

FINAL REPORT

AN ASSESSMENT OF THE ECONOMIC VALUE OF THE COASTAL BAYS' NATURAL RESOURCES TO THE ECONOMY OF WORCESTER COUNTY, MARYLAND

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
EXECUTIVE SUMMARY	I
1.0 INTRODUCTION.....	1
1.1 The Changing State of the Coastal Bays	1
1.2 Purpose of the Study	3
1.3 Defining the Conceptual Approach	4
1.4 Geographic Area (Study Area)	6
2.0 ECONOMIC VALUES OF COASTAL RESOURCES	9
2.1 Overview of Approach.....	9
2.2 Market and Non-Market Values	11
2.3 Summary of the Approach to Valuing the Coastal Bays.....	11
3.0 NATURAL RESOURCES OF THE COASTAL BAYS	12
3.1 Maryland Setting	12
3.2 Worcester County	12
3.3 The Bays.....	13
3.3.1 The Coastal Bays Natural Resources.....	13
3.3.2 Physical Environment.....	13
3.3.3 Flora and Fauna.....	16
3.3.4 Water Quality.....	18
3.3.5 Air Quality.....	19
3.3.6 Land Use	19
4.0 USES OF THE BAYS.....	20
4.1 History, Population Growth and Development.....	20
4.1.1 Recreational Community Development.....	20
4.1.2 Ocean City Bayside	22
4.1.3 Mainland Side of Assawoman Bay and Isle of Wight Bay.....	22
4.1.4 West Ocean City	23
4.1.5 Sinepuxtent Bay	23
4.1.6 Assateague Island National Seashore and Maryland Assateague State Park.....	24
4.1.7 Newport Bay	24
4.1.8 Mainland Side of Chincoteague Bay	24
4.2 Wildlife Observation.....	25
4.3 Tourism and Recreation	25
4.4 Commercial Fishing and Shellfishing.....	27
4.5 Waterfront Property	27
4.6 Government Services	28
4.7 Other Values.....	29
5.0 VISITATION AND PARTICIPATION RATES.....	29
5.1 Visitation for Worcester County.....	29
5.2 Visitation to the Coastal Bays	30
5.2.1 Activity Days and Participation Rates	31
5.2.2 Methodology.....	32

TABLE OF CONTENTS (Cont'd.)

<u>Section</u>	<u>Page</u>
5.3	Estimates of Annual Participation in Recreational Activities
	On the Coastal Bays..... 33
5.3.1	Boating 33
	5.3.1.1 Powerboats, Sailboats 33
	5.3.1.2 Personal Watercraft..... 34
	5.3.1.3 Canoeing/Kayaking 34
5.3.2	Wildlife Observation, including Birdwatching..... 35
5.3.3.	Sightseeing..... 35
5.3.4	Fishing, Clamming and Crabbing (shore, dock) 35
5.3.5	Swimming..... 36
5.3.6	Camping and RV Parks 36
5.3.7	Hunting 37
5.3.8	Summary of Coastal Bay Recreational Activity 37
6.0	VALUING RECREATIONAL ACTIVITY BY EXPENDITURES 39
6.1	Overview 39
6.2	Survey of the Costs of Various Recreational Activities..... 40
6.3	Methodology 42
	6.3.1 Expenditures Associated with Coastal Bay Recreational Activities..... 42
	6.3.2 Literature Activity Day Values 43
6.4	Expenditure Calculations 44
	6.4.1 Sightseeing..... 44
	6.4.2 Wildlife Observation 44
	6.4.3 Fishing and Shellfishing (shore and dock)..... 45
	6.4.4. Swimming..... 45
	6.4.5 Camping..... 45
	6.4.6 Hunting..... 45
	6.4.7 Total Direct Expenditures for Recreational Participation - Not including Boating 45
	6.4.8 Expenditures for Boating..... 46
	6.4.9 Allocation of Food, Lodging and Transportation Expenditures 50
7.0	COMMERCIAL VALUES OF COASTAL BAY EXPENDITURES..... 52
7.1	Commercial Rentals and other Recreational Activities 52
7.2	Market Value of the Coastal Bay Commercial Fishery 54
7.3	Commercial Value to Worcester County of Ocean Fishing..... 55
7.4	Total Commercial Value of Bay and Ocean Fishing 55
8.0	OTHER SELECTED VALUES DERIVED FROM THE COASTAL BAYS..... 55
8.1	Effects of Coastal Bays on Waterfront Residential Property Values 55
8.2	Values Associated with Wetlands Supported By the Coastal Bays 57
	8.2.1 Wetlands Ecology 57
	8.2.2 Water Quality/Pollution Remediation Value 58
	8.2.3 Flood Protection Value..... 58
8.3	Government Bay-Related Services 59
8.4	Total "Other" Values..... 60

TABLE OF CONTENTS (Cont'd)

<u>Section</u>	<u>Page</u>
9.0 NON-MARKET VALUE OF THE COASTAL BAYS ACTIVITY	60
9.1 Approach	60
9.2 Literature Sources of Consumer Surplus Values	62
9.3 Estimates of Non-Market Values for Recreational Activities on the Coastal Bays.....	63
9.3.1 Sightseeing.....	63
9.3.2 Wildlife Observation	64
9.3.3 Fishing and Shellfishing (shore and dock).....	64
9.3.4 Swimming.....	64
9.3.5 Camping.....	65
9.3.6 Hunting	65
9.3.7 Boating	66
9.3.8 Total Non-Market Value of Recreation on the Coastal Bays.....	66
9.4 Non-Market Values for Other Activities and Attributes of the Coastal Bays	67
9.4.1 Waterfront Property.....	67
9.4.2 Wetlands	68
9.4.3 Summary of Non-Market Values for Other Activities and Attributes of the Coastal Bays	68
 10. IMPLAN AND THE TOTAL ECONOMIC IMPACT OF THE COASTAL BAYS.....	 69
10.1 Economic Impact Analysis using IMPLAN	69
10.2 Analysis Using IMPLAN	71
10.2.1 Multipliers.....	71
10.2.2 Data Inputs For The Coastal Bays of Maryland.....	72
10.3 Analysis and Output of the IMPLAN Calculations for each "Project"	73
 11.0 IMPACT TO MARYLAND'S COASTAL BAYS	 73
11.1 Regional and State Economy Total Impact of Coastal Bays Activities	73
11.2 Worcester County Local Share of Coastal Bays Activities	75
 12.0 CONCLUSIONS.....	 78

**APPENDIX A: Non-Market Values Of Natural Resources In Maryland's Coastal Bays And
Methods For Determining Their Value**

APPENDIX B: Bibliography

EXECUTIVE SUMMARY

The Coastal Bays of Maryland (Assawoman, Isle of Wight, Newport, Sinepuxent and Chincoteague Bays) provide vital natural resources to the environment and economy of the State and Worcester County. The area supports a permanent population of over 40,000, and annually attracts as many as ten million visitors.

The objective of this study is to identify, characterize and quantify the "market" and "non-market" economic values of the natural resources of the Coastal Bays to the economy of Worcester County. The results from the study are intended to be useful in assisting planning and policy development by the County and State in continuing to ensure that the region grows and prospers.

This study uses data gathered from on-site surveys of the types and costs of recreational and other activities prevalent on the Coastal Bays, together with interviews of knowledgeable persons and literature values, to estimate the value of these activities to the economy of Worcester County. The objective is to estimate the value of activities based on consumers' "willingness to pay."

What people spend in the County related to the Bays, as opposed to Ocean City, Maryland, and the oceanfront, or other interests unrelated to the Bays, is one value that this study presents. Commercial fishing and crabbing in the Bays, for example, produces \$1.3 million annually in revenues to local watermen. These spending data are reported and compiled by State and Federal agencies. Other spending related to recreation on the Bays, boat rentals, food and lodging, and other uses involve actual reported expenditures. In many cases, various activities, such as boating, fishing, swimming and other Bay-related activities, involve expenditures that were estimated. These reported data and estimates of actual spending are important to the local economy.

These spending data were input into an economic impact analysis software program, "IMPLAN", provided by the Maryland Department of Natural Resources specific to Worcester County. This program uses estimates of the direct annual spending from these activities to calculate the economic impact from spending, including indirect and induced economic values to the County. The indirect economic impact represents spending within the County by businesses on goods and services resulting from the direct spending. The induced effects result from earnings (income and profits) created by direct and indirect economic activity that are returned to the County through local purchases of goods and services. The direct, indirect and induced spending are considered to be the market value of the recreational and other activities conducted on or around the Coastal Bays.

This study also considered the non-market economic value of Bay-related activities. The non-market economic value represents another part of the "willingness to pay" by those who use, reside near, or visit the Coastal Bays. In economic terms, "willingness to pay" represents the spending and also the non-market values of activities that are not priced in the market place. This value is known as "consumer surplus"; it is the additional value (the consumer would be willing to pay) above what the consumer

actually pays in direct spending on an activity. For instance, various activities have value, such as an afternoon of fishing, where the economic value is measured by "willingness to pay." This measure of total economic value includes estimates of the spending, and estimates of the additional amount a visitor would be willing to spend. The non-market values have been heavily researched and an excellent literature is available. Mean values per person for each recreational activity were used to estimate these benefits of the Coastal Bays.

Estimates of the annualized values were also prepared for some assets. For instance, the annualized premium values are estimated for waterfront property (which benefits from location on the Bays). Annualized values were also estimated of avoided costs or the benefits of wetlands that absorb pollution and provide protection from flooding. In addition, the latter provide immeasurable fishing benefits of habitat and nursery for 90% of the commercially important fish or shellfish that either pass through or spend their lives in these estuarine environments. These wetland/habitat values are captured in the annual estimates of the commercial fishing business.

The general approach used in this study was to determine or estimate the number of persons per year who participated in specific recreational activities on the Coastal Bays of Maryland, the number of days they spent annually on these activities, and the direct spending they made as a result. (The average visitor spends 3.1 days in the area.)

The estimated values for visitation and participation rates in various activities are as follows:

	<u>Persons/Year</u>		
Visitation to County	8,500,000		
Bay-related Visitation	2,040,000		
<u>Activities:</u>	<u>Persons/Year</u>	<u>x 3.1 =</u>	<u>Activity Days/Year</u>
Sightseeing	1,122,000		3,478,200
Wildlife Observation.	979,200		3,035,500
Swimming	102,000		316,200
Fishing/Crabbing/Shell	61,200		189,700
Camping	10,200		31,600
Hunting	2,900		9,000
Motorboating	-		241,000
Personal Water Craft	-		41,100
Canoeing/Kayaking	-		8,800

Based on direct surveys and literature estimates of spending on these activities, the total direct spending on these activities is estimated to be as follows:

TOTAL DIRECT SPENDING \$/YEAR (YEAR 2000)

Recreational Activities (other than boating)	\$ 46,110,000
Boating Recreation (own boat)	\$ 5,870,000
Lodging, Food, Travel	\$114,000,000
Boat Rentals (Commercial)	\$ 7,196,000
Fishing (Commercial)	\$ 7,900,000
Government and Other Values	<u>\$ 33,720,000</u>
TOTAL	\$214,796,000

The need to avoid double counting is an issue in studies like this, particularly if estimates of spending are developed for each type of Bay-related activity. To avoid this problem, lodging, food and travel expenditures, which are related to all activities, were not allocated to each activity category, but, instead, were addressed for the total annual visitation and the length of the average stay. This is important because visitors can participate in more than one activity per day.

In addition, avoided costs could affect direct spending. The values for absorbing pollution (\$150,000/year) and mitigating flood damages (\$270,000/year) were estimated. Other factors, which do not affect direct spending, are also important in estimating the economic value of the Bays. Waterfront property commands a premium over other non-waterfront property. The extra value is estimated at about \$360 million and was annualized to a value of \$36.6 million (8% for 20 years).

Total direct spending values were used as input to the IMPLAN input-output model for Worcester County. The overall results from the IMPLAN model resulted in calculated estimates for direct, indirect and induced economic activity produced by recreation and other activities on the Coastal Bays:

- \$180 million in value added
- \$290 million in output (sales)
- 5,680 full-time jobs (equivalent)

These IMPLAN estimates of the economic impacts in Worcester County of value added (i.e., wages), sales and jobs, driven by nearly \$215 million in direct spending, are only part of the value of the Bays. The surrounding economies, including the State and nation, also benefit because of spending leakages.

In addition to expenditures, which produce local jobs and income, the non-market values of recreational activities and natural resources are also important estimates of the value of the Bays. These additional values that some participants would place on an activity above the market price, the “consumer surplus,” are estimated from travel cost and literature sources. Based on the appropriate literature values and the above estimated participation rates, the following non-market values were obtained:

ANNUAL NON-MARKET VALUES (YEAR 2000)

Sightseeing	\$105,000,000
Wildlife Observation	\$ 45,100,000
Fishing/Shellfishing	\$ 3,300,000
Swimming	\$ 5,100,000
Camping	\$ 770,000
Hunting	\$ 289,000
Boating	<u>\$ 19,600,000</u>
TOTAL	\$179,159,000

These values are often regarded as the appropriate economic measure of the value of the resources. Economists assume that the expenditures will be spent on other activities if the Bays did not exist. Non-economists are more likely to think in terms of the total impact. When combined, the annual value of the Bays is over \$500 million per year. The present value of these annual spending streams, beneficial impacts on property values, and avoided costs would be nearly \$5 billion (8% for 20 years).

1.0 INTRODUCTION

1.1 The Changing State of the Coastal Bays

Maryland's Coastal Bays are enormous environmental and economic resources to the State and region. These economic resources are dependent to a large extent on the natural environment that supports the region's largest industry, tourism, and a relatively small permanent population.

Ocean City is a major resort town located on the 10-mile long barrier island that separates the Atlantic Ocean from a chain of bays--Assawoman, Isle of Wight, Newport, Sinepuxent and Chincoteague--and the mainland to the west. The Ocean City Inlet, which offers access to the Atlantic Ocean, and the Coastal Bays offer a range of recreational opportunities that attract sportsmen for sport fishing and pleasure boating. Worcester County alone has over 5,000 registered boats, not including the significant numbers of visitors who haul their boats to the Coastal Bays.

Deep-sea fishing for white and blue marlin, tuna, wahoo, and bull dolphin can be arranged through a number of charter boat operators, as well as large public fishing boat operations. Marinas provide access for pleasure boating and fishing, as well as rental of equipment for windsurfing, jet skiing, parasailing and other boating activity.

This area, with shops, arcades and restaurants lining a 3-mile-long boardwalk, attracts tourists primarily through the May to October season, but even all year-round by hosting numerous events and tradeshows. The wide ten-mile-long sandy beach from the Inlet to the Delaware State Line has recently been enhanced and nourished by the U.S. Army Corps of Engineers, including the construction of a sand berm planted with beach grass to ensure protection from the erosive and other damaging effects of major storms.

Ocean Pines, a residential recreational/retirement community, was developed primarily as a seasonal recreational community in 1968. Located on the mainland just 4 miles west of Ocean City on State Route 90, facing the St. Martins River and the Isle of Wight Bay to the east and fronting State Route 589 to the west Ocean Pines provides access to the River and Bay for water-borne recreation. A series of canals dredged throughout the Community provide waterfront access for numerous lots that are on the canals, and many homeowners have docks and boats. Ocean Pines has a recently enlarged boat launching facility with access to the St. Martins River. The Ocean Pines Yacht Club provides sail and motor boat docking, fueling and other facilities as well as dining and swimming facilities. The Yacht Club provides access to the Isle of Wight Bay for the boats and other watercraft.

There are other smaller residential recreational/retirement communities on the Bays, including Mystic Harbor just south of West Ocean City, Snug Harbor further along State Route 611, and a new development under construction on St. Martins Neck just north of Route 90. Population trends suggest that Worcester County will see six (6) more developments the size of Ocean Pines by the year 2020 ("Today's Treasures for Tomorrow: Towards a Brighter Future," Maryland Coastal Bays Program, 1999).

There are County public boat launching ramps off Route 90 on the Isle of Wight, off Route 589 on Gum Point Road in Taylorville; in West Ocean City; at Assateague State Park on the mainland; at the end of South Point Road on Sinepuxent Bay; and on Chincoteague Bay at the end of Route 365 near Snow Hill; at the end of Taylor Landing Road in the E. A. Vaughan Wildlife Management Area; and at the end of George Island Landing Road, Route 366. There are also several boat ramps along the Pokomoke River, favored by persons fishing for bass and other game fish in that River.

Below Ocean City across the Ocean City Inlet is Assateague Island National Seashore. Assateague Island is accessible via State Route 611 south from West Ocean City about seven (7) miles to the Verrazano Bridge. On both sides of the Bridge is Assateague State Park which offers residents of the State a boat launching facility on the mainland side and access to a broad sandy beach on the Atlantic Ocean side, with changing facilities, rest-rooms and other amenities. Just to the south of the State Park is the Assateague Island National Seashore Park. The National Park facilities provide camping, nature trails, and naturalist-led demonstrations, as well as access to the broad sandy beach on the Atlantic Ocean side and the usual changing facilities, rest-rooms and other amenities. The portion of the Island within the State of Maryland is noted for herds of free roaming horses and the small Sitka deer. A fence across Assateague Island at the border with Virginia prevents the northern herd of horses from mingling with the southern, private herd of "Chincoteague" ponies.

Berlin, a partner in the Maryland Coastal Bays Program with Ocean City, Worcester County, and Maryland DNR, as well as several other agencies, is about seven (7) miles west of Ocean City on the mainland. It is a charming small town with cozy shops offering antiques, dry-goods, hardware and other useful items. The city was recently the locale for the popular movie "The Runaway Bride" starring the well-known Richard Gere and Julia Roberts. Not far from Berlin and Ocean City is "Frontier Town" which offers a water slide, camping and a depiction of the era of the Wild West with staged hold ups, street fights, rodeos and cancan shows.

About 16 miles south of Berlin on U. S. Route 113 is Snow Hill, the County Seat of Worcester County. This is another pleasant small town, oriented around the County Court House and Administrative offices, with shops offering antiques and other items useful to the agricultural community which surrounds it. Snow Hill is on the Pokomoke River and is the furthest point at which the River is navigable. About 5 miles east of Snow Hill is a public boat landing and picnic area on Chincoteague Bay. Furnace Town, a restored nineteenth century iron furnace, is a historic site about 5 miles west of Snow Hill.

Roughly 12 miles further south on U. S. Route 113 is Pokomoke City, also on the Pokomoke River. This is another small town serving a primarily agricultural area. The Pokomoke State Forest lies along the River between Snow Hill and Pokomoke City, and about mid-way is the Pokomoke River State Park. The Pokomoke River forms the western boundary between Worcester and Somerset Counties to the

south and between Worcester and Wicomico Counties to the north. The northern boundary of Worcester County is also the State boundary between Maryland and Delaware. The southern boundary of Worcester County is also the State boundary between Maryland and Virginia.

Besides the tourism, fishing and boating activities in and around Ocean City and the Bays, Worcester County is strongly agricultural, raising corn and soybeans, largely for the flourishing chicken industry, as well as wheat, sorghum and a variety of other valuable crops. Chicken houses dot the countryside, and one of the larger chicken processing and retail marketing firms has its headquarters a short distance west of the County on U. S. Route 50.

1.2 Purpose of the Study

The purpose of this study is to identify, characterize and quantify the "market" and "non-market" values of the natural resources of the Coastal Bays to the economy of Worcester County. The results from the study are intended to assist in planning and policy development that continues to be cognizant of the impacts on the interdependent environment and economy relationships. This study is about understanding the value of the market economy, and the natural environment and resource-based industries' role in the economy so that wise decisions about controls can be made, and benefits and costs of policy proposals can be evaluated in terms of the economic impacts of alternatives. This study will provide a basis of information to address these issues.

The resources of the Coastal Bays of Worcester County, Maryland, benefit the region in several ways. From the biological and ecological perspective of the living resources, the Coastal Bays environment provides habitat, food and protection, including unique estuary water resources and wetlands that support flora and fauna, and fish, wildlife, insects and birds. These Coastal Bay resources are also valued by humans for their boating, fishing and swimming, as well as aesthetics, tranquility, and their environmental features that attract development, new residents, tourists and economic growth.

This interaction is synergistic and delicate, and the features of the natural environment and ecological habitat can be damaged or destroyed if people and development introduce excessive pollution and reduce the productivity of the habitat to support the living resources. In turn, unanticipated environmental degradation could undermine the basic locational factors that attract the visitors, developers and residents in the first place. Such a situation could eventually undermine the economic value of the resources. On-going concern for policy and regulatory measures will be needed to ensure protection of the environment, and, as a result, the local economy. An estimate of the economic value of the Coastal Bays will be useful in this regard to government policy-makers in continuing their efforts to preserve the natural resources of the Bays.

Maryland's Coastal Bays region (Worcester County) attracts an estimated five (5) million to over ten (10) million vacationers per year who spend an estimated \$2 billion or more. In addition, permanent population and economic growth are likely to expand in the future. The current year-round population of

the County is estimated to be about 44,000 (to be updated as soon as the year 2000 U. S. Census becomes available). The County population is projected to reach or exceed 50,000 by the year 2010 at the same rate of growth as experienced from 1990 to 2000. Similar increases in the seasonal summer population are anticipated as well. This population increase could potentially affect the fragile ecosystems that serve as nurseries and habitat for fisheries, and stopping places for migratory birds using the Atlantic flyway (an interconnection with the seasonal egg laying of the horseshoe crab, which is currently being monitored). The increasing population is likely to increase the recreational use of the Bays. There could be additional loss of farmland, and possibly additional environmental impacts. Wise use of zoning, subdivision review, and infrastructure planning, currently on-going in the County, can direct growth to areas that will minimize the impacts to the environmental productivity of the area. Environmental tourism and education can help enlighten the public regarding the need for protection of the region.

The impacts to the economy from this planning may both benefit and impact residents, property owners, tourists, businesses, and local county and state governments. Developers, realtors, and businesses may be affected as controls impact growth in the area. Buffers and setbacks from wetlands, protection of habitat and spawning areas, and control of nutrients and pollution sources could provide environmental benefits, and also impact the economy, as will prohibition or control of development in sensitive areas.

Unanticipated growth, or insufficient protection policies, could eventually affect the environmental productivity of the area, and the environmentally-based economy could suffer. Property values could decline, tourism could be affected and economic, and fiscal impacts could result in declining tax revenues and increasing tax rates to those who remained.

The Coastal Bays have been the focus of numerous environmental studies under the Maryland Coastal Zone Management (CZM) Program. A Coastal Bays Comprehensive Conservation Management Plan (CCMP) was developed, and the State was designated as the lead for the program with leadership and staff support for the Maryland Coastal Bays Program (MCBP). The CZM Coastal Non-point Source Program requires the State to develop a "process to identify additional management measures." This study, along with the MCBP, will satisfy this requirement by providing an understanding of the potential value of the natural resources and resource-based industries.

1.3 Defining the Conceptual Approach

Because the visual beauty, the environmental productivity, and recreational opportunities attract populations and residents to the region, it is appropriate to determine the economic value of the Coastal Bays in supporting and affecting the local economy. These economic values are of two (2) types: (1) market economy values, and (2) non-market and non-use values.

Market economy values are revealed as willing buyers and sellers interact in the purchase of land, housing, recreation (both active and passive), commercial fishing, rentals of marinas, and other activities

in and around the Bays. Market data are available for many of the activities of interest in Worcester County. In those cases where market data were not available in the County, literature values were obtained for market values similar to the activities observed in and around the Coastal Bays.

The non-market/non-use values, however, do not result from the exchange interactions of buyers and sellers, but they still represent the willingness of buyers to pay. A visitor who spends the day on Chincoteague Bay fishing values the day and would be willing to pay for the experience. Observing nature and wildlife, such as bird watching, and scenic views are other examples. These activities have both market (spending) and non-market economic values, which define the importance of the Coastal Bays' resources.

Also, it is possible to make the case that the Coastal Bays of Maryland are an integral or perhaps the key part of the development and economic activities that have occurred in Worcester County. This role in the County's economic development is less obvious than the direct value of the Bays for boating, fishing, swimming and commercial water sports, and commercial fishing. This role may be even more significant than the values of aesthetics for sightseers and the premium waterfront property values that support developers, real estate, and county and local property taxes.

When the oceanfront development is surveyed along the middle and southern Atlantic coast, it is observed that very few significant oceanfront developments, such as Ocean City, exist without a "Coastal Bays" type of geography. This setting of oceanfront and bays produces an economic engine that can draw 5-10 million people a year to the Worcester County area. This relationship of bays and oceanfront visitor-draw and development potential are similarly apparent in New Jersey's bay-portion of the State from the Manasquan Inlet, south to Cape May. It is also apparent in the vicinity of Delaware's Inland Bays. This combination of oceanfront and bays is ideal for the ocean-goers, but it also supports boardwalks, commercial development, marinas, restaurants and housing, a significant economic premium over oceanfront alone. Where settings are primarily oceanfront, "Ocean City-type" developments do not occur, with the possible exception of Myrtle Beach, South Carolina. These areas attract residential housing only, but not the draw of 5-10 million visitors per year as is seen in Ocean City and the Maryland Coastal Bays.

South of Worcester County, Coastal Bays exist in Accomack and Northampton Counties, Virginia, but the coastal barrier islands are not suitable for the Ocean City-type development. In attempts to achieve this type of economic engine, the Town of Chincoteague, Virginia, immediately below the Maryland border, has developed, primarily to support the growing interests in the region's natural resources, wildlife, birding, and the Chincoteague ponies. Where oceanfront and natural resources are not enough to stimulate economic growth, other methods are often pursued. Economic growth is being pursued in this area with a proposal for a Wallops Island NASA project that would bring additional economic activity to the region. However, the additional distances of Chincoteague from the major

population centers of Washington, Baltimore and Philadelphia may well mitigate against the number of tourists who might visit the Chincoteague area versus Ocean City and the Coastal Bays of Maryland.

For Worcester County, this synergy between the Bays and the oceanfront development is apparent when local businesses and County-wide development that the Bays support are observed. The marinas, for example, support ocean-going commercial and fishing party boats, that would not be in the area if the Bays were not there. The Bays provide a homeport and a protected area from storms. The economic value to the County would include the total value of the annual fishing revenues from the Bays and ocean catch, and the secondary and induced economic benefits to the region.

Probably, most important, the Bays provide an ideal setting for developers to build housing that is more protected (when compared to oceanfront development) and at the same time, has proximity to water, which homebuyers desire and will pay more to own.

From this perspective, the Bays are and have been essential to the Worcester County oceanfront as well as bay-front developments, and without the Bays, Ocean City would more than likely be a very different and smaller place. This suggests a much broader concept and a larger economic role of the value of the Bays not only to the County but also to the State of Maryland. Despite this likely broader role, to determine quantitatively the much larger value that could be attributed to the effect of the Bays on the County is beyond the scope of this study. This study takes a more limited but still significant view of the economic value of the Bays to the economy of Worcester County. From a spending perspective, the Bays have value based on the direct, as well as the indirect and induced effects of spending. Another perspective is also taken where various uses of the Bays are valued based on the “willingness to pay” of participating visitors – the “non-market” value of the Bays. This approach reveals values that reflect the total value (“market” plus “non-market”) to users, including the “consumer surplus” that users would be willing to pay. Appendix A: Non-Market Values of Natural Resources in Maryland's Coastal Bays And Methods for Determining Their Value, provides some background on these economic concepts.

1.4 Geographic Area (Study Area)

The Coastal Bays of Maryland fronting on the Atlantic Coast include five large tidal bays from north to south: Assawoman, Isle of Wight, Sinepuxent, and Newport Bays, and the northern (Maryland) portion of Chincoteague Bay. These bays are separated from the Atlantic Ocean by two barrier islands; Fenwick Island to the north and Assateague Island to the south. The Ocean City Inlet divides these two barrier islands. The smaller Martin, Brockatorton, Johnson and Purnell Bays are located along Chincoteague Bay’s western shore. These and other features of the Coastal Bays are illustrated in Figure 1. The drainage basin feeding into these bays forms a watershed of 117,939 acres. The basin includes Greys Creek to the north which runs into Assawoman Bay, the St. Martins River, and Manklin, Turville and Herring Creeks which run into the Isle of Wight Bay; Trappe Creek which runs into Newport Bay; and Marshall Creek and numerous smaller creeks which feed directly into Chincoteague Bay. A narrow,

overgrown canal connects the northern end of Assawoman Bay with the Indian River and Rehoboth Bays of Delaware to the north. The Coastal Bays of Maryland are located a little over 100 miles from the large metropolitan areas of Washington, DC, Baltimore, MD and Philadelphia, PA, accessible within two to three hours via U. S. Routes 50 and/or 113. Since the early 1970's, the Bays have attracted a large tourist, recreational and retirement population with a growing number of permanent residents.

The general setting of Maryland's Coastal Bays is illustrated in detail in various sources. "Maryland's Coastal Bays – An Assessment of Aquatic Ecosystems, Pollutant Loadings and Management Options" prepared for the Maryland Department of the Environment (MD DNR) Chesapeake and Special Projects Branch by the University of Maryland System Center for Environmental and Estuarine Studies, March 19, 1993 provides:

Plate 1. Maryland Coastal Bays Study Area

Plate 2. Maryland Coastal Bays Maryland Natural soils Group

Plate 3. Maryland Coastal Bays 1990 Land Use and Surface Runoff Subwatersheds

Plate 4. Maryland Coastal Bays Projected Land Use (Year 2005)

Plate 5. Maryland Coastal Bays Boat Slips and Point Source Discharges

Plate 6. Maryland Coastal Bays 1990 Land Use and Ground-Water Sub-Basins.

Additional details describing the current and prospective future conditions of the Maryland Coastal Bays are given in the several reports listed in the Bibliography, including in particular:

1. "Maryland Coastal Bays Program, Today's Treasures for Tomorrow: An Environmental Report on Maryland's Coastal Bays" - Status and Trends Report on Maryland's Coastal Bays, Maryland Department of Natural Resources, MCBP 97-02, prepared by Curtis Bohlen, Catherine Stokes, Ph. D., David Goshorn, Ph.D., and Walter Boynton, Ph.D., April 1997;
2. "Maryland Coastal Bays Program, Base Program Analysis, Today's Treasures for Tomorrow – An analysis of existing statutory, regulatory and programmatic authorities affecting Maryland's Coastal Bays," Maryland Department of Natural Resources, MCBP 98-01, prepared by Jean Aiosa, September 1998;
3. "Today's Treasures for Tomorrow: Towards a Brighter Future" – A Comprehensive Conservation and Management Plan for Maryland's Coastal Bays," Maryland's Coastal Bays Program, 9609 Stephen Decatur Highway, Berlin, MD 21811, Final Draft, June 1999.
4. "Maryland Coastal Bays Boating Survey" prepared for the Maryland Coastal Bays Program Water-Based Activities Subcommittee by James M. Falk, University of Delaware Sea Grant Program, Lewes, DE 19958, February 2000.

Insert Figure 1

2.0 ECONOMIC VALUES OF COASTAL RESOURCES

2.1 Overview of Approach

What people pay and what people would be willing to pay for the use of the Bays and their resources provide important information to Maryland DNR and Coastal Bays Program planners. This study takes a snapshot of the direct spending on Bay-related activities, and applies this information using an input-output model of the County to estimate the impacts of the Coastal Bays on the economy of the County. Spending is important, since it is an input to the County's economy that supports jobs and provides income to the area. Also important are the indirect and induced market values. Furthermore the non-market benefits that people derive from the Bays associated with the direct spending are similarly important. Their willingness to pay could exceed what they actually spend. In addition, people engage in activities where there are no market transactions, such as swimming or fishing from a boat. These measures of value also provide valid estimates of the economic value of the Bays to the County and State.

The relationship between expenditures (spending) and the overall economic impact of the Coastal Bays to the economy of Worcester County was estimated using the *Impact Analysis for Planning (IMPLAN) Model*.¹ IMPLAN is a standard model that is used frequently in planning studies to estimate the impact of expenditures on different sectors of the economy. IMPLAN analyzes the relationship between the producing sectors of the economy (inputs) and the consuming sector (outputs). IMPLAN divides the total economy into 528 sectors related to manufacturing, transportation, trade, agriculture, extraction and government. The Maryland Department of Natural Resources (MD DNR) provided to the study group a version of the IMPLAN model specific to Worcester County. To use IMPLAN, some additional judgments had to be made. Each category of Bay-related expenditure that occurs in Worcester County was matched by the study group to one or more of the IMPLAN sectors. In some cases it is obvious which sectors of the local economy are affected by an expenditure. In many cases the matching of expenditures for IMPLAN sectors can be less obvious, and it was necessary to make assumptions and generalizations when assigning expenditures to particular sectors.

Much of the input data used in the IMPLAN model for this study was specific to Worcester County. For instance, Worcester County's economy is not as complex as the national economy. As a result, the IMPLAN data for the County only recognize the existence of 134 out of the 528 IMPLAN sectors. IMPLAN data also include a socioeconomic profile of County residents. The IMPLAN software uses this information to help calculate industry multipliers specific to Worcester County. These multipliers estimate the spending and re-spending effects of the direct expenditure on the County.

¹ IMPLAN is a commercially-available software package and database that is the outgrowth of work done by the University of Minnesota, with the U.S. Forest Service's Land Management Planning Unit at Fort Collins. MIG, Inc., 1725 Tower Drive West, Suite 140, Stillwater, MN 55082.

The monetary value of Bay-related expenditures that occur within Worcester County is referred to as the *direct economic impact* associated with the Coastal Bays on the economy of Worcester County. The basic input used for IMPLAN in this study includes direct expenditures related to Coastal Bay residence and visitation. These expenditures include primarily recreation, both active and passive. Also included are the commercial values of the Coastal Bay fishery and that portion of commercial and recreational fishing in the Atlantic Ocean related to vessels that operate from marinas on the Bays. Since spending associated with an activity can take place within the County or some place else, the input to the model in general has been limited only to the County part. For example, birding is a popular outdoor activity, and participants spend a great deal of money on equipment such as cameras and binoculars. For visitors, more than likely, most of this spending would take place outside of the County and has not been included in the model calculations. On the other hand, expenditures on film and other consumables as well as on food, transportation and lodging directly in the County have been included in the model.

Total economic impact, however, extends well beyond this direct measurement. Each initial expenditure related to the Coastal Bays generates additional rounds of spending that if transacted locally continue to have an impact on the Worcester County economy. This “multiplier effect” measures the impact of spending by the businesses and individuals that benefit from the initial bay-related spending.

Indirect economic impact results from the additional rounds of spending by businesses on goods and services in Worcester County. The sectors of the economy where initial bay-related spending takes place are supported by other sectors of the economy. For instance, a boat rental business buys equipment, supplies and services from many other businesses. Indirect activity measures the effects of spending by the direct sectors on the supporting industries that are located in Worcester County.

Induced economic impact results when earnings created by direct and indirect economic activity is returned to the Worcester economy through additional purchases. When bay-related spending occurs in the direct and indirect sectors of the economy it creates income and profits for employees and proprietors. This money may then be spent on goods and services within Worcester County.

In general, activities involving the Bays result in spending for transportation, lodging and food. This spending could have been incorporated into the value of each activity. Instead, to avoid double counting of such expenditures on more than one activity in a single trip to the Bays, the analysis provides spending for transportation, lodging and food as separate components of the effects of Bay-related visitation. Other economic impacts could include the increase in waterfront property values because of the attractiveness of the Bays and the ready availability of recreational activities on the Bays, as well as the benefits derived from Bay-related water quality and flood protection. Because these values of the Bays are asset values and they are less likely to affect expenditures, they are separately considered and discussed. Finally included are the non-market values of the willingness to pay for being on or near the presence of the Bays, as represented by the “consumer surplus.”

2.2 Market and Non-Market Values

As noted above, economic values are of two types: (1) “market” values as revealed by the cost of goods and services purchased by consumers; and (2) “non-market” or “non-use” values represented by the willingness of the residents and visitors to the Coastal Bays to pay simply for the experience of an activity, or being on or near the Bays. Data for the market values for the various goods and services purchased by the residents and visitors to the Coastal Bays were obtained from various sources. These included direct observation of the costs of recreational activities (such as boat rentals) together with recent recreational use surveys, as well as real estate data on the costs of land and housing.

Data for non-market or non-use values have been estimated on the basis of previous studies and surveys reported in the literature, modified to represent the specific situation in the Coastal Bays area. These non-market values represent the other portion of “willingness to pay” of residents and visitors for recreational activities including estimates of “consumer surplus.” In some cases, as noted below in the text, the non-market value of an activity was estimated based on the costs to engage in that activity if the Coastal Bays of Maryland were not there, for instance to travel to another bay for boating. (See Chapter 9.0 and Appendix A for further discussion of non-market values.)

Many activities have both market and non-market values, such as fishing on the Coastal Bays which may have the direct cost of renting a boat and buying the fishing gear and bait as well as the value to the fisherman of enjoying the experience of being on the bay and later eating his catch.

2.3 Summary of the Approach to Valuing the Coastal Bays

This report focuses on both the market and non-market values. The overall economic impact that results depends on the levels of annual visitation to the Coastal Bays area and participation rates in various bay-related activities. Sections 3.0 and 4.0 of this report describe the natural resources setting and the uses of the Coastal Bays, respectively. Section 5.0 provides the estimates of the visitation and participation rates. Section 6.0 describes the “*IMPLAN Model*” which is driven by these estimates and survey data of actual spending. Section 7.0 provides the data obtained in a recent survey (August 2000) of the direct costs of various Bay-related recreational activities. Section 8.0 provides estimates of the commercial values of Bay and Bay-related Atlantic Ocean fishing. Section 9.0 gives data on the Bay waterfront property values (also as of August 2000) as well as estimates of the values of the water quality and flood protection provided by the Bays. Section 10.0 discusses non-market values and gives estimates for the Coastal Bays. Section 11.0 provides the results of running the IMPLAN model in terms of the individual *direct, indirect, induced as well as the overall* economic impacts of spending generated by the Coastal Bays of Maryland on the economy of Worcester County. Section 12.0 gives the summary and conclusions from the study.

3.0 NATURAL RESOURCES OF THE COASTAL BAYS

3.1 Maryland Setting

Maryland's Coastal Bays have served as the basis of an economic resource since pre-Columbian times as the local native Americans made use of the abundant fish, shellfish, wildfowl and other game produced or supported by the bays. European settlers arrived in the 17th century and made similar use of the bays. With the introduction of roads and railroads in the 19th century, agriculture became another mainstay of the Worcester County economy, while fishing, shellfishing and hunting continued to be important. Then, in the mid-to-late 20th century, tourism and recreation became major activities. Now, at the end of the 20th and into the 21st centuries, growth of tourism is increasing, and permanent residents enjoying the benefits of the moderate climate and almost year-round recreational activities is occurring primarily but not solely by those of retirement age.

3.2 Worcester County

Worcester County contains a total of 303,924 acres or 475 square miles, not including about 140,000 acres of water area of which the Coastal Bays cover about 60,000 acres. Fifteen percent of the County is in wetlands, 39% in forests, 33% in agriculture, 9% is developed (residential, commercial and industrial), and 1% in poultry feeding operations. The tidal wetlands consist primarily of estuarine (mixed salt and fresh water) areas totaling 18,954 acres versus 9,497 palustrine (fresh water vegetated) wetlands and only 731 acres in purely salt water marine areas and 198 acres in riverine (fresh water river system) wetlands.

About 44,000 people live full-time in Worcester County, of which about 30,000 people live in the watershed of the Coastal Bays. More than 25 percent of the County's population resides in the area of the Isle of Wight Bay, largely in Ocean Pines. Worcester County is the fastest growing county in Maryland, increasing in population by 15 percent from 1990 to 1995, or three times the growth rate for the State as a whole. The per capita income is estimated to be about \$21,000 currently and the median age is 38.5. Both the per capita income and median age are expected to increase significantly in the beginning of the 21st century. (Note: These figures are approximate based on growth projections from the 1990 census. More accurate figures will be available as soon as the year 2000 census becomes available.) An estimated five to ten million people visit Ocean City, Maryland every year, swelling the population in the summer. More than a million people visit the State or National Seashore Parks on Assateague Island annually. Tourism is now a \$2 billion per year industry in the County, which generates roughly \$700 million in employee income.

3.3 The Bays

3.3.1 The Coastal Bays Natural Resources

The Coastal Bays of Maryland serve many purposes and provide many natural resources. The barrier islands, Fenwick Island to the north on which Ocean City is located and Assateague Island to the south, were formed during the preceding millennia by natural processes of sand accumulation, removal and deposit which are still going on. Indeed, Assateague Island has moved about 14,000 feet west since the building of the Ocean City inlet jetty in 1934. Prior to 1933, Assateague Island was connected to Fenwick Island, with a gap in the barrier to the north near the Delaware State line. In 1933, a hurricane opened the inlet, which currently separates Assateague from Fenwick Island, and the northern opening became silted up and closed. The inlet was made more-or-less permanent with the construction of the stone jetty and its maintenance and improvements to date. In recent years, the U. S. Army Corps of Engineers has conducted beach sand replenishment operations along both Fenwick Island, from the Inlet north to the Delaware State Line, and Assateague Island from the inlet south to the Virginia State Line. A sand berm has been formed a hundred yards or so inland from the ocean water's edge and planted with beach grass for stabilization. Although these measures may not stabilize the location and area of the barrier islands permanently, it is intended that they will maintain the current situation for a period of years. It must be remembered that the barrier islands are dynamic and will shift and move with time as the ocean's processes of sand accumulation, removal and deposit occur.

The first natural resource provided by the Coastal Bays is protective – to control and moderate the impact of the Atlantic Ocean's waves and winds. This protective function then maintains the other natural resources, the water, wetlands and shoreline for the many activities and the many habitats for aquatic, avian and terrestrial species that are provided by the quiet waters of the bays.

3.3.2 Physical Environment

Assawoman Bay is bounded by the State of Delaware to the north (roughly State Route 54); Fenwick Island with North Ocean City to the east; a largely agricultural area of northeastern Worcester County, MD and part of the Isle of Wight to the west; and the Route 90 bridge to the south. The northern end of the Bay connects via a short canal with a bridge for Route 54 to Little Assawoman Bay in Delaware, which in turn connects via the Assawoman Canal to Indian River and Rehoboth Bays. Miller, Dirickson, Roy, Drum and Greys Creeks provide sources of fresh water to the Bay. Currently under construction is the Lighthouse Sound residential development on Saint Martins Neck Road (between the St. Martin River and Assawoman Bay), consisting of an 18-hole golf course with clubhouse and a planned 92 single-family homes on individual lots. The Ocean City bayside contains hotels, trailer parks, single and multi-family condominium residential areas, and various commercial establishments fronting on Assawoman Bay. A Worcester County Office Center is located on the Isle of Wight at Route 90.

Isle of Wight Bay is bounded by the Route 90 bridge to the north; Ocean City to the east; the Isle of Wight, South Ocean Pines, and various residential, commercial and agricultural areas to the west; and the Ocean City Inlet to the south. A drawbridge on U. S. Route 50 marks the southern edge of the Bay. The Ocean City bayside contains hotels, single and multi-family condominium residential areas, a number of sight-seeing and other small ship berths, and various commercial establishments fronting on the Isle of Wight Bay. A public boat launching ramp to the Bay is located off Route 589. The St. Martin River provides a significant source of fresh water to the Isle of Wight Bay, as well as access for the population in much of Ocean Pines and in the River Run residential development to the recreational and other attributes of all of the Coastal Bays. Ocean Pines contains numerous canals to provide waterfront lots for many of the residences. Some of these waterfront lots provide direct access for boats, as does the Ocean Pines Yacht Club and the Swim and Racquet Club. For other residents of Ocean Pines a boat launching ramp is located at the end of Beauchamp Road that provides access to the St. Martins River.

Sinepuxent Bay is bounded by the Ocean City Inlet to the north; West Ocean City, the Ocean City Airport, the community of Mystic Harbor and various residential homes, recreational and commercial establishments to the west; Assateague Island to the east; and Chincoteague Bay to the south. West Ocean City contains a major seaport for fishing trawlers, fish processing, sport fishing and various commercial establishments supporting the fishing interests and other retail businesses. A public boat launching ramp is also provided for access to the Inlet and Sinepuxent Bay. The Route 611 Verrazano Bridge connects the Worcester County, MD mainland to Assateague Island. On the mainland side of the bridge is a portion of the Maryland Assateague Island State Park with a boat launching ramp and fishing piers. Also on the mainland at the western end of the Verrazano Bridge is the headquarters of the Assateague Island National Seashore Park. On Assateague Island itself is the main portion of the Maryland Assateague Island State Park facing the Atlantic Ocean, directly to the east of the Verrazano Bridge, and the Assateague Island National Seashore Park a few miles to the south of the Bridge. The National Seashore Park provides beach access to the Atlantic Ocean, as well as facilities for camping, canoeing, kayaking, clamming, crabbing and ecological tours of the Sinepuxent Bay. A four-foot deep channel is maintained the length of Sinepuxent Bay from the Inlet to Chincoteague Bay.

Newport Bay is fed by Trappe and Newport Creeks and is bounded on the north, east and west by largely agricultural areas of Worcester County, MD. South Point divides Newport Bay from Sinepuxent Bay, and a boat landing is provided at the end of South Point Road with a 4-foot dredged channel across to Goose point on Assateague Island where camping facilities are provided by the National Park. The Ocean City Golf Club is located off South Point Road south of Route 611.

Chincoteague Bay is the largest of Maryland's Coastal Bays. It is bounded on the north by Newport and Sinepuxent Bays; on the east by Assateague Island; and on the west by largely agricultural areas of Worcester County, MD with some residential properties facing the Bay; and on the south by the

Maryland-Virginia State Line. A series of creeks provide fresh water to the Bay, including Marshall, Fivemile Branch, Scarboro, Pawpaw, Pikes and Riley Creeks. A fence is maintained on Assateague Island marking the state line and preventing the northern herd of horses from mingling with the private herd of “Chincoteague Ponies” to the south. A public landing and boat launching ramp with picnic and swimming facilities are located at the end of Route 365 from Snow Hill, MD, the County Seat. Boat launching ramps are also provided at the end of Taylor Landing Road in the E. A. Vaughan Wildlife Management Area, and at the end of Route 366 from Stockton, MD at George Island Landing. The 4-foot deep channel from Sinepuxent Bay continues south for about four miles into Chincoteague Bay.

The open water of the Coastal Bays totals about 65,776 acres, all of it tidal with a range of about three feet at the inlet but less in the middle, and most of it shallow, a mean depth of about 4 feet. The characteristics of the bays are as follows:

TABLE 1
THE WATER AREAS AND SHORELINE OF THE
COASTAL BAYS OF MARYLAND

<u>BAY</u>	<u>TOTAL AREA</u>	<u>DRAINAGE AREA</u>	<u>AVE. DEPTH</u>	<u>CHANNEL DEPTH*</u>	<u>TIDAL RANGE</u>
	<u>Acres</u>	<u>Acres</u>	<u>Feet</u>	<u>Feet</u>	<u>Feet</u>
Chincoteague	46,700	34,840	4.0	5.9-24.9	0.4 (3 at inlets)
Sinepuxent	5,955	65,975	2.3	6.2-25.6	0.4 (3.4 “ “)
Assawoman	5,164	6,103	3.3	8.2	1-1.5
Isle of Wight	4,695	36,077	4.0	30.5	3-4
Newport	<u>3,262</u>	<u>27,920</u>	4.0	6.2	na
TOTALS	65,776	170,915			

* Dredged

TABLE 2
THE WATER AREAS AND SHORELINE OF THE
COASTAL BAYS OF MARYLAND

<u>BAY</u>	<u>LENGTH OF SHORELINE*</u>	<u>AVG. LENGTH</u>	<u>AVG. WIDTH</u>	<u>BOTTOM TYPE</u>	<u>AVG. SALINITY</u>
	<u>Miles</u>	<u>Miles</u>	<u>Miles</u>		<u>Parts/Thousand</u>
Chincoteague	300	32.3	4.47	Sandy/Silty**	25-30
Sinepuxent	110	9.4	0.80	Sandy**	25-30
Assawoman	70	13.5	2.0	Sandy/Silty **	26
Isle of Wight	100	2.7	2.5	Sandy/Silty	26-27
Newport	80	2.0	2.2	Sandy	24
St, Martins River	<u>90</u>	5.0	1.0	Silty	24-26
TOTAL	750 *				

* Very rough estimate.

** A significant seagrass area of about 11,000 acres exists along the eastern shoreline of these bays.

3.3.3 Flora and Fauna

The natural resources of the Bays may be categorized as the habitats for the aquatic, avian and terrestrial species which live, visit or make use of the Bays. Maryland's Coastal Bays report (Reference 1) provides a compilation of many of these species. **Phytoplankton and macroalgae** are the most important primary producers of estuarine ecological systems. Salt marshes are among the most productive organic systems, and Chincoteague Bay and Newport Bay contain about 25,000 and 3,000 acres of salt marsh respectively. No estimate is available for the area of salt marsh in the other Coastal Bays, but significant areas have been lost by the construction of canals and other shoreline stabilization and construction projects since the late 1960's when Ocean Pines was built. **Seagrasses** likewise form highly productive communities, but are limited primarily to Chincoteague and Sinepuxent Bays, with some seagrasses now colonizing Assawoman Bay. **Benthic invertebrates** which have been collected in Chincoteague Bay are listed in Reference 1, Table IV-D-1, and Table IV-D-2 gives the same for Isle of Wight and Assawoman Bay. Benthic invertebrates include mollusks, crustaceans and a variety of other bottom-dwelling species.

According to national data, marina and estuarine habitats support species from the lowest to the highest levels. Nationally, almost 35% of all "threatened" and "endangered" species are either located in or dependent on wetland habitats, and 90% of the species of commercially important fish and shellfish either pass their entire lives in estuarine habitats or require estuaries as nursery grounds (Delaware Estuary Program, April 1996).

Fish are the most directly useful species in the Bays. Over 120 species of **finfish** have been identified in the Coastal Bays. The shallow waters provide an important role as both nursery and forage areas for both marine and estuarine species. Table V-D-1 in Reference 1 provides an annual summary of finfish harvested commercially from the Coastal Bays from 1950 through 1991, based on MD DNR data in 1992. The ten most-harvested species were sea trout, menhaden, bluefish, spot, striped bass, white perch, American shad, eel, river herring and black mullet. In a limited survey conducted in August 1999 among recreational boaters, the fish species most targeted were flounder (71%) croaker (10%), sea trout (8%) and other (11%) [see “Maryland Coastal Bays Boating Survey” prepared for the Maryland Coastal Bays Program Water-Based Activities Subcommittee by James M. Falk, University of Delaware Sea Grant Program, Lewes, DE 19958, February 2000.] (Reference 13).

Shellfish likewise have always been a vital resource of the Coastal Bays. Four species comprise the primary types taken for commercial and recreational purposes: blue crabs (hard and soft shell), hard-shell clams and oysters. . Table V-D-1 in Reference 1 provides an annual summary of shellfish harvested commercially from the Coastal Bays from 1950 through 1991, based on MD DNR data in 1992. Most blue crabs are taken as hard-shell, and this species continues to be important both commercially and recreationally in the Coastal Bays. Hard-shell clams likewise represent a continuing commercial and recreational asset in the Bays. However, at this time the taking of clams from the St. Martin River and Turville and Herring Creek is prohibited because of contamination by various pathogens. Oysters used to be an important commercial catch in the Coastal Bays, but since the early 1980’s have not been available due to the devastating oyster drill and other oyster parasites and diseases, such as MSX and Dermo. It has been reported that some oysters and bay scallops are re-appearing in the southern (Virginian) portion of Chincoteague Bay.

Birds also represent a vital resource. With regard to avian species, estimates made by the MD DNR in 1992 are given in Tables IV-E-2, 3 and 4 of Reference 1. They show that between thirteen and fourteen species of **waterfowl** use the Coastal Bays as a winter feeding grounds. These include Canada Geese, Buffelhead, Black duck, Mallard, Old Squaw, Canvasback, Brant, Goldeneye, and Pintail. The **wading bird** population includes three types of herons and four types of egrets. The **seabird** populations are represented by three types of gulls, six types of terns and the Black Skimmer. Recently the brown pelican has made its appearance in the Coastal Bays and along the Atlantic shore. The piping plover is an endangered species whose nesting sites on the ground are being protected along the Sinepuxent shore of Assateague Island by the National Park Service.

Terrestrial species making use of the shores of the Coastal Bays include the Assateague horses, prized by the tourists for their appearance in the national and state parks, as well as the small Sitka Deer. White-tailed deer abound wherever brush and tree cover occur. Smaller species include turtles, raccoons, muskrat, otter, etc.

3.3.4 Water Quality

Surface water quality in the river, canals and creeks within the drainage basin of the Coastal Bays is of major importance to preserving the nature and value of the Bays. Anything placed or dumped on land, in the creeks and canals, or in the air can wind up in the Bays. The Bays already contain small to moderate levels of potentially toxic chemicals including heavy metals (arsenic, chromium, copper, lead, nickel and zinc), organo-metallic anti-fouling paints, herbicides, pesticides, nutrients (nitrates, phosphates), polychlorinated biphenyls (PCB's), and polycyclic aromatic hydrocarbons (PAH's). Pathogens such as disease-causing bacteria are present in sufficient quantities that shellfishing is currently prohibited in the St. Martin River, and Turville, Manklin and Herring Creek. The surface waters in the drainage basin and in the Bays themselves are monitored regularly by the MD DNR and U. S. Environmental Protection Agency to ensure that the public is adequately warned of potentially serious pollution problems. Surface water quantity depends upon the amount of rain during each season of the year and affects the flushing action of the river, creeks and canals upon the Bays. The Bays are tidal, and the majority of the fresh surface water sources have low rates of freshwater discharges. One estimate of the amount of freshwater in Chincoteague Bay was 33% despite an annual average rainfall of approximately 40 inches. The average annual freshwater inflow as a fraction of the volume of Chincoteague Bay was estimated to be only 0.00084 per day. On this basis, it takes more than two months to replace 99% of the water in Chincoteague Bay.

Ground water quality is similarly of major importance, primarily because most of the potable water used by the population of the area comes from ground water sources, but also because there is a net flow of ground water into the Bays. The Worcester County Department of Public Works, Water & Wastewater Division monitors the quality of the drinking water in its various service areas, testing for over 435 possible contaminants including ten tests per month for total coliform and fecal coliform bacteria. The service areas include Bridgetown, Mystic Harbour, Nantucket Point, Newark, Oyster Harbor, River Run and Ocean Pines. As of December 31, 1999, the County Department of Public Works declared the quality of the ground water in each service area to be "safe." Of the contaminants which were detected, none were at levels exceeding established water quality standards. Ground water quantity is also of major concern, since over-pumping of the wells can lead to intrusion of salt water from the ocean. At the present time the ground water wells throughout the County draw primarily from an underground source about 150 feet below the surface called the "Pleistocene Aquifer." Although there have been some tests that showed slightly elevated levels of sodium (as in sodium chloride or the salt in salt water), no serious intrusion of salt water into this aquifer has been noted within the County.

Water quality in the Coastal Bays includes consideration of the levels of sediments, algae, dissolved oxygen (DO), biological oxygen demand (BOD), nutrients (primarily nitrate and phosphate), chemicals (metals, organics, pesticides, etc.), and pathogens (primarily coliform bacteria). Sediments

reflect the rate of erosion from the shores surrounding the river, creeks, canals and the shoreline of the bays themselves. Although sediments give a muddy appearance to the bay water and may influence the amounts of dissolved nutrients and other materials, they do not affect the ability of the water to support aquatic life unless present in very large amounts. Algae can grow and become a nuisance when levels of nutrients and sunlight become sufficient. Unless the organic matter consists of poisonous diatoms (ie., red or brown tides), algae are not necessarily dangerous to aquatic life. Dissolved oxygen is necessary for aquatic life and to date most measurements show that there is adequate oxygen for the phytoplankton, seagrasses, benthic invertebrates, fish and other species to survive. Generally, the water has been shown to be saturated with oxygen. Biological oxygen demand is a measure of the amount of biological organic matter in the water. BOD is used to estimate the possibility of an oxygen deficiency. Nutrients are present in the waters of the Bays and, as noted above, can cause algal growth and other problems with water quality. The level of nutrients is a continuing problem of concern for the Bays. Similarly chemical contamination is present in the waters of the Bays and likewise requires monitoring and evaluation. Pathogens such as coliform bacteria are already a problem for shellfishing in the St. Martin River and will require attention to septic tanks, wastewater discharges and other sources. The water quality of the Coastal Bays may ultimately be the most important factor in the overall value of the Bays.

3.3.5 Air Quality

Air quality over the Coastal Bays is generally good, although there is concern that airborne pollutants such as acid rain, sulfates, nitrates, lead, PCBs, PAHs and other volatile chemicals can be washed out of the air into the Bays and pollute the bay waters. Some of the toxic chemicals that are presently detected in the Bays, although not currently at dangerous or hazardous levels, may have originated as airborne species. Motor boats emit carbon monoxide, carbon dioxide, nitric oxide and various hydrocarbons, which could be hazardous at high concentrations.

3.3.6 Land Use

The land use surrounding the Coastal Bays is critical to preserving the natural resources of the Bays themselves. The following table illustrates that, as of 1993, agriculture, forests and for three of the bays, marshlands dominated the use of lands around the Bays. However, development of the lands around Assawoman and Isle of Wight Bays already competes significantly with the other land uses, and since 1993 has increased appreciably.

TABLE 3
LAND USE (% OF LAND AREA) SURROUNDING THE COASTAL BAYS *

<u>WATERSHED</u>	<u>AGRICULTURE</u>	<u>FOREST</u>	<u>MARSH</u>	<u>DEVELOPED</u>
Chincoteague	25	40	31	1
Sinepuxent	19	29	33	9
Assawoman	26	23	25	24
Isle of Wight	40	37	4	15
Newport	34	42	14	7
St. Martins River	66	27	1	6

*As of 1993 (see Reference 1)
Totals may not add to 100% due to rounding.

The restriction of development to the corridors already used for residential, commercial and industrial purposes will be important to prevent unwarranted and unnecessary pollution of the Bays. The use of best management practices (“BMP”) for preventing or decreasing erosion of soils, decreasing the use of pesticides and herbicides, and controlling nitrate, phosphate and other pollutant runoff from agricultural and industrial (e.g., chicken processing plants) processes will similarly continue to be important. The conversion of forest lands to developed areas must also be carefully considered.

A list of the “Native Plants of Worcester County” has been published by the Maryland Coastal Bays Program, with particular emphasis on native plants for landscaping. Such use of native plants will prevent or slow the introduction of foreign invasive species which can become pests or threats to native species, such as phragmites which has come to dominate the area’s wetlands.

4.0 USES OF THE BAYS

4.1 History, Population Growth and Development

The Coastal Bays of Maryland provided for a significant commercial fishing and shellfishing industry from the days of the earliest European settlers up to the present. When Ocean City became a tourist attraction toward the end of the 19th century, and particularly after the Inlet was stabilized in 1934 and the automobile provided relatively easy access to the Atlantic Ocean beaches, tourism and recreation became major industries for the City itself. The Coastal Bays continued to be used primarily for commercial interests, albeit some recreational boating and fishing occurred in former times on the bay side of Ocean City. Also, a few residences and commercial establishments had been established on the mainland side of each of the Bays.

4.1.1 Recreational Community Development

In 1968 the development of Ocean Pines as a recreational community by Boise Cascade Home and Land Corporation, Inc. was started. Just prior to the institution of environmental regulations by the

U. S. Environmental Protection Agency, the U. S. Army Corps of Engineers, and the MD DNR, which would have prevented massive shoreline and wetlands excavations, a series of canals was excavated and bulkheaded to provide for the maximum number of “waterfront” residential lots. Eventually, over nine miles of waterfront facing the St. Martin River and the Isle of Wight Bay, and twelve miles of canals were developed. Various amenities were constructed including 67 miles of paved roads, eight community parks, attractive entrances (initially gated), an 18-hole golf course, a swim and racquet club with boat slips and a swimming pool, a yacht club with more boat slips and a pool for adults, a tennis club, a “sports core” with swimming pool, a community center, a beach club with a swimming pool on the Atlantic Ocean in Ocean City, and fire and police protection. A community potable water supply was provided with four ground water wells, and a “state-of-the-art” vacuum sewer system and wastewater treatment plant were installed. It should be noted that the wastewater treatment system provides “advanced” (85% to 90%) secondary treatment with the effluent being discharged into the St. Martin River near the Route 90 bridge. Ocean Pines has developed since 1968 as a coherent, largely self-governing community with roughly an equal proportion of year-round versus seasonal residents. In accordance with restrictive covenants signed at the outset, the role of Boise Cascade was gradually transferred to the Ocean Pines Association. A Community Association Board of Directors and a professional General Manager with a permanent staff now provide direction and maintenance for the community. Roughly 8,800 residents (about 20% of the County resident population) in 3,600 households, primarily retirees, live permanently in the community, and about an additional 6,500 residents live in 2,500 seasonal recreation homes. As of June 2000, a total of 6,138 homes had been built with an additional 240 under construction with room for 1,238 more on platted lots, a total of 7,606 homes at full build-out. The Ocean Pines Association, Inc. Board of Directors commissioned the “Ocean Pines Comprehensive Plan” to be prepared by a Comprehensive Plan Committee in 1998. The Board approved the plan on December 3, 1998. The plan describes the community profile as of the 1990 Census and describes the potential development of parks and recreation facilities, community facilities and services, transportation facilities and services, and land use and community design. By the year 2008 the year-round population is expected to increase to 12,000 and the seasonally high summer population to over 20,000.

In the succeeding 32 years since 1968, the positive impact of Ocean Pines on the Bays, primarily the St. Martin River, Isle of Wight Bay and Assawoman Bay, has been significant, with boating, fishing, and other forms of recreation turning the Bays into a water-borne playground. Equally, if not more significant, are the non-market benefits of the waterfront on the Bays, which provide the thousands of residents with a deeply aesthetic feeling of being “at the shore.” The negative environmental impact of Ocean Pines on the Bays has likewise been significant, including the loss of wetlands and submerged aquatic vegetation, the loss of species that depend on those areas, increased water pollution from the

wastewater treatment plant, run-off from the roads, golf course and lawns, chemicals from the built-up areas and anti-fouling paints, and congestion on the waterways.

Ocean Pines is now not the only development along the Coastal Bays. With the rise of a large population seeking recreational activities and the improvements in road access to Ocean City from the population centers of Washington, DC, Baltimore, MD and Philadelphia, PA in the past twenty to thirty years, development has taken place all along the Coastal Bays. Just to the north of Ocean Pines off Beauchamp Road is River Run, a residential development of single-family homes and a trailer park with a pier and boat ramp accessing the St. Martin River. The River Run Golf Course is to the west of the residential area.

4.1.2 Ocean City Bayside

In Ocean City itself, as the Atlantic Ocean shoreline became built-up, development turned to the bay side along both Assawoman and Isle of Wight Bays. Hotels, motels, trailer parks, single-family and multi-family homes, and restaurants were built on the bay side, and commercial firms specializing in recreational activities sprung up, including jet-ski and hobey-cat (sailboat) rentals, and three para-sailing ventures. Recently three “eco-tour” ventures have been licensed by the National Park Service to take 40 to 50 people from berths on the Ocean City bay side to Sinepuxent Bay for a tour of the upper portion of that Bay and northern Assateague Island. Other boats berthed on the bay side of Ocean City take tourists out through the Inlet for a trip along the ocean beach. A large number of fishing vessels are berthed on the bay side, both privately owned and commercial “head-boats” (*ie.*, the fishermen are charged per person or by the “head”) for day trips out to the fishing grounds off-shore in the Atlantic Ocean.

4.1.3 Mainland Side of Assawoman Bay and Isle of Wight Bay

The mainland side of Assawoman Bay has been slow to develop. Some private residences front on the Bay but the remainder of the County to Bishopville and across Route 113 to Bishop is largely agricultural. Development of a residential community with various amenities had long been proposed for that area but was delayed for many years by environmental and other considerations. Now the “Lighthouse Sound,” residential development has been approved and construction started, with views of (but not access to) Assawoman Bay. An 18-hole golf course with clubhouse has been completed. Water supply to each home is from a private well, but centralized sewage treatment is provided by a package plant with the outfall of treated sewage effluent going into the St. Martin River. A public boat ramp exists at the tip of the Isle of Wight providing access to the Isle of Wight Bay. On the mainland side of the northern part of the Isle of Wight Bay is the southern portion of Ocean Pines, including the Ocean Pines Yacht Club and a new residential development of condominiums known as Mumford Landing with fifty additional boat slips providing access to the Bay. Additional private residences, commercial facilities and retail shops existed previously or have been built along Manklin, Turville and Herring Creeks with access to the Isle of Wight Bay. The Bally Ocean Downs Harness Racetrack with off- and

on-track betting is located on Route 589 near the source of Turville Creek. Along the southwestern portion of Isle of Wight Bay on the mainland are additional private residences, some remaining agricultural land, Hoopers Restaurant, and a bit inland on Route 50 an outlet mall with many shops, a movie theatre and several restaurants. Further inland along Route 50 are several recreational outlets including miniature golf and go-carts. Recently, a Wal-Mart department store was built on Route 50 near Route 589, which presages further commercial development along the Route 50 corridor. The Worcester County Planning Commission is currently developing proposed regulations to guide future development along this corridor.

4.1.4 West Ocean City

West Ocean City has long provided a sheltered harbor near the Inlet for the large commercial fishing trawlers that work the Atlantic Ocean. The catch is processed by several firms for shipment around the world. Also, “head boats,” which take recreational fishermen out into the ocean on a daily basis, have used boat slips on the mainland adjacent to the Inlet for many years. Competitions are held each summer for prizes in fishing contests for the white marlin and other large sport fish. Now numerous commercial and retail establishments are located in West Ocean City. There is the Shantytown complex of shops adjacent to the Route 50 bridge, the Bayside Boatel providing summer boat slips and winter boat storage, and the piers with numerous fishing boats awaiting customers. Shopping at modern retail stores is available at the outlet mall, at a new Wal-Mart store, and at smaller strip malls along Route 50 west of Ocean City.

4.1.5 Sinepuxent Bay

South of West Ocean City along Route 611 on the mainland side of Sinepuxent Bay is Mystic Harbor, a residential community similar to but smaller than Ocean Pines but with no canals. Further south is the Ocean City Airport which does not now but in the past offered commercial flights to inland cities. The Airport does offer facilities for general aviation, tourist flights over Ocean City, and the base for advertising flights over the ocean beaches. Further along are an “executive” golf course and driving range, the Eagle’s Nest campground, Frontier Town waterslide and recreation center, and additional private residential homes and small residential developments fronting on the Bay. The latter include Snug Harbor and the Lewis Corner campground. Route 611 leads to the Assateague Island National Seashore over the Verrazano Bridge. On the Bay side are the National Park Headquarters and Visitor Center on one side of the road and a set of piers and a boat launching ramp of the Maryland State Assateague Park. On South Point Road past its intersection with Route 611 is Genezer Estates fronting on Sinepuxent Bay. At the end of South Point Road is a boat landing at the southern end of Sinepuxent Bay with a dredged channel leading across the Bay to then Goose Point campground of the National Park on Assateague Island.

4.1.6 Assateague Island National Seashore and Maryland Assateague State Park

In the 1970's, efforts were successful to prevent further private development of Assateague Island and to purchase and set aside the entire island as the Assateague Island National Seashore. A portion of the ocean beach area on the northern end of the island was developed as the Maryland Assateague Island State Park. The remaining portion of the island, both on the ocean side and the Sinepuxent and Chincoteague Bay side make up the Assateague Island National Seashore Park. These developments ensure that both the Sinepuxent and Chincoteague Bays are protected from commercial development along the entire Assateague Island shore. The State Park provides swimming, fishing, camping, ocean beach and bayside, and other water-borne recreational opportunities for Maryland residents. The National Park provides ocean beach swimming and fishing opportunities, camping, and permitted off-the-road vehicle trails. On the Sinepuxent Bay side the National Park provides guided naturalist tours, as well as canoeing, kayaking, clamming and crabbing. At the southern end of the Maryland portion of Assateague Island is the Chincoteague National Wildlife Refuge. As noted above, a fence across Assateague Island separates the Assateague Island horse herd to the north from the Chincoteague pony herd to the south in Virginia. Efforts are underway to limit the size of the Assateague Island herd through contraceptive methods. Some of the Chincoteague ponies are forced to swim across the bay to the mainland each fall whereupon they are sold to provide funds to maintain the private portions of Chincoteague Island in Virginia.

4.1.7 Newport Bay

The smallest bay of the five Coastal Bays, Newport Bay, is surrounded by primarily agricultural land with some private residences. The Ocean City Golf Course is located off South Point Road on the east side of Newport Bay. Hayes Landing Road off Route 113 south of Berlin leads to Hayes Landing on the west side of Newport Bay.

4.1.8 Mainland Side of Chincoteague Bay

Numerous creeks provide fresh surface water from the mainland side of Chincoteague Bay. A number of local roads lead off Route 113 south of Newport Bay to private residences and agricultural lands that border the mainland side of Chincoteague Bay from Newark, MD to Snow Hill, the Worcester County seat. South of Snow Hill, a number of local roads similarly lead off Route 12 to private residences and agricultural lands that likewise border the mainland side of Chincoteague Bay. From Boxiron to Stockton and on to the Virginia State Border, the E. A. Vaughan Wildlife Management Area is on the mainland side of Chincoteague Bay. Boat landings are provided from Girdletree, MD at the end of Taylor Landing Road, and from Stockton, MD at the end of George Island Landing Road. The E. A. Vaughan Wildlife Management Area includes the small islands in the lower Maryland portion of Chincoteague Bay, including Rattlesnake, Shelldrake, Ready Cove Tump, Robbins Tump, Big Bay Marsh, Tizzard, Assacorkin, and Mills Islands.

4.2 Wildlife Observation

As previously stated, the majority of the visitation at Assateague State Park and the Assateague Island National Seashore Park is directed at nature and wildlife observation. The attractions of sandy beaches, herds of free-roaming horses, and Sitka deer in Maryland's Assateague Parks and Chincoteague ponies in Virginia, as well as the Atlantic flyway, and bird migration attractions, provide many opportunities for nature enthusiasts.

Birding is an increasingly popular activity. Worcester County provides brochures for visitors: "Birdwatching in Worcester County," and the "Birdwatcher's Checklist, Worcester County, MD." The area is sufficiently popular for birdwatching that it is a destination for several organizations. Wings, a Tucson, Arizona, organization arranges two trips annually to the Coastal Bays. One is in the Spring (mid to late May) and the other is in the Fall. Vent, another organization, arranges a Fall trip. The Maryland Ornithological Society has fifteen to sixteen chapters, all of which schedule trips to the Coastal Bays at least once a year.

Interviews with Sam Dykes and Elia Fehr, who represent the Ward Museum (a wildlife museum), and local Worcester County interests in wildlife, respectively, indicated that increasing popularity of tours and ecotourism. Sam Dykes also indicated that access to observation sites is becoming a problem. Conversion of access areas to condominiums and boat slips, and 24-hour/365 day parking meters are limiting factors. Worcester County is also focused on expanding golfing as a recreational opportunity for visitors. These golf courses are "bird friendly" for birds that like grassy areas (with controls on herbicides and fertilizer use).

4.3 Tourism and Recreation

As a consequence of these developments, there is a wide variety of recreational opportunities available to the permanent residents of the County and to the millions of tourists that arrive each summer. As noted above, tourism increases the year-round permanent population from 44,000, with an estimated 300,000 per week during the summer. Of that increase, many of the visitors to Ocean City stayed and/or ate at motels and restaurants on the Bayside of Fenwick Island, as well as visitors to the Ocean City Convention Center. A small but significant number of those who went to Ocean City participated in recreational activities on Assawoman and Isle of Wight Bays.

The types of recreational activities offered on and around the Bays to residents and tourists range from passive forms such as simply visiting relatives, sightseeing, and observing nature and wildlife, to active forms involving both free and paid-for uses. The various types of uses are listed in Table 4.

TABLE 4
RECREATIONAL ACTIVITIES AVAILABLE ON THE COASTAL BAYS OF MARYLAND

Passive

- Visiting Relatives
- Shopping
- Sightseeing (Auto Scenic Tours - see Maryland State Scenic Routes Map)
 - Speedboat (“Sea Rocket” or “OC Rocket”) from the Inlet out along the ocean beach and back
 - Evening Cruise from the Inlet out along the ocean beach and back
- Observing Nature and Wildlife (Bird watching, Observing Horses and Deer at Assateague Island, etc.) see “Birdwatcher’s Check List for Worcester County
See also “Delmarva Birding Weekend”
- Instructional
 - Eco-Tours to Sinepuxent Bay and Assateague National Seashore Park
 - Dolphin Watch in ocean along the beaches

Active

- Walking/Jogging/Hiking
 - Nature Walks (for instance trails are provided in the Assateague National Seashore Park)
- Bicycling (see Maryland State Bicycle Map)
- Swimming (in own pools, motel pools, recreational community pools, Frontier Town and other commercial pools; and from own pier or from boats on bays)
- Boating
 - Motorboats (own boat or rentals)
 - Personal Watercraft (jet ski, owned or rented)
 - Sailing (Sailboats owned or rented)
 - Para-sailing (1 hr boat trip – 10 minutes in the air)
 - Canoeing (see “Sinepuxent Water Trails” owned or rented)
 - Kayaking (see “Sinepuxent Water Trails” owned or rented)
- Camping (free at Assateague State or National Seashore Parks – reservations advised), plus 69 Bayside private campgrounds
- Fishing (free from shore [or from the Route 50 bridge] or from one’s own boat); (“Head Boats” available at bayside marinas for bay or ocean fishing)
- Shellfishing - clams and crabs - (free at own pier or boat and at Assateague National Seashore Park and State Park bayside)
- Golf (public course at Ocean City, numerous private courses)
- Tennis (public courts at Ocean City, numerous private courses)
- Hunting
 - Birds/Waterfowl
 - Deer
- Amusement Park Rides
- Go-Karts

4.4 Commercial Fishing and Shellfishing

Besides the “head boats,” which are berthed in the Bays, a number of large and small commercial fishing boats are berthed in the Bays also, primarily at West Ocean City but also at marinas on the Ocean City bayside. Therefore, the Bays provide not only the berths themselves but also protection to the boats and berths from storms and floods. Furthermore, the Bays provide access to the commercial fish and shellfish processing, marketing and shipping facilities which were constructed many years ago in West Ocean City to handle the catch from the Atlantic Ocean and Coastal Bays. The economic activity stimulated by these commercial facilities contributes to the overall economy of Worcester County through the direct wages paid by the firms as well as through their indirect and induced economic effects.

As noted above, over 120 species of finfish have been identified in the Coastal Bays. The ten most-harvested species taken commercially from the Bays were sea trout, menhaden, bluefish, spot, striped bass, white perch, American shad, eel, river herring and black mullet. Large trawlers take similar species as well as tuna, marlin, swordfish and other larger species from the Atlantic Ocean from the near-shore to 50 or more miles at sea.

Shellfish likewise have always been a vital resource of the Coastal Bays and the off-shore ocean. Four species comprise the primary types taken for commercial (as well as recreational) purposes: blue crabs (hard and soft shell), hard-shell clams and oysters. Lobsters are taken off-shore as well. Most blue crabs are taken as hard-shell, although soft-shell blue crabs make their appearance in fish markets in late August. Hard-shell clams likewise represent a continuing commercial asset in the Bays and ocean. As noted above, oysters used to be a very important commercial catch in the Coastal Bays, but since the early 1980’s have not been available due to parasites and diseases. It has been reported that some oysters and bay scallops are re-appearing in the southern (Virginian) portion of Chincoteague Bay. Processing the ocean and bay catch is a major industry in West Ocean City. Some of the catch is available to residents and visitors at local retail outlets, but most is shipped to markets across the U. S. and around the world. For instance, eel and conch are considered delicacies in Europe but are not widely eaten in this country.

4.5 Waterfront Property

Perhaps the largest impact on the economy of Worcester County due to the presence of the Coastal Bays is the increase in real estate values since the development of Ocean Pines and other recreational and retirement communities on the shores of the Bays and the Bay side of Ocean City. The attraction of the bays for new residents, visitors and tourists since the 1960’s can hardly be overemphasized. These recreational and residential developments not only provided an initial input to the County tax base and local economy as the lots were sold and people moved in, but the escalation in land values has been significant as well. For instance, a waterfront lot in Ocean Pines sold initially for \$10,000 and an inland wooded lot or a golf course lot for \$5,000 to \$7,500. Today waterfront lots average over \$125,000, inland lots over \$20,000 and golf course lots over \$40,000. Waterfront homes

now sell for up to half a million dollars or more and average close to \$225,000; inland homes average close to \$120,000; and homes adjacent to the golf course average close to \$135,000 (data for Ocean Pines as of August 2000 courtesy of the Coastal Association of Realtors). Weekly and seasonal rentals for these homes have similarly escalated in price. Property values throughout the County, particularly along the bay shores, have likewise increased throughout the last few decades. Increases have also been noted in Berlin, Snow Hill and elsewhere throughout the County, although perhaps not to the same extent as along the shores and in Ocean City.

Worcester County has also experienced increases in expenses over the years. One new elementary school, Showell Elementary, was built in the late 1980's, which serves primarily Ocean Pines and the northern part of the County. Similarly the Stephen Decatur Middle School was constructed in the late 1990's to serve the northern area. The Stephen Decatur High School is undergoing major extension and renovation to handle the increase in the teen-age school population. There are in all seven elementary schools, three middle schools, four high schools, one special education school, one Career and Technical Center, and the Wor-Wic Community College. A new County public library has been built in Ocean Pines. Although Ocean Pines maintains its own administration, fire, police and public works departments, and recreation department, the County has had to increase and modernize its own governmental activities.

4.6 Government Services

Worcester County provides up-to-date legislative, administrative and judicial governmental services. The on-going improvement and extension of these services is vital to the economic vigor and prosperity of the County and the Coastal Bays region. County court house was upgraded in the 1990's and utilizes state-of-the-art equipment and facilities. The County is responsible for K-12 education and library services, which, as noted above, have required recent major expenditures. The County is also responsible for water and sewer services throughout the County which similarly have required expansion and increased maintenance. The County maintains a solid waste landfill, developed in the early 1990's off Route 113 between Berlin and Snow Hill. The facility also offers recycling capabilities. The modern County jail can house a total of 264 inmates, and the County maintains a 24-hour health clinic with helicopter pad in Ocean City. Fire protection is provided throughout the County (except in Ocean Pines and Ocean City) by six volunteer fire companies. Police protection outside of Ocean Pines and the incorporated municipalities is provided by the County Sheriff's Office and the State of Maryland.

The result has been a necessary increase in County property taxes of a little over two percent per year since 1970, despite the added property values from the new developments. The current assessable tax base (year 2000) is \$2.49 billion (\$51,530 per capita), with an annual operating budget of \$76.3 million. The business personal property tax rate is \$1.74 per \$100 of assessed value, taxed at 100% of initial value with 10% depreciation allowed per year. The real property tax rate is 70 cents per \$100

assessed valuation (100% of market value with reassessment every three years as per Maryland State law). The County personal income tax rate is 1.25%.

4.7 Other Values

The Coastal Bays provide other benefits to the County. The barrier islands that form the Bays protect the mainland from strong wave action and storm surges. In a sense, the attractiveness of the Bays arises fundamentally from this protective aspect. Although a dollar value cannot be placed on this aspect alone, the increase in property values, the availability of recreational opportunities, and the berthing of boats and ships large and small, is based on the relatively calm waters of the Bays. A common statement by ecologists is “What is a Wetlands Worth?” The shallow waters of the Bays, the seagrasses and mud flats, and the wetlands areas on shore are the invaluable nurseries of the plankton, microalgae, benthic invertebrates, fish, shellfish, waterfowl, small mammals and other ecological species which are useful if not essential for human life. In this light, the total value of the commercial fish and shellfish catch, together with the value of recreational fishing and boating, represent only a portion of the overall value of the Coastal Bays to the ecology of the region.

5.0 VISITATION AND PARTICIPATION RATES

Calculations of a significant part of the economic value of the Coastal Bays, as noted above, depend fundamentally upon data and estimates of the numbers of persons who visit the area and who participate in various activities whose costs or values may be obtained from surveys or literature estimates.

5.1 Visitation for Worcester County

Estimating the annual visitation to Worcester County is vital for this study, since this estimate provides the basis for many subsequent calculations. Estimates published by the survey firm *TravelScope* of annual visitation to Worcester County vary substantially, from under 5 million people to over 10 million annually based on a Coastal Bays Management Plan Press Release, June 29, 1999.²

The Ocean City Public Relations Office estimates visitation of 8,036,000 visitors to Ocean City in 1998.³ This figure is broken down by month and shows a peak of about 300,000 visitors per week during the summer season. This estimate, however, does not count the percentage of visitors to Worcester County who do not visit Ocean City. Since visitor estimates for Worcester County vary considerably, probably exceeding 8 million, but could be as much as 10 million, and vary over time, a conservative estimate of 8,500,000 visitors annually to the entire County was used for this study. This estimate has been based on a review of all of the available data of tourism, visitations and recreation surveys relevant to the County.

² Travel Trends Maryland Eastern Shore Area 1997-1998.

³ Ocean City Public Relations Office (based on wastewater calculations).

The value of 8,500,000 visitors annually has been discussed with the State, County, regional and local individuals who have been acquainted with this study. Although the estimate may seem high (or low) to some people, the further breakdown of the annual number of visitors into the estimated activity days for each recreational activity on the Coastal Bays equates reasonably well with observations of such activities in and around the region (see the discussion below summarized in Table 6). It should be remembered that tourism and visitation varies significantly from year to year and depends on where the visitors are coming from.

TravelScope data indicate that visitors to the Maryland Eastern Shore mostly come from Maryland, the District of Columbia, and nearby states. In 1997, 43.5 percent of visitors came from Maryland and D. C. and 23.9 percent were from Pennsylvania. Virginia, Delaware, New Jersey and New York State each accounted for about 5 to 7 percent of the total. The remainder were scattered and hailed from as far away as Florida and California. Visitation varies from year to year. Estimates from 1997 to 1998 showed a significant decline in total visitation (an 11.5% drop), and the length of stay decreased from 3.2 average duration to 3.1 (3.2% decline). The most significant decrease was reported by Marylanders, which declined from 43.5 percent to 35.2 percent (a 19.1% drop), while Pennsylvania visitation was off by 5.4 percent. The Ocean City visitation decreased from 3.6 million in 1997 to 2.8 million in 1998 (a 22% decline).

TABLE 5
EASTERN SHORE PERSON TRIPS*

	<u>1997</u>	<u>1998</u>	<u>% Change</u>
Eastern Shore	4,944,752	4,376,482	-11.5
Ocean City (Part)	3,644,647	2,838,035	-22.1

* TravelScope Data

This variability (Table 5) is a function of many factors, including the weather and economic conditions. A cool, wet summer can reduce visitation dramatically.

5.2 Visitation to the Coastal Bays

Only a portion of the 8,500,000 estimated annual visitors are relevant for this study. The majority of Worcester County visitors do not participate in recreational activity on the Coastal Bays. The 1997-1998 TravelScope survey provides information about the purpose (business 14.0%, pleasure 63.4%), method of travel (90.5% by automobile), lodging (52% paid accommodation, 26% private home, 3% camper, and 14.5% no overnight stay). It is assumed that the 26% of the visitors staying in private homes were visiting relatives or friends in their homes.

The survey also provides information about the types of activities in which visitors engaged. The majority visit the beaches (48.5%), followed by shopping (33.6%) and outdoor activities (23.5%). The

latter are necessarily focused on the Bays. Eleven (11%) percent are there for nightlife and dancing, and theme/amusement parks account for 8.6 percent. The remainder is scattered through national and state parks (8.6%), cultural events/festivals (5.5%), historic sites/museums (4.9%) and golf (4.2%). The results of this study have been taken to be representative of Worcester County visitor activity. Since the majority of outdoor activities in Worcester County, aside from ocean activities and golf, are related to the Coastal Bays, this study has based its estimate of the number of visitors to Worcester County who participate in Bay-related outdoor activity on the above *TravelScope* survey percentage of 23.5% (rounded off to 24% due to the inherent variability in the number).

The 8,500,000 annual visitors to Worcester County times 24 percent participating in Bay-related activities equals 2,040,000 participants

5.2.1 Activity Days and Participation Rates

It is necessary to estimate how long each visitor to the Coastal Bays region stayed in pursuing their recreational activities. Again the *TravelScope* survey was used. The average number of days per visitor trip was given as 3.1 days.⁴ Multiplying this figure (the average visitation stay of 3.1 days) by the number of Bay-related participants (2,040,000) yields an estimate of 6,324,000 visitor activity days per year directed at the Bays. This estimate will be exceeded in this analysis because some visitors participate in more than one activity per day. This assumption is verified in many studies of outdoor recreation participation, such as the Pennsylvania's Outdoor Recreation Plan 1991-1997, Commonwealth of Pennsylvania.

TravelScope data also indicate that the majority of the 2,040,000 Worcester County visitors who participate in bay-related activities participate in more than one activity during their visit. They may participate in several different bay-related activities during this time or may spread their time between the Bays, the Ocean, or other destinations. Because activity day values are used to calculate expenditures on various activities, it is necessary to estimate the number of activity days spent on each activity. The definition of activity day for this study has nothing to do with the number of hours spent on a particular activity. It simply indicates that a person participated in a particular activity on a certain day. As a result, the total number of activity days can be greater than the total number of days spent visiting the Coastal Bays.

The aggregate number of activity days spent on bay-related recreation, the number of visitors who participate in various recreation activities on the Coastal Bays, is calculated from the 6,324,000 visitor days spent on Bay-related recreation during visits to Worcester County. For most recreational activities (except boating), this number was then multiplied by the participation rates from various

⁴ *TravelScope* 1997-1998 Survey.

literature sources for various activities to obtain the number of activity days spent on each activity. In other words, a participation rate of 10 percent for an activity would yield 632,400 activity days.

5.2.2 Methodology

Various sources of information were reviewed for estimates of visitor participation in recreation activities. These included surveys of boating and recreational activity on the Coastal Bays, outdoor recreational plans in Maryland and Delaware, and studies of recreational activities on bays at other locations. However, no one source was available that provided a consistent set of participation rates that were relevant to the Coastal Bays. The Maryland Land Preservation and Recreation Plan 1993 was one such source of potentially relevant information and data. The Plan provides a summary of outdoor activities, including average time and participation by County and State, and maps of recreational facilities by County. The average rates for recreational activities were not used, however, because they are Statewide and County averages that would be heavily weighted by Chesapeake Bay activities and activities in other regions of the State. Data from studies that represented similar Bay and recreational opportunities were more useful for this study.

Another secondary source of data was a study of visitors to the Indian River Lagoon Study (1985-1986) in Florida. This study, another source of potential activity data, for instance, employed a series of surveys to estimate the rate at which visitors participated in different activities. Respondents were asked whether or not they participated in a list of activities including swimming, fishing, boating, and nature observation. The rate at which respondents participated in each activity was then applied to published regional visitation numbers in order to estimate the annual number of participants for each activity. The Indian River Lagoon Study also used a survey questionnaire to estimate the value of recreation activities. These data were collected and a simulation of the recreation market was created. This data collection and contingent valuation method (CVM) is often used to estimate the demand and economic values that are estimated for studies like this. These data are expensive to collect, but this secondary data source was judged to be an unrepresentative estimate of use and value in Maryland's Coastal Bays.

The Maryland Coastal Bays Boating Study, University of Delaware, February 2000,⁵ provides a detailed picture of boating activity on the Coastal Bays, including participation rates for various types of recreational boat use. This was a major source of information for this study. It permits an evaluation of the many types of boating on the Coastal Bays, and each of these types separately, including aerial flyovers. The only difficulty in using these survey estimates is that they are percentages of total Coastal Bay boat activity, not the total number of Coastal Bay visitors. Additional information, such as the Assateague Island Survey⁶ does not reflect the overall boating activity in the Coastal Bays either, because

⁵ Maryland Coastal Bays Boating Study, University of Delaware, February 2000.

⁶ PARVS Public Area Recreation Visitor Survey 1985-1986, A Research Report on : Characteristics and Expenditures of Visitors to Assateague Island National Seashore, National Park Service, March 1991.

the shallow depths of the Bays along the Island are not nearly as conducive to boating as the more northerly Bays. This source was used selectively for wildlife-watching and related participation rates. Also, a current aerial and access intercept survey is being conducted of recreational boating in the Bays by the University of Delaware for the Maryland Fishery Service,⁷ which unfortunately has not yet been published. The current work (Maryland Coastal Bays Boating Study 1999, published February 2000) involved sampling boating activity on weekdays, as well as weekends (a previous survey only sampled weekends). The survey sampled a window of activity between 11:00 a.m. and 1:00 p.m. when, according to survey information, the peak use occurs. The average number of boaters was 3.2 boaters per boat (based on 94% of boaters surveyed) in the 1999 survey.

Several problems were encountered with literature sources:

- Surveys did not distinguish between Bay and ocean activities;
- Secondary data from other Bay environments were not representative of the Maryland Coastal Bays;
- Some data were outdated;
- Boating participation rates as a percent of visitation were not available.

The major problem involved estimating participation rates for all types of boating. None of the sources provided a method for using rates that could be applied to the annual visitation estimates.

As a result, two different methods were used, one for boating, and the other for all other recreational activities. Boating activities were estimated based on the number of boats registered in Worcester County and on the recent University of Delaware boating survey for the Coastal Bays, rather than on the number of visitors. All other recreational activity estimates are based on participation rates from various literature sources that were applied to the annual visitation numbers.

Further discussion of the actual data and estimates used in this study to determine activity days for each type of recreational activity are given below in Section 5.3.

5.3 Estimates of Annual Participation in Recreational Activities on the Coastal Bays

5.3.1 Boating

5.3.1.1 Powerboats, Sailboats

In 1999, there were 2,357 boats registered (MD DNR Licensing and Registration Service) in Worcester County. This number represents the number of boats between 16 and 25 feet (i.e. powerboats and sailboats) that spend the majority of the year in Worcester County as "home port." By residence of

⁷ Telephone conversation 8/7/00 with Thomas O'Connell (MD, Fishery Service).

owner, State data indicate that 5,139 boats are registered in the County, of which 4,358 are pleasure boats, 103 are commercial, and the remainder (678) are described as "other." The 2,357 boats claiming Worcester County as "home port" are assumed to represent an appropriate estimate of boats using the Bays and omits the ocean-going commercial boats, and accounts for or balances the "in" and "out" movements of boats by trailer, and sea by visitors and residents. The MD DNR report indicates that 80 percent of the boats using the Bays are of this type.

Several factors make it reasonable to conclude that most of these boats registered in Worcester County are used for recreation in the Coastal Bays. These factors include a large number of the recreational boaters who are retired and are likely to spend much of their time in Worcester County. In addition, the Coastal Bay boaters on average take 32 boating trips on the Bays each year.⁵

For the purpose of this study, it is assumed that the undercounting, caused by some Coastal Bay boats not being registered in Worcester County, is balanced out by some boats that are registered in Worcester County and are not used for recreation on the Coastal Bays, such as commercial vessels and boats used elsewhere.

Therefore, the 2,357 registered boats were used as the basis for estimating the recreational boating activity on the Coastal Bays. By multiplying the registered boats by the average number of boating days per recreational boater (32) yields over 75,000 annual boating trips for these large boats.

If there are 3.2 people per boat, as reported in the February 2000 Maryland Coastal Bays Boating Study,⁵ the annual activities days for boating (for boats with lengths of 16 to 25 feet) is 241,000. According to the February 2000 report, this represents 82 percent of the boaters on the Bays. Thus, the total boating activity is estimated at 294,000 days per year ($241,000/0.82$). The other boating categories are calculated as a percentage of this total in following sections.

5.3.1.2 Personal Watercraft

Personal watercraft, such as jetskiing, has become a major recreational activity on the Coastal Bays over the past decade. About fifteen (15%) percent of the observed boats during the aerial flights conducted by Maryland DNR⁵ were personal watercraft. This percentage was multiplied by the estimated total activity days for all types of boats on the Coastal Bays to determine an annual participation of approximately 44,100 personal watercraft boating activity days ($294,000 \times 0.15$). It should be noted that jetski activity in Sinepuxent Bay adjacent to the Assateague Seashore National Park has been prohibited.

5.3.1.3 Canoeing/Kayaking

Interest in recreational canoeing and kayaking has grown in the past decade. Many Coastal Bay visitors canoe and kayak in locations less frequented by larger boats. Three (3%) percent of the boats observed from the aerial flights conducted by Maryland DNR⁵ were canoes or kayaks. This percentage was multiplied by the estimated total activity days for all types of boats on the Coastal Bays to determine an annual participation of approximately 8,800 boating activity days ($294,000 \times 0.03$).

5.3.2 Wildlife Observation including Birdwatching

In a survey of Assateague National Seashore⁶ visitors 48 percent reported participating in wildlife observation. As indicated previously in Section 4.2, many of the visitors enjoy seeing the wild horses and rare Sitka Deer at the Park. In addition, birdwatching is an important recreational activity for many visitors to the Coastal Bays. The islands located in Sinepuxent Bay are internationally recognized for their birdwatching opportunities. There is even a local website on which the Worcester County tourism office promotes the opportunities for birdwatching on the Coastal Bays. Because prime locations for wildlife observation are located throughout the Coastal Bay system and various tours make the Coastal Bays a destination, the 48 percent participation rate was assumed to be representative of the visitors to the Coastal Bays. This percentage was multiplied by the total number of activity days (6,324,000) to obtain an estimate of 3,035,500 activity days spent on wildlife observation including birdwatching (6,324,000 x 0.48).

5.3.3 Sightseeing

The aesthetics of the Coastal Bays provide valuable sightseeing opportunity. Fifty-five (55%) percent of visitors to the Maryland portion of Assateague National Seashore listed passive sightseeing as one of their activities.⁶ This value likely reflects participation in several different Bay-related activities that involve sightseeing, including nature walks, pleasure drives, and hiking. Similarly high sightseeing participation rates are common for many parks and natural areas throughout the region.

Sightseeing opportunities exist not just along Assateague Island, but up and down the entire Coastal Bay system. As a result, this participation rate was applied to the entire population of Coastal Bay visitors to obtain a value of 3,478,200 activity days spent on active sightseeing along the Coastal Bays (6,324,000 x 0.55).

In this study, sightseeing was determined to be different and separate from wildlife observation. Sightseeing is generally a passive activity whereas wildlife observers take a more active role, such as driving to out-of-the-way places and using binoculars and cameras.

5.3.4 Fishing, Clamming, and Crabbing (shore, dock)

There are two types of recreational fishing activity on the Coastal Bays: fishing from boats and fishing from the shore or a dock. Because the activity day values, used later in this report for recreational boating, includes expenditures for fishing, it is not appropriate to evaluate the recreational boat fisherman separately from boater participation in general. Other visitors to the Coastal Bays fish, clam, and crab on the Coastal Bays from a dock or the shore rather than from a boat. Twelve percent of Assateague National Seashore visitors participated in fishing. However, this number includes ocean surf fishermen. It was assumed that one-quarter of the people fishing from a dock or from the shore were fishing on the Bays, three percent of the entire visitor population. This value was multiplied by the total number of

visitor days to obtain a combined estimate of 189,700 activity days spent on these activities (6,324,000 x 0.03).

5.3.5 Swimming

Recreational swimming is not a major activity on the Coastal Bays, most likely due to the lack of surrounding beaches. Most participation rates relating to swimming from other studies do not distinguish between swimming in the oceans, where swimming activity is significant, and swimming in the Bays. The TravelScope data for 1997⁴ indicate that over 51 percent of visitors use the oceanside beaches. The Maryland Coastal Bays Boating Study, February 2000, indicates that swimming in the Bays may be as low as five percent of participants (percent of boaters who participated "on day of interview," Figure 11), or as high as eighteen percent (percent of boaters indicating participation in activity, Table 16). The lower number (5%) is probably a conservative estimate of participation by the typical visitors who use the Bays over the season, including swimming from boats and at beaches in campgrounds. The DNR aerial flights (Maryland Coastal Bays Boating Study, February 2000)⁵ for the Coastal Bay boating survey observed that about five percent of boaters were participating in swimming as well. This participation rate is low, however, and the five percent participation rate was applied to the number of visitor days engaged in the Bay-related recreation to obtain an estimate of 316,200 activity days spent on swimming in the Coastal Bays (6,324,000 x 0.05).

5.3.6 Camping and RV Parks

Camping is very popular in Worcester County. The aesthetics of the Coastal Bays and access to the ocean beaches provide strong incentives for tent and recreation vehicle (RV) campers to visit the area. Many campgrounds have facilities specific to the Bays and offer boat ramps, fishing, and boating facilities, including rentals. The Assateague Island National Seashore Park provides camping facilities oceanside and Bayside that can be used by the over one million annual visitors.

There are sixty-nine (69) campsites on the Bayside of Assateague National Seashore, serving over 20,000 overnight stays.⁸ Private and State campgrounds serving the Ocean City area offer about 1,000 campsites. These campgrounds, located on Route #611 and the Ocean City vicinity, include boat launch and ramp facilities, fishing and crabbing.

TravelScope data⁴ indicate that five (0.5%) percent of visitors (1997) use RV/tent facilities for overnight lodging. Based on the Bay-related recreation participants (2,040,000) and the average duration

⁸ Camping survey information: National Park Service, Assateague Island National Seashore, Draft Statement for Management, December 20, 1993; Campground Sites Serving Ocean City, MD (<http://www.ocean-city.com/camping.html>) 7/17/00; Worcester County Economic Development, Community Profile; Quality of Life (http://skipjack.net/le_shore/worcestr/profile/quality.html); Ocean City Maryland Chamber of Commerce, Ocean City Area Community Guide (<http://www.oceancity.org/idx.asp>).

of a visitor stay (3.1 days), the Bays support an estimated 31,600 activity days annually (6,324,000 x 0.005).

5.3.7 Hunting

Recreational hunting is not a large activity on the Coastal Bays. In 1992, 2,920 registered hunters were recorded in Assateague National Seashore,⁶ a number that included 562 waterfowl hunters.⁹ Although the Bays provide habitat for game species, particularly waterfowl, a decrease in the overall popularity of hunting, the increasing incidence of lyme disease-infected ticks, and an increase in the population density of Worcester County all contribute to the limited numbers of hunters. Assuming all of the hunting that takes place in Worcester County is within the Coastal Bay area, the estimated annual number of hunters of Bay-related species in Worcester County would be 2,900 (rounded) individuals, about 0.14 percent of participants. Based on the average duration (3.1 days) of a stay in Worcester County, the area supports about 9,000 activity days of Bay-related hunting (6,324,000 x 0.0014).

5.3.8 Summary of Coastal Bay Recreational Activity

Recreation in the Coastal Bays is popular and attracts an estimated 2,040,000 people to the region. Sightseeing and observing wildlife and birds are probably the most popular activities. An estimated 1.1 million visitors enjoy the Bays and the scenery and walk and drive the area. Birding is popular, and wildlife observation in general is estimated to attract nearly a million visitors to this rich habitat and environment. Together, these activities account for about six million activity days annually. Table 6 provides a summary of these participation rates, total participants and activity days for recreation on the Coastal Bays of Worcester County.

Boating is obviously very popular on the Coastal Bays. In 1999, 2,357 (part of the total 5,139) boat owners registered Worcester County as "homeport" for boats 16 feet and 25 feet in length. After considering the net affects of "in" and "out" boat movements, this number of registered boats provided an estimate of 294,000 activity days per year. The majority (82%) of boating includes powerboats, pontoon boats, sailboats, etc., or 241,000 activity days per year. An estimated 67 percent of this boating activity is focused on sportfishing, according to the Maryland Coastal Bays Boating Study, February 2000. Personal Watercraft (PWC), including Wave Runners and jet skiis are an increasingly popular boating activity, which accounts for about fifteen percent of boating activity and over 44,000 activity days per year. Canoeing and kayaking account for about three percent of boating activity and, annually, nearly 9,000 activity days.

⁹ National Park Service, Assateague Island National Seashore, Draft Statement for Management, December 20, 1993.

TABLE 6
VISITATION AND PARTICIPATION RATES ON THE COASTAL BAYS

Visitation

Total Worcester County Visitors	8,500,000
Estimated Participants in Bay-Related Recreation	2,040,000
Average Duration of Visit	3.1 Days
Days Spent Visiting the Coastal Bays	6,324,000

Recreational Participation – Not Including Boating

<u>Activity</u>	<u>Participation Rate*</u>	<u>Total Participants</u>	<u>Activity-Days</u>
Sightseeing	55.0%	1,122,000	3,478,200
Wildlife Observation	48.0%	979,200	3,035,500
Swimming	5.0%	102,000	316,200
Fishing, Crabbing, Shellfishing**	3.0%	61,200	189,700
Camping	0.5%	10,200	31,600
Hunting(Bay-Related)	0.14%	2,900	9,000

* Adds up to 111.55% because of more than one activity in one day by persons involved in recreation.

**From docks, piers and shore, not from power boats.

Reference: Maryland Coastal Bay Boating Study, Figure 20, February 2000.

Recreational Participation – Boating (Based on Registered Boats)

Total Activity Days

293,900

<u>Type</u>	<u>% of Boating Activity</u>	<u>Activity Days</u>
Motor Boats, Pontoon Boats, Sail Boats, etc.**	82%	241,000
Personal Watercraft (Jet skis and Other)	15%	44,100
Canoeing, Kayaking	3%	8,800

** Table 16 of the Reference indicates that 67 % of the boat types do “sportfishing”, 93% participate in fishing, and 36% participate in crabbing.

Swimming involves about 100,000 participants and over 316,000 activity days, followed by shore and dockside fishing, crabbing and shellfishing, about 189,000 activity days per year. Camping and hunting complete the categories of Bay-related activities that were investigated, with estimated use of 31,000 and 9,000 activity days, respectively.

These estimates of visitor activities were based on available data sources and are believed to be good approximations of the major uses of the Coastal Bays. Certainly, other uses probably exist, but no important uses have been overlooked.

6.0 VALUING RECREATIONAL ACTIVITY BY EXPENDITURES

6.1 Overview

Demand for the recreational enjoyment of the resources of the Coastal Bays provides a market for industry to sell various types of recreational experience that depend on these resources. The following is a summary of the recreation-based industry dependent upon the resources of the Coastal Bays and the estimated annual revenue of this industry.

Some recreational businesses that rely on the Coastal Bays for revenue are highly dependent on the ecological and aesthetic condition of the Bays. One charter boat business that offers ecotours on the back bays of Ocean City and Assateague advertises the opportunity to see the endangered brown pelicans, wild birds, and beautiful sunsets. Other recreational businesses, such as personal watercraft rentals, are perhaps less sensitive to the Coastal Bay ecology, but still all activities are highly dependent on the perception of the visiting public that the Bays are in good environmental condition. Most Worcester County businesses in the recreation industry have highly seasonal revenue and are dependent upon the volume of seasonal visitors to the Coastal Bays. Likewise, most of these businesses benefit from the high concentration of visitors to the Ocean City beaches and are located on the Bayside of Ocean City.

A variety of types of recreational activities can be assigned “market values” simply by finding out what it costs to engage in that specific activity. Such a survey was conducted in Ocean City bayside and elsewhere in August 2000 by witnessing “market transactions” as visitors obtained tickets for their particular recreational activity. Other “market transactions” do not occur at the time that an individual engages in a particular recreational activity. Although a birdwatcher does not pay an actual fee to visit an opportune location and observe birds, that person may have bought film for his camera, as well as lunch somewhere up the road. These market values cannot be determined directly at the place of business where the transaction took place because there is no way to allocate the expenditures at the time of purchase to a specific activity and location. However, the value of these expenditures may be estimated from surveys of those engaged in the activity. Such surveys are conducted regularly for each state by the U. S. Department of the Interior as the “National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.” The latest such survey was conducted in 1996 and the results for the State of Maryland are

TABLE 7 (Continued)

Boating - Motorboats

Motorboats (Outboard – 6 passenger)	1 hr \$ 63.99	(\$100 deposit)
	4 hr \$171.99	“ “
	8 hr \$289.99	“ “
Motorboat (Inboard – 6 passenger)	1 hr \$125.99	(\$100 deposit)
	4 hr \$198.99	“ “
	8 hr \$324.99	“ “
Pontoon Boats (6 - 8 passenger)	1 hr \$ 63.99	(\$100 deposit)
	4 hr \$171.99	“ “
	8 hr \$289.99	“ “
Jet Boats (6 passenger)	Single Engine \$125.99	(+\$100 deposit)
	Twin Engine \$243.99	“ “

Personal Watercraft (jet ski) \$50 for ½ hr; \$70 for 1 hr (no deposit)

Parasailing (6 persons, 1 hr boat trip – 10 minutes in the air)

400 ft high -	\$ 40
700 ft high -	\$ 50
1,000 ft. high -	\$ 60
1,500 ft. high -	\$ 70

Speedboat (“Sea Rocket” or “OC Rocket”) from the Inlet out along the ocean beach and back - \$10 per adult; \$8 for seniors; \$5 for children

Evening Cruise from the Inlet out along the ocean beach and back

\$6 per adult; \$5 for seniors; \$4 for children.
free cruise with dinner at some bayside restaurants.

Instructional Tours by Boat

Eco-Tours	\$14.50 per adult; \$12 for seniors; \$8 for children
Dolphin Watch	Jet Boats Single Engine \$125.99 (\$100 deposit) Twin Engine \$243.99

Boating

Sailboats	- Hobey-Cat - \$50 for ½ hr; \$70 for 1hr + deposit [Ocean Pines Boat Slip - \$510 to \$1,200 per summer season]
Wind-Surfing	- 1 hr \$25 + deposit
Canoeing (see “Sinepuxent Water Trails”)	- provide own canoe + vehicle if needed
Kayaking (see “Sinepuxent Water Trails”)	- provide own kayak + vehicle if needed
Commercial Kayak	- \$20 half-day; \$35 full day

Boating

Other Tours by Boat	
Canoe Trips	- \$30 per canoe
Boat Expeditions	- \$15 per person
Night Life Watch	- \$10 per person
Day Treks	- \$10 per person

TABLE 7 (Continued)

Other Recreation:

Golf	Ocean City Public Golf Course - \$55 per round [Ocean Pines Golf Membership \$875 individual; \$1,400 family] [Many other public and private golf courses are available in the area]
Tennis	Ocean City Tennis Facility - \$35 per hour [Ocean Pines Tennis Membership \$190 individual; \$290 family] [Other tennis facilities are available in the area]
Amusement Park Rides	- \$1 per ticket (most rides take 4 to 6 tickets)
Go-Karts	- \$8 per 5 -minute ride

6.3 Methodology

Participation in recreational activity accounts for a substantial portion of the market value of the Coastal Bays. Obtaining an estimate of this value requires two sets of data: participation rates for different recreational activities on the Coastal Bays and activity day values of activity-related expenditures. Multiplying these two sets of values together provides an estimate of annual recreational expenditures in Worcester County.

Participation rates are listed in Table 6 and are discussed in Section 5 on the previous pages. Activity-related expenditures are described and discussed below.

6.3.1 Expenditures Associated with Coastal Bay Recreational Activities

Determining the total spending generated by activities that use the resources of the Coastal Bays is the first step in determining the value of the Coastal Bays to the local economy. Because expenditures related to a recreational activity can occur at different moments in different locations a survey of recreational participants is the best way to account for spending habits. A number of different surveys have been published related to the expenditures associated with different recreational activities. There are two detailed surveys of particular relevance to this study. The first, noted above, is the *1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Maryland* published by the U.S. Fish and Wildlife Service. The second is *Recreational Boating In Maryland: An Economic Impact Study* by Douglas W. Lipton and Scott Miller. These studies provide detailed analysis of the expenditures related to several types of recreational activities found on the Coastal Bays. Although these surveys were for the entire state of Maryland, they were used in part as the basis for some of the expenditures for activities on the Coastal Bays.

Certain concerns arise when aggregating the expenditures related to specific recreational activities. To avoid double counting common expenditures over different activities, thereby inflating the overall value of these expenditures to the economy of Worcester County, it is necessary to isolate and consider only those expenditures that are specific to the recreational activity being valued. In particular,

this study attempted to avoid double counting if a person participated in several different activities during his visit to the Coastal Bays by isolating each type of activity. Also, it was important to avoid counting trip-related expenditures that do not occur in Worcester County. The recreational expenditures from the expenditure surveys that are not likely to have been spent at the site of participation are not included in the calculation of activity-day values. Expenditures such as dock fees and boat fuel costs associated with a recreational fishing trip on the Coastal Bays are likely to impact the economy Worcester County and are included, while expenditures on fishing magazine subscriptions were not.

In addition to spending money on specific activities, recreational users of the Coastal Bays spend money in Worcester County on general trip related expenses such as transportation, food and lodging that are either difficult, or impossible to allocate to a particular activity. For instance, when a family vacations in Worcester County, they participate in numerous activities, some related to the Coastal Bays and other unrelated. Therefore, it is impossible to determine by a simple survey the amount of the rental cost that should be attributed to a particular type of recreation, and included in an estimate of the activity day value. In order to avoid these issues, the costs for transportation food and lodging are addressed separately (in Section 6.4.9) from the valuation of various activities which are assumed to exclude these costs. This calculation is adjusted to exclude campers and day travelers from the aggregate 6,324,000 days spent visiting the Coastal Bays.

6.3.2 Literature Activity Day Values

An extensive survey of the spending patterns of Coastal Bay users would be the most accurate way to determine expenditures on specific Coastal Bay recreational activities and compute activity day values. Because such a survey does not exist, and is costly to conduct, this study instead relied on local prices, and activity day values from literature sources that had been calculated for similar activities at locations with characteristics similar to those of the Coastal Bays. These values were also adjusted based on assumptions about owner versus rental costs (such as Table 7) information. A substantial amount of data on recreational expenditures is available for Maryland as a whole. It was used to calculate statewide activity day values, which could then be applied to the recreational activities in the Coastal Bays. These calculations yield estimates for annual expenditures in Worcester County related to specific recreational activities

This analysis helps to show what resources of the Coastal Bays are important to the economy of the County. Calculations were made to estimate the spending associated with various Bay-related activities from 1996 data. These 1996 values were escalated to the year 2000 values, as indicated in the text.

6.4 Expenditure Calculations

Expenditure calculations are made for each of the recreation activities based on 1996 spending data. Table 8 at the end of this section, summarizes these expenditures and escalates the values to year 2000 prices.

6.4.1 Sightseeing

Sightseeing, which does not include wildlife watching, is a fairly passive activity that is not associated with significant expenditures. As a result the activity day value used for this category is taken from the U.S. Army Corp of Engineers' default values to use for expenditures associated with general recreation. Such expenditures would include film for a camera, post-cards and other gift-shop items, and snacks (not included in regular meals). These values range from \$2.72 to \$8.16 per activity day based on the site characteristics.¹⁰ This study will use the value \$5.44 per activity day, the average of this range. This relatively low value does not imply that sightseeing does not have significant value to the Worcester County economy. While individual participants spend little, the heavy, but casual, participation in sightseeing results in an aggregate value that is very high. Applying this activity day value to the number of activity days, 3,478,200, yields a direct annual economic impact of about \$19 million.

6.4.2 Wildlife Observation

As the popularity of serious wildlife watching has grown, so has the amount of time that people spend in pursuit of this activity. In 1996 a typical wildlife-watching enthusiast in Maryland spent \$90 for food and lodging, \$39 for transportation, and \$242 on equipment and other related expenses during an average 12 days of participation – about \$20 per day. These equipment expenditures included binoculars, spotting scopes, photographic equipment, etc. As the popularity of serious wildlife watching has grown, so has the amount that people spend in pursuit of this activity. Some Coastal Bay visitors are serious enough to spend this much on an activity-day of wildlife watching. The majority of those who participate in wildlife observation do it casually. For these individuals a minimal activity-day value the U.S. Army Corp of Engineers' default values to use for expenditures associated with general recreation as noted above for sightseeing. These values range from \$2.72 to \$8.16 per activity day based on the site characteristics, not including lodging, food travel cost and equipment expenditures. This study will use the value \$5.44 per activity day, the average of this range. Of the 48 percent of visitors who participated in wildlife observation at Assateague National Seashore, only 7.1 percent (equivalent to about 14.2% of visitors to the Coastal Bays) were serious wildlife observers who claimed that wildlife observation was their primary activity. Applying a casual "birders" value, and an adjusted value of the ardent observer's local cost, which was assumed to be half of the average (\$20) day cost (since equipment purchases are made elsewhere), yields two different activity-day values, \$10 and \$5.44. Based on these daily value

¹⁰Economic Guidance Memorandum 00-2, Unit Day Values for Recreation, Fiscal Year 2000," U.S. Army Corps of Engineers.

estimates, Worcester County visitors spend \$18.4 million annually on bay-related wildlife observation. Of that expenditure, \$4.3 million is spent by the smaller group of serious wildlife observers (14.2% x 3,035,500 x \$20), and the remaining \$14 million is spent by more casual observers (85.8% x 3,035,500 x \$5.44).

6.4.3 Fishing and Shellfishing (shore and dock)

Expenditures associated with an activity day of fishing and crabbing and clamming include bait and tackle as well as other necessary gear. The activity day value for shore and dock fishing and shellfishing was derived from the Maryland boating survey, which includes an expenditure category for fishing supplies. This activity day value of \$6.03 per fishing day is multiplied by the number of fishing days along the docks and shore of the Coastal Bays, 189,700, to obtain a value of about \$1.1 million in direct annual expenditures.

6.4.4 Swimming

The activity of swimming is essentially free; swimming from a dock, pier or beach is free; but there are some expenditures. Swimming in a motel pool, as an example, is covered under the costs of lodging. Swimming in a pool in Ocean Pines costs \$6 (child) to \$7 (adult). Taking the average per activity day value of \$5.44 used by the Corps of Engineers for low-key recreation activity, and multiplying by the number of activity days of swimming, 316,200, yields a direct annual expenditure of about \$1.7 million.

6.4.5 Camping

The activity of camping requires expenditures for food (\$55) and transportation (\$39) or \$94 per person for 12 days or about \$8 per activity day (not included in the food/lodging calculations of Section 6.4.1). The fee at the Assateague National Seashore Park averages about \$5 per person per day depending on the type of entrance permit obtained. The fee at other camp grounds averages about \$10 per person per day. Taking an average of \$7.50, the total cost per activity day would be \$15.50. Multiplying by the number of activity days, 31,600, the direct annual expenditure is about \$500,000.

6.4.6 Hunting

Expenditures associated with an activity day of hunting include the purchase of guns and ammunition, as well as other equipment including equipment rentals. Using the data from the 1996 National Fish and Wildlife Survey for Maryland total non-travel related expenditures were amortized over the average number of trips per hunter, yielding a hunting-day value of about \$30. Multiplying this number by the number of hunting days for the Coastal Bays, 9,000, results in a calculation \$270,000 in direct expenditures associated with hunting on the Coastal Bays.

6.4.7 Total Direct Expenditures for Recreational Participation – Not including Boating

Adding up the direct expenditures listed above, the total direct expenditures for recreation on the Coastal Bays are as follows:

TABLE 8				
TOTAL DIRECT EXPENDITURES FOR RECREATIONAL PARTICIPATION – NOT INCLUDING BOATING (2000)				
Activity	Cost per day	Activity-Days	Total Expenditures (As of 1996)	Escalated to Year 2000*
Sightseeing	\$5.44	3,478,200	\$ 19,000,000	\$ 21,400,000
Wildlife Observation	\$10.00	3,035,500	\$ 18,400,000	\$ 20,700,000
Swimming	\$5.44	316,200	\$ 1,700,000	\$ 1,910,000
Fishing, etc.	\$6.03	189,700	\$ 1,100,000	\$ 1,240,000
Camping	\$15.50	31,600	\$ 500,000	\$ 560,000
Hunting	\$30	9,000	\$ 270,000	\$ 300,000
TOTALS		7,060,200	\$ 40,970,000	\$ 46,110,000

*3% per year for 4 years (rounded to nearest 10,000) .

These estimates show nearly \$46.1 million in direct expenditures for Bay-related activities, not including the transportation, food and lodging that is captured later for all those who will require it. These expenditures are inputs to IMPLAN (Section 10.0) where the multiplier effects of these expenditures are estimated to obtain the full effect on the Worcester County economy.

6.4.8 Expenditures for Boating

Boating on the Bays is very popular and growing in participation every year. In 1991, the most recent comprehensive survey by the University of Maryland Eastern Shore¹¹ indicates that there were 85 launching ramps located in the County, ten maintained by the county or other governmental agency, ten commercial ramps and 65 private ramps in residential areas. The study identified 553 “wet” boat slips and 6,951 other boat slips or “docking structures” available for boats on the Coastal Bays; 4,506 of the latter in Ocean City bayside; 1,565 on the mainland north of Route 50; 743 along Sinepuxent Bay; and 137 along Chincoteague Bay. In an aerial survey of boats actually using the Bays from noon to 1:30 PM on ten weekend days between June 15 and September 7, 1991, an average of 456 power boats, 25 sailboats, 35 jet skis, and 8 wind surfers were observed. These numbers have undoubtedly increased since 1991, but more recent actual counts of boats are not available.

¹¹ *Marina and Recreational Boating Survey, Worcester County, Maryland, 1991*. by C. L. Counts et al. Coastal Ecology Research Laboratory, Department of Natural Sciences, The University of Maryland Eastern Shore, May 1992.

The types of boating engaged in by visitors to the Bays takes numerous forms, including the use of motorboats, sailboats, personal watercraft (jet skis), canoes, kayaks, peddle boats, rowboats, etc., either rented or owned. Motorboats are used simply for a pleasurable ride – in effect sightseeing or observing nature and/or wildlife (discussed above), or for going from one place to another – in effect for transportation, or for fishing, water-skiing, water-rafting, parasailing, or other active sport. The expenditures associated with recreational boating are significant. Boat slip rental alone can cost over \$1,000 a year. Adding in equipment costs, fuel and maintenance adds to this cost significantly.

The next three (3) sections describe different methods for estimating the annual expenditures related to recreational boating. The first two (2) methods "cost of owning a boat," and "cost per trip" present problems, and were not used. The third method, the "cost of renting" is based on market-price data collected by GPG in the study area. This method provides a conservative estimate of the annual costs of boating.

Cost Of Owning A Boat: The first method considered (but not used) for evaluating expenditures related to recreational boating is based on the average annual boat related expenditures for Maryland boating. These were \$1,196 in 1993 for trailered powerboats and \$2,849 for in-water powerboats, and \$4,454 for sailboats, including payment on loans for boat purchase, insurance, equipment, boatyard expenses and miscellaneous.¹² Dividing the average cost per boat by the number the average number of trips per boat (27; 22; and 24 respectively) yields activity-day values of \$44.30 for trailered powerboats, \$129.95 for in-water powerboats and \$185.58 for sailboats. The number of trailered power boats in Worcester County was 2,472 or 82 % of the total, with 481 in-water powerboats (16%) and 60 sailboats (2%). Multiplying a weighted average of the activity-day values (\$60.82 per day) by the annual total participation for owned-boats (169,000 - Table 6, 241,000-72,000 rentals [see below]) gives a combined expenditure value of \$10.3 million in direct expenditures. Escalated seven years to the year 2000 at a 3% annual inflation rate, the total value becomes 1.23 times greater or \$ 12.6 million. This amount, however, over-emphasizes the cost of recreational boating on the Coastal Bays. The trailered boats could be used elsewhere and the “opportunity” cost of each additional boat trip should not necessarily be attributed to the Bays. The value on \$12.6 million was not used in this study. These are the costs simply to own a boat for use on the Coastal Bays.

Cost per Trip: A second method for evaluating annual boating expenditures (also not used), but probably more appropriate than the cost of owning a boat, would be based on the costs per trip actually to use the Bays for recreation. Estimates of the trip-related costs were also given in the Maryland study. These averaged annually \$1,283 for trailered powerboats, \$1,192 for in-water powerboats, and \$720 for sailboats, including food and lodging, transportation, fishing supplies, fuel and miscellaneous.

¹² *Recreational Boating in Maryland – An Economic Impact Study*, by D. W. Lipton and S. Miller, University of Maryland.

Subtracting out the cost of food and lodging, transportation and fishing supplies, covered separately below, the average costs were \$301, \$433, and \$152 for the trailered powerboats, in-water powerboats, and sailboats respectively. Dividing by the average number of boat trips per year for each type of boat, 27, 22, and 24 respectively, the average activity-day costs were \$11.15, \$19.68 and \$6.33. Multiplying a weighted average of the activity-day values (\$12.42 per day) by the annual total participation in owned-boats (169,000) gives a combined expenditure value of \$ 2.1 million in direct expenditures. Escalated seven years to the year 2000 at a 3% annual inflation rate, the total value becomes 1.23 times greater or \$ 2.6 million. This value likewise over-emphasizes the Bay-related expenditures since it ignores the per-trip related costs of ownership. The cost of \$2.6 million was not used in this study.

Cost of Renting: The method used in this study assumes that the market value of these boating activities is set or equivalent to the cost of renting the boats. This method was used to estimate the direct expenditures for various types of boating. The following direct expenditures can be calculated based on the survey of boat rental costs in Ocean City in August 2000 made by GPG:

Motorboats: There are four outlets in Ocean City renting motorboats by the hour or day. The types of boats include regular outboards, jet-powered boats, pontoon boats, and jet skis. Each outlet rents on the average six boats of each type, perhaps a total of about 100 boats using the Bays each day. The rental costs (see Table 7) vary from \$64 per hour for a six-passenger pontoon boat to \$244 per hour for twin engine jet boats holding up to six people, an average of about \$20 per person per hour. If the 100 boats are rented for an average of eight hours per day for a 90-day season, a total of 72,000 activity days at an average rental of \$20 per person per hour, the total direct expenditures for motorboat rentals are \$1.4 million. This value is included in Section 7.1, “Commercial Rentals of Motorboats.” Assuming that the private use of personally-owned motorboats on the Bays costs the same, \$20 per person per hour, taking into account fuel, maintenance, berthing and depreciation, and the private use amounts to 169,000 activity days (241,000 minus 72,000 – see Table 6) when the boat is used on the average for one hour per day. The total direct expenditures are then about \$3.4 million for the motorboats owned and/or operated on the Coastal Bays of Maryland ($169,000 \times \$20 = \$3,380,000$ rounded to \$3.4 million).

Sailboats: The costs of sailing may be estimated by the costs of rental of a “Hobey-Cat” - \$70 for one hour. A “Hobey-Cat” is a two-person double-pontoon sailboat for use strictly in the Bays. Larger sail boats are essentially privately owned. There is only one outlet renting Hobey-Cats and they have an inventory of only six boats. There are only about two dozen privately-owned sailboats that use the Bays. Therefore, the total use of sailboats is minimal (because of depth and draft requirements) and may be included in the total for motorboats listed above.

Personal Watercraft (Jet skis): The four outlets renting jet skis charge \$50 for ½ hr and \$70 for one hour with no deposit required. The jet skis can carry two or three persons, so the rental cost is about \$35 per person per hour. The total number of jet skis rented is about five per outlet per hour for an eight

hour day over a 90-day season, or roughly 14,400. The use of privately-owned jet skis is perhaps about twice as many, for a total of about 44,100 activity days (see Table 6 – Personal Watercraft - Boating). At \$35 per person per hour, the total direct expenditure is about \$1.5 million (44,100 x \$35 = \$1,543,500 rounded to \$1.5 million).

Canoeing and Kayaking: Renting a kayak commercially costs \$20 for half-day and \$35 for a full day. Assuming that this cost represents the cost for all rentals and privately-owned canoes and kayaks, and taking the value in Table 6 of 8,800 activity days, the total direct expenditures for this category is \$308,000 (8,800 x \$35 = \$308,000).

Total Expenditures for Boating: Adding up the above direct expenditures, the total for boating comes to the following:

TABLE 9 TOTAL DIRECT EXPENDITURES FOR RECREATIONAL PARTICIPATION (2000) BOATING				
Activity	Cost per day	Activity-Days	Total* (As of 1996)	Escalated to Year 2000**
Motorboating***	\$ 20	169,000	\$ 3,400,000	\$ 3,830,000
Personal watercraft (Jet skiing)	\$ 35	44,100	\$ 1,500,000	\$ 1,690,000
Canoeing, Kayaking or Wind-Surfing	\$35	8,800	\$ 308,000	\$ 350,000
Totals		221,900	\$ 5,208,000	\$ 5,870,000

* See Section 6.4.8

**@ 3% per year for 4 years (rounded to nearest 10,000)

*** Including inboard and outboard boats, jet boats, pontoon boats, sailboats, etc.

The conservative, third method, value of \$5.87 million was used for this study for boat-related recreation on the Coastal Bays. The first method value of \$12.6 million based on motorboat ownership in Maryland over-emphasizes the costs of ownership rather than the costs of boat-related recreation. The trailered boats may be used anywhere, not just on the Coastal Bays, and since the boats are already owned the “opportunity” cost of each additional trip should not necessarily be attributed to the Bays. The second method based on boat trip expenditures in Maryland (\$ 2.6 million) totally ignores the per-trip-related costs of ownership. The third method is based on recent actual rental (market) costs for boat-related uses of the Bays and is considered to reflect market costs (spending in Worcester County) more accurately.

**TABLE 10
TOTAL DIRECT EXPENDITURES FOR RECREATIONAL
PARTICIPATION (2000) – ALL ACTIVITIES**

Activity	Activity-Days	Total Expenditures (As of 1996)	Escalated to Year 2000*
Exclusive of Boating	7,054,300	\$40,793,000	\$45,910,000
Boating	293,900	\$5,208,000	\$ 5,870,000
Totals	7,348,200	\$46,001,000	\$ 51,780,000

*@ 3% per year for 4 years (rounded to nearest 10,000)

6.4.9 Allocation of Food, Lodging and Transportation Expenditures

Visitors spend several hundred million dollars each year on food and lodging in Worcester County. These expenditures are part of a consumer's direct expenditures for various types of activity. It is therefore appropriate to allocate a portion of these expenditures in Worcester County to the enjoyment of Bay-related recreation. In order to simplify the analysis, food and lodging expenditures associated with tourists' visitation of the Coastal Bays are not included in the activity-day expenditures values associated with bay-related activities. This was done because of the difficulty in allocating expenditures to any particular activity.

In 1998 approximately \$200 million was spent by visitors to Worcester County on all lodging rentals, including hotels, motels, and condominium rentals.¹³ Additionally, approximately \$160 million was spent by visitors at restaurants within Ocean City, accounting for most but not all of the restaurant revenue in the County.¹⁴

Since this study has estimated that 24 percent of visitors participate in Bay-related activity, it is appropriate to allocate 24 percent of Worcester County food and lodging expenditures to the Coastal Bays. This results in the conclusion that \$50 million in lodging expenditures and \$40 million in restaurant expenditures are generated by the Coastal Bays. This works out to roughly \$9 in lodging and \$20 in food per day for every visitor to the Coastal Bays, based on the calculated visitor population using the Bays for recreation of about 2 million, and with an average stay of 3.1 days, for a total of 6,324,000

¹³ Determined from Worcester County 3% room tax collections. Verified by Upman Frizzell & Mitchell, LLC, Lodging Industry Report, Ocean City Revisited, 2000, and telephone interview with James Waggoner, Long & Foster Realtors.

¹⁴ This value imputed from Worcester County 1% food and beverage tax collection from Ocean City includes both residential and visitor expenditures. It is assumed that the exclusion of food and beverage revenue outside Ocean City (not taxed by County) to yield the net expenditures by Worcester County visitors.

person days per year. Lodging was adjusted for the 16 percent who have no overnight stay, 12.6 percent who visit private homes, and 0.5 percent who are camping (1997), according to TravelScope data.

Transportation for the typical wildlife-watching enthusiast in Maryland, as estimated in the 1996 National Survey of Wildlife-Associated Recreation, to cost \$39 for 12 days of participation. Increasing this value to \$50 to account for out-of-state visitors and dividing by 4 for an average 3-day visit to the Coastal Bays, the total expenditure on transportation (primarily gasoline but also parking and buses [in Ocean City] in Worcester County is \$12 per visit or \$24 million in all) .

The overall total of direct expenditures in Worcester County for Recreation on or near the Coastal Bays is thus as follows:

TABLE 11 FOOD, LODGING AND TRANSPORTATION DIRECT EXPENDITURES FOR RECREATIONAL PARTICIPATION IN WORCESTER COUNTY (2000)			
Food	Lodging	Transportation	Overall Total
\$ 40 million	\$ 50 million	\$ 24 million	\$ 114 million

7.0 COMMERCIAL VALUES OF COASTAL BAY EXPENDITURES

7.1 Commercial Rentals and other Recreational Activities

Motorboats: As noted above, there are four commercial outlets in Ocean City renting motorboats by the hour or day. The types of boats include regular outboards, jet-powered boats, pontoon boats, and jet skis. Each outlet rents on the average five boats of each type, a total of about 20 boats of each type using the Bays each day. The rental costs for boats vary from \$64 per hour for a six-passenger pontoon boat to \$244 per hour for twin engine jet boats holding up to six people, an average of about \$20 per person per hour. If the 20 boats are rented to an average group of five persons for an average of eight hours per day for a 90-day season (a total of 72,000 activity days at an average rental of \$20 per person per hour), the total direct commercial income for motorboat rentals is \$ 1.4 million ($20 \times 5 \times 8 \times 90 \times \$20 = \$ 1,440,000$ rounded to \$ 1.4 million).

Parasailing: There are three parasailing boats in operation on the Coastal Bays. Each boat holds six customers at a time, with each customer enjoying a ten-minute ride. The entire trip lasts one hour. It is estimated that each boat takes a full load of customers an average of eight times each day during the high season, which lasts approximately 90 days. Multiplying these figures together yields an estimate of 12,960 person-trips ($3 \times 6 \times 8 \times 90 = 12,960$). The cost of parasailing varies depending on the elevation that is desired, ranging from \$40 for a 400 foot elevation to \$70 for a 1,500 foot elevation. These costs are averaged to obtain a cost of \$55 per person per trip. Multiplying this by the 12,960 estimated seasonal participants produces an annual commercial income of \$ 712,800 ($12,960 \times \$55 = \$ 712,800$).

Sailboats: The costs of sailing may be estimated by the costs of rental of a “Hobey-Cat” - \$70 for one hour. A “Hobey-Cat” is a two-person double-pontoon sailboat for use strictly in the Bays, a rental cost of \$35 per person per hour. Larger sailboats are essentially privately owned. There is only one outlet renting Hobey-Cats and they have an inventory of only six boats. Thus, the commercial income from renting all six boats per hour for an eight-hour day over a 90-day season is about \$ 302,400 ($6 \times 8 \times 90 \times 2 \times \$35 = \$ 302,400$).

Personal Watercraft (Jet skis): The four outlets renting jet skis charge \$50 for ½ hr and \$70 for one hour with no deposit required. The jet skis can carry two or three persons, so the rental cost is about \$35 per person per hour. The total number of jet skis rented is about five per outlet per hour for an eight hour day over a 90-day season, or roughly 28,800. At \$35 per person per hour, the total direct commercial income is about \$ 1.0 million ($4 \times 5 \times 8 \times 90 \times 2 \times \$35 = \$ 1,008,000$ rounded to \$ 1.0 million).

Canoeing, Kayaking and Wind-Surfing: Renting a kayak commercially costs \$20 for half-day and \$35 for a full day. Assuming that this cost represents the cost for all rentals of canoes, kayaks and

wind-surf boards, if the total number of units rented per day is 36 over a 90-day season, the total commercial income for this category is \$ 113,400 ($36 \times 90 \times \$35 = \$ 113,400$).

Eco-Tours: Three boats holding up to 45 passengers at an average fee of \$12 on three tours per day over a 90-day season totals \$ 145,800 ($45 \times 90 \times 3 \times \$12 = \$ 145,800$).

Dolphin Watch: Assuming four single-engine jet boats carrying six people each make three tours per day to watch for dolphins just off the ocean beach during a 90-day season, the income at \$126 per boat trip totals \$ 136,080 ($4 \times 3 \times 90 \times \$126 = \$ 136,080$). Although this activity involves watching dolphins in the ocean, the activity would not exist without the Bays for staging and safe harbor protection (the same is true for speedboat tours, day and evening cruises, and head-boat fishing below).

Speedboat Tours “Sea Rocket” or “OC Rocket” from the Inlet out along the ocean beach: Assuming 65 passengers on each of two boats for six tours per day over a 90-day season at an average cost of \$8, the total commercial income is \$ 561,600 ($65 \times 2 \times 6 \times 90 \times \$8 = \$ 561,600$).

Day and Evening Cruises from the Inlet out along the ocean beach and back: Assuming three cruise boats make six cruises per day and evening each with 85 passengers aboard over a 90-day season at an average cost of \$5, the total commercial income is \$688,500 ($3 \times 6 \times 85 \times 90 \times \$5 = \$ 688,500$).

“Head-Boat” Fishing: There were 332 commercial and “other” boats counted in the survey done in 1991. Assuming that the number is closer to 500, each carrying an average of twelve persons deep sea fishing. If twenty percent of the boats go out each week-day (35 days), and sixty percent of the boats go out each two-day weekend (14 days) for the season at \$20 per person, the commercial income totals roughly \$ 840,000 ($500 \times 12 \times .20 \times 35 \times \20) + \$ 1,008,000 ($500 \times 12 \times .60 \times 14 \times \20) = \$ 1,848,000 from the head boats. The more expensive “sport fishing” might involve 20 boats at a time with six persons each during the seven two-day weekends (say 280 trips) and an additional 20-22 trips weekdays during the season at \$400 per trip (say 440 trips), equaling 720 trips \times \$400 = \$ 288,000. The total commercial value of the fishing head boats is then \$ 1,848,000 + \$ 288,000 = \$ 2,136,000.

Total of Commercial Rentals :

The total commercial value of the above rental activities is given in Table 12:

TABLE 12 TOTAL COMMERCIAL VALUE OF RENTALS (2000)	
Motorboats	\$1,400,000
Parasailing	\$712,800
Sailboats	\$302,400
Personal Watercraft (Jet skis)	\$1,000,000
Canoeing, Kayaking and Wind-Surfing	\$ 113,400
Eco-Tours	\$ 145,800
Dolphin Watch	\$ 136,080
Speedboat Tours	\$ 561,600
Day and Evening Cruises	\$ 688,500
“Head-Boat” Fishing	\$ 2,136,000
TOTAL	\$7,196,580

7.2 Market Value of the Coastal Bay Commercial Fishery

The productivity of the Coastal Bay fishery, especially in the upper Bays, has been threatened in recent years by diminishing water quality. While the numbers of some species are still abundant, the populations of pollution intolerant species, such as flounder, have declined. A once-abundant and valuable oyster population has almost been eliminated over the past decades.

Nevertheless, the Coastal Bay fishery remains viable. The Blue Crab is the staple species with over 150 crabbing operations in place on the Bays during the peak harvest months. In addition, there are over a dozen fish species commercially harvested as well as a limited amount of clams and oysters. The total market value of the Coastal Bay fishery was obtained by combining the data received by Maryland DNR into a single value. The data provided included the landing information in terms of pounds and in terms of the dollar value of the harvest.

The market values for Blue Crab, fish, and shellfish harvest for the three year period for the entire Coastal Bay system is as follows: the fish, crabs, and shellfish caught within the Coastal Bays has an average annual dockside value in excess of \$1,300,000 (\$1.6 million in 1997, \$1.0 million in 1998, and \$1.5 million in 1999). Overall, the Blue Crab (hard and soft shell) is the most valuable species, ranging in value from \$1.4 million in 1997 to \$752,000 in 1999, and averaging more than \$975,000 in revenue over the past three years. The annual market value of fish and shellfish caught within the Bays has averaged \$289,000 and \$158,000, respectively.

7.3 Commercial Value to Worcester County of Ocean Fishing

As noted above, ocean fishing in the Ocean City region is dependent upon the protective nature of the Coastal Bays and the berths and processing facilities on shore there. The value of the catch landed from fishing and trawling in the ocean less than three miles off-shore is given from values obtained by the Maryland DNR as \$2.7 million in 1997, \$1.76 million in 1998, and \$ 2.1 million in 1999, for an annual average of \$2.2 million.

The value of the catch taken from the ocean beyond three miles from shore was provided by the National Oceanic and Atmospheric Administration (NOAA), Fisheries Statistics Office, National Marine fisheries Services (NMFS). The catch, which is landed at Ocean City, MD, consists of approximately 35 species of fish and shellfish. Angler, Dogfish, Sea Bass, Swordfish and Tuna are frequent high value catch, which average \$6.6 million over the last three years (valued at \$7.1 million in 1997, \$6.3 million in 1998, and \$6.2 million in 1999). Since the NMFS reports all ocean landings, including the \$2.2 million catch data obtained from Maryland DNR within the three-mile limit, Table 13, therefore, reports only the difference (\$4.4 million) in the catch beyond the three-mile limit for NMFS data.

7.4 Total Commercial Value of Bay and Ocean Fishing

The total value of fishing and shellfishing in both the Bays and the Atlantic Ocean is as follows:

Location	Value of Catch
Coastal Bays	\$1,300,000
Ocean - Within 3 Miles of Shore	\$ 2,200,000
Ocean – Beyond 3 Miles of Shore	\$ 4,400,000
TOTAL	\$ 7,900,000

8.0 OTHER SELECTED VALUES DERIVED FROM THE COASTAL BAYS

8.1 Effects of Coastal Bays on Waterfront Residential Property Values

The presence of a water body on the value of adjacent land is significant in coastal areas. Residents enjoy the benefits of access and aesthetics result. The closer a land parcel is located to the Bays, the higher the value of that parcel will tend to be. This value is approximated by comparing the values of land close to the bay with the values of similar land further away from the bays. Both market and non-market factors, such as the aesthetic value of a view of a Bay view, may contribute to the additional land value.

Determining appropriate areas for comparing land value is made difficult by several complexities. While a Bay-front property might demand an obvious premium, it is difficult to determine how much value might be added to parcels of land that are further away from the waterfront. Furthermore, it may be difficult to determine how much value is added by the Bays as opposed to another attraction like a golf course or the ocean.

The primary source of data used in this study is a summary of property values collected from the community of Ocean Pines.¹⁵ These data included a list of the sale value and resale value of different homes and lots in the community broken down by the categories of (1) Waterfront, (2) Golf-course, and (3) Other. Waterfront includes all properties directly adjacent to the waterfront, “golf-course” includes all properties adjacent to the golf course, and 'other' includes all properties not directly adjacent to either of these features. Because of the complexities described in the prior paragraph, the method used for determining the capitalized land value of the Coastal Bays is shaped by the data that were used. Since the Ocean Pines data permitted only waterfront land to be distinguished from non-waterfront land, the value effect of location near, as opposed to on, the Bays could not be estimated.

Using the Ocean Pines data, the additional value of a home or lot attributable to a Bayfront location is about an average of \$ 90,000 (see Table 14 below). Multiplying this average additional value by the total number of Bay-front or canal-front homes in all of Ocean Pines, about ¼ of the total as a result of the canals, or about 2,000 homes and lots, yields an aggregate difference in residential land value attributable to the waterfront location of approximately \$180 million. This calculation actually underestimates the actual impact of the Coastal Bays on residential property value because it doesn't take into account any impact on the value of property not adjacent to the Bays or to a canal with access to the Bays. Furthermore, in order to compare the capitalized land values with other annual dollar flows estimated in this study, the land values must be annualized.

TABLE 14 REAL ESTATE VALUES IN OCEAN PINES, AUGUST 2000			
Location	New Homes	Resales	Lots
Waterfront (Bays or Canals)	\$ 222,805	\$ 216,837	\$ 128,363
Non-waterfront	\$ 134,958	\$ 117,228	\$ 51,893
Difference WF vs. NWF	\$ 87,847	\$ 99,609	\$ 76,470

¹⁵ Association of Coastal Bays Realtors Data for Ocean Pines, August 2000.

Data are not available to extend these values to all of the Bayfront property in Worcester County. Bayside property in Ocean City is perhaps even more costly than in Ocean Pines. Lots in the new Lighthouse Sound development on Manklin Creek Road just north of the Isle of Wight are costing from \$200,000 to \$500,000 with spec-built homes costing \$700,000 to \$800,000. These lots and homes are all considered to be waterfront, since they face Assawoman Bay, even though they have no access to the Bay. In other areas of the County the average difference between Bayfront and inland homes and lots is probably considerably less. There are a number of other expensive homes on Isle of Wight and Sinepuxent Bays, but also some trailer parks. Down the shores of Newport and Chincoteague Bays are likewise quite a number of less expensive homes that appear not to reflect a major difference between waterfront and non-waterfront property values. Assuming that the overall average difference is about \$45,000 rather than \$90,000, and that there are a total of about 29,373 persons living in the Coastal Bays watershed. With about 2.5 persons per home in the County, the total number of homes in the watershed in the year 2000 is about 11,750 “associated” with the Coastal Bays, (62% of the population of the County lives in the watershed of the Coastal Bays). Assuming that two-thirds of them are actually on or close to the waterfront, there are roughly 8,000 homes benefiting from their location relative to the Coastal Bays. At an average increase of \$45,000 in value due to the Bays, the total increase in value due to the Bays would be roughly \$360 million.

This estimate of the waterfront property value benefit to the County can be annualized by amortizing it over an assumed period of time and using approximate current interest rates as a discount rate. Assuming a twenty-year period and using an eight percent discount rate, the \$360 million asset is valued at about \$36.6 million per year (using a capital recovery factor of 0.10185). Although this annual estimate is bound-up in the value of the property, and is actually a part of the wealth of the owners, and is not actually spent in the economy annually, it represents a wealth effect that does promote spending.

8.2 Values Associated with Wetlands Supported By the Coastal Bays

8.2.1 Wetlands Ecology

There are over 28,000 acres of wetlands located in Worcester County that are part of the Coastal Bays. These wetlands, and the areas of seagrasses and open water in the Bays themselves, form an essential part of the ecology of the area. The wetlands may be considered to be the hatchery and nursery for the wide variety of fish and shellfish that are of commercial value within the Bays and to a certain extent the ocean itself. The wetlands also form the basis for the area’s waterfowl and shore birds of commercial value to hunters and of recreational value to birdwatchers and other wildlife observers, and to sightseers. The commercial market values to the fishing industry and the recreational value to the hunters have been addressed above. The non-market values of the Bays wetlands and open water ecology will be addressed in Section 9.0.

8.2.2 Water Quality/Pollution Remediation Value

Wetlands provide a natural filtration system. Wetland vegetation absorbs excess nutrients and other contaminants that enter the Coastal Bays, helping to maintain water quality. Cleaner water makes the Coastal Bays more livable for other organisms and makes visiting the Coastal Bays more enjoyable for people. Measuring the actual value of this pollution removal value for an acre of wetland is difficult. One possible way to conceptualize this value in terms the avoided costs associated with sewage treatment and other forms of pollution prevention that would provide an equivalent amount of pollution prevention. Several studies have attempted to estimate the pollution removal value of wetlands. One estimate from the expansion of the Ocean Pines sewage treatment plant was about \$5 million per million gallons of water per day (mgd) capacity for removal of nitrate and phosphate to provide essentially tertiary wastewater treatment. The area of the wetlands is about forty-two (42) percent as large as the area of the Bays themselves. However, the wetlands of the Coastal Bays are not fully effective in this action because they are not involved directly in the treatment process and only about two percent (2 %) of the discharged wastewater goes through wetlands. However, these wetlands do intercept runoff from streets and provide treatment for nonpoint source pollution sources. On this basis, two percent treatment for the removal of the nitrate and phosphate from the 15 million gallons of wastewater treated and discharged to the Bays per day, the value of pollution remediation is \$ 1.5 million.

Using the same discounting method that was used to annualize the waterfront property value (20 years and 8% discount rate or a capital recovery factor of 0.10185), the avoided costs to residents and the avoided pollution to the Bays would have an annual value of about \$150,000 per year. This value would be spent by local residents if the wetlands were not there. This avoided cost is a benefit of the wetlands in the Bays system.

8.2.3 Flood Protection Value

The barrier islands, Coastal Bays and wetlands provide a barrier of protection against the effects of hurricanes and other severe storms. Besides the physical barrier posed by the barrier islands and the capacity of the Bays to absorb storm surge and floods, the aquatic vegetation contained in wetlands is valuable in absorbing the energy of storms and minimizing the effects of floods and storm surges. This storm protection potential is an asset that adds value to the economy by permitting the enjoyment of the coastal resources of Worcester County while at the same time minimizing the risk associated with this enjoyment.

Estimating the value of avoided damages is straightforward if there is significant economic development at the site selected for analysis. With commercial or residential development, the avoided damages to constructed property, businesses, and agriculture can be estimated. However, most wetlands are adjacent to (protect) undeveloped land areas. The value of this protection is limited by the small measure of benefit of limiting erosion or protecting areas that have limited market value. These estimates

are also constrained by the limited information about the habitat or other values in these undeveloped lands.

Several studies have attempted to isolate the flood protection value of wetlands. A typical flood protection analysis would measure avoided storm and flood damages at a site if a project were constructed. Usually, several project designs would be considered to determine the lowest cost project that would provide the intended level of protection. To apply this method to a wetland area, the value of the wetland could be estimated by estimating either the cost to construct a project providing the same level of protection or the present value of the avoided storm and flood damages (over time) provided by the wetlands. An alternative to measuring avoided damages of flood protection is to estimate the cost of building flood protection that would provide the same level of protection. Implicit in this method is the assumption that in the absence of wetlands, a flood protection project would be constructed.

One measure is the value of flood insurance to the inhabitants of the shores of the Bays and to the owners of boats and other recreational and commercial facilities. If the wetlands contribute an additional ten percent to this value, in terms of reducing the probability of flooding shore and Bay property, the potential savings of the cost of flood insurance would be the benefit. If this savings were 90% percent, for example, the Federal flood insurance rate times the value of the property insured would produce a savings attributable to flood protection from wetlands. Assuming that most (90%) of the properties threatened by flooding and/or storm surge have flood insurance, roughly \$500 million in shoreline property, at flood insurance rate of six (6) cents per \$100 of assessed evaluation, the value of the wetlands for flood protection is $.06 \times \$500,000,000/100 \times 90\%$ or \$270,000 per year, or about \$9.60 per acre per year for the 28,000 acres in the Coastal Bays. This estimate is in the range for typical undeveloped lands. Values of wetlands' flood protection can range into the thousands of dollars per acre for more densely developed lands.¹⁶

8.3 Government Bay-Related Services

County, State and Federal government agencies all provide services in relation to the Coastal Bays. The County provides 10 public boat-launching ramps, 7 marinas with 574 boat slips, 3 public parks and associated services including water, wastewater and trash disposal. There are also two health clinics provided by the County. These facilities and services are directly related to the Bays. However, it could be assumed that all the Bay-related facility development and County services that are provided to support the Bay communities would not have developed without the Bays. Section 4.6 indicates that the County's operating budget is \$76.3 million. Based on the estimated 24 percent of the Bays' share of the County (used previously), \$18.3 million per year is spent to support County government services in the Bay area.

¹⁶ Assessment of Selected Delaware Estuary Economic and Natural Resource Values, Delaware Estuary Program, January 1993.

The State of Maryland manages the Bay and mainland sides of Assateague Island State Park. The Bay side of the Park includes the Park headquarters, parking, fishing piers, and a boat-launching ramp. The State also provides environmental and recreational regulations, education and enforcement to ensure that the state laws and implementing regulations are understood and followed. The Maryland Department of Natural Resources (MD DNR) expenditures for monitoring and enforcing these regulations for the Coastal Bays amounts to about \$ 5 million per year, including the Maryland Marine Police.

The Federal Government provides regulations and oversight for the environment and recreation, and directly funds the Assateague Island National Seashore Park. The annual budget of the park is \$ 3.25 million which mainly goes to pay for salaries. Most maintenance and improvements to the park are paid for by entrance and other park fees. The U. S. Coast Guard provides a station at the Ocean City Inlet at the entrance to Sinepuxent Bay. The total annual Federal expenditures amount to about \$10 million.

Thus the total direct annual value of government expenditures and services is about \$ 33,300,000.

8.4 Total “Other” Values

Table 15 provides the total value of waterfront, wetlands values and government services, as well as annualized values.

TABLE 15 TOTAL “OTHER” VALUES		
“Other” Attributes	Market Values	Annualized Values
Waterfront Property	\$ 360,000,000	\$36,600,000
Wetlands – Water Quality	\$ 1,500,000	\$ 150,000*
Wetlands – Flood Protection	\$ 2,700,000	\$ 270,000*
Government Services	\$ 33,300,000	\$33,300,000*
TOTAL	\$ 397,500,000	\$70,320,000

*Direct spending impacts.

9.0 NON-MARKET VALUE OF THE COASTAL BAYS ACTIVITY

9.1 Approach

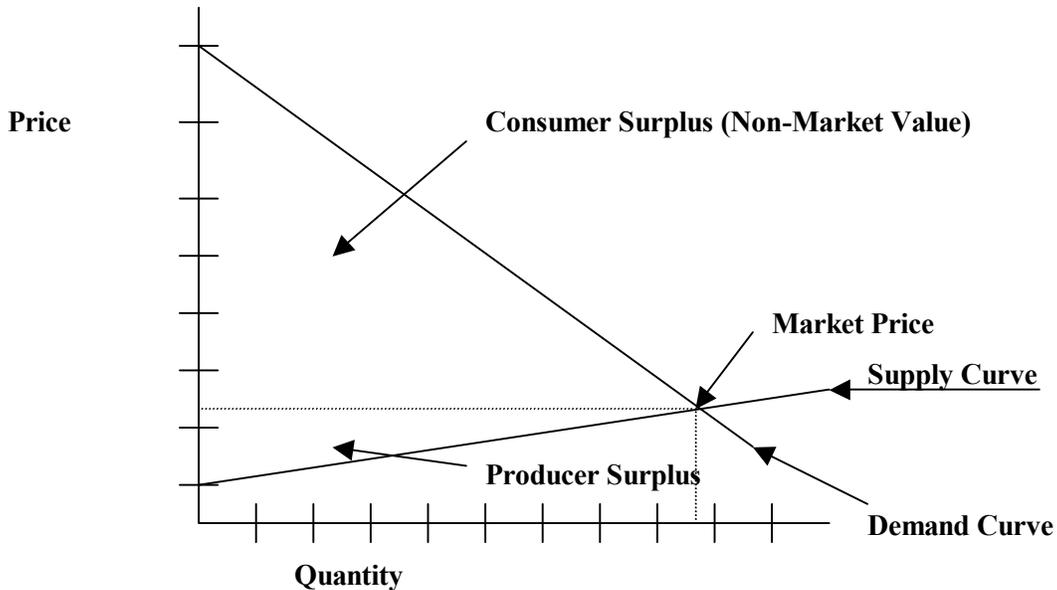
There are a variety of methods for determining non-market values. These include the “Travel Cost Method” (TMC), “Hedonic Pricing” (HP), “Contingent Valuation” (CV), and “Unit Day Value” (UDV). Each is used to estimate values that are not revealed directly in the market place, but are important to understanding the economic values of resources, such as the Bays and Bay-related activities. These methods are described and discussed in Appendix A. Non-market values of activities on the Coastal Bays are estimates of one component of a consumer's “willingness to pay”. Residents and visitors enjoy the activities on the Bays. “Willingness to pay” includes expenditures paid by a person, as

well as the benefit from the experience of each type of activity that he would be willing to pay for, that is the amount over and above the direct expenditure for each activity, as listed in Section 6.0 above. These non-market values depend, of course, on each person's experience and his or her ability to pay.

Economic theory describes how market prices are set by the interaction of market supply and demand curves (Figure 2). The downward sloping demand curve represents a consumer's willingness to purchase more of a good or service, as prices decline, all other things equal. The demand curve is a function of the individual's income, preferences, etc. The upward sloping supply curve indicates a similar logic where producers are willing to produce more, if sales prices are higher: For a market of buyers and sellers, the interaction of these curves determines the equilibrium price that would clear the market. The triangle defined by the market price and the demand curve (which indicates what buyers would have been willing to pay) identifies an area under the demand curve above the market price that is called "consumer surplus." This value is the savings to buyers who would have been willing to make purchases at higher prices, but did not have to because the market price was lower. This consumer surplus, plus the actual expenditure is the measure of consumers' willingness to pay. Previous chapters identified the spending part of this value. This chapter estimates the consumer surplus, which measures the value of the Bay-related activities, which do not show up as expenditures.

A similar benefit accrues to producers who would have been willing to sell the products or services at prices less than the market price. This is the producer surplus (which is not estimated here). In this study, these non-market values are estimated primarily on a unit day value approach, based on literature values of similar circumstances. But estimates are also made using the Travel Cost Method.

FIGURE 2
CONSUMER SURPLUS



This chart illustrates that some of the participants in the market, for example, birdwatchers, would be willing to pay more than the market price (the expenditures) for the experience on the Bays.

The mean non-market value for each activity-day for each type of activity is multiplied by the number of activity days to arrive at the non-market value for the activity. The non-market values for all of the types of activities are added together to obtain the total annual non-market value for all of the uses of the Coastal Bays.

9.2 Literature Sources of Consumer Surplus Values

There is a large literature on the economics of recreation, which includes estimates of non-market value for various activities. The literature includes values for everything from swimming and fishing to bicycling, jogging and big game hunting. The literature also includes estimates using the TCM, CV, and UDV methods.

One source, prepared by Randall Rosenberger, West Virginia University, and John Loomis, Colorado State University, reduces the relevant literature to a list of mean values by activity and region.¹⁷ This source used over 760 journal articles and reports, which described values based on CV and TC methods for 22 recreation activities, and six regions, including Northeast, Southeast, Mountain, Pacific, Alaska, and national (only) regions. The mean values exclude the high and low values (those values

¹⁷ Benefit Transfer of Outdoor Recreation Use Values: A Technical Document Supporting the FY2000 RPA Values, Randall S. Rosenberger and John B. Loomis, for the USDA Forest Service, June 19, 2000.

beyond two standard deviations from the mean). All of the recreational activity areas evaluated in Section 6.0 are included in the values for the northeast. The northeast regional (census region) list is based on 211 sources and is most representative of values for the Coastal Bays.

Table 14 provides the mean recreation values per person/day for the recreation areas of interest.

TABLE 14		
MEAN RECREATIONAL VALUES PER PERSON/DAY		
FOR SELECTED ACTIVITIES (Year 2000 Dollars)		
Recreational Activity	Number of Articles	2000 Value (\$)
Sightseeing*	13	30.32**
Wildlife Observation	56	26.06
Fishing	43	31.16
Swimming	3	16.37
Camping	7	24.34
Waterfowl Hunting	23	32.09
Motorboating	1	66.75

**Escalated (3%/yr.) value from draft report 1996 value.

*Mean recreation values per person/day for different activities by census region, from raw data, Loomis, McNair, Walsh Review 1986-1998, 9/21/98.

The easiest way to think about these values is that they represent the additional costs that people would be willing to pay to enjoy the recreational experience for fishing, boating, etc. If the Bays changed and people could no longer go to the Bays, how much more would they spend over what they now spend to find the same experience elsewhere?

9.3 Estimates of Non-Market Values for Recreational Activities on the Coastal Bays

9.3.1 Sightseeing

This study used the value \$5.44 per activity day for the direct expenditure (market value) of sightseeing on and around the Coastal Bays. Although there are many opportunities to go elsewhere for sightseeing, many of them would require driving additional distances, more fuel and food and even overnight lodging. The 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation indicated that Maryland residents who watched wildlife away from home but in Maryland spent an average of \$136 in food, lodging, transportation, fees and other costs. Those who traveled to other parts of the U. S. spent an average of \$749, about five and one-half times as much as those who watched wildlife only in Maryland. On the other hand, if the Coastal Bays were not there, Worcester County residents and visitors to the County would have to travel to a comparable location, perhaps as far as New

Jersey, for a mix of bays and oceanfront that the Coastal Bays represent. The 1996 literature value for sightseeing was \$26.94. It was very similar to the southeast (\$27.36) and mountain (\$24.60) values. The Pacific value was much higher (\$39.56). (The June 2000 report provides a higher number of \$101.19/person/day, which was judged to be too high and was not used.) An escalated 1996 value of \$30.32 per person per day was used for this study. Applying the \$30.32 activity day value from Table 14 to the number of activity days for sightseeing, 3,478,200, yields a non-market value of about \$ 105 million.

9.3.2 Wildlife Observation

Since wildlife observation is a major activity in the Worcester County area, this study used two classifications of observers: "Serious" (14.2%) and "Casual" (85.8%). The difference is in the intensity of the involvement and the spending and equipment that serious observers utilize. The Table 14 literature value for wildlife observation is \$26.06/person per day. This compares to similar values for the southeast (\$29.13), Mountain (\$36.10) and Pacific (\$29.74). The "serious" observers of wildlife would be expected to pay much more for their experience. One estimate, based on bird watchers' willingness to pay to view the horseshoe crab/shorebird event in New Jersey over expenditures, is \$65.00 per day, may be at the high end of the various estimates. Using the \$26.06 value from Table 15, and 14.2 % of all wildlife observers who are "serious" ($\$26.06 \times 14.2\% \times 3,035,500$) the non-market value is \$11.2 million.

The unit day value which would be lower for the casual 85.8% of the observers (assumed to be half, or \$13.03/person per day) would be valued at \$33.9 million. The combined values yield a non-market value of \$45.1 million.

9.3.3 Fishing and Shellfishing (shore and dock)

Non-market values of fishing, crabbing and clamming may likewise be separated into "serious" and "casual" participants. If the Bays were totally closed to fishing, crabbing and clamming, serious and casual fishermen and women would go elsewhere.

The literature value for fishing is \$31.16/person per day for the Northeast (Table 14). Values for other regions vary: Southeast \$27.74, Mountain \$40.82, and Pacific \$36.97. The value for the Northeast is assumed to represent the non-market value for the "serious" 14.2 percent of 189,700 activity days or \$839,000 per year. The "casual" fishing (85.8%) was valued at half the \$31.16/person per day mean value, or \$15.58. The non-market value of casual interest fishing activity is \$2.5 million. The total non-market value for these activities is then \$ 3.3 million.

9.3.4 Swimming

If the Bays were closed to swimming, the participants would have to travel to a suitable alternative location or use either a private pool, a motel pool or a club pool. The daily cost to maintain a private pool is about \$ 50 for water, chemicals, fuel (if heated), maintenance, insurance and amortization. Swimming in a pool in Ocean Pines costs \$6 (child) to \$7 (adult) per day for visitors plus the annual cost

of membership for the family being visited (\$155 to \$250 for the season, or about \$3.00 per day). A motel during the summer on the Bayside of Ocean City costs about \$100 for a single or double room. A portion of these costs might be assigned to the availability of the pool at a motel. Assuming that the average participant would not have either a private or club pool available, a family visiting the Ocean City Bayside area would probably have to travel to a comparable setting. The Northeast literature value for swimming is \$16.37/per person per day, lower than the others, Southeast (\$22.87), Mountain (\$24.62), and Pacific values (\$22.74). The year 2000 Northeast non-market mean value of \$16.37 (Table 14) is multiplied by the number of activity days of swimming, 316,200, to yield a non-market economic value of about \$5.1 million.

9.3.5 Camping

If camping in the area of the Coastal Bays were unavailable or restricted, most serious and even casual campers would simply go elsewhere. As noted above for sight-seeing, Maryland residents who watched wildlife away from home but in Maryland spent an average of \$136 in food, lodging, transportation, fees and other costs. Those who traveled to other parts of the U. S. spent an average of \$749, about five and one-half times as much as those who watched wildlife only in Maryland. The purchase of camping equipment also presumes an interest and ability to pay the costs of traveling to camping sites with as much aesthetic value and things to do and see as the Coastal Bays. The National Survey of 1996 indicated that persons participating in wildlife watching spent an average of \$124 for camping equipment.

The literature value for camping is \$24.34/person per day. This value is higher than the value for the Southeast \$21.90, but lower than the Mountain (\$25.87) and the \$86.96 value in the Pacific. The year 2000 Northeast mean value is \$24.34 (Table 14). Multiplying by the number of activity days spent camping, 31,600, the non-market value is about \$ 770,000.

9.3.6 Hunting

Hunters similarly will go where the game is and where they are allowed to hunt. If the Coastal Bays were not available, they would have to travel elsewhere. Since waterfowl is the primary Bay-related hunting that benefits from the Bays, waterfowl values, rather than higher valued small game non-market value estimates, were selected from the activity day mean values. The mean non-market value for waterfowl hunters is \$32.09 for the Northeast. This value is higher than the value for Southeast, but lower than the Mountain and Pacific regions. The Table 14 mean value for waterfowl hunting is \$32.09/ person per day. Multiplying this number by the number of hunting days for the Coastal Bays, 9,000, results in a calculated non-market value of about \$289,000.

9.3.7 Boating

Boating on the Bays is quite different from the other activities since boating on other bays of a similar protected nature would require trailering one's boat a considerable distance, finding a public (or friendly private) marina or boat ramp, and making the investment in time and money to enjoy a day or more on the water. The 1993 Maryland Study of Recreational Boating listed the typical annual trip-related expenditures for boats and the annual costs of owning a boat as follows:

Expenditures	Trailered Powerboats	In-Water Powerboats	Sailboats
Annual Trip-Related	\$ 1,283	\$ 1,192	\$ 554
Annual Costs	\$ 1,196	\$ 2,849	\$ 4,454
Total	\$ 2,479	\$ 4,041	\$ 5,008
Number of Trips/Boater	27	22	24
Average Activity Day Cost	\$ 91.81	\$ 183.68	\$ 208.67

The average activity day cost (weighted by the relative number of boats) is \$168.63. The literature values indicate that the mean non-market value (over expenditures) is \$66.75/person per day for the Northeast. This mean value (Table 14) is multiplied by the number of recreational boating activity days, 293,900. The non-market value of boating is about \$19.6 million.

9.3.8 Total Non-Market Value of Recreation on the Coastal Bays

Table 16 summarizes the total \$179,159,000 non-market value of recreational activity on the Coastal Bays:

**TABLE 16
NON-MARKET VALUE OF RECREATION
(2000)**

Type of Activity	Non-Market Value
Sightseeing	\$ 105,000,000
Wildlife Observation	\$ 45,100,000
Fishing/Shellfishing	\$ 3,300,000
Swimming	\$ 5,100,000
Camping	\$ 770,000
Hunting	\$ 289,000
Subtotal	\$159,559,000
Boating	\$ 19,600,000
TOTAL	\$179,159,000

9.4 Non-Market Values for Other Activities and Attributes of the Coastal Bays

Other activities, such as commercial rentals also have non-market values. Many people who rent sailboats and jet skis, for example, would be willing to pay more. However, these numbers of participants are generally small and were not estimated. Table 16 summarizes the major non-market values in the Coast Bays area.

9.4.1 Waterfront Property

Waterfront property, as shown above, has a large market value. If the Coastal Bays were not available for residential housing, the home owners and renters would have to go elsewhere. Waterfront property in nearby communities is generally more expensive than in Worcester County. Along the shore around Chesapeake Bay, north in Delaware at Bethany, Dewey, Rehoboth Beaches and around the Inland Bays, equivalent property values are about 10 to 25% greater, probably reflecting the shorter travel time from the metropolitan areas to the shore. Further north in New Jersey property values are as much as 50 to 100% greater. Similarly to the south in Virginia Beach, the Outer Banks or Pamlico Sound in North Carolina, Myrtle Beach and Hilton head in South Carolina, and on to Amelia Island and further on in Florida, the homeowner or renter looking for waterfront property would pay a premium. Based on these price differences, it can be assumed that waterfront property owners would be willing to pay a premium above the cost to own waterfront property around the Coastal Bays, but no value was estimated for this study.

9.4.2 Wetlands

There have been a number of efforts to augment or create wetlands. One of these is underway in Ocean Pines where the U. S. Army Corps of Engineers is planning to create 6.3 acres of wetlands in an area that had been disturbed during the construction of Ocean Pines and had reverted to the undesirable invasive species *phragmites*. The project will cost an estimated \$850,000 of which Worcester County will pay \$300,000 and the Federal government the balance. This is about \$ 6.33 per resident for the Worcester County share. The cost of this project is about \$135,000 per acre. Extrapolating that to all 28,000 acres of wetlands in the Coastal Bays results in a non-market “replacement” value of \$3.78 billion. Obviously this is far greater than anyone would reasonably pay for restoring a large area of wetlands.

Other projects have cost less per acre. The Federal Department of Transportation is required to replace or otherwise mitigate the impacts of federal highway construction on wetlands. A project in Delaware constructing State Route 1 with partial Federal funds resulted in the replacement of a wetlands at a cost of about \$5,500 per acre. It was estimated that extending the technique used to a large area, such as the 28,000 acres in the Coastal Bays, could be achieved at about one-tenth that amount, assuming little or no land acquisition, earth moving, or other construction would be required. The total cost to replace the wetlands of the Coastal Bays would then be about \$15 million.

Another approach to determining the non-market value of wetlands was the “contingent value method” (CVM) using a survey questionnaire of the residents of Indian River Lagoon in Florida.¹⁸ The questions involved the estimated willingness to pay for various action plans to protect the environment of the Lagoon and improve stormwater management. The average amount that the respondents to the survey were willing to pay was \$24.67 for protection of the wetlands. This would be a total of about \$1.17 million for the 47,375 residents of Worcester County. The survey also asked the residents for their willingness to pay for stormwater management and protection. This amount was an average of \$58.01, or a total of \$2.75 million for all of the Worcester County residents. The total willingness to pay as the non-market value of the wetlands of Worcester County would then be \$3.92 million.

This CVM-based, non-market value of the Coastal Bays' wetlands was used.

9.4.3 Summary of Non-Market Values for Other Activities and Attributes of the Coastal Bays

Table 17 shows the Non-Market Values for Other Activities and Attributes of the Coastal Bays:

¹⁸ *Economic Assessment and Analysis of the Indian River Lagoon*, by Apogee Research, Inc., Bethesda, MD in association with Resource Economics Consultants, Inc., Gainesville, FL, January 1998, page 3-19.

**TABLE 17
NON-MARKET VALUES FOR OTHER ACTIVITIES
AND ATTRIBUTES OF THE COASTAL BAYS**

Assets	Non-Market Value
Waterfront Property	N/A
Wetlands	\$ 3,920,000
TOTALS	\$ 3,920,000

The overall value of the Coastal Bays is summarized in Table 18 below:

**TABLE 18
ANNUAL ECONOMIC VALUE SUMMARY
(2000)**

Type of Activity	Market Value	Non-Market Value	Total Value
Recreation	\$ 46,110,000	\$ 159,559,000	\$ 205,669,000
Boating	\$ 5,870,000	\$ 19,600,000	\$ 25,470,000
Food, Lodging and Transportation	\$114,000,000	\$ 0 *	\$114,000,000
Commercial Rentals	\$ 7,196,000	\$ 0 *	\$ 7,196,000
Commercial Fishing	\$ 7,900,000	\$ 0 *	\$ 7,900,000
Government Services	\$ 33,300,000	\$ 0 *	\$ 33,300,000
Property	\$360,000,000**	N/A	\$36,600,000**
Wetlands	\$ 420,000	\$ 3,920,000	\$ 4,340,000
TOTALS	\$574,796,000	\$183,079,000	\$434,475,000

*Producer surplus (not estimated).

**Not used in IMPLAN.

10.0 IMPLAN AND THE TOTAL ECONOMIC IMPACT OF THE COASTAL BAYS

10.1 Economic Impact Analysis using IMPLAN

Economic impact analysis is used to estimate the economic activity within a region, such as a county or state, that is triggered by an initial round of spending. This direct spending, for example, by visitors to the Coastal Bays, produces a direct economic impact, such as output, earnings, and jobs as goods and services are purchased. In turn, these directly-impacted businesses rely on other businesses for supplies and services. These indirect impacts also stimulate the economy and produce additional

economic impacts. Finally, the employees of these businesses spend their wages for mortgages, food, clothing, etc., and these induced impacts produce additional economic activity, including more output, earnings, and jobs. This spending and re-spending affects the immediate economy, such as the county, based on the components or sectors of the economy that exist there. When these sectors do not exist, the spending impacts shift out of the county (leakage), and sectors elsewhere serve the needs. By tracking these economic impacts, it is possible to estimate the total effect of spending at the local level, as well as the State level. The impact of the direct, indirect and induced spending is the multiplier effect at the county and State levels.

To determine the relationship between expenditures and their overall economic impact, this study uses the Impact Analysis for Planning (IMPLAN) model. This is a standard model that has been used in many studies to estimate the impact that expenditures from construction of a project or routine spending on activities have on different sectors of the economy. It is a commercially available software package and database that is the outgrowth of work done at the University of Minnesota, with the U.S. Forest Service's Land Management Planning unit. IMPLAN analyzes the relationship between the producing sectors of the economy (inputs) and the consuming sector (outputs). The model divides the total national economy into 528 sectors related to manufacturing, transportation, trade, agriculture, extraction and government. IMPLAN uses BEA I-O benchmark tables produced by the U.S. Department of Commerce, Bureau of Economic Analysis, which are "conventions" of Input-Output studies. The model provides regional multipliers for output, income, other value added, and employment. Because data on these 528 sectors are based on national averages of industry spending behavior, it is assumed that industry behavior in Worcester County is similar to that of the rest of the United States. (IMPLAN can be modified to create a more locally specific model of a region.)

Once the activities of interest are identified and the spending in these areas is estimated, IMPLAN can be used to estimate the effects on the State and local (County) economies. This is the method that was used to value the activity within the economy of Worcester County that is generated by the Coastal Bays. It takes the snapshot of the direct effect of the Bays on the economy in terms of Bay-related direct expenditures and applies this information to the intricacies of the macro-economy to estimate the Coastal Bays' broader impacts. The monetary value of Bay-related initial expenditures that occur within Worcester County is referred to as the *direct economic impact* associated with the Coastal Bays on the economies of Maryland and Worcester County. The total economic impact extends well beyond this direct measurement. Each initial expenditure related to the Coastal Bays generates additional rounds of spending that, if transacted locally, continue to have an impact on the Worcester County economy. Thus, the "multiplier effect" estimates the impact of spending by the businesses and individuals that benefit from the initial Bay-related expenditures.

Indirect economic impact results from the additional rounds of spending by businesses on goods and services in Worcester County. The sectors of the economy where initial Bay-related spending takes place are supported by other sectors of the economy. For instance, a boat rental business buys equipment, supplies and services from many other businesses. Indirect activity measures the effects of spending by the direct sectors on the supporting industries that are located in Worcester County.

Induced economic impact results when earnings created by direct and indirect economic activity are returned to the Worcester economy through additional purchases. When Bay-related spending occurs in the direct and indirect sectors of the economy, it creates income and profits for employees and proprietors. This money may then be spent on a goods and services within Worcester County

10.2 Analysis Using IMPLAN

To use IMPLAN, each category of Bay-related expenditure that occurs in Worcester County must be matched to one or more of the IMPLAN sectors. In some cases, it is obvious what sector an expenditure category falls under. In many cases, the matching of expenditures for IMPLAN sectors can be difficult, and it is necessary to make assumptions and generalizations when assigning expenditures to a particular sector. Occasionally expenditures are unrelated to any IMPLAN sectors. In these situations it might be necessary to create a custom sector for IMPLAN using available data from external sources about that sector. Because the economy of Worcester County is fairly simple, simplifying assumptions were used in defining sector categories, such as food and lodging, general merchandise, food processing, etc. These assumptions can be refined, if the DNR wishes to develop a County-level model of the Bay region, which was not a part of the present scope of work.

Much of the data used in the IMPLAN model for this study was specific to Worcester County. This included detailed information about the types of industry in Worcester County, as well as a socioeconomic profile of County residents. The IMPLAN software used this information to calculate multipliers specific to Worcester County.

10.2.1 Multipliers

IMPLAN contains several types of multipliers that can be used for different types of impact analysis. This study uses Type II multipliers which yield estimates of the indirect and induced economic impacts from a change in direct expenditure. A Type II County-level output multiplier of 1.35 for a particular industry means that for every dollar expenditure made on that industry, \$1.35 of impact is generated within Worcester County. These multipliers can also be used to estimate the impact that an expenditure has on various other items, such as employment and taxes. The multipliers are broken down by industry, so in order to use a proper multiplier, it is necessary to determine which sectors of the economy benefit from the Coastal Bays and determine the amount of Bay-related expenditures that are spent in each of these sectors.

Much of the money spent in Worcester County trickles down to provide an indirect benefit to other Worcester County businesses and industries. Much of the direct spending in Worcester County is re-spent on goods and services outside of Worcester County. Although this *leakage* benefits other locations, it reduces the multiplier effect for both the indirect and induced economic activity within Worcester County. The IMPLAN data for Worcester County includes regional purchase coefficients (RPCs) for each sector that indicate the extent to which expenditures made on various sectors of the Worcester County economy stay within the County. After expenditures are separated into IMPLAN sectors, they are then multiplied by the individual RPCs before economic activity multipliers are applied.

10.2.2 Data Inputs For The Coastal Bays of Maryland

IMPLAN Professional Model 2.0 provides a convenient way to carry out the analysis of the economic impacts of various activities related to the Coastal Bays on Worcester County. The Maryland DNR has prepared a model of Worcester county for IMPLAN by inputting all of the data needed for the 528 sectors incorporated into version 2.0 of the Model. This “Recent Model” is labeled “IMPLANWORC1.iap”. Using this model as the basis, IMPLAN allows the user to input various “events” in the form of: (1) a name for the event activity; (2) its sector (one of the 528); (3) its reported or estimated dollar value; (4) the associated employment (the value and employment are linked for each sector so that specifying one will automatically input the other); (5) whether it is an industry or commodity; (6) the basis year (of the dollar value), (7) the “deflator” (to deflate or inflate the dollar value to a previous or future year); the “margin” (e.g., a household, industry, for investment, the Federal Government, or a State or Local Government); and (8) the percent local share (in the value added, output and employment associated with the event). Several “events” may be assembled into a “group”, and several groups may be combined into a “Project.”

For this use of the IMPLAN Model Version 2.0, the various activities described above (for which market values were estimated), were listed as separate groups and combined into various “projects.” Each of these “projects” was analyzed by running the IMPLAN Model. The “projects” are as follows:

Project #1: Recreation on the Coastal Bays – Market Value

Including: Sightseeing
 Wildlife Watching
 Swimming
 Fishing
 Camping
 Hunting
 Boating (all forms)
 Food
 Lodging
 Transportation

Project #2: Commercial Activities – Market Value

Including: Rentals
 Fishing

Project #3: Other Values – Market Value

Including: Wetlands – Water Quality
 Wetlands – Flood Protection
 Government Services

Project #4: Total Market Values – Including all of the above

10.3 Analysis and Output of the IMPLAN Calculations for each “Project”

The analysis conducted by the IMPLAN Model 2.0 consists of calculating the “Direct”, Indirect” and “Induced” values of each of the 528 sectors resulting from the expenditures for each of the events in the “Project.” The Model calculates these values separately for “Value Added”, “Output” and “Employment.” The Model conveniently suppresses all of the sectors for which zero values were calculated, and provides a total sum of the values for all of the remaining sectors.

The primary output of the IMPLAN Model list consists of three tables: the “Value Added”, the “Output” and the “Employment” for each “Project.” Listed in each table are the “Direct”, the Indirect”, the “Induced”, and the Total values of each of the 528 sectors in the Worcester County economy as a consequence of the expenditures for each of the events in the “Project.”

11.0 IMPACT OF MARYLAND'S COASTAL BAYS

11.1 Regional and State Economy Total Impact of Coastal Bays Activities

Table 19 provides the IMPLAN analysis runs at the level that describes the total impacts. These economic impacts occur at the local County-level and at the larger regional-level, which includes the leakage to the surrounding counties in Maryland and beyond.

Project #1, for example, indicates that recreational activity-related spending, and lodging and food generated by the Bays in Worcester County produces about \$165 million in direct output (sales), which creates \$27 million in indirect sales for other businesses, and an additional \$42 million in induced, employee spending from wages. This initial spending produced a total of \$235 million or 1.42 times the initial spending. The 3,976 full-time job equivalents generated by the direct spending also generated additional jobs by the indirect and induced economic impacts, with a total of 5,114 jobs dependent on the Bays. Value added (wages) are over \$150 million a year and average over \$30,000 per full-time job equivalent.

TABLE 19
SUMMARY OF THE TOTAL VALUE ADDED, OUTPUT, AND EMPLOYMENT IN
TERMS OF THE DIRECT, INDIRECT AND INDUCED VALUES FOR EACH “PROJECT”
RELATED TO THE COASTAL BAYS

Project #1: Recreation on the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 111,435,000	\$ 15,953,000	\$ 26,955,000	\$154,343,0000
Output	\$165,780,000	\$ 27,260,000	\$ 42,658,000	\$235,698,000
Employment	3,976	424	714	5,114

Project #2: Commercial Activities Associated with the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 11,576,000	\$ 1,126,000	\$ 1,747,000	\$14,449,000
Output	\$ 15,097,000	\$ 2,017,000	\$ 2,764,000	\$19,878,000
Employment	440	30	46	516

Project #3: “Other” Values Associated with the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 36,626,000	\$ 67,999	\$ 9,886,000	\$46,579,999
Output	\$ 33,720,000	\$ 98,698	\$ 15,646,000	\$49,464,698
Employment	823	2	262	1,087

The total market values were calculated for the three of the market-related “Projects”. The total market values were summed and are given below:

Project #4: Total Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 159,638,000	\$ 17,147,000	\$ 38,588,000	\$215,373,000
Output	\$ 214,597,000	\$ 29,375,000	\$ 61,067,000	\$305,039,000
Employment	5,239	456	1,022	6,717

The smaller effects of commercial boat rentals and fishing (Project #2) add another \$19.8 million to the economy in sales. This multiplier, when direct output is compared to total, is about 1.3 times the direct, which indicates its smaller impact on indirect and induced economic activity, than the activities in Project #1. Project #3, which includes primarily government spending, relates to the Coastal Bays (about 16 percent of the Bay-related economy) shows the effects on the economy. Because of higher income, a large part of the economic effect is from induced wage spending. As a result of the importance of government jobs, recycling income into an economy is apparent.

Finally, the total market values (Project #4) shows the aggregate economic effect of the Coastal Bays to all economies that are affected. Output \$214.7 million is the spending (Table 18) not including property values of \$360 million that affect the economy. Additional benefit from the waterfront property premium would also impact the region, but was not estimated.

11.2 Worcester County Local Share of Coastal Bays Activities

Table 19 above listed the total value added, output and employment generated by the activities on the Coastal Bays. These total values benefit the overall economy of Maryland and the County (indeed of the world in the case of exports of fish taken in the Bays and ocean). The percent of each event that benefits Worcester County was determined by applying the regional purchase coefficients (RPCs) for each sector that indicate the extent to which expenditures made on various sectors of the Worcester County economy stay within the County. These RPCs (Table 20) were assigned in the IMPLAN Model developed by the MD DNR. The RPCs assigned to each event were as follows:

TABLE 20
REGIONAL PURCHASE COEFFICIENTS (% LOCAL SHARE)

<u>Project</u>	<u>Event</u>	<u>Type of Expenditure</u>	<u>RPC (%)</u>
<u>#1 – Recreation</u>	Sightseeing	Miscellaneous Retail	92.6
	Wildlife Watching	Miscellaneous Retail	92.6
	Swimming	Miscellaneous Retail	92.6
	Fishing	Miscellaneous Retail	92.6
	Camping	Miscellaneous Retail	92.6
	Hunting	Miscellaneous Retail	92.6
	Boating (all forms)	Miscellaneous Retail	92.6
	Food	Food Stores	95.0
	Food	Eating and Drinking	89.9
	Lodging	Hotels and Motels	68.6
	Transportation	Automobile Repair and Service	90.0
<u>#2: Commercial</u>	Rentals	Boats and Equipment	83.3
	Fishing	Bay and Ocean	15.5
<u>#3: Other Values</u>	Wetlands	Water Quality	100.0
	Wetlands	Flood Protection	26.2
	Government Services	Federal/State/Local	91.6

These RPCs indicate that miscellaneous retail for most recreational activities captures a large percent of spending within the County. The table indicates that commercial fish catch (fishing) mostly impacts outside economies, which accounts for the 15.5 percent RPC.

Table 21 gives the resulting Worcester County share of the total Value Added, Output and Employment resulting from activities related to the Coastal Bays, including the Direct, Indirect and Induced amounts.

Table 21 indicates the effects of the Coastal Bays on Worcester County's economy. What part of the economic activity that is generated in the County is captured by the County.

Again, Projects #1 - #4 are used to describe the effects of spending. Direct output (the initial spending) from Table 18 is the same as the estimates in Table 19. But, now the results of the IMPLAN runs for the County indicate what share remains in the County. The results are good with regard to output multiplier effects, where 95 percent of the sales are captured (compare Project #4 total market values in Tables 19 and 21). Jobs and value added are about 85 percent of the totals, which indicates the leakage outside of Worcester County. Again, government services (Project #3) are beneficial, and 91 percent of jobs are in the County. Commercial activities, such as commercial fishing (Project #2) has the most leakage; 265 jobs are in the County and 51 percent are outside. Bay-related recreation and food and lodging captures about 86 percent of the jobs within the County.

The Bays are important to Worcester County and, in particular, the recreational activities (Project #1) which produce almost \$225 million in annual sales and over 4,400 full-time job equivalents. The total effects of the Bays are nearly \$300 million in sales and nearly 6,000 jobs.

It is realized that these totals are rough estimates based on a number of assumptions, not only in the spending and participation rate estimates associated with each activity but also on the characteristics of the IMPLAN Model for Worcester County.

However, in relation to the Worcester County economy as reported by the County for 1997, the total personal income for the population of 42,135 was estimated to be \$1.029 billion. Total employment was given as 30,211. The Bays account for 20 percent of the County's employment.

TABLE 21
SUMMARY OF THE TOTAL VALUE ADDED, OUTPUT, AND EMPLOYMENT FOR
WORCESTER COUNTY IN TERMS OF THE DIRECT, INDIRECT AND INDUCED VALUES
FOR EACH “PROJECT” RELATED TO THE COASTAL BAYS – THE “LOCAL SHARE”

Project #1: Recreation on the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 94,796,000	\$ 13,219,000	\$ 22,840,000	\$130,855,000
Output	\$165,800,000	\$ 22,632,000	\$ 36,147,000	\$224,579,000
Employment	3,470	348	605	4,424

Project #2: Commercial Activities Associated with the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 4,776,000	\$ 787,000	\$ 1,011,000	\$6,574,000
Output	\$ 15,096,000	\$ 1,376,000	\$ 1,600,000	\$18,072,000
Employment	218	20	27	265

Project #3: “Other” Values Associated with the Coastal Bays – Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 33,454,000	\$ 31,670	\$ 9,031,000	\$42,516,670
Output	\$ 33,720,000	\$ 49,086	\$ 14,292,000	\$48,061,086
Employment	753	1	239	993

The total market values were calculated for the three market-related “Projects”. The total market values were summed and are given below:

Project #4: Total Market Values

<u>Type</u>	<u>Direct</u>	<u>Indirect</u>	<u>Induced</u>	<u>Total</u>
Value Added	\$ 133,026,000	\$ 14,038,000	\$ 32,883,000	\$179,947,000
Output	\$214,597,000	\$ 24,056,000	\$ 52,039,000	\$290,692,000
Employment	4,440	369	871	5,680

12.0 CONCLUSIONS

The Coastal Bays in Worcester County are important natural and economic resources. In addition to the natural habitat and living resources the Bays support, the Bays provide a setting for recreational activities and development. Spending by residents and an estimated eight to ten million visitors annually produces output (sales), jobs, and income for the County and surrounding economies.

The Coastal Bays-related economic activity that is represented by actual spending produces in Worcester County:

- \$180 million in value added
- \$290 million in output (sales)
- 5,680 full-time jobs (equivalent)

In addition, because of many other factors, the Bays have a much larger value to the County than that indicated only by annual spending. Visitors' willingness-to-pay indicates that non-market values are more than \$183 million. In addition, waterfront property, with an estimated value of the premium (only) for waterfront location is \$360 million, with an annualized value of \$36.6 million per year. And additional values can be estimated for the avoided costs of benefits provided by wetlands, which absorb pollution and absorb storm energy, as well as government services related to protecting the area.

If all of the values of the Bays are combined, the annual value to Worcester County is over \$0.5 billion per year. The present value of this annual spending streams, beneficial impacts on property values, and avoided costs would be nearly \$5 billion (8 % for 20 years).

The Coastal Bays represent a resource of extremely significant value to the economy of Worcester County. In a sense, the value of the Bays is, in the long run, inestimable since without the Bays the County would be a very different place. It would more likely resemble the many ocean seashore communities along the Atlantic Seacoast that have no protective shelter and few opportunities for safe waterborne and shore recreation. However, placing a dollar value on the impact of the Bays on Worcester County represents one method for placing that impact in perspective.

APPENDIX A

NON-MARKET VALUES OF NATURAL RESOURCES IN MARYLAND'S COASTAL BAYS AND METHODS FOR DETERMINING THEIR VALUES

1.0 INTRODUCTION

Estimating the economic value of Maryland's Coastal Bays is a complex task that requires a valuation of the Bays' resources in various functions. While market transactions provide a reliable base estimate for assessing the economic impact of Coastal Bays, a full account of economic value must extend beyond a simple measurement of the market prices of Bay-related goods and services. In fact, much of the economic value of the Coastal Bay resources is not incorporated into market transactions at all. As a result, alternate methods must be employed in order to provide a more complete measure of the economic value created by the Coastal Bays.

2.0 NON-MARKET VALUATION: ECONOMIC THEORY

Economic value is a measurement of the benefit that people receive from the resources and services they consume. Essentially, it is the dollar amount that a person is willing to pay to use a good rather than lose it. Economic values represent much more than financial measurements, such as cost and profit; economic values are a measure of welfare, the subjective value that a person derives from his activities. Total economic value, therefore, is the combination of values arising from the day-to-day exchange of goods and services (market values), as well as the values people have for the goods they enjoy but for which no market transaction is performed (non-market values).¹

Many uses of natural and environmental resources cannot be valued in the marketplace because of incomplete or non-existent markets. For example, when a recreational angler fishes in the Bay, he/she derives a value from the fishing experience yet does not have to make an explicit payment for the right to fish.² Quantifying the value of non-market activity provides a basis for the development of informed decisions regarding the management of resources within the Coastal Bay watershed. Decision-making

¹ Scodari, 22

² Apogee Research, 2-4

strategies, such as cost/benefit analysis, are much more effective when additional consideration is given to the impact of a policy proposal upon non-market values.

Economic value is typically measured using the concept of willingness to pay (WTP). Using this concept assumes that an individual can translate the value of a good into a dollar amount. In aggregate, WTP for a resource represents the monetary value society places on that resource. A full assessment of WTP and, hence, economic value of a good, includes a measure of both market value and consumer surplus. For example, if a person pays \$10 for a good, we might say that the good is worth \$10. Even in this situation where a market for a good exists, however, market price is just the lower bound for an estimate of economic value. Although a consumer only pays \$10 for a good, he may have been willing to spend \$15; as a result, he enjoys \$5 worth of benefit above the market price of the good. This benefit, known as consumer surplus, is an additional component of willingness to pay. Consumer surplus and WTP can be estimated by constructing demand functions for a good or services.

Non-market value is measured as net willingness to pay (full WTP - market value). Market prices are often used to derive supply and demand curves to estimate net WTP. Demand and supply functions for goods and services revealed through market price cannot be a basis for establishing value, however, if the exchange process is inefficient, as is often the case with natural resources and other public goods. For example, market prices for the physical resources of the Coastal Bays do not reflect the full value of these resources because they fail to quantify benefits such as recreation and aesthetics. When market price cannot be used to construct supply and demand functions, it is necessary to use other methods to determine willingness to pay. Economists develop 'shadow values' to estimate the supply and demand curves that would have been revealed if efficient markets were to exist for these goods.³

Several obstacles make it difficult to quantify the benefits offered by natural resources, such as the Coastal Bays in monetary terms. Many non-market benefits are public goods; in other words, the consumption of the good by one individual does not reduce the amount available to anyone else. Since there is no rivalry among users, beautiful scenery and access to the sand on a public beach are examples

of such goods. Recreation is frequently an example of a public good, however at a certain point, congestion may occur, and each person's enjoyment may be reduced as more people occupy a site. Since non-rivalry characterizes public goods, there is no need to allocate a resource by means of price. As a result, it is necessary to estimate an efficient price at which to value the good.

In some circumstances, economists can impute values of non-rival goods using similar goods for which a market does exist. For example, the value of recreational fishing on public land might be determined by examining the price that individuals pay to fish on similar privately-owned land. Non-excludable goods, such as fresh air, cannot be valued using a simulated market, however, because there is no feasible way to restrict access to that good. With non-excludable goods, there is no incentive for consumers to reveal their demand preferences. A related problem in valuing protected resources is that of 'free riders', who receive the benefit from protected areas without paying any of the costs of protection. Since their ability to enjoy the protected resource is secure, regardless of whether they pay, it is difficult to estimate the value of a resource to a free-rider.⁴

'Use' and 'non-use' are another set of terms frequently discussed with regard to estimating economic benefits. While these concepts are closely related to 'market' and 'non-market' values they should not be used as substitutes. Non-use value typically refers to the intrinsic values associated with a resource rather than any activity associated with the resource. The three main non-use values that are recognized are option value, existence value, and bequest value. Option value refers to the benefit a person enjoys just by knowing that he has the option to visit a resource in the future. Existence value indicates the amount of satisfaction that a person receives by virtue of the fact that a resource exists in a particular physical state. Bequest value refers to the satisfaction of knowing that a resource will be passed to future generations in a given condition.⁵ While it is generally agreed that these values exist and can account for a significant portion of the value of a natural resource, few studies have been attempted to actually estimate non-use

³ Batie and Shabman, 6

⁴ Dixon and Sherman, 25

⁵ Prato, 311

values. Because the theory behind these values remains undeveloped, these values will not be considered for the purpose of this study.

Use value refers to any activity involving the Bay resources, regardless of whether that activity is consumptive (fishing, hunting) or non-consumptive (wildlife viewing, scenic enjoyment). Non-market value can be derived from both use and non-use values. The focus of the remainder of this discussion is on the methods available to measure non-market economic values.

3.0 METHODS OF ESTIMATING VALUE

There are two (2) general approaches for estimating the total social benefit of natural resources: indirect market methods and direct questioning methods. Indirect market methods assign values to resources based on the market value of related resources. For example, the recreational value of fishing in an area of particular water quality can be estimated by comparing the differences in recreational demand for fishing in water of different water quality. Widely recognized indirect market methods include the Travel Cost Method, Hedonic Pricing, and Valuation Transfers. Direct questioning methods use questionnaires and surveys in order to determine an individual's willingness to pay. The Contingent Valuation Method is the primary direct questioning method.

While all of these methods can be useful, depending on the type of study being performed, none gives a complete account of non-market value. That is because these methods only recognize non-market value that is observable to site users. These methods are appropriate for tasks, such as estimating the non-market benefit of recreational activities, however, they fail to account for other non-market values that natural resources provide, including services, such as flood control and pollution mitigation. These less observable benefits must be studied in a more intensive manner, and values for these benefits must be obtained separately.

The U.S. Army Corps of Engineers, which conducts many economic studies involving changes in recreational activity, officially recognizes three (3) methods for the valuation of non-market goods:⁶

⁶ Vincent et al, 9

- Travel Cost Method
- Contingent Valuation Method
- Unit Day Value Method

Choosing an appropriate method depends on the needs of a study, including available data and budget. Although not officially endorsed by the Army Corps of Engineers, the Hedonic method is also used to estimate certain economic values.

3.1 Travel Cost Method

The Travel Cost (TCM) Method is an indirect valuation technique that was first used in a study to determine recreational demand for several U.S. National Parks. This method uses the variations in unit costs of travel to a site and the value of time as proxies for price in estimating a demand curve. It assumes that per capita recreation use at a site will decrease as out-of-pocket and time costs of travel to the site increases, all else remaining the same.

A simple TCM study involves dividing the area surrounding the study site into concentric zones and computing the travel costs for each zone. Site visitors are then surveyed to determine visitation rates. This combined information can be used to construct a demand curve for the recreational activity at the site that can be used to derive net WTP.

In general, the TCM is an appropriate valuation technique when (1) there is sufficient variation in travel costs among users to allow estimation of demand, and (2) the travel expenses have been made mainly for the purpose at the site. TCM has certain limitations and ambiguities. Because travel costs are often associated with trips encompassing more than one site, it is often difficult to apportion travel costs to a specific site. Also, distances traveled must vary enough to significantly affect travel costs or the number of trips made. Several refinements have been made to the basic travel cost method to improve accuracy of consumer surplus estimates. These include adding income and other socioeconomic factors to the demand equation, accounting for the quality of the site, and accounting for substitute sites.⁷

⁷ Prato, 318

3.2 Hedonic Pricing

Hedonic pricing is based on the idea that the observed market price of a good is a function of the prices of the numerous attributes of that good. Since consumers ultimately derive satisfaction from the bundled attributes that define that good, the Hedonic theory holds that the price paid for a particular good is directly related to all of its attributes. This analysis method attempts to separate out the specific attribute of interest. A house, for example, may be located on the Coastal Bays. Hedonic analysis could be conducted to determine what part of the value of a house could be attributed to the scenic view.

By comparing the market value of two (2) goods or resources that differ only with respect to a single attribute (the houses are identical, but one is located on the Bay), the value or the implicit price of that amenity can be determined. The most common Hedonic technique relies on variations in property value to reveal implicit prices for environmental amenities. Once the value of a particular attribute is determined by comparing goods with market-determined property values, the value of that particular amenity can be taken and applied to a non-market good possessing that attribute.

The Hedonic Pricing Method has several drawbacks. Data for estimating the Hedonic price function are difficult to acquire, especially for a good that is not traded or for goods with a low turnover rate. Additionally, Hedonic models will tend to understate the values of natural resources because they do not measure intrinsic value or any other characteristics that are not of observable benefit to those who utilize a site. In other words, the Hedonic Pricing approach is applicable only to those natural resources whose value would be captured by land values in a market.⁸

3.3 Contingent Valuation Method

The Contingent Valuation Method (CVM), rather than being based on actual demonstrated behavior of users, is based upon their contingent behavior. CVM uses a survey scenario and questionnaires to simulate a market situation and assess respondents' willingness to pay for changes in

⁸ Scodari, 36

recreation opportunities. It is most appropriate for valuing goods or activities that are easily understood by users.

CVM is predicated on the assumptions that consumers can assign an accurate value to outdoor experiences. Unlike the indirect valuation methods, it is not dependent on market data to provide an estimate of economic value. Another important advantage of the CVM method is that it obtains an estimate of economic value that includes consumer surplus.

Successful application of the CVM method requires skill and precision in the development of surveys that yield unbiased and statistically significant results. CVM surveys have been criticized as being inherently biased, and even nonbiased answers may not indicate a consumers true behavior. WTP values obtained by CVM are often unreliable because the surveys ask hypothetical questions, and respondents who are inexperienced with the good or misunderstand the information being requested cannot be expected to provide accurate WTP values.⁹ Another drawback of the method is that CVM surveys are also expensive to design and conduct.¹⁰

The CVM method has been used to estimate the value of improving water quality, increasing visibility by reducing air pollution, protecting groundwater, reducing congestion, and enhancing fish, wildlife and wilderness resources. The most notable use of CVM was in the assessment of the aggregate damage to households as a result of the Exxon Valdez oil spill.

3.4 Valuation Transfers: Activity Day Value

It is often difficult to apply the above economics-based methods for estimating the use value of non-market recreational goods because of resource constraints and a lack of data directly pertaining to the study site. When this is the case, it may be appropriate to use studies of other sites to develop an estimate of unit value for an activity and then apply this value to the study site. Such valuation 'transfers' provide an inference of the value of similar goods at the study site.

⁹ Ajzen et al, 43

¹⁰ Harrison and Lesley, 79

There are two (2) types of valuation transfers. A complicated transfer might apply a valuation model derived from a previous TCM or CVM study at another site to the study site. For example, the regression equation developed for a TCM study might be used, with the only change being the value of the explanatory variables to reflect the characteristics of the study site. This information, along with estimates of recreational user days at the study site, provides an estimate of recreational use value. This type of valuation transfer is usually not cost-effective, however, because implementing it requires almost as much data as is required to develop an original site-specific study.¹¹

A simpler type of approach involves using a unit day value previously developed at another site to value this activity at the study site. For example, an estimate of net WTP for a day of recreational saltwater fishing might be obtained by applying activity day values that have been calculated from a TCM or CVM study at a different site to the study site. Multiplying this activity day value by the estimated annual number of participation days at the study site produces an estimate for the annual value of the activity at that site. The U.S. Fish and Wildlife Service, for example, provides data pertaining to the economic impact of recreational activities for the State of Maryland, as well as recreational participation days.¹² Because these data are not County-specific, however, it may not be appropriate for use directly in this study. In order to apply this information specifically to Worcester County, it may be necessary to adjust an activity day value and apply this value to the estimated recreational activity days specifically within Worcester County.

Recreation activity day values represent values accruing to actual users of a recreational good at a particular site. Real recreational value often varies due to factors, such as site quality characteristics, location, and the socioeconomic characteristics of site users. Because activity day values are based on these site/location/user specific factors, the cross-application of unit day values from one site to another will lead to inaccurate results unless the sites share similar characteristics. Variation across sites will result in different values for recreational activities at the sites. Bias resulting from the cross-application

¹¹ Scodari, 37

¹² 1996 National Survey, U.S. Fish and Wildlife Service

of unit-day estimates can be reduced by using estimates derived for sites with characteristics that are similar to the study site. While the activity day approach may not be as precise as other methods, it is oftentimes the most appropriate when faced with data and resource constraints.¹³

Using unit values, such as activity-day or per-acre values, provides a common basis for comparing different studies and combining different types of values into aggregate measurements. It is also beneficial because it facilitates measuring changes in value to changes in unit quantity.

4.0 APPROACH

The TCM, CVM and Hedonic Pricing approaches are complex and expensive techniques that are not appropriate for the scope of this project. The utilization of unit values or similar pricing techniques identified in relevant literature makes best use of existing resources in order to provide a suitable estimation for the non-market values of the Coastal Bays. Participation rates and land features specific to Worcester County will be determined, then multiplied by activity day or acreage values to calculate the total non-market value of the Coastal Bays. The non-market value can then be combined with the market value to assess the overall impact of Maryland's Coastal Bays on the economy of Worcester County.

5.0 IDENTIFICATION OF NON-MARKET VALUES

One of the most difficult tasks involved in determining non-market value is selecting the specific types of values that will be evaluated. Ideally, all non-market values would be considered, however, in practicality, this is not possible. Some types of non-market benefits, such as non-use values and the value of wildlife habitat are too theoretical or controversial to be measured in a reliable manner. For other non-market benefits, lack of available data makes an assessment of value particularly difficult. This section outlines different types of non-market benefits that are most likely to be considered in this study as part of the economic value of the Coastal Bays.

5.1 Recreation Value

The Coastal Bays provide recreation value to visitors that may fish, hunt, or come to observe and enjoy the wildlife and aesthetics. Non-market value reflects the enjoyment that the participant receives

¹³ Scodari, 38

from an activity that is not captured by market transactions. As there are no entrance gates or significant fees collected for many of the recreational activities, net willingness to pay is often high. This study will estimate the non-market values of the following recreational activities:

- Recreational Fishing/Shell Fishing
- Boating
- Swimming
- Hunting (Bay-related species)
- Passive sightseeing
- Nature observation/Education

5.2 Flood and Storm Damage Protection

The Coastal Bays act as a natural buffer between the ocean and land and can reduce significantly the level of damage incurred during a storm. In addition to protecting commercial and residential development, the Bays provide a safe haven for residential boats. The value of this protection can be viewed as an estimation of the value of the avoided damages that would otherwise have been incurred.

5.3 Pollution Reduction Values

The wetland resources of the Coastal Bays have the ability to remove pollutants from the environment. The value of wetlands in wastewater treatment can be estimated by calculating the cost of building and operating a waste treatment plant that could provide the same level of pollution reduction.¹⁴

6.0 CONCLUSION

The analysis of non-market values provides a more complete estimate of the economic value of Maryland's Coastal Bays. The nature of public goods, along with other economic inefficiencies, prevents much of the economic value of the Coastal Bays from being incorporated into market transactions. As a result, alternate methods must be employed in order to provide an estimate of this non-market value. Because of data limitations and resource constraints, the use of activity day, per acre, and other unit values is the most appropriate method for estimating the non-market value of the Coastal Bays.

¹⁴ Greeley-Polhemus Group, Inc., 7.7-7.15

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APPENDIX B
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