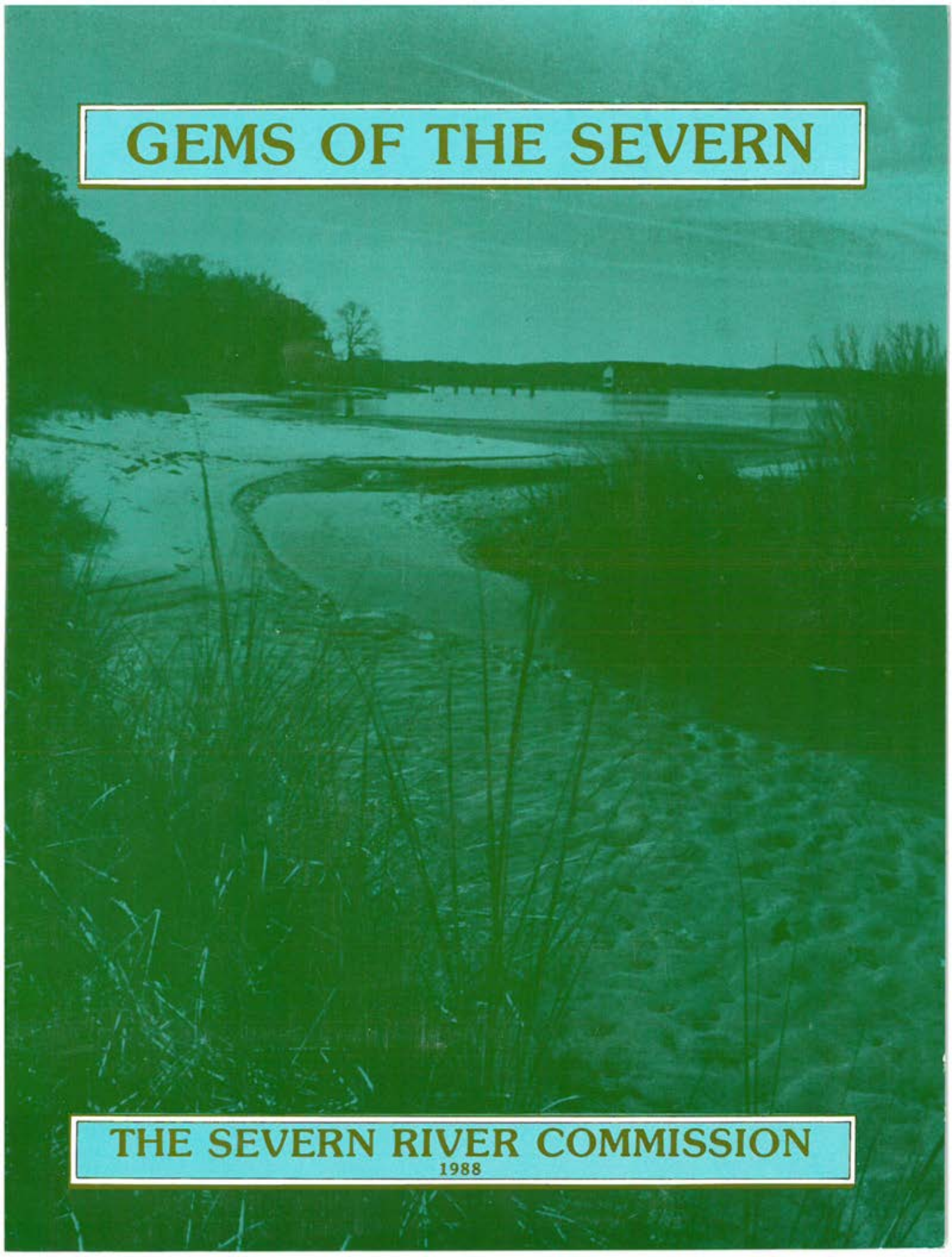

GEMS OF THE SEVERN

THE SEVERN RIVER COMMISSION

1988

Severn River
Land Trust, Inc.

P.O. Box 2008, Annapolis,
Maryland 21404-2008

FOREWORD TO THE 1996 PRINTING

Gems of the Severn (Gems) was published in April, 1988. Since then the book has served as an important source of information on the ecological and environmental character of the portion of the Severn River watershed to the Bay side of Route 3. The Severn River Land Trust (SRLT) is a private, nonprofit corporation that helps to protect the ecology and character of the Severn River watershed by obtaining and managing conservation easements on important land in the watershed. SRLT has made extensive use of *Gems* to guide its property evaluation and easement activities. The book also has become of general interest to owners of property in the vicinity of the River. It enables them to understand the ecological significance of their land and its relationship to the Severn. To the Trust, any land that is part of the Severn's watershed is a "gem" and needs to be carefully managed to support conservation of the River, so the book plays a vital educational role.

Gems of the Severn proved to be extremely popular. Copies have not been available for general distribution for many years. To remedy this situation, the Chesapeake Bay Trust has provided SRLT with a grant that, with matching funds generously contributed by private donors, has permitted SRLT to reprint *Gems*. SRLT will use the book to promote land conservation in the River's watershed and, through sale to the public at large, to raise money for the Trust's activities.

Even though there have been changes in the watershed since *Gems* was published in 1988, most of the material in the book is as relevant today as it was then. In addition, *Gems* is regarded as a classic. For these reasons, SRLT has chosen to reprint the book exactly as it appeared in 1988. The only change is the substitution of this Foreword for a list of the original sponsors on the inside front cover: the Maryland Department of Natural Resources, the Severn River Commission and the City of Annapolis. The Severn River Land Trust acknowledges the extrordinary work done by these sponsors in producing the book in 1988 and is grateful to them for providing permission for this reprinting. We also want to recognize, once again, the skill and committment demonstrated by Colby Rucker and Todd Davidson in authoring the document. They also have given their permission for the reprint.

I hope that you will enjoy reading and using this 1996 reprinting of *Gems* as much as many of us did reading it in 1988 and using it since then.

Clifford G. Andrew
President
Severn River Land Trust, Inc

Annapolis, Maryland
September, 1996

PRODUCTION NOTES:

Word processing by Monica Sellman.
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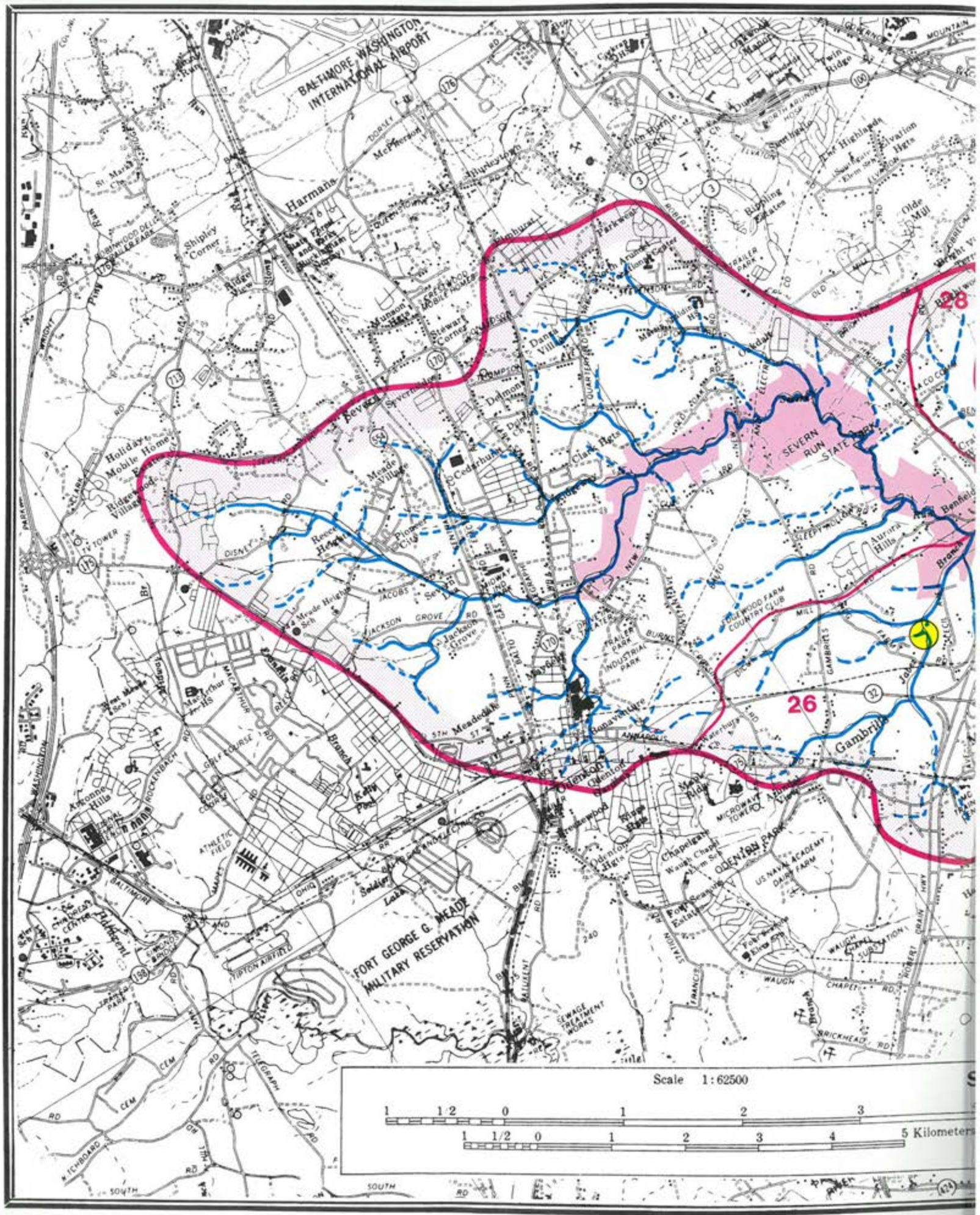
BALTIMORE WASHINGTON INTERNATIONAL AIRPORT
FORT GEORGE G. MEADE MILITARY RESERVATION
SEVERN RUN STATE
28
26
Scale 1:62500
5 Kilometers

The Severn River Commission

GEMS OF THE SEVERN

1988

LEGEND

NATURAL AREAS:

- COMPLETE ECOTYPE
- ENVIRONMENTAL COMPLEX
- INCOMPLETE ECOTYPE
- MICROSYSTEM
- ALTERED GREEN AREA

WATERSHED LIMIT LINE

SEVERN RUN NATURAL ENVIRONMENT AREA

Individual Natural Features are not shown on this map, but are listed on the Matrix Chart.

MARYLAND DEPARTMENT OF NATURAL RESOURCES
CAPITAL PROGRAMS ADMINISTRATION
LAND PLANNING SERVICES
SCENIC AND WILD RIVERS PROGRAM
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ANNAPOLIS, MARYLAND 21401

The Severn River Commission

SUBWATERSHED [1]	#1 LAKE OGLETON	#2 CHASE POND/HERON LAKE	#3 BACK CREEK	#4 SPA CREEK	#5 COLLEGE CREEK	#6 WEEMS CREEK	#7 COVE OF CORK	#8 LUCE CREEK	#9 MARTIN'S POND	#10 SALTWORKS CREEK	#11 CLEMENTS CREEK	#12 BREWER CREEK	#13 BREWER ROAD	#14 HOPKINS CREEK	#15 MAYNADIER CREEK	#16 LITTLE ROUND BAY	#17 ST. HELENA ISLAND	#18 FOX CREEK	#19 VALENTINE CREEK	#20 PLUM/GUMBOTTOM CREEK	#21 ARDEN POND	#22 CYPRESS BRANCH	#23 INDIAN CREEK BRANCH	#24 THREE ISLANDS	#25 SEWELL SPRING	#26 JABEZ BRANCH	#27 POINT FIELD BRANCH	#28 BEAR BRANCH	#29 COOLSPRING BRANCH	#30 CHARTWELL BRANCH	#31 STEVENS CREEK	#32 FORKED CREEK	#33 YANTZ CREEK	#34 SULLIVAN'S COVE	#35 ROUND BAY SHORE	#36 RINGGOLD COVE	#37 ANSQUITH CREEK	#38 RAY'S POND	#39 CHASE CREEK	#40 COOLSPRING CREEK	#41 WINCHESTER POND	#42 BROWN'S COVE	#43 JONAS GREEN POND	#44 PENDENNIS MOUNT	#45 WOOLCHUP	#46 CAP
NATURAL AREAS [2]	5	2	1	2	2	2	1	?	1	?	?	1	1	1	1	?	1	1	1	1	1	1	1	1	3	1	1	1	?	?	?	?	1	?	1	?	?	?	1	5	?	1	1	1	1	1	1	3
ACREAGE — ENVIRONMENTAL COMPLEX									72.4			164.7	394.1	417.7	725.6				682.0			309.6		346.7		1151.45							25.1					124.2	172.6				69.3		48
ACREAGE — COMPLETE ECOTYPE	82.0		12.3	15.3	7.6	34.0										9.0	39.3				49.2				12.7													113.1		58.2		6.0	9.0			
ACREAGE — INCOMPLETE ECOTYPE	6.0	11.5																	5.5																											
ACREAGE — MICROSYSTEM							1.0																																							
ACREAGE — ALTERED GREEN AREA	13.0			53.3	3.4	17.0												64.4					0.7										5.6						23.7			93.9			30.0	
TOTALS	101.0	11.5	12.3	68.6	11.0	51.0	1.0		72.4			164.7	394.1	417.7	725.6	9.0	39.3	64.4	682.0	5.5	49.2	309.6	0.7	346.7	12.7	1151.45							5.6	25.1					124.2	309.4		58.2	93.9	6.0	9.0	69.3	30.0	48
ECOTYPES [3]	12	5	6	20	5	6	1		4			7	9	11	11		2	5	6	12	3	4	7	4	8	5	6					2		6				7	16		4	8	4	2	9	7	2
ACREAGE — UPLANDS AND TERRACES	84.6		4.2	18.3	9.8	37.0			36.3			70.4	166.5	182.4	476.7		6.8		17.0	261.5		13.0	143.6		239.3	541.9	0.3							3.0					26.2	138.5		9.0				27.7	24.0	19
ACREAGE — STEEP SLOPES	2.5		4.1	11.4		10.0			30.6			70.3	167.7	180.2	118.1			30.4	23.0	307.5		28.5	115.5		88.0	447.6	4.3							10.4					83.2	129.6		43.0	77.0	5.0	4.0	27.6		19
ACREAGE — RAVINE BOTTOM				2.8					5.2			13.4	22.0							2.0	4.3																	11.2	36.9		6.0	15.0					
ACREAGE — FLOODPLAIN FORESTS	2.0		2.9	8.4								4.9	6.8	40.9	31.6					87.0		7.0	21.1		12.6		5.5																			3
ACREAGE — WOODED SWAMPS				6.2									45.		87.7			5.4	15.0				26.4		4.0	131.2	0.8																	2.0		4
ACREAGE — SHRUB SWAMPS	2.5			5.8								1.4	1.4	2.8						22.0	0.7		1.4		2.0	30.0	0.5											1.0	0.4					5.0			13
ACREAGE — TIDAL MARSHES	10.0	1.5	1.1	8.4	1.2	4.0			0.3			1.5	3.2	10.6	10.0		2.2	3.5	9.4	2.0		0.7	1.6		0.8		1.3							9.7					2.1	1.4		0.2	1.9			0.1	1.5	10
ACREAGE — OLD FIELD				5.1																																						0.6		3.0	4.5	
ACREAGE — FRESH WATER MARSHES				2.2																												2.0											0.7		
ACREAGE — MEADOWS												2.8																																		2
ACREAGE — BOGS														0.8	1.5																1.0															
ACREAGE — PONDS		10.0											22.0								0.5					0.75					4.6					0.5	2.6				0.4				3
ACREAGE — SANDBARS & BEACHES																								0.06																			8.0		
ACREAGE — ISLANDS							1.0																	0.64																			0.2		
TOTALS	101.0	11.5	12.3	68.6	11.0	51.0	1.0		72.4			164.7	394.1	417.7	725.6		9.0	39.3	64.4	682.0	5.5	49.2	309.6	0.7	346.7	1151.45	12.7					5.6		25.1				124.2	309.4		58.2	93.9	6.0	9.0	69.3	30.0	48
NATURAL FEATURES [4]																																														
TOTALS — NATURAL HERITAGE ELEMENTS	1		1	4	2	1	1					2	1		7			3					6		4	4	2	1		1	2	3		5			2	7			1					3
TOTALS — NOTEWORTHY PLANTS				4	2	2			1			4			1					1		1	1		3	2					1		1				6								
TOTALS — STATE CHAMPION TREES																							2										1													1
TOTALS — BIG TREES	2	1		8	2	2			1			2	1							2					4										1		17			3					1
TOTALS — OLD/HISTORIC TREES				3	2	3							2							1			2													6								5
TOTALS — HISTORIC FEATURES	4	1		5	5	6			2			2	1	1	4	1	1	1		3	1	3	10	1	6	7	2		1	2	2	1	1	2	3	2	2	3	5	3	2	3	3	2	5	3	5
TOTALS — ARCHEOLOGICAL FEATURES	2	2	1	3	8	6	2	2	3	3	5		1	5	5	7	2	1	2	1	1	1		3	1	1	1	3	1			1	3	2		3		3	1	1	2		1	1	4	4	4
TOTALS — SPRINGS & SEEPS	1							1		1						1				1		1													1		2		1							
TOTALS — CLIFFS	1					1		1	1	1				1			1															1		1		2	1	2		2	1	1	1	1	1		
ISOLATED WETLANDS [4]																																														
ACREAGE — TIDAL WETLANDS				1.0	0.8	2.4	0.4	1.6		6.6	1.6					1.4												0.5		0.7			3.95	1.6		2.1	1.1		0.3	2.8						23.3	6.
ACREAGE — NON-TIDAL WETLANDS				0.5	3.0	12.0	2.0	4.0		41.9	24.0					3.5												15.0		5.0	1.5		3.0			2.3								6.5	14.
TOTALS				1.5	3.8	14.4	2.4	5.6		47.5	25.6					4.9												15.5		5.7	1.5		6.95	1.6		2.1	3.4		0.3	2.8						29.8	21.

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GEMS OF THE SEVERN MATRIX

A SUMMATION OF ACREAGE AND NATURAL FEATURES BY WATERSHED, NATURAL AREA, AND ECOTYPE
- 1988 -

LEGEND

? Denotes subwatersheds that received only cursory field work and for which precise acreages cannot be given.

1– Refer
2– Refer
3– Refer t
4– Refer t

1988 Preface to Gems of the Severn

There are many compelling reasons why we should preserve the Gems of the Severn, good practical reasons: buffers and scenery, aquifer recharge and water quality, air quality and noise reduction, rare plant and wildlife habitat, neighborhood values, and an alternative to development. That is reason enough; but there is something more: reasons beyond reasoning, and values beyond value.

In the Gems of the Severn there is something special, yet hidden to most. True, there are no sequoias, no rainbow-girded cataracts, no herds of caribou or wildebeest; but these are differences of quantity, not substance. Nature, even the smallest bit of it, provides a broad window, linking us to the tarn and fen, and beck and lea of our far yesterdays, providing truth and beauty for today, and promising a bit of today in a tomorrow beyond our ken.

Life is but the pursuit of knowledge. Through art, music, literature, and poetry we extend the limits of our sensitivity and understanding, but these are but imitations of nature. In the study and contemplation of nature itself we are drawn further, toward a sublime unity both real and elusive.

Through our access to nature we may move through progressive levels of understanding. In the defense of the smallest creature is the salvation of the whole, for in preservation we exhibit the highest attributes of our existence, being at one with the theme of creation. Conversely, whatever our wealth or office, in the unnecessary destruction of one tree we consign ourselves to the Stone Age of intellectual progress.

Though we strive to understand nature, we cannot judge nature: ultimately, it is nature which judges each of us. That we understand all the intricacies of the Gems of the Severn is not essential. What is essential is that each of us respect these areas, and preserve them. If we fail, we shall have turned our backs on true progress, and shall have permanently denied a dimension of truth and enlightenment to all who may follow.

Colby B. Rucker

GEMS OF THE SEVERN

by
A. Todd Davison
and
Colby B. Rucker

Technical and Financial Assistance
Provided by Land Planning Services,
the Maryland Scenic and Wild
Rivers Program of the Maryland
Department of Natural Resources,
and Anne Arundel County
Office of Planning and Zoning

THE SEVERN RIVER COMMISSION
CITY OF ANNAPOLIS
ANNE ARUNDEL COUNTY
APRIL 1988

EXECUTIVE SUMMARY

Over 500 "gem" sites, areas and special features have been found in the Severn River watershed. Some are of ecological importance, some of historic value, and some of archaeological significance. These are worthy of clear identification, protection and appreciation. They are located and described by the authors of this report, and the Severn River Commission has developed a set of specific Recommendations to assist in the preservation of as many as possible for future generations. The task involves all levels of government and the citizens of the watershed. If it can be accomplished, this excellent watershed will always be an exceptionally interesting, diverse and pleasing place for the people who enjoy it as their own personal habitat.

BACKGROUND

The Severn River watershed comprises some 70 square miles around an exceptionally valuable tributary of the Chesapeake Bay. Special emphasis on protecting natural areas of the Severn River was first provided in 1971 when it was incorporated into the Maryland Scenic and Wild River System. In 1983, the Maryland Department of Natural Resources (DNR) published a scenic river plan entitled "Maryland Scenic Rivers: THE SEVERN". Among the report's recommendations was the creation of a Severn River Commission (SRC). This was accomplished in January of 1985 through concurrent resolutions by the Anne Arundel County Council and the City Council of the City of Annapolis. The SRC was entrusted with providing counsel and advice to Annapolis, Anne Arundel County, and the State of Maryland on environmental and other matters within the Severn River watershed.

The attention of the Severn River Commission was focused in June of 1985 on identification and protection of the many exceptional natural areas of the Severn. In March of 1986, the DNR, through their Land Planning Services, awarded a contract to produce a report entitled GEMS OF THE SEVERN for the Commission. This report is the product of that contract. It is a detailed analysis of the ecological, historical, archeological, scenic, and other impalpable attributes of the Severn River natural areas and a reference guide for their protection.

INTRODUCTION

Over the last several decades commendable efforts have been taken by governmental and environmental groups to ensure that the designation of the Severn as a scenic river remains a worthy one. However, during the same period, many natural areas that helped the Severn originally merit the scenic label were being permanently replaced by residential and commercial development. In addition, major engineering projects for highway construction, sewer lines, and dredging have continuously been implemented.

Faced with increasing population pressure and demand for additional residential land, many believe the Severn to be at a critical threshold, with additional development threatening permanent and

irreversible loss of its scenic and ecological integrity. The capacity of the Severn to accommodate development and still function as a scenic river and deserve the title may have been reached.

This realization has brought a renewed and concerted desire to both identify and protect the remaining natural areas of the Severn. Toward this desire, the authors hope that the Gems of the Severn will provide guidance and the answers needed by the Severn River Commission, the City of Annapolis, Anne Arundel County, and State and Federal agencies.

ORGANIZATION

The Gems of the Severn is divided into two parts. Part I consists of introduction and methodology sections; a section explaining the organizational scheme, formatting, and the categories used to describe natural areas; and sections discussing land conservation and preservation methods for natural areas. Part II contains detailed descriptions of natural areas in the Severn's 50 subwatersheds -- thus 50 subsections (Table 1). These subwatersheds are the drainage basins of the major tributaries that flow directly into the Severn (Figure 1).

For each of the 50 subwatershed sections included in Part II, descriptions of natural areas are organized into separate categories as shown in Table 2. To include the wide array of natural areas found on the Severn, a graduated ecological classification system was devised. Using this 6-tier system, each natural area is described in Part II as being composed of one or more of the following constituent ecotypes.

- o Uplands and Terraces
- o Steep Slopes
- o Ravine Bottoms
- o Floodplain Forests
- o Wooded Swamps
- o Shrub Swamps
- o Marshes (Fringe, Draw, Cove)
- o Old Fields
- o Meadows
- o Bogs (Sphagnum/Cedar)
- o Ponds
- o Tidal Tributaries
- o Branches (Runs)
- o Islands
- o Sandbars
- o Cliffs

Acreage measurements for these ecotypes, as well as for each natural area and subwatershed, were calculated.

NATURAL AREAS

For each natural area and ecotype a description of the common or dominant plant species of the canopy, understory, shrub, and herbaceous layers is provided in Part II. With the aid of the Maryland Natural Heritage Program, 69 threatened and endangered plant species, as well as 48 other noteworthy or uncommon plants, were inventoried in the subwatershed.

The Severn River is blessed with many exceptional trees of extraordinary qualities including State Champion Trees, Maryland "Big Trees", "Bicentennial Trees", and historic trees. A total of 76 trees of exceptional stature and/or age were located and are described in Part II.

The Anne Arundel County Historic Sites Survey being conducted by the Office of Planning and Zoning is part of the Maryland Historic Trust (MHT) Inventory for sites, buildings, and objects which are 50 years and older. A total of 133 historic features either recognized by the Historic Sites Survey or identified through field work for this report are described in Part II. The Severn is also important among Maryland watersheds for the vast amount of archeological information it has yielded about prehistoric cultures in the Middle Chesapeake Region. Data from the MHT Archeological Division reveals that at least 117 archeological sites are located in the watershed. These sites and the artifacts they contain are described in Part II.

Although this study is acknowledged to be biased toward floral characteristics, wildlife observed during field work is provided in Part II. The overall impact of the tremendous habitat reduction and fragmentation on total wildlife numbers in the watershed over the last several decades is not precisely known. However, there appears to have been a trend toward decreasing diversity (the total number) of different species. The consensus is that many wildlife species which only decades ago were abundant are now rarely sighted or no longer observed at all.

The geology, soils, and topography of a natural area as described in Part II are predominant factors which determine its ecological characteristics and capacities. The Severn also possesses unique geomorphological landforms such as 21 prominent cliffs and many geologically intriguing stream valleys (Figure 1).

LAND CONSERVATION

The latter half of this report identifies the past, present, and future influences of man on the Severn's natural areas. As described in Part II, the ownership type, land use, adjacent residential development, existing stresses and problems, preservation options, and potential future uses of natural areas are critical factors which determine the success or failure of efforts to protect them.

PRESERVATION TOOLS

Before selecting the most appropriate strategy for preservation of natural areas of the Severn River, a basic understanding of existing preservation tools is necessary. The tools which have potential application in the Severn watershed are land acquisition, planning and regulation, conservation easements, mutual covenants, tax incentives, donation, long-term lease, transfer of title with attached conditions, land exchange, and voluntary landowner protection.

Choosing the most appropriate tool or tools to use in a comprehensive preservation effort will vary greatly depending on the set of circumstances unique to each natural area. Each natural area is different in the nature of the resource, landowner makeup, environmental pressures and problems, future intended use, and many other circumstances. Preservation tools should be analyzed and chosen on a case-by-case basis, since no one approach is likely to conserve the many diverse natural areas of the Severn.

CONCLUSIONS

As a result of the Gems of the Severn study, 50 natural areas and 244 ecotypes covering approximately 5921 acres were inventoried in 33 of the Severn's 50 subwatersheds. An additional 409 acres of isolated wetlands were identified in the 17 subwatersheds not studied with detailed field work. Continuing field work is important to locate "Gems" still undiscovered.

One of the greatest environmental challenges facing Anne Arundel County, the City of Annapolis, and the State of Maryland today is the preservation of these remaining natural areas. Certainly, this challenge will be a difficult and time-consuming effort. Acting alone, no single organization or level of government will be able to achieve the political agreement and the actions necessary to preserve the Gems of the Severn. It is vital that the preservation effort be viewed as a shared responsibility. Only through a unified effort of all levels of government, the many environmental and civic groups of the watershed, the business sector, and especially the citizens and landowners along the river, can a meaningful and inclusive preservation effort be initiated and successfully implemented.

RECOMMENDATIONS

On the basis of the information in this report, the Severn River Commission recommends a two phase approach -- Planning and Implementation. These recommendations pertain to the work of the Commission, the City of Annapolis, Anne Arundel County, the State of Maryland, Federal agencies, civic groups, and the private sector.

A synopsis of the recommendations is as follows:

PLANNING FOR EFFECTIVE PRESERVATION

- Develop a comprehensive plan for preservation of natural areas in the Severn River watershed.
- Develop a model of the watershed depicting the desired outcome of a successful preservation program.
- Develop a similar plan to protect historical and archeological resources in the watershed.
- Locate and identify the many natural areas and additional features not covered in "Gems of the Severn".

IMPLEMENTATION OF IMPROVED PRESERVATION

- o Improve aggressive and anticipatory preservation actions in contrast to reactive efforts.
- o Involve the business community in natural area preservation efforts.
- o Promote positive and tangible support for all available preservation tools.
- o Improve management and dissemination of information.
- o Update and expand the Severn River Data Base. *
- o Develop and utilize effective educational and technical assistance programs.
- o Improve cooperation and develop an effective coalition of environmentally conscious government agencies and private organizations.
- o Establish, fund and use a quasi-public land Trust for the Severn.
- o Expand the amount of open space areas for land use and zoning purposes.
- o Recognize, at all levels of government, the urgency and importance of effective preservation and take all appropriate actions.
- o Adequately monitor the environmental and biological qualities of the Severn River and the condition of the GEMS and similar sites.

* An additional offshoot of this report was the creation of the Severn River Data Base which is now housed at the offices of the Maryland Scenic and Wild Rivers program. The data base contains an assortment of published and unpublished maps covering the watershed, a wealth of existing publications concerning various aspects of the Severn, field notes and maps used in compiling this report, and other natural resources data pertaining to the river. Use of the Severn River Data Base can be gained by contacting the Chief of the Maryland Scenic and Wild Rivers Program at 2012 Industrial Dr., Annapolis, MD 21401, or by calling (301) 974-3656.

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Part II

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PREFACE

The Severn River Watershed is becoming a notable example of a cooperative approach to a coastal region. It comprises 70 square miles including an exceptionally valuable tributary of the Chesapeake Bay and its drainage area. If success in protecting and enhancing the value of the river and watershed is achieved, this watershed may provide a stimulating model and example for all of the fifty or more tributary systems of the Chesapeake Bay and for other coastal regions.

Special emphasis on the Severn River was provided in 1971 when it was incorporated into the Maryland Wild and Scenic Rivers Program. This provided the authority and support for the development of an excellent summary entitled "Maryland Scenic Rivers: THE SEVERN" in 1983, which said "The Severn is one of Maryland's greatest treasures, notable for fine scenery and a rich historic heritage." The report drew data and ideas from State and County offices as well as from a valuable Local Advisory Board. The well-illustrated volume summarizes the history of the watershed, the natural areas, a set of concerns, detailed recommendations for constructive actions, a valuable bibliography and other information. Among the recommendations was the creation of the Severn River Commission, which was accomplished in January of 1985 through concurrent resolutions by the Anne Arundel County Council and the City Council of the City of Annapolis. The Commission provides counsel and advice to Annapolis, Anne Arundel County and the State of Maryland on environmental and other matters within the Severn River Watershed.

From its creation, the Commission has placed special emphasis on the areas in the watershed which are unique, remain natural, have exceptional ecological significance or for other reasons merit special attention, appreciation, and protection. This emphasis has been stimulated primarily by Mr. Colby Rucker, whose personal knowledge and concern for the Severn environment has been principally responsible for several major actions by the Commission. Out of discussions of guidelines for environmentally significant sites, attention was focused as early as June of 1985 on areas of critical importance and the many sites which should be identified and protected. Mr. Rucker chaired a sub-committee on developing a document locating and characterizing what have been titled "Gems" of the Severn. He gathered much relevant information, but urged that competent staff be obtained to supplement his efforts in providing the intensive and extensive work necessary for a definitive report. He located 117 sites of interest.

One spin-off from this interest was the report "Severn River Natural Areas of Highest Priority for Preservation" completed in February of 1986. It highlighted 12 sites and areas from the longer list which need, in the opinion of the Commission, urgent attention and the highest degree of protection possible. Appropriate action was recommended to the County, State and City and some of the suggestions have been implemented.

The Maryland Department of Natural Resources, under the leadership of Assistant Secretary Thomas C. Andrews, awarded a six month contract in January, 1986, to Todd Davison, a highly capable and enthusiastic scientist with an excellent background for such a project. The Commission wishes to record its appreciation to Mr. Davison for his exceptional personal contribution in work far beyond the contract and personal interest far above average. The invaluable support of the Department of Natural Resources and the untiring work and extensive knowledge of Colby Rucker and Todd Davison have produced the "Gems of the Severn."

The Severn River Commission has accepted the report and endorsed its content. On the basis of the reports by the primary authors, the Commission recommends 20 specific actions and programs to protect the "Gems" and other important sites. We urge that the information, concepts and recommendations in the report be given continuing and serious attention in the activities and decisions of the City of Annapolis, Anne Arundel County, the State of Maryland, the federal government and the public. We believe that these "Gems" will be of increasing value in the future to the quality of life in the watershed. We recommend exceptional and effective efforts to preserve them.

L. Eugene Cronin
Severn River Commission Chairman
1985 - 86
Carlo Brunori
Severn River Commission Chairman
1987 - 88

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GEMS OF THE SEVERN

PART I

A REFERENCE GUIDE
FOR THE PROTECTION OF
A MARYLAND SCENIC RIVER
AND MARYLAND'S CAPITAL RIVER

INTRODUCTION

The Severn was designated a Maryland Scenic River in 1971. Since then, preservation of natural areas and other commendable efforts have been taken to ensure that this designation remains a worthy one. Such measures include; the Maryland Department of Natural Resources (DNR) acquisition of the Severn Run Natural Environment Area (NEA); Anne Arundel County (hereinafter the County) purchase of a portion of Sullivan Cove Marsh as an Area of Critical State Concern; publication of "A Greenway Strategy for Weems Creek" in 1982 and "Maryland Scenic Rivers: The Severn" in 1983; the establishment of the Severn River Commission (SRC); allocation of funds by the City of Annapolis (hereinafter the City) for an urban forestry program; the County passage of a development moratorium in the Critical Areas on April 21, 1986; effective extension of that control in December of 1986; and recent efforts by the DNR and the County toward acquisition and preservation of Whitney's Landing Farm and the Mylander tract. In February of 1986, the SRC produced a report entitled, "Severn River Natural Areas of Highest Priority for Preservation," providing information on 12 such areas.

However, during the same period, many of the natural areas that helped the Severn originally merit the scenic label were being permanently replaced by residential development. The list is long: Pointfield Landing, The Downs, Saefern, Glen Oban, Indian Landing Estates, Martins Cove Farm, Whispering Woods, Bayberry, Tall Timbers, Woodlore, Bluff Point, and many more. The number of recently proposed subdivisions is even more threatening. In the County, 22 subdivisions were proposed in 1985 and eleven more in 1986 before the moratorium was emplaced. The names Harbour Glen, Belvoir, Cranberry, Swan Point, Bancroft, College Creek Hotel, Bretton Woods, Luce Creek Estates, and others are familiar to those concerned with the fate of natural areas in the path of these proposed subdivisions and projects. Not all are highly destructive, but some have been and the rate of permanent alteration is frightening to many.

In addition, major projects for highway construction, sewerage lines, and dredging are continuously being proposed. Even as of this writing, massive changes related to I-97 are occurring. Other new or enlarged roads are scheduled for construction in the immediate future. In the past, such major works have permanently altered important natural areas in the Severn River watershed.

Faced with increasing population pressure and demand for residential land, many believe the Severn to be at a critical threshold, with additional development threatening permanent deterioration of its scenic and ecological integrity. The capacity of the Severn to accommodate development and still function as a Scenic River and deserve the title may have been reached.

This realization has brought renewed and concerted efforts, especially since the establishment of the SRC, to save the remaining natural areas in the watershed. But prior to formal preservation steps, the SRC realized that questions about these natural areas needed to be answered. How many and where? How large? How rare? How threatened? How used? How owned?

This report is a detailed analysis of the ecological, historical, archeological, scenic, and other impalpable attributes of the Severn River natural areas. It is derived from a wide variety of sources, such as existing publications; topographic, soil, and geologic maps; aerial photography; personal interviews with knowledgeable residents, and government file data. But above all, this is a field-oriented document based on observations collected during site visits to the subwatersheds of the Severn. The authors hope that it will provide the needed answers to the many questions asked not only by the SRC, but also by the City, County, State, and the several Federal agencies involved.

The report is divided into two parts. Part I consists of introduction and methodology sections; a section explaining the organizational scheme, formatting, and the categories used to describe natural areas; sections discussing preservation strategy and recommendations, and a glossary. Part II contains detailed descriptions of natural areas in the Severn's 50 subwatersheds -- thus 50 subsections. A third document, A Registry of Landowners, has been prepared and printed in modest numbers to assist preservation efforts.

With user accessibility and convenience in mind, natural area descriptions in Part II were organized into separate categories. The user of Part II should first refer to Part I for explanations of each category and the significance, reliability, and precision of the data it contains. The user should keep in mind that although features are listed by separate categories, they actually interact in complex ways to form natural areas.

The fact that a field visit was made to a natural area during this study does not suggest that everything is now known about the site. Undoubtedly many important features were missed, and additional field work at these sites is encouraged. Field visits to subwatersheds not covered in this study will also be necessary. From this, new areas of exceptional natural value will certainly emerge, requiring expansion of the data base. In addition, natural areas are dynamic in time and, therefore, should be continually monitored for changes, and the data base updated accordingly.

Finally the reader should note that this report has not been formally edited nor officially endorsed by the Maryland Department of Natural Resources, Anne Arundel County, or the City of Annapolis. The findings and statements are those of the authors, and the recommendations are those of the Severn River Commission. Much support and agreement has been found among the staffs of government agencies, interested and knowledgeable citizens, and the members of the Severn River Commission.

OBJECTIVES

In March, 1986, this 6-month project was undertaken with enthusiastic hopes of accomplishing eight primary objectives:

1) Through field work, to assess and inventory all salient features of natural areas in each of the 50 subwatersheds of the Severn River.

2) To establish a Severn River Data Base housing published and unpublished reports, maps, photography, field data, and various other sources of information.

3) To compile a comprehensive register of all landowners for each natural area where field work permitted delineation of natural area boundaries.

4) To develop a conceptual framework around which a preservation strategy for natural areas could be developed.

5) To produce a report that would allow the SRC and planners from the City, County, and State to quickly and easily access specific types of information about natural areas in the watershed.

6) To make recommendations for consideration by the SRC and City, County, State, and Federal governmental agencies concerning natural areas and their preservation.

7) To develop new and innovative techniques which would offer incentives to private landowners for preservation of their land.

8) To implement these techniques in a subwatershed as a pilot study to gauge landowner acceptance and evaluate the success of the techniques.

Regretfully, time constraints did not allow fulfillment of the last two objectives. However, they are still important tasks that warrant consideration by the SRC and various governmental agencies.

ACHIEVEMENTS

Toward the first objective, natural areas in 33 of the 50 subwatersheds were surveyed in the field. Time and inaccessibility to some private property precluded full coverage of all subwatersheds. However, much was learned about the remaining 17 through publications, file data, maps, cursory field visits, aerial photographs, and interviews with experts and knowledgeable residents.

Unfortunately, funding and time restraints negated the inclusion of extensive illustrations and maps in this report. However, as part of objective 2, detailed field maps, in addition to a wealth of other data, are housed at the offices of the Scenic and Wild Rivers Program of the DNR, Land Planning Services, as the Severn River Data Base.

This report is the principal product of efforts to this time in a program which must continue for many decades.

Severn River Data Base

The Severn River Data Base contains, by subwatershed, all field notes and maps used to compile this document. It also contains a complete set of the following maps (at a scale of 1:2400) for the Severn River watershed: U.S. Fish and Wildlife Service, National Wetlands Inventory (1979); Archeological Sites recognized by the Maryland Historic Trust; and Historic Sites as surveyed by both the County Office of Planning and Zoning and the Maryland Historic Trust. A complete set of the published and unpublished reports used is also on hand. Many additional miscellaneous pieces, such as photocopied maps at various scales, the many photographs and slides taken during field work, and relevant newspaper articles are available as well.

The data base is designed for primary use in relation to land areas. It does not contain water quality and quantity information, fisheries records, and other water related material. The data base will require continuous updating and revision as new information about the "Gems" listed in this report is unveiled. It will also require additions as new natural areas are found and documented.

Through cooperation between the SRC and the Maryland Scenic and Wild Rivers Program (within DNR, Land Planning Services) this data base can become a valuable and actively used information resource. The information in this file can be used by calling the Chief of the Maryland Scenic and Wild Rivers Program (301-974-3656) or by visiting this DNR office at 2012 Industrial Drive, Annapolis, Maryland 21401. Hopefully, the creation and utilization of this data base can serve as a model for the other scenic and wild rivers in the State.

METHODS

Literature Review

The sound foundation for any scientific report is an extensive literature review. City, County, State and Federal governmental agencies; secondary schools, universities, and research consortiums; and private citizens have published a substantial body of information on the Severn River. Unpublished reports and file data from these sources can also provide a surprising fortune of data pertinent to the Severn. The Bibliography at the end of Part II lists the sources of information that provided supportive and background information for this report.

Field Work

Data collection in the field did not involve detailed methods such as point-sample timber cruising, soil descriptions, or bird inventories. Field work was oriented toward development of a holistic picture of each natural area. Typically, many hours were spent in walking through or canoeing the shore of each natural area and recording observations about plants, wildlife, soils, geology, and aesthetics. Promptly after the field visit, before the vividness of mental impressions faded, field notes were assimilated and rewritten into a coherent text. Most of the descriptions presented in Part II are based on these writings.

Throughout Part II, the reader will note a heavy emphasis on the floral, versus faunal, characteristics of natural areas. There are several reasons for this imbalance. First, the authors' personal expertise are more aligned toward the fields of botany and plant taxonomy. Second, the short period (four months) available for field work did not allow for a comprehensive study of wildlife. Such studies are very dependent on the seasonality of the breeding and migration patterns of various species. The optimum times to study each species occur at different cycles throughout the year. Many of these cycles did not necessarily overlap with the period available for field investigation.

Because plants are static in time and place, they lend themselves more readily to this type of hurried and limited study. In addition, a truly valid study of the diverse wildlife types (e.g., forest interior breeding birds versus brook trout) would require indepth study by various specialized biologists (e.g., ornithologists, ichthyologists etc).

The authors do not assume that the ecological health of each natural area is totally based on its floral attributes. Indeed, a comprehensive investigation requires equal treatment to wildlife and other attributes. However, given the inherent time and professional limitations associated with this study, the authors feel that the field descriptions (weighed heavily toward plants) provide the reader with an adequate characterization of the general ecological quality of each natural area.

Mapping

Topographic base maps were provided by the County Office of Planning and Zoning. These maps were of sufficient detail (scale 1:2400) and precision (contour interval, 2 and 5 feet) to allow the boundaries of natural areas and constituent ecotypes to be delineated. Separation of "natural" areas from "non-natural" was a

subjective delineation based on the present intensity and spatial distribution of man's influence. In cases where natural areas were only partially traversed, aerial photography was used to support field observations in mapping boundaries. Black and white aerial photography (scale 1:2400) taken in the winter of 1984 was also provided by the Office of Planning and Zoning for this task. The winter photography revealed man-made features that might otherwise have been camouflaged by tree canopies had summer photography been used.

Acreage Measurements

After delineations of natural areas and constituent ecotypes on base maps, acreage was measured using a "Lasico" electronic planimeter (resolution 0.01 inch^2). Each polygon was measured three times and the average calculated to reduce human operational error. Measurement of wetland acreage from DNR and U.S. Fish and Wildlife Service wetland maps followed the same procedure.

Considering the subjectivity of boundary delineations and human operational error inherently involved in planimetering, acreage figures should not be considered absolute. However, for the purposes of this study, the acreages are considered reliable and accurate (within a 10% margin of error of the actual).

Landowners

Information on landowners was compiled from Anne Arundel County Tax maps (1985) published by Spec Print Inc. Landowners whose parcel(s) made up a portion of a natural area were included. The inclusion of landowners whose parcel(s) were along the periphery of natural areas was subjective and based on the natural characteristics and geography of the parcel and the ecological makeup of the natural area.

ORGANIZATION

In scientific research and natural resources management, the most suitable breakdown of a study area of this type is usually by natural drainage areas or subwatersheds. In this report, the Severn River watershed, which comprises 70 square miles, is separated into 50 subwatersheds (Table 1). As shown in Figure 1, these are the drainage basins of the major tributaries which flow directly into the Severn.

Subdividing the Severn is for convenience purposes, and the need to preserve the River as a whole should not be overlooked. But in large measure, preservation will be accomplished (probably more effectively) through the cumulative protection of the constituent parts, the subwatersheds.

TABLE 1

The 50 Subwatersheds of the Severn River

1) Lake Ogleton*
2) Chase Pond-Heron Lake*
3) Back Creek*
4) Spa Creek*
5) College Creek*
6) Weems Creek*
7) Cove of Cork*
8) Luce Creek**
9) Martins Pond*
10) Saltworks Creek**
11) Clements Creek**
12) Brewer Creek*
13) Brewer Pond*
14) Hopkins Creek*
15) Maynadier Creek*
16) Little Round Bay Upper Shore
17) St. Helena Island*
18) Fox Creek*
19) Valentine Creek*
20) Plum-Gumbottom Creek*
21) Arden Pond*
22) Cypress Branch*
23) Indian Creek Branch*
24) Three Islands*
25) Sewell Spring Branch*
26) Severn Run
27) Point Field Branch*
28) Bear Branch
29) Coolspring Branch
30) Chartwell Branch**
31) Stevens Creek**
32) Forked Creek*
33) Yantz Creek**
34) Sullivan Cove*
35) Round Bay Shore
36) Ringgold Cove
37) Aisquith Creek
38) Rays Pond*
39) Chase Creek*
40) Coolspring Creek
41) Winchester Pond**
42) Browns Cove*
43) Jonas Green Pond*
44) Pendennis Mount Pond*
45) Woolchurch Cove*
46) Carr Creek*
47) Mill Creek*
48) Whitehall Creek**
49) Meredith Creek*
50) Hacketts Point to Sandy Point**

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* - Denotes field work over a portion or all of the subwatershed

** - Denotes cursory field visit.

- Subwatersheds 2-6 are partially or wholly within Annapolis City Limits.
- Note that in four cases islands or shoreline segments form "subwatersheds".

The sequencing begins at Lake Ogleton, the extreme downstream subwatershed on the south shore of the Severn. From Lake Ogleton, the succession is upriver along the south shore to Severn Run; then downriver along the north shore to Greenbury Point; and then eastward across the bay-front of the Broadneck Peninsula to Sandy Point. This incorporates all of the drainage area within the jurisdiction of the SRC, as defined by the County Council in Resolution 130-84 of 1984, which established the Commission. The Severn Run can, as a large (24 square miles) subwatershed, be broken down further, as was done by CH$_2$M Hill (1980). However, because the CH$_2$M Hill (1980) study covered the Severn Run watershed in detail, the present study will only concentrate on one of its key subwatersheds, Jabez Branch.

Category Format

For each of the 50 subwatershed sections included in Part II, descriptions of natural areas are formatted into separate categories (Table 2). A standardized format was chosen to facilitate and speed up data retrieval of specific types of information for specific areas.

For example, assume the user needed information on prehistoric Indians in the Maynadier subwatershed (# 15). The Table of Contents for Part II lists the page numbers covering the Maynadier subwatershed. Referring to the Maynadier category entitled "Archeological Features," one might find information on shell heaps, artifacts, or prehistoric cultures in specific natural areas. Referring next to the category "Isolated Features", one may find facts about an isolated archeological site in the subwatershed not located in a particular natural area.

Category Descriptions

The following subheadings provide explanations for each of the categories listed in Table 2, describe how the reader can use the information in each category, how that information was obtained, its significance, limitations, and precision. These subheadings are designed to function as a "user's manual" for Part II.

TABLE 2

NATURAL AREA CATEGORIES

SUBWATERSHED

- Name
- Location

NATURAL AREA

- Name
- Geographical Limits
- Total Acreage
- Ecological Classification
- Ecotypes
  - Acreage
  - Flora
- Natural Heritage Elements
- Noteworthy Plant Species
- Exceptional trees
  - State Champions
  - Maryland Big Tree Inventory
  - Old Trees
  - Historic Trees
- Historic Features
- Archeological Features
- Wildlife
- Scenic Qualities
- Geology
- Soils
- Topography
- Contiguity
- Other
- Previous Listings

LAND CONSERVATION

- Ownership Type
- Land Use
- Residential Communities
- Problems
- Preservation Options
- Future Use

ISOLATED FEATURES

- Archeological Features
- Historic Features
- Wetlands
- Exceptional Trees
- Natural Heritage Elements
- Noteworthy Plant Species
- Wildlife

SUBWATERSHEDS

Name: Subwatershed nomenclature follows the most recent or generally accepted name of the affiliated water body (creek, cove, lake, pond, run, or branch). Where applicable, alternate spellings, secondary names, and historical names (with dates referring to dates of specific maps or other sources) are provided for general interest. Most names appear on U.S.G.S. Topographic Quadrangles and other conventional maps.

Location: The general location of the subwatershed is given (e.g., as being between the immediately adjacent upstream and downstream subwatersheds). The proximity of well known features (e.g. the Route 50 Bridge) may also be given.

NATURAL AREAS

Name: Nomenclature follows the same criteria as for subwatersheds (see above). Where no known name exists, the natural area is named after the most proximate physical or cultural feature of prominence.

Geographic Limits: The general bounds of the natural area are described in a circumnavigational pattern using both physical and cultural landmarks. In the absence of detailed maps, this verbal description will help the reader readily locate the natural area on most conventional maps.

Total Acreage: The acreage of the contiguous portion of the natural area is given. This figure represents the sum of the acreage measurements of the constituent ecotypes comprising the natural area.

Ecological Classification: In ecological studies, the definition of a "natural area" is almost always tailored to the objectives of the study and the size of the area under investigation. Past studies designed exclusively for identification of natural areas over large expanses have employed highly restrictive definitions which consider only the most pristine sites. The present study, however, goes beyond simple identification and considers comprehensive preservation of natural areas over a limited region (the Severn River watershed) as the ultimate objective.

Thus, this study has chosen not to use a single exclusionary definition, but a graduated classification system which will include the side array of natural areas found on the Severn (Table 3). "Natural area" in this system pertains to any feature or area that positively contributes to the ecological and scenic integrity of the Severn River and which provides some type of benefit to wildlife and citizens.

Table 3

CLASSIFICATION SYSTEM FOR NATURAL
AREAS IN THE SEVERN RIVER WATERSHED

Environmental Complex: This is usually a large area composed of a variety of complete ecotypes which complexly interact. The gene pool of the complex is probably sufficient for the continued survival of all species inherent to a functioning natural system.

Complete Ecotype: In this case there is but one ecotype (a tidal marsh, freshwater pond, ravine, etc.), but it includes the surrounding transitional zones. These "life zones" can be thickets, water influence areas, or wooded shorelines, but are essential to the scenic and ecological integrity of the habitat.

Incomplete Ecotype: An ecotype without its surrounding transitional (life) zones may still be of some significance as a habitat for species whose life cycles do not require the protection or interaction of these zones. The term "buffer" is frequently used to imply the lessening of the effects of adjacent negatively impacted areas. Transitional zones are not synonymous with buffers; in fact, the life zones should often be protected by buffers.

Microsystem: A small site which provides an ecologically stable station for the perpetuation of an uncommon plant and/or animal or which displays positive scenic qualities. A microsystem may be especially important if enough associated species are present to indicate the niche which an uncommon plant typically occupies in a larger system.

Isolated Features: A State Champion, exceptionally large, old, or historic tree; historic sites; and archeological sites existing in a developed area. In many cases, however, there is no associated natural system to lend additional clues to the special natural factors which gave rise to the isolated feature.

Altered Green Area: Many areas have been severely altered, causing the disruption of the original ecology, and the colonization of non-native species. Nonetheless, such areas sometimes provide good wildlife habitat, or have potential to produce important natural features with time.

In this classification system, size is not a factor. Although bigger is usually better, a minimum size for particular uses or benefits is difficult to determine. For example, a 0.5 acre wetland ("microsystem") may support interesting, locally unique, or State rare species. Or this wetland may be within a community, and residents may identify with its scenic and "open space" qualities.

Most natural areas in the watershed have been or are currently being negatively impacted by man's actions. The degree of this impact is a limiting factor for inclusion in the classification system (e.g., sites that have suffered irreversible ecological change such as residential areas are not included). Conversely, many areas have been impacted, but not irreversibly so, and still provide significant ecological and/or scenic benefits. Whereas past studies may have excluded these areas and included only "ecological complexes" and perhaps "complete ecotypes", the objectives of the present study warrant that the "altered green areas" receive consideration.

The inclusion of "altered green areas" and "incomplete ecotypes" also addresses the recuperative potential of natural areas. Many of the finest natural areas now present in the watershed were highly disturbed by agricultural endeavors only 100 years ago. Some areas heavily disturbed just 20 years ago are now quite productive habitats and are on the road to stable ecological recovery. In consideration of a prudent, long-term preservation program, these areas are included under the classification system.

To develop a preservation strategy it must be understood that some natural areas are more ecologically valuable than others. However, it is important that we still consider every natural area as an "adequate facility," providing benefits, to wildlife and citizens. The classification system offered in this report promotes identification of natural areas in every subwatershed and helps insure that a negative image will not be cast on "less natural" areas. A positive approach and a wide geographical distribution of natural areas will be necessary for developing broad citizen support. A unified preservation program can prosper if each community has a local natural area to adopt and help protect.

When planning a preservation strategy, the classification system can be used to analyze natural areas of the same class. Thus each natural area identified in Part II is labeled as one of the six ecological classes listed in Table 3.

Ecotype: Using the 6-tiered classification system, each natural area is composed of one or more constituent ecotype(s). Therefore, each natural area listed in Part II is described in terms of its component ecotypes. For consistency purposes, the following ecotype nomenclature is used throughout Part II:

- o Uplands and Terraces
- o Steep Slopes
- o Ravine Bottoms
- o Meadows
- o Bogs (Sphagnum and Cedar)
- o Ponds

- o Floodplain Forests
- o Wooded Swamps
- o Shrub Swamps
- o Marshes (Fringe, Cove, Draw)
- o Old Fields
- o Tidal Tributaries
- o Branches (Runs)
- o Islands
- o Sandbars
- o Cliffs

Most of these names were established in the 1983 Severn Scenic River Plan and are adopted here to maintain uniformity and reduce terminology confusion. Table 4 provides definitions for each ecotype.

In general, the number of different ecotypes listed for a natural area will provide some indication of its diversity.

Ecotype Acreage: The area (in acres) of each ecotype is given.

Ecotype Flora: A description of the plant species which best characterize each ecotype is provided in Part II. Descriptions are based on field observation and available literature and do not reveal exact composition or cover percentages of species.

The most common or dominant plant species of the canopy, understory, shrub, and herbaceous layers, where present, are listed. The approximate dimensions, densities, and intermixing of species is discussed. In some cases, descriptions also include plant communities of unusual age, maturity, or productivity: species that occur in very unusual positional relationships to other species; and the anomalous absence of typical species.

A general description of the relationship of species to topography, sunlight exposure, soil type, and soil moisture is occasionally given as well. Discussing these relationships will remind the reader that every plant is adaptive to a certain suite of ecological conditions. A basic knowledge of the relationship of species to these conditions can change the way we look at natural areas in terms of preservation. For example, there may be no verified sighting of a rare plant in an ecotype conducive to its occurrence. However, by knowing the tolerance limits of that species, we may highly suspect and reasonably assume its presence in that conducive ecotype, especially if a similar ecotype in the watershed supports that species.

Until such time that all natural areas can be thoroughly covered by qualified biologists, understanding ecotype/species relationships that tell us where rare plants might occur may be a more prudent (albeit more difficult) approach than predicating natural area preservation only on confirmed sightings of rare plants. We must be cognizant of the very limited coverage of on-site ecological observations in the watershed.

Table 4

ECOTYPE GLOSSARY

Uplands: The highest portions of a natural area that are relatively flat (0-15% slopes). Commonly, uplands occupy the linear ridge crests between drainage courses. In relation to other ecotypes, uplands are usually bounded on either side by steep slopes which drop down to ravines, floodplains, runs or tidal tributaries.

Terraces: Flat, "stair-stepped" landforms occurring about halfway up steep slopes of tidal tributaries at elevations of between 55 and 70 feet (msl). These terraces are probably "wave-cut benches" formed through erosional processes in the Pleistocene Epoch when relative sea level was much higher than present.

Old Fields: These are recently cleared uplands and terraces that have begun to revegetate. Old Fields actually refer to a successional stage between pastures or open fields and forested uplands and terraces.

Ravine Bottoms: Alluvial lowlands narrowly confined between adjacent steep slopes. Ravine bottoms may contain springs, small branches, or wetlands but are almost always typified by cool, moist, and shaded conditions.

Floodplain Forests: Any flat deposit of alluvium which is forested and periodically inundated. Floodplains are broader and have thicker alluvium accumulations than ravine bottoms. Usually, ravine bottoms grade into a floodplain or a floodplain is formed when two or more ravine bottoms converge.

Wooded Swamps: Forested alluvial lowlands typified by highly organic, saturated soils and, commonly, areas of standing water.

Shrub Swamps: Alluvial lowlands supporting shrubs and stunted tree species due to extremely saturated soil conditions and standing water which do not allow for full growth of vegetation.

Marshes: Areas of shallow water, thickly vegetated by characteristic herbs and grasses. Depending on the local salinity, marshes can range from fresh to brackish. Marshes usually fall into three categories: fringe, draw, and cove. Fringe marshes occur as narrow linear strips along sandy shorelines. Cove marshes occur at the heads of major tidal tributaries and large offshoot coves. Draw marshes are genetically similar to cove marshes, but are smaller in size, and normally occur at the apex of small indentations in the shoreline.

Tidal Tributaries: The downstream most estuarine extensions of major runs or branches flowing into the Severn.

Runs and Branches: Small freshwater streams which flow through ravine bottoms or floodplain forests.

Table 4 (continued)

Steep Slopes: Forested portions of natural areas having gradients which approach or exceed 15%.

Cliffs: Also called bluffs, these are the dramatic geologic outcrops along the Severn River shoreline which range in elevation from 30 to 100 feet (msl). The profile of cliffs range from sheer vertical to approximately 60 - 70%. Typical colors of weathered sediments exposed in cliff faces include red, brown, tan, yellow, and buff. Both the steepness of the vertical profile and the color of the cliff exposure depend on the geologic formation in which it occurs.

Sandbars: Sandy, unconsolidated sediments which occur as linear deposits or spits across the mouths of tidal tributaries.

Islands: Land masses, completely surrounded by the tidal waters of the Severn River. Islands of the Severn vary greatly in size, age, elevation, and stability, as a function of the geologic formation from which they were carved or the geomorphic processes which deposited them (i.e., they can be either erosional or depositional features).

Bogs: Areas of highly acidic, saturated soils and standing water which are colonized by either sphagnum moss or Atlantic white cedars.

Ponds: In the Severn River watershed, these are relatively small manmade bodies of water created by damming ravines and branches, by excavation of geologic materials (glass sand pits), or by trapping of runoff between hill slopes and railroad embankments.

Meadows: Relatively flat surfaces dominated by tall grasses and characteristic lowland herbs. Most meadows occur in moist lowlands or depressions influenced by hydric soils, but no standing water.

Natural Heritage Elements: The Maryland Natural Heritage Program of the DNR was established in 1979. Since that time, the program has developed a statewide inventory that focuses on the "elements" of natural diversity. An "element" in this case is a plant or animal species, natural community, or other natural feature of particular interest because it has been determined to be exemplary, threatened, or endangered on a statewide or national basis. Species rank is determined by considering total and state range, distribution and number of occurrences, protection status, threat of destruction, and ecological fragility. The rank (according to the DNR Natural Heritage Program as of 1986) is as follows:

A1 - Nationally endangered, in imminent danger of extinction throughout its range

A2 - Nationally threatened, in danger of extinction throughout all or most of its range.

A3 - Nationally rare, close to extinction throughout all or most of its range.

B1 - Regionally rare, in danger of extinction in Maryland.

B2 - Highly State rare, in danger of extinction in Maryland.

B3 - State rare, in danger of extinction in Maryland.

/U - Status unknown, uncertain Maryland record or questionable taxonomic entity.

/X - A population has not been found or reported in Maryland since 1950.

C - "Watch List", species believed secure in Maryland but are uncommon, local or seriously declining.

Many elements ranked in the B-series and C have been identified in the watershed. During field work for this study, additional sightings of B and C elements were made. Despite the numerous confirmed sightings, we must be conscious of the shortage of detailed field surveys in many natural areas. Assuredly, there are many as yet undiscovered B and C elements. Hopefully, many can be identified and protected before they are unknowingly lost.

Protection of natural areas which support heritage elements is of paramount importance to maintenance of species diversity and insurance against extinction of state and regionally rare plants. Protection of natural areas is thus not just a watershed issue but one of much wider importance.

Although B and C heritage elements known to exist in the watershed are listed in Part II, their specific locations are not disclosed for obvious security reasons.

Noteworthy Plant Species: Besides officially recognized heritage elements, some Severn River natural areas support disjunct, range peripheral, locally rare, or highly fragile plant species. In addition to heritage elements, this study considers these noteworthy plant species as being extremely important and worthy of preservation.

Some plants are at the periphery of their range or disjunct and far removed from their usual range. A few of these species have been termed "rare", "uncommon" or "infrequent" for the Coastal Plain setting of the Severn. Some species that flourish in the Piedmont have found a refugium in the "Piedmont-like" microclimate of certain Severn River ravines.

Plants considered rare within the sphere of the watershed deserve special consideration if they are to escape extirpation (the extermination of a population of species at some relatively local level). Some of these locally rare plants are considered to be so susceptible to changes induced by man that they may become threatened at the watershed level in the foreseeable future.

Noteworthy plant species should be considered a major factor in the evaluation of natural areas for preservation. These species are listed in Part II.

Exceptional Trees: The Severn River is blessed with many trees of extraordinary qualities including State Champion Trees, Maryland "Big Trees" and "Bicentennial Trees", and historic trees. These trees of exceptional stature or age are invaluable aesthetic, financial, and sentimental assets that improve the quality of life for residents of the watershed. Beyond being valued for their beauty and tangible merits such as shade protection, air conditioning, or noise absorption, exceptional trees should be valued for their intangible virtues.

Because every acre of every natural area was not traversed, the lists of "Big Trees", "Bicentennial Trees", and historic trees are not complete. Undoubtedly, there were many grand trees not observed during field work.

Exceptional trees not located within the bounds of a natural area are listed under the category "Isolated Features" in Part II.

State Champions: In 1973 the DNR published "The Big Tree Champions of Maryland." This publication included data on the circumference at breast height (CBH), total height, spread, owner, and location of State Champion trees. The publication was recently updated; this data is included in Part II for those State Champions occurring in the watershed.

Certain tree species do not have a reigning State Champion. The largest known examples of these species in the watershed were identified and unofficially measured during field work for this study. These trees should be officially measured by the DNR Urban Forestry Program and crowned State Champions until larger trees are discovered. These potential champions are also listed in Part II.

Big Trees: The Urban Forestry Program in the DNR maintains an inventory for "Maryland Big Trees": trees with dimensions that may eventually rival State Champions. Many Big Trees in the watershed are on the inventory.

Through field work for this report other exceptionally large trees were observed that warrant inclusion in the inventory. The circumference at breast height (CBH) of these trees was measured with a standard tape and the height and spread dimensions visually estimated. These new Big Tree observations as well as those from the official inventory are included in Part II.

Old Trees: In 1975, the DNR identified trees over 200 years in age as part of the bicentennial celebration. The publication "Bicentennial Trees" notes several trees in the watershed which meet the age criterion. These are listed in Part II.

During field work for this report, additional trees thought to be at least 200 years in age were also identified. These are also listed in Part II. Age estimates for these trees was not based on standard dendrochronological methods. Estimates were strictly superficial, based on tree bark patterns, morphology, thickness and blemishes, and also on knowledge of local history and historic engravings that were legible. These estimates should not be taken as absolute ages.

Nonetheless, exact age is not as important as recognition of the venerable trees in hopes that public knowledge of their existence will help prolong their lives. Some "Old Trees" are former giants that are now mere shells of their former dimensions. But some are healthy specimens, and if left undisturbed, should live for many years, perhaps centuries, to come.

Historic Trees: This category recognizes trees that, beyond antiquity, are valuable for personal, sentimental, or other intangible reasons.

Trees have played an important role in shaping events of the past as official meeting places, boundary markers, or sites for marriage proposals. Trees also act as symbols which help preserve memories of special times and local folklore.

This category requires much more field work, historical research, and communication with long-time residents. The information included in Part II barely scratches the surface, but hopefully it brings out important concepts about other values of trees. Unlike trees specifically managed for wood fiber production, "Historic Trees" are unique nonrenewable resources.

Historic Features: The "Anne Arundel County Historic Sites Survey" is currently being conducted by the County Office of Planning and Zoning. This County-wide survey, which includes all of the Severn watershed, is part of the Maryland Historic Trust (MHT) Inventory for

sites, buildings, structures, and objects which are 50 years and older. Sites recognized by the survey that are specific to the watershed are listed in Part II. Information includes age, ownership, architectural and historical significance, and physical condition of each site. Detailed maps showing the location of each historic site have been included as part of the Severn River Data Base.

Historic sites that were not recognized by the survey (e.g., mill sites, sand caves, etc.) are also listed in Part II. This information was derived from field work, previous publications, and communication with long-term residents.

Many sites in the survey are recognized by "The National Register of Historic Places". The large number of National Register sites testifies to the historic richness of the Severn River.

Sites within the Historic District of Annapolis, are, regretfully, too numerous to include in a report of this scope. Information on these sites is on file with the MHT.

Historic sites not within the boundaries of a natural area are included under the category "Isolated Features" in Part II.

The 1985 County General Development plan states (p.21) that:

> An archeological and Historic Sites Preservation Plan will be developed that will outline protective measures for the County's archeological and historic resources.
>
> An Archeological and Historic Resource Protection Ordinance will be considered to implement the Preservation Plan. The ordinance would require review procedures of County sponsored and permitted activities, mitigation standards, and an enforcement capability of those standards would be established to guard against adverse effects on archeological and historic resources. Guidelines for rehabilitation of historic and architecturally significant structures and architectural standards for new structures that lie adjacent to historic structures would be established.

Prompt formulation of this plan and passage of a comprehensive, enforceable ordinance by the County is of paramount importance in the preservation of historic and archeological resources in the watershed.

Archeological Features: The Severn is unique among Maryland rivers for the amount of archeological information it has yielded about prehistoric cultures in the region.

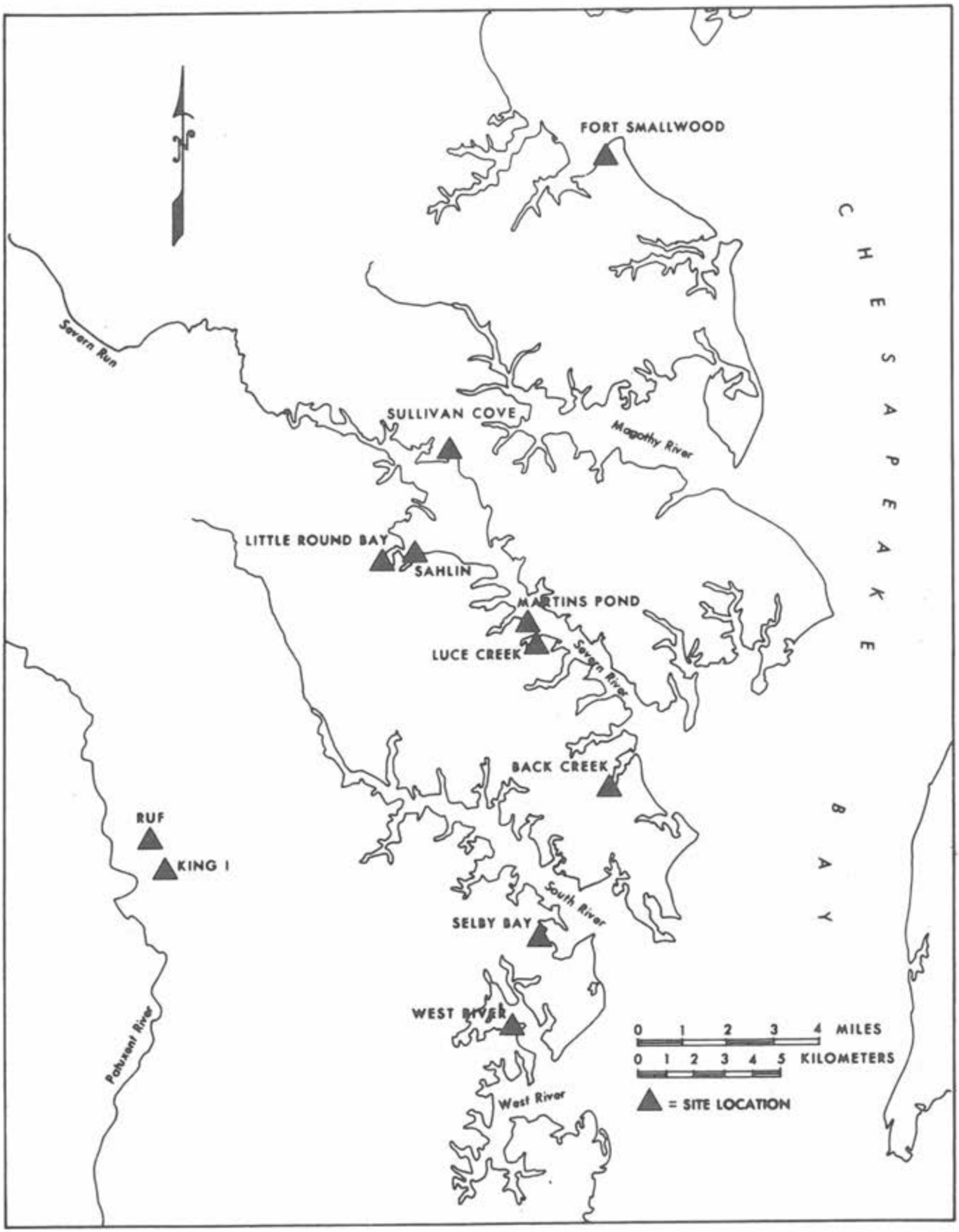

Figure 2. Archeological Sites of the Middle Chesapeake Region (after Wright, 1973)

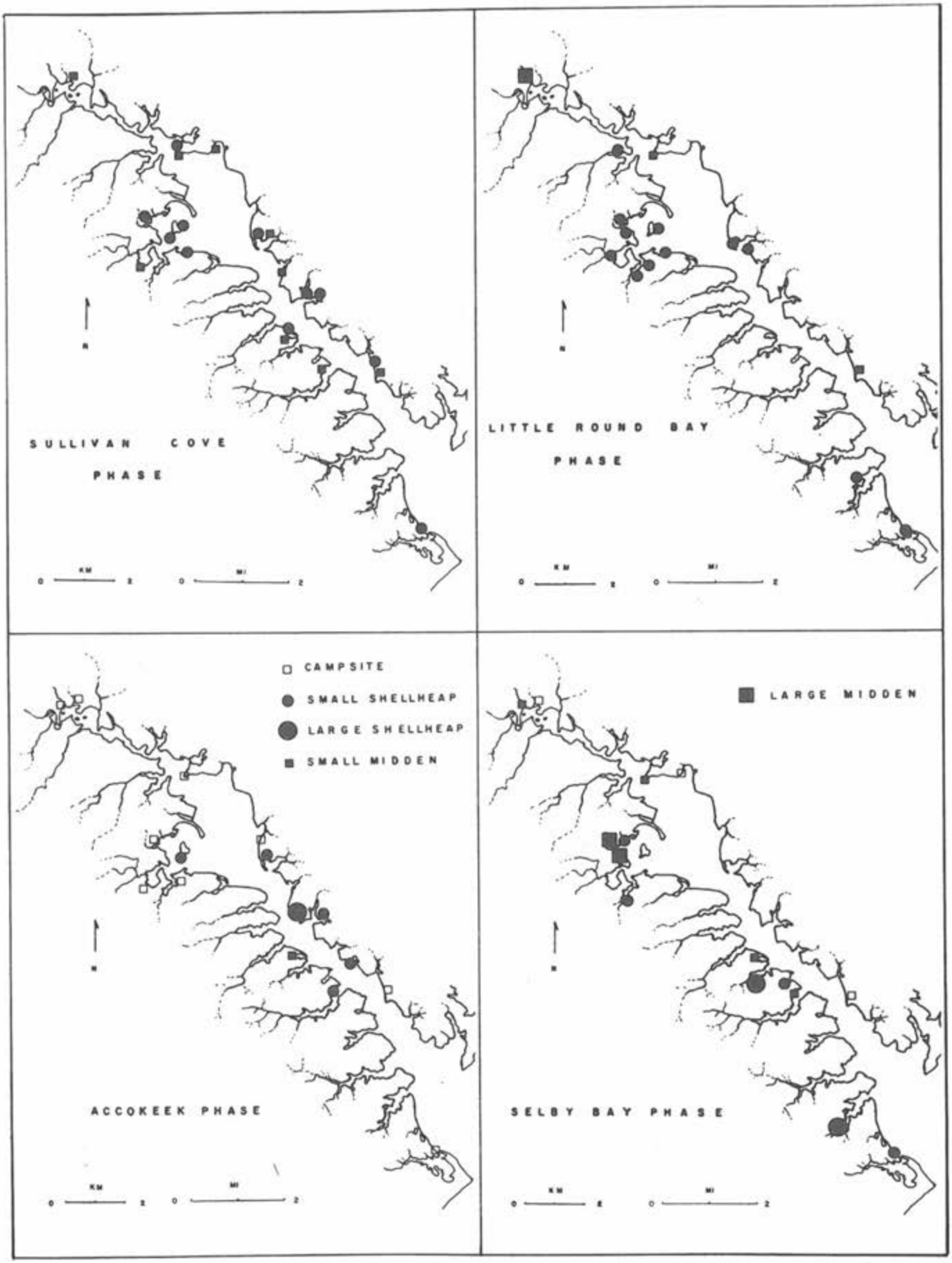

Figure 3. Prehistoric Settlement Distribution on the Severn River (after Wright, 1973).

The MHT Archeology Division maintains a comprehensive file of known archeological sites in the State. "Quad File" sites - isolated artifact finds and miscellaneous data - are also kept by the MHT. Sites specific to the Severn River watershed are listed in Part II. Although variable from site to site, information may include significant artifacts: physical condition, type, and size of the site: prehistoric phase: and general significance.

Henry T. Wright (1973) in "An Archeological Sequence in the Middle Chesapeake Region, Maryland" identified six major archeological sites in the watershed (Figure 2). Knowledge gained from these key sites was used to formulate a majority of the present understanding about phases of Indian culture in the Middle Chesapeake Region from about the time of Christ to A.D. 1300. These key sites and the numerous other sites (Figure 3) attest to the archeological wealth in the watershed.

Because these archeological sites must not be casually disturbed or carelessly obliterated, their exact locations are not provided. Detailed maps are, however, now available as part of the Severn River Data Base.

Sites in the Historic District of Annapolis that are too numerous to include are kept on file at the MHT. Archeological features that do not occur within the confines of a natural area are included under "Isolated Features" in Part II.

Wildlife: Over the past 20 -30 years there has been a significant decrease and fragmentation of intact habitat available for wildlife species in the Severn River watershed. The exact effect of this loss on wildlife species has not been formally substantiated, and the total impact is largely unknown. However, several trends are apparent (D. Daniel Boone and Gary Taylor, Maryland Forest, Park and Wildlife Service, 1987, personal communication).

First, wildlife species that require either very specialized habitats, extensive habitat areas, or little or no human disturbance for survival have decreased in number. Either the populations of these highly specialized species have decreased or the species has been extirpated from the watershed (no sightings having been recorded in many years). Examples of these might include forest interior breeding birds, bobcat, tiger salamander, and striped skunk.

Second, the more robust and/or less specialized ("common") species have experienced increases within their populations. These species are less dependent on refined habitats and are more adaptable to habitat fragmentation and the impacts of residential and commercial development. Examples of these species may include deer, raccoon, gray squirrel, robin and starling.

Another wildlife trend that is evident throughout the Chesapeake Bay region is that of the great birds of prey; bald eagle, osprey, and peregrine falcon. These bird species have shown an increase in numbers

recently. However, this trend is likely not a factor of recent changes in wildlife habitat. It is more likely a factor of Federal restrictions and reductions on toxic herbicides, pesticides, and other pollutants (e.g., DDT), and of man's careful management practices, including captivity breeding and construction of artificial nesting sites.

In summary, with a lack of a contemporary and comprehensive wildlife study, the overall impact of habitat reduction and fragmentation on total wildlife numbers in the watershed over the last 20 -30 years is debatable. However, there appears to have been a trend toward decreasing diversity (the total number) of different species. The view point of long-term residents familiar with the fauna of the watershed seems to substantiate this decrease in diversity. The consensus is that many species which only decades ago were abundant are now rarely sighted or no longer observed at all.

The nature of this report and time limitations dictated that field work be conducted over many areas as rapidly as possible. This strategy is suitable for study of plants which are (for the most part) fixed in time and place. However, it is not appropriate for comprehensive study of fauna which are fixed in neither time nor place.

Many species such as box turtles, various snakes, and woodpeckers were observed during field work. But these were haphazard and random observations and are not accurate assessments of wildlife in a natural area. The wildlife category requires additional compilation of available wildlife records and much more detailed field work by ornithologists, mammalogists, etc., before definitive statements about wildlife populations in specific natural areas can be made.

Past sightings of large bird species by DNR Forest, Park and Wildlife Service and unconfirmed citizen sightings are listed in Part II. Observations made during field work and thought to be significant are also listed.

Although this study is inherently biased toward surveying floral characteristics, preserving the wildlife resources in the Severn River watershed is of exceptional importance to the quality of the region and cannot be overemphasized.

Scenic Qualities: Observations of scenic qualities in natural areas are highly subjective. They depend on the observer's emotional perception of what is scenic. The time of day, weather conditions, and seasonal variations also effect human perception of scenic qualities.

All natural areas visited during field work were considered by the authors to have invaluable scenic qualities, and as such, copious notes on details of scenery were not taken. However, some sites had extraordinary scenic qualities that warranted pointed entry in the field notes. These qualities are listed in Part II and are almost a verbatim reflection of the field notes and the immediate impressions upon observation.

Besides visual beauty, fragrance and audio qualities, the value of a natural area as a vantage point or strategic lookout are also noted where appropriate.

Geology: The geology underlying a natural area is one of the predominant factors which determines its ecological characteristics and capacities. Soils, moisture conditions, and topography (and thus sunlight exposure) area all functions of the in situ sediments composing a natural area. A basic comprehension of the geology of the watershed is necessary for understanding natural area composition and variability across the watershed. Geology will thus be an important consideration in planning a preservation strategy for natural areas.

Table 5 provides a general description of the geologic formations in the watershed. The formations as they pertain to specific natural areas are listed in Part II.

A description of interesting geomorphological landforms for each natural area is also given in Part II. Such landforms may include misfit valleys, drowned alluvial valleys, relic meander scars, waterfalls, stream terraces, and entrenched stream valleys.

Earthen embankments (for roads, railroads, logging trails, or mill dams) laid across stream valleys have significantly altered the ecological makeup of natural areas throughout the watershed. An embankment elevates local base water level and reduces the gradient of the stream on the upstream side. This causes a reduction in sediment transport competency of the stream, resulting in deposition or "alluvial drowning." With time the floodplain floor aggrades with a wedge of saturated sediments (usually with perennially or seasonally standing water at the surface). As this happens, a succession of ecotypes - from floodplain forest to forested swamp to shrub swamp - may occur.

The stream on the downstream side of the embankment uses little or none of its energy for sediment transport, most material having been trapped upstream. The stream expends its excess energy through entrenchment of its channel bed, thereby entraining additional sediments for transport (an attempt to regain sedimentary equilibrium). The converse ecotype succession occurs in this case. A forested swamp will evolve into a floodplain forest, which with time will become drier as the local water table falls with continued stream entrenchment.

The circumstances described above have occurred on many of the runs and branches in the watershed over the past 200 years. Earthen embankments have had a profound impact on ecotype composition and ecological diversity of stream valleys throughout the watershed. These sites can be of exceptional value for outdoor education and research purposes, and are noted in the descriptions of natural areas in Part II.

Table 5

GEOLOGIC FORMATIONS OF THE SEVERN RIVER WATERSHED*

Alluvium	-	alluvial deposits underlying floodplains of branches and runs and tidal freshwater marshes. Sediments include interbedded sand, silt-clay, and gravel with organic matter, including partially decomposed grasses, leaves, and branches. Sediments are unconsolidated and perennially and seasonally saturated. Alluvium has been deposited within the last 10,000 years and has a maximum thickness of 15 feet. Soils formed in alluvium are highly variable from deposit to deposit depending on the geology of the source area from which the alluvium was eroded and on the percentage of organic matter.
Talbot Formation	-	underlies the "20 foot" flat terrace of Broadneck bordering the Bay and the community of Bay Ridge. The silt-clay parent material contains some glauconite and produces moderately fertile soils. Probably deposited 30,000 - 40,000 years ago as shallow Bay bottom sediments during a Pleistocene interglacial period when sea level was somewhat higher than its present stand. Maximum thickness attained is 35 feet.
Terrace Deposits	-	a small outcrop near St. Margaret's on Broadneck occurs at elevations of 40-80 feet (msl). Medium- to coarse-grained sands containing cobbles and boulders of Appalachian rock types capped by fine silt-clay unit at the surface. Deposited as a floodplain of an ancestral Susquehanna River during times of high sea level (100,000 - 1 million years ago?). Maximum thickness is about 40 feet. May be correlative with wave cut terraces in the Aquia Formation found at approximately the same elevations.
Calvert Formation	-	small sporadic remnants that cap the interfluves at 150-175 feet (msl) occur from Belvoir to Epping Forest on the southern shore. Possibly unmapped remnants occur at the same elevations directly across the river near Joyce Lane. Sands and diatomaceous silts result in extremely rich, fertile soils. The formation was a marine basin deposit about 25 million years ago.

* Information taken from Maryland Geological Survey "Geologic Map of Anne Arundel County" (1976).

Table 5 (continued)

Aquia Formation	-	most of the steep slopes, deep ravines, and spectacular bluffs in the watershed were formed in the glauconitic "greensands" of this formation. Because of the glauconite (sea floor remains) soils produced in the Aquia Formation tend to be very fertile. Where exposed to atmospheric conditions the greensand has oxidized to a rusty brown color. Lenticular pieces of reddish-brown sandstone (ironstone) are abundant in the soil zone where permeable sand lenses have concentrated water flowage. Aquia sands accumulated in very shallow marine waters of the inner continental shelf 52-57 million years ago. Attains a maximum thickness of 180 feet.
Monmouth Formation	-	very limited surface exposures in the watershed in the vicinity of Round Bay. Very fine to fine grained sands with micaceous clayey silt and occasional glauconite produces relatively fertile soils. It was formed through continental shelf deposition about 80 million years ago.
Magothy Formation	-	fine to medium well-sorted "glass" sands outcrop in a belt that crosses the watershed from Severna Park through Whitney's Landing Farm to Odenton. Soils produced from these "glass" sands are generally of very low fertility. Ironstone is readily formed in this formation which is about 60 feet thick at the outcrop. Its deposition occurred in a shoreline, beach type of environment about 110 million years ago.
Potomac Group	-	the Severn Run watershed except for Jabez Branch lies almost entirely within this formation. Two facies, a sand-gravel and a silt-clay with a highly variable spatial distribution produce soils of variable characteristics. These soils are generally low to moderate in fertility. Its deposition occurred in a fluvial environment (floodplains and backswamps) about 135 million years ago.

"Stream piracy", the natural diversion of all or part of one stream into another, has also resulted in ecological changes in the watershed. Through erosion, a drainage divide between two nearby streams is breached. The flow of both streams above the breach will be diverted into the stream with the steepest gradient below the breach. This leaves one unoccupied (streamless) valley below the breach point. Such a valley may be occupied by a highly undersized stream, thus the term "misfit valley." In some cases the misfit valley becomes a linear swamp or, if inorganic sediment input is low, a bog. A chain of intermittent "rain-fed" lakes may also evolve in the misfit valley.

Evidence of stream piracy is clear in several subwatersheds of the Severn. It has produced geomorphic and ecological settings of unique quality which are noted in Part II.

Soils: To a large extent, the grain size, mineral composition, depth, available moisture capacity, and other properties of a soil will determine the kinds of flora that will grow in a natural area. Ultimately, this affects faunal diversity and abundance. Soils are differentiated into "series" based on these properties. Commonly occurring combinations of soil series are grouped into "associations." In a general sense, the spatial distribution of soil associations reflect the underlying geologic parent material.

Table 6 provides a general description of the soil associations in the watershed, their approximate geographic location, and geologic significance. Table 7 provides a description of the constituent soil series comprising each association.

The soil series occurring in each natural area are listed in Part II. In some cases, soils may occur that are generally uncommon or unique in the watershed. These soils usually produce or help explain the occurrence of uncommon plants or plant communities. Where such soils occur, they are also described in Part II.

Topography: Extremely steep slopes, flat land, or topographic anomalies can strongly influence the floral and faunal makeup of a natural area. In determining possible future uses the topography of a natural area will be a major consideration. The general topographic character and elevation above mean sea level (msl) of each natural area is described in Part II.

Contiguity: Some natural areas are totally isolated and do not interact as an ecosystem with other natural areas. Other natural areas are only separated by narrow bands or isolated plots of developed land. When this development is compatible with the natural setting, wildlife may be able to partially or wholly function as if the natural area were contiguous. Many natural areas are fully contiguous to natural areas in adjacent subwatersheds. When considered in aggregate, a contiguous chain of natural areas is much more important (especially for wildlife) than if the natural areas are viewed separately by subwatershed.

Table 6

SOIL ASSOCIATIONS IN THE SEVERN RIVER WATERSHED*

Evesboro-Rumford-Sassafras:	This association is comprised of excessively drained to well-drained, sandy and loamy soils that are common throughout the Severn Run watershed and extend southeast to Severna Park and Whitney's Landing Farm. Soils were formed in parent material of the Potomac and Magothy geologic formations.
Monmouth-Collington:	This association is comprised of well-drained, sandy, and loamy soils that developed in sediments containing glauconite. Soils were formed in the parent material ("greensands") of the Monmouth and Aquia geologic formations. Extends over the remainder of the watershed except for the bay-front of Broadneck.
Elkton-Othello-Mattapex:	This association is comprised of level, poorly drained and moderately well-drained, silty and loamy soils of the flat silty terrace (Talbot geologic formation) along the bay-front of Broadneck from Mill Creek to Sandy Point.

* Modified after U.S. Department of Agriculture Soil Conservation Service "Soil Survey of Anne Arundel County, Maryland" (1973).

Table 7

SOIL SERIES IN THE SEVERN RIVER WATERSHED*

Evesboro-Rumford-Sassafras Association

Evesboro - Very deep, well-drained to excessively well-drained, very sandy soils; occasional clayey substratum. Low available moisture capacity and low fertility. Formed in relic sand dune deposits. Sandiest soils in the watershed.

Rumford - Deep, somewhat excessively drained loamy sand soil. Formed in sandy parent material containing some clay but little sand on uplands of the Coastal Plain. Moderate available moisture capacity and low fertility.

Sassafras - Deep, well-drained fine sandy loam and loam soils on uplands. Loamy surface and sandy clay loam subsoil. Formed in beds of sandy sediment containing moderate amounts of silt and clay. High available moisture capacity and moderate fertility.

Woodstown - Deep, moderately well-drained sandy loam and loam soils that have a subsoil layer of sandy clay loam. Occurs on uplands of sandy sediments containing moderate amounts of silt and clay. High available moisture capacity and fertility. Seasonal high water table 1.5 - 2.5 feet.

Keyport - Deep to very deep, moderately well drained, sandy loam and silt loam soils that have a slowly permeable fine textured (silt-clay) subsoil. Formed in relic deposits of clay and silt (e.g., Potomac geologic formation, silt-clay facies). High available soil moisture capacity, impeded drainage, slow permeability, moderately high seasonal water table.

Klej - Deep, moderately well-drained, loose, loamy sand soils occurring on level uplands. Formed in thick beds of very sandy material. Spring wetness, high permeability, moderate available moisture capacity, moderate fertility, moderately high seasonal water table.

Table 7 (continued)

Elkton - Poorly drained, sandy loam and silt loam soils with a fine textured plastic subsoil. Occurs in level landscape positions. Formed in old marine sediments (Potomac geologic formation, silt-clay facies). High available soil moisture capacity, moderate fertility, seasonal high water table to 0 - 1 foot.

Croom - Well-drained, gravelly-sandy loam soils. Formed in relic deposits of sandy and clayey gravel. Very gravelly, firm surface layer. Low available moisture capacity, moderately slow permeability.

Galestown - Deep, very sandy soils; loose sandy subsoil. Formed in deep loose sandy sediments (Potomac geologic formation, sand gravel facies). Low available moisture capacity, low fertility, moderately low permeability.

Fallsington - Poorly drained, nearly level, sandy loam surface layer, sandy clay loam subsoil. Formed in old sandy Coastal Plain sediments (Potomac geologic formation, sand gravel facies) that include some amounts of silt and clay. High available moisture capacity, extremely acid, seasonal high water table. Occurs along margins of floodplains, and in swales of small tributaries near their headwaters.

Osier - Deep, poorly drained, loose, loamy-sandy soils in depressions (broad swales of intermittent streams). Formed in thick beds of sandy material saturated with water much of the time. Seasonally high water table.

Bibb - Poorly drained silty loam soils of floodplains of major streams. Formed in recently deposited alluvium (Alluvium geologic formation) washed from silty and sandy uplands. Frequent flooding and wetness most of the year.

Monmouth-Collington Association

Monmouth - Deep, well-drained, loamy sandy and fine sandy loam soils with olive brown surface layers and thick, fine textured, sticky olive-brown subsoils. Formed in unconsolidated beds of fine textured glauconite (greensand). Glauconite ranges from 40-70% of parent material (Aquia and Monmouth geologic formations). Quite deep water table, moderate permeability, thorough drainage. High available moisture capacity. Highly fertile.

Collington - Deep, well-drained, brown soils of the uplands. Silt loam, fine sandy loam, loamy sand surface soils; light olive brown sandy clay loam subsoil. Formed in unconsolidated sandy sediments containing moderate amounts of glauconite (greensand - Aquia and Monmouth geologic formations). High available moisture capacity, highly fertile.

Marr - Deep, well-drained, dark brown fine sandy loam upland soils formed in old deposits of well sorted very fine sandy material containing considerable amounts of silt and clay. High available moisture capacity, high fertility.

Butlertown - Moderately well-drained, yellowish brown silt loam soils; sticky upper subsoil and a brittle, silty lower subsoil. Spring wetness, high available moisture capacity, high fertility, moderately slow permeability.

Mixed Alluvial Land - Sand to clay frequently inundated floodplain soils washed from uplands. Very wet in wet periods, moderately wet in drier periods. Usually contains significant amounts of glauconite (floodplains in the Monmouth and Aquia geologic formations).

Elkton-Othello-Mattapex Association

Elkton - (see above)

Othello - Poorly drained, highly silty soils occurring at low elevations. Formed in a mantle of silt over older, predominantly sandy sediments. Moderately low permeability, high available moisture capacity, moderate to high fertility. Poor natural drainage and seasonal high water table.

Mattapex - Deep, moderately drained silt loam and fine sandy loam soils through which water moves moderately slow. Occurs on nearly level surfaces. Formed in a mantle of silt and very fine sand overlying older deposits of loamy and in some places gravelly material (Talbot geologic formation). Seasonal wetness, moderate to high fertility.

Keyport - Deep to very deep, sandy loam and silt loam, moderately well drained, soils. Slow permeability occurs in level to nearly level areas. High available moisture capacity. Moderate fertility. Seasonal moisture. Formed in old deposits of clay and silty clay (Talbot geologic formation).

A description of the contiguity of natural areas is provided in Part II to ensure that a more comprehensive picture of the functioning natural areas is gained.

Other: Noteworthy features of natural areas that do not pertain to the aforementioned categories are listed under this category in Part II. Features may include natural springs or groundwater seeps, transitional zones, and a host of "other" items. In addition, the date of the field review for each subwatershed is listed. This reference may prove useful to the reader, especially in regard to plant and animal sightings.

Natural springs may have been very important in determining initial settlement patterns. Ground water seeps and springs are excellent sites to collect and study ground water invertebrates. The biological significance of these specialized invertebrates and their scarcity statewide is currently being studied by the DNR. Springs and seeps in the Severn River watershed are proving to be valuable research stations for this study.

The integrity of significant cultural and historical sites is dependent on their physical separation and protection from external disrupting factors. Just as natural ecotypes require transitional zones to maintain their productivity, historic sites, long established and historic communities, and other culturally significant features require buffering from outside visual and audio impacts. Several natural areas in the watershed provide this service.

If the entrance way into the significant cultural area is through the natural area, then the natural area may also function as a scenic promenade which actually enhances the appeal of this cultural area.

With the loss of natural areas which act as transition zones and aesthetic entrance ways, the uniqueness and identity of culturally rich areas will be diminished through assimilation with more contemporary settings.

Previous Listings: Several studies within the last 20 years have identified natural areas in the watershed (Table 8), employing various definitions of such areas. For each natural area, Part II provides a brief statement about the findings of these previous listings.

Recognition by previous studies is in many cases supportive of findings of this study and adds credence to the significance of certain natural areas. However, previous studies must be scrutinized because findings may be outdated. In addition, some studies were not based on original field work, but were only literature compilations from prior studies. These reiterations have tended to transform findings (based on a limited number of original field studies) into rigid verity. The significance of certain natural areas has been overstated, while that of others is neglected.

Table 8

PREVIOUS STUDIES OF NATURAL AREAS IN THE

SEVERN RIVER WATERSHED

- "Catalog of Natural Areas in Maryland" - Maryland State Planning Department, 1968.
- "Scenic Rivers in Maryland" - Maryland Department of State Planning, 1970.
- "Tidal Wetlands Boundaries" - Maryland Department of Natural Resources, 1971.
- "Compendium of Natural Features Information" - Maryland Department of State Planning, Volumes I and II, 1975.
- "Maryland Upland Natural Areas Study" - Maryland Department of Natural Resources, 1977.
- "Recommended Areas of Critical State Concern in Anne Arundel County" - Anne Arundel County Critical Areas Advisory Committee, 1977 and 1978.
- "National Wetlands Inventory" - U.S. Fish and Wildlife Service, 1979.
- "Severn Run Watershed Management Study" - CH_2M Hill, prepared for Anne Arundel County, 1980.
- "Areas of Critical State Concern: Designation Report" - Maryland Department of State Planning, 1981.
- "Ecologically Sensitive Areas in Maryland" - Maryland Department of Natural Resources, Natural Heritage Program, unpublished maps, 1983 and 1985.
- "Anne Arundel County Land Use Map" - Anne Arundel County Office of Planning and Zoning, 1986.
- "Natural Areas of Highest Priority for Preservation" - Severn River Commission, 1986.

In some cases selection of sites for field work was based on previous studies. Although conclusions of these studies may have been derived from original field work, site selection for field areas was preconceived and biased against sites not selected in previous studies. In this case, bolstering the reputation of one site is not as dangerous as the continual omission of other important natural areas that for some reason failed to make the initial lists.

Valuations of natural areas based solely on previous listings should only consider unbiased studies that reached independent and original conclusions. Caution must also be taken to assure that these conclusions are not outdated.

LAND CONSERVATION

The remainder of the category subheadings (i.e., Ownership Type, Land Use, Residential Communities, Problems, Preservation Options, and Future Use) as described below contain information that will be helpful in future conservation efforts of natural areas. Unlike the previous categories which describe natural and ecological attributes, the categories under "Land Conservation" deal with the past, present, and future influences of man on the natural areas. Knowing how landowners, residents, and government officials have, are, and will interface with natural areas is vitally important in planning the appropriate strategy for their protection and continued conservation.

Ownership Type: The types of property owners in the Severn River watershed vary widely (Table 9). The type of ownership of a natural area will be one of the most important factors in planning a strategy and implementing a program for preservation. Specific preservation techniques such as mutual covenants or conservation easements will depend on the landowner type and landowner attitude, which is itself a function of landowner type. Landownership type will also affect the potential future use (e.g., park, sanctuary, outdoor education, etc.) of a natural area.

A first step toward developing preservation techniques and determining future use will be a general understanding of landowner type(s) making up each natural area. Therefore, a list of the principal landowner types for each natural area is provided in Part II.

If significant progress on protection of natural areas in the Severn River watershed is to be made, landowners should be involved in the process. Any preservation techniques short of outright acquisition will require varying degrees of cooperation and commitment on the part of the landowner, and even in acquisition cases, the sympathy and interest of the owners is desirable. Techniques, therefore, should be highly innovative, flexible approaches sensitive to the needs and desires of the landowners.

The first step toward developing a feasible protection method should be to earn the confidence and respect of the landowner. The success of preserving natural areas will largely be determined at this

Table 9

LANDOWNER TYPES IN THE SEVERN RIVER WATERSHED

- Private (single)
- Private (multiple)
- Corporate
- Institutional
- City Government
- County Government
- State Government
- Federal Government
- Community (subdivision)
- Quasi-public (e.g., Boy Scouts of America)

step. Contact and consultation with landowners on an individual and personal basis is very important.

Land Use: Land use is a major element of the County General Development Plan (1986). The official Land Use map is used as the basis for the Comprehensive Zoning Map for the County. The land use designations on the map (Table 10) are therefore of extreme importance to the future of natural areas in the watershed. Land use determines zoning classifications (Figure 4) and thus the type of development (or non-development) the County encourages in any given area.

For each natural area covered in Part II, the official County land use classification is given.

Currently, the County is reorganizing many of its land planning regulations (including rezoning) as part of the Chesapeake Bay Critical Areas program. This reorganization (and subsequent changes made in the Critical Areas regulations) will govern future development and the fate of natural areas within 1000 feet of tidal waters in the watershed. Consequently, it is imperative that the County be encouraged to continue its efforts to expand the "Natural Features" classification to include additional natural areas of the Severn River.

Residential Communities: In some cases natural areas are completely within the confines of a single community or subdivision and provide the many values of "open space." In other cases, two communities border the perimeter of a natural area which functions to separate and preserve the independent identity of each community.

Thus, community associations have vested interests in protecting "their" natural areas. The climate for approaching these associations concerning preservation should be favorable. Contacting the individual landowners through the community associations, with the best interest of the community in mind, may be the appropriate technique in some instances. The names of communities affiliated with each natural area are provided in Volume II.

Problems: To varying degrees, some natural areas in the watershed will be, or are currently being, impacted by acts of man and nature. For each natural area, a description of identifiable pending projects, proposed residential development, and ongoing impacts are given in Part II.

Pending projects may include highway construction, dredging, excavation, or landfills. Information regarding these projects was obtained form the State Highway Administration and the County Department of Public Works and Office of Planning and Zoning. This data is current as of 1986, but changes are continuous and must be monitored in the future.

Proposed residential development includes plans in the presubmittal, submittal, and final phases of the County subdivision review process. This information was derived from the Office of Planning and Zoning. It includes subdivision name, type (major, >4 lots; minor, <4 lots), registration number, and in certain instances the acreage of the development within the natural area.

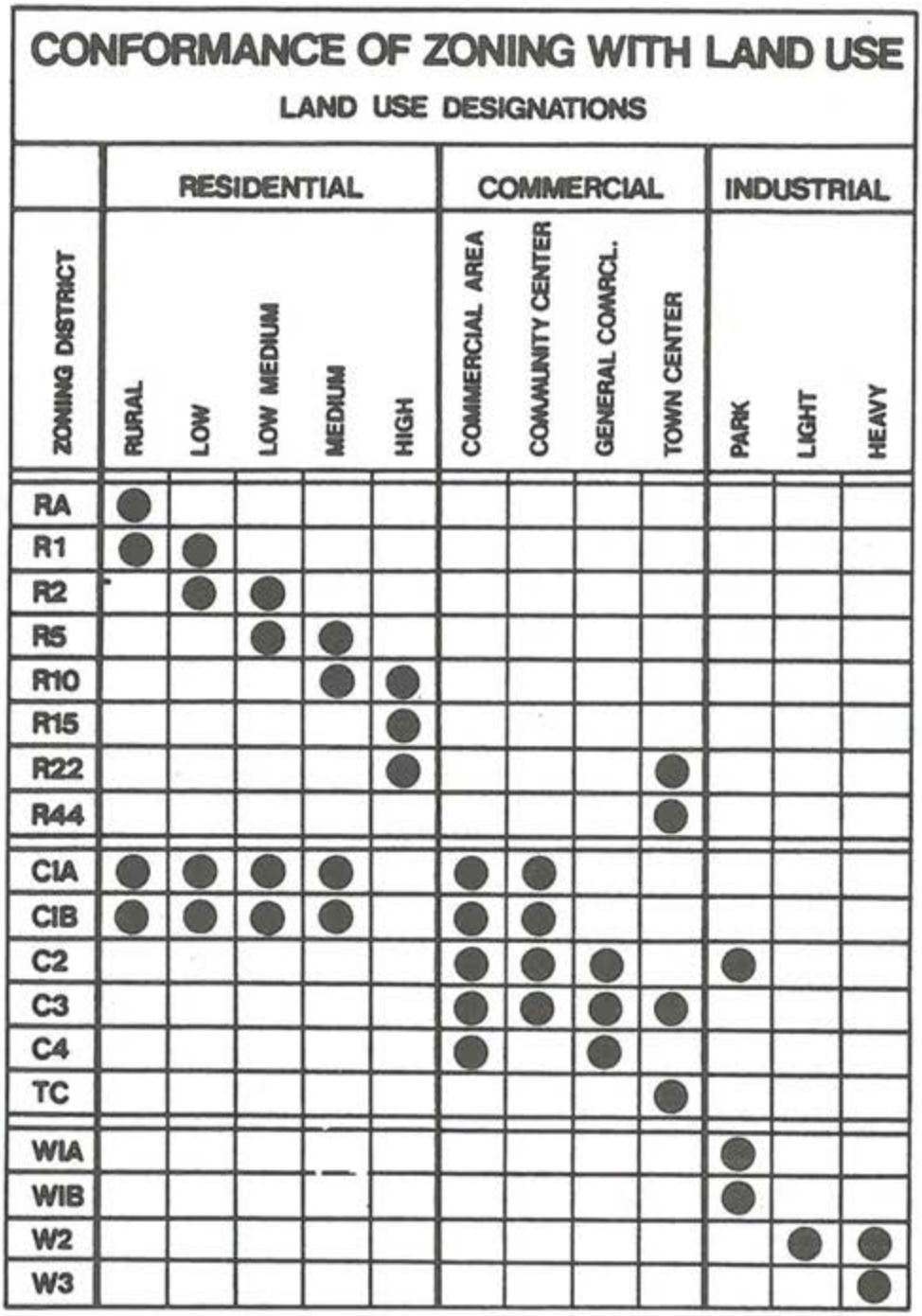

Figure 4. Conformance of Zoning with Land Use (after Anne Arundel County GeneralDevelopment Plan, 1985).

Table 10

COUNTY LAND USE DESIGNATIONS *

Residential**	Units Per Acre
Rural	1/2 or less
Low	1/2 - 2
Low-Medium	2 - 5
Medium	5 - 10
High	10 or more

Commercial

Industrial

Open Space and Recreation (Natural Features)

Government/Institutional

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* After Anne Arundel County General Development Plan (1986).

** Explanations of each classification are provided in Figure 4.

Ongoing impacts, both natural and man-induced, were observed during field work. Man-induced impacts may include, but are not limited to, noise pollution, selective cutting, sediment control devices, scattered littering, concentrated dumping, foot traffic (trail overuse), or stormwater runoff - erosion - sedimentation problems. Natural impacts may include non-native vegetation (kudzu, Japanese honeysuckle, English ivy), fire, storm damage, windthrow, or plant succession which is threatening the survival of uncommon ecotypes or rare plants.

Preservation Options: Before selecting the most appropriate strategy for preservation of natural areas of the Severn River, a basic understanding of existing land preservation tools is necessary. The protection tools described in this section were compiled from the following sources: 1) A Citizen's Guide to River Conservation (1984); 2) Anne Arundel County General Development Plan (1985); 3) The Chesapeake Bay Foundation Landowner's Assistance Directory (unpublished); 4) Maine Rivers Study (1982); 5) Maryland Scenic Rivers: The Pocomoke (1982); and, 6) The Landowners Options, A Guide to the Voluntary Protection of Land in Maine (1985). The specific tools listed were chosen in response to the assessment of the ecological resources and activities of man identified in this study and described in the preceding sections. These tools include the following: land acquisition, planning and regulation, conservation easements, mutual covenants, tax incentives, donations, long-term lease, transfer of title with conditions attached, land exchange, and voluntary protection. This wide variety of alternatives is listed so that the many different types of natural areas along the Severn can be protected against both short and long-term threats to their integrity.

The preservation tools identified are not an exhaustive list, but are meant to stimulate thinking about possible strategies for protecting the Severn River watershed. In the past, these options have been most successful when they are used in combination. The appropriate combination depends on the type of resource, landowner makeup, and other variables. Each river protection effort is unique and different tools in different combinations have been successful.

Several of the preservation tools will require tremendous amounts of preparation, commitment, and education. Others can be initiated almost immediately through existing programs to address a particular threat or issue.

Land Acquisition: Purchase of natural areas for the purpose of environmental protection can be accomplished through a variety of land acquisition methods including: fair market value, bargain sale, installment sale, purchase and lease back, purchase and resale, and reserved life estate.

Acquisition as a preservation tool is usually recommended for land that has exceptionally high ecological value, is intended for public recreation, or is clearly identified as being geographically strategic in terms of a comprehensive river protection effort. Public agencies have long used land purchases as a primary method for protecting land. More recently, acquisition has been increasingly used by private, non-profit land trusts. As described later in this section, land trusts are rapidly becoming popular and effective organizations for acquiring and managing natural areas. Land acquisition has several advantages and disadvantages as a land protection method. When natural areas are purchased by a public or non-profit conservation group capable of properly maintaining it, the biggest advantage of acquisition is that its protection from development and abuse is, for the most part, assured in perpetuity. A second important advantage, unless otherwise specified by the agency owning the tract, is that the land can be safely and properly utilized by the general public.

The major disadvantage of land acquisition is that it is expensive. With increasing population pressures in Anne Arundel County, land values will continue to escalate rapidly in the foreseeable future. A second potential disadvantage of acquisition is that if the acquiring agency does not have adequate methods for maintaining and regulating the land, it can be overused and abused. A third potential exists in the possibility that the policies of the responsible agency may change, so that the original purpose is lost. The fourth, and sometimes negative aspect of acquisition (by a public agency) occurs when private landowners are unwilling sellers and the power of eminent domain has to be used. Condemnation, if not handled in a judicious manner, can develop into an ugly situation and can transform river protection into a negative effort in the eyes of the public.

Fair Market Value: The process of acquisition at fair market value needs little explanation; however, three items are noteworthy. First, opportunities to acquire at fair market value are limited by the fact that most land acquisition groups have restricted available funds and must be particular in selecting lands. Secondly, many government agencies suffer from the slowness of bureaucracy, and the land acquisition process, from start to finish, can be slower than desirable (i.e., the private sector can almost always acquire land through a much faster process and thus outcompete government in cases where land owners wish to sell their land fast). Thirdly, if land is sold at fair market value, and if the property has appreciated since its purchase (often the case in Maryland), the seller will be liable for income tax on the capital gain.

Bargain Sale: In a bargain sale, the landowner sells to a government agency or nonprofit organization at a price less than fair market value. Because of the lower selling price, the landowner is more likely to attract a willing conservation agency to purchase his land. In a bargain sale, the seller can usually

claim an income tax deduction. The Internal Revenue Service (IRS) allows land sellers to deduct, as a charitable contribution, the difference between fair market value and the bargain sale price. This, and a smaller capital gain to be taxed, can be incentives for landowners to sell at bargain sale prices.

Installment Sale: An installment sale involves an agreement between the landowner and purchaser whereby the latter either pays for the land in annual installments or buys a certain number of acres per year. Advantages for the seller include that he is relieved of real property tax responsibilities beginning at the time the agreement is finalized; that he can choose to remain on his land until it is fully sold; and that taxable capital gains are spread over a period of years. Advantages to the buying agency include that it has to pay only a fraction of the entire cost up front. Also, depending on the terms of the installment, the agency may not have to worry about managing the property until the installment sale is complete.

General disadvantages include that installment sales are restricted to county or local government or public nonprofit conservation groups. Federal and state agencies cannot pay in annual installments because they cannot pledge the credit of the Federal or State government; therefore, they are restricted to annual per acre installments.

Purchase and Lease Back: Usually, purchase and lease back involves the acquisition of a site while it is still available at a reasonably low cost considering market values. The acquisition agency leases the land back to a user for either continuation of its current use or for other uses consistent with the goals of the river protection effort. Because this method puts the purchaser-lessor in the role of landlord ultimately responsible for maintenance, it can be a disadvantage if the lessee is not willing or capable of properly managing the land. However, if the lessee is highly responsible and capable, the lessor agency, rid of maintenance problems, gains an advantage.

Purchase and Resale: This method involves land purchased and re-sold under the restrictive conditions established by the purchasing conservation agency. Advantages include: that the buyer is relieved of ownership and maintenance responsibilities while the land is still protected; that monies made from the resale can be used for additional purchases; and that the land is then taxable and generates revenues to public bodies, some of which may go toward future land purchases.

Reserved Life Estate: When a landowner sells a property to a conservation agency under terms that he or his family members can still use or live on the land during their lifetimes it is termed a reserved life estate. The original owner, however, still continues to pay real estate taxes while residing on the

property. Federal income tax determinations depend on the terms of the sale (i.e., fair market value, bargain sale, installment).

Planning and Regulation: The use of existing government planning and regulations to protect natural areas of the Severn is a method that has been successfully used in the past. The fact that planning and regulation are highly subject to change through the political process can be either advantageous or disadvantageous toward the protection of natural areas. Stricter planning guidelines and regulations (e.g., Critical Areas Law) versus zoning special exceptions or variances which negatively impact the environment are examples of this polarity. In addition, some planning and zoning regulations can be subject to constitutional limitations and may not permanently protect natural areas. Planning and regulations that can be effective methods of conserving natural areas include: zoning and land use regulations, comprehensive planning, subdivision regulations, public utility policies and staging, agency consistency, and existing government programs and laws.

Zoning and Land Use Regulations: Zoning and land use regulations have been widely used in Anne Arundel County and the City of Annapolis for many years. This tool, as it applies to the Severn River, can be useful for the purpose of regulating the type use of the land, the density of development, and especially, the protection of areas through designation of open space areas where critical natural features occur. Presently, there are a multitude of zoning techniques and reviews used at the City and County level which are helping to protect both natural and agricultural areas. These techniques include; planned unit development, cluster development, floodplain zoning, sector plans, agricultural zoning, large lot zoning, open space and natural features zoning, and, of course, zoning associated with the Critical Areas program.

Comprehensive Planning: At the County and City levels, comprehensive planning provides the framework for land development, land protection, and overall use practices in the Severn River watershed. The process of comprehensive planning is used at the county level to compile the General Development Plan and thus determines zoning classifications. In comprehensive planning, the responsible agencies use existing information on tidal and nontidal wetlands, steep slopes, endangered species, floodplains, historical and archeological resources, upland natural areas, and champion trees. A key to protecting natural areas through comprehensive planning, therefore, is to generate a more widespread and detailed base of ecological and historical information for planners to utilize. Although planning per se is not recognized as an effective preservation method, its real value is for decision-making, on a factual basis, as it affects other government regulatory policies.

Subdivision Regulations: Since 1979, through a comprehensive subdivision review process, the County has evaluated subdivision

applications for environmental impacts. In the review process, such things as the layout and size of lots, streets, drainage, utilities, sediment and stormwater facilities, and other aspects of land development are assessed. Subdivision review works in concert with zoning, as zoning cases are included in this procedure. A typical submittal will be reviewed for such things as archeological potential, historic structures on-site, floodplain requirements, noise impacts, tidal and nontidal wetlands, champion trees, upland natural areas, endangered species, and wildlife habitat. In addition, projects are reviewed for compliance with the Areas of Critical State Concern (adopted by the County in 1981) and, especially now, with the County Chesapeake Bay Critical Areas Plan. The subdivision review process can work in two ways: 1) through minimization of environmental impacts of a subdivision which otherwise conforms with the criteria established for development; 2) through denial of subdivision approval if the potential environmental impacts are thought to be too great. To date, in the majority of cases, the County has worked in various ways with developers (e.g., through increases in lot size, reduction in the number of lots, creation of additional open space, etc.) to minimize environmental impacts to natural areas. Thus, the major strength of subdivision review is minimization of impacts; the method does not, nor is it designed to, protect natural areas intact. As with comprehensive planning, the effectiveness of subdivision review is largely determined by the coverage and level of detail of ecological and historical information available to the reviewers.

Public Utility Policies and Staging: The planning and construction of major public utilities (roads, sewer, water, and electric and gas service) significantly affects the overall pattern and intensity of urban development, and thus natural area destruction, in the Severn River watershed. The staging and construction of utilities toward areas where natural area protection is desirable will make that protection much more difficult. Guiding public utilities away from natural areas in need of protection is an important and foresightful aspect in developing a successful river preservation effort.

Government Agency Consistency: Certain natural resources in the Severn River watershed have been inadvertently destroyed or degraded by public and private actions. An effective river preservation tool is to assure that City, County, State and Federal agencies proceed carefully and limit adverse impacts of their actions in the watershed. On government projects, there is usually an extensive environmental review and comment process conducted by the various responsible divisions within the different levels of government. Although the environmental review process has been effective, there is room for improvement, both between divisions within the same level of government and between the different levels of government. In some other states where scenic rivers are involved, political directives have been issued

which require all government levels, as part of their normal process of planning and environmental review, to consult with an identified focal agency or council prior to making decisions or taking action. The purpose of the coordination requirement through a focal agency is to provide an opportunity, early in the planning process, for experts to aid other agencies in meeting program and project objectives while avoiding inadvertent destruction of unique and outstanding river-related resources. Successful implementation of the environmental review process (possibly using a focal agency or council) is a very effective tool which can help minimize or altogether avoid impacts to natural areas in the Severn River watershed.

Existing Governmental Programs, Laws and Regulations: A variety of governmental programs, laws, and permitting regulations currently exist which influence decisions on use of the natural resources in the watershed. An important protection tool is the ability, guaranteed under law, to participate or intervene in the permitting or program policy-making process and to make one's interest known before a decision is made. The more that is known about the specifics of programs and regulations the more effectively they can be used to protect natural areas of the Severn River. Although the laws, programs and permits are too numerous to mention, some examples include Waterway and Floodplain Permitting of the Maryland Water Resources Administration, sediment and stormwater regulations of the Maryland Department of the Environment, and the environmental review process of the Maryland Natural Heritage Program. As river preservation tools, these and many other programs have great potential to be used more effectively in the future.

Special Districts: A river protection tool that has effectively been used on state scenic rivers in other states is the creation of special districts for scenic preservation, recreational development, and other objectives. Special districts involve the delineation of a legal or physiographic boundary and the determination of specific protection goals and responsibilities within that district. Commonly, special districts have legal taxing and land acquisition powers (usually granted by the County or City level of government) to maintain open space and recreational land and to protect scenic corridor districts or natural heritage conservation areas.

Conservation Easements: Conservation easements are legal agreements between a property owner and a nonprofit conservation (or government) organization that protects the natural values of a parcel by permanently limiting the future uses and changes an owner may make. Generally, conservation easements limit the number and location of structures, and specify what can be done to the surface of the land and its natural growth.

An owner can still use the land and can sell it, but if sold, it remains subject to the terms of the easement. The easement is officially recorded by the County or City and thereafter becomes part of the title of the land, whether the land is transferred by sale, gift, or will. Conservation easements are usually obtained by two methods. They may be purchased from the property owner by a government agency or nonprofit organization or they may be donated by the owner to those groups. The major program at the state level for accepting donated easements is the Maryland Environmental Trust (MET). Programs for purchase of easements involve such agencies as Program Open Space and the Maryland Agricultural Land Preservation Foundation. Nonprofit groups actively involved in the purchase of easements in Maryland include the Chesapeake Bay Foundation and the Natural Lands Trust.

The most important advantage of protecting land through a conservation easement is that the land remains in private ownership for the continuation of existing uses compatible with river protection, yet these uses are regulated, and the resulting protection is generally stronger than that afforded by zoning or land-use laws. Another major advantage of conservation easements is flexibility. Versatility allows them to range from a highly restrictive "forever wild" easement to an easement that allows limited residential use, farming, or managed commercial timber harvesting. The proportion of a landowner's parcel under easement is highly flexible also. A landowner may ease all or just those portions of his land that have greatest significance from a conservation point of view. Each conservation easement is created in light of a particular situation, according to the values of the land and the needs and desires of the owner. Another advantage is that easements can be granted or purchased with relative ease; however, the decision must be made very carefully, for once done they are difficult to annul.

If purchased, conservation easements (as a function of the number and types of rights purchased) generally cost much less than fee simple acquisition. But if development rights need to be acquired for protection, the savings will be small and it may be more economical to just acquire the land in fee (development rights usually cost in the neighborhood of 85 -90% of the total market value). A fair price for a purchased easement is usually determined by a professional appraiser and is determined by the difference between fair market value of the land unrestricted and the value of the land subject to the restriction set forth in the easement.

Easements may significantly reduce the marketability of a property and co sequently its value. However, significant income tax advantages which offset this development may be realized by the donor of an easement. For a landowner donating easements to the MET, a 15-year state property tax credit is realized (if the easement is approved by the MET Board of Trustees and the Maryland Board of Public Works). Federal income tax credits for the donation can also be realized if the easement qualifies as a charitable contribution.

In the Severn River watershed, conservation easements, to date, have had limited application because of the relatively small size of most parcels and because of the uncertain fate of adjoining property owners. "Packaging of easements" is an alternative, but is complex because of the number of parties involved. However, this method may still have potential, considering the number of recent landowners who have sold their properties to developers due to pressures from increasing property taxes. This problem is self-perpetuating because as surrounding land is developed, the potential value of the adjacent property (and taxes) is increased.

Mutual Covenants: Mutual covenants can be attractive tools where a conservation easement may not be feasible, either because the landowner is reluctant to enter into an agreement with an outside group or because no such group exists. A mutual covenant involves landowners of neighboring or abutting properties who enter into a mutually beneficial agreement. Generally, these covenants control land use by giving the owners specified rights in each other's property and/or prohibiting specified uses of the properties involved. Once negotiated and signed, the agreements are officially recorded by the County and become part of each landowner's property title.

Mutual covenants differ from conservation easements in three respects. First, the nature of the enforcer is quite different because it is a public citizen or group of neighbors rather than a conservation agency. Commonly, enforcement of the covenants' terms is not mandatory; rather, it is optional and depends on their determination and resources. Second, mutual covenants may not be as lasting as easements. For example, a developer could acquire all parcels bound by the covenants and abolish them. Future owners may also execute a written mutual agreement to cancel or modify the covenants. Third, mutual covenants do not meet IRS standards of charitable co servation contributions and can not be claimed as deductions.

Tax Incentives: Tax incentives offer reductions or exemptions in property or income taxes to landowners who forego development of their land or donate certain ownership rights of it to a co servation agency or organization. Tax deductions have been particularly successful in other river protection efforts in encouraging the donation or "bargain sale" of sensitive natural areas to land trusts.

Another tax approach is preferential assessment, under which land that is being taxed at its highest market or potential use value can be taxed at a much lower rate if its use is limited to prescribed functions that have conservation value. Preferential assessments can lessen the pressure on landowners to sell their land for development.

Several State tax incentive programs currently exist in Maryland. As earlier mentioned, through donation of easement to the MET, a 15-year state property tax credit can be realized. Under Maryland Tax law, Article 81, Sec. 12E of the Annotated Code of Maryland, counties, including Anne Arundel, are eligible to grant property tax credits up

to 100% for donations of conservation easements. However, to date, the County has not elected to use this tax law to help protect natural areas.

In the Severn River watershed, preferential assessments may have much promise. In many cases, small undeveloped adjoining parcels form part of or entire natural areas, but are platted as part of an established community and are therefore taxed at full market value. In situations where these parcels are in a long-established subdivision and the landowner legally commits not to develop the parcel for an extended determined period, it could be assessed at a much lower (non-developable) rate. Retroactive tax penalties for breaking the commitment could be implemented as a guarantee. Preferential assessment as a conservation tool appears to be highly suited for protection of natural areas nestled tightly within or between subdivisions. Many of the natural areas in the Severn watershed are of this type. Because some of the parcels are very small, an option for "aggregated" preferentially assessed parcels may be applicable and would also help guard against future fragmentation of natural areas through development.

Donation: Some landowners may wish to give important natural area parcels to a government or private conservation group. There are several ways that donations may be handled, each with different financial and personal implications for the landowner. Whether it be an outright donation, a donation by devise, or a donation with a reserved life estate, the challenge is to find the way that best suits both the landowner and the acquiring agency.

Outright Donation: Because there is no financing or negotiations about price, outright donation is a simple process. The impetus for the samaritan donor is usually the immediate personal satisfaction derived from perpetual protection of a natural landscape dear to the donor. However, besides personal satisfaction, further impetus for outright donation is that the donor can claim income tax deductions for the fair market value of the land. In cases where the land is extremely valuable, the landowner may want to donate undivided partial interests in the land in installments to permit the deduction of full value over an extended number of years.

Donation by Devise: A gift by devise is made at the time of the landowner's death simply by making the gift in a will. The advantage of this is that the landowner retains full use and control of the land during his life. Financially, this allows the owner to reduce estate taxes by removing the value of the land from the estate. A disadvantage is that property taxes must be paid until the landowner's death.

Donation by Reserved Life-Estate: Landowners may donate land yet retain the use of all or part of the land during their lifetimes and/or lifetimes of named persons. The donor usually must pay

property taxes on the land retained for residency. In terms of possible income tax benefits, the current value of the future gift could qualify as a current charitable contribution deduction under current IRS codes.

Long-Term Lease: Long-term leases allow for unrestricted and exclusive use of the land by the receiving agency for a given number of years. Besides rental payments, other possible incentives include impact of the lease on the value of the land that would be taken into account in calculating estate taxes. Long-term leases are commonly used by agencies desiring to use the land for public access (i.e., recreation). The lease as a tool provides an alternative for landowners not wishing to transfer title to an agency but who want to see their land correctly used by the public and still be protected by the agency receiving the lease.

Transfer of Title With Conditions Attached: One highly variable group of land protection tools are those legally restricting future use through transfer of title with conditions attached. These tools include: prior granting of ca servation easements, deed restrictions, and conditional transfers.

Prior Granting of a Conservation Easement: For a landowner wishing to protect his land in perpetuity but wanting to sell his land on the open market, prior granting of a conservation easement may be an attractive tool. The landowner is eligible to deduct the loss in market value on his land as a charitable contribution for income tax purposes. He may also be eligible for the 15-year state property tax credit provided by the MET.

Deed Restrictions: Prohibitory clauses placed in the deed at the time of transfer are termed deed restrictions. Deed restrictions can be less permanent than perpetual ca servation easements for they are limited by the doctrine of changed circumstances. In other words, a court may refuse to enforce the restrictions if it no longer seems possible to achieve the benefit sought when the restrictia s were created. Deed restrictia s may also be less desirable than easements because there may not be a third party in existence to assure the monitoring and enforcement responsibility. To avoid this, a landowner can transfer the property to an intermediary ca servation agency which then transfers it to the agency that is to hold the title permanently. The intermediary agency i serts the deed restrictions during the second transfer. The advantage here is that the intermediary ca servation agency holds the right to enforce the restrictions and presumably the agency will be long-lived and maintain its enforcement ability.

Deed restrictions will affect market value of the land if they significantly limit its development potential. A major disadvantage is that the IRS does : ot recognize the loss in value

resulting form private imposition of deed restrictions as a charitable deduction.

Conditional Transfers: Conditional transfers or reverter clauses are like deed restrictions, but carry more force. They allow the landowner to name a party to which the title should transfer if the landholding agency does not utilize the land in a manner consistent with the conditions. Thus, breaking the conditions may mean loss of title rather than just enforcement of restricitons. If the reverter specifies a qualified charitable organization to receive the land in case the conditio s are violated, the landowner may be eligible to claim the value of the gift as a charitable income tax deduction. Because courts have been known to disfavor conditions of a transfer, they cannot be relied upon to protect natural areas indefinitely.

Land Exchange: Land exchange is a method of trading ownership or control of land between one owner and another to obtai stricter environmental protection. For example, many state agencies own land, but some do not have adequate enforcement powers. In cases where one of these agencies owns an environmentally sensitive tract of land and co siders it excess to its needs, that agency may wish to exchange or surplus that land to another state agency better able to maintain it. Similar exchanges between public agencies and private landowners would be complex but possible.

Voluntary Protection: An increasingly popular preservation tool which is being used successfully in the northeast and New England states is that of voluntary protection. In general, conservation groups seeking voluntary commitments from landowners first seek to develop a personalized line of communication. Simply, they talk to the landowners and find what they like and don't like about the river. But this initial exposure never entails plans or assumptions about the landowner's property. Often, misconceptio s and confusion about conservation techniques such as acquisition or easements can alarm landowners and prevent co structive communication. The next step generally used is to attempt to understand the landowner's attitudes and needs. The process may take several separate meetings before the stewardship climate is favorable enough to begin more formal proceedings which encourage the landowner to commit to voluntarily protect his land.

Of course, the major drawback to voluntary protection is that it is nonbinding and can be immediately terminated at the will of the landowner. However, in the absence of any other feasible preservation tool, the pursuit of voluntary commitments will, at the very least, open lines of communication, educate, and create a sense of stewardship that otherwise would not exist.

In the Severn River watershed, there is a need for the creation of intangible (non-financial) incentives that make voluntary preservation more attractive. Public exposure and positive recognition for

voluntary efforts and "good deeds" is a proven motivator. One possibility is the establishment of a "golden deeds" type award for landowners who voluntarily pledge to preserve their property in a natural state. For broad, high-level exposure, the mass media (newspapers, radio, and television) would be obvious sponsors for this award.

Another possible intangible incentive is the development of a landowner registry by locally active and well-respected citizens and environmental groups such as the Severn River Association. On a state and regional level, the Nature Conservancy has effectively used land owner registries for organizing voluntary protection efforts. To develop a registry, landowners are approached, again on a very personalized basis, and after each side feels comfortable, the landowner is asked to enlist in a registry. Commonly, all the registry requires is that if the landowner decides to sell, develop or alter his property, that he notify the sponsor of the registry 30 days before hand. Registries, as "gentleman's agreements", have proven to be successful ways to develop a grass roots network of public support, to inventory private land holdings, and to follow and react to changes in these holdings.

Another intangible incentive could be through the creation of "conservation cooperatives" - landowners pledging to protect certain assets of a natural area for a given length of time for no real dollar incentive, just the realization of a civic duty to maintain the heritage of the Severn, carried out in cooperation with their neighbors. Official establishment of these cooperatives through sponsorship by a highly respected civic group would lend credibility and provide public recognition. Certificates of commendation presented at meetings of the sponsoring civic group, and acknowledgement in a newsletter may seem like small things, but they would be incentives nonetheless, especially to civic-minded landowners. Although a "conservation cooperative" might be non-binding and have no legal attachments, it would be a "word-of-honor" type pledge that is certainly better than no effort to protect natural areas.

Preservation Options - Conclusions: One of the greatest environmental challenges in Anne Arundel County and the City of Annapolis today is the preservation of the remaining natural areas in the Severn River watershed. Certainly, this challenge will be a difficult and time consuming effort. Acting alone, a single organization or level of government will not be able to achieve all of the political agreement necessary to preserve the Gems of the Severn. It is vital that the preservation effort be viewed as a shared responsibility. Only through a unified effort of all levels of government, the many environmental and civic groups of the watershed, and especially the private citizens and landowners along the river, can meaningful and inclusive preservation effort be initiated and successfully implemented.

A basic understanding, not just of the Severn's natural areas, but of the people who live along the river will be imperative. The

preservation effort must be relevant to the lives of the landowners and their plans for the future. When such a community relations process is carried out successfully, it can create an atmosphere that will allow the consideration of the broad range of preservation options listed in this section. However, when community relations are ignored or handled poorly, mistrust, hostility, and confrontation may result, making full use of the many diverse preservation tools impossible.

Choosing the most appropriate tool or tools to use in a comprehensive preservation effort will vary greatly depending on the set of circumstances unique to each natural area. Preservation tools should be analyzed and chosen on a case-by-case basis. Each natural area will vary tremendously in the nature of the resource, landowner makeup, environmental pressures and problems, future intended use, and many other circumstances. Caution should be taken in looking for a single solution or preservation tool, since no one approach is likely to conserve the many diverse natural areas of the Severn.

Such an effort will involve personalized contact with hundreds of landowners with different attitudes, age, financial status, educational backgrounds, and environmental consciousness. By no means will the effort be easy; it will certainly require more than the part-time effort that volunteer members of civic groups can afford to donate. To be fully effective the job may require a paid, full-time professional, hired to promote preservation of natural areas through cooperation with landowners in the Severn River watershed.

For each natural area, suggestions for preservation options are discussed in Part II. These are preliminary suggestions about a range of potential options based on ownership type and a limited knowledge of landowners gained during the course of this study. These suggestions should not be construed as recommendations, but simply as realistic possibilities.

Future Use: Some not familiar with the tangible (not to mention intangible) benefits of natural areas will argue, "we can't let good land sit idle, we must put it to use." Many natural areas of the Severn are currently being "used" by citizens (not to mention wildlife) for many activities. However, these natural areas have not been officially designated as "use areas", and in some cases individuals who use the natural areas fail to recognize and appreciate the benefits. To satisfy the concerns of some, each natural area in the watershed which still exists should be officially designated as a certain type of "use area" (Table 10). This designation would help define the benefits of the natural area; justify its existence and the need to preserve it; defend it against the "lying idle" accusation; raise the level of consciousness among those who use an area but take the "product" they receive for granted; and control damaging uses by establishing a range of compatible uses.

Once natural areas are protected, selection of their most appropriate future use will be based on many factors. Some of the more

important include ownership type, acreage, contiguous land use, accessibility, ease of passage, and plant and animal composition, rareness and sensitivity. Table 11 lists categories of future designations for natural areas and uses that would be minimally impactive.

For each natural area, potential future designations are listed in Part II. Where field work was performed, "use area" designations are somewhat more definitive than for natural areas not surveyed. These designations should not be construed as unequivocal recommendations, but simply as realistic possibilities.

ISOLATED FEATURES

Some noteworthy features occur singularly and are associated with no particular natural area. Exceptional trees, historical sites, archeological sites, wetlands, and other features often occur in partially or wholly developed areas, but still contribute to the heritage of the Severn River. For each subwatershed, these sites will be listed as "Isolated Features" in Part II. Isolated features that are wetlands are sometimes synonymous with "microsystems" in the ecological classification system.

PRESERVATION STRATEGY

Holistic protection of the ecological and scenic qualities of the Severn River requires development of a logical progression of efforts on behalf of the constituent parts, the natural areas and subwatersheds, as well as opportunistic action in special circumstances. But before developing a preservation strategy, a model of the Severn watershed must be drawn which is imaginative and foresighted. What would we want a map of natural areas in the watershed to look like 50 years from now? This map or model would illustrate the desired outcome of efforts that insure preservation of the complete heritage of the Severn River.

After the model is developed, a strategy to bring it to fruition should be planned. First, a strategy should determine what natural areas warrant preservation (do all indeed warrant preservation, and is it realistic to try and save each one?). Of those that do, what is the most logical order in which they should be considered for protection?

There are many concepts and questions that should be addressed in planning a preservation strategy, including:

1) Security: A ranking of natural areas in terms of the urgency of preservation may be more useful than a prioritized list based on natural values. For instance, a natural area that will probably be threatened within five years should receive first priority over the most exceptional natural area that is secure for the next ten years.

Table 11

FUTURE DESIGNATIONS AND USES OF NATURAL AREAS

Passive Recreation:	Uses include hiking, birdwatching, plant identification, canoeing, etc.; will require strict oversight; accessibility and ease of passage are considerations (e.g., Severn Run NEA).
Outdoor Education:	Not only primary and secondary education (e.g., Arlington Echo), but adult programs, including elected and appointed officials also; outdoor laboratories and field camps for universities and colleges; site suitability will depend on program scope and level of students.
Sanctuary:	Applicable for largest and most sensitive natural areas; minimum size is a factor (e.g., Jug Bay program).
Scientific Monitoring:	Non-manipulative research in natural areas with valuable ecological characteristics, including vegetation and animal diversity, rare species, unusual productivity, or wildlife seasonality (e.g., Round Bay Bog).
Experimental Research:	Manipulative type of scientific testing, including sedimentation techniques, reforestation, reintroduction of extirpated species. Applicable to a wide variety of areas (e.g., Whitney's Landing Farm).
Forest Wildlife Reservation:	Woodlands with highly productive and diverse wildlife species (e.g., Sherwood Forest Woods). Regulations that insure the preservation and reproduction of these species.
Wetland Wildlife Reservation:	Large stands of both tidal* and nontidal marshes and shrub swamps (e.g., Mill Creek) that support productive and diverse wildlife species. Regulations that insure the preservation and reproduction of these species.

* - Tidal wetlands are currently protected under the Maryland Wetlands Act (1970); however, their surrounding transitional zones are not.

Table 11 (continued)

Recognized Species Preserve:	Smaller areas not suitable for sanctuaries, but that support "State Rare" species; (e.g., Chase Creek, South Branch).
Restricted Sightseeing:	Applies to the more spectacular natural and historical features such as State Champion or other exceptional trees, old mill sites, or certain historical structures; (e.g., Liberty Tree, Brice's Mill site); access onto private property is a major limitation and concern.
Buffers:	Includes both scenic and ecological "transition zones" and entrance ways (promenades) to significant cultural areas.
Stormwater Management:	Many past examples have been over-designed to the point of destroying natural areas. Small-scale, more environmentally compatible methods can be effective while causing minimal impact (e.g., Brewer Creek - the Downs Subdivision check dams).

- This list is not meant to be all-inclusive. Much more discussion concerning site suitability and limitations and private property access by the public is needed.

The present level of protection, and short-term and long-term security of each natural area should be evaluated.

How much effort (if any) should be expended on saving a tract fully approved for development? It may be wiser to expend the extra effort on preserving other, less threatened sites where the probabilities of success are greater.

2) Uniqueness: The uniqueness of a natural area depends on the geographical sphere (national, state, county, watershed) under which it is considered. A natural area in the watershed may be very common at the state level, but highly rare at the watershed level. Should natural area qualities be evaluated on their scarcity in the Severn River watershed? If not, at what level? The concept of species extirpation applies here. For each natural area should we ask if its destruction would bring about extinction of one or more species at the watershed (or other) level?

Should a natural area with one state rare species be preserved before a natural area with many species considered rare at the watershed level?

3) Size and Geographical Distribution: Should size of a natural area be a factor? Is bigger better? Should efforts concentrate on saving two or three tracts of several hundred acres each? Or, should saving one small natural area per community or subwatershed be the focus? Geographical distribution is an important concept, especially when the number of people that will benefit is considered. Would a Bay Ridge resident benefit and care more about saving a five acre wetland in his community or 200 acres on Jabez Branch?

Individual desires of citizens aside, which is the best overall approach for the watershed, citizens, and wildlife as a whole? Should we strive for a mix which balances geographical distribution and citizen support on one hand versus preservation of large tracts and wildlife habitat on the other?

4) Ecotype Balance: For sake of ecological diversity and preservation of a complete heritage array, should efforts strive toward protecting a balance of different ecotypes and at least one of each? Given 20 upland forests, five wetlands, and two bogs, should the infrequently occurring ecotypes receive priority? If in 50 years the outcome of efforts shows preservation of 20 natural areas, all of one ecotype, will the complete heritage of the Severn have been saved? Should the strategy center around preservation of at least one population of every species in the watershed? In a simplistic sense, this "Noah's Ark" concept is viable in terms of preserving the remaining heritage of the Severn.

5) Disturbance: Should the level of disturbance be a factor in earmarking areas for preservation? All else being equal between two ecological complexes, should the least disturbed receive first

attention? Should a strategy reflect the ecological classification system used in this report? Should "ecological complexes" be saved before "complete ecotypes", before "incomplete ecotypes", before "altered green areas"? How should "microsystems" and "isolated features" be developed into a strategy?

6) Future Needs: Should priorities be based on future need? Should one site be chosen over another because it is better suited for outdoor education, a future need? In planning a strategy should we ask the question, "Are the natural areas targeted suitable for the forecasted needs of the citizens?" Perhaps we cannot define the needs of the future, but should we not at least pass on enough land for future generations to make a choice?

7) Maintenance: Should preservation attempts be made for an area that will be virtually impossible to maintain and protect against overuse, vandalism, and general abuse?

Many more conceptual and practical questions will undoubtedly surface. The above items are offered to stimulate ideas and to develop an awareness that meaningful preservation will require planning and indepth thought about the final outcome of the effort. These and other questions should be clearly stated, and specific answers should be agreed upon by a responsible and competent group. The product would not be rigid rules, but a set of powerful guidelines, to be applied with the advantages of increasing experience and knowledge. Preservation efforts can not be approached haphazardly if the complete heritage of the Severn is to be maintained in perpetuity.

GEMS OF THE SEVERN

RECOMMENDATIONS

On the basis of the text of GEMS OF THE SEVERN, the Severn River Commission recommends the following actions toward effective preservation of the important historic, scenic, archaeological and ecological treasures of the Severn River watershed. They are presented in two Phases -- PLANNING and IMPLEMENTATION. They pertain to the work of the Commission, and also to actions by the City of Annapolis, Anne Arundel County, the State of Maryland, federal agencies, civic groups, private organizations and all other relevant parties.

A. PLANNING FOR EFFECTIVE PRESERVATION

1. That a comprehensive Plan for Preservation of Natural Areas of the Severn Watershed be developed and adopted by cooperative action of the City of Annapolis, Anne Arundel County, the State of Maryland, this Commission and private organizations. It should incorporate:

   a. Use of the report on GEMS and all of the previous Reports on the watershed, including those for the Maryland Critical Area Program, as a basis for designing a protection plan.

   b. A new model of the watershed depicting the desired outcomes of a successful preservation program.

   c. A strategy for identification and incorporation of additional important natural areas.

   d. An implementation plan incorporating all appropriate options and participants.

2. That a similar Plan for Preservation of Historic and Archaeological Resources of the Severn River watershed be completed and adopted by the appropriate city, county and state agencies in cooperation with the Commission and private organizations.

3. That every feasible effort be made continuously by all of those involved in these plans to learn from the successes and failures of related planning programs in other watersheds of the nation and elsewhere.

4. That field studies of natural areas, historical sites, archaeological features and other GEMS be employed in continuous improvement of the Plans.

B. IMPLEMENTATION OF IMPROVED PRESERVATION

1. That preservation policies for the Severn River watershed be reviewed and improved by the City of Annapolis, Anne Arundel County and agencies of the State of Maryland, with advice and participation by this Commission and the public. Specifically, policy improvement should include:

   a. Aggressive and anticipatory preservation actions in contrast to the reactive efforts which have frequently occurred late in programs of construction or "development".

   b. Effective involvement of the business community in recognition that an excellent environment is an economic asset.

   c. Positive and tangible support of all available techniques for preservation, employed as may be appropriate. These include:

      (1) Public acquisition
      (2) Protection by planning and regulation
      (3) Easements and covenants
      (4) Tax incentives
      (5) Long-term leases
      (6) Conditional-use transfers
      (7) Land exchanges
      (8) Voluntary private protection

2. That improved management and dissemination of information be achieved by the City, County and State agencies in cooperation with the Commission and private organizations. Specifically:

   a. Nourishment and utilization of the Severn River Data Base as a central repository.

   b. Establishment of a Severn River Information Exchange linked to the Data Base and with effective communication with landowners and concerned citizens as well as with pertinent agencies.

   c. Development and use of effective educational and technical assistance programs related to the Severn River watershed for students, citizens, government personnel and public officials about the exceptional benefits of natural areas and about the options for their protection.

   d. Maintenance of a Landowner Registry for the Severn River Watershed.

   e. Continuous encouragement of the public media to continue their valuable work in conveying reliable and interesting information on the watershed, the areas of special importance, the values of preservation, and effective achievements by government agencies, private citizens and others in preservation.

3. That cooperation be improved among the many environmentally conscious government agencies and private organizations interested in the Severn River and its watershed. Tools could include:

   a. Formal or informal coalitions
   b. Newsletter
   c. Periodic forums on appropriate topics

4. That specific administrative actions be taken by the governments of Annapolis, Anne Arundel County, the State of Maryland and the United States to enhance preservation of the GEMS and other important sites, including but not limited to the actions recommended above and:

   a. Directives from the Governor, County Executive and Mayor that special emphasis is to be placed by all agencies on preventing damage to these valuable locations and to preserving all such sites.

   b. Expanded investment in the public acquisition and protection of such sites.

   c. Development and enforcement of innovative laws and regulations that improve protection of GEM sites.

   d. Establish, fund and use a quasi-public Land Trust for the Severn.

   e. Expand the acreage classified as "Natural Features" or "Open Space" in rezoning plans and actions affecting the Severn River watershed.

   f. Provide adequate funds and staff for the agencies of the City, County, and State for performing their roles effectively in preservation programs.

   g. Strengthen the concept and aggressive protection of systems classified as "Scenic Rivers" with staff and resources to create greater public concern and to support watershed analyses and the activities of advisory commissions or committees.

   h. Improve and further implement the environmental review policy for proposed changes, possibly using a focal agency or council.

   i. Assure full compliance by federal agencies with the Federal consistency provisions of the Coastal Zone Management Act to preclude adverse effects from federal activities in the Severn River watershed and achieve federal support of local objectives.

j. Continuously and adequately monitor the environmental and biological qualities of the Severn River, the health of all areas designated as or similar to the GEMS, and the condition of all historical and archaeological sites of importance. Aggressively incorporate the findings back into watershed planning and protection.

The Commission believes that each of these Recommendations has significant merit and that their prompt and effective implementation can make major contributions to the sustained high quality of "Maryland's Capital River" and its watershed. We offer our full cooperation in achieving them.