagorda area. Transport magnitudes in the northeast Gulf were stronger in October 1982 than the five-year average value.

November 1982 transport in the southwestern Gulf was different from previous Novembers, the 1982 wind drift showing more southerly and offshore directions, and smaller magnitudes. At one grid point off the coast of Mexico, the transport reversed completely from the 1977-81 average of onshore (270°T) to a 1982 average of southeast, offshore (135°T). Over the remainder of the Gulf, November 1982 showed much stronger wind-driven transport than the previous five-year average with a more northerly set. The divergence between northward and southward flow in the western Gulf remained near Matagorda in November 1982.

December 1982 transport differed from the 1977-81 average much like the November pattern. The divergence between northerly and southerly flow moved north to the Freeport area. South of Galveston the flow appears southerly, setting offshore along the Mexico coast. The upper, central, and eastern Gulf showed stronger transport in 1982 than 1977-81 averages and a more northerly set to the directions. There is strong evidence of a counterclockwise gyre in the Gulf of Campeche during the month. The transport for the northeastern Gulf was onshore during December 1982 compared to 1977-81 were the December average was offshore.

SECTION 4
FISHERIES

The largest U.S. commercial fishing industry is located in the western Gulf of Mexico. The most productive fishing grounds are off Atchafalaya Bay, Louisiana. The fishing industry of the eastern Gulf is largely recreational.

Menhaden dominate Gulf commercial finfish landings in volume and dollar value. Shrimp, blue crabs, and oysters dominate the commercial shellfish landings.

According to the National Marine Fisheries Service there are 18 major ports associated with the Gulf fishery. Landings at individual ports range from 6.35 million to 558.8 million pounds, based on averages for years 1979 to 1982. In 1981, 841 processors and wholesalers operated in the Gulf coast states averaging 18,034 workers in season and averaging 13,170 workers annually. In 1980, 431 fishing fleet vessels were constructed in the Gulf region, ranging in size from 22 to 169 feet in length.

4.1 Summary of Commercial Fishing

Fisheries provide a valuable contribution to the Gulf of Mexico regional economy. In 1982, Gulf region landings were 2.3 billion pounds valued at $613 million, an increase of 600 million pounds and $60 million dollars over 1981 due to an increase in menhaden landings. United States Department of Interior studies show the actual value of the Gulf fishery is about four times the ex-vessel landings figure (price received by the harvester) when satellite industries are included.

Louisiana landings were a record 1.7 billion pounds in 1982 (Table 4-1). Texas had a decrease of nearly 24 million pounds, although value increased about 12 million dollars. While Alabama and Florida both had lower landings in 1982 compared to 1981, Mississippi landings increased by 119 million pounds.

Gulf region landings in 1982 were nearly 36 percent of the total U.S. landings by weight and about 26 percent by value. Louisiana led the 50 States in volume with record landings of 1.7 billion pounds (Tables 4-2 and 4-3).

In quantity of commercial fishery landings in 1982, Gulf of Mexico ports accounted for four out of the top five ports in the country: Cameron, Empire-Venice, and Dulac-Chauvin, Louisiana; and Pascagoula-Moss Point, Mississippi. The port of Brownsville-Port Isabel, Texas was one of the top five ports in the country in terms of dollar value (Table 4-4).

Table 4-1. Commercial Landings of Finfish and Shellfish by States, 1977 through 1982, and Record High Landings (in Thousands of Pounds).

State	Year						Record Landings	
	1977	1978	1979	1980	1981	1982	Year	Record High
Texas	111,898	103,524	84,891	98,478	113,108	89,218	1960	237,684
Louisiana	917,523	1,673,922	1,529,081	1,423,374	1,168,597	1,718,668	1982	1,718,668
Mississippi	316,627	377,534	383,632	337,765	264,891	383,767	1971	400,576
Alabama	36,158	31,553	33,269	26,605	33,677	27,362	1973	39,749
Florida (1)	167,827	171,462	163,056	191,470	215,281	195,060	1938	241,443

Data from National Marine Fisheries Service. State totals include fresh water areas such as the Mississippi River.

(1) Data include Atlantic and Gulf coasts.

Table 4-2. Total Landings of Finfish, Gulf States, 1982.

State	Distance from U.S. Shores: From 0 to 3 miles		Between 3 and 200 miles	
	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars
Texas	1,703	1,008	1,306	1,834
Louisiana	1,353,044	56,134	223,176	9,540
Mississippi	316,393	11,234	3,619	1,999
Alabama	1,157	332	4,171	1,959
Florida (West Coast)	42,049	12,011	28,320	28,417

Data from National Marine Fisheries Service. Landings for high seas or off foreign shores not included.

Table 4-3. Total Landings of Shellfish, Gulf States, 1982.

State	Distance from U.S. Shores: From 0 to 3 miles		Between 3 and 200 miles	
	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars
Texas	27,634	29,653	50,050	143,045
Louisiana	76,965	86,709	43,454	79,018
Mississippi	10,476	11,272	3,561	10,200
Alabama	8,832	16,290	10,728	27,739
Florida (West Coast)	21,352	23,838	24,719	49,548

Data from National Marine Fisheries Service. Landings for high seas or off foreign shores not included.

Table 4-4. Commercial Fishery Landings and Value at Major Gulf of Mexico Ports, 1979 through 1982.

Port	Quantity (Million Pounds) 1979	1980	1981	1982	Value (Million Dollars) 1979	1980	1981	1982
Cameron, LA	593.1	479.8	447.6	714.7	34.3	33.3	29.9	40.4
Pascagoula-Moss Point, MS	283.8	291.9	220.5	331.6	18.1	18.9	16.8	18.5
Empire-Venice, LA	278.9	275.4	221.5	267.3	28.8	31.0	30.5	36.4
Dulac-Chauvin, LA	246.3	265.8	203.9	265.6	41.5	50.0	51.5	51.7
Brownsville-Port Isabel, TX	22.0	21.6	28.9	19.0	50.0	42.2	48.4	52.0
Aransas Pass-Rockport, TX	19.0	22.1	24.4	18.0	40.0	40.2	41.0	41.0
Bayou La Batre, LA	21.8	19.9	25.1	17.8	34.9	23.7	31.4	33.8
Golden Meadow-Leeville, AL	15.6	15.4	18.5	14.2	22.5	12.2	19.9	21.5
Lafitte-Barataria, LA	10.4	11.1	14.7	11.9	16.6	14.8	20.8	21.9
Delacroix-Yscloskey, LA	--	--	--	10.6	--	--	--	9.8
Delcambre, LA	--	8.6	11.0	10.4	14.8	13.3	18.8	17.6
Key West, FL	16.5	15.4	18.0	10.0	25.9	18.3	27.0	19.0
Fort Myers, FL	15.9	13.5	15.0	9.2	17.8	10.9	18.0	11.9
Freeport, TX	8.0	10.1	14.9	9.0	25.0	19.9	26.8	26.0
Apalachicola, FL	10.4	11.6	12.0	9.0	10.1	11.3	12.3	10.2
Galveston, TX	--	--	8.1	7.0	--	--	13.3	15.0
Bon Secour-Gulf Shores, AL	--	--	7.0	5.9	16.0	7.7	11.6	12.4
Grande Isle, LA	--	--	7.1	5.6	--	--	7.8	5.7
Port Arthur-Sabine, TX	--	--	--	--	--	--	8.2	10.0
Palacios, TX	--	--	--	--	--	--	--	9.0
Port Lavacca, TX	--	--	--	--	--	--	--	6.0

Data from National Marine Fisheries Services. Blank entries indicate data unavailable.

4.2 Finfish

The dominant fishery species in the Gulf of Mexico is menhaden, totaling nearly 1.9 billion pounds landed during 1982, worth 72.7 million dollars (Table 4-5). Landings of all other species totaled 91.7 million pounds. The total value of all finfish landed in the Gulf in 1982 was 124.7 million dollars.

Menhaden landings increased in the Gulf of Mexico in 1982 by 665.3 million pounds (55 percent) over 1981. Menhaden landings in 1982 were a record high, surpassing the previous record of 1.8 billion pounds set in 1978. Landings peaked in July and August with 545.1 and 498.4 million pounds, respectively.

Contributing factors to record high menhaden landings in the Gulf region during 1982 were a large 1981 year class and favorable weather conditions during harvesting. Little fishing time was lost due to adverse weather during peak harvest months in the summer 1982.

Twenty-three species other than menhaden were reported in 1982 Gulf landings (Table 4-5). After menhaden, species with the highest total value were grouper, red snapper, and mullet.

Analysis of wind-driven currents for 1982 reveals transport conditions were favorable for year-class strength (recruitment) of Gulf menhaden during the 1981-82 spawning season. Young-of-the-year Gulf menhaden are transported by wind-driven currents from the primary spawning area (offshore to a depth of approximately 50 fathoms or 45-50 miles offshore) into estuaries. The overall spawning range extends from the Mexico-U.S. border to Tampa, Florida, although the principal area is between Galveston, Texas, and Pensacola, Florida. The year-class strength (recruitment) of menhaden is strongly influenced by the direction and intensity of prevailing wind-driven currents occurring during the spawning season. Menhaden spawning occurs from October until March and usually peaks in late December or early January in the Gulf of Mexico. The transport interval of eggs and larvae from ocean to estuary is approximately one month. In the upper Gulf in January, February, and March 1982 the wind-driven transport set slightly onshore compared to 1977-81, when the five-year average transport sets slightly offshore (Figure 3-7). Additional data for October, November, and December 1981 show prevailing wind-driven transport was onshore in October and similar to the five-year average for November and December. These drift current conditions for the 1982 spawning season suggest a high availability of larvae for menhaden recruitment. Local estuarine conditions such as temperature, salinity, and runoff would ultimately determine the year-class strength.

Other commercially valuable Gulf finfish species with larvae which rely on Gulf currents for transport into coastal nursery areas include red drum and Atlantic croaker. Red drum spawn offshore in the northern Gulf from August to October. The Atlantic croaker spawning period is from August to February, also offshore in the northern Gulf. The wind-driven transport for August through December 1982 was favorable for moving the larvae into the estuaries of the region.

Table 4-5. Total Finfish Landings by Species for the Gulf Region, 1982.

Species	DISTANCE FROM U.S. SHORES: From 0 to 3 Miles		Between 3 and 200 Miles		Total		
	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars	$/LB
Alewives	392	33	0	0	392	33	$ .084
Bluefish	804	137	332	62	1,136	199	$ .175
Bonito	44	4	220	22	264	26	$ .098
Croaker	644	228	2,277	888	2,921	1,116	$ .382
Flounder:							
Fluke	259	270	86	90	345	360	$1.043
Atlantic	581	353	662	309	1,243	662	$ .532
Grouper	96	127	12,207	12,308	12,311	12,440	$1.010
Mackerel:							
King	125	114	2,270	2,075	2,395	2,189	$ .913
Spanish	396	32	2,790	981	3,186	1,013	$ .317
Menhaden	1,661,193	64,184	222,275	8,544	1,883,468	72,728	$ .038
Mullet	24,826	5,503	129	15	24,955	5,518	$ .221
Scup or Porgy	90	44	102	50	192	94	$ .489
Sea Bass, Black	16	5	0	0	16	5	$ .312
Sea Trout:							
Spot	2,665	2,385	51	19	2,716	2,404	$ .885
White	293	97	690	174	983	271	$ .275
Sharks, Unclass.	67	22	588	243	655	265	$ .404
Snapper:							
Red	2	2	5,595	9,643	5,791	9,912	$1.711
Other	404	460	2,359	2,922	2,763	3,382	$1.224
Swordfish	0	0	1,256	3,120	1,256	3,120	$2.484
Tilefish	16	12	364	240	380	252	$ .663
Tuna:							
Little	0	0	128	18	128	18	$ .140
Yellowfin	0	0	6	3	6	3	$ .500
Unclass.	0	0	202	334	202	334	$1.653
Blackfin	0	0	91	38	91	38	$ .417
Fish, Other	21,433	6,707	5,912	1,651	27,345	8,358	$ .305
Total Finfish	**1,714,364**	**80,719**	**260,592**	**43,749**	**1,975,140**	**124,740**	

Data from National Marine Fisheries Service. Landings for high seas off foreign shores account for 0.01% of total weight and 0.2% of total value. Value is ex-vessel price per pound.

4.3 Shellfish

Five species dominated the Gulf shellfish fishery during 1982: shrimp, blue crabs, oysters, other crabs, and spiny lobsters (Table 4-6). Total landings for all shellfish species were 280 million pounds worth 486 million dollars.

Gulf shrimp landings declined by 22 percent in 1982 compared to 1981 (209.9 million pounds in 1982 and 268.2 million pounds in 1981). Although Mississippi shrimp landings increased by 10.2 million pounds, all other Gulf states showed declines ranging from 18 to 36 percent. The ex-vessel price per pound of shrimp in 1982 for the Gulf region was $2.03, an increase of $0.53 over the 1981 price.

Brown shrimp landings in Louisiana were down in 1982 possibly due to high 1982 rainfall and river runoff and below average recruitment in 1982.

Wind-driven currents during the peak spawning months of February and March in 1982 were favorable for transport of brown shrimp postlarvae into estuaries of the north-central Gulf coast. Transport in March, the most critical month for the success of the year-class, was onshore compared to the average of the previous five-year period (Figure 3-7). Transport in May 1982 was onshore during the occurrence of white shrimp postlarvae. White shrimp postlarvae occur also in June when transport was onshore in the northwestern Gulf. Calm conditions prevailed in the northeastern Gulf in June 1982 with onshore transport toward the western panhandle of Florida. Transport was generally onshore in June and July 1982 in the northern Gulf when pink shrimp postlarvae are most abundant. Although onshore transport may bring a large stock of larvae into the estuaries, local conditions such as temperature and salinity or runoff will determine the size of stock which survives to adulthood.

Gulf oyster landings were highest in the U.S. at 44 percent of the national total. Total production in 1982 was 24.2 million pounds of oyster meats, with 51 percent of the landings from Louisiana.

High oyster landings reflect increased availability of oysters due to successful spawning and survival of oyster spat in 1979 and 1980. The oysters produced in 1979 and 1980 were of marketable size in 1982. Another contributing factor to increased availability of oysters in Louisiana was high runoff in March and April. Lowered salinities provided unfavorable conditions for predators (primarily oyster drills) and diseases.

Table 4-6. Total Shellfish Landings by Species for the Gulf Region, 1982.

Species	DISTANCE FROM U.S. SHORES: From 0 to 3 Miles Thousand Pounds	From 0 to 3 Miles Thousand Dollars	Between 3 and 200 Miles Thousand Pounds	Between 3 and 200 Miles Thousand Dollars	Total Thousand Pounds	Total Thousand Dollars	$/LB
Clam, Hard	1	1	0	0	1	1	$1.000
Crabs:							
Blue	35,902	10,341	0	0	35,902	10,341	$ .288
Other	750	1,043	4,838	6,703	5,588	7,746	$1.386
Lobster, Spiny	2,500	5,925	2,489	5,899	4,989	11,824	$2.370
Oyster Meat	24,158	29,985	0	0	24,158	29,985	$1.241
Scallop, Bay	13	35	0	0	13	35	$2.692
Shrimp	81,847	120,174	125,020	296,795	209,926	425,748	$2.028
Squid:							
Long Fin	0	0	52	12	52	12	$ .230
Short Fin	14	6	5	1	19	7	$ .368
Shellfish, Other	74	252	108	140	182	392	$2.153
Total Shellfish	**145,259**	**167,762**	**132,512**	**309,550**	**280,830**	**486,091**	

Data from National Marine Fisheries Services. Landings for high seas or off foreign shores account for 1.0% of total weight and 1.8% of total value. Value is ex-vessel price per pound.

Although larval transport of blue crabs in Gulf waters is poorly understood, research has shown that blue crab egg-bearing females are present in Gulf and estuarine waters in spring, summer, and fall. Blue crab zoeae (early life-stage larvae) have been detected in Gulf coastal waters in spring, summer, and fall, and megalopae (post-larval stage) may occur year round with peaks in May and late September and October.

Wind-driven currents were favorable for onshore transport of larvae in spring and summer for both the upper Gulf and the west coast of Florida. In fall 1982 drift currents continued to set onshore in the northern Gulf. Along the west coast of Florida below the Cedar Key area, currents in the fall set offshore and may have been unfavorable to the fall-spawned crab larvae recruitment.

4.4 Blooms

Red tides occurred on the west coast of Florida in 1982 in the area between Panama City and Fort Myers. Red tides have occurred on the Florida west coast every year since 1978, causing damage to fisheries (fish kills and shellfish bed closures) and restricting tourism (beach use). Non-migratory benthic (bottom-associated) fishes in shallow coastal areas are particularly vulnerable to the red tide algal toxin. Effects of red tide events in 1982 along the Florida west coast were minor compared to other years such as 1971-72 when combined damage to fisheries and tourism totaled 21 million dollars.

Blooms were first observed by the Florida Department of Natural Resources on July 3 north of Tampa Bay (28° latitude) and remained stationary through the end of July. Movement ("spreading") occurred at the end of July when red tides were detected south of the Tampa Bay area. Red tides ranged from Tampa Bay to Charlotte Harbor by August 2. At the end of August blooms were absent north of Tampa Bay. In early September red tides ranged from off Sarasota to Naples. Red tides were also observed off Panama City on September 15. No red tides were detected by October 6 off Panama City. By October 8, moderate cell counts were reported off Dry Tortugas. Cell counts diminished along the Florida coast in early October. When spreading of the red tide reaches the Naples area, currents disperse the bloom organisms resulting in reduced cell counts.

SECTION 5
RECREATION

The Gulf of Mexico is a major recreational area of the United States, particularly for boating, saltwater fishing (bay, surf, and pier), and beach activities. The coasts of Texas, Louisiana, Mississippi, Alabama, and the Florida panhandle display a diversity of natural landscapes and seascapes. Barrier islands, coastal beaches, bays, sounds, river deltas and marshes, together with a subtropical climate, provide an ideal setting for outdoor recreation and tourism. Tourism within the Gulf region generally encompasses such activities as sightseeing, swimming, sunbathing, bird watching, hiking, amusement parks, conventions, sports, and festivals. Activities are widespread over the region and contribute to its economic well-being.

5.1 National and State Park Visits

The National Park Service operates seven national parks in the Gulf of Mexico region. Four parks are located along the coast of Florida and there is one park in each of the other Gulf states, except Alabama (Table 5-1). Total visits to national parks in the region have grown since 1980, despite the recession which has hit the recreation industry particularly hard in recent years. Visits increased from 4.5 million in 1980 to 5.0 million people in 1981 and 5.4 million in 1982. These changes correspond to growth rates of 12.4 percent and 6.9 percent in 1981 and 1982, respectively. These rates compare favorably with national average rates which were 8.0 percent and 2.0 percent respectively possibly reflecting population growth in the region. The decline in Gulf area attendance may be an overall reflection of recessionary factors. Recent estimates by the Census Bureau indicate that the South is growing more than twice as rapidly as the Northeast and North-central parts of the United States. Estimates of Southern state population growth rates are in the neighborhood of 2 percent per year.

A look at individual states and national parks within states indicates substantial variability from site to site and year to year. Total visitations in Texas, for example, declined by 5 percent 1980 to 1981, yet rose 20 percent 1981 to 1982. Within Texas, attendance at the only marine-oriented national park, Padre Island National Seashore, declined 19 percent from 1980 to 1981 and rose 18 percent during 1981 to 1982. Padre Island was partially closed throughout most of 1981 after suffering damages from a hurricane in September 1980.

By contrast, total Mississippi visits to state and national parks rose a modest 5 percent in 1981 and declined 1 percent in 1982. Nonetheless, the state's Gulf Islands National Seashore park attendance experienced a growth of 32 percent and 6 percent during the same period.

Florida parks experienced different attendance patterns. Whereas visits as a whole grew 15 percent in 1981, visits to Everglades National Park plummeted 24 percent while visits to Gulf Island National Seashore rose 32 percent.

Table 5-1. National Park Visits (in Thousands) to Gulf States Sites, 1980 through 1982.[1]

	1980	1981	1982
FLORIDA (State Total)	5057	5800	6030
De Soto National Memorial	172	165	197
Everglades National Park	744	564	550
Fort Jefferson National Monument	8	10	10
Gulf Island National Seashore	2006	2653	2806
Total (Florida Gulf)	2931	3393	3563
LOUISIANA (State Total)[1]	271	373	377
Jean Lafitte National Historic Park and Preserve	271	348	377
MISSISSIPPI (State Total)	9780	10284	10159
Gulf Islands National Seashore	501	663	701
TEXAS (State Total)	4170	3968	4747
Padre Island National Seashore	765	620	731
Total in Gulf region National Parks	4469	5025	5373

[1] No National Park Gulf Sites are located in Alabama and only 1 National Park (Jean Lafitte) is in Louisiana

SOURCE: Statistics Office, Denver Service Center, National Parks Service

A look at 1982 national park visits by month (Table 5-2) reveals seasonal variations in visitation patterns from park site to park site. For example, the peak three months of visits at Everglades National Park occurred from January through March; at DeSoto, February through April; at Jean Lafitte, March through May; and at all the others, May through July (Figure 5-2). Over 80 percent of all Gulf site visits occurred at the two Gulf Islands National Seashore parks in Florida and Mississippi, and at Padre Island National Seashore in Texas. Figure 5-1 shows the distributions by state of monthly Gulf national park visits. Total visits for the region peaked during July at a level of 664.6 thousand in a high season extending from March through August. The lowest level of regional visits was recorded in December when the total dipped to 254.7 thousand.

State park attendance levels also displayed a varied pattern across the Gulf region (Tables 5-3 through 5-6). Texas parks attendance experienced considerable growth during the period with a net increase of 31 percent. Mississippi parks followed with a net increase of 22 percent. In contrast, Louisiana parks attendance fell 22 percent, while Florida visits, excluding newly opened Honeymoon Island, increased by only 1 percent. The differences among Gulf state visits may reflect regional impacts of the general economic recession. Texas, for instance, has been notable for consistently lower-than-average unemployment levels throughout the recession period and consistently shows higher recreational parks usage growth than the other four Gulf states.

Within each state there is substantial variability at specific park sites and in different seasons. These variations could be due to a range of factors including site improvements and expansions as well as the weather. The opening of Honeymoon Island in 1982, for example, increased Florida's visits at Gulf sites by over 67 percent.

5.2 Marine Accident Statistics

The U.S. Coast Guard conducts emergency search and rescue (SAR) missions throughout the Gulf region. The number of cases handled by the Coast Guard reflects the level of boating activity within the area. Data indicate a general decline in boating accidents for the region as a whole (Table 5-7). There were 4.7 percent fewer cases reported in 1982 than in 1980 in the Gulf of Mexico. The overall decline was dominated by an 11 percent decline for the Eastern Gulf region. Western Gulf cases rose 7.5 percent between 1980 and 1981 and declined 2.8 percent in 1981 to 1982. Once again, differences in the recession's impacts on the Eastern and Western Gulf states referred to in the previous section could be the major factor in explaining these variations.

5.3 Boating Registrations

Data on the number of boat registrations by state is presented in Table 5-8. Whereas the Western Gulf states of Texas and Louisiana experienced increases of 2.6 percent and 11.3 percent respectively from 1981 to 1982, the Eastern Gulf state of Florida had a decline of 5.6 percent in the same period. The growth rate of total Gulf state boat registrations declined from 4.3 percent between 1980 and 1981 to only 1.2 percent between 1981 and 1982.

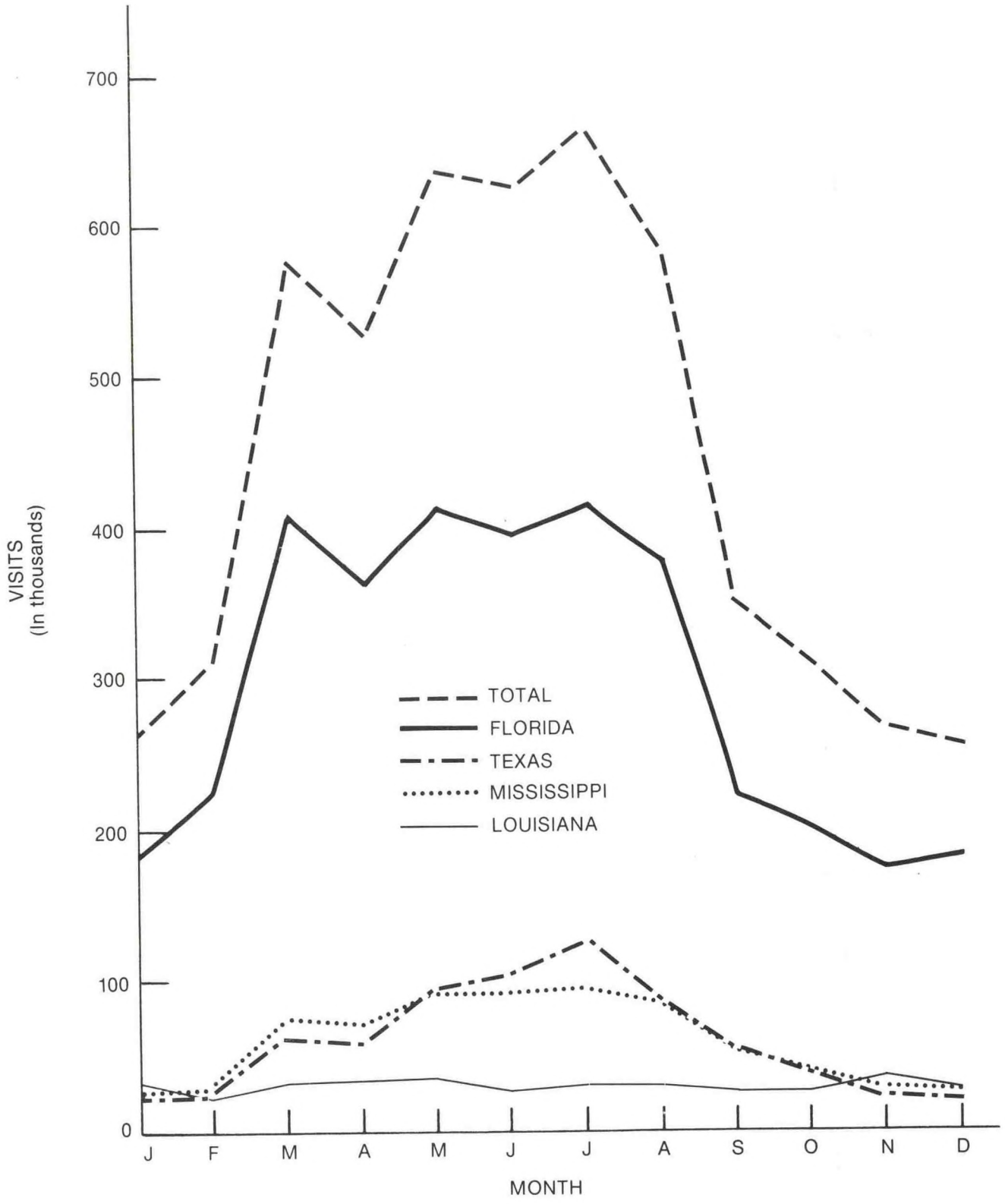


Figure 5-1. Monthly National Park Visits (in Thousands) Gulf Sites, 1982.

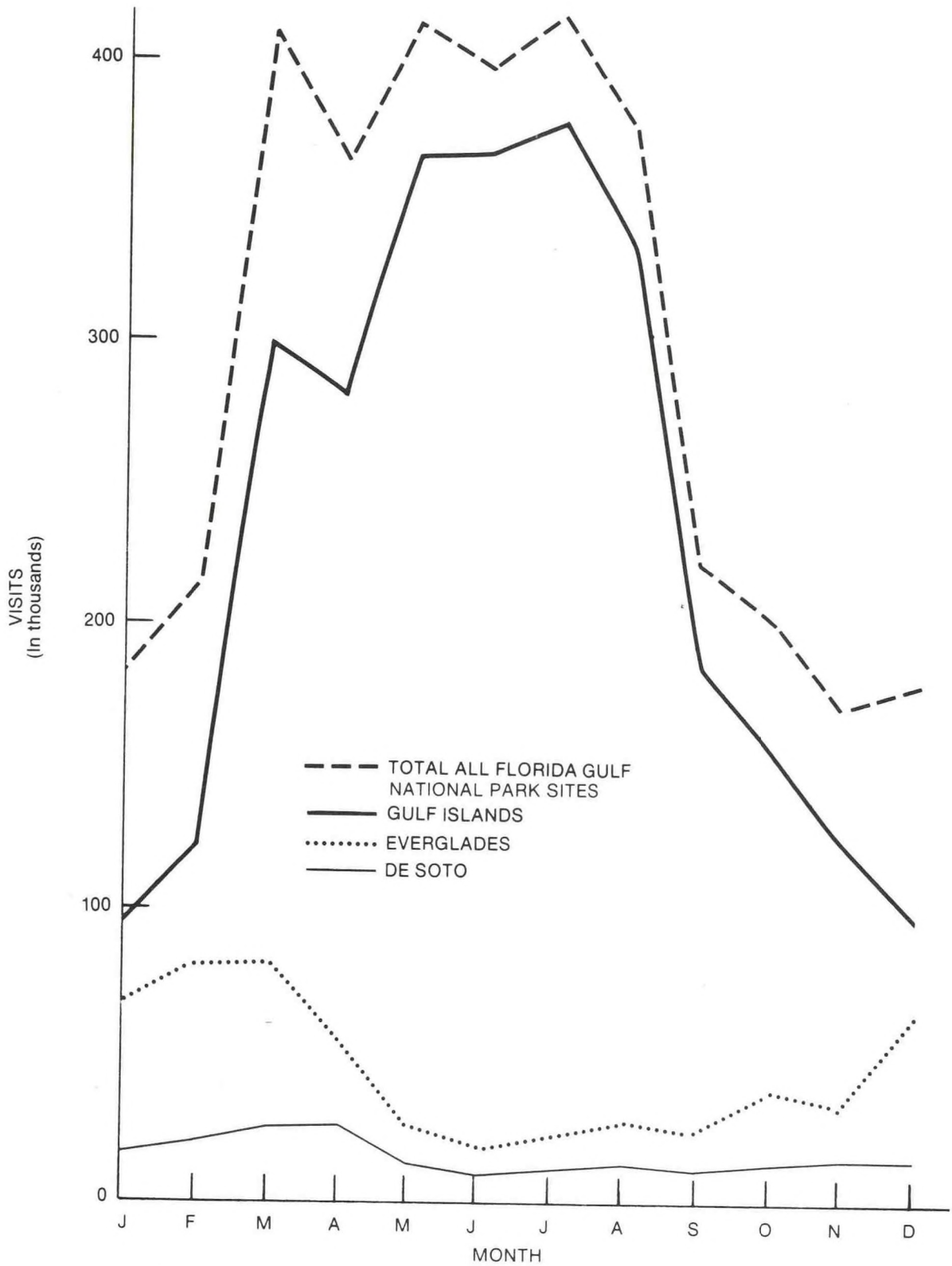


Figure 5-2. Monthly Florida (Gulf Coast) National Park Visits (in Thousands), 1982.

Table 5-2. Monthly National Park Visits (in Thousands), Gulf States Sites, 1982.[1]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FLORIDA	351.3	407.0	623.8	600.1	813.5	629.0	699.1	633.2	399.0	380.3	327.0	326.9
De Soto National Memorial	17.3	21.6	26.5	26.9	14.1	10.0	12.0	12.9	10.5	13.8	15.7	15.8
Everglades National Park	69.2	81.7	81.8	56.3	31.2	19.0	23.1	29.0	25.0	33.9	34.0	65.9
Fort Jefferson National Monument	.8	0	1.3	0	1.4	.7	.9	.8	.5	.6	.5	.6
Gulf Islands National Seashore	96.7	124.1	298.8	281.4	364.2	365.2	377.2	334.7	186.6	154.9	123.9	98.2
Total Florida Gulf	184.0	227.4	408.4	364.6	410.9	394.9	413.2	377.4	222.6	203.2	174.1	180.5
LOUISIANA	33.4	26.2	34.6	35.5	35.5	29.9	30.8	30.8	26.8	28.8	36.2	28.8
Jean Lafitte National Historic Park and Preserve	33.4	26.2	34.6	35.5	35.5	29.9	30.8	30.8	26.8	28.8	36.2	28.8
MISSISSIPPI	676.1	720.1	903.4	951.5	898.3	873.4	930.1	880.7	831.7	878.4	867.2	748.5
Gulf Islands National Seashore	24.2	31.0	74.7	70.4	91.0	91.3	94.3	83.7	46.7	38.7	31.0	24.6
TEXAS	168.7	203.5	367.3	533.2	573.0	558.4	781.4	558.7	318.1	305.4	234.5	145.9
Padre Island National Seashore	23.7	30.4	61.1	59.3	97.6	106.7	126.3	86.4	53.8	39.8	25.3	20.8
Total Gulf Sites	265.3	315.0	578.8	529.8	635.0	622.8	664.6	578.3	349.9	310.5	266.6	254.7

[1]No National Park Gulf Sites are located in Alabama.

SOURCE: Statistics Office, Denver Service Center, National Park Service.

Table 5-3. Florida (Gulf Coast)* State Park Visits (in Thousands), 1982.

	1980	1981	1982
Big Lagoon**	21.4	28.0	33.7
Calodesi Island**	112.7	142.4	132.5
Grayton Beach**	43.0	38.3	40.2
Honeymoon Island	-	-	957.1[2]
Rocky Bayou**	29.9	34.9	40.8
St. Andrews	559.5	549.3	553.6
St. George Island**	65.7	70.7	75.4
St. Joseph Peninsula**	95.9	88.9	91.6
Scherer, Oscar	108.3	102.2	90.9
Wiggins Pass	464.0	426.5	462.2
Total Florida Gulf	1500.4	1481.2	1520.9
			2478.0[1]

*For FY Ending June 30.

**Estimated Attendance (Based on Automobile Traffic or Seasonal Sample Counts).

[1]Including Honeymoon Island.
[2]Opening Year.

SOURCE: Florida Department of Natural Resources, Division of Recreation and Parks.

Table 5-4. Louisiana (Coastal Parishes) State Park Visits (in Thousands), 1982.

	1980	1981	1982
Cypremort Point	134.5	116.4	149.0
E.D. White	.2	1.6	1.3
Fairview-Riverside	358.0	206.7	275.2
Fontainebleau	384.5	197.6	210.4
Fort Pike	171.3	121.7	78.0
Grand Isle	305.4	403.7	225.8
Longfellow-Evangeline	506.3	367.6	335.9
Old Arsenal	59.4	64.4	67.5
Plaquemine Locks	-	-	.6
Port Hudson		not open	
Sam Houston Jones	365.8	403.9	386.0
St. Bernard	46.2	69.7	83.1
Total (All Louisiana State Parks)	4064.1	3535.1	3187.2
(Gulf Parks Only)	2331.6	1953.3	1812.8

SOURCE: State of Louisiana Office of State Parks, Department of Culture, Recreation, and Tourism

Table 5-5. Mississippi (Gulf Counties) State Park Visits (in Thousands), 1982.

	1980	1981	1982
Hancock County	409.7	515.1	509.0
Harrison County	155.1	161.2	178.2
Jackson County	NA[1]	NA	NA
Hancock and Harrison	564.8	676.3	688.1

[1]Not Available

SOURCE: Mississippi Department of Natural Resources

Table 5-6. Texas State Park (Parks Fronting Saltwater) Visits (in Thousands), 1982.

	1980	1981	1982
Bryan Beach	9.7	16.0	15.2
Copano Bay St. Park	92.5	84.3	52.2
Galveston Island	404.0	637.2	724.8
Goose Island	276.5	294.6	319.4
Mustang Island	309.0	357.5	764.3
Port Isabel	32.4	35.9	35.6
Port Lavaca Causeway	24.4	28.5	15.2
Queen Isabella Fish Pier	150.0	136.8	134.2
Sabine Pass Battleground	148.5	101.6	165.2
San Jacinto Battleground	1391.3	1439.0	1530.7
Sea Rim	203.8	218.6	227.9
Total (All Texas State Parks)	14086.8	14776.9	17035.2
(Gulf Parks Only)	3042.1	3350.0	3984.7

SOURCE: Texas Parks and Wildlife Department.

Table 5-7. Search and Rescue Operations, U.S. Coast Guard, Gulf of Mexico, 1980 to 1982.

	1980	1981	1982
Eastern Gulf of Mexico	5447	5123	4846
Western Gulf of Mexico	3751	4034	3920
Total Gulf	9198	9157	8766

SOURCE: U.S. Coast Guard.

Table 5-8. Boating Registrations (in Thousands), Gulf of Mexico States, 1980 to 1982.

	1980	1981	1982
ALABAMA	222.7	227.0	227.3
FLORIDA	497.9	512.6	483.7
LOUISIANA	283.4	300.0*	333.8
MISSISSIPPI	102.5	117.4	117.4
TEXAS	546.5	567.1	581.9
TOTAL GULF	1653.0	1724.1	1744.1
TOTAL U.S.	8577.9	8905.1	9074.0

*Estimate.

SOURCE: U.S. Coast Guard.

5.4 Recreational Fishing in the Gulf

The National Marine Fisheries Service conducted a comprehensive survey of marine recreational fishing in the Atlantic and Gulf regions in 1979. Table 5-9 lists estimated annual totals of fish caught by recreational fishermen by species and coastal Atlantic subregion. Over a third of the total combined catch, or more than 109 million fish were caught in the Gulf in 1979. Most frequently caught fish include catfish, seatrout, croaker, pinfish, mullet and snapper. No data are available for 1982.

Direct measures of recreational fishing activity levels are difficult to obtain. Surveys are one method used by various state, federal, university and private organizations. The results of the National Marine Fisheries Service study shown in Table 5-9 identify the various species caught by recreational fishermen in the Gulf and will be useful in future Gulf assessments. Probably the most feasible approach to assess climate impact on recreational fishing activities is to use a series of indirect indicators for a locality within the Gulf that has been identified as influenced by a climate event. These indirect indicators may include: fishing tournaments, boat launches, equipment sales data, observations of boating activity from oil platforms, and boating repair costs.

Table 5-9. Estimated Total Number (in Thousands) of Fish Caught by Marine Recreational Fisherman by Species Group and Subregion, Jan. 1979 - Dec. 1979.

SPECIES GROUP	NORTH ATLANTIC	MID-ATLANTIC	SOUTH ATLANTIC	GULF	ALL REGIONS
1. Barracudas	*	-	358	38	418
2. Basses, Sea	339	2,181	3,341	2,440	8,301
3. Bluefish	4,824	15,610	4,994	1,903	27,332
4. Blue Runner	*	*	802	496	1,298
5. Bonito, Atlantic	34	333	69	142	578
6. Catfishes, Sea	-	216	5,517	14,993	20,727
7. Catfishes, Freshwater	-	154	*	198	375
8. Cod, Atlantic	2,602	-	*	*	2,627
9. Croaker, Atlantic	*	1,719	3,778	11,008	16,505
10. Cunner	2,083	1,253	*	*	3,335
11. Dolphins	*	-	2,766	54	2,828
12. Drum, Black	*	-	415	2,245	2,665
13. Drum, Red	*	*	520	3,593	4,113
14. Drums	*	-	154	381	538
15. Eel, American	113	172	47	43	375
16. Flounder, Summer	571	12,653	988	1,882	16,095
17. Flounder, Winter	12,448	10,107	*	*	22,554
18. Flounders	523	350	-	427	1,315
19. Groupers	*	*	537	880	1,417
20. Grunt, White	*	*	970	2,902	3,873
21. Grunts	*	-	3,187	1,546	4,733
22. Hakes	62	322	-	*	393
23. Herring	800	240	2,927	2,142	6,109
24. Jack Crevalle	*	-	351	1,204	1,556
25. Jacks	*	51	852	907	1,810
26. Kingfishes	*	31	1,083	3,383	4,498
27. Ladyfish	*	*	105	761	865
28. Little Tunny	*	-	200	326	546
29. Mackerel, Atlantic	2,172	1,870	*	*	4,043
30. Mackerel, King	*	-	393	598	994
31. Mackerel, Spanish	*	*	917	1,292	2,209
32. Mackerels and Tunas	119	131	126	144	519
33. Mullets	*	-	3,198	5,205	8,414
34. Perch, Sand	*	*	190	1,643	1,834
35. Perch, Silver	*	-	271	1,622	1,906
36. Perch, White	143	5,284	67	*	5,494
37. Perch, Yellow	*	322	*	*	322
38. Pigfish	*	-	456	1,521	1,992
39. Pinfish	-	-	3,720	9,070	12,811
40. Pollock	2,277	270	*	*	2,547

Table 5-9 (Continued). Estimated Total Number (in Thousands) of Fish Caught by Marine Recreational Fisherman by Species Group and Subregion, Jan. 1979 - Dec. 1979

SPECIES GROUP	NORTH ATLANTIC	MID-ATLANTIC	SOUTH ATLANTIC	GULF	ALL REGIONS
41. Porgies	215	2,883	347	159	3,604
42. Puffers	-	90	160	167	409
43. Scup	4,851	3,004	-	-	7,601
44. Searobins	475	2,499	655	128	3,757
45. Seatrout, Sand	*	*	-	6,286	6,291
46. Seatrout, Silver	*	-	534	179	723
47. Seatrout, Spotted	*	410	1,511	13,506	15,426
48. Sharks	-	702	439	769	1,914
49. Sharks, Dogfish	156	601	54	80	892
50. Sheepshead	*	*	1,106	1,861	2,967
51. Skates and Rays	178	587	172	621	1,557
52. Smelts	644	*	*	*	644
53. Snapper, Gray	*	*	660	1,088	1,748
54. Snapper, Red	*	*	687	3,567	4,254
55. Snapper, Vermillion	*	*	153	358	511
56. Snappers	*	-	2,209	620	2,850
57. Spadefish, Atlantic	*	*	-	451	462
58. Spot	*	8,708	8,840	932	18,480
59. Striped Bass	185	948	47	-	1,181
60. Tautog	999	1,883	-	*	2,883
61. Toadfishes	-	815	295	202	1,313
62. Tomcod, Atlantic	833	-	*	*	849
63. Trigger and Filefishes	-	37	364	506	910
64. Weakfish	59	4,234	124	*	4,417
65. Windowpane	91	377	*	*	468
66. Other Fish	2,499	1,217	4,436	2,896	11,048
TOTALS	40,064	82,452	66,135	109,372	298,023

NOTE: An Asterisk (*) denotes none reported.

NOTE: A Hyphen (-) denotes less than thirty thousand reported. However, the figure is included in row and column totals.

SOURCE: Marine Recreational Fishery Statistics Survey, Atlantic and Gulf Coasts, 1979, National Marine Fisheries Service, DOC.

SECTION 6
TRANSPORTATION

The Gulf of Mexico is used heavily for transportation. Goods are moved by barges through the Intracoastal Waterway along the coast and through rivers in each Gulf state. U.S. Department of Interior studies show that grain and other products of the Mississippi Basin come down to the Gulf, while foreign goods and products from other parts of the country are moved back up the river and along the coast.

There are seven major ports in the Gulf of Mexico region based on U.S. Department of Commerce, Bureau of Census data. Houston and New Orleans, two of the largest ports in the U.S., ship large amounts of oil.

In addition to the intracoastal and international shipping in the Gulf of Mexico, the transportation sector also includes pipelines and related shore facilities such as refineries.

The Gulf of Mexico is among the most seriously polluted major bodies of water in the world. Oil pollution is strongly influenced by mean Gulf circulation patterns and is found to be heaviest in the eastern Gulf.

Most Gulf spills are small. U.S. Department of Interior studies show about 99 percent are less than 50 barrels and 85 percent are less than one barrel. Studies done over several years show that most of the volume of oil spilled is contributed by a few large spills, although major spills (1,000 barrels and over) are few in number.

6.1 Shipping and Related Shore Activity

Value and weight of imports and exports at seven major Gulf ports are listed in Tables 6-1 and 6-2.

Transportation levels in general are lower in 1982 than in 1981, probably reflecting general economic conditions.

6.2 Accidental Spills of Oil and Hazardous Substances

The total number of spills in the Gulf of Mexico during 1982 was 1547. The total volume was 522,729 gallons. Oil contributed 91.6 percent of the total number of Gulf spills and 88.9 percent of the total volume. Hazardous substances accounted for 0.5 percent of the total number and 0.2 percent of total volume. Other materials were 7.9 percent of the total number and 10.8 percent of the total volume. (Figures do not total exactly 100 percent due to rounding.)

Table 6-3 lists the total number and the total volume in gallons of all spills in the Gulf of Mexico during the period 1973 through 1982. The highest number of spills recorded was in 1976, and the highest volume was in 1975. Spills have declined in number and in volume over the five year period 1977-81.

Table 6-1. Foreign Export Waterborne Commerce, Leading Gulf of Mexico Seaports, Calendar Years 1981 and 1982.

SHORT TONS (Thousands)

Ports	1981	1982	Percent of Change
New Orleans, LA	38,850	28,850	-25.7
Houston, TX	23,266	25,909	+11.4
Baton Rouge, LA	14,368	14,986	+ 4.3
Tampa, FL	15,061	13,512	-10.3
Mobile, AL	11,069	11,969	+ 8.1
Galveston, TX	7,560	5,596	-26.0
Corpus Christi, TX	3,505	3,066	-12.5

DOLLAR VALUE (Millions)

Ports	1981	1982	Percent of Change
New Orleans, LA	10,562	7,793	-26.2
Houston, TX	13,063	13,358	+ 2.3
Baton Rouge, LA	2,505	2,345	- 6.4
Tampa, FL	1,640	1,179	-28.1
Mobile, AL	1,322	1,229	- 7.0
Galveston, TX	2,281	1,873	-17.9
Corpus Christi, TX	606	646	+ 6.6

SOURCE: Foreign Commerce Statistical Report 1982, Maryland Department of Transportation. Data from U.S. Department of Commerce, Bureau of the Census.

Table 6-2. Foreign Import Waterborne Commerce, Leading Gulf of Mexico Seaports, Calendar Years 1981 and 1982.

SHORT TONS (Thousands)

Ports	1981	1982	Percent of Change
Houston, TX	27,788	22,257	-19.9
New Orleans, LA	19,417	18,303	- 5.7
Corpus Christi, TX	18,506	15,716	-15.1
Baton Rouge, LA	16,394	8,207	-49.9
Mobile, AL	8,030	4,072	-49.3
Tampa, FL	4,093	3,450	-15.7
Galveston, TX	1,945	2,003	+ 3.0

DOLLAR VALUE (Millions)

Port	1981	1982	Percent of Change
Houston, TX	13,332	10,603	-20.5
New Orleans, LA	7,022	6,000	-14.6
Corpus Christi, TX	3,639	2,903	-20.2
Baton Rouge, LA	2,892	1,239	-57.2
Mobile, AL	734	554	-24.5
Tampa, FL	861	655	-23.9
Galveston, TX	674	997	+47.9

SOURCE: Foreign Commerce Statistical Report 1982, Maryland Department of Transportation. Data from U.S. Department of Commerce, Bureau of the Census.

Table 6-3. Total Number and Total Volume (Gallons) of All Spills in Gulf of Mexico, 1973 through 1982.

Year	Total Number of Spills	Total Volume of Spills
1973	4,419	3,715,619
1974	4,435	4,274,666
1975	4,113	4,368,466
1976	4,518	2,586,394
1977	4,492	3,382,495
1978	4,448	2,870,111
1979	4,067	2,689,299
1980	2,675	1,026,359
1981	1,842	388,502
1982	1,547	522,729

Preliminary data from U.S. Coast Guard Pollution Information Reporting System (PIRS) database.

Table 6-4 lists spills of oil, hazardous materials, and other substances by state in the northern Gulf of Mexico during 1982. Although the total number of spill incidents in 1982 declined, the total volume increased slightly. One contributing factor to the decline in number during 1982 was a slowdown in petroleum shipments. U.S. stocks of crude oil remained high through 1982. Louisiana had the largest number of spills of oil and other substances (1122). Mississippi had the smallest number and volume of spills with no indications of hazardous substances being spilled in the state for 1982.

Most of the spills in the Gulf of Mexico during 1982 occurred on the high seas, although total volume spilled was greatest within 3 miles of shore (Table 6-4). Gulf spills accounted for 18.9 percent of the total number and 2.6 percent of the total volume of all U.S. spills in 1982.

Table 6-4. Gulf of Mexico Spills of Oil, Hazardous Materials, and Other Substances by State and Water-Body; Number, Volume, and Percent of U.S. Total, 1982.

A. Spills by State

State	OIL				HAZARDOUS				OTHER				TOTAL			
	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent
Alabama	87	1.3	3592	0.0	4	1.6	6304	1.3	11	1.0	400	0.0	102	1.2	10296	0.1
Florida	323	4.7	239965	1.5	1	0.4	400	0.1	65	5.8	40371	1.1	389	4.7	280736	1.4
Louisiana	987	14.4	1441791	9.3	34	14.0	193196	38.4	101	9.1	164531	4.5	1122	13.7	1799518	9.1
Mississippi	40	0.6	24175	0.2	0	0.0	0	0.0	4	0.4	3	0.0	44	0.5	24178	0.1
Texas	513	7.5	456104	2.9	7	2.9	6148	1.2	92	8.3	29610	0.8	612	7.5	491862	2.5

B. Spills by Water-Body

Water-Body	OIL				HAZARDOUS				OTHER				TOTAL			
	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent	Spills	Percent	Volume	Percent
Open Internal Waters	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
River Channels	117	1.7	20039	0.1	1	0.4	420	0.1	11	1.0	6091	0.2	129	1.6	26550	0.1
Ports and Harbors	198	2.9	31706	0.2	5	2.1	728	0.1	33	3.0	25229	0.7	236	2.9	57663	0.3
Beaches	43	0.6	3130	0.0	0	0.0	0	0.0	10	0.9	23000	0.6	53	0.6	26130	0.1
Territorial Sea (Shore-3 MI)	288	4.2	316805	2.0	1	0.4	15	0.0	22	2.0	115	0.0	311	3.8	316935	1.6
Contiguous Zone (3-12 MI)	348	5.1	37524	0.2	0	0.0	0	0.0	22	2.0	2442	0.1	370	4.5	39966	0.2
High Seas (12 MI or More)	423	6.2	55474	0.4	0	0.0	0	0.0	25	2.2	11	0.0	448	5.5	55485	0.3
TOTAL	1417	20.7	464678	3.0	7	2.9	1163	0.2	123	11.1	56888	1.5	1547	18.9	522729	2.6

Preliminary data from U.S. Coast Guard Pollution Information Reporting System (PIRS) Database.
All volumes are in gallons. State and waterbody totals are not equal due to insufficient information on spills by waterbody.

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