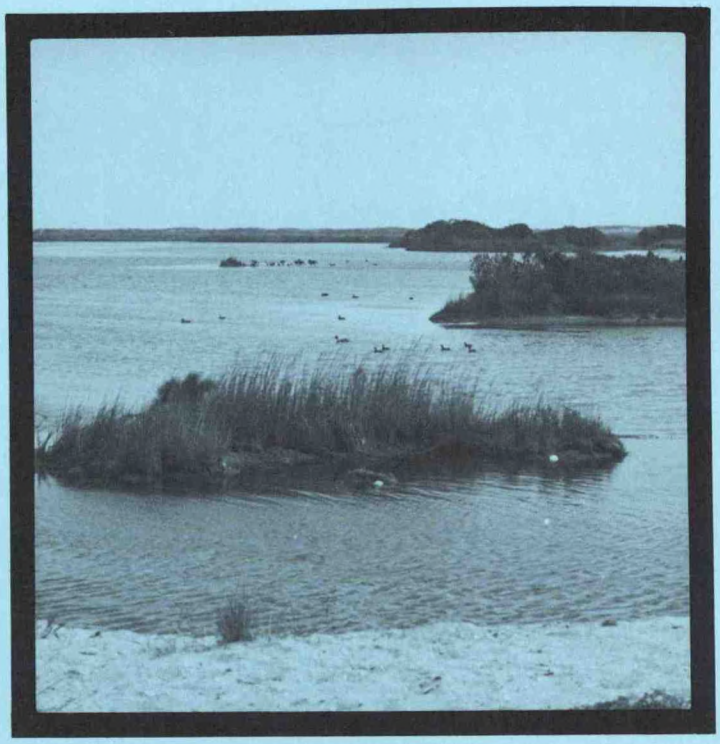
Marine Environmental Assessment

CHESAPEAKE BAY

MARCH - MAY 1983



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Assessment and Information Services Center

CLIMATE IMPACT ASSESSMENT
UNITED STATES

The name of the Center for Environmental Assessment Services (CEAS) has been changed to the Assessment and Information Services Center (AISC) because of NOAA reorganization and the consolidation of CEAS with the Environmental Science and Information Center.

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 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, N.W. Washington, D.C. 20235, or call (202) 634-7379.

Front Cover Photographs

Wave Damaged Coastline - Star News Photo by J. Nesbitt
Beach Scene - EPA Documerica - Hope Alexander
Salt Marsh - NOAA File Photo
Catch on Fishing Boat - NOAA Photo by M. Dowgiallo

June 1983

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CHESAPEAKE BAY MARINE ASSESSMENT

At present the Assessment and Information Services Center (AISC) limits marine assessment coverage to Chesapeake Bay. The marine ecosystem exhibits many complex interrelationships which are difficult to measure. Climatic events do not often produce an obvious immediate response in the marine environment. The extended intervals that frequently exist between a climate event and the observed impact present a problem different from the land oriented assessment AISC produces. This difference necessitates relating changes in climatic variables to marine environmental changes on a quarterly basis. For Chesapeake Bay, June through August covers the warm, relatively stable summer months; September through November covers the dynamic fall period of decreasing temperatures and water column turnover and vertical mixing; December through February covers the cold winter period; and March through May covers the dynamic spring period of increasing temperatures and nutrient enrichment.

The Assessment and Information Services Center effort in Chesapeake Bay is a first step toward providing operational marine assessments for major water bodies within and adjacent to the United States.

Table 1. Climate impact summary, Chesapeake Bay, March - May, 1983.

EVENT	IMPACT SECTOR: FISHERIES — Finfish harvest activities (General)	Shellfish harvest activities (General)	Oyster population (Impact of MSX)	Blue crab harvest	Soft clam population			RECREATION — Boating	Safety	State park usage			TRANSPORTATION — Port operations	Vessel traffic				
High precipitation								-	-	-			-					
Cool air temperature								-	-	-								
Cool water temperature				-				-	-									
High streamflow								-	-									
Lowered salinities			+		-													
Squalls								-	-									
Lightning								-	-									

[+] Favorable

[-] Unfavorable

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

Chesapeake Bay Marine Environment

1. Highlights - General Events and Impacts

Blue crab prices were abnormally high during the spring quarter due to fewer crabs surviving from the 1981 hatch; delayed normal seasonal activity of crabs due to cooler-than-normal water temperatures; a shortage of crab meat pasteurized in the fall of 1982; and fewer crabs harvested from southern states which normally supplement the Bay crab market in spring. Crab prices in Maryland reached $17.95 per pound of crab meat and $75.00 per bushel of live crabs.

Northern extents of softshell clam beds that had become established after periods of high salinities over the past several years were reduced to commercially unproductive levels by lowered salinities in spring 1983. Continued low salinities could destroy other viable beds farther south.

MSX disease in oysters is being monitored by agencies in Maryland. The effect of lowered salinities on the disease in spring 1983 is not yet clear. Because MSX appears to thrive in higher salinities, extended low salinities may provide unfavorable conditions for MSX.

The arrival of valuable finfish species such as bluefish and flounder was delayed by lower-than-normal water temperatures along the Virginia coast and Chesapeake Bay.

A low incidence of plankton blooms in Maryland coincided with high April precipitation, high streamflow, and lowered surface salinities. Low salinities may have delayed the arrival of stinging nettles which normally infest Bay waters in summer months.

Lightning struck and killed one person on a small boat on May 23 on the Severn River.

High streamflow in April made upper portions of rivers unsafe for recreational boating.

Intense squalls on April 17 disabled many small boats on the Potomac River and portions of middle Chesapeake Bay.

2. Weather and Oceanography Summary

Weather

Weather during the quarter was wet and cool. Precipitation over the area averaged 71 percent above normal for the quarter and temperatures averaged 0.4°F below normal for the three-month period despite a warmer-than-normal March. (Average +2.9°F above normal.)

March:

March precipitation and temperatures were above normal at the 11 stations in Figure 1. Temperatures ranged between 2.1°F and 3.8°F above normal, with the average departure for the 11 stations being 2.9°F above normal (Table 2). This continues the trend of warmer-than-normal temperatures beginning in November 1982. Highest temperatures were reached early in the month (62°F at Williamsport, 77°F at Baltimore and Royal Oak on the 4th), and lowest toward the end of the month (16°F at Williamsport on the 26th, 25°F at Baltimore on the 26th and 30th, and 27°F at Royal Oak on the 30th).

Except for Williamsport's 0.61 inches below normal for the month, station precipitation excess totals ranged from 0.65 inches at Wilkes-Barre to 3.49 inches at Aberdeen (Table 2). Table 2 suggests heaviest precipitation concentrated over the Bay region north of Norfolk. Five stations in the central part of the Bay region show precipitation totals of 6 inches or better. A record total of 9.76 inches for the month was recorded at the National Weather Service Baltimore City office, and over 9 inches was reported in the northeast corner of Maryland according to the State Climatologist. The month rated as the wettest March at Harrisburg as well.

Winds reaching 30 to 40 mph accompanied frontal storms from the 10th to the 13th and from the 21st to the 25th. Wind-raised tides reached 6 feet above wharf level at Royal Oak on March 19th, the highest since March 8, 1962. Tides driven by 44 mph winds in an intense coastal low March 25 - 26 reached 5 feet above mean low water at Norfolk, causing minor flooding and beach erosion.

Streamflow remained slightly below average at month's end despite abundant precipitation (Figure 2). Contributions from the Potomac and rivers south of the Potomac were high. However, below-normal rainfall in western Pennsylvania yielded little increase in the flow of the Susquehanna River.

April:

Persistent rain in April averaged 7.48 inches for the 11 stations in Figure 1, with departures from normal averaging 4.35 inches (Table 2). Wilkes-Barre, with 9.56 inches for the month, exceeded its normal by 6.55 inches, a new record for that station. Cooperative stations near Wilkes-Barre reported rainfalls for the month in excess of 11.5 inches, making the month one of the wettest on record in that part of Pennsylvania. A record 3.80 inches fell in 24 hours at Wilkes-Barre from a frontal storm along the Middle Atlantic coast the 15th and 16th. Aberdeen, Royal Oak, and Patuxent each exceeded their normals for the month by more than five inches, and all stations except Richmond exceeded normals by more than three inches (Table 2). April was the first month since June 1982 that precipitation has averaged above normal at Williamsport.

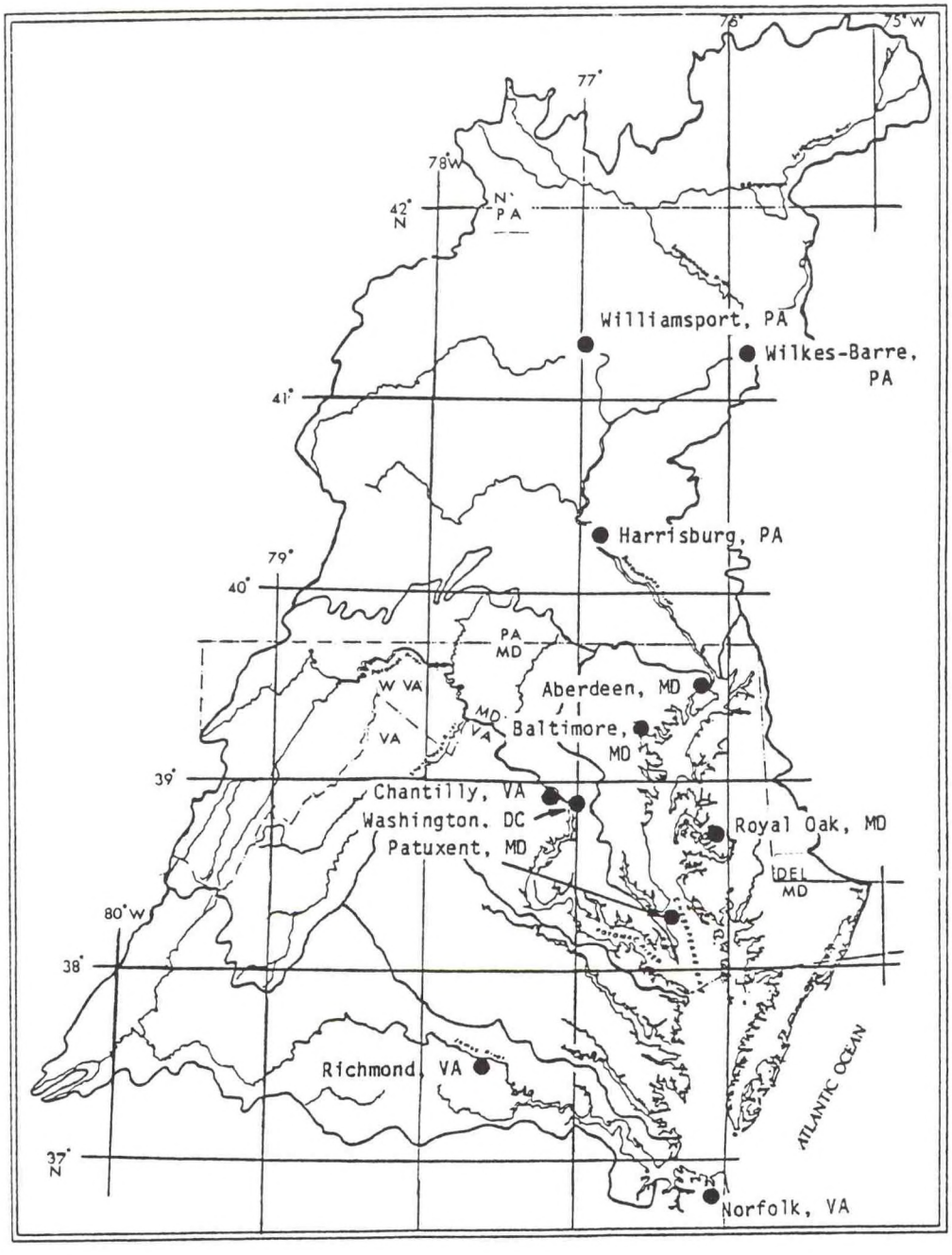

Figure 1. Selected meteorological stations, Chesapeake Bay watershed (Modified EPA map).

Table 2. Precipitation/temperature totals and anomalies, Chesapeake Bay watershed, March - May 1983.

Station	Total Precipitation (Inches) and Departure from Normal (Percent of Normal) Observed/*Anomaly			Air Temperature and Departure from Normal Observed/*Anomaly (Deg.F)		
	March	April	May	March	April	May
Williamsport, Pa.	3.05/-17%	7.03/+99%	4.51/+23%	41.0/+3.4	47.9/-1.7	56.3/-3.3
Wilkes-Barre, Pa.	3.28/+25%	9.56/+218%	3.28/+4%	38.8/+2.7	45.9/-2.4	55.7/-2.9
Harrisburg, Pa.	4.86/+39%	7.96/+150%	5.36/+46%	42.7/+2.1	49.3/-2.9	58.4/-3.6
Aberdeen, Md.	7.31/+91%	8.43/+156%	4.43/+18%	46.3/+3.8	51.1/-2.4	61.6/-1.7
Baltimore, Md.	6.80/+83%	6.55/+96%	5.47/+59%	45.4/+2.1	51.8/-2.2	61.5/-1.9
Washington, D.C.	4.84/+40%	6.88/+135%	4.62/+33%	48.8/+3.0	53.3/-3.4	64.9/-1.1
Chantilly, Va.	4.21/+23%	7.24/+131%	3.63/0%	46.0/+3.6	50.2/-3.1	59.5/-2.9
Royal Oak, Md.	7.46/+83%	9.02/+165%	6.35/+75%	47.8/+2.6	53.1/-2.7	63.9/-1.3
Patuxent, Md.	6.82/+101%	8.28/+196%	5.18/+40%	48.6/+3.1	53.7/-1.7	64.0/-0.5
Richmond, Va.	6.04/+69%	5.21/+80%	2.50/-30%	50.4/+3.2	56.1/-1.8	66.1/ 0.0
Norfolk, Va.	4.55/+18%	6.13/+114%	3.52/-6%	51.0/+2.5	55.7/-2.5	65.8/-0.6
Average	5.38/+51%	7.48/+139%	4.44/+24%	46.1/+2.9	51.6/-2.4	61.6/-1.8

*Anomaly = departure from 30-year average for each month.

Temperatures during April were uniformly cooler than normal ranging from 1.7°F below normal at Williamsport and Patuxent to 3.4 °F below normal at Washington, D.C.

The coastal storm on the 15th and 16th produced strong winds in the Bay area. Wind gusts of 45 mph were noted at Baltimore on the 16th and 17th. Wind speeds above 35 mph from the northwest occurred on the 19th and 20th, and the 24th and 25th at Baltimore.

Streamflow in April rose to a new record high for the month, a pronounced rise from its March value (Figure 2).

May:

May precipitation averaged well below that of April, yet nine of the 11 stations in Figure 1 exceeded normal monthly precipitation for May. Overall average departure was 0.86 (24%) inches above normal. Rain was absent at Royal Oak on only 4 days between May 15th and May 31st. Five thunderstorms occurred during the month at Royal Oak. A daily record of 1.91 inches fell at Washington, D.C. during a storm on May 16th.

May temperatures remained cool, averaging 1.8°F below normal for the 11 stations. Departures ranged from normal at Richmond to 3.6°F below normal at Harrisburg. Warmest temperatures occurred in the middle of the month: Royal Oak recorded a high of 88°F and Norfolk recorded 89°F on May 15th.

Oceanography

Salinities around the Bay responded to high streamflow for April and May and declined to normal or below normal values for the first time in nearly a year. Water temperatures for April and May were well below normal for most of the Bay.

Salinity:

Salinity in the beginning of the quarter was much higher than normal around the Bay. March anomalies ranged from 2.0 parts per thousand (ppt) above normal at Kiptopeke to 5.4 ppt above normal at Annapolis, except at the Bay Bridge Tunnel where the salinities were near normal (0.2 ppt above normal). Following the wet March and April in the region, salinity anomalies were reduced greatly in April and went below normal in May. Station anomalies in the Bay ranged from -2.1 ppt at Solomons to -3.0 ppt at Kiptopeke; however, the Bay Bridge Tunnel station again showed little effect from the runoff with a salinity in May exactly normal. The data suggest the southern half of the Bay mouth is dominated by a nearshore shelf water mass while the stations above the mouth of the Bay reflect the large runoff of the spring quarter.

Water temperature:

Water temperatures around the Bay began the quarter warmer than normal (Average 1.8°F above normal) in March, dropped below normal in April (Average 2.4°F below normal) and recovered slightly in May (Average 1.4°F below normal). The surface water temperatures appear to respond quickly to the air temperature regimes of stations in the Bay region.

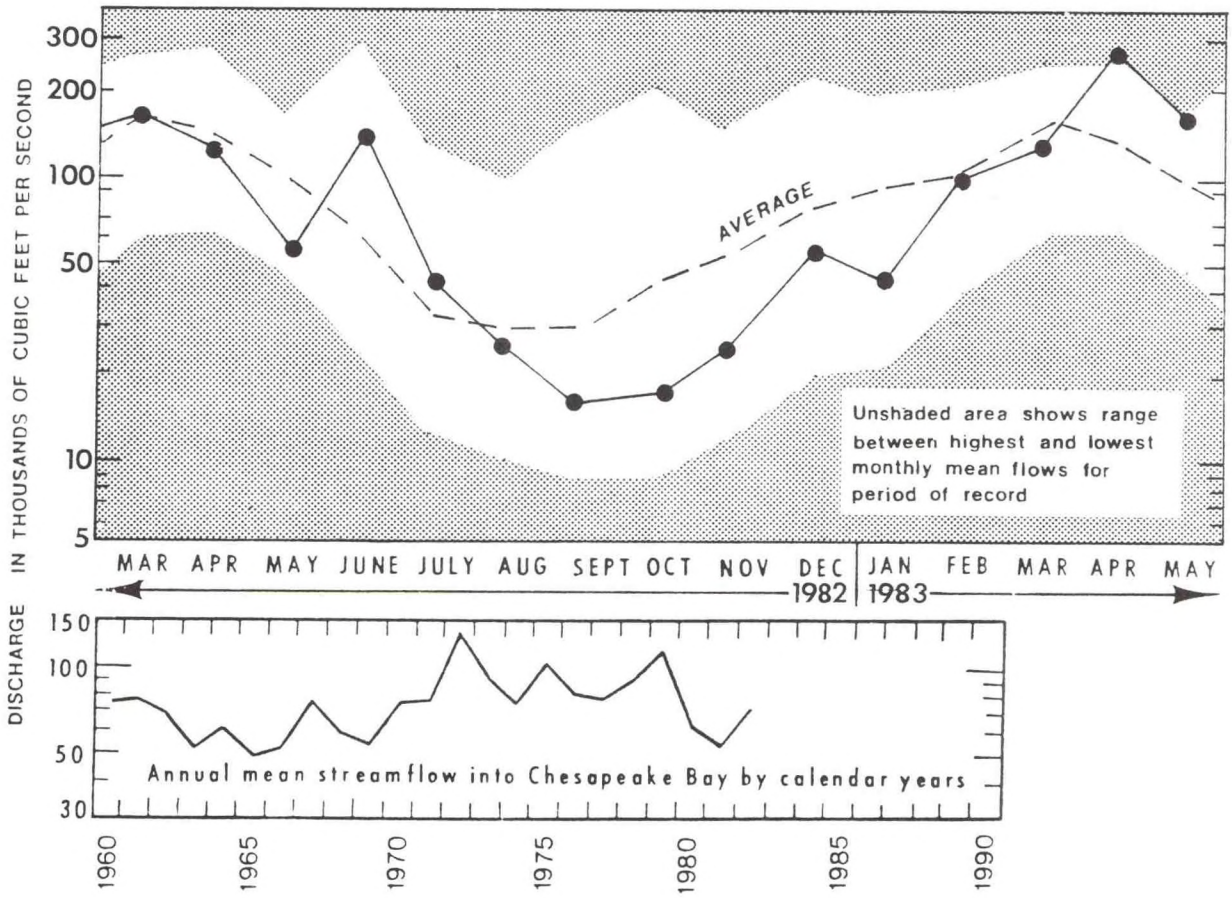

Figure 2. Monthly streamflow into Chesapeake Bay, March-May 1983, and annual mean flow 1960-82.

Streamflow is below normal in March and above normal in April and May. April flow of 264,000 cubic feet per second is the highest during the period of record 1951-80. May flow is the third highest value surpassed only in 1958 and 1978. Data from U.S. Geological Survey.

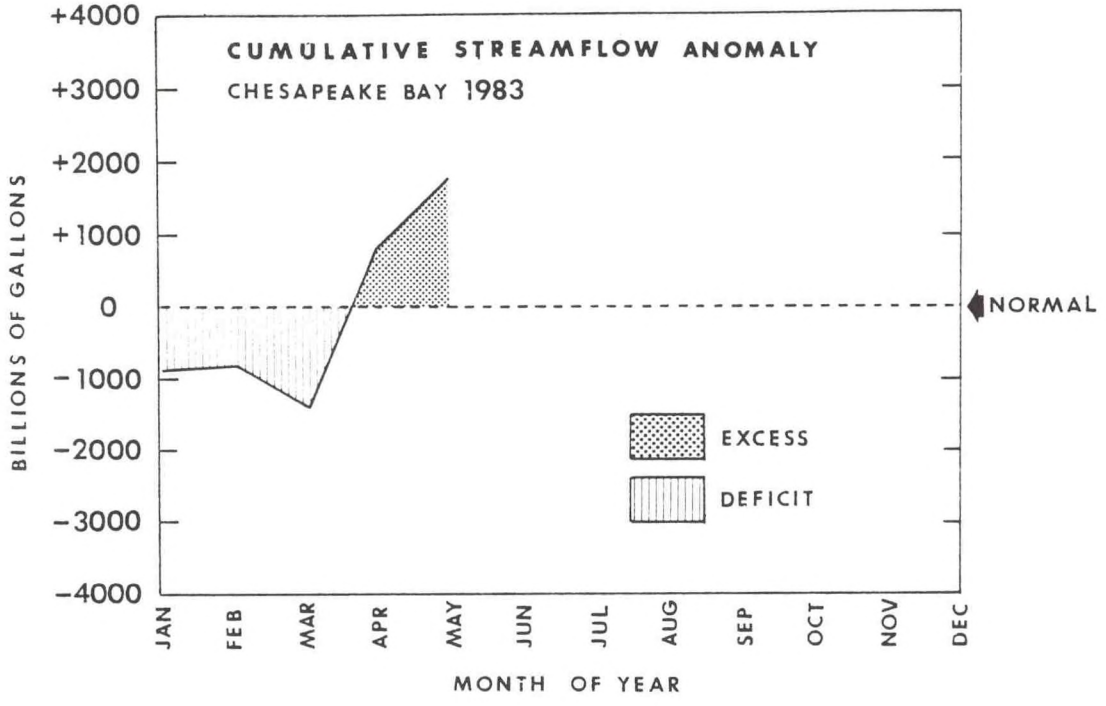

Figure 3. Cumulative monthly streamflow anomaly, Chesapeake Bay, 1983.

The cumulative streamflow anomaly (sum of negative and positive departures from normal) through March was a 1.54 trillion gallon deficit. Record high streamflow in April and above normal streamflow in May brought the cumulative total for the spring quarter to a 2 trillion gallon excess. Data from U.S. Geological Survey.

Table 3. Bay surface salinities and surface water temperatures, March - May 1983.

Station	Surface Salinity and Departure from Normal Observed/*Anomaly (ppt)			Surface Water Temperature and Departure from Normal Observed/*Anomaly (Deg. F)		
	March	April	May	March	April	May
Baltimore, Md.	11.3/+2.9	8.1/+1.9	3.5/-2.3	44.5/+1.9	51.0/-2.1	65.0/+0.8
Annapolis, Md.	15.0/+5.4	8.4/+1.2	5.1/-1.8	44.4/+1.8	49.5/-3.7	62.3/-2.5
Solomons, Md.	17.3/+4.2	12.8/+1.6	8.7/-2.1	43.5/+0.9	51.0/-1.5	62.7/-1.9
Kiptopeke, Va.	27.4/+2.0	22.6/-1.8	21.6/-3.0	46.1/+1.9	50.9/-2.2	61.9/-1.2
Bay Bridge-Tunnel, Va.	19.9/+0.2	20.5/+0.6	20.6/ 0.0	48.8/+1.9	52.6/-2.6	62.3/-3.4

*Anomaly = departure from long-term averages for each month.

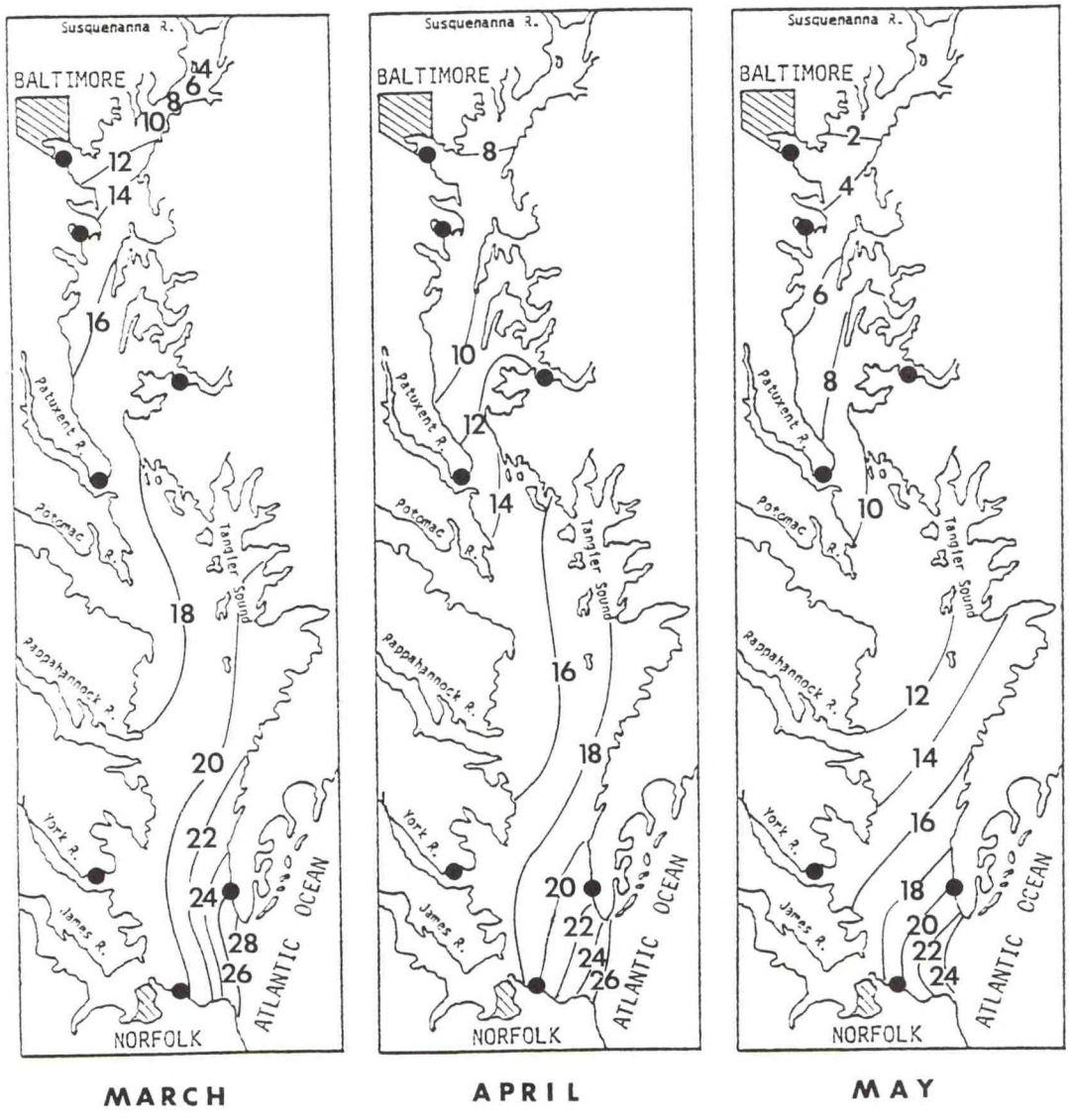

Figure 4. Mean surface salinity distribution, Chesapeake Bay, March-May, 1983.

Isohalines (parts per thousand) are linearly interpolated from designated station data. High streamflow in April and May diluted Bay waters, reducing salinities to their lowest values this year. Data from National Ocean Service, NOAA.

3. Impact of Climate/Weather on Bay Fisheries, Recreation and Transportation

Fisheries

Shellfish:

Blue crab prices were extremely high during the spring quarter. Wholesale and retail prices for live crabs and crabmeat remained high through the quarter. The effect of high prices was evident at retail markets where crabs were in short supply, and in restaurants, many of which added supplementary charges to crab meat. Several factors contributed to the high prices: an overall shortage of crabs due to smaller year class recruitment from the 1981 hatch; delayed normal seasonal activity of crabs due to cooler-than-normal water temperatures; a shortage of crab meat pasteurized in the fall of 1982; and a shortage of crabs from southern states which normally supplement Bay crabs in colder months.

Blue crabs from southern states normally supplement the Maryland market (primarily Baltimore) in early spring when Maryland crabs are unavailable or in low supply. North Carolina and Louisiana supply a large portion of the southern catch although blue crabs are also shipped to the Bay region from Florida and Texas. Blue crab prices from southern states appear to be highest in March and April when supply is normally low in the Chesapeake region. Gulf of Mexico blue crabs were in unusually low supply in spring 1983. March 1983 blue crab landings were down 56 percent in North Carolina and 24 percent in Louisiana compared to March 1982. Landings were also down in other southern states as much as 87 percent compared to March 1982. Preliminary Mississippi landings showed a drop in supply beginning in September 1982 and continuing into spring 1983. February 1983 landings of 8,900 pounds were well below the 13 year (1970-82) average of 68,000 pounds which indicates crabs to be in lowest supply that month. March 1983 Mississippi landings were 37,900 pounds compared to the 13 year average of 101,000 pounds. Preliminary landings data in South Carolina show March 1983 to be abnormally low, possibly the lowest on record. The 1973-82 March average blue crab catch in South Carolina is 384,000 pounds compared to only 96,000 pounds landed in March 1983. The lowest catch during the period of record 1973-82 is 136,000 pounds. Persistent rainfall, wind, and cold in southern states during the spring 1983 quarter interrupted normal blue crab harvest activities in those states and contributed to the abnormally low landings. High rainfall during the period is attributed to the effects of the Southern Oscillation episode of 1982-83 where anomalously warm Pacific Ocean surface waters affected weather events worldwide.

Blue crabs were in short supply throughout the quarter. Based on spot checks of market conditions, the last two weeks of March and the first two weeks of April in Maryland and the last week of May in Virginia appeared to be particularly hard hit. Highest recorded retail market prices were in Maryland at $75 per bushel of live crabs and $17.95 per pound of crab meat.

Virginia Institute of Marine Science blue crab sampling in the York, James, and Rappahannock Rivers indicates a good 1982 hatch which could result in a good peeler and soft crab market during summer 1983 and above average hard crab landings in August continuing into fall 1983 assuming relatively normal environmental conditions through the summer months.

According to the Maryland Department of Natural Resources, productive soft-shell clam beds north of a line drawn from Bodkin Point, Md., to Rock Hall, Md., were reduced to commercially unproductive levels by low salinities in spring 1983. Soft-shell clam beds had become re-established farther north during periods of high salinities in 1980 and 1981. Viable beds as far north as Sandy Point, Md., are susceptible to continued low salinities.

The Virginia Marine Resources Commission (VMRC) reports the Virginia public-ground (seed and market) oyster harvest to be down during the 1982-83 season (October 1 to March 31). Landings in March 1983 are down 43 percent from March 1982, primarily due to a 39 percent decrease in the amount of effort in harvesting. Effort is based on a count of tong boats or number of boats per day, expressed as "boat-days". VMRC data also show a 5 percent decline in catch per unit effort in March 1983 landings compared to March 1982. Disease-related mortality, sustained high levels of fishing pressure, and natural fluctuations in abundance may also be contributing to the decline in the oyster harvest.

Preliminary sampling by the National Marine Fisheries Service and Maryland Department of Natural Resources of MSX infested areas in Maryland indicate little or no change in prevalence of the disease in oysters beds previously shown to be infected during 1982 sampling. High freshwater inflow during spring 1983 greatly reduced surface salinities in areas of the Middle and Upper Bay (see section 2 - surface salinities). Low salinities may present a barrier to the spread of MSX; however, the effect of the abrupt lowering of salinities in April 1983 is unclear at present. Initial infection by MSX occurs around late June and requires about five weeks of exposure to be detected in oysters. Continued low salinities into summer and fall may provide unfavorable conditions for MSX disease.

Trawl surveys and other observations by the Virginia Institute of Marine Science indicate abundance of juvenile croaker in Virginia rivers is substantially higher than in recent spring seasons. The mild winter of 1982-83 provided favorable conditions for stocks of overwintering juvenile croaker.

Finfish:

According to the Virginia Institute of Marine Science, persistent winds during the spring quarter increased the seasonal drift of bottom water shoreward resulting in cooler water temperatures along the Virginia coast. Cool water delayed the arrival of finfish species such as bluefish and flounder along the coast and in Chesapeake Bay. Movement of certain finfish species is related to the northern extent of the 15°C isotherm which remained south of Chesapeake Bay later in spring 1983 than in most years.

High volume of Susquehanna River flow in the spring quarter prevented the Maryland Department of Natural Resources from conducting the shad sampling program.

Other:

Maryland Office of Environmental Programs reported high phytoplankton counts in March at Potomac River stations. March 1983 counts were 416 percent higher than the March 1982 average, and 93 percent higher than March 1981. Counts were highest at the Morgantown area of the Potomac River where a heavy

dinoflagellate bloom was evident constantly from January through March. April sampling showed low cell densities in the Morgantown area of the Potomac, coinciding with greatly reduced surface salinities.

Lowered salinities and cooler-than-normal water temperatures may delay the arrival of stinging nettles until later in early summer than in previous years.

Recreation

Levels of recreational activity were reduced in April due to frequent rainfall and cooler-than-normal air and water temperatures. High streamflow made upper portions of rivers unsafe for most boating activities in April.

Table 4 lists marine advisories and warnings issued by the National Weather Service for Chesapeake Bay during March - May 1983.

Intense squalls on April 17 capsized dozens of boats, injured at least 12 persons and damaged some sailboats. One person was reported missing. Winds gusted to 58 mph on the Potomac River before the line of squalls moved eastward across Chesapeake Bay. U.S. Coast Guard Group Baltimore handled 68 search and rescue (SAR) cases in April (Table 5). Thirteen of the 68 cases occurred on April 17 on the Potomac River and Chesapeake Bay. Group Eastern Shore caseload appeared normal with a total of 15 operations during the quarter. Search and rescue operations in the lower Bay totalled 264 for the quarter although most of the activity was concentrated in May. Abnormally wet weather during most of April kept activity relatively low. Intense boating activity in May resulted in a higher number of rescue operations. U.S. Coast Guard observers attribute many rescues to disabled powerboats which are particularly suceptible to difficulties in springtime after months of inactivity.

Table 6 lists Maryland marine accident statistics for the spring quarter. One fatality on May 23 on the Severn River occurred when lightning struck a boat operator at the helm of the boat.

Table 7 lists state parks attendance and revenue at six selected facilities around Chesapeake Bay. Attendance in May at Virginia facilities was reduced in part by continuous rainfall over Memorial Day weekend. Another contributing factor was some Virginia schools were in session on Memorial Day.

Attendance at Point Lookout State Park was near normal during the spring quarter despite rain and below normal temperatures. Spring attendance at Point Lookout is closely related to the start of the fishing season and attendance is usually high regardless of weather conditions.

State park usage levels around Chesapeake Bay appear to be minimally affected by inclement weather during the spring quarter. Specially scheduled activities and opening of the fishing season appear to have a greater effect on attendance than weather conditions.

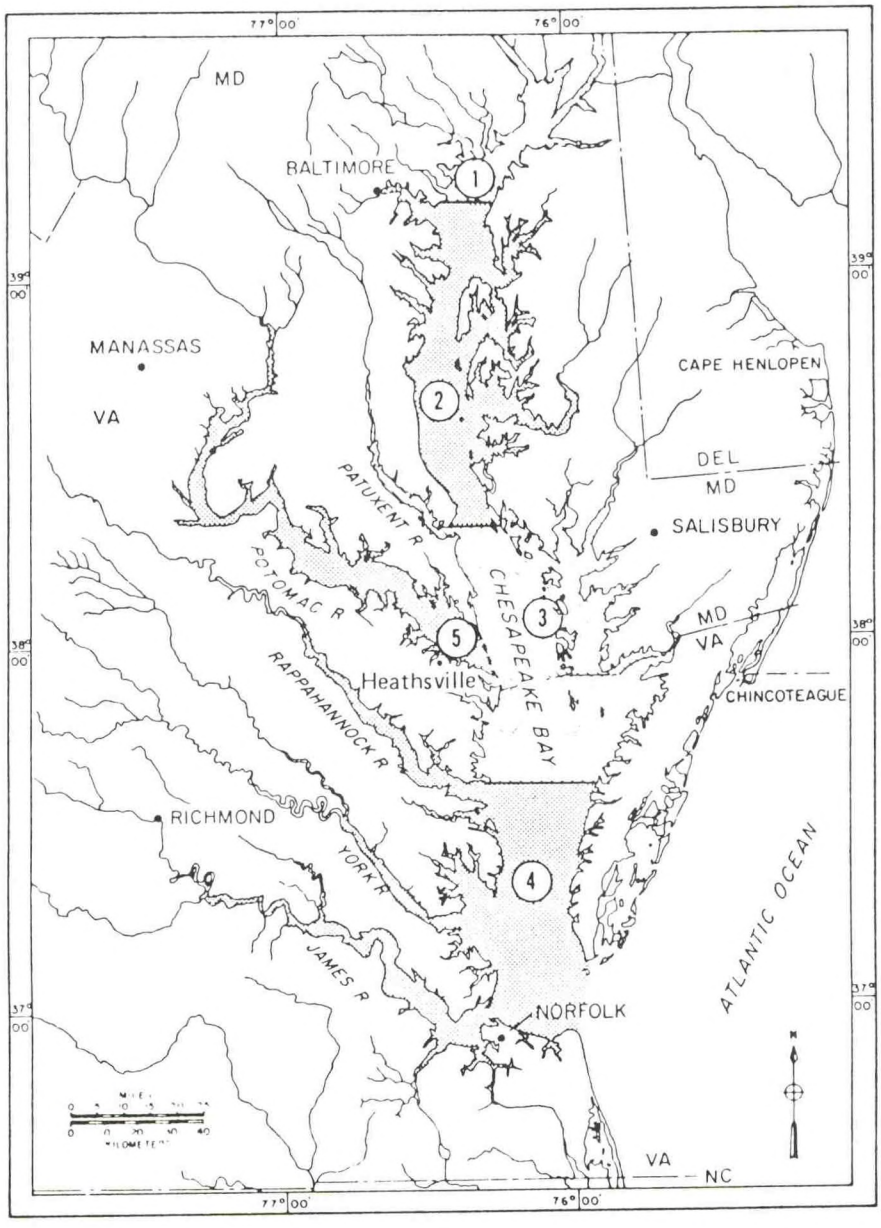

Figure 5. National Weather Service (NWS) forecast areas for Chesapeake Bay.

Key to forecast areas:

1 = North of Baltimore Harbor
2 = Baltimore Harbor to Patuxent River
3 = Patuxent River to Windmill Point
4 = South of Windmill Point
5 = Tidal Potomac River

Table 4. Marine advisories/warnings, Chesapeake Bay, March - May 1983 (National Weather Service data). For definition of areas see Figure 5.

Date	Condition Report[1]	Location
March 1	B	South of Windmill Point[2]
1	A	Baltimore Harbor to Windmill Point
1	A	South of Windmill Point
11	A	Entire Bay and Tidal Potomac River
12	B	Entire Bay and Tidal Potomac River
12	A	Chesapeake Bay and Tidal Potomac River
13	A	Chesapeake Bay, north of Patuxent River and Tidal Potomac River
16	A	South of Windmill Point
17	B	South of Windmill Point
18	A	South of Windmill Point
18	A	North of Windmill Point
21	A	Entire Bay and Tidal Potomac River
24	A	South of Windmill Point
24	A	North of Windmill Point and Tidal Potomac River
24	B	South of Windmill Point
27	A	Entire Bay and Tidal Potomac
28	A	Chesapeake Bay and Tidal Potomac River
April 1	A	Chesapeake Bay South of Windmill Point
2	A	North of Windmill Point and Tidal Potomac River
3	A	Entire Bay
14	A	Chesapeake Bay and Tidal Potomac River
15	A	North of Windmill Point and Tidal Potomac River
16	A	Entire Bay and Tidal Potomac River
18	A	Entire Bay and Tidal Potomac River
20	A	North of Windmill Point and Tidal Potomac River
20	A	South of Windmill Point
23	A	South of Patuxent River
23	A	South of Windmill Point
23	A	North of Patuxent River
24	B	South of Windmill Point
24	A	South of Windmill Point
26	A	Chesapeake Bay and Tidal Potomac River
30	A	Chesapeake Bay and Tidal Potomac River

[1]Key to Condition Reports:

A = Small Craft Advisory (Wind 25-34 knots)
B = Gale Warning (Wind 34-47 knots)
C = Storm (Wind 47-64 knots)
D = Special Marine Warning (Unusual weather phenomena)

[2]Windmill Point = North side of Rappahannock River

Table 4 (continued). Marine advisories/warnings, Chesapeake Bay, March - May 1983 (National Weather Service data). For definition of areas see Figure 5.

Date	Condition Report[1]	Location
May 2	A	Chesapeake Bay and Tidal Potomac River
4	A	Chesapeake Bay and Tidal Potomac River
9	A	Chesapeake Bay and Tidal Potomac River
10	A	Entire Bay and Tidal Potomac River
16	A	South of Patuxent River
16	A	North of Patuxent River and Tidal Potomac River
19	A	Chesapeake Bay and Tidal Potomac River
23	A	South of Patuxent River
30	A	Entire Bay and Tidal Potomac River

[1]Key to Condition Reports:

A = Small Craft Advisory (Wind 25-34 knots)
B = Gale Warning (Wind 34-47 knots)
C = Storm (Wind 47-64 knots)
D = Special Marine Warning (Unusual weather phenomena)

Table 5. U.S. Coast Guard Search and Rescue (SAR) caseload, March - May 1983.

Month	Number of Search and Rescues		
	Group Baltimore	Group Eastern Shore	Group Norfolk
March	18	4	36
April	68	2	72
May	132	9	156
TOTALS	218	15	264

Group Baltimore - most of Upper Bay
Group Eastern Shore - lower central portion of Eastern Shore
Group Norfolk - most of Lower Bay

Table 6. Maryland marine accident statistics, March - May 1983.

Month	No. of Boating Accidents	No. of Injuries	No. of Deaths	Property Damage
March	6	2	1	$ 5,950
April	9	0	1	26,325
May	21	4	7	72,828
TOTALS	36	6	9	$105,103

Data Source: Maryland Department of Natural Resources Marine Police. All categories are for recreational boating. Includes Potomac River to Virginia shoreline.

Table 7. State parks attendance and revenue, selected Maryland and Virginia facilities, March - May 1983.

Facility	Month					
	March		April		May	
Maryland	Attendance	Revenue	Attendance	Revenue	Attendance	Revenue
Sandy Point	16,031	$ 772	42,917	$ 596	57,361	$24,217
Point Lookout	7,025	839	6,971	532	28,057	3,610
Virginia						
Westmoreland	1,302	$ 290	2,203	$ 2,828	5,754	$ 5,010
Chippokes	2,900	0	4,285	20	4,829	432
York River	1,531	0	3,610	0	6,517	299
Seashore	22,956	1,094	89,431	9,848	83,740	27,279

Data from Maryland Department of Natural Resources, Forest and Park Services; and Virginia Department of Conservation and Economic Development, Division of State Parks. Revenue does not always reflect usage levels. Special scheduled activities, seasonal revenue changes, and equipment breakdown influence total revenue amounts.

Transportation

Operations at the ports of Baltimore and Hampton Roads were affected by frequent rainfall in April.

Rain delayed movement of general ship cargo (loose cargo) at Port of Hampton Roads, resulting in increased costs to shippers for rain pay to dock-workers and for vessel delays. Total cost incurred to shippers from rain delays can range up to $30,000 per day.

High winds at the Port of Baltimore shut down crane operations 12 times during the quarter. Total loss of productive time was 80 hours and 7 minutes. Table 8 summarizes crane shutdowns due to winds in excess of 40 mph during the spring 1983 quarter.

Table 8. Number of crane shutdowns and productive time lost due to wind at Port of Baltimore, March - May 1983.

Date	Number of Shutdowns	Productive Time lost (Hours:Minutes)
March 2	1	2:10
March 2	1	:41
March 12-13	1	30:41
March 21	1	:42
March 21	1	1:07
March 22	1	11:46
April 15	1	2:12
April 16	1	3:00
April 20	1	11:15
April 25	1	11:50
May 4	1	:35
May 26	1	4:08

Data from Maryland Port Administration.

High rainfall during the spring quarter resulted in delays in vessel loading and cargo handling at the Port of Baltimore. Loss of productive time due to rain during the spring 1983 quarter was greater than the comparable 1982 quarter.

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