Is the non-market literature adequate to support coastal and marine management?

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Abstract

Analysts increasingly look to the literature for estimates of the non-market value of coastal and marine resources. We examine the comprehensiveness, timeliness, geographical completeness, and methodological breadth of the peer-reviewed literature on non-market valuation studies for coastal and ocean resources in the United States. With the exception of beaches and recreational fishing, the literature is generally insufficient to support effective policy-making. Most assets have not been well studied. Values for many assets have not been estimated in recent years, the geographical coverage is incomplete, and the application of methodologies is uneven. We offer recommendations to improve the policy usefulness of the valuation literature.
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1. Introduction

Coasts and oceans provide an array of goods and services ranging from security and food to commercial development and leisure. Coastal and ocean resources continue to play an important role in supporting local, regional, and even national economies. In 2004, the coastal recreation and tourism industry supported more than 1.7 million jobs, resulting in 31.5 billion dollars in total wages earned [1]. Coastal areas also provide habitat for almost half of the country's protected and endangered species, act as a source for pharmaceutical products, assist in flood control, provide filtration of river-borne pollutants, and serve as

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a barrier for storm events [2]. The economic health of these resources, however, is at risk due to erosion, pollution, and overuse. The final report of the Pew Ocean Commission [3] finds America's oceans in a state of crisis and places emphasis on good governance as the key to protecting oceans and coasts. This theme was repeated in a report by the U.S. Commission on Ocean Policy [4].

The management and protection of ocean and coastal resources can be costly, but failure to steward these resources can have even greater consequences on coastal and ocean economies. To date, however, we have only begun to understand the magnitude of the contribution of the ocean and coast to our economy. Without a complete understanding of the economic value of these resources, it is difficult for policymakers to determine effective levels of spending and investment in coastal and ocean management. Even more difficult is the evaluation of the economic impacts of ocean and coastal policy alternatives. Clearly, there exists a need for more and better data on the economic value of ocean and coastal resources.

Much of the economic value of the coast and ocean lies outside of the market. These non-market values include the value of recreation, open space, beach-going, shoreline protection, and habitat for wildlife. Because non-market goods (resources) and services are not traded in the market, special economic methods must be employed to estimate the values people place on these goods and services. The economic valuation of non-market resources is now a normal part of governmental decision-making and analysis: government agencies use non-market valuation methods to estimate the value of coastal resources and to evaluate the potential economic impacts of policies. The National Oceanic and Atmospheric Administration (NOAA) serves as an example of an agency that has used non-market values to quantify physical damages to coastal ecosystems. NOAA's multidisciplinary team relies on both market and non-market value data when making assessments, deciding on restoration alternatives, and determining compensation, as illustrated in the agency's valuation of the 1993 Tampa Bay oil spill [5].

Estimates of non-market values can be used in designing management policies for beach nourishment, marine protected areas, coastal recreation, coastal wetlands restoration, marine wildlife protection, and water quality. Most applications of non-market methods, however, are expensive and time-consuming; policymakers rarely have the luxury of commissioning original studies to find these values. Fortunately, over 70 peer-reviewed, non-market valuation studies pertaining to oceans and coasts have appeared in the literature over the last three decades. Policymakers may be able to turn to this literature to gain insight regarding the values of the resources they must manage. The transfer of values from the literature to policy can involve complicated attempts to modify values in order to best suit local applications (benefit transfer) or may simply involve the use of summary data to provide policymakers with a clearer idea of the potential value of non-market coastal resources. The development of non-market values for coastal and marine resources, however, has not been well planned for the purpose of benefit transfer and certainly has not been undertaken within a comprehensive strategy for use by policymakers. The ultimate usefulness of this body of literature for policy-making will certainly be constrained by the comprehensiveness and quality of values found within the literature.

In this review and analysis, we examine the peer-reviewed literature to understand the degree to which the published literature provides the valuation data needed for coastal and marine management. We describe and analyze the comprehensiveness, timeliness,

geographical completeness, and methodological breadth of the peer-reviewed valuation studies for coastal and ocean non-market resources in the United States. In doing so, we attempt to assess the degree to which the peer-reviewed literature provides useful non-market data for coastal and ocean resource management in the continental United States, Hawaii, and Alaska, including resources in the Great Lakes. We identify coastal and ocean resources that have received considerable attention by economic researchers and also those resources for which values are not widely available. The geographic coverage of valuation estimates available in the literature is explored and spatial gaps in our knowledge of non-market ocean and coastal values are identified. Finally, we explore the degree to which value estimates have been made using multiple estimation methods. We term this latter dimension methodological breadth.

The first section of this paper is an overview of the relevant non-market literature databases. Cross-sectional and trend analyses of the literature follow. We close with a discussion of the challenges that must be addressed in order to create a body of knowledge regarding non-market values that will be sufficiently rich to support sound policy-making in the coastal zone.

2. Economic valuation databases

In the last three decades, many non-market valuation studies have been conducted on coastal and ocean goods and services. Because these values have proven useful for policy evaluation and analysis, at least six major bibliographic databases have been created to organize and present these studies. Below is a descriptive inventory of the online bibliographic databases which include studies relevant to the coast and ocean.

The Environmental Valuation Reference Inventory (EVRI) is an international database of non-market studies that can be accessed in three different languages. The EVRI allows the user to choose the good or service valued and identifies studies with potential for benefits transfer (e.g. values from one study can be used to value an asset elsewhere with similar conditions). The EVRI contains concise and detailed information about the methods and approaches taken in existing valuation studies. There are six main categories of information, contained in more than 30 fields, including geography, environmental stressors, specific/general goods and services, and valuation technique. Recent entries in the EVRI are concentrated in the area of water valuation studies, with about 5% of the 1500 studies available being specific to saltwater and beaches in the United States. The scope of the database also has been broadened to include valuation studies for many types of natural capital from all parts of the world.

The Beneficial Use Values Database (BUVD) is a database of economic values for beneficial uses of water. It aims at providing information on the types of economic values specific to water-based amenities, including values of water for recreation, habitat, municipal, and industrial uses. The BUVD contains descriptions of beneficial use values and the studies from which they were taken. There are a total of 131 studies conducted in the last 25 years, collected from a variety of sources, including scholarly journals, books, conference proceedings, government reports, and working paper series. About 25% of the studies are related specifically to coastal and marine resources.

Since 1985, the Coastal and Ocean Resource Economics (CORE) Program at the National Oceanic and Atmospheric Administration (NOAA) has conducted marine-related socioeconomic research for a wide variety of applications and geographic areas.

CORE projects include socioeconomic monitoring in the Florida Keys National Marine Sanctuary, a nationwide estimate of participation rates in marine-related recreation activities (part of the National Survey on Recreation and the Environment), an extensive beach valuation effort in Southern California, and valuation of both artificial and natural reefs. The program has conducted inventories of outdoor recreation areas and facilities in coastal areas and valuations of marine resources for outdoor recreation use. A complete description of these projects, available reports, data, and related links are provided through NOAA's marine economics website.

First released in 1995, the ENVALUE environmental valuation database, developed by the Environmental Protection Agency in New South Wales, Australia, is a collection of more than 400 peer-reviewed studies containing data on environmental values covering air, water and land quality, recreation, and other values for natural areas. The values estimated by the original studies are given in 2002 Australian dollars, but can be displayed in other currencies. Studies can be searched by selecting the environmental medium, the valuation method, and geographic location. Because the ENVALUE database covers a wide range of environmental topics, the number of studies specific to coastal and marine resources is limited; most are not focused on resources in the United States.

Prepared by Industrial Economics, Incorporated with support from the U.S. Fish and Wildlife Service, the Sportfishing Values Database provides a detailed account of 109 non-market valuation studies of sportfishing. Sixteen of these studies involve marine resources. To the extent possible, the database describes the resource and the basis for the reported value, including changes in species and resource quality characteristics. In addition, the database describes the statistical and methodological characteristics of the study, the valuation methodology, and other study-specific conditions.

3. The National Ocean Economics Program

The National Ocean Economics Program (NOEP) is the first Non-Market Values Portal dedicated to compiling and organizing bibliographic information on non-market valuation studies specific to coasts and oceans (including the Great Lakes). This database includes over 150 studies, of which nearly 110 studies are based in the United States. NOEP's database has a significant number of beach-related studies, but also includes other coastal and ocean assets. Studies in the NOEP include journal articles, technical reports, working papers, and book chapters. The studies are categorized in a manner that facilitates navigation of the literature by analysts, policymakers, and others interested in the non-market value of coastal and ocean resources http://noep.mbari.org/.

The literature in the NOEP portal was compiled using a two-step approach. The initial step involved a query of studies that are available online through major search engines, including Google and Google Scholar, Web of Science, and EconLit—an electronic bibliography of the economics literature. Varying combinations of keywords related to the non-market valuation of coastal and marine resources were used in constructing queries (Table 1). Search results were reviewed for all studies relevant to the NOEP database. Second, existing databases of valuation studies, summarized above, were consulted to supplement the literature that could be found using online search engines. For each database with a 'keyword' search option, keywords similar to those entered in Google, Google Scholar, Web of Science, and EconLit were used. Many of the databases also include word-specific search protocols. In those cases, terms related to marine and coastal

Table 1
Search engines and keywords for article discovery

Search engine/database	Search words[a]
Google/Google Scholar/ EconLit/Web of Science	Marine, coastal, non-market, valuation, travel cost, hedonic, contingent valuation, marine economics, coastal economics, United States
BUVD	Data field to query: 'Amenity'
	Refine search under 'Amenity' by choosing: 'beach recreation and water quality,' 'beach re-nourishment,' 'coastal wetlands,' and 'endangered marine mammal protection'
NOAA	Marine, coastal, non-market, valuation, marine economics, coastal economics, assets listed the NOEP Non-Market Portal
ENVALUE	'Country' (US)
	'Medium' (water quality and natural areas)
	Refine search under 'water quality' by choosing: 'recreational water'
	Refine search under 'natural areas' by choosing: 'beaches,' 'coastal,' 'wetlands.'
Sportfishing Values Database	Data field to query: 'Habitat'
	Refine search under 'Habitat' by choosing: 'Marine' and 'Great Lake'
EVRI[b]	Keywords: marine, coastal, non-market, valuation, travel cost, hedonic, contingent valuation, marine economics, coastal economics, United States
	'Environmental Asset': 'saltwater' or 'beaches'
	'Geographic Characteristics': 'United States'
	'Environmental Goods and Services': assets listed in the NOEP Non-Market Portal

[a]Used separately and in varying combinations.
[b]When entering an author's name in the EVRI database, only the last name is recognized (i.e. when searching for publications by George Parsons, entering 'George Parsons' produces zero results; entering 'Parsons' produces six results).

resources were chosen (Table 1). This database obviously is not comprehensive as many technical reports and older peer-reviewed articles may not be available through these sources. Nevertheless, we assume that the literature in the NOEP, and also the literature found through these online search engines and online literature databases, comprise a representative sample of the kinds of valuation studies that would be most readily available to the public. In the discussion, we explore ways in which the availability of studies ought to be improved to enhance the use of non-market studies in policy analysis and development.

4. Economic valuation methods

Non-market valuation methods measure the use or non-use values of environmental assets. Use value is the value society places on the active, direct use of an asset. The use can either be extractive (e.g. recreational fishing) or non-extractive (e.g. snorkeling). Non-use values reflect the value of an asset beyond any immediate and direct use by people. One type of non-use value, existence value, is the amount society is willing to pay to guarantee that an asset simply exists regardless of actual use (e.g. willingness to pay for the protection of an endangered species). For example, an individual might place a value on gray whales without ever going whale watching. Some non-use values measure a society's willingness to

pay for the option to use the asset in the future (e.g. option values and bequest values). The NOEP and this analysis focus exclusively on non-market valuations of use values.

Methods to capture the non-market economic value of environmental goods and services fall into two categories: revealed preference and stated preference methods. Revealed preference methods identify the underlying preferences for goods and services based upon the market and non-market choices users reveal in their consumption patterns [6]. Stated preference methods, on the other hand, rely on society's expressed willingness to pay for an environmental amenity. In stated preference methods, surveys are used to elicit values from people regarding their willingness to pay for environmental goods and services (or willingness to accept degradation of these resources). Often stated preference methods attempt to value a hypothetical provision, loss, or change in a resource.

The travel cost method, a revealed preference method, is used to estimate the economic use value of environmental sites used for recreational purposes (e.g. snorkeling, recreational fishing, beach visits). The assumption is that recreational sites have different travel costs (e.g. travel time, entrance fees, parking fees, lodging) and that consumers traveling from varying distances to the site(s) must take these costs into consideration when deciding where to visit. The travel and access expenses that would be incurred by visitors to sites represent prices for these recreational sites and thus information regarding the marginal value placed on trips to these sites. Information regarding the number of trips taken at different travel costs is gathered and used to create a demand function for a specific site. This demand function can be used to determine the amount of benefit derived for each visitor (also referred to as consumer surplus) that, when multiplied by the total number of visitors per year, indicates the total recreational benefits derived from that site. Since the first application of the travel cost method in the late 1960s, numerous other methods have emerged for using travel cost data to estimate the value of outdoor recreation and even changes in the quality and quantity of recreational opportunities (e.g. multiple site travel cost models, hedonic travel cost models, random utility site choice models) [7].

Another example of a revealed preference method for non-market valuation is the hedonic method. For coastal resources, the hedonic method is most commonly applied to the valuation of property. Hedonic methods use market prices, most often derived from the real estate market, to estimate the value of local environmental attributes. The method is based on the recognition that land and housing values are influenced by at least three types of characteristics: the physical attributes of the property, the attributes of the surrounding neighborhood, and environmental quality/amenities near and at the property (e.g. proximity to the beach or coastal wetland). The total price of the property is a function of these characteristics. Through statistical analysis, it is possible to estimate the contribution of these characteristics to the total sale price of the property and thus to estimate the implicit price of each characteristic. For example, if two houses have the same physical attributes and are located in the same neighborhood, but one has easy access to the beach while the other does not, then the difference in price is an indication of the value placed on beach access. Of course, the relationship between price and attributes is rarely so straightforward and, as a result, hedonic methods have been developed to tease out the relationship between environmental attributes and property values.

Contingent valuation methods (CVM) represent the largest categories of stated preference methods. We use CVM to describe all contingent and stated preference methods in the literature. In theory, CVM is capable of measuring both use and non-use

values. Most contingent valuation studies rely on surveys in which an individual's willingness to pay for an environmental good or service is elicited. CVM techniques have been used to value beach nourishment, water quality and its impact on recreation, and the protection of endangered species (e.g. sea turtles, gray whales). In their simplest form, contingent values are derived from respondents' willingness to pay for a beneficial environmental change or willingness to accept an environmental degradation. More complicated methods use contingent choices and rankings to reveal similar values.

5. Assessing the peer-reviewed literature

For the literature to serve as a solid foundation for the use of non-market values in coastal and ocean policy-making in the United States, it is important that the values available in the literature adequately represent the country's coastal and ocean resources. Furthermore, for these values to be robust, it is important that the methods employed are current. When possible, multiple estimates from a variety of methods may provide the analyst with greater confidence in the true range of values associated with a coastal or ocean resource.

Of the 110 non-market studies of US coastal and marine resources available in the NOEP database, 73 are peer-reviewed, journal publications dating from 1977 to 2005. In this section, we examine the coverage of this literature by looking first at the assets valued in the literature, the recentness of the value estimates, the geographic coverage provided by these asset valuations, and the methods used to estimate these values. Finally, we briefly examine the role that authors and journals have played in the publication of valuation estimates.

5.1. Comprehensiveness of assets valued

Studies in the NOEP database are categorized based on the asset being valued in the study, but not the cause of the environmental change (Table 2).[1] For instance, a study that values the impact of pollutants on beach recreation would be categorized under the asset 'Beach.' These categories are not exclusive. It should be noted that the same study can involve more than one asset. The frequency and distribution of studies across asset categories has been patchy: some assets have dominated the field of non-market valuation throughout the last three decades, while other assets received relatively little attention or have just recently been valued.

Beaches have been valued more often in the literature than any other marine or coastal asset. The asset 'Beach' includes studies related to beach and shoreline recreation (excluding boating, fishing, and wildlife viewing), beach water quality, and beach nourishment. Beach studies appear consistently in the literature, with a slight increase in the number of publications following 1990 (Table 2).

Studies on recreational fisheries and coastal property (categorized as 'Land' in the NOEP database) are the most numerous after beach studies. Marine recreational fishing was valued in 16 studies, published mostly between 1989 and 1995. Between 2000 and 2005, however, the number of studies related to recreational fisheries declined considerably. Valuations of coastal property, which appear 15 times overall in the literature, began sporadically in the 1980s and appeared more consistently in the 1990s,

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[1]The one exception is Boating—a category that includes any research that estimates a value for some kind of recreational boating activity.

Table 2
Assets covered in the peer-reviewed literature: Every 5 years

Asset	1976–1980	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	Total
Beach	1	3	4	10	8	7	33
Fishery	1	0	6	6	3	0	16
Land	0	2	1	6	5	1	15
Coastal wetlands	0	1	3	1	1	1	7
Wildlife	0	0	1	2	2	0	5
Boating	0	0	0	1	2	0	3
Ecosystems	0	0	1	0	1	1	3
Estuary	0	1	0	1	0	1	3
Marine protected area	0	0	0	0	0	2	2
Coastal farmland	0	0	0	0	0	1	1
Reefs	0	0	0	0	0	1	1
Ocean information	0	0	0	0	0	1	1
Watersheds	0	0	1	0	0	0	1

with about one study published annually. In later years, the number of studies on land values decreased. Coastal wetland valuations have appeared at consistently low levels across the period examined.

Other assets have not been covered as extensively as beaches and fisheries (e.g. wildlife, reefs, marine protected areas). Only five studies in the literature include non-market values for wildlife (i.e. all studies dealing with marine life, biodiversity, oil spills that impact wildlife, and endangered species). Although the marine waters of the United States include over 6000 square miles of coral reefs, very few studies in the peer-reviewed literature have been devoted to valuing reefs. Finally, marine protected areas have received relatively little attention in the peer-reviewed literature.

5.2. Timeliness

For values to be relevant for current policy-making, they need to reflect current estimates of non-market values. The rate of publication of non-market valuation studies for coastal and ocean resources peaked in the 1990s (Fig. 1). As a result, many of the non-market coastal and ocean values we find in the literature are at least 10 years old.

The literature is most thin for those assets that have least often been the subject of research (Table 2). For example, while the literature has consistently produced articles on beach values, there are fewer recent studies on coastal wetlands, recreational fisheries, or coastal land (Fig. 2). This means any attempt to use benefit transfer in valuing current coastal wetlands would involve relying on values dating back to the 1980s. Since methods have been refined and preferences have changed over time, dependence on older valuation data can affect the accuracy and relevancy of values derived through benefit transfer.

5.3. Geographical completeness

While the non-market valuation studies in the peer-reviewed literature appear to be evenly distributed among all coastal regions (Fig. 3), the coverage of assets across all states
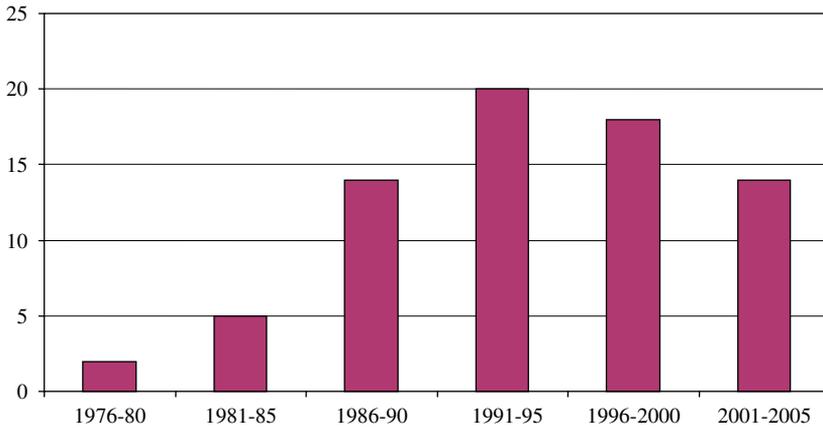
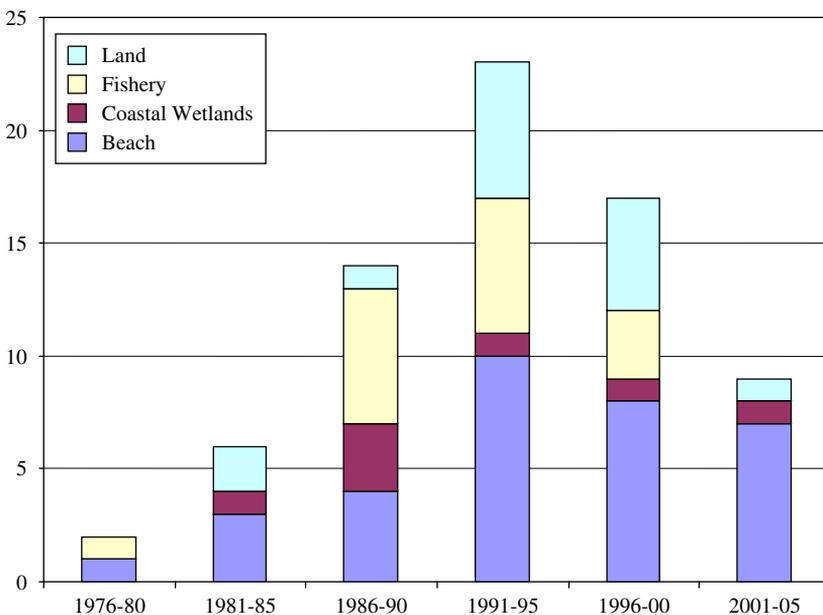Fig. 1. Publications of non-market coastal and ocean valuation studies: Every 5 years.

Fig. 2. Publications of selected assets valued: Every 5 years.

is highly uneven (Fig. 4). For instance, in California, a series of publications appeared on the valuation of its beaches starting in the mid-1990s. Publications that have valued Florida's coast have focused on a broad array of assets including beaches, reefs, marine protected areas, and fisheries while studies in North and South Carolina follow the pattern seen in California where most publications report values for beaches and coastal property. Several studies have also been conducted in New England, mostly in Rhode Island and Massachusetts. Only seven studies in the literature provide values for the Gulf States'
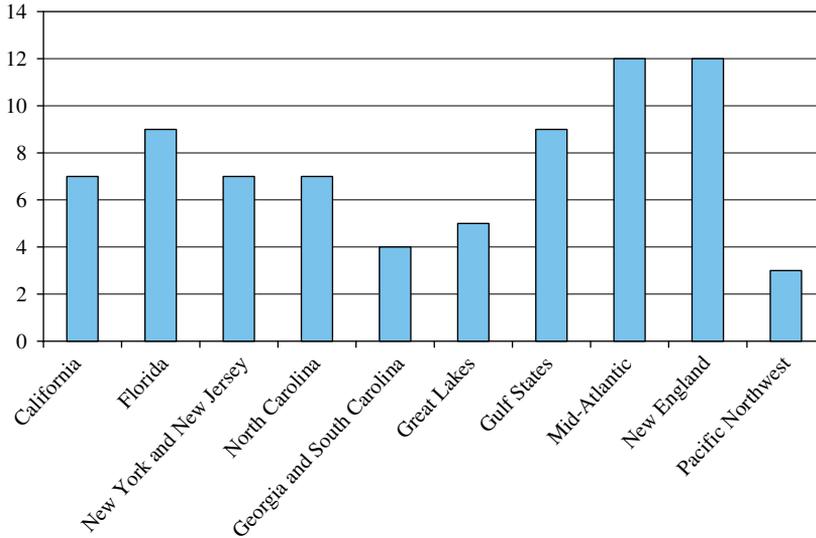
Fig. 3. Publications by state or region. Regions are defined as Mid-Atlantic: DE, MD, VA; Pacific Northwest: AK, WA, OR; Great Lakes: OH, PA, WI; New England: MA, ME, NH, and RI; Gulf States: TX, LA, AL, and MS.

coastal resources, most focus on wetlands in Louisiana. Even fewer studies have been conducted in the Pacific Northwest (e.g. Washington, Oregon, and Alaska) and on the Great Lakes.

5.4. Methodological breadth: the application of multiple methods to assets

Because valuation estimates are often sensitive to the valuation method used, it is helpful to have value estimates from multiple methods. Studies in the NOEP database are categorized based on the non-market valuation method(s) applied in the study. With respect to the methods used in the 73 peer-reviewed journal publications, most can be categorized as some type of travel cost, hedonic, or contingent valuation method. It should be noted that the same study can involve more than one method.

Travel cost, contingent valuation, and hedonic methods account for most of the valuation methods applied in the literature. Travel cost methods are used in 29 papers, contingent valuation in 27 papers, and hedonic in 26 papers. However, the distribution of these methods over time is not uniform. Relatively few non-market coastal and ocean studies appeared before the mid-1980s. In the late 1980s, however, many articles in the literature focused on the application of travel cost methods to marine and coastal resources. Shortly thereafter, contingent valuation and hedonic methods appeared with similar frequency to travel cost methods. In later years, a slight shift occurred with fewer hedonic methods studies appearing in the marine and coastal literature (Fig. 5).

While each of these three methods (travel cost, hedonic, and contingent valuation) appear in the literature in relatively equal numbers, their distribution among assets has not been uniform (Fig. 6). Certain methods (e.g. the travel cost and random utility models) are disproportionately associated with particular kinds of assets or uses (e.g. beach or
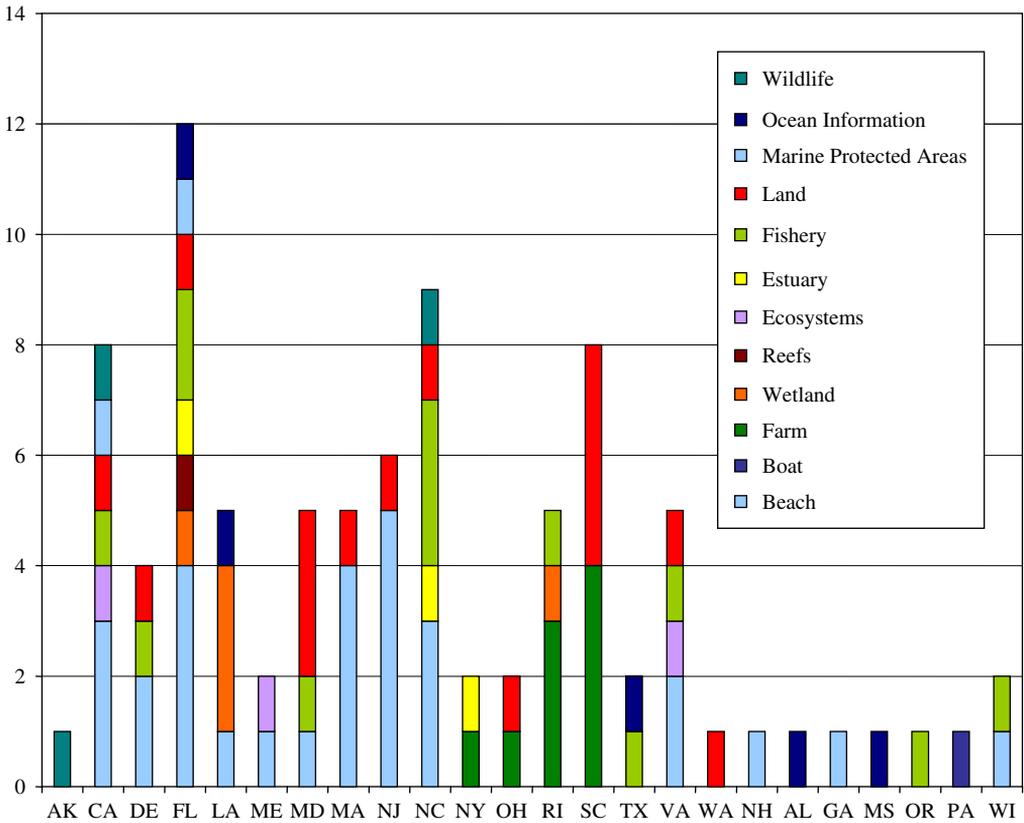
Fig. 4. Assets valued across states in the literature.

recreational fishing site choice). Within the major asset categories, however, 52 of the 73 studies examined fall into one of the following five categories[2]: (1) travel cost method used to value beaches (11), (2) travel cost method used to value fisheries (14), (3) hedonic method used to value land (15), (4) hedonic method used to value beaches (13), or (5) contingent valuation method used to value beaches (13). Beach values have been estimated using every major valuation technique. The breadth of methodological approaches used to measure other assets is much narrower.

5.5. Authors

Certain authors have made considerable contributions to the valuation literature of coastal and ocean non-market resources in the United States. V. Kerry Smith, Kenneth McConnell, James Rinehart, Jeffrey Pompe, Nancy Bockstael, George Parsons, Yoshiaki Kaoru, and Catherine Kling have the largest number of peer-reviewed publications containing non-market coastal and ocean values.[3] Collectively, theses eight authors

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[2]Some studies use more than one method.

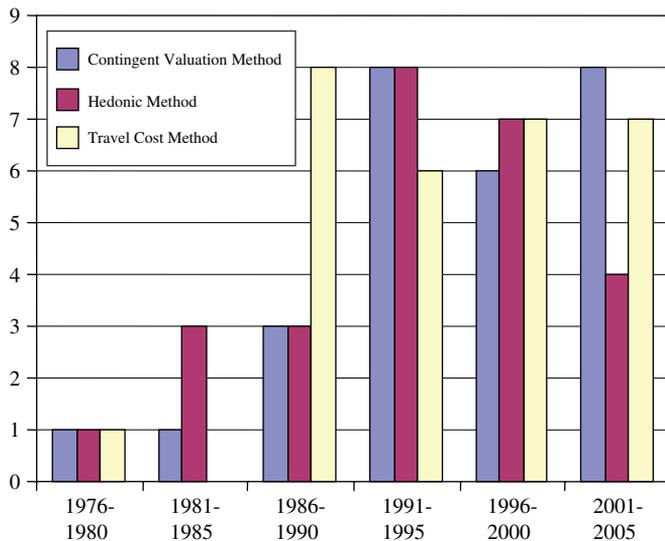[3]Many of these authors are co-authors.
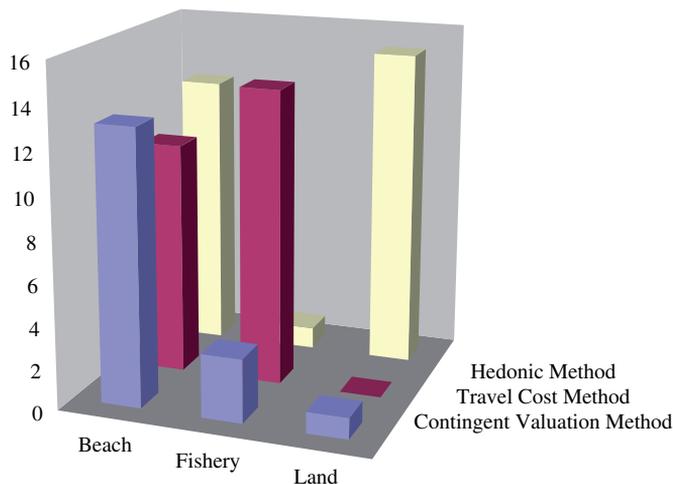
Fig. 5. Number of publications by methodology.

Fig. 6. Distribution of methods used and assets valued.

account for 35% of the peer-reviewed publications in the NOEP database with 25 papers in all. It is important to note that the pattern of authorship is likely to be significantly different in the gray literature. These authors, taken together with other prolific authors from the gray literature (e.g. Michael Hanemann and Vernon R. Leeworthy), have done much to shape the content of non-market values for coastal and ocean resources currently available in the literature.

The regional focus of many authors may explain the uneven geographic distribution of value estimates (Table 3). Of the eight authors examined, four valued the same region in all

Table 3
Papers by most prolific authors by region[a]

	California	Florida	Great Lakes	Mid-Atlantic	New England	New Jersey	North Carolina	South Carolina
Catherine L. Kling	1		1		1			
George R. Parsons				3				
James R. Rinehart								4
Jeffrey J. Pompe								4
Kenneth E. McConnell		1		4	2			
Nancy E. Bockstael		1		4	1			
V. Kerry Smith						1	5	
Yoshiaki Kaoru							2	

[a]This table refers to prolific authors in the peer-reviewed literature only. Some papers discuss more than one region; others are not region-specific. For these reasons, the total number of publications per author is not evident from this table.

of their papers. Some valued multiple regions in a single paper, thus some authors sum to more than 100%. Not surprisingly, the regions valued are frequently regions in which the authors reside and conduct their research.

Additionally, because of co-authoring, many of these authors value the same regions as each other and many regions of the United States are not valued by any of them (e.g. Pacific Northwest, Gulf of Mexico). For example, each of Pompe's four papers was co-authored with Rinehart; Bockstael worked with McConnell or Kling on three of her four publications. The authors examined also vary considerably in their usage of different methodologies (Table 4). Kling, McConnell, Bockstael, Smith, Parsons, and Kaoru all make use of several methodologies, often in the same publication, while Rinehart and Pompe use a single methodology (the hedonic method) in each of their papers, exclusively. All of the most prolific authors use revealed preference methods more frequently than contingent valuation.

5.6. Journals

Coastal and non-market valuation studies have appeared in at least 20 journals. Four journals have published the most studies related to the non-market valuation of coastal and marine resources: *Journal of Environmental Economics and Management* (*JEEM*), *Land Economics*, *Coastal Management*, and *Marine Resource Economics* (Fig. 7). *JEEM* and *Land Economics*, the first of the major journals to publish non-market marine and coastal studies, published a steady stream of these articles from the late 1970s to the 1990s. *Marine Resource Economics* followed from the mid 1980s to the mid 1990s, but has

Table 4
Proportion of papers by most prolific authors by methodology

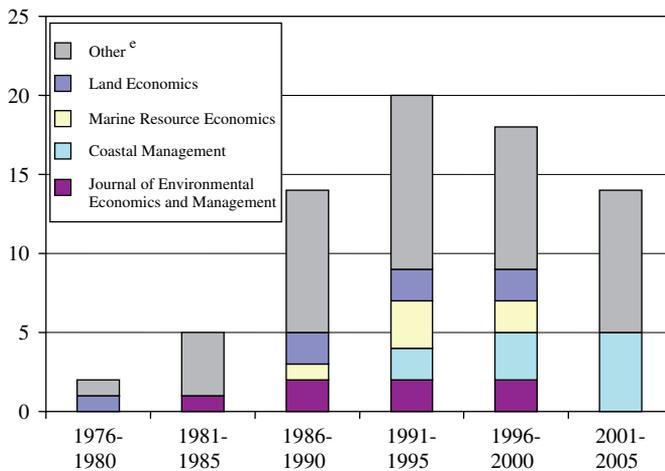|	Contingent valuation (%)	Hedonic method (%)	Travel cost method (%)
Bockstael, Nancy E.		50	75
Kaoru, Yoshiaki	33		66
Kling, Catherine L.		33	100
McConnell, Kenneth E.	20	20	80
Parsons, George R.		75	25
Pompe, Jeffrey J.		100	
Rinehart, James R.		100	
Smith, V. Kerry	20	40	40

Fig. 7. Publication trends in selected journals. [e]Examples of 'Other' include: Ecological Economics, Water Resources Research, Environmental and Resource Economics, and Ocean & Coastal Management.

recently decreased its publication frequency of these kinds of studies. Starting in the late 1990s, the number of non-market studies in *Coastal Management* increased and now the journal publishes more studies about the non-market valuation of marine and coastal resources than any other journal. From 2001 to 2005, *Coastal Management* was the only journal of the four to publish articles of this kind. The shift from *JEEM* and *Land Economics* to *Coastal Management* may reflect a paradigm shift in the application of non-market valuation to marine and coastal resources. *JEEM* and *Land Economics* tend to focus on methodological advances, while *Coastal Management* focuses on policy applications. This shift could imply a movement in the use of non-market valuation methods from economic research to coastal management and policy.

6. Conclusion

Policy analysts need non-market valuation data on ocean and coastal resources to make better informed policy. Whether they simply want a summary of relevant values or a more thorough set of data and methods to conduct benefit transfer, analysts face a number of

important challenges. First, finding the results of valuation research can be difficult. Second, policy analysts must be able to locate previous research that meets a number of criteria: (a) the research must include values for resources that are similar to those of interest, (b) the valuations must have been conducted using modern methods, and (c) policy analysts will often benefit from having one or more studies to rely on when examining values from the literature. Third, policy analysts need a way of assessing the quality of the available research. Without other indicators of quality, many analysts turn first to the peer-reviewed literature to ensure a minimum level of quality—an exercise that may seriously limit the ability of the analyst to find research and values to support decision-making.

Fortunately, finding valuation research is becoming increasingly easy. More than 100 research papers and publications on non-market valuations of coastal and ocean resources can be found online. Unfortunately, though, serious challenges remain in finding research that will adequately support the data and quality needs of coastal and ocean managers and policy analysts.

The articles reviewed in this paper do not represent the literature in its entirety—only those articles for which bibliographic information has been referenced, catalogued, or is otherwise available online. Nevertheless, these articles do represent the bulk of the peer-reviewed non-market valuation literature that would be available to coastal and ocean managers and policy analysts.

The peer-reviewed publication of studies on the non-market valuation of coastal and marine resources in the United States has a long history, yet the frequency of publication in recent years has declined. Furthermore, the depth of the literature is seriously concentrated on four assets: beaches, recreational fishing, coastal lands, and wetlands. Analysts interested in other important coastal and marine assets and uses (e.g. watersheds, wildlife viewing, estuaries, and private boating) will find only scant resources in the published literature.

The geographic coverage of the literature is similarly concentrated. A small handful of authors are responsible for much of the research output on non-market valuations in the coastal zone. These authors tend to focus their research locally. As a result, there is a relative paucity of valuation information in the peer-reviewed literature for a number of states and regions including the Pacific Northwest, Texas, the Great Lakes, Long Island Sound and New Jersey, and many southern states outside of Florida and North Carolina. Policy analysts working in these areas would find the peer-reviewed literature inadequate; the result is that the non-market values for resources in these coastal areas often are poorly understood.

If previous research on the non-market valuation of coastal and marine resources is going to be used effectively to inform coastal zone policy, four major issues must be addressed:

(1) there is a need for a clearinghouse of published literature that is constantly updated with direct assistance from authors, journals, and granting agencies;
(2) better use of the gray literature (technical reports, working papers, etc.) must be made including some attempt to provide quality information for non-peer-reviewed research;
(3) more of the peer-reviewed and gray literature need to be made available online. Many papers, including published articles in journals, are not available without a subscription and many journals are not even available on most university campuses;

(4) granting agencies must direct more research funding to coastal and marine assets and coastal regions that have remained poorly researched and explored from a valuation perspective. High priority assets include wildlife viewing, wetlands, estuaries, watersheds, and private boating. High priority coastal regions include the Pacific Northwest, the southern states (excluding Florida and North Carolina), and the tri-state area of New Jersey, New York, and Connecticut.

The NOEP is moving forward with an information system that will act as a clearinghouse for the peer-reviewed and gray literature. The NOEP will also work with authors to provide more information regarding methodology, statistical significance, and the collection of meta-data that will allow analysts to make more informed decisions about the quality of valuation data—especially the many valuation results that are available only through the gray literature.

The ability of the NOEP to help policy analysts better use non-market valuation data, however, is limited to existing research. Government agencies, coastal commissions, foundations, and other funding sources need a more structured and well-defined plan of research support so that future valuation research provides a more solid, consistent, and comprehensive foundation for coastal management. A national workshop on non-market valuation research needs and goals could dramatically improve the ability of new, original research to meet the needs of coastal managers and policymakers throughout the United States.

Acknowledgments

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