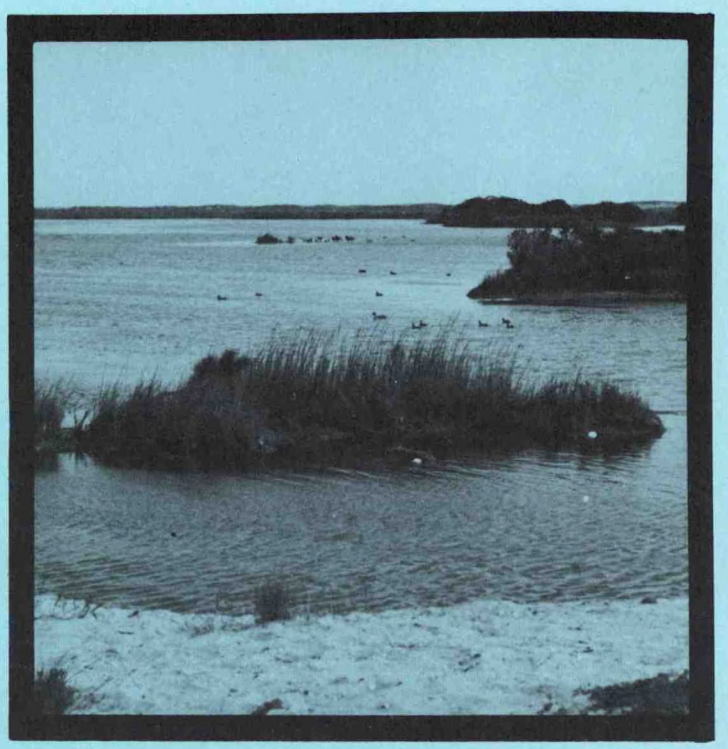
Marine Environmental Assessment

CHESAPEAKE BAY
MARCH - MAY 1984



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Assessment and Information Services Center

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 within existing resource limitations.

Please send any comments or subscription queries 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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MARCH–MAY 1984

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Marine Environmental Assessment Division

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CHESAPEAKE BAY MARINE ASSESSMENT

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 1984.

	FISHERIES							RECREATION					TRANSPORTATION					
EVENT	Finfish harvest activities (General)	Shellfish harvest activities (General)	Oyster population	Blue crab harvest	Stinging nettles			Marina (Structural)	Boating	State park usage	Safety		Port operations	Vessel traffic				
High rainfall			-						-	-								
High streamflow			-															
Low salinities			-	-	-													
Low water temperatures				-	-													
Low air temperatures				-					-	-								
High winds (March storm)								-										

[+] Favorable

[-] Unfavorable

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

Chesapeake Bay Marine Environment

1. Highlights - General Events and Impacts

Lower-than-normal water temperatures delayed blue crab catches during the spring quarter, reducing availability to consumers and increasing prices, though prices were lower than the record high prices in spring 1983. Cool water temperatures also delayed the summer arrival of stinging nettles. Nettles should be present in lower numbers than normal in summer 1984.

Heavy rainfall in March and April greatly reduced salinities Bay-wide, reducing the range of suitable conditions for oysters in upper portions of Bay tributaries and the Upper Bay. Higher-than-average oyster mortalities occurred in the James River in Virginia following the heavy freshwater influx during March and April.

Marine recreation on Chesapeake Bay showed the normal pattern of low activity early in the quarter, followed by increased activity with seasonal warming temperatures. State park usage and boating activity were reduced during periods of high rainfall and cooler-than-normal temperatures.

High winds associated with a severe March storm caused some structural damage to a marina in the Upper Bay area.

2. Weather and Oceanography Summary

Weather

The 1984 spring quarter was predominantly wetter and cooler than normal springs. The wettest station over the quarter was Patuxent, Md., and the driest was Williamsport, Pa., reflecting the track of precipitation centers of storms passing through the middle Bay region. Temperatures and departures from normals showed strictly geographic patterns with southern stations being both warmer and closer to normal than northern stations.

March:

March 1984 weather was dominated by numerous cyclonic systems striking Chesapeake Bay region. Precipitation was well above normal (+64%) and temperatures well below normal (-4.7°F) for the region. A strong storm near the end of March brought over a foot of snow in Pennsylvania and 70 mph winds damaged boats, homes, and trees in the northern end of the Chesapeake Bay.

At the beginning of the month a very large storm exited the area, giving rain and some snow to the region. Winds were gusty from the northwest and on the 2nd a weak cold front brought light snow to northern Pennsylvania. A large high pressure cell covered the area on the 3rd and the 4th.

Cold frontal systems moved through the area on the 5-6th and 8-9th depositing moderate amounts of rainfall in the region. By the morning of the 9th the one inch snowfall line was east to west across northern Virginia. Between the 5th and the 9th Richmond received 1.5 inches of rain.

High pressure and strong winds followed a cold front on the 9th and dominated the weather for the next two days. On the 11th another cold front preceded a mass of cold air which brought lowest temperatures of the month to many of the stations. In the trailing end of this cold front in the Gulf of Mexico, a low developed which deepened and brought glaze ice and heavy precipitation to the Bay area on the 13th and 14th. Temperatures rose throughout the area on the 16th due to southerly flow preceding another cold front on the 17th.

A new storm developed out of the Gulf region on the 20th, bringing moderate amounts of precipitation and temperatures in the 60's. As the storm receded on the 22nd high pressure covered the area. On the 25th a low pressure system from the Gulf of Mexico moved northeastward into the Bay region, spreading heavy rain for two days. Richmond received 2.60 inches over the 25th and the 26th. Still another system from the Gulf Coast deepened and moved through the area over the 28th and 29th, bringing heavy rains (2 inches or more) throughout the area and 70 mph winds to communities at the north end of the Bay, causing damage to boats and facilities. Snow accumulated over 16 inches in parts of eastern Pennsylvania on the 29th and 30th.

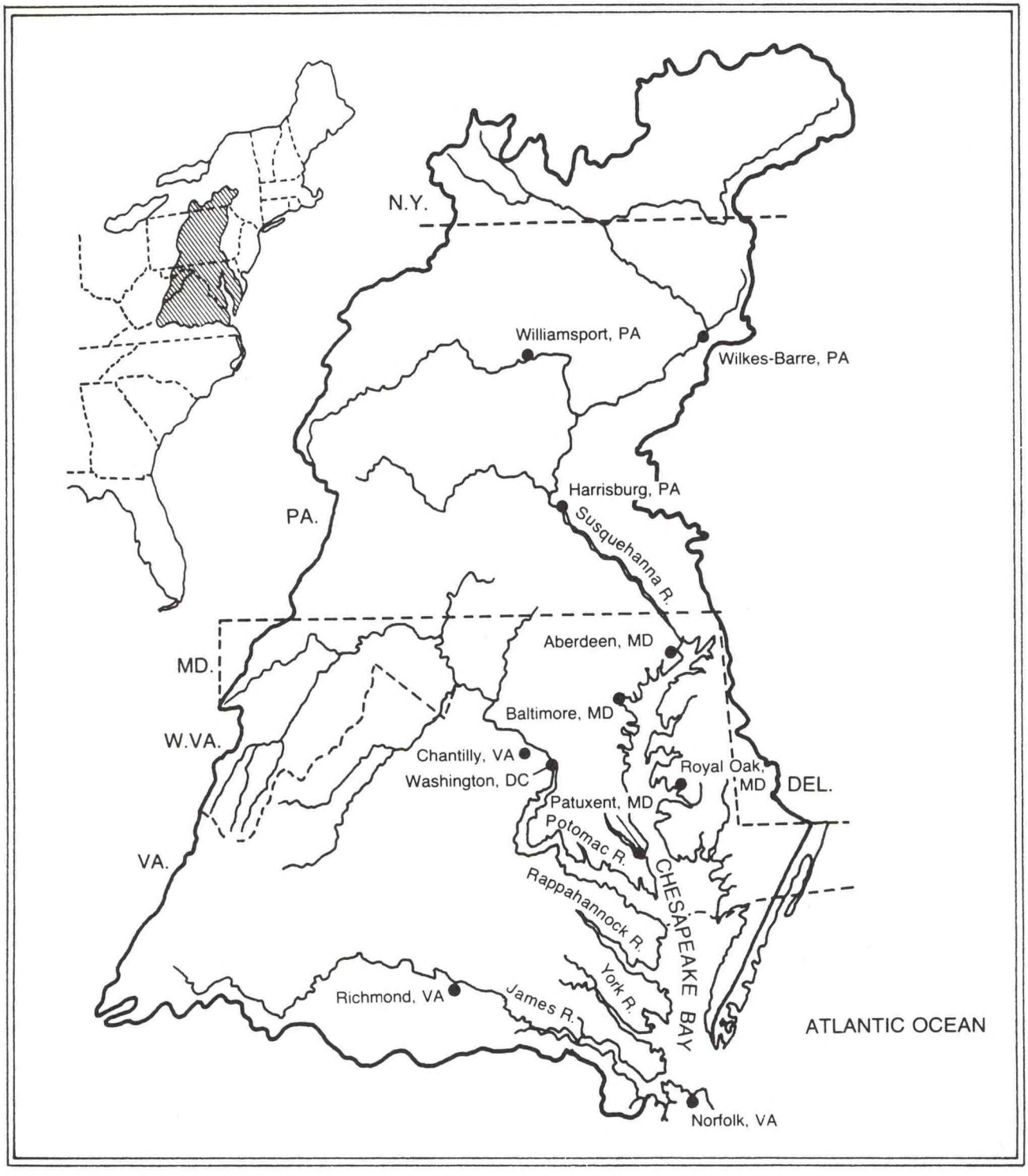


Figure 1. Selected meteorological stations, Chesapeake Bay watershed (Modified EPA map).

Table 2. Total precipitation, mean air temperatures, and departures from normal for 11 stations, Chesapeake Bay watershed, March - May 1984.

Station	Total Precipitation (Inches) and Departure from Normal (Percent of Normal) Observed/*Anomaly			Mean Air Temperature and Departure from Normal Observed/*Anomaly (Deg.F)		
	March	April	May	March	April	May
Williamsport, Pa.	3.63/-1%	4.56/-30%	4.89/+34%	30.4/-7.2	47.4/-2.2	55.9/-3.7
Wilkes-Barre, Pa.	2.42/-8%	4.09/+36%	6.70/+112%	30.9/-5.2	48.3/ 0.0	57.5/-1.1
Harrisburg, Pa.	5.36/+53%	4.46/+40%	6.20/+69%	33.7/-6.9	48.0/-4.2	58.2/-3.8
Aberdeen, Md.	3.94/+3%	3.63/+10%	5.40/+44%	39.3/-3.2	53.9/+0.4	61.6/-1.7
Baltimore, Md.	5.79/+56%	2.95/-12%	4.29/+25%	38.2/-5.1	51.5/-2.5	61.3/-2.1
Washington, D.C.	6.14/+77%	3.71/+27%	3.80/+9%	41.8/-4.0	54.9/-1.8	64.9/-1.1
Chantilly, Va.	5.81/+69%	5.01/+60%	4.23/+17%	37.5/-4.9	50.9/-2.4	59.8/-2.6
Royal Oak, Md.	7.34/+80%	4.40/+29%	7.43/+105%	41.2/-4.0	53.7/-2.1	64.6/-0.6
Patuxent, Md.	10.07/+196%	4.76/+70%	10.99/+198%	41.8/-4.2	53.9/-1.1	64.5/-0.5
Richmond, Va.	8.65/+142%	5.92/+104%	4.52/+27%	43.6/-3.6	55.8/-2.1	65.4/-0.7
Norfolk, Va.	5.09/+32%	7.25/+153%	6.23/+66%	45.4/-3.1	55.6/-2.6	67.8/+1.4
Average	5.84/+64%	4.61/+47%	5.88/+64%	38.5/-4.7	52.2/-1.9	62.0/-1.7

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

Precipitation, part of it snow, ranged from 2.42 inches at Wilkes-Barre, Pa. (8 percent below normal) to 10.07 inches at Patuxent, Md. (196 percent above normal) among the eleven stations in the Chesapeake Bay region (Figure 1 and Table 2). Williamsport and Wilkes-Barre received slightly less-than-normal amounts of precipitation for the month, but both had extensive snow from the storm of March 28th and 29th. Most of the stations were more than 50 percent above normal in precipitation with greatest concentration of excess precipitation in the middle Bay area (Table 2). For the region, the eleven stations averaged 5.84 inches of precipitation, 64 percent above the normal for the month (Table 2). Frontal storms on the 5th to 9th, 13th to 14th, 21st, 25th and 26th brought most of the precipitation during the month.

Temperatures averaged 4.7 degrees below normal for the eleven stations during March, ranging from 3.1 degrees below normal at Norfolk, Va., to 7.2 degrees below normal at Williamsport, Pa. (Table 2). Williamsport and Harrisburg, Pa. experienced their second coldest March on record (March 1960 was colder). Lowest temperatures of the month for most stations occurred on the morning of the 10th, when a large mass of cold air pushed southeastward behind a cold front. High temperatures for the month occurred in the southerly flow of the 16th.

Winds were strong, frequently gusting 30 to 35 mph generally associated with cold fronts or low pressure systems. Winds up to 40 mph blew from the southwest from the 21st to 23rd. Strongest winds during the month were from the northeast (gusts to 48 mph at Baltimore) on the 28th and 29th accompanying a powerful storm, causing damage to boats and a marina on the Northeast River and felling numerous trees near the Sassafras and Chester Rivers. Unofficial readings in the north end of the Bay clocked winds in the storm at 70 mph.

April:

April weather was again predominantly cyclonic activity on a regional scale but with slightly fewer storms than March. Precipitation was still well above seasonal norms (+47%) but temperatures were down to normal (-1.9°F) compared to March.

High pressure dominated the first three days of April until a deep storm system on the 4th through 6th brought moderate to heavy rains to the area and wind gusts to 38 mph at Royal Oak, Md. Temperatures fell from the high 60's on the 6th to the low 30's on the 10th as cool air masses pushed southward out of Canada into the area.

Temperatures returned to the high 60's on the 12th and 13th, preceding a rainy period extending from the 13th through the 20th. A large storm on the 16-17th brought rainfall between 0.75 and 1.25 inches to stations in the area and temperatures in the 60's. A high pressure system on the 20th brought clear weather for a few days, but a new storm on the 22nd brought rainfalls of nearly an inch in some locations between the 22nd and 24th.

Northwesterly winds, gusting to 31 mph at Royal Oak on the 25th, accompanied high pressure covering the area from the 26th to the 28th. Temperatures climbed into the high 70's on the 26th and 27th. A warm front -- cold front system

moved eastward through the region on the 28th-29th and a frontal storm system developed late on the 29th and 30th bringing renewed light rain to the area.

Precipitation during April for the eleven Bay stations ranged from 2.95 inches (12 percent below normal) at Baltimore to 7.25 inches (153 percent above normal) at Norfolk (Table 2). The area average of 4.61 inches was 47 percent above normal for the month. The larger excesses of precipitation for the month were concentrated in the southern portion of the region. Both Richmond and Norfolk received more than twice their normal April precipitation. Williamsport experienced a different regime being 30% below normal for the month. Rain fell on 16 days during the month in the mid and upper Bay areas with principal amounts occurring over the 4-5, 15-16, and 22-23 April.

Monthly average temperatures among the eleven stations ranged from 47.4 degrees (2.2 degrees below normal) at Williamsport to 55.8 degrees (2.1 degrees below normal) at Richmond (Table 2). Departures from normal temperature ranged from 4.2 degrees below normal at Harrisburg to normal at Wilkes-Barre. Lowest temperatures for most stations occurred at the beginning of the month, although Norfolk recorded its lowest temperature for the month on the 11th. Highest temperatures for most stations occurred late in the month on the 26th, 27th, or 30th.

Winds during April were not as strong as during March. Royal Oak had wind gusts to 38 mph from the south on the 5th and 6th and gusts to 31 mph from the northwest on the 25th. Patuxent recorded peak wind speeds of 30, 32, and 35 mph on the 4th, 5th, and 25th, respectively. These are the only readings in excess of 30 mph recorded during the month.

May:

May weather records are dominated by three storms, two storms early in the month and a major storm at the end of the month. Precipitation totals were well above normal (+64%) for the fourth successive month. Temperatures averaged two degrees below normal. A tornado caused minor damage in Kent County on the eighth.

The frontal storm at the end of April stayed in the region long enough to welcome May. Precipitation amounts were generally light, though Aberdeen received 0.66 inches on the 1st. A second storm over the 3rd and 4th brought larger amounts of precipitation (1.42 inches at Aberdeen). A warm front on the 6th and 7th preceded a major storm which brought damaging winds to some areas along the eastern side of the Bay on the 8th-10th. Rainfall totalled nearly one inch over the region for the three days. Temperatures reached the 80's due to southerly flow on the 8th.

Northwesterly winds and high pressure followed on the 10th and 11th, and a cold front on the 12th brought only small amounts of rain. High pressure fair weather dominated the area until the 19th when a warm front brought a tenth of an inch of rain to many stations. The warm front remained stationary over the area until the appearance of a cold front on the 23rd and 24th bringing fair weather again. On the 29th and 30th a sizeable storm developed bringing very heavy rains to the area (Royal Oak, 3.33 inches).

Monthly precipitation totals at all eleven stations of Figure 1 were above average during May (Table 2). Individual monthly totals ranged from 3.80 inches (+9%) at Washington, DC to 10.99 inches (+198% Patuxent, Md.). The regional average of 5.88 inches (+64%) nearly duplicated the value for March. Wilkes-Barre, Pa., Royal Oak, Md., and Patuxent experienced more than twice normal precipitation. Thunderstorms, prevalent toward the end of the month, produced some very heavy rainfalls within the region: Harrisburg had a record 1.85 inches on the 29th, Patuxent received 4.31 inches on the 29th, and Royal Oak received 3.33 inches on the 30th.

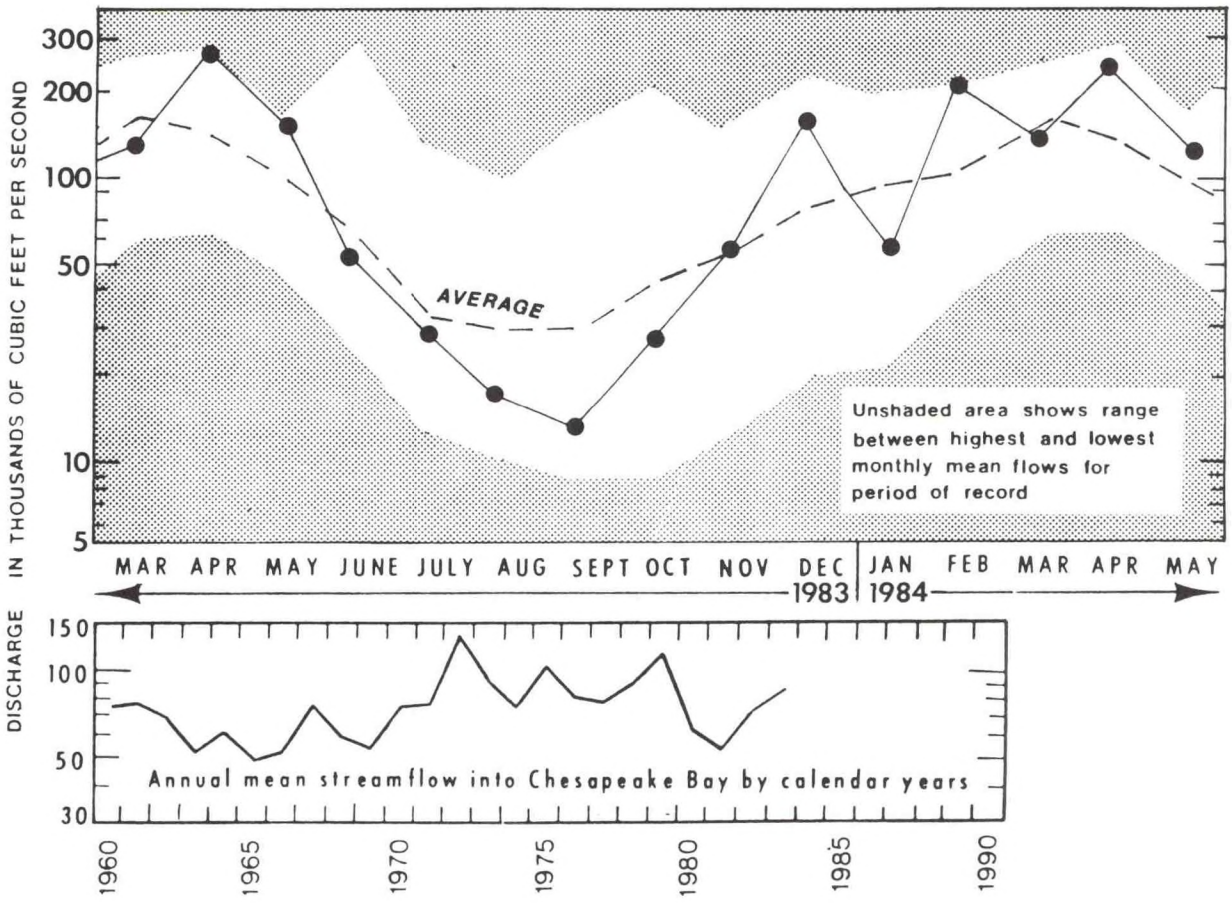
Monthly average temperatures ranged between 55.9 degrees (3.7 degrees below normal) at Williamsport, Pa. and 67.8 degrees (1.4 degrees above normal) at Norfolk, Va. (Table 2). Average temperature for the eleven stations was 62.0 degrees, 1.7 degrees below the average of their normals. The northern stations of Harrisburg (-3.8°F) and Williamsport (-3.7°F) were further below normal than the rest of the region. Only Norfolk averaged higher-than-normal temperatures for the month. Lowest temperatures for the month occurred around the 17th, while highest temperatures for the month fell around the 22nd.

Peak wind speed reached 53 mph at Patuxent and 42 mph at Royal Oak on the 8th as a vigorous cold front pushed through the region, producing thunderstorms throughout the area and spawning an apparent tornado, which caused minor damage, in Kent County, Md. Winds gusted to 37 mph in a frontal thunderstorm at Patuxent on the 4th, and later in the month, on the 23rd, winds gusted to 31 mph at Patuxent as a cold front moved east through the area.

Streamflow

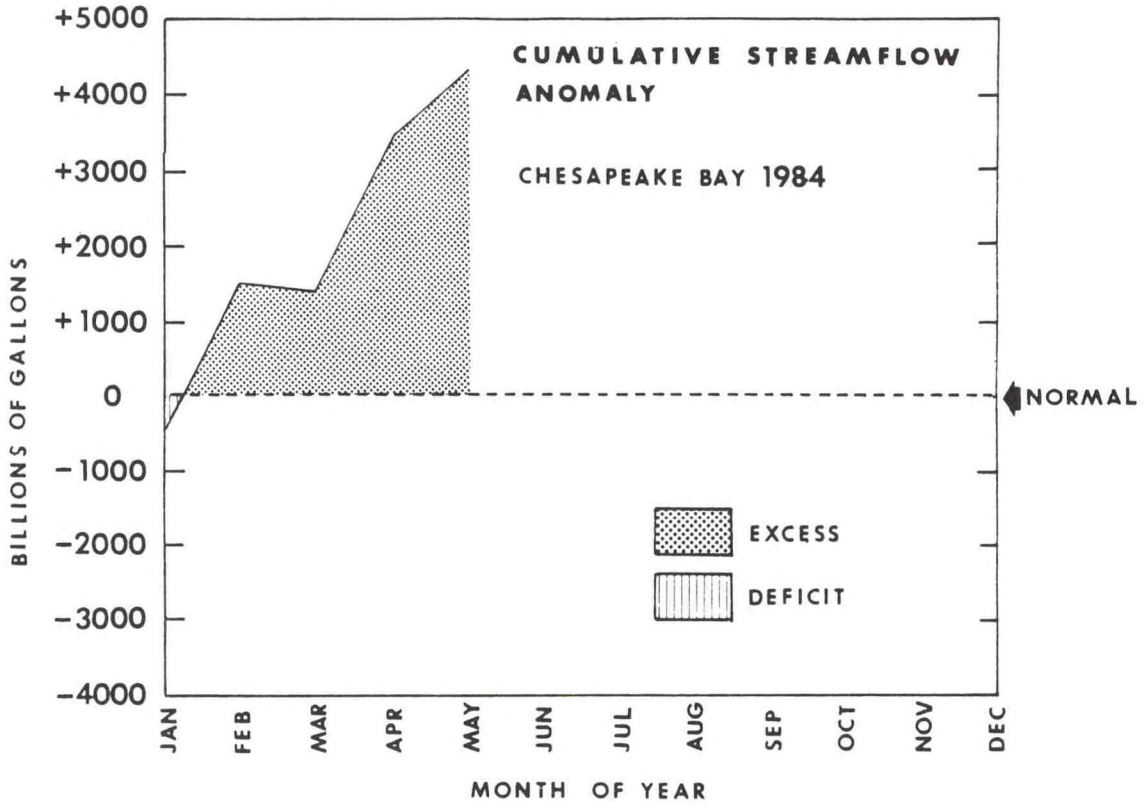
Bay streamflow was slightly below normal in March and well above normal in April and May (Figure 2). April 1984 flow of 251,000 cubic feet per second (cfs) was extremely high for that month, surpassed only in April 1972 (264,000 cfs) during the period of record 1951-present. May 1984 flow of 134,000 cfs was 38,000 cfs higher than the 33-year May average of 96,000 cfs.

Streamflow continued the above-normal trend seen since February 1984, which brought the cumulative streamflow anomaly to a 4.3-trillion-gallon excess by the end of the spring 1984 quarter (Figure 3).



Streamflow was below normal in March and above normal in April and May. April 1984 flow of 251,000 cubic feet per second (cfs) is the second highest for April during the period of record 1951-present compared to the record high April 1983 flow of 264,000 cfs. Data from U.S. Geological Survey.

Figure 2.--Monthly streamflow into Chesapeake Bay, March 1983-May 1984 and annual mean flow 1960-83.



The cumulative streamflow anomaly (monthly sum of negative and positive departures from normal by calendar year) for January through May 1984 reached an excess of 4.3 trillion gallons. Record high streamflow in February and well above normal flow in April and May contributed to the large excess to date. Data from U.S. Geological Survey.

Figure 3.--Cumulative monthly streamflow anomaly, Chesapeake Bay, 1984.

Oceanography

The quarter began with lower-than-normal salinities at all stations around the Bay and by end of May higher than normal streamflow reduced salinities at some stations to near record lows, especially in the lower Bay. Bay surface waters warmed seasonally over the three months, but by the end of May the average temperatures at all stations were nearly a degree Fahrenheit below normal.

Salinity:

March salinity averages were near normal at the northern and southern ends of the Bay but were well below normal in the center of the Bay. Following near record flow of the Potomac and Susquehanna Rivers in April, station salinities dropped to an average of nearly four parts per thousand below normal. Kiptopeke in May fell to a near record monthly average of 17.9 parts per thousand, almost seven parts per thousand lower than normal. Chesapeake Bay Bridge Tunnel salinity was 5.5 parts per thousand below normal. Salinities in early summer should begin to increase with the seasonal cycle. Solomons and Annapolis already have begun a return toward higher salinity with slight upturns in May.

Temperature:

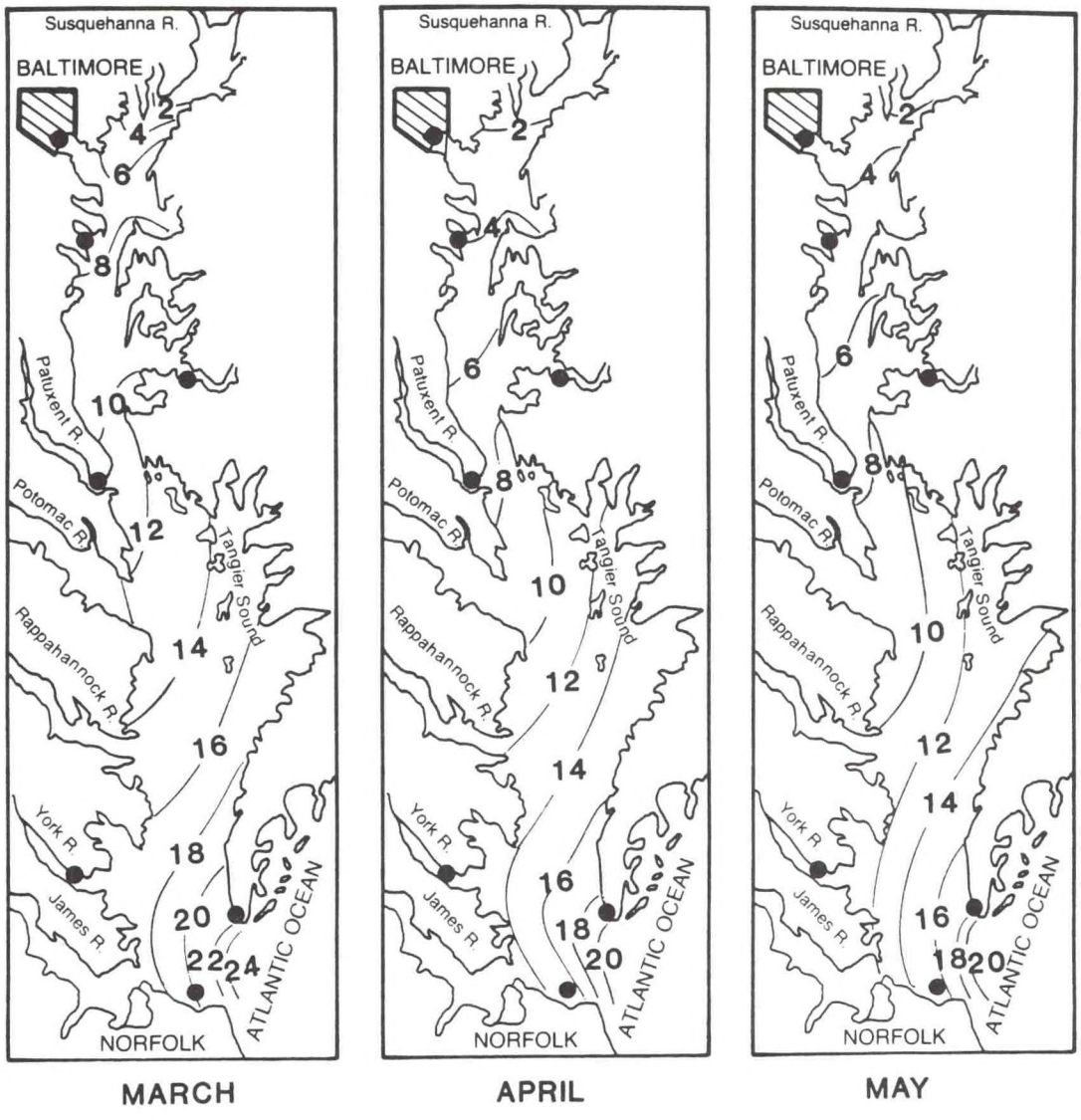
Water temperature around the Bay during the quarter followed normal seasonal warming trends. In March, Annapolis water averaged nearly four degrees F below normal. April water temperatures increased an average of 9.6°F which is normal for the month; however, Annapolis remained more than two degrees below normal and Solomons averaged a degree below normal. Warmer weather in May increased the water temperatures at all stations. Chesapeake Bay Bridge Tunnel showed the highest monthly average (65.3°F) and Annapolis the lowest (61.4°F). The average surface water temperatures for May remained below long-term normals with the region averaging 1.2 degrees F lower than normal.

Table 3. Bay surface salinities and surface water temperatures, March - May 1984.

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	8.2/-0.2	4.2/-2.0	3.7/-2.1	41.9/-0.7	53.2/+0.1	62.3/-1.9
Annapolis, MD	7.6/-2.0	4.0/-3.2	4.5/-2.4	38.9/-3.7	50.9/-2.3	61.4/-3.4
Solomons, MD	10.8/-2.3	7.6/-3.6	7.8/-3.0	42.7/+0.1	51.5/-1.0	62.9/-1.7
Kiptopeke, VA	21.1/-4.3	18.6/-5.8	17.9/-6.7	44.4/+0.2	53.1/+0.0	64.4/+1.3
Bay Bridge-Tunnel, Va.	20.0/+0.3	15.6/-4.3	15.1/-5.5	47.5/+0.6	54.7/-0.5	65.3/-0.4

*Anomaly = departure from long-term monthly averages.

All salinity data are provisional. Salinities are based on water densities normalized to 15°C.



Isohalines (parts per thousand) are linearly interpolated from designated station data. Stations around the Bay began the spring quarter showing lower-than-normal salinities following record high streamflow in February. Salinities fell further below normal in April and May following above normal precipitation and above normal streamflow during those months. Isohalines shifted 10 to 12 miles downstream from normal seasonal patterns during maximum streamflow periods in the spring quarter. Data from National Ocean Service, NOAA.

Figure 4.--Mean surface salinity distribution, Chesapeake Bay, March-May 1984.

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

Fisheries

Lower-than-normal water temperatures delayed blue crab catches during the spring quarter, reducing availability to consumers and increasing prices, though prices were lower than the record high prices in spring 1983. Cool water temperatures also delayed the arrival of stinging nettles which may be present in low numbers in summer 1984. Oyster beds in the upper James River in Virginia showed high mortalities due to greatly reduced salinities following excessive rainfall.

Shellfish:

Heavy rainfall in March and April greatly reduced salinities Bay-wide during the spring 1984 quarter, reducing the range of suitable conditions for oysters in upper portions of Bay tributaries and the Upper Bay. Oysters are distributed in most Chesapeake Bay tributaries upstream to a mean salinity of 7 to 8 parts per thousand. The heavy freshwater influx during April shifted isohalines 10 to 12 miles downstream in the upper James River. Sampling by the Virginia Institute of Marine Sciences during the spring 1984 quarter showed higher than ayerage oyster mortalities in the upper portions of the James River. The Deep Water Shoals area of the upper James River, which produces approximately 4 to 5 percent of the total Virginia seed oyster resource, experienced up to 60 percent mortality. The next seed producing areas downriver from Deep Water Shoals showed mortalities of 15 to 20 percent. The James River has extensive oyster bars which produce approximately 80 percent of Virginia's seed oysters (379,000 seed oyster bushels). Estimating conservatively that up to 15% of the seed oysters may have been damaged by fresh water conditions, high runoff may have caused $200,000 of potential losses in the River. Weather-related damage to seed oysters at Deep Water Shoals may have contriubted $32,000 of the total. Market prices for see oysters were higher in 1984 ($3.00 - $4.00 per bushel in 1984 vs. $2.50 - $3.50 per bushel in 1983) but probably responded more to the market pressures for larger size available seed oysters in 1984 rather than to any supply problems.

The James River is primarily public oyster ground except in some areas close to shore which are privately leased for the harvesting of market size oysters. Some damage to these areas in the upper James River occurred at the 10-20 percent level.

Watermen experienced delays in normal springtime blue crab catches due to cooler-than-normal water temperatures which delayed crabs from becoming active. Adverse weather conditions, including strong northeasterly winds, abnormally high tides, and heavy rainfall, prevented some crabbers from working at some periods in April and May in Virginia.

Unusually good landings of hard crabs in fall and early winter 1983 reflected the highly successful 1982 year class (crabs hatched in summer and fall 1982). Virginia landings in March and April 1984 (Table 4) were higher (32% and 7%, respectively) than in the same months in 1983 despite cooler-than-normal water

temperatures and adverse weather. Maryland landings in April 1984 were much higher (130%) than in the same month of 1983. Cooler-than-normal water temperatures during spring 1984 reduced crab activity but the relative abundance of the 1982 year class gave impressive landings for watermen. During similar spring environmental conditions in early 1983, landings were very low due to the overall shortage of crabs following a very poor 1981 hatch and recruitment.

April blue crab landings are normally low compared to landings during peak summer months when adult crabs become more active and the strength of the year class becomes evident. The sampling of VIMS and catches in late 1983 suggest an excellent season for catches of crabs during summer 1984.

Juvenile blue crabs from the 1983 year class are now present in Chesapeake Bay and should attain the 5 inch legal size limit in late summer 1984. Blue crab sampling programs during spring 1984 by the Maryland Department of Natural Resources and the Virginia Institute of Marine Sciences both show unusually high numbers of juveniles from a strong 1983 year class; these crabs will add to the catch possibilities as they attain market size.

Soft crab production in Virginia showed delays as a result of cooler-than-normal water temperatures. The first seasonal soft crab production run in mid-May was delayed for up to 2 weeks in the Northern Neck and Rappahannock areas in lower Chesapeake Bay. During this period soft crab prices were depressed in the Baltimore and New York City markets due to the availability of soft crabs from the southern states of Georgia, North Carolina, and South Carolina. Southern states have greatly increased soft crab production over recent years and begin seasonal production earlier than more northern states including Maryland and Virginia.

Blue crab prices in April 1984 were close to prices in April 1983, though as landings increased in May 1984, prices did not reach the record high May 1983 prices. The weighted average price for all categories of blue crab (hard, soft, peeler) in Maryland in April 1984 was $0.82 per pound compared to $0.76 per pound in April 1983. The May 1984 weighted average price of $0.89 per pound was considerably lower than the $1.30 per pound price in May 1983 (Maryland Department of Natural Resources value statistics).

Cooler-than-normal water temperatures were also reported in North and South Carolina. Blue crabs from North Carolina and other southern states normally supplement the Maryland market (primarily Baltimore) in early spring when Maryland crabs are unavailable or in low supply. Watermen in North Carolina experienced delays in normal springtime catches in March and April 1984 (Table 5). South Carolina landings were well below the long-term (1973-82) averages in March and April 1984 (384,000 pounds, and 297,000 pounds, respectively).

Table 4. Maryland and Virginia hard blue crab landings (thousands of pounds) spring 1983-84.

		1983	1984	Changes
Maryland	April	223	513	+130%
	May	795	588*	-26%*
Virginia	March	556	733	+32%
	April	2,235	2,392	+7%

* May landings data for Maryland are incomplete.
Data from Maryland Department of Natural Resources and Virginia Marine Resources Commission.

Table 5. North Carolina and South Carolina hard, soft and peeler, blue crab landings (thousands of pounds), March - May 1983 and 1984.

	North Carolina		South Carolina	
	Hard	Soft	Hard	Soft
March 1983	1,049	none	137	none
March 1984	650	*	240	none
April 1983	1,551	5	185	2
April 1984	1,445	18	105	5
May 1983	3,059	34	353	1
May 1984	3,162	88	362	3

Data from NOAA, National Marine Fisheries Service, Beaufort, North Carolina.
* = less than 1,000 pounds reported. April and May 1984 data are preliminary and subject to revision.

Finfish:

Finfish harvest activities proceeded uninterrupted by weather during the spring 1984 quarter, though some watermen reported lower-than-normal pound net catches. Extremely low salinities during the quarter may have contributed to the reduced pound net catches by altering local distribution of finfish.

Sampling by the Virginia Institute of Marine Sciences showed high abundances of croaker and spot in the southern Bay and lower tributaries. Spot which were 4 inches and under at the end of May should reach the 7 to 8 inch size range in fall 1984. Croaker from the highly successful 1982 year class were running 8 to 9 inches in spring 1984 and should grow to 10 inches by fall 1984.

Stinging nettles:

Cooler-than-normal water temperatures during the spring quarter can delay the arrival of stinging nettles. Below normal temperatures observed around Chesapeake Bay during the spring 1984 quarter delayed the appearance of stinging nettles in summer 1984. Observations by the Chesapeake Biological Laboratory at Solomons, Md., show nettles appeared later than normal and in very low numbers at the time of publication (July 13). Stinging nettles should show a very low infestation in the Upper Bay, with numbers less than 25 percent of average in Bay waters north of the Potomac River according to preliminary estimates by the Chesapeake Biological Laboratory. Juvenile free-floating medusae of the stinging nettle appear from mid-May to June. The medusae are released from sessile polyps in a salinity range between 7 and 25 parts per thousand. The polyps are found in tributaries of both Maryland and Virginia, but are less abundant in the higher salinity areas of the Lower Bay. Reduced salinities Bay-wide during spring 1984 provided conditions in the Lower Bay favorable to nettle development while unfavorable conditions prevailed in the Upper Bay. Therefore, while a low summer infestation of stinging nettles may occur in the Upper Bay, higher-than-average numbers of nettles may occur in the Lower Bay in summer 1984.

Recreation

Marine advisories and warnings issued by the National Weather Service for Chesapeake Bay (Figure 5) March through May, 1984, are listed in Table 6. Two gale warnings were issued: one at the beginning and one at the end of March for Chesapeake Bay and the tidal Potomac River. Nine small craft advisories were issued in April 1984. Four special marine warnings were issued for the tidal Potomac River during May 1984, three of which stemmed from sighted lines of thunderstorms and the other from a very heavy thunderstorm.

The U.S. Coast Guard conducted a total of 529 Search and Rescue (SAR) operations in the Bay area during the 1984 spring quarter (Table 7). During the same period in 1983, 497 SAR cases were handled during a similar pattern of weather conditions over the spring quarter.

Maryland Department of Natural Resources accident statistics for recreational boating are listed in Table 8. The number of accidents from January through April 1984, is slightly lower than during the comparable period in 1983, though recreational boating activity is normally extremely low in the late winter and early spring on Chesapeake Bay. From January through May 1984, a total of 42 accidents, 15 injuries, and 11 fatalities occurred, with $244,319 in property damage. Damage estimates in spring 1984 are higher than in 1983 due to the costs of property damaged and do not reflect weather intensity.

Five fatalities occurred on the Potomac River in a rafting accident on May 5. The Potomac River was at a high flow stage in early May making conditions especially hazardous for boaters. Flow for the Potomac River on May 5 was 36,000 cubic feet per second (cfs), compared to the monthly average daily flow for May of 14,700 cfs. Lightning associated with a thunderstorm struck a 32-foot motorboat on May 28 on Chesapeake Bay between Point Lookout, Md., and Smith Point, Md. One passenger was killed, and the boat captain was injured.

Table 9 lists state park attendance and revenue at selected Maryland and Virginia facilities during the spring quarter. Attendance figures reflected increasing activity as temperatures increased seasonally, though attendance was reduced during periods of cooler-than-normal temperatures and above-normal rainfall. Seashore State Park in Virginia showed greatly reduced attendance in April 1984 (28,990 in 1984 compared to 89,431 in April 1983) due to heavy rainfall and flooded campsites. Attendance at Point Lookout was higher during all three months of the spring 1984 quarter than during the same months in 1983. Increased weekday usage and heavy fishing activity contributed to the increases at Point Lookout. Spring attendance at Point Lookout is closely related to the start of the fishing season and attendance is usually high regardless of weather conditions.

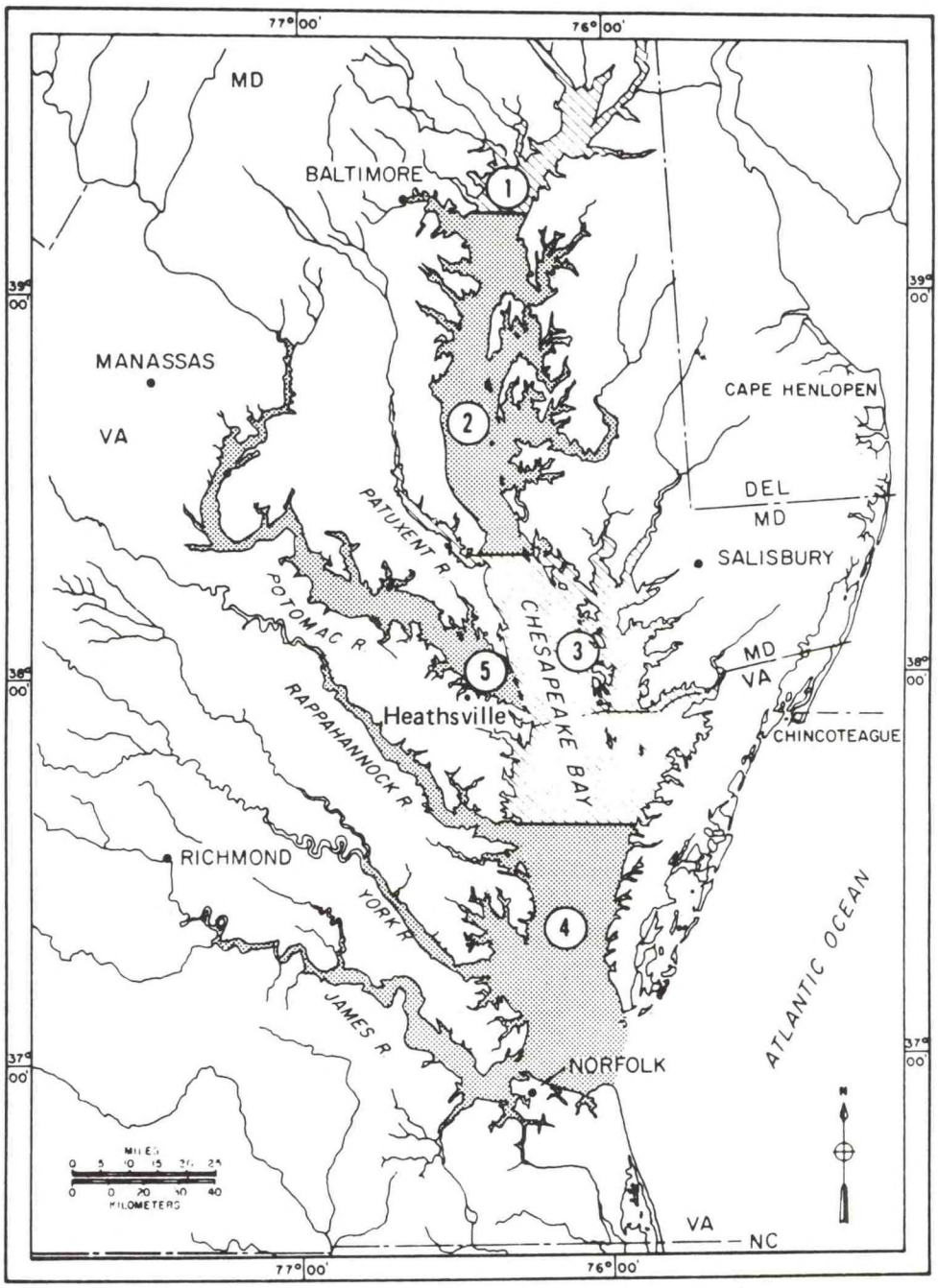


Figure 5.--National Weather Service (NWS) forecast areas for Chesapeake Bay.

Key to forecast areas:

1 = Head of Bay to Baltimore Harbor
2 = Baltimore Harbor to Patuxent River
3 = Patuxent River to Windmill Point
4 = Windmill Point to Mouth of Bay
5 = Tidal Potomac River

Table 6. Marine advisories/warnings, Chesapeake Bay, March - May 1984 (National Weather Service data). For definition of areas see Figure 5.

	Date	Condition Report[1]	Location[2]
March	1	A	Head of Bay to Patuxent River and Tidal Potomac River
	5	A	Patuxent River to Mouth of Bay
	5	A	South of Windmill Point
	8	A	Entire Bay and Tidal Potomac River
	9	B	Entire Bay and Tidal Potomac River
	9	A	Head of Bay to Windmill Point and Tidal Potomac River
	9	A	South of Windmill Point
	11	A	Entire Bay and Tidal Potomac River
	11	A	Head of Bay to Patuxent River
	13	A	South of Windmill Point
	16	A	Head of Bay to Windmill Point
	17	A	Entire Bay and Tidal Potomac River
	20	A	Entire Bay
	21	A	Tidal Potomac River
	22	A	Entire Bay and Tidal Potomac River
	23	A	Entire Bay and Tidal Potomac River
	25	A	South of Windmill Point
	28	A	Entire Bay and Tidal Potomac River
	28	B	Entire Bay and Tidal Potomac River
April	3	A	South of Windmill Point
	5	A	Entire Bay and Tidal Potomac River
	7	A	Entire Bay and Tidal Potomac River
	16	A	South of Windmill Point
	17	A	South of Windmill Point
	22	A	Entire Bay and Tidal Potomac River
	23	A	South of Windmill Point
	24	A	Entire Bay and Tidal Potomac 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)

[2]Windmill Point = North side of Rappahannock River

Table 6. (Continued) Marine advisories/warnings, Chesapeake Bay, March - May 1984 (National Weather Service data). For definition of area see Figure 5.

	Date	Condition Report (1)	Location (2)
May	3	A	Entire Bay and Tidal Potomac River
	4	A	South of Windmill Point
	8	A	South of Windmill Point
	8	D	Tidal Potomac River
	11	A	Baltimore Harbor to Mouth of Bay
	12	A	Entire Bay and Tidal Potomac River
	12	D	Tidal Potomac River
	16	A	Head of the Bay to Windmill Point
	23	A	Entire Bay and Tidal Potomac River
	23	D	Tidal Potomac River
	26	D	Tidal Potomac River
	31	A	South of Windmill Point
	31	A	Head of Bay to Windmill Point 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 7. U.S. Coast Guard Search and Rescue (SAR) caseload, March - May 1984.

Month	Number of Search and Rescues		
	Group Baltimore	Group Eastern Shore	Group Norfolk
March	18	2	36
April	66	2	57
May	127	12	209
TOTALS	211	16	302

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

Table 8. Maryland marine accident statistics, March - May 1984.

Month	No. of Boating Accidents	No. of Injuries	No. of Deaths	Property Damage
March	8	2	2	$12,340
April	6	0	3	2,485
May	27	12	6	229,044
TOTALS	41	14	11	243,869

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

Table 9. State parks attendance and revenue, selected Maryland and Virginia facilities, March - May 1984.

Facility	Month					
	March		April		May	
Maryland	Attendance	Revenue	Attendance	Revenue	Attendance	Revenue
Sandy Point	10,976	$1,397	35,422	$1,046	56,481	$14,702
Point Lookout	10,957	1,012	13,384	923	29,438	5,819
Virginia						
Westmoreland	4,762	$ 20	7,697	$1,794	18,403	$ 7,555
Chippokes	1,400	0	1,544	164	4,120	852
York River	2,346	0	2,570	107	5,976	1,410
Seashore	21,960	2,215	28,990	10,662	76,151	35,246

Data from Maryland Department of Natural Resources, Forest, Park, and Wildlife Service; 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

Winds in excess of 40 mph shut down crane operations 18 times at the Port of Baltimore during the 1984 spring quarter for a total of 47 hours and 21 minutes (Table 10.) During the same period in 1983, winds shut down operations 12 times for a total of 80 hours and 7 minutes productive time lost.

Table 10. Number of crane shutdowns and productive time lost due to wind in excess of 40 mph at Port of Baltimore, March - May 1984.

Date	Number of Shutdowns	Productive Time lost (Hours:Minutes)
March 1	1	7:05
11	1	6:05
21	1	1:35
22	1	2:55
23	1	8:50
30	1	2:56
April 24	4	3:28
30	1	4:00
May 4	4	3:42
8	1	2:34
23	1	3:06
26	1	1:05
Totals	18	47:21

Data from Maryland Port Administration.

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