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PRESSURES ON THE EDGES OF CHESAPEAKE BAY – 1973

APRIL 1974

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PRESSURES ON THE EDGES OF CHESAPEAKE BAY - 1973

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PREFACE

With funds provided by the Research Applied to National Needs program of the National Science Foundation (Grant No. G.I. 38973), the Wetlands/Edges Program of the Chesapeake Research Consortium initiated during the fall of 1973 a study of the problem of incremental physical alterations of the edges of Chesapeake Bay. The goal of this study is:

> To develop information, criteria and guidelines which can be used to improve the management of physical alterations of the edges of Chesapeake Bay.

Objectives considered necessary for attainment of the program goal have also been established. The objectives are:

1. To identify the principal patterns, trends and rates of physical alteration of the edges of Chesapeake Bay.

2. To assess the present and future environmental significance of these patterns, trends and rates.

3. To develop a greater understanding of the decision making process pertaining to physical alterations of the Bay.

4. To evaluate policies and programs affecting land use and environmental quality of the Bay's shore zone.

The research approach selected to achieve the goal and objectives of the study involves three distinct but related activities.

1. Analyses of existing shoreline conditions.

   These analyses are being undertaken to identify present patterns of shoreline characteristics, conditions, and use.

2. Analyses of permit applications for physical alteration of the edges of the Bay which have been submitted to the Corps of Engineers. (Approximately 2,000 were submitted during 1973)

   The analyses are being made in order to determine trends and rates as well as patterns of physical alterations.

3. Detailed case studies of:

   a). Permit applications
   b). Generic problems (Shoreline protective structures, marinas, etc.)
   c). Geographical areas (Shore zone areas with numerous alterations)

   These studies are being undertaken to develop information necessary for: 1) environmental assessments of the condition(s) of the shoreline, 2) analyses of the decision process pertaining to physical alterations, and 3) evaluation of policies and programs affecting shore zone land use and environmental quality.

4. General assessments.

   Assessments of shoreline conditions, analysis of the decision process, and evaluations of policies and programs affecting shore zone land use and environmental quality will be undertaken in this component of the program.

The material reported herein is based upon an initial analysis of permit applications that were submitted to the Corps of Engineers during 1973. In addition to being necessary for attaining long range objectives of the program, the study was also designed to give local, state, and federal management personnel of the Chesapeake region a more detailed and useful understanding of the present pressures for the physical alteration of the edges of Chesapeake Bay. Bay managers should thereby be able to better focus their attention on the more significant environmental problems.

Several Bay-area agencies have actively participated in the preparation of this report. Their assistance is gratefully acknowledged. Special thanks go the Baltimore and Norfolk District Offices of the U. S. Army Corps of Engineers.

William H. Queen
Wetlands/Edges Program Manager

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SUMMARY

In an effort to identify current pressures for the physical alteration of the Chesapeake Bay, permit applications (1,691) submitted to the Baltimore and Norfolk District Offices of the U.S. Army Corps of Engineers during 1973 were analyzed. Data were collected on both applications submitted and permits granted. In the analysis, emphasis was placed on:

1) the spatial distribution of application and permit types;

2) the structure types (bulkheading, dredging, etc.) most frequently applied for and most frequently granted;

3) the distribution of applications and permits according to extent or magnitude of alteration (e.g., spoils disposal applications involving less than 100, 100-150, 500-1000, etc. cubic yards);

4) the distribution of applications and permits according to ownership and use;

5) wetlands and critical natural areas potentially impacted by physical alterations of the shore zone.

Applications and permits were found to be unequally distributed along the 8,000 miles of Bay shoreline. In Maryland, 55 percent of the applications (for which county data were available) came from only three counties: Anne Arundel, Baltimore and Talbot. Areas in Virginia that appear to be under the greatest pressure are: Virginia Beach, Norfolk, and Lancaster and York Counties. These four areas accounted for 43 percent of the Virginia applications.

Applications and permits are routinely categorized by most Bay management agencies according to approximately 20 structure types. However, over 76 percent of the Maryland applications were found to involve only four of these structure types: piers, piles, bulkheads and fill. Similar data was obtained for Virginia; piers, bulkheading, fill, and dredging or channelization accounted for 65 percent of the applications. Permits were found to have been granted (as of March 15, 1974) for a much lower percentage of dredging and channelization applications than for piers, piles and bulkheading applications.

Data pertaining to extent or magnitude of alteration were found to vary with structure type. A substantial percentage of the material dredged (fill, spoil) involved a relatively small number of permits. Of the Maryland permits for fill, 23 percent involved 94,500 cubic yards of material. The remaining 77 percent involved a total of only 6,190 cubic yards. Of the Maryland permits for dredging or channelization, 55 percent involved 147,500 cubic yards of spoil. The remaining 45 percent amounted to the relatively small total of 2,130 cubic yards. In Virginia, 47 permits for fill had been granted as of March 15, 1974. Of these 47, five (10.6 percent) accounted for 1,054,000 cubic yards of fill while the remaining 42 (89.4 percent) accounted for only 16,800 cubic yards.

Most bulkheading permits, unlike those for dredging and fill, involved relatively short segments of shoreline, typically 300 feet or less. The most frequently applied for length is 100-150 feet. As of March 15, 1974, 206 permits involving 39,500 feet of shoreline (about 7.5 miles) had been granted. Another 364 applications for bulkheading were pending as of the same date.

A substantial percentage of the applications received by both the Baltimore and Norfolk Offices of the Corps came from private citizens. Most involved alterations that would enhance the use of their property for either residential or recreational purposes.

Of the applications for which shoreline data were available (1,059), 265 (25%) involved marshes. From the information examined to date, most of the applications appear to involve narrow fringing marshes rather than extensive marshes.

The distribution of applications relative to "critical natural areas" has been depicted graphically on a map of Chesapeake Bay (Plate 2 in the envelope attached to the back cover). The map shows:

1) sites in the Bay area for which applications were received during 1973;

2) publicly owned areas (many are wildlife preserves);

3) natural areas which have been recommended for acquisition (with buffer zones where considered necessary) on either a first or second priority basis by the Smithsonian Institution.

From the work reported herein, the following observations and conclusions also appear to be justified:

1) In order for Bay management and advisory agencies to improve decisions regarding future development, a need exists to more fully analyze and evaluate the temporal and spatial patterns of shoreline alterations on the Bay. For such analyses and evaluations, selected information from permits currently being granted should be retained. Permits from selected previous years, such as 1968 and 1963, should also be analyzed.

2) Detailed studies of geographical areas with numerous alterations, and of certain alteration problems with a potential for serious impact should be performed.

3) In order to better identify the Bay shoreline development pattern, those permits involving wetlands which do not require a Corps of Engineers permit should be analyzed.

4) Assessments of impacts resulting from shoreline alterations must include the analysis of the integrated effects of large numbers of alterations which have little impact when considered separately. (The rate of disappearance of wetlands can be ascertained only by evaluating the cumulative effects of all alterations.)

5) Pressures for the alteration of the edges of Chesapeake Bay are unequally distributed along the 8,000 miles of the Bay's shoreline. Many applications and permits are a part of "alteration clusters" that are not coexistent with either geographical areas (waterways, etc.) or political boundaries (cities, counties, etc.). Information relative to these clusters can be used by local, state and federal management agencies in identifying high priority areas for regional planning.

INTRODUCTION

People are attracted to the shore zone of the Chesapeake Bay by its recreational opportunities and by the amenity of a residence on or near the water; industries are attracted by the water itself---as an industrial coolant, as a waste disposal system, or as a maritime transportation system. In order to take advantage of a coastal location, it is often necessary to undertake projects which physically alter the coastline or the submerged bed. Piers and bulkheads must be built, water intake and effluent discharge structures erected, and boat channels deepened. Moreover, since the coastline is finite, pressure exists for meeting spatial needs for industrial and residential sites by the dredging of new lagoons or by the creation of artificial land areas by fill. The magnitude of these demands on Chesapeake Bay is reflected in the approximately 2,500 requests for permission to dredge, fill or build structures in navigable waters and wetlands which various regulatory agencies received during 1973.

Since the foreshore, the water column, and submerged land are, generally speaking, "common property," there is a particular justification for governmental regulation of the propriety of such projects. Without governmental intervention, resources of this region could be overused and destroyed. Various units of government have responded to the need for regulation. At the federal level, permission of the Army Corps of Engineers is required as a prerequisite to any construction, excavation or filling in navigable waters. Both Maryland and Virginia have enacted "Wetlands laws" which establish a state and county role in the evaluation of shorefront development projects. Finally, various local governments may become involved in the exercise of their traditional regulatory powers over harbor and shorefront areas, or through the exercise of zoning and public health powers.

Although government involvement in the regulation of physical alterations of Chesapeake Bay is considerable, there are major obstacles to effective decision making. An inadequate understanding of the cumulative impacts of incremental alterations of the edges of the Bay is an especially serious obstacle. The study reported herein was initiated to provide information considered essential to any effort to assess cumulative impacts. Specifically, this study was undertaken to identify:

a) shore zone areas around the Bay which are currently subject to the greatest pressure for physical alteration in terms of the number of permit applications for alteration, the number of permits for alteration granted, and the extent of shoreline involved;

b) the types and extents (magnitudes) of alteration to the Bay's shoreline most frequently requested, and those most frequently granted;

c) the distribution of permit applications according to ownership and use;

d) the extent to which marshes are involved in applications for shoreline alterations.

As a result of the above determinations, it is possible to make recommendations regarding the processing and disposition of some types of applications.

Any one of several methods could have been chosen for examining the alteration pressures on the edges of the Bay. For the purpose of the study, the method chosen involved an examination of the permit applications made to the Baltimore and Norfolk District Offices of the U.S. Army Corps of Engineers during the calendar year 1973. The Baltimore District Office, which has jurisdiction over fifteen Maryland and five Virginia counties in the Bay area, received 1,357 applications in 1973. Of these, 1,273 were available and analyzed for this report. The Norfolk District Office, which has jurisdiction over the remaining Virginia counties in the Bay area, received 564 permit applications in 1973. Of these, 418 were available and analyzed for this report. Thus, 1,691 applications were analyzed. The status of these applications was determined as of March 15, 1974; throughout the report, whenever application status is indicated, it is as of that date. A summary of the status of those applications analyzed is presented in Table 1.

Table 1. Status of 1,691 Applications as of March 15, 1974.

Corps of Engineers District	Total Number Applications Analyzed	Status as of March 15, 1974		
		Granted	Withdrawn	Denied
Baltimore	1,273	516	16	2
Norfolk	418	283	32	4

Much of the information presented in this report is in the form of simple tabulations of data from permit applications and granted permits. It should be emphasized, however, that this information has heretofore, for the most part, been unavailable. Two main reasons account for its availability now. The first is the cooperation of several agencies in the Bay area, which resulted in most of the data being made available to the Chesapeake Research Consortium (CRC) in one form or another. The second is the utilization of computer processing, without which the compilation of the data would have required far more time and effort.

The section following the Introduction contains the results and analyses for the State of Maryland. This is followed by a similar section for the State of Virginia, and a section containing comparisons and conclusions. A section which describes the methodology employed in compiling and analyzing the data for this report is included in the Appendix. The Maryland and Virginia results are presented separately to enhance their utilization by the various state and local regulatory and advisory agencies.

One note of caution is in order. This report represents an initial analysis of the pressures on the shoreline of Chesapeake Bay. The data could have been compiled and analyzed in many ways. Only a few selected data combinations and analyses are presented herein. It may, then, be profitable to recall a few lines from Barry Commoner's book, The Closing Circle:

> "The reason why the scientific enterprise has a well-deserved reputation for unearthing the truth about natural phenomena is not the 'objectivity' of its practitioners, but the fact that they abide by a rule long established in science..... open discussion and publication. Whatever his personal aims, values, and prejudices, when a scientist speaks and publishes openly..... presenting facts, interpretations, and conclusions .....he has done his service to the truth. For science gets at the truth not so much by avoiding mistakes or personal bias as by displaying them in public.....where they can be corrected."

MARYLAND RESULTS

The results of the analyses of the 1973 permit applications in Maryland are presented in this section. An analysis by counties, presented in the first subsection, focuses on the three counties which account for a majority of the Maryland applications. Subsections which follow analyze the applications with regard to structure types, wetlands, ownership and purpose/use.

Analysis by Counties

A summary of the status of permit applications by county is listed in Table 2. All Maryland tidewater counties except Worcester County, which is on the Atlantic Ocean, have been included. Three counties (Anne Arundel, Talbot and Baltimore) immediately emerge as those which are under the greatest pressure for alterations of their shorelines. Between them they account for 55.2 percent of the total number of Maryland applications for which county data are available. In each case, the percentage of the applications granted (36%, 40%, 38%) is quite similar. Of those counties with more than 30 applications in 1973, Harford and Queen Annes represent areas where the greatest percentage of applications had been approved as of March 15, 1974.

Table 3 illustrates the distribution of granted permits according to types of structure for six structure types in Anne Arundel, Talbot and Baltimore Counties. (Each permit may allow the construction of more than one structure type.) From Table 3, it is evident that piers and/or piles are involved in the greatest number of permits. Most of these probably represent multiple structure permits because piles are generally associated with piers. Most of the remaining permits are associated with bulkheads and/or fill. Again, these two structure types are often combined in multiple structure permits. Table 3 also shows that 48 percent or more of the Maryland permits for bulkheads, fill, piers and piles arise from these three counties. The six structure types selected for analysis are those most often applied for (See Table 8).

The number of permits associated with each of the six main structure types granted in Maryland, and the percentage of the number granted in each of the three previously designated counties are listed in Table 4. From this table, it appears that a significantly higher proportion of the permits for piers, piles, bulkheads and jetties are granted in Anne Arundel County than are granted in Talbot or Baltimore Counties. The Anne Arundel County shoreline thus seems to have undergone the potential for a greater amount of change than any other Maryland county in 1973. This could be significant if it has been the pattern over previous years or is likely to be the future pattern.

Table 2.

Summary of 1973 Maryland Permit Applications by County

County	Total Number of Applications	Number of Permits Granted as of March 15, 1974
Anne Arundel	278	99
Talbot	156	63
Baltimore	150	57
St. Marys	96	34
Calvert	72	25
Dorchester	72	35
Queen Annes	71	37
Harford	31	17
Somerset	29	6
Charles	28	12
Cecil	22	10
Kent	22	10
Wicomico	16	4
Baltimore City	9	1
Prince Georges	4	1
Caroline	2	0

Table 3.

Number of Permits Involving One or More of Six Structure Types
for Three Maryland Counties

Number of Permits* Granted as of March 15, 1974							
County	Bulkhead	Dredge	Fill	Pier	Pile	Jetty	Total
Anne Arundel	25	2	18	62	59	4	170
Talbot	15	3	15	42	36	0	111
Baltimore	16	3	18	31	27	1	96
Total	56	8	51	135	122	5	377

* Resulting from 1973 applications.

Table 4

Percentage of Total Number of Permits Granted For
Six Structure Types in Three Maryland Counties

Structure	Total Number of Permits* Granted as of 3/15/74	Percent of Total Number Granted		
		Anne Arundel County	Talbot County	Baltimore County
Pier	281	22.1	14.9	11.0
Pile	229	25.8	15.7	11.8
Bulkhead	102	24.5	14.7	15.7
Fill	93	19.4	16.1	19.4
Dredge	27	7.4	11.1	11.1
Jetty	32	12.5	0.0	3.1

* Resulting from 1973 applications

Table 5

Number of Permits per Shoreline Mile Involving
Six Structure Types for Three Maryland Counties

County	Number of Permits* Granted per Shoreline Mile as of 3/15/74					
	Bulkhead	Dredge	Fill	Pier	Pile	Jetty
Anne Arundel	.0691	.0055	.0497	.1712	.1630	.0110
Talbot	.0285	.0057	.0285	.0798	.0684	.0000
Baltimore	.0894	.0168	.1006	.1732	.1508	.0056

* Resulting from 1973 applications.

The data of Table 3 are presented in a slightly different context in Table 5, which illustrates the number of permits per mile of shoreline for each of six structure types in the three Maryland counties. Based upon this method of evaluation, the Baltimore County shoreline seems to have undergone the potential for a greater percentage of alteration, at least for four structure types, than any other Maryland county in 1973. This, again, could be significant if it reflects past patterns, or forecasts future patterns (up to the point the shoreline is saturated).

Table 6 illustrates the number of permits granted for each of four purpose and use categories for each of the three counties. The purpose and use categories selected are those for which at least thirty permits were granted. From this table it is clear that three categories (private, recreational, and residential) account for a great majority of the granted permits. This, however, does not give a complete picture of the situation because one permit for a major bulkhead or a major dredging operation could have a far greater impact than a number of smaller scale operations. This issue is examined in the next subsection. It is,however, important to note the impact of the private owner in these three counties. Anne Arundel County again emerges as the county where the quantitative pressures are the greatest. (It should be noted that more than one purpose and use may be coded for each permit.)

Table 7 summarizes information concerning the ownership associated with permits granted in the three counties. (Ownership information is available for 439 granted permits in Maryland.) This table shows that most of the structures in the three counties are privately owned, although again this should be considered in relation to structure extent, as is discussed later. Anne Arundel County again is evidently under the greatest quantitative pressure.

Analysis of Structures

The types and numbers of structures applied for in Maryland in 1973 are listed in Table 8. This table shows that piers and piles with bulkheads and fill form the predominant structures requested (76.6 percent of the total). It should be noted that each application can represent more than one structure in the cases cf piles, buoys and dolphins. For the purpose of illustration, all repair operations, regardless of structure type involved, have been combined in Table 8. A significant percentage of piers (45.7 percent) and piles (51.2 percent) had been granted as of March 15, 1974. About one quarter of the bulkheading and fill requested had been granted. Requests for dredging or channelization would seem to be examined relatively carefully because out of 188 applications, only 27 had been granted as of March 15, 1974. Most of the other structures are in such small numbers that no useful comment relative to pressure on the Bay is possible.

Table 6. Number of Permits Involving Four Purpose and Use Categories Granted in Three Maryland Counties.

	Number of Permits* Granted as of 3/15/74			
County	Private	Recreational	Residential	Commercial
Anne Arundel	85	74	61	8
Talbot	54	42	32	2
Baltimore	47	41	37	2
Total	186	157	130	12
Maryland Total	359	315	216	37

* Resulting from 1973 applications

Table 7. Number of Permits Involving Three Ownership Categories Granted in Three Maryland Counties.

	Number of Permits* Granted as of 3/15/74		
County	Private	Corporate	Public Utility
Anne Arundel	82	7	3
Talbot	55	3	0
Baltimore	49	1	1
Total	186	11	4
Maryland Total	362	36	8

Table 8. Summary of Structure Types Applied for in Maryland During 1973.

Structure	Total Number Requested	Number Granted as of 3/15/74
Pier	615	281
Bulkhead	395	101
Fill	351	93
Pile	447	229
Dredge or Channelization	188	27
Jetty or Groin	76	32
Riprap	57	20
Ramp	37	11
Building	36	14
Intake & Discharge Pipe	13	1
Buoy	9	7
Aerial Crossing	8	4
Submerged Cable	7	3
Pipeline	6	0
Dolphin	5	1
Spoil Disposal	3	0
Marine Railroad	2	1
Berm	1	0
Dam	1	0
Duck Blind	1	0
Repair (all structure types)	104	40
Totals	2362	866

Figure 1 depicts the relationship between the number of piles per permit and number of permits. This figure clearly shows that most of the permits (mainly for private purposes) are modest and involve from two to four piles. Six permits out of the total of 229 involve 40 or more piles. Such installations, even though large, probably do not represent a major threat to the bay, since there are so few of them. A total of 1340 piles had been approved as of March 15, 1974. This represents a substantial increase in the number of piles in the Bay.

In the case of bulkheads, the majority of permits are for structures 50-150 feet long, as is illustrated by Figure 2. This dimension range is typical of private property widths. The 101 permits for bulkheading granted as of March 15, 1974, represent a total extent of about 19,700 feet (about 3.7 miles). Ten of the permits account for bulkheads of over 500 feet in extent, representing a total extent of about 8,500 feet. This compares with 63 permits for bulkheads 0-150 feet totaling about 5,570 feet, and 28 permits for bulkheads 150-500 feet totaling about 5,660 feet.

The majority of pier permits (61.9 percent) apply to piers less than 100 feet in extent. A limitation is imposed by the Corps of Engineers with respect to the channelward extent of piers, in that they may not extend beyond one third of the channel width and may not impede navigation. Some of the more extensive piers are parallel rather than perpendicular to the shore. A summary of the number of permits granted for various pier extents is illustrated in Table 9. (The extent is computed as the total length of the new structure.)

Table 9. Number of Permits Involving Various Pier Extents Granted for Maryland.

Pier Extent in Feet	Number of Permits* Granted as of 3/15/74
0-50	81
50-100	93
100-150	74
150-200	17
200-250	6
250-300	6
>300	4

*Resulting from 1973 applications

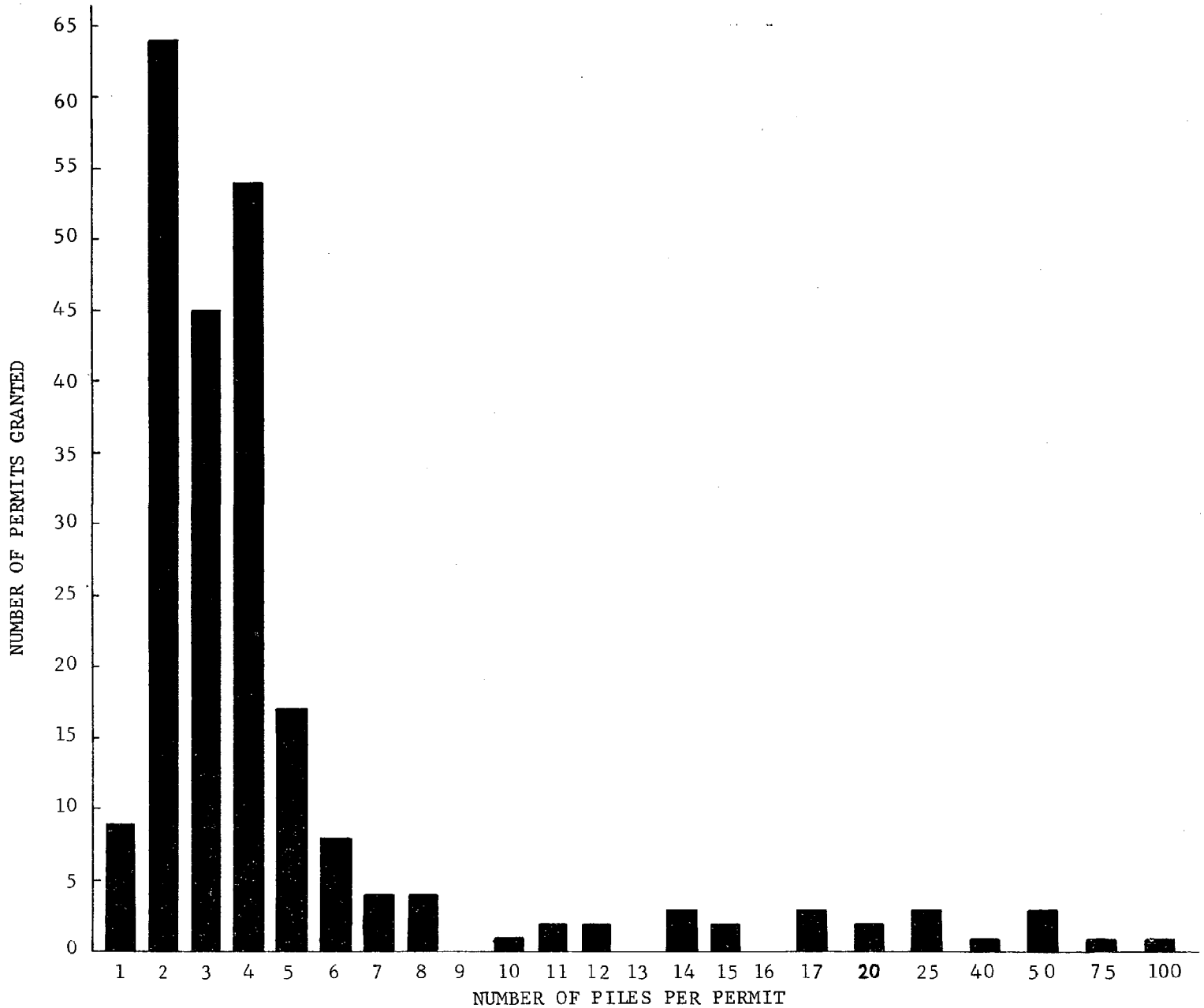

Fig. 1. Number of permits versus number of piles per permit for Maryland.

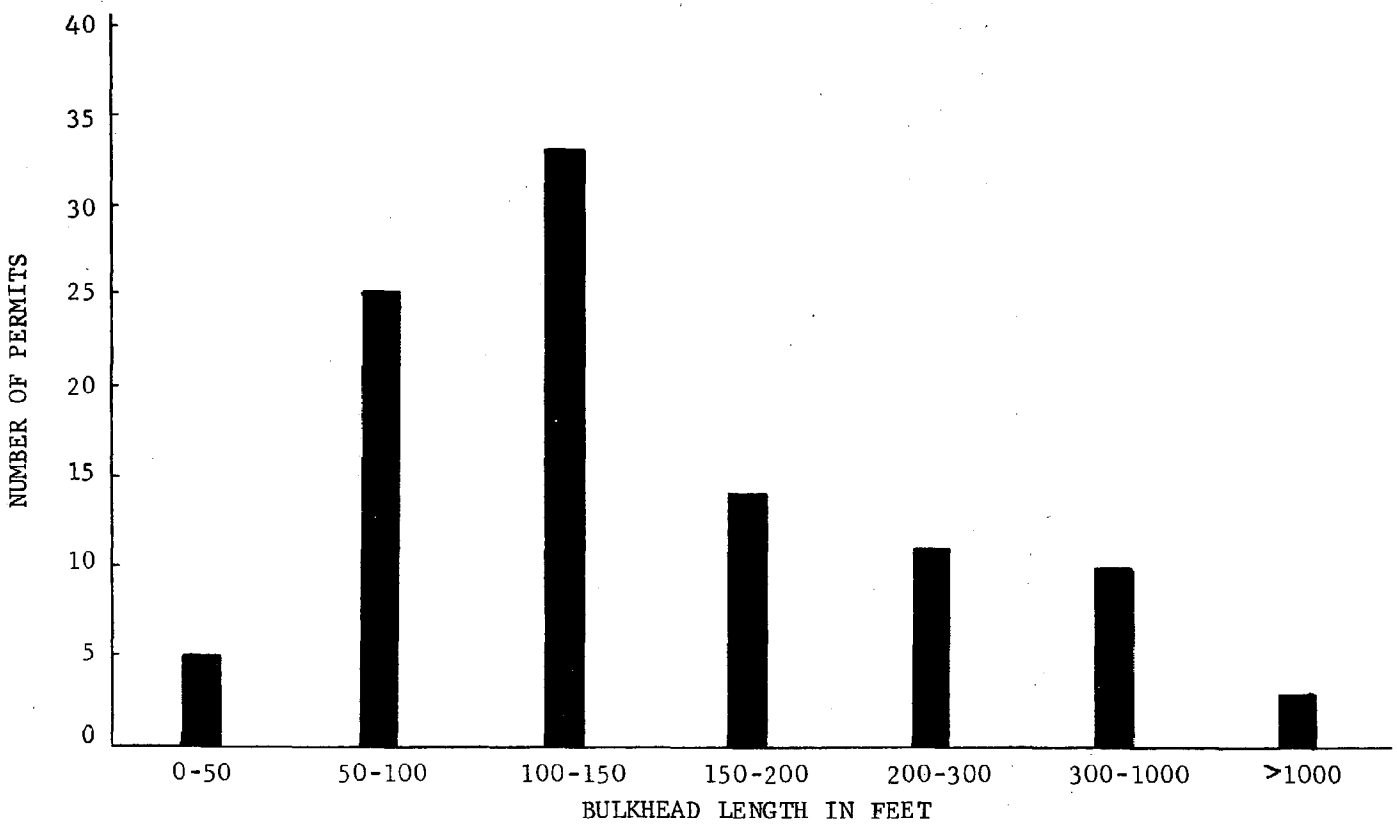

Fig. 2. Number of permits versus bulkhead length for Maryland.

Of the permits for fill, 22.7 percent involve a total of 94,500 cubic yards of material. (Each of these permits is for 500 cubic yards or more of fill.) The remaining 77.3 percent involve a total of 6,190 cubic yards. This clearly demonstrates that a few permits involving large extents could be more damaging to the environment than a large number of permits involving small amounts of material. Of the permits for dredging or channelization, 55.5 percent involve a total amount of 147,500 cubic yards of spoil. (Each of these permits is for 500 cubic yards or more.) The remaining permits account for a relatively small total of 2,130 cubic yards. Here again, one or two permits involving large volumes can present a greater hazard to the environment than a mass of smaller ones. Table 10 summarizes the extents in cubic yards associated with the permits granted for fill and for dredge or channelization.

The locations of the structures in the Upper Bay which had been granted by permit as of March 15, 1974, are illustrated on Plate 1, which is inserted in the envelope attached to the inside of the back cover of the report. The pressures on Baltimore and Anne Arundel Counties are immediately apparent. That these counties represent somewhat older areas of development is evident from the relatively large proportion of structures coded "X", representing structure repair. Also apparent is the rather extensive new development taking place in the Talbot County area. Other "hot spots" of development appear at Havre de Grace (at the mouth of the Susquehanna River) and at Solomons (at the mouth of the Patapsco River).

Table 10. Summary of Permits Granted for Fill, and for Dredge or Channelization in Maryland.

Extent In Cubic Yards	Number of Fill Permits* Granted as of 3/15/74	No. of Dredge & Channelization Permits* Granted As of 3/15/74
0-50	29	2
50-150	22	1
150-500	17	9
500-2,000	12	5
2,000-10,000	4	5
10,000-50,000	3	3
>50,000	1	2
Total	88	27

*Resulting from 1973 applications

Analysis of Wetlands

A total of 686 applications for alterations to the edges of Chesapeake Bay in Maryland were made to the Baltimore District of the Corps of Engineers in 1973 for which shoreline data are currently available. Of these, 161, or 23.5 percent, actually involved marshes. Because shoreline types for the Maryland permit applications are determined from 7.5-minute U.S.G.S. quadrangles, a number of fringe marshes probably went undetected. Table 11 shows the distribution by county of the applications and permits involving marshes. This table shows that five counties (Anne Arundel, Baltimore, Dorchester, Queen Annes and Talbot) are responsible for about 73 percent of the applications involving marshes. The percentage of permits granted in these counties ranges from 51 percent for Talbot to 78 percent in Baltimore. This suggests that all of these counties should be examined carefully with respect to the number of permits granted.

The distribution of the applications and permits in relation to extensive marshes is shown in Table 12. Extensive marshes appear to be under pressure in Dorchester, Queen Annes and Harford Counties, although the low number involved makes this somewhat uncertain.

Analysis by Ownership and Purpose/Use

Ownership information for applications and granted permits for which the information is available is summarized in Table 13. Table 14 contains data on the distribution of purpose/use categories. With respect to sheer numbers of applications and permits, it is immediately evident that the greatest pressures are coming from the private sector, since purpose/use categories Private and Residential both refer to private use, and Recreational category nearly always refers to private use. These two tables do not necessarily indicate the severity of possible damage to the Bay, because the 29 industrial and public utility applications (see Table 14), could involve far greater changes to the shoreline than the 369 residential applications. In Table 13, the only significant ownership group besides private is the corporate group. It is interesting to note in Table 13, however, the relatively high percentage of State applications which have been granted. In Table 14, the only quantitatively significant purpose/use group besides those which are predominately private is the commercial group.

Table 11. Distribution of Applications and Permits in Maryland Involving Marshes.

County	Number of 1973 Applications With Shoreline Data Available	Number of 1973 Applications With Marshes	Number of Permits* Granted as of 3/15/74 With Marshes
Anne Arundel	178	27	18
Baltimore	101	23	18
Calvert	49	5	4
Caroline	1	0	0
Cecil	17	8	5
Charles	6	4	2
Dorchester	54	21	13
Harford	25	9	9
Kent	13	3	1
Prince Georges	3	0	0
Queen Annes	55	17	11
Saint Marys	47	7	3
Somerset	10	5	3
Talbot	117	29	15
Wicomico	10	3	0
Total	686	161	102

*Resulting from 1973 applications.

Table 12. Distribution of Maryland Applications and Permits Involving Extensive Marshes.

County	Total Number of Applications Involving Extensive Marshes	Number of Permits* Granted as of 3/15/74 Involving Extensive Marshes
Harford	7	7
Dorchester	6	4
Queen Annes	6	4
Baltimore	4	3
Wicomico	3	0
Somerset	3	2
Anne Arundel	2	0
Talbot	1	1
Total	32	21

* Resulting from 1973 applications.

Table 13. Summary of Ownership Categories for Maryland Applications and Permits.

Ownership	Total Number of Applications	Number of Permits* Granted as of 3/15/74
Private	900	364
Corporate	108	36
County Government	29	7
Unincorporated Group	20	5
State of Maryland	25	13
Public Utility	19	8
Local Government	13	6
Federal Government	5	2
Total	1119	441

* Resulting from 1973 applications.

Table 14. Summary of Purpose/Use Categories for Maryland Applications and Permits.

Purpose/Use	Total Number of Applications	Number of Permits* Granted as of 3/15/74
Private	625	359
Recreational	495	315
Residential	369	216
Commercial	88	37
Public Utility	19	8
Maritime	19	11
Industrial	10	2

* Resulting from 1973 applications.

Discussion

As has been evident from previously presented data, many applications involve more than one type of structure. In a sample of 380 granted permits from the Baltimore Office of the Corps of Engineers, the distribution of number of structures per granted permit is as illustrated in Table 15. Permits involving one or two structures account for about 82 percent of the granted permits. Unless permits for three or more structures involve major alterations, it would not seem that multiple-structure permits represent a major pressure on the edges of the Bay. An average of 1.82 structures per permit resulted from the permits analyzed. (Note that piles, buoys, and dolphins were treated as one structure for each permit in which they were involved.)

A map of the entire Chesapeake Bay (Plate 2) is inserted in the envelope attached to the inside of the back cover of the report. This map shows:

a) sites in the Bay area for which applications for alterations were received during 1973,

b) present reserves of various kinds (parks, flora and fauna, military reservations, etc.),

c) county and state boundaries, and

d) further areas which have been recommended for acquisition (with buffer zones, where considered necessary) on either a first or second priority basis by the Smithsonian Institution (Ref. 1).

Table 15. Summary of Number of Structures per Granted Permit in Maryland

Number of Structures per Permit	Number of Permits
1	178
2	133
3	41
4	18
5	7
6	3

This map emphasizes the great pressures that currently exist in the Maryland Counties of Anne Arundel, Baltimore and Talbot. It also shows that some applications border on areas proposed for future conservation. Action to preserve the coastline in the three counties would seem to deserve a high priority.

Since about one half of all Maryland applications for bulkheads, fill, piers and piles arise from these three counties, careful consideration should now be given to the present length of shoreline bulkheaded and the total number of piles and piers in order to determine how many more of these structures should be allowed. Since a high percentage of piers and piles are generally approved, it would seem that the time has come when some decisions should be made regarding the total number of each kind of structure that may be allowed in specific areas. Because of the serious impacts which can arise from bulkheads and fill, similar decisions should be made regarding these structure types. A complete survey of the critical areas would be necessary before such decisions could be made.

While the number of applications provides an indication of the pressures on the various areas, it is an accurate reflection only when it is related to usage. Industrial, public utility, commercial or governmental uses may all have greater impacts upon the environment than private uses, and an evaluation of the size and extent of such applications should be given high priority, particularly for applications involving bulkheading, filling and dredging.

The greatest pressure on wetlands seems to exist in Baltimore and Anne Arundel counties. Since there are only relatively small areas of wetlands left in these counties, careful analysis of the impacts of shoreline alterations on the remaining wetlands should be made.

Extensive marshes may have been adversely impacted in Talbot, Dorchester and Queen Annes Counties. These counties still possess considerable areas of wetlands, but the situation is such that the existing areas should be preserved. A survey conducted by the Smithsonian Institution (Ref. 1) recommends the acquisition of first and second priority areas, some with buffer zones, throughout the Bay (see Plate 2). In view of the requests involving extensive marshes in the three above mentioned counties, there would seem to be a strong case for the State of Maryland vigorously protecting both categories of wetlands in these counties.

VIRGINIA RESULTS

The results of the analyses of the 1973 permit applications in Virginia are presented in this section. An analysis by counties and independent cities, presented in the first subsection, focuses on the four areas which account for almost one-half of the Virginia applications. Subsections which follow analyze the applications with regard to structure types, wetlands, ownership and purpose/use.

Analysis by Counties and Independent Cities

Of the 418 permit applications for 1973 available from the Norfolk District Office of the Corps of Engineers, 13 pertained to proposed alterations to the Atlantic Ocean shoreline in Accomack County or Virginia Beach. These 13 will not be considered further. The Baltimore District Office of the Corps received 50 applications from the five Virginia counties in which it has jurisdiction. A total of 455 applications for the State of Virginia will thus be considered in this report. A summary of the status of these applications by county is presented in Table 16. Because Virginia counties are smaller and have lower population density than Maryland counties, on the average, and because of the existence of a number of independent cities in Virginia, the number of applications per jurisdiction in Table 16 is generally less than the corresponding listing for Maryland (see Table 2).

Of the Virginia areas analyzed, Virginia Beach stands out as the area under greatest pressure for shoreline alteration. Lancaster County, Norfolk, and York County are under substantial pressure, and were selected with Virginia Beach for more detailed analysis. The four areas represent about 43.5 percent of the Virginia applications for which data are available, and will hereafter be referred to as the "Detailed Analysis Areas" (DAA's). Of the 455 Virginia applications analyzed, 62.9 percent had been granted as of March 15, 1974 . The percentage granted in the Detailed Analysis Areas varied from about 56.8 percent in Lancaster County to about 78.8 percent in York County. Of those counties with more than 20 applications in 1973, the county with the lowest percentage granted is Northumberland. An unusual situation exists with respect to Northumberland County, since part of it is within the jurisdiction of the Baltimore District of the Corps, and the remainder is within the Norfolk District jurisdiction.

The distribution of granted permits according to structure type (for the five most often applied for structures) in the DAA's is listed in Table 17. (Each permit may allow the construction of more than one structure type.) Evident from the table is the relatively large number of permits for bulkheading, fill and piers in Virginia Beach. Also evident is the relatively large amount of dredging, channelization and spoil disposal in Lancaster County.

Table 16. Summary of 1973 Virginia Permit Applications by County or Independent City.

County or Independent City	Total Number of Applications	Number of Permits Granted as of 3/15/74
Virginia Beach (Chesapeake Bay)	79	58
Lancaster	51	29
Norfolk	35	21
York	33	26
Northumberland	32	9
Accomack (Chesapeake Bay)	29	17
Middlesex	23	18
Gloucester	19	14
Mathews	18	8
Westmoreland	17	7
Essex	15	13
Hampton	15	10
Chesapeake	11	5
Portsmouth	11	8
James City	11	10
Newport News	9	5
Richmond County	9	5
Fairfax	8	2
Northampton (Chesapeake Bay)	5	2
Prince George	4	4
Chesterfield	3	1
Isle of Wight	3	2
New Kent	3	3
Prince William	3	1
Suffolk	3	3
King George	2	1
Surry	2	2
Charles City	1	1
Henrico	1	1

Table 17. Number of Permits Involving One or More of Five Structure Types Granted for the Virginia Detailed Analysis Areas.

Area	Number of Permits* Granted as of 3/15/74					
	Pier	Bulkhead	Dredge or Channelization	Fill	Spoil Disposal	Total
Virginia Beach	20	32	6	12	7	77
Lancaster County	13	14	11	6	10	54
Norfolk	4	5	4	4	7	24
York County	12	13	4	5	0	34
Total	49	64	25	27	24	189

* Resulting from 1973 applications

Table 18. Percentage of Total Number of Permits Granted for Five Structure Types in the Virginia Detailed Analysis Areas.

Structure	Total Number of Permits* Granted as of 3/15/74	Percent of Total Number			
		Virginia Beach	Lancaster County	Norfolk	York County
Pier	122	16.4	10.7	3.3	9.8
Bulkhead	105	30.5	13.3	4.8	12.4
Dredge or Channelization	47	12.8	23.4	8.5	8.5
Fill	47	25.5	12.8	8.5	10.6
Spoil Disposal	38	18.4	26.3	18.4	0.0

*Resulting from 1973 applications

Table 19. Number of Permits Granted per Shoreline Mile Involving Five Structure Types for the Virginia Detailed Analysis Areas.

Area	Number of permits* granted per shoreline mile as of 3/15/74				
	Pier	Bulkhead	Dredge or Channelization	Fill	Spoil Disposal
Virginia Beach	.2564	.4103	.0769	.1538	.0897
Lancaster County	.0778	.0838	.0659	.0359	.0599
Norfolk	.0290	.0362	.0290	.0290	.0507
York County	.0625	.0677	.0208	.0260	.0000

*Resulting from 1973 applications

The number of permits associated with each of the five main structure types granted in Virginia, and the percentage of the number granted in each of the DAA's are illustrated in Table 18. From this table, it appears that a larger percentage of permits for fill, bulkheads and piers is granted in Virginia Beach than is granted in any of the other areas. Also, it can be seen that a larger percentage of permits for dredge or channelization and for spoil disposal is granted in Lancaster County than is granted in any of the other areas. (The majority of Lancaster County permits are concentrated in Carter Creek.) Thus, the shorelines of these two areas seem to have undergone the greatest amount of change in 1973. This could be significant if it reflects past patterns or forecasts future patterns (up to the point the shoreline is saturated).

Table 19 illustrates the number of permits per mile of shoreline for each of the five structure types in the Virginia DAA's. This method of evaluation emphasizes the pressures on Virginia Beach, in that it seems to have undergone the potential for the greatest percentage of alteration in all five structure categories.

Table 20 illustrates the number of permits granted for each of five purpose and use categories for the Virginia DAA's. The purpose and use categories selected are those which were involved in at least 50 permits. (More than one purpose and use may be involved in each permit.) The table illustrates the high proportion of erosion control projects in Virginia Beach. Of the erosion control projects in Virginia Beach, 30 of the 36 are associated with the use category Residential. (Five are associated with the Private category, and one with the Recreational category.) None of the areas appears to have experienced major additional commercial impact as a result of 1973 applications. This summary does not give a complete picture of the situation, however, because one permit for a major bulkhead or a major dredging operation could have a far greater impact than a number of smaller scale operations.

Table 21 summarizes information concerning the ownership associated with permits granted in the DAA's. This table shows that an overwhelming majority of the structures in these areas are privately owned, although this should be considered in relation to structure extent, as is discussed later. Five of the six Norfolk permits in the "all other" category involve Federal Government ownership.

Table 20. Number of Permits Involving Five Purpose and Use Categories Granted in the Virginia Detailed Analysis Areas.

Area	Number of permits* granted as of 3/15/74				
	Private	Residential	Recreational	Erosion Control	Commercial
Virginia Beach	14	46	17	36	1
Lancaster County	27	15	14	11	3
Norfolk	6	8	7	3	4
York County	20	16	11	3	2
TOTAL	67	85	49	53	10
Virginia Total	145	125	123	76	51

*Resulting from 1973 applications

Table 21. Number of Permits Involving Three Ownership Categories Granted in the Virginia Detailed Analysis Areas.

Area	Number of Permits* Granted as of 3/15/74		
	Private	Corporate	All Other
Virginia Beach	56	2	0
Lancaster County	26	3	0
Norfolk	10	5	6
York County	21	2	3
TOTAL	113	12	9
Virginia Total	212	46	28

*Resulting from 1973 applications

Analysis Of Structures

The types and numbers of structures applied for in Virginia in 1973 are listed in Table 22. Piers, bulkheads, dredge or channelization, and fill represent about 65 percent of the structures requested. It should be noted that each application in Table 22 can represent more than one structure in the cases of piles, buoys, and dolphins. For the purpose of the listing, all repair operations, regardless of structure type involved, have been combined in Table 22. Over 50 percent of five of the structure types (pier, bulkhead, spoil disposal, jetty or groin, pile) had been granted as of March 15, 1974. Requests for dredging or channelization apparently undergo relatively careful examination since only 47 of the 134 applications (about 35 percent) had been approved as of March 15, 1974.

The 53 applications involving piles represent a total of 434 piles; the 43 granted permits represent 204 piles. Thus, each granted permit is for, on the average, about five piles. Of the 10 applications still active, one is for 107 piles and another is for 39 piles.

Figure 3 depicts the size distribution of bulkheads for which permits have been granted. The majority of the permits are for structures 50-199 feet long, which is a dimension range typical of private property widths. The 105 permits for bulkheading granted as of March 15, 1974, represent a total length of about 19,800 feet (about 3.8 miles). The 57 permits for bulkheads from 0 to 149 feet in length account for a total length of about 5,730 feet. The 34 permits for bulkheads from 150 to 299 feet long represent a total length of about 6,770 feet. Fourteen of the permits account for bulkheads of 300 feet or more in extent, and account for a total length of about 7,320 feet.

The majority of pier permits (59.8 percent) are for piers less than 100 feet in extent. Some of the larger piers are parallel rather than perpendicular to the shoreline. Pier extent is computed as the total length of the new structure. A summary of the number of permits granted for various pier extents appears in Table 23.

Of the 47 permits for fill, five (10.6 percent) account for a total of 1,054,000 cubic yards. (Each of these permits is for 39,000 cubic yards or more of fill.) The remaining 89.4 percent involve a total of about 16,800 cubic yards. This vividly illustrates that a few permits involving large extents of fill can be more damaging to the environment than a large number of permits involving small amounts of material.

Table 22. Summary of Structure Types Applied for in Virginia During 1973

Structure	Total Number Requested	Number Granted as of 3/15/74
Pier	182	122
Bulkhead	175	105
Dredge or Channelization	134	47
Fill	108	47
Spoil Disposal	70	38
Jetty or Groin	56	40
Pile	53	43
Building	25	14
Crab Impoundment	15	12
Aerial Crossing	11	8
Riprap	10	3
Buoy	9	9
Dolphin	9	9
Submerged Cable	3	3
Pipe, Intake or Discharge	5	2
Bridge	1	0
Fence	1	1
Marine Railroad	1	1
Repair (all structure types)	54	36
Totals	922	540

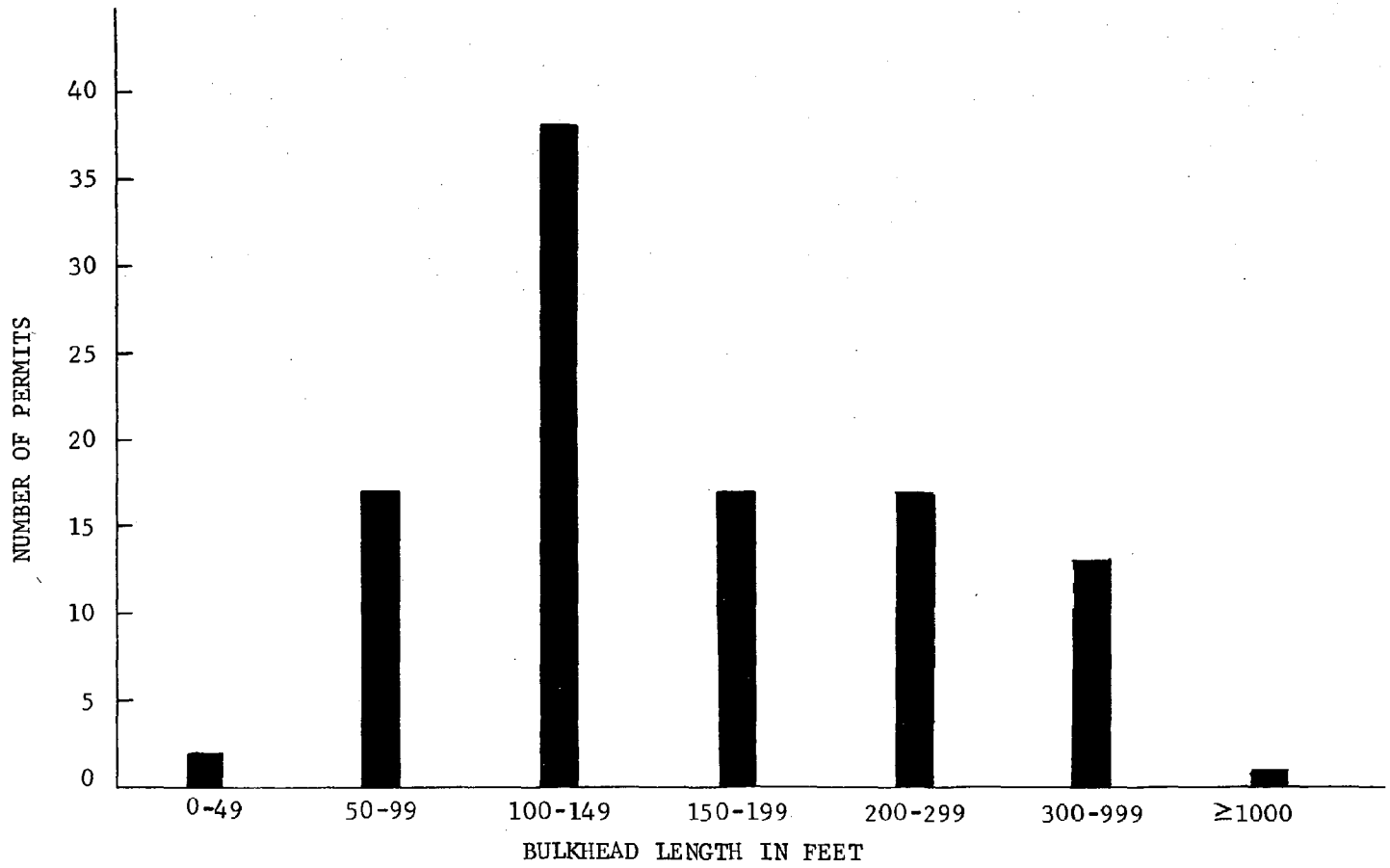

Fig. 3. Number of permits versus bulkhead length for Virginia.

Of the permits for dredging or channelization, 17 of the 47 (36.2 percent) account for 855,300 cubic yards. (Each of these permits is for 1,000 cubic yards or more.) The largest amount of material approved for dredging is 500,000 cubic yards, in a permit to the City of Portsmouth. The remaining 30 permits account for a relatively small total of 7,200 cubic yards. Here again, a few permits can represent a greater hazard to the environment than a mass of smaller ones. Table 24 summarizes the amounts of material in cubic yards associated with the permits granted for dredge and channelization, fill, and spoil disposal.

The locations of the structures in the Lower Bay which had been granted by permit as of March 15, 1974, are illustrated on Plate 3, which is inserted in the envelope attached to the inside of the back cover of the report. The pressures on Virginia Beach are immediately apparent. Also evident is the development taking place in the other Virginia Detailed Analysis Areas. Older areas of development may be determined by the presence of a relatively large proportion of structures coded "X", representing structure repair. It should be noted that the apparent "hot spot" of development on Tangier Island represents, for the most part, crab impoundments and associated structures, and should not be considered a serious pressure on the Bay. It should also be noted that those structures in Virginia granted by the Baltimore District of the Corps appear on Plate 1.

Table 23. Number of Permits Involving Various Pier Extents Granted for Virginia.

Pier Extent in Feet	Number of Permits* Granted as of 3/15/74
0-49	33
50-99	40
100-149	21
150-199	13
200-249	7
250-299	4
$\geq$ 300	4

*Resulting from 1973 applications.

Table 24. Summary of Permits Granted for Fill, Spoil Disposal, and Dredge/Channelization in Virginia.

Extent in Cubic Yards	Number of Dredge and Channelization Permits* Granted as of 3/15/74	Number of Fill Permits* Granted as of 3/15/74	Number of Spoil Disposal Permits* Granted as of 3/15/74
0-49	4	6	4
50-149	1	14	2
150-499	15	10	10
500-1,999	17	11	11
2,000-9,999	2	1	2
10,000-49,999	5	1	4
≥50,000	3	4	4

* Resulting from 1973 applications.

Analysis of Wetlands

A total of 373 applications for alterations to the edges of Chesapeake Bay in Virginia were made to the U.S. Army Corps of Engineers in 1973 for which shoreline data are currently available. Of these, 104, or 27.9 percent, involved marshes. (Since U.S.G.S. 7.5-minute quadrangles are sometimes used to determine the shoreline types in Virginia, some fringe marshes might have gone undetected.) Table 25 shows the distribution of the applications and permits by county and independent city. From the table, it can be seen that three areas (Lancaster County, Virginia Beach, and Gloucester County) are responsible for about 36 percent of the applications involving marshes. The percentage of applications granted in these areas varies from about 21 percent in Lancaster County to about 55 percent in Gloucester County.

Marshes represent only one-half of one percent of the total area of the State of Virginia, but play an indispensible role with respect to fisheries, wildfowl and animal populations, shoreline stability, water quality and protection from coastal flooding. With such a limited resource and with a destruction rate far in excess of a recruitment rate, it must be concluded that all uses or activities which destroy or degrade any type of wetlands have consequences which are environmentally undesirable. This suggests that any applications which involve the destruction or degradation of wetlands should continue to be examined with extreme care.

Table 25. Distribution of Applications and Permits in Virginia Involving Marshes.

County or Independent City	Number of 1973 Applications With Shoreline Data Available	Number of 1973 Applications Involving Marshes	Number of Permits* Granted as of 3/15/74 Involving Marshes
Virginia Beach	75	12	3
Lancaster	48	14	3
Norfolk	30	7	2
York	30	5	3
Northumberland	21	8	2
Middlesex	20	6	4
Gloucester	19	11	6
Mathews	17	5	2
Essex	14	2	2
Hampton	13	2	0
Portsmouth	11	3	0
James City	10	1	1
Accomack (Chesapeake Bay)	10	7	1
Richmond County	8	3	0
Chesapeake	8	5	2
Westmoreland	6	0	0
Newport News	6	2	1
Northampton (Chesapeake Bay)	5	1	0
Suffolk	3	3	3
Isle of Wight	3	3	2
Fairfax	3	0	0
Prince George	3	1	1
Chesterfield	2	1	0
New Kent	2	1	1
Prince William	2	0	0
King George	1	1	1
Surry	1	0	0
Charles City	1	0	0
Henrico	1	0	0

* Resulting from 1973 applications.

Analysis by Ownership and Purpose/Use

Ownership information for applications and granted permits for Virginia is summarized in Table 26. In this table, the only significantly large ownership group besides the private group is the corporate group. It is interesting to note, however, the relatively high percentage of Federal and State applications which have been granted.

The distribution of the purpose/use categories is illustrated in Table 27. With respect to the numbers of applications and permits, it is obvious that the greatest pressures are coming from the private sector, since the purpose/use categories Private, Residential and Recreational nearly always refer to private use. In Table 27, the only quantitatively significant purpose/use groups besides those identified above as predominately private are the erosion control and commercial groups. Tables 26 and 27 do not necessarily indicate the severity of possible damage to the Bay, because the 37 industrial and public utility applications (see Table 27) could involve far greater changes to the shoreline than the 203 residential applications.

Table 26. Summary of Ownership Categories for Virginia Applications and Permits

Ownership	Total Number of Applications	Number of Permits* Granted as of 3/15/74
Private	333	212
Corporate	83	46
Public Utility	9	7
Federal Government	7	6
County Government	7	3
Local Government	6	4
State of Virginia	5	5
Unincorporated Groups	5	3
Total	455	286

*Resulting from 1973 applications.

Table 27. Summary of Purpose/Use Categories for Virginia Applications and Permits.

Purpose/Use	Total Number of Applications	Number of Permits* Granted as of 3/15/74
Private	236	145
Residential	203	129
Recreational	177	123
Erosion Control	102	76
Commercial	96	51
Public Utility	22	19
Fisheries	21	14
Maritime	17	11
Industrial	15	12
Federal Government	7	6
Local Government	5	3
State Government	4	4
County Government	3	1

* Resulting from 1973 applications

Discussion

As has been evident from the previous sections, applications often involve more than one type of structure. In a sample of 279 granted permits from the Norfolk District Office of the Corps of Engineers, the distribution of number of structures per granted permit is as illustrated in Table 28. Permits involving one or two structures account for about 81 percent of the granted permits. Unless they involve major alterations, it would not seem that multiple-structure permits represent a major pressure on the edges of the Bay. An average of 1.82 structures per permit resulted from the permits analyzed. (Note that piles, buoys and dolphins were treated as one structure for each permit in which they were involved.)

Table 28. Summary of Number of Structures per Granted Permit in Virginia.

Number of Structures per Permit	Number of Permits
1	147
2	79
3	36
4	8
5	4
6	3
8	1
16	1

A map of the entire Chesapeake Bay (Plate 2) is inserted in the envelope attached to the inside of the back cover of the report. This map shows:

a) sites in the Bay area for which applications for alterations were received during 1973,
b) present reserves of various kinds (parks, flora and fauna, military reservations, etc.),
c) county, independent city and state boundaries, and

d) further areas which have been recommended for acquisition (with buffer zones, where considered necessary) on either a first or second priority basis by the Smithsonian Institution (Ref. 1).

This map emphasizes the pressures for alterations which now exist in Virginia Beach, Lancaster County, York County, Norfolk and other areas. It also shows that a number of applications border on areas proposed for future conservation by the Smithsonian Institution.

Because of the relatively large percentage of permits for bulkheads, fill and piers granted in Virginia Beach (see Table 18), careful consideration should now be given to the total length of shoreline bulkheaded, and to the total extents of piers and fill in order to determine how many more of these structures should be allowed. The same sort of consideration appears to be warranted with respect to dredging, channelization and spoil disposal in Lancaster County. Complete surveys of the critical areas would be necessary before such determinations could be made.

While the number of applications provides an indication of the pressures on the various areas, it is an accurate reflection only when it is related to usage. Industrial, public utility, commercial or governmental uses may all have greater impacts upon the environment than private uses, and an evaluation of the size and extent of such applications should be given high priority.

Pressure exists on the wetlands throughout the State of Virginia to varying degrees. The greatest pressure in terms of the number of applications involving wetlands is in Virginia Beach and Lancaster County (see Table 25). Both of these areas are characterized by narrow fringing marshes. In terms of the percentage of the applications involving wetlands, the greatest pressure is in Gloucester and Accomack Counties, counties characterized by extensive marshes, and by applications which involve more acreage than those in Virginia Beach and Lancaster County. A survey conducted by the Smithsonian Institution (Ref. 1) recommends the acquisition of first and second priority areas, some with buffer zones, throughout the Bay (see Plate 2). In view of the requests involving marshes in the four above mentioned areas, there would seem to be a strong case for the State of Virginia vigorously protecting both of the categories of wetlands in these areas.

COMPARISONS AND CONCLUSIONS

Comparisons: Maryland and Virginia

Many similarities and some differences have been found between the Maryland and Virginia results. One of the most obvious differences is the number of applications submitted to the Baltimore District (1357) and the number submitted to the Norfolk District (564) during 1973. The Virginia Chesapeake Bay shoreline mileage is 3,164 miles, compared with 4,380 miles for Maryland (Ref. 2). The Maryland: Virginia ratio of 1.38, however, does not account for the difference in the number of applications, even if all 50 Virginia applications made to the Baltimore District are allotted to Virginia. The relatively higher number of applications in Maryland could be due, at least in part, to a generally higher level of development occurring there. It should be pointed out, however, that as of March 15, 1974, over ten times as much volume of fill and over five times as much volume of dredging and channelization had been approved in Virginia as in Maryland.

Another obvious difference is the proportion of applications granted as permits as of March 15, 1974, by the two offices. Of those applications analyzed, 67.7 percent had been granted by the Norfolk District Office, while the Baltimore District Office had granted only 40.5 percent. A detailed analysis of this difference will not be attempted, since, during the period of the writing of this report, both offices were undergoing procedural changes with respect to the processing of applications. It is interesting, however, to examine the differences in the length of time the two offices took to grant the permits which were analyzed for this report. The percentage of permits granted versus the length of time in weeks between the date the application was submitted and the date the permit was granted is illustrated in Figure 4. The somewhat more rapid processing by the Norfolk Office is evident from this figure. This faster processing might be partially explained by the fact that the Norfolk Office does not issue public notices for a significant percentage of their applications. It must be emphasized, however, that both offices are undergoing procedural changes which may alter processing time substantially, and Figure 4 should <u>not</u> be interpreted as an indication of the efficiencies of the two Corps of Engineers Offices.

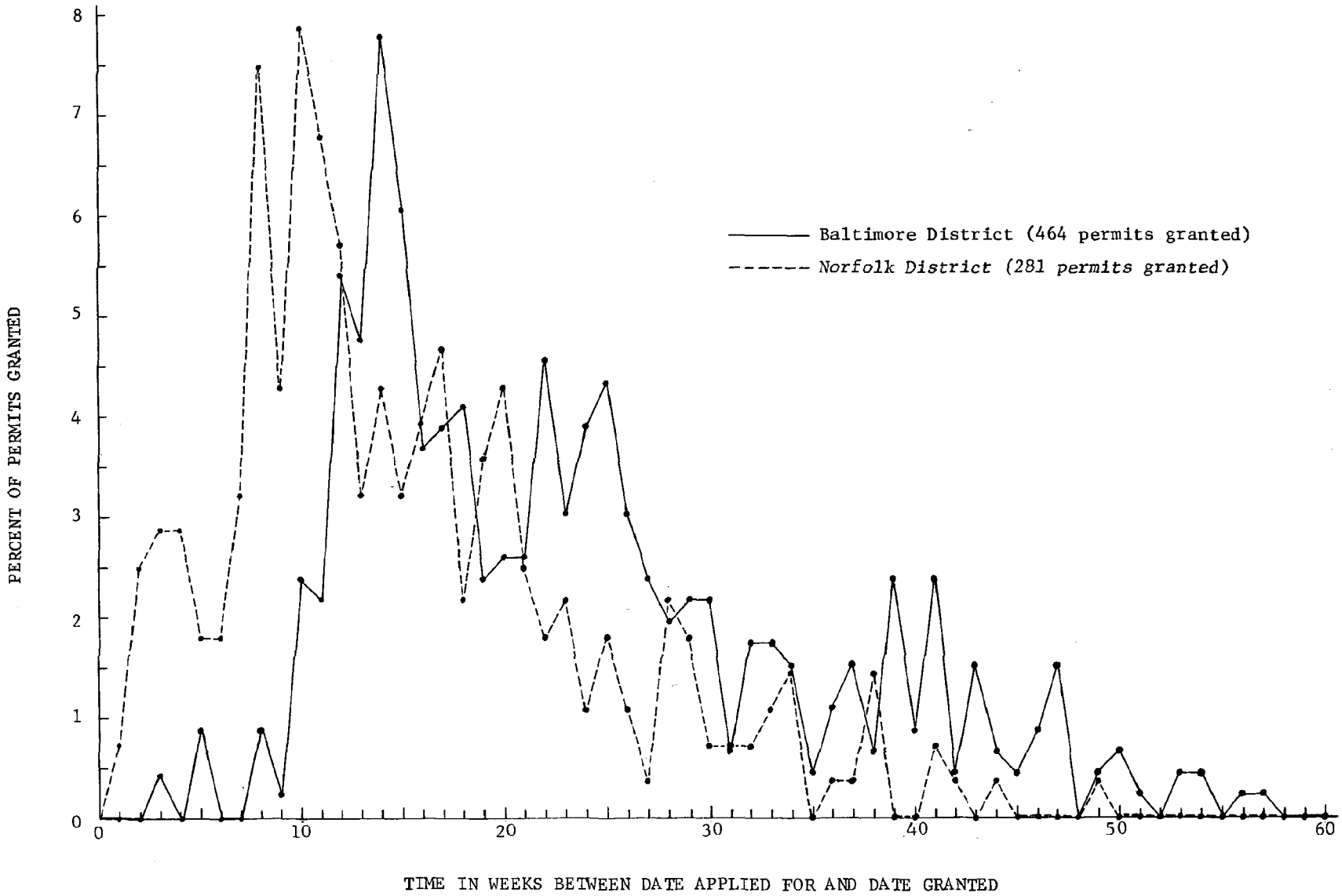

Fig. 4. Percent of permits granted versus elapsed time in weeks between date applied for and date granted.

A third difference between the two states is the relatively low number of piles granted in Virginia (204) and the relatively high number granted in Maryland (1340). Again, the difference in shoreline miles in the two states does not account for the difference. One explanation could be that piles are installed in the lower Bay without permits more often than in the Upper Bay. More likely, however, piles are used as an adjunct to piers more frequently in Maryland due to the more sheltered nature of the waters.

The low incidence of spoil disposal in Maryland relative to Virginia, a fourth but less obvious difference, seems to be due mainly to the difference in coding the structure type for the byproduct of dredging operations in Maryland and Virginia. Most of the time, the result of such operations in Maryland was coded as "fill": in Virginia it was coded as "spoil disposal".

A fifth difference is in the higher number of applications with the purpose/use category "erosion control" in Virginia. This is because the Baltimore District of the Corps of Engineers did not start using erosion control as a purpose/use category until the time this report was being prepared.

The above discussed differences do not appear to be significant in relation to the similarities between the two states. Alterations are clustered in particular areas in both Maryland and Virginia. Structure types requested, their distribution according to extent (magnitude) and the uses of their structures are similar in both states. Finally, a majority of the alterations in both the upper and lower Bay are being made by private citizens in order to enhance their residential and/or recreational use of the shore zone. Specific similarities become obvious with a point by point comparison of the Maryland and Virginia results.

Conclusions

Conclusions relating to specific informational items have been presented in the discussions of the Maryland and Virginia Results Section, and the above Comparisons: Maryland and Virginia. Attention is directed in the following paragraphs to additional observations and conclusions resulting from the analyses carried out for this report.

1. In order for Bay management and advisory agencies to improve decisions regarding future shore zone development, a need exists to more fully analyze and evaluate the temporal and spatial patterns of shoreline alterations on the Bay. For such analyses and evaluation, selected information from permits currently being granted should be retained. Permits from selected previous years, such as 1968 and 1963, should also be analyzed.

2. For the same general reason outlined above, detailed studies of geographical areas with numerous alterations, and of certain alteration problems with a potential for serious impact should be performed.

3. In order to better identify the Bay shoreline development pattern, those permits involving wetlands which do not require a Corps of Engineers permit should be analyzed.

4. Assessments of impacts resulting from shoreline alteration must include the analysis of the integrated effects of large numbers of alterations which have little impact when considered separately. (The rate of disappearance of wetlands can ascertained only by evaluating the cumulative effects of all alterations.)

5. Pressures for the alteration of the edges of Chesapeake Bay are unequally distributed along the 8,000 miles of the Bay's shoreline. Many applications and permits are a part of "alteration clusters" that are not coexistent with either geographical areas (waterways, etc.) or political boundaries (cities, counties, etc.). This information can be used by local, state and federal management agencies in identifying high priority areas for regional planning.

REFERENCES

1. D. Jenkins et al, "Natural Areas of the Chesapeake Bay Region: Ecological Priorities", Center for Natural Areas, Ecology Program, Smithsonian Institution, May 1974.

2. R. Eberhart et al, "Research and Management Shoreline (RAMS) Data Bank - Coding Instructions", Chesapeake Research Consortium Publication No. 25, April 1974.

METHODOLOGY

Maryland

The original intention of CRC was to request access to Corps of Engineers permit application files in order to extract information which was considered relevant to the CRC Wetlands/Edges Program. This operation would be carried on independently of any Corps activity, and so as to cause minimal inconvenience to Corps personnel.

After meeting with representatives of the Baltimore District office, it became apparent that a cooperative (rather than independent) effort between CRC and the Corps could prove beneficial to both parties, since the Baltimore office was in the process of establishing a computer data base for permit applications.

A course of action was decided upon by which the Corps would implement certain alterations and additions to the data base as suggested by CRC. These alterations and additions were not only designed to enable CRC to satisfactorily complete this report, but also to enhance the value of the data base as a management and information tool for the Corps. CRC agreed to provide personnel to assist the Corps in coding the permit application information for entry into the data base, and in entering the coded information into the data base from computer terminals.

The data base was altered to include four additional classes of information:

1) Coordinates - The latitude and longitude of each alteration applied for is entered in degrees, minutes, and tenths of minutes.

2) Ownership - A three-letter code indicating ownership of the property involved is entered.

3) Shoreline Type - A six letter code indicating fastland type (two letters), shore zone type (two letters), and near shore zone type (two letters) is entered.

4) Purpose and Intended Use - A three-letter code indicating the purpose and use of the alteration is entered. As many purposes and/or uses as desired may be entered for each application.

In addition, the data base was altered so as to allow any number of structures, with two dimensions per structure, to be entered for each permit application. Previously, the only dimensional information entered for each application, regardless of the number of structures involved, was the maximum extent channelward for one structure. Also, the structure types and extents were coded into fixed formats for each structure type, thus simplifying data searching, sorting and manipulation routines. (Prior to the coding, the structure types were spelled out, in what could result in a variable format.) A copy of the Coding Instructions which are used to implement the aforementioned additions and alterations to the data base is attached (page 47).

Finally, CRC, in cooperation with the Corps, developed the coding form which is being used to code the data from the permit application files for entry into the computer. Currently, over 2000 of the forms have been printed and delivered to the Corps. A copy of the coding form is attached (page 51).

A Control Data Corporation (CDC) Model 6600 computer, located in Rockville, Maryland, which utilizes the System 2000 information system, is used by the Baltimore District office to store and process the permit application data. A disc drive is utilized to store the data on-line, making it immediately accessable by telephone link whenever the computer is operational.

For the tabulations and analyses carried out for this report, CRC accessed the CDC computer directly, and, utilizing System 2000, sorted, tabulated and manipulated the data. (The data relating to all granted permits is now being entered into CRC's Research and Management Shoreline (RAMS) Data Bank, located at the Johns Hopkins University Applied Physics Laboratory (Ref. 2). The Baltimore District office is continuing to provide granted permit information to CRC for inclusion in the RAMS Data Bank on a regular basis.)

Virginia

The information regarding permit applications in Virginia was obtained from a variety of sources. Basic information regarding application number, application date, applicant's name and final action (if any) was made available by the Norfolk District office of the Corps of Engineers. Much of the remaining information was obtained from permit application files maintained at the Virginia Institute of Marine Science (VIMS). Some of the data, such as shoreline type and coordinates, were obtained from U.S.G.S. 7.5-minute quadrangle maps. All of the information was then compiled and coded onto RAMS Coding Forms (Ref. 2) by CRC and VIMS personnel.

Information pertaining to granted permits was punched into cards and entered into the RAMS Data Bank. It was then tabulated and analyzed by computer. The information relative to active, denied and withdrawn applications for 1973 was tabulated by hand.

The Norfolk District Corps office has recently implemented a permit application information system on a General Electric Model 437 computer located in Norfolk, Virginia. The system utilizes a Fortran program for information storage and retrieval. Almost no technical information (such as structure types and extents) is stored in the system, however, so that other methods, described above, had to be found for the acquisition and analysis of the data needed for this report. As is the case with the Baltimore office, the Norfolk office has agreed to provide granted permit information for inclusion in the RAMS Data Bank on a regular basis.

CODING INSTRUCTIONS

The following computer codes have been established for use in the U.S. Army Corps of Engineers (Baltimore District) permit application data bank.

STRUCTURE (STRUC)

STRUCTURE TYPE

	New Structure	Repair or Maintenance
Aerial crossing	AECR	RPAE
Bouy	BOUY	RPBO
Building	BUIL	RPBL
Bulkhead	BULK	RPBU
Channelization	CHAN	RPCH
Dolphin	DOLP	RPDO
Dredge	DRED	RPDR
Duck blind	DUBL	RPDU
Fill	FILL	RPFI
Intake structure	INTK	RPIN
Jetty or groin	JETT	RPJE
Marine railroad	MARR	RPMA
Pier	PIER	RPPR
Pile	PILE	RPPE
Pipe, discharge	PIPD	RPPD
Pipe, intake	PIPI	RPPI
Pipeline	PIPL	RPPL
Ramp, boat	RAMP	RPRA
Rip rap	RRAP	RPRR
Spoils disposal	SPDI	RPSP
Submarine cable	SUCB	RPSU

Coding Instructions - cont.

STRUCTURE EXTENT

Aerial crossing - Length (Feet).
Bouy - Number (Units).
Building - Area (Square feet).
Bulkhead - Length (Feet). Extent channelward (Feet)
Channelization - Volume (Cubic yards). Area (Acres)
Dolphin - Number (Units).
Dredge - Volume (Cubic yards). Area (Acres)
Duck blind - Length (Feet).
Fill - Volume (Cubic yards). Area (Acres)
Intake structure - Length (Feet).
Jetty or groin - Length (Feet).
Marine railroad - Length (Feet).
Pier - Total length new structure (Feet). Extent channelward (Feet)
Pile - Number (Units).
Pipe, discharge - Length (Feet).
Pipe, intake - Length (Feet).
Pipeline - Length (Feet).
Ramp, boat - Length (Feet).
Rip rap - Length (Feet).
Spoils disposal - Volume (Cubic yards). Area (Acres)
Submarine cable - Length (Feet).

COORDINATES (COORD)

Latitude and longitude are coded in the same format. Each is coded in degrees, minutes, and tenths of minutes. Two examples of coding follow:

1) If latitude is 38° 54.5', it is coded as 3854.5

2) If longitude is 76° 11.2', it is coded as 7611.2

Coding Instructions - cont.

OWNERSHIP (OWNER)

Federal government - GFD
State of Maryland - GSM
State of Virginia - GSV
State of West Virginia - GSW
Local governmental jurisdiction (City) - GLO
County government - GCY
Private - PRI
Corporation - COR
Public Utility - PUU
State of Pennsylvania - GSP
State of Delaware - GSD
Unincorporated groups - UIG

SHORELINE TYPE (SHORE)

FASTLAND
- Low Shore - LO
- Moderately Low Shore - ML
- Moderately High Shore - MH
- High Shore - HI
- Dune - DU

SHORE ZONE
- Beach - BE
- Fringing Marsh - MF
- Extensive Marsh - MX
- Embayed Marsh - MM

NEAR SHORE (To depth of six feet)
- Less than 300 feet - XN
- 300-600 feet - NA
- 600-1200 feet - IN
- More than 1200 feet - WI

The shoreline type is coded in the order of fastland, then shore zone, then near shore. Two examples of coding follow:

Coding Instructions - cont.

1) If the fastland is a low shore, the shore zone is a fringing marsh, and the near shore distance to a depth of six feet is about 900 feet, the coding is "LOMFIN".

2) If the fastland is a cliff (high shore), the shore zone is a beach, and the near shore distance to a depth of six feet is about 200 feet, the coding is "HIBEXN".

PURPOSE AND INTENDED USE (USE)

Residential - RES
Private - PRI
Commercial - COM
Industrial - IND
Recreational - REC
GOVERNMENTAL
- Federal - GFD
- State - GST
- County - GCY
- Local - GLO

Agriculture - AGR
Public Unility - PUU
Maritime - MAR

COMMAND INFORMATION

COMMAND						
NEW	FILE NO.	NAME LAST FIRST M.I.		DATE SENT BY APPLICANT	DATE RECEIVED BY CORPS	INITIALS OF CORPS MANAGER
AG3 (or AG2 or AG)	FILE NO.	AGENCY INITIALS	AGENCY INITIALS	AGENCY INITIALS	See separate sheet for agency initial codes.	
LOCATION	FILE NO.	WATERWAY	TOWN	COUNTY	STATE	
ADDRESS	FILE NO.	BODY OF MAILING ADDRESS		CITY	STATE	ZIP (NO COMMAS)
STRUC	FILE NO.	STRUCTURE TYPE	STRUCTURE EXTENT	See separate sheet for structure type and extent codes.		
STRUC	FILE NO.	STRUCTURE TYPE	STRUCTURE EXTENT			
PN	FILE NO.	PUBLIC NOTICE DATE (MM/DD/YY)	EXPIRATION DATE (MM/DD/YY)			
COORD	FILE NO.	LATITUDE (DEGREES MINUTES. TENTHS)	LONGITUDE (DEGREES MINUTES. TENTHS			
OWNER	FILE NO.	OWNERSHIP	See separate sheet for ownership codes.			
REVIEW	FILE NO.	CYCLE NO.	DISPOSITION	DATE (MM/DD/YY)		
ML	FILE NO.	MAILING LIST NO.				
SHORE	FILE NO.	PRIMARY SHORELINE TYPE	SECONDARY SHORELINE TYPE	See separate sheet for shoreline codes.		
USE	FILE NO.	PURPOSE AND USE	See separate sheet for purpose and use codes.			
USE	FILE NO.	PURPOSE AND USE				
AGENCY	FILE NO.	AGENCY CODE	DISPOSITION	ACTION DATE (MM/DD/YY)		
AGENCY	FILE NO.	AGENCY CODE	DISPOSITION	ACTION DATE (MM/DD/YY)		
DISP	FILE NO.	AGENCY CODE	NEW DISPOSITION	DISPOSITION DATE		
OBJECTION	FILE NO.	OBJECTOR (INITIALS AND LAST NAME)	OBJECTION DATE (MM/DD/YY)			
REMARK	FILE NO.	REMARK NO.	DATE-REMARK-INITIALS			
REVISION	FILE NO.	CYCLE NO.	DATE REVISION EFFECTIVE (MM/DD/YY)	DATE REVISION RECEIVED (MM/DD/YY)		
FA	FILE NO.	ACTION	DATE OF ACTION (MM/DD/YY)			
	FILE NO.					
	FILE NO.					
	FILE NO.					

	INITIALS	DATE
CODED		
ENTERED		
UPDATED		
ENTERED		

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