

***The Economic Value of Casco Bay***

**Prepared for**

**The Maine Coastal Program  
Maine State Planning Office**

**by**

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## Summary of Economic Values

*NOTE: Please do not quote the figures in this table without reference to the estimating techniques for each figure discussed in the body of the report.*

### The Value of Goods and Services in the Casco Bay Region

<b>GNP Basis</b>	<u>Employment</u>	<u>Output</u>
Coast Dependent	2,040	\$104,189,961
Coast Linked	415	\$17,479,746
Coastal Service	10,503	\$398,930,293
<b>TOTAL</b>	<b>12,957</b>	<b>\$520,600,000</b>

### **Industrial Survey Basis** (Millions of Dollars)

<u>Industry</u>	<u>Estimate</u>	<u>Year</u>
Cargo Ports	32,444,461	1988
Fisheries	121,557,000	1988
Tourism/Recreation	250,300,000	1986
Boating (Marina Services)	15,146,106	1989

### Land Values

Property Value Assessments, Casco Bay Towns	\$9,359,600,613
Submerged Lands	\$1,960,430

### Investment in the Environment

<u>Low Estimate</u>	<u>High Estimate</u>
\$55,000,000	\$65,000,000

### Nonmarket Values

	<u>Low Estimate</u>	<u>High Estimate</u>
Parks	\$774,816	\$6,503,816
Wetlands	\$63,086,000	\$319,680,000

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## **Introduction**

That Casco Bay is a valuable resource is, in one sense, so obvious that one might wonder why it is necessary to attempt to measure that value. Casco Bay's waters have provided home and sustenance to a diverse wildlife and to man for centuries. It has been a source of recreation and food. It has been an important military and naval center for the United States, and for the English and French before there was a United States. It is the geographic justification for Maine's largest urban complex. It has recently been recognized as an "Estuary of National Significance" by the Environmental Protection Agency, and today serves so many different roles in the lives of those who live in and visit Maine that it is difficult to imagine encapsulating that variety in some single measure of "economic value". What more need be said?

But it is important to know something about the economic value of an area such as Casco Bay. Part of the reason is that a great deal of money and many jobs depend directly and indirectly on the resources of Casco Bay. In making decisions about the Bay, it is important to keep these relationships in mind so that decisions may enhance rather than diminish the value of the Bay. Another reason is that Casco Bay is an important public resource, in which investments must be made in order to maximize public benefits.

It is also important to identify economic value because it is clear that additional resources are going to have to be devoted to

sustaining and improving the ecosystem of Casco Bay. Some of these resources will be federal, some state, and some local. Some will be public and others will be private. Whenever people are asked to use their limited funds and resources for a particular purpose, they need to be reasonably sure that their resources are being used wisely. Understanding something about the economic value of Casco Bay is part of the process of making wise use of the economic resources that will have to be devoted to maintaining and improving the Bay's natural resources.

But appreciating the importance of identifying the economic value of Casco Bay and actually measuring that value are two quite different matters. There are two fundamental conceptual problems that must be addressed before any attempts at measurement can be made. The first deals with the question "What do we mean by "economic value". The second concerns the knotty problems of defining the geographic limits of measuring the value of a region such as Casco Bay.

#### **What is meant by "economic value"?**

To most people, the term economic value conjures up two images: an amount of money and some number of jobs. These are important aspects of economic value, but they are not value itself. Economists start their definition of value with a simple idea: all resources are scarce, but the demands on those resources are



infinitely large. There is never enough money or land or water or anything else to do all the things that all individuals might wish.

Because resources are scarce, it is necessary to make choices about how we will use the resources available to us. The choices about how much of our resources to devote to each of these purposes is made by individuals. Other choices, such as among schools, roads, libraries, and natural resource protection programs, are made collectively, through governments. The choices that are made are complex, but usually wind up being made after comparing a number of options and deciding which is "best".

Thus value comes from the decisions we make about how we use the resources (time, money, effort) available to us individually and collectively. Those things we choose to devote our limited resources to are those that we value. The measure of that value is the resources that we give up in order to secure those things we believe are important.

The most common setting in which people exchange their available resources for things they value is the market for goods and services which we enter every day to buy food, clothing, gasoline, books, etc. One of the nice things about markets is that they usually offer people different choices for each of the items they wish to purchase, so that by observing what people buy we are seeing them making choices that reveal the values they place on

things. This leads to the first definition of the economic value of Casco Bay: the contribution of the Bay to the creation of the market value of goods and services.

For purposes of this study, two measures of market value are used. One approximates the concept of Gross National Product. Gross National Product (GNP) is defined as the market value (the price of the good or service multiplied by the quantity sold) of all the goods and services that the nation as a whole produces. The values are adjusted to account for the fact that the outputs of some industries are the inputs of others. An estimate of the market value of goods and services produced from Casco Bay is made as the first, and broadest, measure of the economic value of the Bay.

In addition to these estimates of overall production, available data on output and utilization of industries clearly tied to the Bay, such as fishing, ports, and boating, are provided. These are necessarily imperfect estimates of the value of Casco Bay, but they are important in any assessment, providing a detailed look at key economic activities.

The GNP-based and industry-based estimates are two different approaches to measuring the concept of the value of goods and services associated with Casco Bay. Each technique has both advantages and disadvantages. The GNP-based values are broad in

their coverage and produce data that is comparable with other studies of national coastal values, but they are basically indirect measures of output values. The industry-based data has the advantages of detail, but the data is only sporadically available. The estimates in these two sections cannot be added together, since that would be double counting.

One other market-determined measure of economic value is the value of the physical assets in the region. Economists distinguish between "stock" and "flow" variables in describing an economy. The goods and services produced and sold by firms represent a flow of value as producers and consumers exchange money for goods and services. But there is also economic value in the assets used by consumers and producers, for example, is the value of residential and commercial property. Ultimately, this asset value is determined by the "flows" of value that the asset can produce over time and so the "stock", or asset, and flow values are intimately related.

But not all the goods and services are traded in markets in such a way that we can easily measure the value. What, for example, is the value of an evening walk along the Spring Point Shoreway in South Portland or a day at Wolf Neck Woods, or a day spent sea kayaking among the islands of Casco Bay? Economists have long recognized that these are just as valuable as anything purchased from a business. These nonmarket values must also be

measured and included in any realistic assessment of Casco Bay. However, there are a number of very difficult problems in doing so. These values, and the issues surrounding their measurement, are discussed below.

There are also nonmarket values that are very important to some people, but for which no measurement is really possible. These are known as option and existence values. Option values recognize that even though people do not currently use a resource, they may still be willing to pay something to assure that it will be preserved so that they will continue to have the option of using it. Other resources are so unique and special that, even though one may never seriously entertain the possibility of using the resource, its very existence is something worth preserving.

Both of these values can be quite important, even though they may not show up in dollar values. They are what motivate people to support groups like the Friends of Casco Bay and others to fight for the preservation and enhancement of the Bay's resources. Although they are not measured here, these values should not be ignored as important components of the value of the Bay.

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~~What is the geographic region to be considered?~~

At first glance, the question of what geographic region is to be considered in an assessment of the economic value of Casco Bay would hardly seem like one that has to be asked. Casco Bay is a

well-defined geographic entity, so what is the issue? However, a moment's reflection will quickly reveal some of the difficult issues involved.

As a geographic definition, Casco Bay runs from Cape Elizabeth to Small Point in Phippsburg. It is bordered by the towns of Cape Elizabeth, Falmouth, Cumberland, Yarmouth, Freeport, Brunswick, Harpswell, West Bath, and Phippsburg, and the cities of Portland and South Portland. These municipalities constitute the study region for purposes of collecting economic data, but the problem immediately arises that each town has both a coastal and a noncoastal aspect to the economic activity taking place within its borders. This difference will be recognized in part by selecting industries within these towns that are "coast"-related in various ways.

Some economic activity in these towns is clearly related to Casco Bay, such as clamming or shipbuilding or port activity, but even with such clearly coastal businesses, there are still problems trying to draw a neat border around Casco Bay so that one can identify whether a particular economic activity is clearly related to the Bay or not. A chandlery on the Portland waterfront may serve primarily the fishing and marine industries of Casco Bay, but it may also serve boat owners and builders throughout the state. Conversely, fishing gear firms might be located in towns well away

from the coast, yet depend for their success on the fishing industry of Casco Bay.

This problem can be seen in Table 1, which shows the number of commercial fishing licenses (of all types) issued to residents of the Casco Bay region, including the inland areas of Cumberland and Sagadahoc counties. As can be seen, nearly one third of all the commercial fishing licenses in the area are issued to residents of non-coastal communities. It is not necessarily the case that any of those fishermen living in the region fish exclusively, or even predominantly, in Casco Bay, although it is reasonable to assume that most do. But it is clear that fishing, surely the quintessential coastal activity, is not strictly coastal in economic effect.

The ambiguity that extends inland also extends seaward. Portland is the largest fishing port in Maine, and with the Portland Fish Exchange, is a major center for the northeast fishing industry. While no data exists to indicate where fish are caught (fishermen are notoriously secretive about where they fish), only a portion of the fish landed in Portland are actually caught within the confines of Casco Bay. At the same time, a portion of the fish stocks caught throughout the Gulf of Maine may have spent important parts of their life cycles in Casco Bay.

Table 1

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CASCO BAY REGION COMMERCIAL FISHING LICENSES : ALL CLASSES  
Cumberland and Sagadahoc Counties

	1985	
	<u>Licenses</u>	<u>Fees</u>
License Holders Resident of Coastal Communities	2,122	\$89,238
License Holders Resident of Noncoastal Communities	1,018	\$38,900
Total License Holders	3,140	\$128,138
Per Cent Coastal	67.58%	69.64%
Per Cent Non Coastal	32.42%	30.36%

Source: Maine Department of Marine Resources

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There is also economic activity that is indirectly related to the Bay. The state's largest urban center, Portland-South Portland, is located on Casco Bay. The original location of these cities and their growth over the past three centuries has been intimately tied to their location on Casco Bay. In one sense, therefore, all of the economic activity in these urban centers can be indirectly tied to the Bay, partly through a historical connection, and partly through the contribution the Bay makes to the region's quality of life and attractiveness to businesses to locate and grow in the area.

Thus the boundaries' of Casco Bay's economic influence are inherently fuzzy. If narrowly drawn, one answer will emerge about

the value of the Bay. Other logically plausible boundaries may be drawn in space or in time and produce other answers.

A note regarding interpretation of the data

It should be apparent from the previous discussion that there is no single number that can be represented as the value of Casco Bay. The variety of approaches used here represent different methods of determining value, and different assumptions about the geographic location of Casco Bay's values. Readers are cautioned to be careful to use the figures contained in this report only with an appropriate understanding of their sources, coverage, and limitations.



## The value of goods and services produced in the Casco Bay Region

### GNP-Based Estimates

The broadest direct measure of economic value for the Casco Bay region is the region's contribution to the gross national product (GNP). This is defined as the market value of all the goods and services (the "output" produced in the region). The estimation of GNP for a region is not easy, however, because no direct measurements of output are made at the state or substate levels. Therefore, output must be inferred from other statistics.

The identification of a distinct GNP derived from marine resources is also somewhat difficult. However, three studies conducted over the past 10 years have demonstrated that an estimation of a "marine GNP" can be done. The first two studies, conducted by Pontecorvo in 1980 and 1987<sup>1</sup> identified what he called an "ocean product sector" and the value of that sector. The "ocean value" he identified was the "value added by those establishments within 66 Gross Product Originating (GPO) sectors that either utilize an ocean resource in the production process or exist because the demand for the establishment's final output is due to some attribute of the ocean sector."

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<sup>1</sup> Pontecorvo, Giulio M. Contribution of the Ocean Sector to the United States Economy. 1980. 30 Science May, 1980. Also see "Contribution of the Ocean Sector to the United States Economy: Estimated Values for 1987", 23 Marine Technology Society Journal 2, pp. 7-14 (1988).

The concept of "value added" is an important one. Many goods and services are produced by businesses for use by other businesses as inputs to yet other goods and services. One company's sales is another company's costs. In measuring the total value of goods and services (the gross product) it is critical that sales not be double counted. In the construction of the National Income Product Accounts (the official name for the Gross National Product calculations) the Federal Government takes great care not to double count output.

In calculating GNP, the U.S. Department of Commerce uses the following equation:

$$GNP_i = (P_i + p_i + r_i + X_i + D_i)$$

Where: GNP = Gross National Product

$P_i$  = Payroll to employees  
 $p_i$  = Profits to the business owners  
 $r_i$  = Net interest payments  
 $X_i$  = Indirect taxes  
 $D_i$  = Capital consumption allowance (depreciation)

$i$  = a given industry

Each sector of the economy's contribution to total output is calculated by the Bureau of Economic Analysis of the Department of Commerce for the nation as a whole and for detailed breakdowns of industry types. From these national figures it is possible to approximate what the product of an industry is in the Casco Bay region. This can be done by assuming that the relationship between

payroll and output at the national level also holds true at the regional level. Since payroll is available for detailed analysis within Maine, it possible to estimate the output of an industry using the following equation:

$$GNP^{cb}_i = P^{cb}_i / (P^{us}_i / GNP^{us}_i)$$

Where:  $GNP^{cb}_i$  = The "GNP" in the Casco Bay region of a given industry i.

$P^{us}_i$  = Payroll in the U.S. industry.

$GNP^{us}_i$  = Output in the U.S. industry

$P^{cb}_i$  = Payroll in the Casco Bay region in industry i.

That is, the GNP for an industry in the Casco Bay region is estimated as the same ratio between payroll and GNP for the same industry at the national level.

In order for this comparison to be reasonably meaningful as an estimate of the value of Casco Bay region, careful selection of the industrial sectors to be included is required. Pontecorvo proposed one approach to choosing "ocean sectors" in his analysis. A more recent analysis of the economic value of the nation's coastal zone has significantly expanded and improved upon the original approach. This analysis, developed by Luger and Coates<sup>2</sup>,

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<sup>2</sup> Luger, Michael M. and Dennis Coates. The Economics of Coastal Zone Management, Volume Three of Evaluation of the National Coastal Zone Management Program 1990. Newport, Oregon, National Coastal Resources Research and Development Institute. See also Colgan, Charles (editor), Valuing Coastal Zone Management

divides economic activity into three groups according to the relationship between the activity and coastal resources and adjusts for the amount of output in sectors directly related to the production of coastal-based goods and services. The major groupings developed by Luger and Coates are:

(1) **"coast-dependent activities"** are economic activities that must be located on, or adjacent to, the oceans, bays, Great Lakes, and estuaries. These include, for instance, fisheries, yacht clubs, beach-related recreation, and ocean transport and shipping. These are activities that can only be performed in the coastal zone.

(2) **"coast-linked activities"** are other economic activities that use the oceans, bays, Great Lakes, and estuaries, and their contents in the production process, or that produce intermediate inputs for coast-related activities, whether or not they are located in the coastal zone. These include, for example, fish processing and packing, and the production of fishing gear and other marine equipment.

(3) **"coastal service activities"** are still other economic activities that are located in the coastal zone and provide services to residents and visitors to the coastal zone. These

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1990. Newport, Oregon, National Coastal Resources Research and Development Institute.

include real estate, wholesale and retail operations, non-ocean related recreation, and business and professional services. The viability of these components depends on the size and income of the coastal population and the success of other coast-related economic components. These are included to capture what economists call "multiplier effects."<sup>3</sup>

Table 2 summarizes the findings from the Luger and Coates study on the national value of the coastal zone broken down into these categories. Table 3 provides the data for the Casco Bay region. The appendix lists the industries that are included in each of the categories.

This approach provides a straightforward method of identifying the value of coastal regions as measured by the market value of goods and services. Because it uses payroll data that is collected at the individual enterprise level, it is suitable for analyzing relatively small regions such as Casco Bay. Nevertheless, there are some important limitations in this method that need to be acknowledged.

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<sup>3</sup> The "multiplier effect" occurs when a dollar is spent several times in the economy. A dollar earned by fishermen is spent to purchase fuel for the boat, which is then used by the fuel supplier to pay labor and the costs of the fuel, etc. A similar effect occurs with the dollar used by the fishermen to purchase food for their families. These indirect effects of spending represent a portion of the value of primary production.

**Table 2**

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U.S. COASTAL GROSS NATIONAL PRODUCT ESTIMATES

Billions of Dollars, 1986

	<u>Jobs</u>	<u>Payroll</u>	<u>Output</u>
Coast Dependent	779,000	\$15.80	\$42.00
Coast Linked	239,000	\$4.59	\$12.17
Coastal Service	27,300,000	\$459.50	\$1270.00

Source: Luger and Coates, 1990

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**Table 3**

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ESTIMATES OF CASCO BAY REGION GOODS AND SERVICES

Billions of Dollars  
1988

	<u>Employment</u>	<u>Payroll</u>	<u>Output</u>
Coast Dependent	2,040	\$0.058	\$0.104
Coast Linked	415	\$0.011	\$0.017
Coastal Service	10,503	\$0.209	\$0.399
<b>TOTAL</b>	<b>12,957</b>	<b>\$0.278</b>	<b>\$0.521</b>

Source: USM Estimates

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This perspective of the coastal economy focuses attention on the primary and secondary industries of the coast, particularly the manufacturing industries. Service industries are placed in a separate category, although those firms in tourist businesses may

be quite directly tied to the coast. This is one of the reasons why separate measures of specific industries are needed.

Another limitation is that these estimates rest on the assumption that the relationship between payroll and output for an industry at that national level holds true for that industry in the Casco Bay region. While this is a reasonable assumption, there is still a margin of error of uncertain magnitude between the national and local figures.

In addition, the present analysis uses national data that is collected at a higher level of aggregation than the data for each of the industries in the three categories just described. Information about industries is collected and published according to the Standard Industrial Classification, a system of grouping related industries together. The Classification groups industries by code numbers, with the number of digits in the code indicating increasing specificity. Thus, for example, all industries starting with a "2" or "3" are manufacturing industries. All industries with a code of "20" are in food processing; all firms with a code of "203" are in fish processing, etc.

The national GNP data is published at the "two digit" level, while the payroll data collected for the Casco Bay region and needed to define "coast-related" industries is available at the three and four digit levels. This means that there is some loss

of precision between the more general national figures on the relationship between payroll and output and the more specific figures for Casco Bay. Again, it is not clear whether the net bias of these differences results in an over or under estimate of actual output.

A final limitation is that the fishing industry is not adequately covered in these figures, because fishermen are not covered by the employment security laws, although fish processors are.

### **Industry-Based Estimates**

For some of the "coast dependent" industries, direct measures of economic value are available from various published sources. These are discussed in the following sections:

#### Ports

Table 4 shows the value of shipments through the port of Portland, including the estimated direct expenditures<sup>4</sup> for the handling of the cargo. These expenditures constitute the "value added" by Casco Bay' transportation services. The table is broken down into bulk cargo (coal, salt, etc.), break bulk (bagged or

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<sup>4</sup> The estimates of direct expenditure were made using U.S. Maritime Administration figures for the average per ton costs of handling each of the types of cargo. See U.S. Maritime Administration, Port Economic Impact Kit.



packaged bulk cargo) and petroleum. In 1988, the Port of Portland handled 9 million tons of cargo, with direct expenditures of more than \$32.4 million to handle that Cargo.

**Table 4**

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CARGO SHIPMENTS - PORT OF PORTLAND 1988					
BULK		BREAK BULK		PETROLEUM	
<u>TONS</u>	<u>Expenditures*</u>	<u>TONS</u>	<u>Expenditures*</u>	<u>TONS</u>	<u>Expenditures*</u>
220,209	\$1,783,693	80,993	\$5,955,415	8,699,068	\$24,705,353
<b>TOTAL</b>			<b>\$32,444,461</b>		

Source: Maine Department of Transportation

\* Estimated based on Port Economic Impact Kit.

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It should be noted that Portland has historically played a much larger role as an oil port. Through the 1960's and much of the 1970's, Portland was the second largest oil handling port on the East Coast because of the Portland Pipeline, which served as the marine terminus and supply route for the large complex of refineries located near Montreal, Que. During the past ten years, the Montreal refineries developed new sources of supply from western Canada and their dependence on the Portland Pipeline has been substantially reduced. Portland's role as a petroleum port

is now about evenly split between the Portland pipeline and the supply of petroleum for Maine markets.<sup>5</sup>

### Fisheries

Table 5 shows the fisheries landings for 1988 for all ports in Casco Bay (of which Portland is by far the most important.) These figures include the Portland Fish Exchange, which now handles more than half of the groundfish landed in Casco Bay. According to the manager of the Exchange, approximately 30% of the fish landed at the Exchange was harvested in Casco Bay. This would imply an estimate of more than 10,000,000 pounds of fish coming from the Bay in 1988.

### Tourism and Recreation

Tourism and recreation are a major part of the value of Casco Bay region. Direct measurement of the various tourism and recreation facilities is very difficult, however, because record keeping is spotty at best.

The most recent study of the value of tourism in Maine was conducted for the Department of Economic and Community Development

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<sup>5</sup> According to Portland Pipeline Company officials.

Table 5

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FISH LANDINGS 1988			
	<u>Pounds</u>	<u>Landed Value</u>	<u>Market Value</u>
Finfish	32,840	\$18,968,000	\$56,094,000
Shellfish (Including Lobster)	16,484	\$21,821,000	\$65,463,000
TOTAL	49,324	\$40,789,000	\$121,557,000

Source: Maine Department of Marine Resources

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by the University of Wisconsin-Parkside in 1986-88. That study estimated the total value of tourism-related expenditures at \$147.15 million per year in Portland, \$55.58 million in suburban Portland, and \$47.57 million in the Bath-Brunswick area, for a total in the Casco Bay region of \$250.30 million. It is important to note these expenditures are not measured with respect to Casco Bay itself, but are for the region as a whole; nonetheless, Casco Bay must be seen as the principal attraction for tourists and, therefore, as the direct or indirect source of these expenditures.

### Boating

Casco Bay is one of the finest recreational boating areas in the United States. With its hundreds of islands and numerous coves and inlets close to a major population center, it provides a variety of recreational boating opportunities in close proximity

to a large population. In 1989, over 12,000 boats were registered in the towns of the Casco Bay region.<sup>6</sup>

Private recreational boating, both sail and power, is served by nineteen marinas. with approximately 1,900 slips. There are also 3,400 moorings in the Bay under the control of municipal governments.<sup>7</sup> It is estimated that about 95% of these are used continually throughout the boating season (May to October). In addition, private marinas in the region report approximately 700 additional boats tie up on a transient basis during a season.<sup>8</sup>

Marinas are a significant business in the Bay, with sales of fuel, boat repairs, boats, etc. Table 6 provides a summary of sales from the marinas in the Casco Bay region.

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<sup>6</sup> These boats paid more than \$268,000 in excise taxes to the towns, and more than \$60,000 in registration fees to the State.

<sup>7</sup> Source: USM survey of harbor masters for this study. These moorings produce more than \$90,000 in revenues for the towns. It should also be noted that some towns, such as Phippsburg, do not have mooring ordinances. In these cases, moored boats would not be counted in these figures.

<sup>8</sup> USM Survey of Casco Bay Marinas, 1990.

**Table 6**

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**Marina Sales in the Casco Bay Region**

1989

Fuel	\$699,000
Repairs	1,220,000
Parts	495,000
Winter Storage	760,000
Retail Sales, misc.	917,000
Slip Rental	1,789,896
Moorings	57,960
Boat Sales	9,060,000
Transient Slip Rentals	135,200
<b>TOTAL</b>	<b>15,146,106</b>

SOURCE: USM Survey of Casco Bay Region Marinas, 1990

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Private boating is only one part of the boating recreational experience. Eleven private cruise lines serve Casco Bay by taking passengers on daily or part daily outings on the Bay. However, figures on utilization and revenues of these cruise lines have not been released by the owners. Another provider of daily cruise services is Casco Bay Lines. In 1989, 24,730 passengers took cruises (either as individuals or as part of charter groups) on Casco Bay Lines, accounting for sales of more than \$282,000. This accounted for 4% of total passengers carried, but more than 15% of the revenues.

Another component of the recreational boating picture are the cruise lines, including the *Scotia Prince* and the *Star* and *Clipper* lines, which offer coast-wise cruising that stops at Portland.

The *Scotia Prince* is the international ferry that operates between Portland and Yarmouth, Nova Scotia from May to October. The *Prince* is an important part of the maritime value of Casco Bay because of the diversity of services it offers. Its ferry service between Nova Scotia and Maine provides an important link for both tourist and commercial traffic. In 1989, the *Prince* carried nearly 186,000 passengers on its trips to and from Nova Scotia, with 30,000 auto trips and 1,000 motor coach trips. Some of these passengers were tourists from Nova Scotia to Maine (and New England), and others were using the *Prince* to visit Nova Scotia (and the Maritimes). Additionally, the *Prince* offers casino gambling on board (outside U.S. and Canadian territorial waters), and so many of the passengers remain on board for the round trip.

The *Scotia Prince* is also an important commercial link between New England and Nova Scotia, with over 1,100 commercial vehicles using the *Prince* during its season. No information is available on the revenues of the *Scotia Prince*, however.

The second component of the cruise ship business is the coast-wise cruise lines. This is a recent development in the tourism business in New England, with cruise ships that are used in the

winter in the Caribbean being brought north for cruises out of Boston and along the Maine coast. In 1989, 16 cruise ship calls were made in Portland, with 7,500 passengers. In 1990, 15 cruise ship calls were expected, but larger ships were used so that the expected number of passengers in 1990 will be more than 12,000.<sup>9</sup>

During their stops at Portland, passengers are given several hours to shop in the downtown and Old Port areas, and even bus trips to Freeport. It is estimated by the Department of Transportation that passengers spend an average of \$60.00 per person while in Portland. This would result in retail sales of approximately \$720,000 attributable to these cruises.

#### Land Values

The total value of property for the towns bordering Casco Bay, as measured by "full value assessments" for property tax purposes, is shown in Table 7. How much of the value of property is attributable to Casco Bay? Unfortunately, property value data is not available to allow a measurement of the contribution of Casco Bay to property values.

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<sup>9</sup> Department of Transportation estimates. The DOT also estimates that there is one crew person per three passengers, and that the crew spend an amount equal to 40% of what the passengers spend. This would imply 4000 crew visits to Maine per summer, with average expenditures of \$25.00 per visit for a total additional expenditure of \$100,000.

**Table 7**

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**Property Values - Casco Bay Region Municipalities**

	Municipal Valuation
Cape Elizabeth	\$657,812,412
South Portland	\$1,419,296,167
Portland	\$3,810,311,011
Falmouth	\$687,784,250
Cumberland	\$344,925,780
Yarmouth	\$807,030,462
Freeport	\$580,534,688
Brunswick	\$806,243,700
West Bath	\$66,283,692
Phippsburg	\$179,378,453
<b>TOTAL</b>	<b>\$9,359,600,613</b>

Source: Bureau of Taxation Records

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It is well known that proximity to the water increases the value of property because of the aesthetic and recreational features of waterfront land that make it in such high demand, and so Casco Bay contributes significantly to the value of property. Experts in the region's real estate markets estimate the additional value of a property with shore frontage on Casco Bay ranges from 100% of base value to 400%; just a view of the water adds as much as 50% to the value of a residence.

Unfortunately, no data exist that permit an accurate assessment of Casco Bay's contribution to the property values of the region. As discussed in the section on research needs below,



techniques have been developed that permit measurement of the contribution of a resource to property values.

### Submerged Lands

All lands below mean low water are owned by the public, and are leased by the Maine Bureau of Public Lands for docks, marinas, etc. The thirty-five leases of submerged lands currently in effect in the Casco Bay region provide annual lease revenues to the Bureau of \$18,566. Calculating the capitalized value of these leases (that is, taking the present value of twenty years of annual leases as the measure of the market value of the properties), the submerged lands are worth \$231,373.

It should be noted that the Bureau of Public Lands has recently established a policy that will substantially raise submerged lands leases over the next ten years to a level approximately eight times current levels. This will raise the asset value of submerged lands to \$1,960,430.<sup>10</sup>

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<sup>10</sup> It should be noted that the price of submerged lands leases is not exactly analogous to a market price. Since the State owns all the submerged lands there is no real market in the same sense of other lands. Rather the price is an administered one; this is apparent from the fact that until the recently announced changes in policy, rents had not changed in many years while the market value of all other real estate had been increasing rapidly.

## **Investment in the Environment**

As noted above, the economic value of something is measured by what people are willing to give up in order to obtain it. This perspective indicates another measure of the value we place on Casco Bay, namely the investment we have made to clean up the waters of the Bay. The investment for primary and secondary sewage treatment facilities for the cities and towns around the Bay, plus the investment of private residences for sewage treatment to eliminate straightpipe discharges, is estimated at \$55,000,000 to \$65,000,000 by the Department of Environmental Protection. This figure does not include any investments by businesses in sewage treatment, and is thus an underestimate of this value.

## **Nonmarket Values**

Whichever market values are used for the analysis, it must be recognized that these do not reflect the entire range of economic values associated with Casco Bay. Market values are imperfect reflections of the real value that people place on many items. There are a number of important nonmarket values that need to be recognized, although it is often difficult to measure these values. The values discussed for Casco Bay include the value of recreation and the nonmarket value of the Bay's wetlands resources.

**Recreation** values are obviously critical to the importance of Casco Bay. Part of the value of recreation is measured in the market transactions described above, but, even when prices are charged, the full value may not be reflected. This can be most easily seen in the case of parks. Most public parks are provided free of charge (or as in the case with State Parks, a nominal parking fee), but it would obviously be an error to assume that because there is no price there is no value.

There are three state parks in the Casco Bay region, including Two Lights State Park in Cape Elizabeth, Wolf Neck Woods in Freeport, and Andrews Beach on Long Island. In 1988, these parks had attendance of 129,736, with Two Lights accounting for about 60% of this figure, as shown in Table 8. In addition, Admiral Robert Peary's home on Eagle Island is managed as a park open to the public.

Of these state parks, only Wolf Neck Woods charges a parking fee (which in 1988 produced revenues of \$45,970). However, a rough estimate may be made of the "consumer surplus" inherent in the parks, that is the value of the visit over and above what was paid out-of-pocket. If one assumes that the value of a visit to the Park was at least equal to the value of another recreation expenditure that might have been made, say a movie, then a rough estimate might be made. Assuming a value of \$6.00 per visit to these three parks (roughly the price of a movie) would yield an

**Table 8**

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CASCO BAY PARK UTILIZATION

1988

Andrews Beach		5,431
Two Lights	77,780	
Wolf Neck Woods	46,435	
Eagle Island		12,074
<b>TOTAL</b>	<b>129,736</b>	

Source: Bureau of Parks and Recreation

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estimate of \$774,816.

This is certainly an underestimate of the real economic value of the parks. A 1988 study by Lindsay and Tupper<sup>11</sup> applied the contingent valuation method to three beaches (Old Orchard, Pine Point, and Ocean Park) in southern Maine and one in southern New Hampshire. Their findings indicate an average willingness-to-pay

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<sup>11</sup> Lindsay, Bruce and Helen Tupper. 1988. "Demand for Beach Protection and Use in Maine and New Hampshire: A Contingent Valuation Approach". Durham, N.H., University of New Hampshire Sea Grant Paper Number UNHMP-AR-SG-897.

of \$50.14 per visitor day for the three Maine beaches surveyed.<sup>12</sup> Applying this value against the visitor rates for Andrews Beach, would yield an estimate for that park of more than \$272,000, and it accounted for less than 4% of the visitors to the three Casco Bay State parks.

It should be recognized, however, that the Lindsay and Tupper estimate is certainly at the upper bound of such values, and in any event is too high for Andrews Beach, a small park without easy access. Moreover, it is not strictly applicable to parks without beach facilities. However, for the sake of establishing a rough estimate, this estimate could be seen as a high end of possible park values. If the \$50.14 per day of value is taken as an upper bound and the \$6.00 figure as a lower bound, then the value of the

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<sup>12</sup> Contingent value is a technique of asking people directly what monetary value they place on things such as park or beach visits. Asking such questions takes great care because people often have difficulty actually putting a price on things that seem priceless. The phrasing of the question must be done carefully in order to avoid leading people to answer in ways that reflect the questioner's biases rather than the respondent's values. Most contingent value studies find very wide ranges of value as a result; there is no single "price" that everyone can agree upon.

Despite the many methodological difficulties in contingent valuation studies, they are the most commonly used for valuing recreational resources. No such studies have been done for the beaches or other major recreational resources of the Casco Bay region.

For a discussion of the contingent valuation method, see Mitchell, Robert C. and Richard T. Carson. Using Surveys to Value Public Goods: The Contingent Valuation Method. Washington: Resources for the Future, 1989. Also see Cummings, Ronald G., David Brookshire, and William D. Schulze, editors. Valuing Environmental Goods: An Assessment of the Contingent Valuation Method. Totowa, N.J.: Rowman and Allanheld, 1986.

visits to the State Parks on Casco Bay ranges from a low of \$774,816 to a high of \$6,503,809.

There are a number of municipal parks that are also very significant resources in the region, most notably Fort Williams in Cape Elizabeth (the location of Portland Head Light), the Spring Point Shoreway in South Portland, and Winslow Park in Freeport. Historic memorials and forts, such as the Munjoy Hill Observatory, and Forts McKinley and Gorges in Portland, are also important municipal recreation attractions. Unfortunately, no data is kept on visitation to these areas, so even an approximation of value cannot be arrived at.

**Wetlands** Another important nonmarket land value is that of wetlands. Casco Bay contains 1332 acres of coastal wetlands (salt marshes)<sup>13</sup>. Wetlands are recognized as extremely important ecological resources that serve a variety of important functions: nursery to fish and wildlife resources, waste filtration, buffer to storm damages, recreational opportunities, etc. The diversity and importance of the ecological roles that wetlands provide has required significant restrictions on the destruction and development of these resources. As a result, wetlands have little or no value as property for residential or commercial purposes.

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<sup>13</sup> Source: Maine Coastal Program estimates. The legal definition of wetlands for regulatory purposes includes submerged lands, but these are excluded from this discussion.

But there is clearly significant value in wetlands that needs to be recognized and measured.

Determining the value of wetlands is a complex and controversial task. A large number of studies have been done to try to estimate the value of wetlands, and several different approaches to valuation have been developed. Two that have been widely discussed include measuring wetlands values in terms of fisheries values and an "energy value" approach. Each approach produces different results, and each contains its own conceptual and methodological problems.

The first approach, relating the value of fisheries landings to the wetlands, is designed to make clear the critical relationship between fishing and the wetlands that provide spawning and nursery habitat for most commercially harvested species.<sup>14</sup> Earlier estimates of wetlands value on this basis for Maine range from \$15,750 per acre to \$33,663 in 1970.<sup>15</sup> Adjusting these values to 1989 dollars<sup>16</sup> yields estimates of \$47,362 to \$101,224 per acre.

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<sup>14</sup> Lynne, Gary, Patricia Conroy, and Frederick Prochaska. 1981. "Economic Valuation of Marsh Areas for Marine Production Processes" 8 Coastal Zone Management Journal 175-186.

<sup>15</sup> Stroud, R.H. 1970. "Estuary Values". Sports Fisheries Institute Bulletin Number 213 (April, 1970).

<sup>16</sup> Using the Gross National Product Implicit Price Deflator, the broadest measure of inflation in the economy.

Dividing the landed value of fisheries by the wetlands acreage yields an estimate of \$91,259 per acre. These figures imply wetlands values for the Casco Bay wetlands from \$63,086,184 to \$134,830,368.

There are obvious problems with this approach. Not all commercially caught fish landed in Casco Bay utilized the wetlands habitat, nor are the wetlands the sole contributor to the economic value of the fisheries; there are fish who may spend part of their life cycle in the Casco Bay wetlands who are caught and landed elsewhere. Thus, this valuation of wetlands is an overestimate of the fisheries values, although not necessarily an overestimate of the total economic value of the wetlands since there are other values not accounted for by this approach.

A second approach, one which has been both widely quoted and widely criticized, is the use of the energy value of the wetlands as a measure of its economic value. This approach was developed in the early 1970's by Howard Odum and applied to the Louisiana wetlands by Gosselink, Odum and Pope in a famous 1974 paper<sup>17</sup>. The basic approach in these studies was to first estimate the amount of energy embodied in the wetland, measured in kilocalories, including solar energy converted by biological processes and the

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<sup>17</sup> Gosselink, J.G., E.P. Odum, and R.M. Pope. 1974. The Value of the Tidal Marsh. Center for Wetland Resources. Louisiana State University. Baton Rouge, LSU-SG-70-03.



energy supplied by tidal action. An estimate is then made of the dollar value of each kilocalorie based on the general relationship between energy use and economic production in the economy.

The Gosselink, Odum, and Pope paper then calculated a value of \$50,000 to \$80,000 per acre of wetlands. Adjusting to 1989 dollars, this would mean per acre values of \$150,000 to \$240,000, and total values of the Casco Bay wetlands of \$199,800,000 to \$319,680,000.

This approach to valuing wetlands has been widely criticized by economists who believe it constitutes an inappropriate melding of ecological and economic analysis. The most detailed critique was provided by Shabman and Battie<sup>18</sup> who point out that the "energy" basis methodology fails to recognize that energy alone is not the basis of economic value. Other factors of production, including labor and capital, are extremely important in determining value. Moreover, value is set in markets that reflect many forces besides energy content. Shabman and Battie conclude that the "energy approach" is an illegitimate marriage of economics and ecology.

These are important criticisms that cannot be dismissed. They mean that the energy-economic linkage as measured by the Gosselink,

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<sup>18</sup> Shabman, L. and Battie, S.S. 1978. Economic Value of Natural Coastline Wetlands: A Critique. 4 Coastal Zone Management Journal 3, pp. 231-245.

Odum, and Pope cannot be considered a satisfactory method of measuring true economic value. However, this approach does have some merit. It does make clear the importance of wetlands as productive assets rather than as useless areas. These figures may also be interpreted as follows: If the energy in the wetland has the same economic value as the average relationship between all the energy used in the economy and the total value of economic output (GNP), then this method would yield an approximate value. However, since there is no way of knowing whether wetlands are more or less valuable than this average, this method must be considered a very rough approximation.

These figures must be regarded as speculative, and probably too high. They indicate the importance that coastal wetlands have, but further work is needed to determine the actual values of the Casco Bay (and Maine) coastal wetlands.

## An Agenda for Future Research

It is obvious that much of the information needed to make a complete determination of the value of Casco Bay is not available at present, either because the data has never been collected at all or because it is not collected in a form that would be usable for valuation purposes. Filling in all the gaps in information would require significant effort and expenditure, but since time and financial resources are limited, some method of setting priorities for future economic research needs is required.

The inclusion of Casco Bay in the National Estuary Program sets in motion a five year effort to improve the water quality of the Bay. Since the release of the Conservation Law Foundation report<sup>19</sup> and the subsequent threats of lawsuits against the Portland Sewer District, attention has been focused on the deteriorated quality of the Bay's waters. Because of the significant resources to be devoted to water quality issues, the first priority in economic research should be to develop information needed to make the forthcoming critical decisions about investments to achieve improved water quality.

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<sup>19</sup> Hague, Paul. Troubled Waters: A Report on the Environmental Health of Casco Bay. Boston: Conservation Law Foundation, 1988.

This requires that attention be focused on those sources of the Bay's economic value most closely associated with the quality of its waters. While many of the important economic values of the Bay, such as shipping and port activity, are not directly related to its water quality others clearly are. These may be grouped into two major categories: amenity resources and productive resources.

Amenity resources are those that affect the desirability of Casco Bay as a place to live or recreate. Work needs to be done to establish links between water quality and the Bay's ability to provide shoreside and on-water recreational opportunities, and to more accurately establish the value of those recreational opportunities through the use of contingent value studies (such as that employed by Lindsay and Tupper) or travel cost studies (such as those of Bell and Leeworthy<sup>20</sup>) on uses such as boating and park (both state and local) utilization.

The value of the Bay in enhancing the desirability of the region as a place to live is also a critical linkage that must be measured. Indeed, in total dollar amount, this may be the largest value of the Bay. Establishing the "value" of water quality improvements by looking at changes in property values is a well-established method of measuring the value of environmental

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<sup>20</sup> Bell, Frederick W. and Vernon Leeworthy. 1990. Recreational Demand by Tourists for Saltwater Beach Days. 18 Journal of Environmental Economics and Management 189-205.

improvements<sup>21</sup> based on the recognition that the quality of the environment is one of the characteristics of property for which people are willing to pay. Using statistical techniques to isolate the effects of environmental quality from other influences on property values, the benefits of environmental improvement have been measured for both air and water quality in a number of settings.

The study of property values requires determining the value of shore front property throughout the Casco Bay region, and measuring those characteristics that relate to value (size, construction, etc.). Because of the size of the Bay and the number of properties involved, a careful sampling of properties is required for a feasible study.

The study of productive resource values that may be enhanced by water quality improvements will also be important. These studies will focus on the fishery resources of the Bay and the improved productivity that could result from improvements in water quality. Some studies are relatively simple; the increased production from clam flats closed currently because of pollution can be estimated as \$4,007,160 per year, that is the average current production of the acres of clam flats closed to production times the average value per acre for production from the open clam

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<sup>21</sup> Freeman, A. Myrick The Benefits of Environmental Improvement 1979. Washington: Resources for the Future.

flats. Taken as a present value of production over a 20 year time horizon, the value would be \$49,838,071.<sup>22</sup>

A similar, although more complex, analysis will be required for other marine resources of the Bay. The additional complexity arises because other fishery resources are not nearly as accommodating as clams in staying in one place. The relationship between the marine resources living in the Bay and those caught and sold in fishery markets needs to be established, along with the relationship between water quality and fisheries productivity.

Studies of the relationship between amenity and productive resource values and water quality are both likely to be necessary in order to establish the value of water quality improvements. Amenity values are likely to be larger in dollar terms, but the relationship with water quality improvements more difficult to establish. The value of marine resource production is demonstrably related to water quality improvements (although measurement of the exact extent may be difficult), but the economic values are smaller.

Beyond the decisions related to the water quality improvement programs to be funded under the National Estuary Program, important decisions are being made by the communities in the region under the

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<sup>22</sup> These figures are underestimated by as much as 20%, according to the Department of Marine Resources.

Growth Management Program. Most of the towns in the region are Tier 1 towns, that is, they must submit their plans for review by the end of 1990, and thus additional economic information will not be critical to their current planning. Others, such as Portland and South Portland, Cape Elizabeth, and Brunswick are engaged in comprehensive planning processes separate from the growth management requirements.

As these plans are developed and implemented, and as they evolve over the next decade, an improved understanding of the relationship between these communities' growth and Casco Bay will be important. The information gained in the studies suggested above will be very useful, particularly in the case of the property value studies (assuming the samples of property studies are statistically valid samples at both the town and regional level).

A closer examination of the coast dependent, coast related, and coastal service industries would provide a clearer estimation of the value of production of all goods and services directly and indirectly tied to the Bay. The estimates in this report are based on general assumptions about these industries developed from a study of the national coastal zone. While useful as initial estimates, a more detailed investigation of the firms in these industries in the Casco Bay region, through surveys and interviews, would help establish the relationship between economic growth in the region and the Bay.

The application of the wetlands valuation techniques found in the literature to Casco Bay produced figures that suggest the value of coastal wetlands. However, any serious effort to understand the economic value of coastal wetlands requires a much more detailed examination of the biological and economic relationships involved in wetlands. Such a study has been suggested by Batie and Shabman.<sup>23</sup>

Finally, the utilization of the Bay's key recreational resources, such as the municipal parks, needs to be established. These municipal facilities are perhaps the most important public access points to the Bay's amenity and recreational resources, yet no measurement of their utilization, let alone their value, has been done.

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<sup>23</sup> Batie, Sandra S. and Leonard A. Shabman. 1982. "Estimating the Economic Value of Wetlands: Principles, Methods, and Limitations". 10 Coastal Zone Management Journal 3, pp. 255-277.



## Appendix

### Industries Grouped by Coastal Relationship

#### COAST DEPENDENT

- Commercial Fishing\*
- Fish Processing
- Ship building
- Water Transportation
- Electric Generation-Transmission

\* Does not include most commercial fishermen, who are not covered by unemployment insurance laws.

#### COAST LINKED

- Cordage and Twine
- Canvas products and Sails
- Fabricated Structural Metal
- Fabricated Plate Work
- Other Fabricated Metals
- Construction machinery - cranes
- Industrial trucks
- Instruments

#### COASTAL SERVICES

- Marine Construction
- Local passenger transit
- Trucking and warehousing
- Transportation services
- Communications
- Electric - sanitary utility
- Wholesale Trade Durable
- Wholesale Trade Nondurable
- Retail
- Insurance Carriers NEC (Marine Insurance)
- Insurance Agents
- Real Estate
- Hotels
- Personal services
- Business Services
- Auto Repair Services
- Miscellaneous Repair Services
- Amusement and Recreation Services
- Health Services
- Legal Services
- Educational Services
- Social Services
- Private Museums
- Membership Organizations
- Miscellaneous Services

