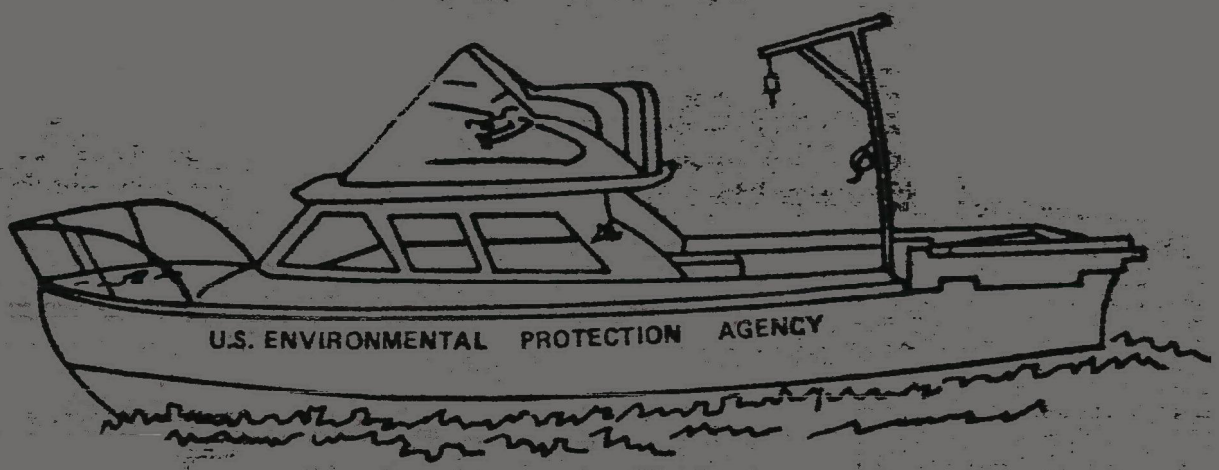
REGION III
ANNAPOLIS FIELD OFFICE

SITUATION REPORT

POTOMAC RIVER

WORKING FOR A BETTER ENVIRONMENT



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SITUATION REPORT

POTOMAC RIVER

May 25, 1976

I. HISTORY

When Captain John Smith explored the Potomac River in 1608 the waterway was virtually in a pristine state with abounding fish life. The crude and limited agricultural activities of the indigenous Indian tribes had little impact on the aquatic environment. In the late 1790's it was reported that President Adams swam in the Potomac Estuary near Washington, D.C. It was about this time that canals were carved along the river and commercial shipping activities took place in the estuary. As the population in the Washington Metropolitan Area grew, so did water pollution problems in the Potomac Estuary. The dumping of raw municipal wastes into the river became so extensive that by the early 1860's President Lincoln frequently was forced to leave the White House at night due to objectionable sewage odors. Following the Civil War the sewage situation worsened to the point that President Harrison ordered a system to be devised to convey all sewage to a point in the river downstream of Washington, D.C.--thus collection and transfer of the problem became the first solution to the municipal waste dilemma. It was not until 1938 that sewage <u>treatment</u> measures were employed in the estuary area, and by this time water quality problems had become quite evident. Even though sewage treatment measures were employed pervasively, excessive population growth more than offset pollution abatement efforts. Historically and to this day the primary cause of water pollution in the Potomac Estuary is municipal waste. Nonpoint sources of pollution, including agricultural runoff and stormwater loadings, also contribute significant amounts of pollutants to the Potomac.

II. CURRENT STATUS

The current problem facing the Potomac River and Estuary is an interrelated one consisting of a marginally sufficient water supply, variable

water quality in the upper reaches of the estuary due to advanced eutrophication (over fertilization of nutrients), and problems of as yet undetermined magnitude as regards toxic metals and organohalogens and their effects on living organisms in the Potomac.

The Washington Metropolitan Area is a rapidly growing region with about 2.8 million people. Present municipal water use is 370 mgd with 72 percent (265 mgd) supplied from the Potomac River above Washington (Great Falls). Projected population and water supply needs are shown in Table I. Present resources are insufficient to supply peak needs during sustained low flows. (See Table II.) It is very possible that a drought could recur as in 1966 and 1969 where the metropolitan water supply would be seriously depleted, if not inadequate to meet water supply needs since the maximum demand of record has exceeded the minimum flow, though fortunately not at the same time. The concurrence of these adverse conditions is not hypothetical and a number of alternatives are being considered to alleviate this situation. The U.S. Army Corps of Engineers has proposed three alternative impoundment systems for water supply augmentation. (See Table III.) Use of the freshwater portion of the estuary for emergency water supply during sustained low flow periods would meet any immediate crisis since the lead time for construction of impoundments is approximately 10 years after approval.

The water supply situation has been further complicated by the Montgomery County decision to construct a municipal sewage treatment

TABLE I

Water Supply Needs

Year	Population	Yearly avg. (mgd)	Maximum Month (mgd)	Maximum Daily (mgd)
1969	2,700,000	370	470	660
1980	4,000,000	570	720	1000
2000	6,700,000	1010	1310	1820
2020	9,300,000	1570	2040	2820

TABLE II

Low-Flow Characteristics Before Water Supply Diversion		Withdrawal from the Potomac Estuary or from Direct Reuse*		
		1980	2000	2020
Recurrence Interval (years)	Minimum Monthly Fresh Inflow (mgd)	For a 720 mgd Need (mgd)	For a 1310 mgd Need (mgd)	For a 2040 mgd Need (mgd)
5	1300	none	210	940
20	1170	none	340	1070
50	910	none	600	1330

*Withdrawal based on minimum 30-day low flow concurrently with a maximum 30-day water supply withdrawal and a 200 mgd minimum base flow over Great Falls into the estuary

TABLE III

System	
I	Bloomington
II	Bloomington, Verona, and Sixes Bridge
III	Bloomington, Verona, Sixes Bridge, Town Creek, North Mountain, Sideling Hill, and Little Cacapon

plant discharging to the Potomac River above the metropolitan water intakes at Great Falls. Various alternatives pertaining to this plant are still undecided, namely siting, plant design/capacity and degree of treatment required and most important its effects on the water supply of metropolitan Washington.

The wastewater disposal problem in the upper reach of the estuary from Great Falls to Indian Head, Maryland, results from the discharge of 325 mgd of municipal sewage from 18 facilities, of which the Blue Plains plant of the District of Columbia is the largest (Fig. I). Of the 325 mgd, 45.5, 23.1, and 35.4 percent, respectively, come from Maryland, Virginia, and the District of Columbia. Since 1913 wastewater volumes have increased eightfold, from 42 to 325 mgd. Similar trends have occurred for total nitrogen and phosphorus with 10-fold and 24-fold increases, respectively. Table IV shows wastewater loading trends of the Washington Metropolitan Area. Increased wastewater loadings to the upper Potomac Estuary have resulted in increased amounts of nutrients and consequently the more frequent occurrence of massive, undesirable algal blooms.

Under summer and fall conditions large populations of blue-green algae (pollution tolerant), mainly Anacystis sp., are predominant in the freshwater portion of the estuary. These algae are not grazed by higher trophic forms and are therefore useless in the food chain. When excessive mats of these blooms expend their life cycle and decay, dissolved oxygen in the water is reduced below acceptable levels to sustain fish life.

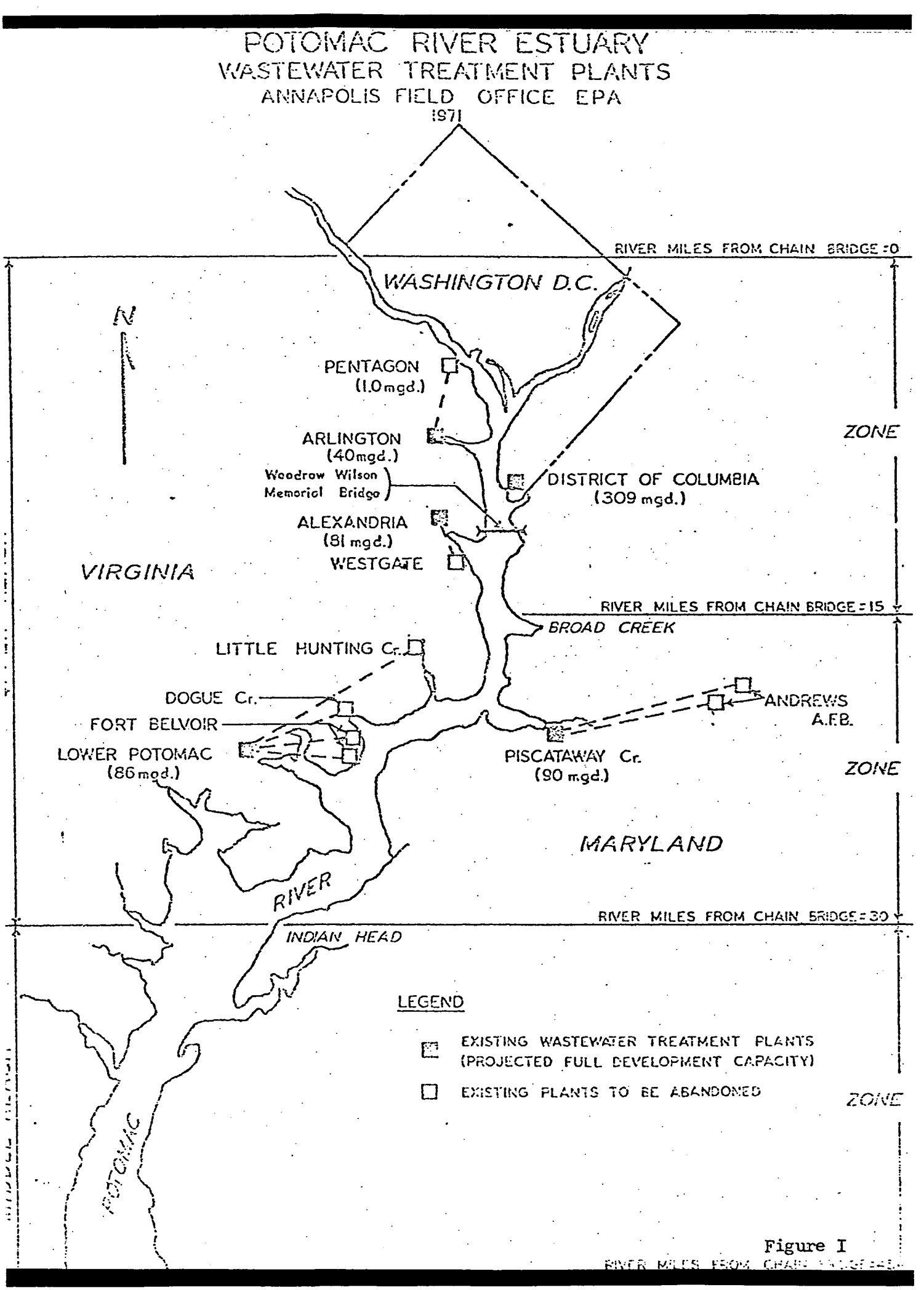

POTOMAC RIVER ESTUARY
WASTEWATER TREATMENT PLANTS
ANNAPOLIS FIELD OFFICE EPA
1971
RIVER MILES FROM CHAIN BRIDGE = 0
WASHINGTON D.C.
N
PENTAGON
(1.0 mgd.)
ARLINGTON
(40 mgd.)
Woodrow Wilson
Memorial Bridge
DISTRICT OF COLUMBIA
(309 mgd.)
ALEXANDRIA
(81 mgd.)
WESTGATE
VIRGINIA
ZONE
RIVER MILES FROM CHAIN BRIDGE = 15
BROAD CREEK
LITTLE HUNTING Cr.
DOGUE Cr.
FORT BELVOIR
ANDREWS
A.F.B.
LOWER POTOMAC
(86 mgd.)
PISCATAWAY Cr.
(90 mgd.)
ZONE
MARYLAND
RIVER
RIVER MILES FROM CHAIN BRIDGE = 30
INDIAN HEAD
LEGEND
EXISTING WASTEWATER TREATMENT PLANTS
(PROJECTED FULL DEVELOPMENT CAPACITY)
EXISTING PLANTS TO BE ABANDONED
ZONE
POTOMAC

Figure I

TABLE IV

WASTEWATER LOADING TRENDS
WASHINGTON METROPOLITAN AREA

Year	Population Served	Flow[1 (mgd)	Untreated 5-Day BOD (lbs/day)	Removal 5-Day BOD %	Treated 5-Day BOD (lbs/day)	Ultimate[2 Car. BOD (lbs/day)	Ultimate[4 Nit. BOD (lbs/day)	Total Ultimate BOD (Car.+Nit.) (lbs/day)	Total Nitrogen (lbs/day)	Total Phos. as P (lbs/day)
1913	320,000	42	58,000	0	58,000	84,000	29,000	113,000	6,400	1,100
1932	575,000	75	103,000	0	103,000	149,000	52,000	201,000	11,400	2,000
1944	1,149,000	167	235,000	40	141,000	205,000	105,000	310,000	23,000	4,000
1954	1,390,000	195	280,000	28	200,000	290,000	145,000	435,000	31,700	5,500
1957	1,680,000	210	305,000	33	204,000	297,000	153,000	450,000	33,500	8,600
1960	1,860,000	222	370,000	70	110,000	160,000	170,000	330,000	37,200	10,000
1965	2,100,000	285	417,000	70	125,000	182,000	192,000	384,000	42,000	16,800
1968	2,415,000	319	428,000	70	130,000	188,000	226,000	414,000	50,000	20,100
1969	2,480,000	320	439,000	71	129,000	186,000	222,000	408,000	55,000	21,100
1970	2,535,000	322	484,000	71	141,000	204,000	254,000	456,000	60,000	24,000

1. Includes estimated sewer overflow loadings
2. Ultimate carbonaceous BOD = 1.45 x 5-day BOD
3. Ultimate nitrogenous BOD = 4.57 x unoxidized nitrogen

In the saline portion of the estuary, growth of marine phytoplankton known as "red tides" proliferates, aggravated by the high nutrient content in the water. These have been known to assume forms toxic to fish life.

The overall effect of increases in nutrient loadings since 1913 (Table IV) on dominant plant forms in the upper estuary has been continuous and dramatic. Figure II visualizes the successive domination of various plant forms leading to the present state of persistent massive summer blooms of the blue-green alga Anacystis in nuisance concentrations of greater than 50 micrograms per liter from the metropolitan area downstream as far as Maryland Point. This condition still persists and will probably increase in intensity unless the nutrient discharges are significantly reduced.

The major detrimental effects of the wastes being discharged to the Potomac are:

(1) An abundance of nutrients which causes over-enrichment of the estuary;

(2) Depletion of dissolved oxygen creating zones of depressed oxygen levels;

(3) High bacterial densities which preclude use of the river for any contact recreational activities and as a potable water supply source.

Approximately 50 million tons of sediment are deposited into the river each year, with 39 percent of it generated in the Washington Metropolitan Area. Stringent regulation is needed to

WASTEWATER NUTRIENT ENRICHMENT TRENDS AND ECOLOGICAL EFFECTS

UPPER POTOMAC TIDAL RIVER SYSTEM

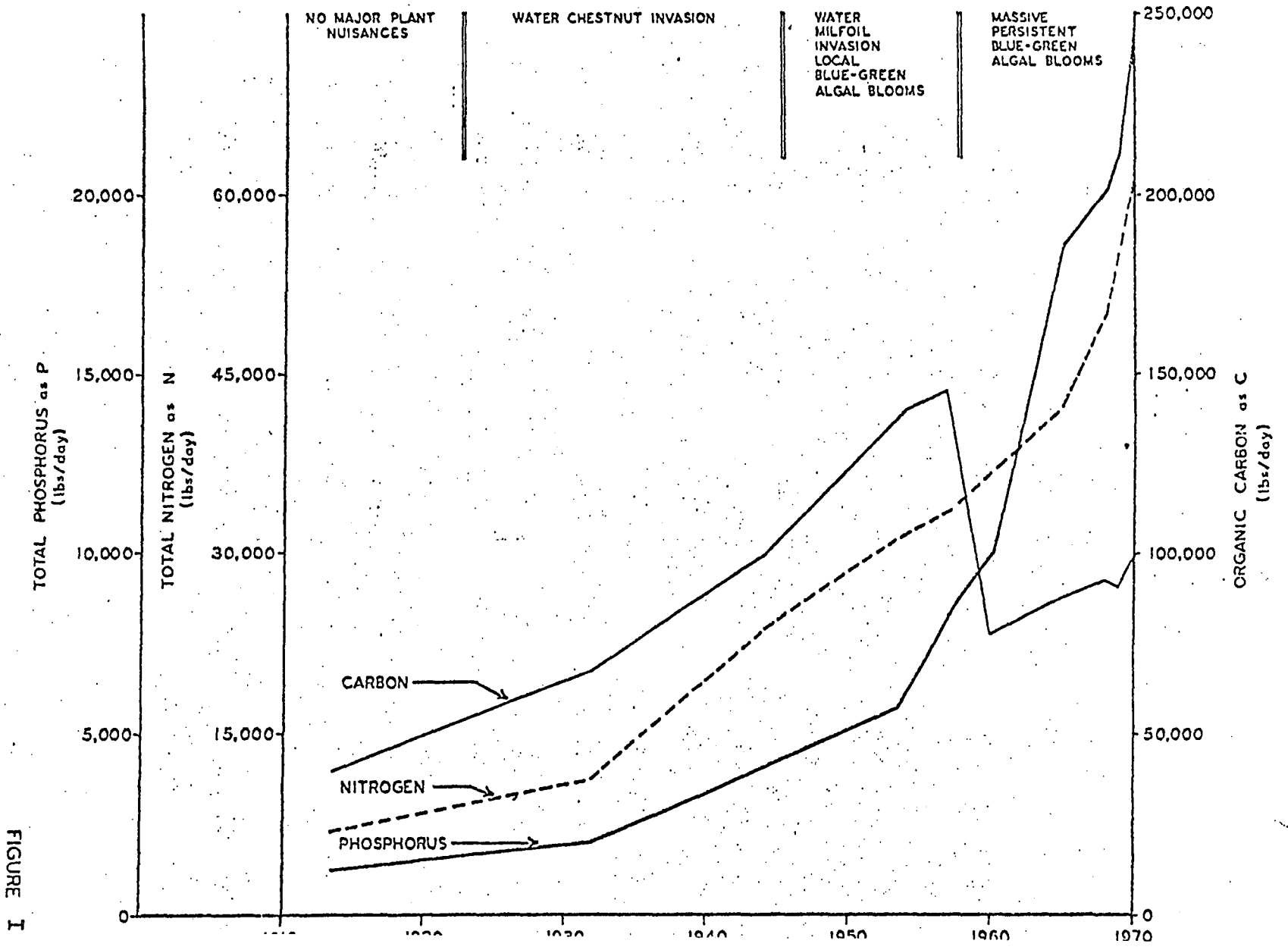


FIGURE I

control this obvious pollutant and minimize its harmful potential. Maryland and the District have specific sediment control ordinances in effect.

In the Washington Metropolitan Area, the amount of water used for manufacturing is insignificant. The major industrial use is as cooling water.

There are currently six major cooling water users in the Potomac River tidal system with another being proposed near Sandy Point. The total cooling water use is 2,748 mgd as follows:

Facility	Water Usage (mgd)	Receiving Water	Remarks
PEPCO at Benning Rd. (Washington, D.C.)	568	Anacostia River	Also Uses Cooling Towers
PEPCO, Buzzard Point (Washington, D.C.)	570	Anacostia River	
Virginia Heating (Arlington, Va.)	40	Boundary Channel of Potomac Estuary	
PEPCO Generating Station (Alexandria, Va.)	450	Potomac Estuary	
VEPCO, Possum Point (Quantico, Va.)	400	Potomac Estuary	
PEPCO, Sandy Point	--	Potomac Estuary	Proposed Facility
PEPCO, Morgantown (Charles Co., Md.)	720	Potomac Estuary	Ultimate Usage to be 1440 mgd
TOTAL	2,748		

Navigational use of the Potomac Estuary waters is primarily to provide commercial transport via river barges. Two commercial firms presently transport various petroleum products from tank farms located in the lower Potomac and in the Chesapeake Bay proper to the Washington Metropolitan Area.

Sand and gravel mining is also a water related industrial use of the estuary bed. Currently, dredging for this purpose is being conducted in the estuary below Indian Head, Maryland.

Recreational facilities on or near the Potomac estuary include a national park, three state parks, seven fish and game areas of 226 county recreational sites. A study by the Bureau of Outdoor Recreation indicated that the recreational potential of the 637 miles of shoreline has barely been developed. Few public beaches have been opened primarily because of poor water quality (in the upper reaches) and to some degree the unwelcome presence of stinging jellyfish.

The dockside value of fish, crabs, clams, and oysters taken from the Potomac tidal system is about $5 million annually. Sport fishing contributes more than $0.6 million per year. There are approximately 95 marina facilities in the tidal Potomac which accomodate over 5,200 recreational watercraft.

III PRESENT ANNAPOLIS FIELD OFFICE EFFORTS

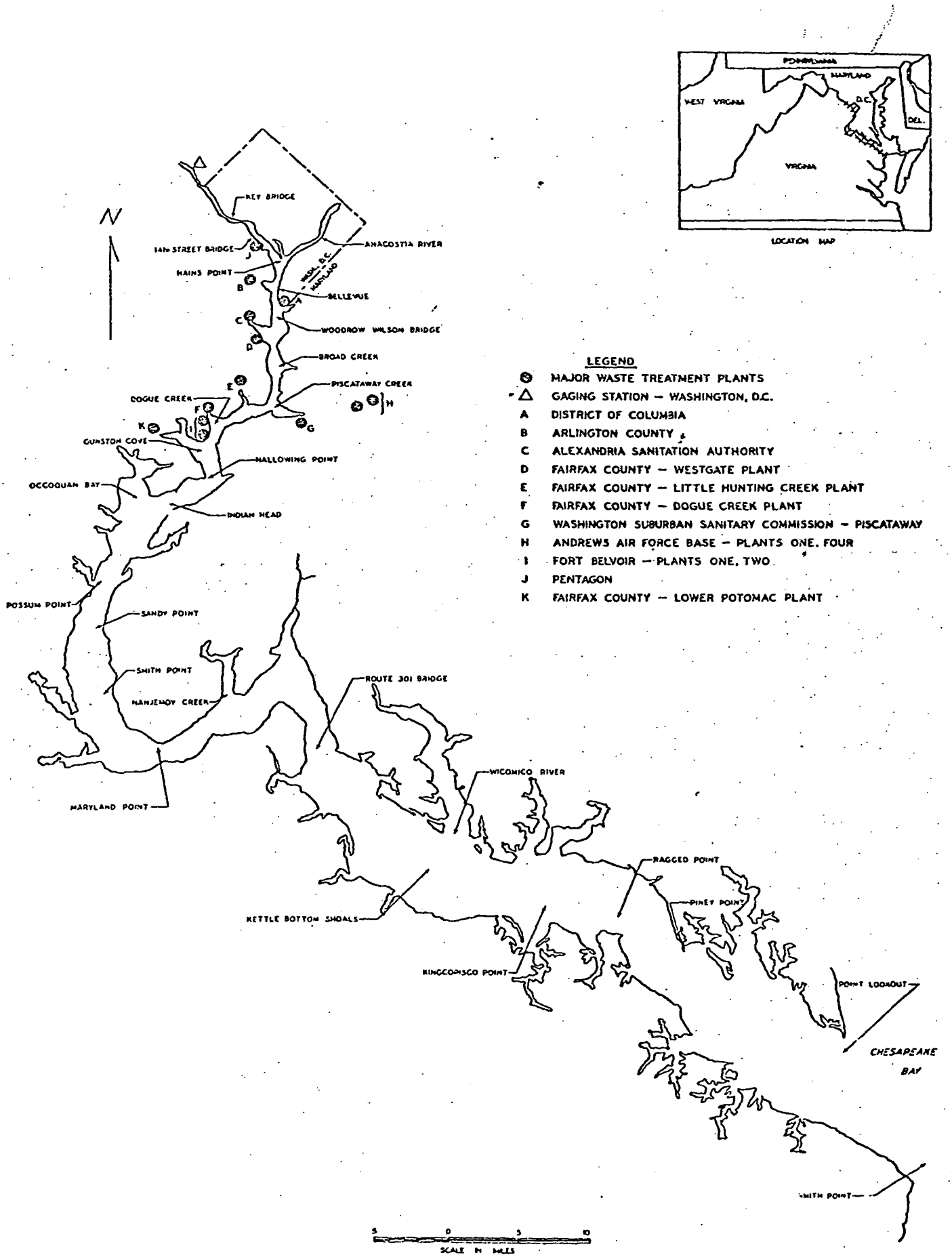
The Annapolis Field Office currently monitors the Potomac estuary on a monthly basis. The sampling survey consists of 26

stations (Fig. III) from Point Lookout to Chain Bridge and analyses are conducted for pertinent chemical and biological parameters related to the hyper-eutrophic conditions existing in the estuary. Various intensive surveys have been conducted and documented in the past few years dealing with specific problems in the Potomac. These studies provide insight by focusing attention on one aspect of the pollution problem.

IV. CURRENT STATUS OF THE CORRECTIVE ACTION PROGRAM

In 1969 the Potomac Metropolitan Area Enforcement Conference, initiated in 1957 as a means of bringing about cooperative action among the political jurisdictions, was reconvened. A memorandum of understanding was agreed upon which established a program for construction of sewage treatment facilities in accordance with the treatment requirements established in an AFO report. Construction is in progress at the D.C. treatment plant, Virginia treatment facilities are being upgraded, and Maryland has not as yet selected the sites for additional treatment plants.

The Interstate Task Force has been set up to implement the program adopted by the Conference for the metropolitan Washington area. Upstream problems, with exception of the need to control nutrients reaching the estuary, are receiving the attention of the specific states involved.



POTOMAC ESTUARY

Figure III