

CHESAPEAKE BAY  
EARTH SCIENCE ATLAS NO. 3

MAP 3-4

TOTAL CARBON CONTENT

BY

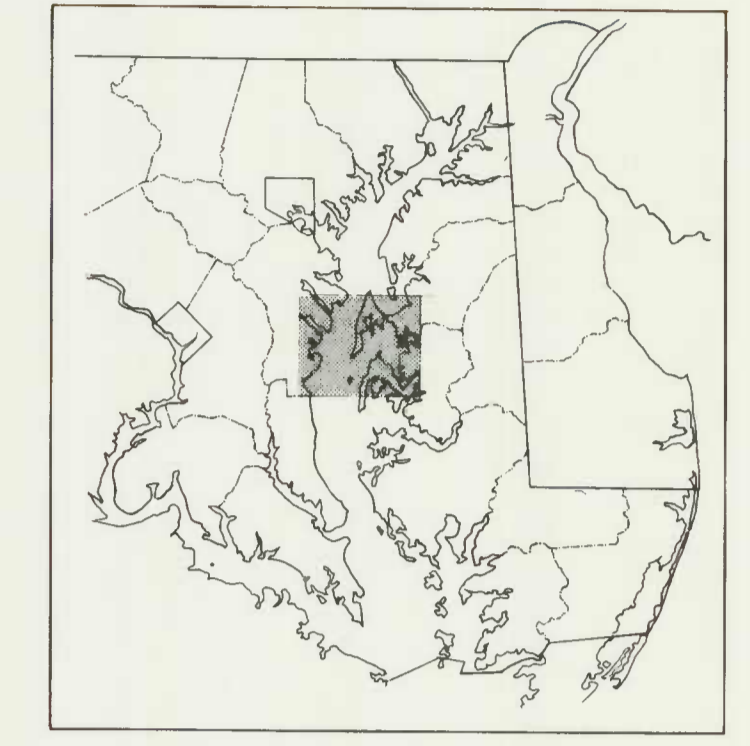
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1980

STATE OF MARYLAND  
DEPARTMENT OF NATURAL RESOURCES  
MARYLAND GEOLOGICAL SURVEY  
KENNETH N. WEAVER, Director

UNITED STATES - EAST COAST  
MARYLAND  
CHESAPEAKE BAY  
EASTERN BAY AND SOUTH RIVER

Map Projection  
Scale 1:60,000 (at 30° 32')  
North American 1983 Datum



EXPLANATION

CONTOUR INTERVAL  
1% BY WEIGHT

TOTAL CARBON CONTENT

Many chemical reactions occurring in the Chesapeake Bay estuary depend upon the availability of organic carbon and sulfur. In addition, the concentration of these elements serves as a pollution level indicator and aids in the location of pollution sites with high concentrations of heavy metals and other pollutants.

Carbon is transported from source to sink in the Chesapeake Bay. Carbon may be transported in dissolved form as seen from the water column and in particulate form as seen from the bottom. In a closed system, this process eventually depletes the estuary of carbon. The estuarine carbon cycle and the chemical weathering processes are related. In the bay environment this substance is sulfur, in the form of sulfide.

In the aquatic environment, sulfides are reduced to sulfide by anaerobic bacteria releasing energy for their use. Sulfide then combines with iron and manganese in the sediment where they are stable as long as the sediment remains anoxic. However, if these sulfides are oxidized or oxidized to elemental sulfur (e.g., through dredging), the following could occur: 1) the oxidation of elemental sulfur to sulfate in the water column and 2) the oxidation of sulfide to sulfate and iron sulfide in the sediment. Sulfate is a nutrient for many organisms and iron sulfide is a nutrient for many organisms. Sulfate is also present in the sediments as mineral skeletal parts such as arthropods, mollusks, and brachiopods. Iron sulfide is a nutrient for many organisms. Sulfate is also present in the sediments as mineral skeletal parts such as arthropods, mollusks, and brachiopods. Iron sulfide is a nutrient for many organisms.

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In general, content of total carbon increases with water depth. Values range from less than 1% to over 5% (see also 3-11) in the depth of about 20 meters. Deep water values are also low in the upper Chesapeake Bay.

The amount of total carbon in any particular sediment sample is largely controlled by the amount of organic carbon in the sample. For this reason the percent of organic carbon distribution is similar to the pattern for total carbon, but for any sampling location the concentration of organic carbon is less than that of total carbon.

The distribution of sulfur is also related to that of both organic and total carbon except for the upper Chesapeake Bay. This increase in sulfur content is related to the increase in organic carbon and total carbon. Sulfur is a nutrient for many organisms and iron sulfide is a nutrient for many organisms. Sulfate is also present in the sediments as mineral skeletal parts such as arthropods, mollusks, and brachiopods. Iron sulfide is a nutrient for many organisms.

Areas of high carbon and sulfur content tend to correspond to areas of deep water and fine-grained sediments. The maximum values are in the upper Chesapeake Bay. In general, content of total carbon increases with water depth. Values range from less than 1% to over 5% (see also 3-11) in the depth of about 20 meters. Deep water values are also low in the upper Chesapeake Bay.

Carbon and sulfur analysis was done on the net of every four samples collected from the deeper waters of the Bay. Some samples from shallow depths were also analyzed. However, these samples contained more of carbon and sulfur than expected. In general, content of total carbon increases with water depth. Values range from less than 1% to over 5% (see also 3-11) in the depth of about 20 meters. Deep water values are also low in the upper Chesapeake Bay.

Table 1. Percent Total Carbon measured in the different sediment size classifications.

TYPE	RANGE % C	MEAN % C	N
SAND	0.000-1.200	0.367	97
SILT	0.483-1.123	0.820	100
CLAY	0.000-3.200	0.460	100
SILT	0.466-0.711	0.597	7
CLAY	0.195-1.420	0.510	10
CLAY	0.000-3.200	0.510	10
SILT	0.280-0.520	0.400	9
CLAY	0.155-1.740	0.510	8
CLAY	0.155-1.740	0.510	8
SUMMARY	0.770-3.400	1.966	23

FUNDING PROVIDED BY:  
THE U.S. ENVIRONMENTAL PROTECTION AGENCY,  
CHESAPEAKE BAY PROGRAM CONTRACT NO. R805965  
AND DEPARTMENT OF NATURAL RESOURCES,  
CAPITAL PROGRAM ADMINISTRATION, ENERGY ADMINISTRATION,  
TIDELWATER ADMINISTRATION THROUGH THE OFFICE OF  
COASTAL ZONE MANAGEMENT, NOAA

