NBP-90-30

Qualitative & Quantitative Analysis of Shore & Near-shore Users

of the Upper Narragansett Bay, Rhode Island 157 pp

West (URI)

Remote Sensing of Upper Narragansett Bay

Using Spot-1 Imagery 22 pp

West & Snyder (URI)

This report includes NBP-90-40

Narragansett Bay Estuary Program

Current Report

The Narragansett Bay Project

QUALITATIVE AND QUANTITATIVE ANALYSIS OF SHORE AND NEARSHORE USERS OF THE UPPER NARRAGANSETT BAY RHODE ISLAND

Neils West
Department of Marine Affairs
University of Rhode Island

NBP-90-30

The Narragansett Bay Project is sponsored by the U.S. Environmental Protection Agency and the R.I. Department of Environmental Management.

FOREWORD

The United States Congress created the National Estuary Program in 1984, citing its concern for the "health and ecological integrity" of the nation's estuaries and estuarine resources. Narragansett Bay was selected for inclusion in the National Estuary Program in 1984 and designated an "estuary of national significance" in 1988. The Narragansett Bay Project (NBP) was established in 1985. Under the joint sponsorship of the U.S. Environmental Protection Agency and the Rhode Island Department of Environmental Management, the NBP's mandate is to direct a five-year program of research and planning focussed on managing Narragansett Bay and its resources for future generations. The NBP will develop a comprehensive management plan by December, 1990, which will recommend actions to improve and protect the Bay and its natural resources.

The NBP has established the following seven priority issues for Narragansett Bay:

* management of fisheries
* nutrients and potential for eutrophication
* impacts of toxic contaminants
* health and abundance of living resources
* health risk to consumers of contaminated seafood
* land-based impacts on water quality
* recreational uses

The NBP is taking an ecosystem approach to address these problems and has funded research that will help to improve our understanding of various aspects of these priority problems. The Project is also working to expand and coordinate existing programs among state agencies, governmental institutions, and academic researchers in order to apply research findings to the practical needs of managing the Bay and improving the environmental quality of its watershed.

This report represents the technical results of an investigation performed for the Narragansett Bay Project. The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement #CX812680 to the Rhode Island Department of Environmental Management. It has been subject to the Agency's and the Narragansett Bay Project's peer and administrative review and has been accepted for publication by the Management Committee of the Narragansett Bay Project. The results and conclusions contained herein are those of the author(s), and do not necessarily represent the views or recommendations of the NBP. Final recommendations for management actions will be based upon the results of this and other investigations.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This project is in two parts. The first analyzes the results from three sets of questionnaires conducted during the Spring, Summer and Fall of 1987 directed at shorebased recreational fishers, passive users, and boaters in the Upper Narragansett Bay. The second part develops an empirical user estimation model quantifying the existing usage of thirteen public facilities located along the shores of the UNB. The data used for the second part of the analysis was based on a series of facilities reports where the primary purpose was to estimate the number of existing users (passive and active) within the eleven facilities surveyed. A total of 130 facility reports were analyzed in order to accomplish this task.

EXECUTIVE SUMMARY

This report is in two parts. The first analyzes the qualitative and quantitative aspects of the Upper Narragansett Bay (UNB) users. The second part consists of a shoreside landcover survey and an unsupervised SPOT remote sensing analysis of the municipalities bordering the UNB.

The objective of the first part of this report is to identify both the shore and nearshore users of the UNB. The second objective estimates the existing number of users in each of the eleven recreational sites identified within the UNB.

The information on which this report is based is obtained from two independent sources. Onsite user surveys were undertaken during the Spring, Summer, and Fall of 1987. Both qualitative and quantitative data were collected. To accomplish the second objective, a facility survey was developed which emphasized the number of users visiting each of the eleven facilities. A total of 130 facility reports were collected.

Major Findings: The UNB is an outdoor recreational resource catering to the needs of fishermen, boaters, park and beach visitors, bicyclists, strollers and joggers. It is especially popular among shorebased fishermen, most of whom are employed in blue collar positions. Although physical access has been elevated to a top priority issue within state government and special interest groups, it does not appear to be of great importance to this user group.

The UNB is homebase for a considerable fleet of recreational vessels, both sail and power. The boaters fall into two groups: general and fishermen, neither of which considers the UNB a valuable boating area in its own right. Most perceive the UNB as a link to the central and lower Narragansett Bay. Most of the passive users appear to come from neighboring municipalities within a short drive from home. Unlike shorebased fishermen and boaters, the passive users seem less affected by and concerned with the environmental quality of Bay shore and beach. This may be because relatively few of these users come into direct physical contact with the water.

The empirical model was developed based on the facility reports covering eleven recreational shore sites. Although not able to test the model among all sites, modelled results from three of the facilities were compared to their respective number of known visitors. One of these included Colt State Park, the largest facility located within the study area.

The model estimates a total of 378,000 user days spent on the UNB during the recreational season. Beach and park visitors account for about one-third of the total usage.

The UNB appears to be underutilized, but could accommodate additional users and activities. The UNB is a valuable, albeit underutilized, resource for the Greater Providence Metropolitan Area. Increases in both passive and active recreation is possible as water quality continues to improve.

Recommendations: This preliminary study has sought to describe and estimate the qualitative and quantitative aspects of current usage within the UNB. As such, it develops a baseline from which projections of future uses can be made. Three research recommendations and several policy recommendations are advanced.

First, there is clearly a need to identify the potential for increasing waterfront usage in the metropolitan core, as well as suburban communities. This would require a more detailed inventory of existing recreational sites, as well as sites which could be developed for additional recreational and commercial usages.

A second recommendation builds upon of the questions included in this survey. To improve shore and nearshore recreational opportunities, there is a need to identify the user's future expectations (projected demand) and relate these to the existing recreational site inventory.

The third recommendation deals with the many urban waterfront recreational studies that have been conducted in recent years. The majority of these are site specific, with few efforts made to extend findings to other areas and situations. There is a real need to summarize these research efforts in an effort to develop models and formulate hypotheses. Such accomplishments will result in greater efficiency of scarce research monies and lead to better utilization of equally scarce waterfront sites. The high pollution loadings present in the

UNB pose potential hazards to recreational fishers who also utilize part of the catch as subsistence. A combined creel and epidemiological study should be undertaken, to assure that the catch caught in this waterbody are indeed safe to consume. Similar studies have been undertaken in New York City a number of years ago following a shorebased research project comparable to the one developed here.

The relatively low recognition factor of the users of the UNB is apparent among several of the state and federal environmental agencies, poses a potential danger if and when future environmental bond issues will be brought before the general public. If the public is unaware of which agency is responsible for what and how well it has done in managing the state's most fragile resource, future bond issues may not be as easy to pass. DEM and other environmental management agencies need to educate the general public about environmental accomplishments as well as areas in need of further improvements. While considerable efforts are currently underway to revitalize the Providence downtown, encompassing a marginal section of the riverfront, much more could and should be done by both the city and the state to revitalize the remainder of the urban water front. This recommendation also covers East Providence and to a lesser extent North Providence. The Providence land-water interface represents a very unique opportunity to integrate legitimate port and marine activities with recreational uses (passive and active) that are likely to benefit the urban area both qualitatively and quantitatively.

There are substantial portions of the UNB shoreline that are presently underutilized and have the potential, under a different set of environmental circumstances, to become one of the most exiting and attractive parts of the metropolitan area. The cities and municipalities should aggressively seek state and federal funding to revitalize the waterfront, similar to efforts being undertaken in other waterfront communities.

Finally, it appears that considerable discrepancies exist between how the users define water and shore quality and how the scientist define it. To the extent it is safe from pollution? It is suggested that many portions of the urban waterfront is underutilized at the present. Passive recreational activities could be accommodated in areas which may not be suitable for contact sports and activities. Similarly, it is possible that some of the areas which are approaching overutilization could be relieved by improving some of the underutilized facilities. It is clear that the UNB represents an important environmental resource which use could be increased if a) attitudes and perceptions were included in the planning process and b) continued environmental improvement takes place within the UNB.

NARRAGANSETT BAY PROJECT

Following an introduction, this report is in two parts. The first summarizes the user characteristics of the Upper Narragansett Bay, hereafter referred to as the UNB, defined as that part of the Narragansett Bay, Providence and Seekonk Rivers which extends north from a line drawn between Popasquash Point in Bristol northwestto Providence Point on Prudence Island and west to Sand Point on Warwick Neck. The northern boundary of the study area is the Rt. 195 Bridge crossing Seekonk River (Fig. 1 and map included in appendix A). The second part of the report seeks to develop an estimate of the overall use of the UNB. Attempts have been made to address individual use categories of which the following three were recognized: passive uses, shorebased fishing, and boat use.

Introduction:

In many ways, the UNB represents the forgotten part of Narragansett Bay which has been the subject of several specific and some comprehensive studies in recent years. Specific studies have addressed the port and port-related facilities (Robadue, 1983). Several planning studies have analyzed the landuse patterns in the UNB as a preliminary step in developing a comprehensive urban waterfront plan (Interface, 1974, RI CRMC,

FIGURE 1

1983). However, compared to the considerable efforts addressing biological, physical, chemical and social problems throughout the Bay, the UNB represents the most heavily utilized in terms of commercial and residential uses; yet from a socio-environmental perspective, we know comparatively little about how the UNB shores and waters are being used in a recreational context (Spaulding, 1973, Collins & Sedwick, 1976, Hennessey and Robadue, 1986, RI Div. of Planning and RI DEM, 1986). Considering that marine recreational activities in coastal states, including Rhode Island, constitute the first or second most important economic sector (Tyrrell, 1989), and further considering that the state's largest urban concentration is located along the shores of the UNB, it is indeed surprising that so little attention has been given to this important portion of the Narragansett Bay.

One of the major objectives of this study is to relate usage; more specifically, the user's attitudes, perception and environmental behavior to the manner in which the UNB is defined or described scientifically. Additionally, investigation is made on how the governance system is being perceived by the users with respect to the relative quality of the water and shore.

While not the emphasis of this report, it is hypothesized that the operational environment, while based on the physical, chemical and biological environment as defined by the scientists, is influenced by a host of factors which has very little to do with the biochemical and physical characteristics

of the Bay (West, 1989). Such factors are influenced by the political decisions which have been made concerning the Bay, numerous newspaper and television items, the individual's own observations and recollections of how the Bay used to be, and any number of educational, social and geographical factors.

The important concept to keep in mind is that the UNB should be viewed as a holistic system where the resource base is made up of the biophysical and chemical elements on which a host of socio-economic and political considerations have been imposed. The inefficiency of the system is not solely a function of the quality of the UNB using conventional physical, biological and chemical parameters. Thus, we have long known the danger of ingesting contaminated shellfish (Myers and Harding, 1983); while outbreaks of red tides and other algae blooms are rare in Narragansett Bay, the perceptions of these and similar biochemical events are very likely to affect usage of the Bay shores, and waters. At the time of writing, many of the beaches in the Northeast, including several Rhode Island beaches, have been adversely impacted by medical waste products including blood vials, syringes and other similar paraphernalia. While no beaches have been closed in Rhode Island as a result of these impacts, real and imagined fears of contracting AIDS, hepatitis and other debilitating diseases have very severely affected beach attendance in both New York and New Jersey.

Resource efficiency then represents a continuum where a given resource has certain utilities associated with it which

may or may not be affected by the quality defined physically and/or biochemically (Edwards, 1987). An example may exemplify this concept. Even the worst waterbody retains some recreational utility in the sense that it may be pleasant or interesting to look at even though both the water and shore may be dirty or littered and unfit for most contact activities. The heavily industrialized harbor, the shoreline of which may contain few "natural" features, represents a valuable environment for certain passive recreational activities; in fact, the commercially active waterfront represents in many ways an opportunity which far too rarely is being used in a recreational context. The working waterfront is an interesting place to visit and observe if it can be accomplished without hindering the primary purpose of the port and if it can be done without endangering the health and welfare of the viewing public (Hershman, et al, 1978). It represents a recreational opportunity which far too often is being closed off to the general public.

The UNB shares many of the characteristics and problems identified above. Providence, the state's largest city, is located at the head of Narragansett Bay and which origin dates back to the Colonial period (Hale, no date). During the industrial revolution, Providence shared in the economic boom characterizing much of Southern New England. While much of the traditional milling and leather industries have long since left the state, Northern Rhode Island and Southeastern Massachusetts

still are the homes of a sizeable custom jewelry industry. This industry utilizes considerable amounts of electro-plating processing which results in significant amounts of inorganic waste products, much of which eventually end up in the UNB. The custom jewel industry has been held responsible for much of the industrial pollutants which have impacted the UNB. Other sources of effluents have resulted from the incomplete treatment of sewage by Providence and other municipalities bordering the Bay up to the late 1970's. Additionally, there is the contributio of the effluents from the Combined Sewer Overflows (hereafter referred to as CSO's), a problem which characterizes many of the older cities and towns in North America.

While the Narragansett Bay, including the UNB, has been the subject of numerous water-quality studies over the years, (Spaulding, 1974, Schultz and Quinn, 1977 Hurtt and Quinn, 1979, Olsen and Lee, 1979, Hoffman, Falke and Quinn, 1980, Oviatt, 1980, Hoffman et.al., 1983, Martin and Robadue, 1983, Swanson and Spaulding, 1983), it is clear that until recently few efforts have addressed the relationship between environmental quality, specifically water quality, and the perceived impacts on the consuming public. The only comprehensive studies are Brown et.al. and West op cit. The Brown study consisted of a telephone survey which elicited attitudinal and perceptional responses from a sample of Rhode Island residents. This study also sought to analyze water use, quality and user conflicts.

The West study analyzed the relationship between environmental quality perceptions among several groups of passive and active users overall in Narragansett and San Francisco Bays.

The present study seeks to continue these efforts by emphasizing the most critical portion of Narragansett Bay. Three major user categories were identified, including shorebased fishing, passive usage, and boat uses occurring within the UNB.

Procedures

Information required to undertake this study was obtained from the users of the UNB shores and water. While it was the original intention to include a quantitative estimate of current use of the UNB shore and water, this was not feasible as the number of sampling sites were too numerous and the number of users too few. Consequently, the first part of the study seeks to describe the environmental attitudes and perceptions of the three major user groups. The information generated from this initial effort then formed background for the second phase which sought to develop estimates of current usage on the larger facilities within the UNB.

Three surveys were developed, each targeting the three recreational user groups. Since we were interested in researching both the extent to which the three groups overlapped in their perceptions of the quality of the UNB, as well as identifying areas considered unique to each user category, three survey instruments were designed, each being an integral part of

a master survey which was used for coding purposes. The master survey is invisible to the respondents in terms of the subsequent analysis undertaken. The three survey forms appear in Appendix A. Since the respondents in some of the groups were few in number, the findings from this part of the study is limited to the user groups surveyed. The number of respondents within each user group does not necessarily relate to their relative strength within the total number of recreational users within UNB.

Two graduate students were responsible for undertaking the surveys during the summer and late Fall of 1987. Because of the unique conditions characterizing the various user activities occurring within the UNB, several different procedures were used to obtain the data. The boat survey was done passively in the sense that the survey itself (including navigational chart facsimile, self-addressed, return envelope and introductory letter) was placed in a plastic envelope and subsequently dropped in moored, anchored boats and boats in slips. Car-topped and trailered boats presented a different kind of problem. Both personally conducted interviews and passive surveys were undertaken usually at known ramps and other access points. A total of 1012 boat surveys were distributed 944 of which were left in moored or anchored boats. Ninety-two were left on cars with trailers and 75 left at Edgewood, Rhode Island and Narragansett yacht clubs. The combined boat response rate

was approximately 17.5 percent. Since the shorefishing and passive user surveys were done in the field, no response rate were computed for these surveys.

The shorebased fishing survey was conducted in the field as personal interviews during the actual fishing excursion while the information covering the passive recreational activities utilized both the interview and self-administered mode. It soon became clear that the return rate of the self-administered questionnaires was very low. Consequently, following the first few weeks all passive surveys were completed through personally conducted interviews.

While no statistical tests were conducted to check for differences in the responses between the two formats, no discernible differences appear in the type of responses from the two data sets.

Prior to the commencement of the field work, a detailed field survey was undertaken over a several day period during the summer of 1986, the year before actual field work began. This trip covered the entire waterfront by land as well as by sea and was made in an attempt to identify all likely locations where people fished or were otherwise engaged in recreational pursuits and served as the sampling template (Fig 1). The intent was to identify not only official areas (parks, ramps, pedestrian paths, beaches etc.) where coastal recreational activities take place, but also to identify areas which may not have been

designated as public access point but which are de-facto used for a variety of recreational pursuits, only some of which are water dependent.

Besides the user surveys, a facility survey was also undertaken. Soon after actual field work began it became quite apparent that the actual use of the UNB was considerably less intense than first anticipated. We were concerned that the same respondents might be interviewed more than once, and to insure a valid estimate of the quantitative aspects of the usage of the UNB shore and nearshore, we decided to develop a facility survey (Appendix B). The purpose of this instrument was to enable an estimation of the total usage of the UNB, a topic which will be addressed in greater detail below.

PASSIVE RECREATION ALONG THE UNB SHORELINE

Passive recreation in this report refers to those activities in which the shoreline acts as a backdrop which enhances the specific recreational activity in question. Walking, bicycling, sunbathing, etc. all are activities which could be undertaken elsewhere but which are enhanced by their coastal location. The only activities which may not fall entirely in the passive category as used here are beach-related activities, including bathing, although even these activities share many of the characteristics of the truly passive recreational activities.

In some studies, passive recreation activities refer to those in which little physical exertion is required. This classification is not used in the present context.

User Characteristics

Respondents included individuals regardless of age as long as they were able and willing to respond to the questions posed. Thus children of school age were included in the survey whether alone or in groups. When individuals from groups were surveyed we let the persons within the group decide who should be the spokesperson. Once a spokesperson had been selected the answers pertained to that individual unless the question covered the group or household. It is partially for this reason that this part of our survey can not be used to estimate the total

usage of the UNB. As mentioned elsewhere our primary purpose of the first phase of the study was to learn how and in what way the UNB waters and shoreline were used by the users.

The UNB shoreline provides passive recreational opportunities to people from all walks of life. The average household size of the passive users was slightly more than three persons (Table 1). More than 45 percent are either white collar employees (29%) or managers or professionals (15%). These groupings are followed by blue collar (20%), and retired (15%). Unemployed and homemakers make up only a fraction of the total (Table P-2).

As with the other recreational use studies (boating and shorebased fishing), we were also interested in identifying the attraction which the UNB shoreline may have on the Rhode Island population. Like in the previous use categories, the distance

Table P-1

Response Characteristics

	N	Mean	Std. Dev.
Distance in Miles Between Home & Facility	89	8.22	10.50
Travel Time in Minutes Between Respondent's Home & Interview Site	104	16.44	13.60
Number in Household	104	3.03	1.74

Table P-2

Participant's Occupation

Occupation	N	Percent
Blue Collar Employees	20	20.2
White Collar Employees	29	29.3
Managers and Professionals	15	15.2
Retired	15	15.2
Students	17	17.2
Unemployed	1	1.0
Disabled	0	0
Homemakers	2	2.0
	99	100.0

decay function is quite weak. This suggests that distance between the user's home and preferred shore plays a relatively small role in the respondent's shore selection process.

Looking at the municipalities which make up the core of the Providence metropolitan area, most visitors to the shoreline come from Providence (20%) and East Providence (12%). The rest of the central metropolitan region (North Providence, Central Falls, Woonsocket and Pawtucket) accounts for a relatively small portion of the balance (8%). The only other communities which significantly contribute to the recreational use of the UNB shoreline are Barrington (18.4%) and Bristol (5%), no doubt

influenced by the close proximity to Colt State Park, the largest state-administered recreational facility in the upper reaches of Narragansett Bay.

The apparent uneven distribution of respondents based on their home municipality (Table P-3), may be a function of facility location and the distance separating the respondent's home from the facility. Another factor which comes into play is the principle of intervening opportunity which may drain off some of a facility's potential demand. Thus, if a smaller and/or inferior facility is situated between the respondent's

Table P-3

Respondent's Residence

Municipality	N	Percent
Narragansett	1	1.0
Warwick	9	8.7
Cranston	6	5.8
Providence	21	20.4
Pawtucket	4	3.9
E. Providence	12	11.7
Barrington	19	18.4
Warren	2	1.9
Bristol	5	4.9
Newport	1	1.0
South Kingstown	2	1.9
Johnston	1	1.0
N. Providence	1	1.0
Woonsocket	2	1.9
Lincoln	1	1.0
Central Falls	2	1.9
Tiverton	1	1.0
Remainder of New England	12	11.7
Outside New England	2	
Total	103	100.0

residence and his or her chosen (preferred) site, the likelihood is good that the respondent may be persuaded to use the nearer facility--even though the expected experience may be inferior. The capture which a nearby somewhat inferior facility may have because of its location can be quite significant.

The estimated distance between the respondent's home and the facility within which the interview took place or where the survey was deposited was 8.2 miles (Table P-1); even though the standard deviation is higher than the mean, this may be accounted for by the considerably longer distances which the few out-of-state respondents contribute to the sample. The time it takes to travel from home to the selected facility is estimated at slightly more than 16 minutes (Table P-1) and may in the future become even more important than it is today.

The vast majority of those interviewed (84%) drove to the beach, park, pier, etc. (Table P-4). A little more than 11 percent used public transportation. The relatively low proportion of users travelling by public transportation is because not all facilities are served by the Rhode Island Public Transportation Authority. This problem is by no means unique to the UNB but is confronting nearly all urban areas interested in developing their shorefront recreational facilities (Heatwole & West, 1980). Other transportation means included biking and walking. All figures tend to support the previously stated observation that most of the UNB usage appears to be local with relatively few from the rest of the state.

Table P-4

Transportation Means

	N	Percent
Car	88	83.8
Public Transportation	12	11.4
Other	5	4.8
Total	105	100.0

Passive Recreational Pursuits Along The UNB

A categorical question was included requesting the respondents to cite other recreational activities in which s(he) had been engaged in during the previous year. Not surprisingly, a variety of activities were cited -- some activities passive, some active.

These activities have been grouped into categories which appear sensible, although no effort has been made to categorize these using a statistical model or some other recognized procedure. The four most popular activities in terms of number of respondents actually having participated appear in Table P-5 and are: boating (20%), swimming and bathing (18%), walking (16%), and bicycling (14%). When interpreting these statistics the reader should keep in mind that the respondents are not necessarily representative of the UNB population. The findings reported on here are restricted to those who have made a

commitment to engage in some aspect of coastal recreation. Recreational use can be measured in a number of different ways. Clearly, the number of participants is an important consideration which will be addressed in a separate section of this report. Besides the number of persons participating, frequency of use and length of stay are also important parameters. The average number of hours spent on the facility appears in Table P-6. These tallies range from two hours and 20 minutes (sightseeing and nature walking) to almost six hours (shorefishing). The low number of joggers included in the survey (3) and the long time spent jogging (5.17 hrs) is an error related in part to the difficulty in interviewing this particular user group.

An estimating model of use for each of the activities identified has been undertaken and is reported in a later section. Consequently, the number of times a given activity is engaged in is of importance, as well as the average number of hours engaged in the activity. The average number of times the respondents participated in their preferred activity appears in Table P-7. Thus, the respondent whose favorite activity is swimming and bathing hasengaged in this about 21 times a season or once or twice a week during the summer. Fishing from shore appears to be a bi-monthly activity, while jogging is undertaken on the average of every three days (Table P-7).

Like in the other user sections, we were interested in identifying the reasons why the passive users were not using the UNB shoreline more, and again it appears that lack of time and

other personal factors unrelated to environmental quality or site availability are the most important constraining factors cited by 35 percent of those responding (Table P-8). Of the remaining single factors, poor water quality and deteriorating

Table P-5

Other Activities Engaged in by Respondents
Expressed as Percent of Total Cited

Activities	N	Percent
Boating	29	20.4
Swimming and Boating	17	18.3
Walking	15	16.1
Bicycling	13	14.0
Sightseeing and Nature Walking	9	9.7
Fishing from Shore	8	8.6
Picnicking	7	7.5
Jogging	3	3.2
Other	2	2.2
Total	103	100.0

Table P-6

Participant Statistics -- Average Time Spent on Site Per Visit

	N	Mean Hours	Std. Dev.
Swimming & Bathing	17	3.59	1.98
Fishing from Shore	8	5.87	2.10
Sightseeing & Nature Watching	9	2.33	1.63
Jogging	3	5.17	2.02
Walking	15	3.95	2.92
Bicycling	13	4.05	2.65
Picnicking	7	5.29	1.63
Boating	19	2.95	1.67
Other	2	3.75	3.18
	93		

Table P-7

Average Frequency Activity is Engaged in Per Year

	N	Mean	Std. Dev.
Swimming & Bathing	18	21.02	18.45
Fishing from Shore	9	12.06	18.37
Sightseeing & Nature Watching	9	28.89	28.66
Jogging	3	124.33	208.45
Walking	15	118.40	130.78
Bicycling	12	91.75	131.12
Picnicking	7	7.71	4.99
Boating	21	61.67	74.81
Other	1	250.00	

Table P-8

Reasons Cited for Not Using the UNB More

Reasons	N	Percent
Lack of time & personal factors	34	35.4
UNB water not sufficiently clean	11	11.5
Deteriorating shoreline	1	1.0
Access is difficult	1	1.0
Lack of time & UNB too crowded	3	3.1
Lack of time and water not sufficiently clean	6	6.3
Lack of time and deteriorating shoreline	3	3.1
Lack of time and UNB not safe	1	1.0
Lack of time and difficult access	4	4.2
UNB too crowded & water not sufficiently clean	1	1.0
UNB water not sufficiently clean & shoreline deteriorating	6	6.3
UNB water not sufficiently clean & access is difficult	5	5.2
UNB shoreline deteriorating & access is difficult	1	1.0
Other Reasons	19	19.6
	96	99.7

shoreline quality accounted for 12 percent, while poor access was cited by only one percent. About half of the respondents cited two or more reasons for not visiting and using the shoreline for recreational activities. Again, lack of time and lack of cleanliness of either water or shoreline were cited by 17 percent, while water/shore quality and lack of access were cited by about 13 percent. The relative low ranking of access is supported by data collected from both San Francisco and Narragansett Bays. Nearly 20 percent cited three or more reasons for not using the UNB as a recreational venue more frequently.

The environmental reasons cited for not using the UNB shore more frequently warrant a more detailed analysis of the respondent's perception of the quality of the UNB environment. This analysis appears in the following section.

Environmental Quality Analysis

The manifestation of the respondent's perceptions regarding the quality of the water is quite interesting and deviates somewhat from the user categories to be discussed below (shorebased fishing and boating). The answers to this question were self-selected. In other words we wanted to identify how the users perceived the environment which account for the somewhat broad categories included in this analysis presented in table 9. In this context the largest category is a very general one, which embodies an unpleasant environment included nearly 27 percent of the responses (Table P-9). By an unpleasant

environment we assume the respondent is unable to be more specific by being able to cite specific examples of what makes the beach and shoreline environment unpleasant.

Nearly 13 percent of the responses included litter and trash as significant detractors of the UNB environment, while another 11 percent made reference to the lack of clarity and/or color of the water.

Very few respondents cited specific pollutants and/or causes. For example, metals, hazardous waste, run-off in the water were cited by only one respondent (Table P-9).

In light of the coastal states' growing responsibilities in managing the improvement efforts in the nearshore marine environment and the corresponding responsibility in raising funds to support these efforts, we were interested in identifying the passive user's perception of how effectively the various sectors or agencies are dealing with these issues. These results appear in Table P-10. From the data it appears that the passive users perceive industry and sewage treatment plants as those most responsible for the existing water quality conditions. These are followed by individuals (35%) and municipalities. Several tentative conclusions can be drawn from this data. First, governments (especially state and federal) are not seen as major contributors to the problem. Secondly, water quality in the eyes of the passive users appears to be a function of local entities (business, sewage treatment plants, and private persons).

Table P-9

Water Quality Manifestations

Manifestations	N	Percent
Litter and trash	22	2.8
Sewage	13	7.6
Toxins and chemicals	6	3.5
Oil	4	2.3
Sediment and sludge	3	1.8
Unclear, water clouded	19	11.1
Algae and bacteria	3	1.8
Metals	1	.6
Hazardous waste	1	.6
Floatable	6	3.5
Run-off	1	.6
Shipping and boat traffic	2	1.2
Fish and marine life contaminated	14	8.2
Vegetation	9	5.3
Unpleasant	46	26.9
Not swimmable	6	3.5
Poor taste	1	.6
Poor smell	8	4.7
Boat litter	1	.6
Other	5	2.9
	171	100.0

Table P-10

Private, Public Sector Organizations Responsible for Environmental Degradation as Perceived by Environmental Users

Sector/Organization	Not Responsible N	%	Moderately Responsible N	%	Very Responsible N	%
Industry & commerce	2	2.2	22	24.4	66	73.3
Municipalities	11	13.9	40	50.6	28	35.4
Sewage treatment plants	3	3.3	25	27.5	63	69.2
State of Rhode Island	13	19.4	37	55.2	17	25.4
Private persons	14	16.7	35	41.7	35	41.7
Federal government	18	28.6	34	54.0	11	17.5
Others	1	25.0	0	0	3	75.0

Table P-11

Agencies and Organizations Which Have Scored High on Environmental Effectiveness

	N	Percent
Coalition of Coastal Communities	2	1.3
Net. Marine Fisheries Service	2	1.3
R.I. Dept. of Environmental Management	25	16.4
U.S. Army Corps. of Engineers	1	.6
City of Providence	1	.6
R.I. Coastal Resources Management Council	2	1.3
R.I. State Office of Statewide Plan	0	0
R.I. Governor's Office	13	8.6
U.S. Coast Guard	4	2.6
U.S. Health & Human Services Administration, Shellfish Branch	7	4.6
Save the Bay, Inc.	74	48.7
URI Coastal Resources Center	19	12.5
Others	2	1.3
	152	99.8

The corollary question pertains to those institutions, organizations and agencies which the passive user perceive to have been most effective in improving the water quality of the

UNB (Table P-11). Save the Bay, Inc. is perceived as the organization which has been most effective in improving water quality of UNB. DEM, and the University of Rhode Island's Coastal Resource Center appear in 16% and 13% of the responses, respectively.

SHOREBASED FISHING

As mentioned above, the shorebased fishing respondents were surveyed along the UNB shoreline generally while engaging in the fishing activity. The analysis is divided into three parts --one which reviews the socio-economic characteristics of the participants, followed by an analysis of the activity itself (fishing), and is concluded by the socio-environmental analysis especially as it relates to user's perceptions of the environment and catch.

A total of 56 surveys were collected from shorebased fishermen along the UNB. While this and other sample sizes may appear to be on the low side, particularly considering the number of items asked, we decided to terminate our analysis when the same respondent was approached again on a different day, and not infrequently, at a different site. While we do not know the size of the total population of shorebased fishermen using the UNB, we believe it to be modest as evidenced by the reappearance in other surveys of respondents already interviewed once. In these instances the survey schedule was abandoned.

User Characteristics

The occupations of the respondents included in our study appear in Table S-1, which suggests that one third of those interviewed were employed in blue collar jobs. The employment categories were initially self-recorded and then categorized by

the PI. Blue collar employment included principally those involved in physical (manual) employment while white collar employment included office and sales jobs. Slightly more than one quarter were either white collar employees (11.8%) or classified themselves as managers and professionals (17.6%). A considerable number of those interviewed identified themselves as students. Homemakers and unemployed contributed a very small proportions of the sample. The average household size was a little less than four (3.78).

Several questions sought information about the respondent's home location, occupation, family and involvement with the UNB in a recreational context. These questions were included to learn something about the urban recreational pattern which is carried out on and along the UNB shoreline.

Not surprisingly, most of the fishing which is being carried out along the UNB shoreline is done by local Rhode Islanders. Only six respondents (10.9%) were from out of state (S-2). Nearly 50 percent came from the metropolitan core area comprising Providence, East Providence, Central Falls, Woonsocket and Pawtucket. The distance decay or gravity model advocated by numerous geographers, resource economists, and most persuasively by Clawson and Knetsch (1966) in a now classical study appears to have been borne out by this study as well. This model points out that the attraction of a given site decreases with increasing distance between the traveler's

residence and the preferred site. While the model initially sought to account for urban functions, size of consumer-oriented businesses and market area, it has been applied within the past several decades empirically to recreational problems as well.

Additional user characteristics have been included in Table S-3. The average distance between the resident's home and the fishing site is 12 miles, and the average time it took to cover this distance was about 21 minutes. All but two of the 56 respondents drove to the fishing site (Table S-4).[1]

Table S-1

Participants' Occupation

Occupation	N	Percent
Blue Collar Employees	17	33.3
White Collar Employees	6	11.8
Managers and Professionals	9	17.6
Retired	8	15.7
Students	9	17.6
Unemployed	1	2.0
Disabled	1	2.0
	51	100.0

Table S-2
Residence of Respondents

Municipality	N	Percent
Providence	11	20.0
East Providence	10	18.2
Bristol	5	9.1
Warwick	3	5.5
Pawtucket	3	5.5
Barrington	3	5.5
Warren	3	5.5
Smithfield	2	3.6
Cranston	2	3.6
Narragansett	1	1.8
South Kingstown	1	1.8
North Providence	1	1.8
Woonsocket	1	1.8
Lincoln	1	1.8
Central Falls	1	1.8
Tiverton	1	1.8
New England	5	9.1
Outside New England	1	1.8
Total	55	100.0

Given the relatively high concentration of local residents using the UNB shores for fishing, we were also interested in finding out how far the respondents would be

willing to travel to an alternate site. This question seeks to identify the respondent's opportunity cost expressed as willingness to travel. The low figures cited (4.78 miles, Table S-3) can only be explained in terms of willingness to travel an additional distance in light of that already covered (12.15 miles). Frankly, we are puzzled by this response which may relate to user's marginal utility. Stated in a slightly different way, given the fairly long average distance already covered (12 miles) and perhaps given the relatively low perceived utility of the UNB environment, most users may have already travelled as far as they are willing to travel to obtain the amenity (shorebased fishing). The resistance to additional modest travel may be very steep with the result that the respondents may opt for a different package of outdoor recreational activities. This concept is analogous to a 'diverted demand' or demand for which other activities may successfully compete (Coppock & Duffield, 1975).

The following questions concern the fishing experience and behavior and in part are, intended to serve as variables in the estimating model which will be addressed in a separate section of this report.

Fishing Characteristics

Before analyzing the responses related to fishing in general and shorebased fishing in particular, we will briefly discuss other UNB shorebased activities engaged in by the

shorebased fishing respondents. Not surprisingly, shorefishing (29) is the most popular activity, with boating (4), swimming and bathing (3), walking (3), picnicking (1), following in that order (Table S-5). Although our sampling times extended from early morning to early evening, we did not encounter any hunters during our survey. We believe, although we do not have any statistics to support our contention, that this activity is very low in the study area.

The time spent in the various activities is interesting in that fishing appears to be an activity in which the respondent is willing to spend approximately four hours compared to bathing and picnicking which appear to be full-day activities.

Table S-3
User Characteristics

Number in household	51	3.78	1.64
Distance between site and user's home	34	12.15	11.69
Travel time between respondent's home and fishing site	53	20.96	14.04
Distance respondent is willing to travel to other sites	49	4.78	1.71

Table S-4
Transportation

Car	54	96.4
Bicycle, walking	2	3.6

Table S-5

Favorite Activities

Activities	Total Time to be Spent on Site			Number of Days Since Last Participated in Activity			Frequency of Use During Last Year			Number of Hours to be Spent on Site		
	N	X	S				N	X	S	N	X	X
Swimming & Boating	3	7	1.0	7	82.6	132.4	6	41.3	45.7	4	50.7	55.7
Shorefishing	29	4.71	4.1	24	20.2	66.2	20	57.0	52.7	23	4.1	1.7
Walking	3	1.8	.8	2	90	84.6	3	35.0	56	3	2.5	1.8
Picnicking	1	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boating	4	4.9	1.6	14	58.0	65.0	4	7.5	8.4	4	4.1	1.7

N = Number of Respondents

$\bar{X}$ = Mean

S = Standard Deviation

N/A = Not applicable as no data or insufficient data was available.

Walking is clearly a part-time activity, even though the average walker spends nearly two hours engaging in this activity. The relatively short time (4 hours) which the average shorebased fisherman engages in this activity may be influenced by the tidal cycle which is on the order of 3-4 feet and which does tend to play an important role in catch success. The discussion of the remainder of the variables included in Table S-5 will be deferred until the recreational participation model is discussed.

Shorefishing appears to be a social activity, at least along the shores of the UNB. Slightly more than three persons made up the average size of the fishing group. When asked how many of the respondent's household members fished regularly, the average was slightly more than two (Table S-6). This question included all types of fishing (fresh and salt water, shorebased, and fishing from a boat). However, when we asked how many family members regularly fished the UNB shores, only ten responded. Of these, nearly four household members on the average would regularly fish the UNB shoreline. The apparent discrepancy between this and the previous question may be accounted for in the following manner. Most family members do fish with the respondents, but based on the limited data available it would appear that most family members prefer to fish in other venues. A possible explanation is that those respondents whose household members regularly fish the UNB

Table S-6

Vital Characteristics

Variable	N	Mean	Std. Dev.
Number of visitors in the group	48	3.06	2.99
Number of family members who fish regularly	45	2.18	2.25
Number of family members who regularly fish the UNB	10	3.7	3.13
Hours spent fishing in UNB	49	3.8	1.98
Number of days since last fished from UNB shores	42	8.67	12.61
Number of days since last fished UNB from boat	4	12.75	5.74
Number of hours spent fishing UNB shores	5	3.6	1.95

shores may view shorebased fishing not only as a recreational pursuit but as a means of supplementing the food basket. This problem has been posed in other urban areas where a significant number of those fishing from shore were of Southeast Asian extraction who considered fishing a means of putting food on the table (Heatwole and West, 1985). Unfortunately, no questions were included in the survey which addressed the ethnic origins of the respondents; thus, we have no way of determining whether fishing from the shores along the UNB is undertaken for other than purely recreational reasons. Southeast Asian fishermen were found along the UNB and were included in our survey. Most were able to communicate in English, although a few were excluded from our analysis because of communication difficulties. For this reason the potential subsistence aspect of the UNB fisheries was not included in our analysis.

The whole question about water quality and usage, of course, is one if not the major concern of policy makers, managers and researchers alike. Thus, the following sections seek to address first the nature of the catch, catch composition, and what happens to the catch once it is landed. This is followed by an analysis of the respondent's perceptions and attitudes related to environmental quality and the agencies and organizations who have jurisdiction or proprietary interest in this environment.

Catch Composition

The number of sizes of fish taken out of the UNB by the shorebased fishing community is modest by any standard. A total of 56 respondents are included in this portion of our survey. The participants spent an average of four and one-half hours fishing and collectively caught a total of 120 fish weighing a total of 153.5 lbs. We can only confirm the statement made by several marine recreational fishing researchers who have addressed this problem. Nearly all researchers who have analyzed recreational fishermen and their behavior suggest that recreational fishing offers other amenities to the participants than catching fish (Bryan, 1976).

The catch, besides being of interest quantitatively, also has a qualitative aspect; more specifically, what is being caught along the shores of UNB. Not surprisingly, Bluefish was caught by 44% of the respondents, followed by Tautog (18%), Mackerel (14%), Flounder and Flatfish (7.0%), Menhaden and Striped Bass (4%), while Scup was caught by only one respondent (Table S-7).

Considering the concern which has been expressed by many epidemiologists researching potential health hazards resulting from the ingestion of contaminated seafood including shellfish, we included in our survey a question which sought information about the disposition of the catch (Table S-8). Of the 34 who responded to this question, nearly one third (32.4%) returned

the catch to the sea, while more than 55% either consumed all or a portion of the catch or gave it away. Two possible interpretations may be offered. First, nearly one third of those fishing may throw back the catch because it is considered too small to eat. A second possible interpretation may be that a significant number of the respondents were sufficiently concerned about the quality of the catch which prompted them to throw it back. Given that the UNB shore and water is being used for recreational fishing, and given that some concern has been expressed by both fishermen and researchers it is suggested that a detailed epidemiological study be undertaken especially of those fish which are most popular by the recreational fishing community. Similar concerns have resulted in catch limits on Striped Bass in some of the Great Lakes and recommendations that consumption of Striped Bass caught in the Hudson River be limited to no more than once a week.

We also included a question which sought information about the number of meals per person the catch would produce. Unfortunately, only about one third of those who caught something responded to this question (Table S-9). Based on these responses, it appears that slightly less than five person meals will be produced from the average catch. The question related to water contamination and fishing is analyzed in he following section.

Water Quality and Fishing

To what extent does the perceived water quality affect recreational activities in general and shorebased fishing in particular?

One of the problems confronting all researchers interested in analyzing environmental perceptions and attitudes concerns the emotions which most have concerning these issues. Nearly all are for the environment, which is not dissimilar to people's feelings about motherhood. As a lead in to the respondent's environmental perception, we were interested in identifying reasons why they were not fishing more frequently. To this end a we were requesting the respondent to provide us with reasons why fishing was not done more often along the UNB shoreline. The rationale for selecting a categorical as opposed to an open-ended question was influenced by the author's previous survey undertaken during the summer of 1985 along the entire Narragansett Bay shoreline. Based on this study, it became quite evident that responses to this question could indeed be categorized.

Of the 36 respondents who answered this question (Table S-10), lack of time and other personal factors were the most important (31%). Only 14 percent cited the deteriorating water quality as an important reason for not fishing more frequently, although more than half included the quality of both shoreline and water as a contributing factor affecting their decisions to utilize the UNB shoreline more frequently.

Table S-7

Species Caught

Species	N	Percent
Tautog, Blackfish	8	18.6
Flounder and Flatfish	3	7.0
Bluefish	19	44.2
Menhaden, Pogies	2	4.6
Mackerel	6	14.0
Eels	2	4.6
Striped Bass	2	4.6
Scup	1	2.3
Total	43	99.9

Table S-8

Catch Disposition

	N	Percent
Catch turned into meals	13	38.2
Catch thrown back	11	32.4
Catch given away	3	8.89
Some catch thrown back, some frozen	1	2.9
Some of the catch turned into meals, some of it given away	3	8.8
Some of the catch frozen, some of it given away	1	5.8
	34	99.8

Table S-9

Catch Data

	N	Mean	Std. Dev.
Numbers of fish caught	33	3.58	4.65
	11	2.27	1.74
	6	4.67	1.97
Size of catch in inches	25	11.68	7.41
	9	4.50	6.93
	3	7.00	2.00
Weight of catch in lbs.	19	5.50	7.27
	8	1.75	1.04
	2	7.00	1.41
Person meals made from catch	10	4.7	4.4

During the summer of 1986 when the interviews were conducted, the question of access appeared in the media with regularity, yet access was mentioned by only 11 percent as the single most important issue and by another eight percent who cited it together with water quality. This finding supports the comparable studies done by the author for the Bay as a whole (Table S-10) which findings have yet to be written up.

We also asked the respondent to rank the water quality on a scale of 1-10 with one indicating a very high quality. Unfortunately, only 28 respondents answered this question and scored water quality in the middle of the range (5.3 std. dev. 1.8)[2].

Table S-10

Factors Cited for Not Using UNB More Often

	N	Percent
Lack of time and other personal reasons	11	30.6
Too crowded	2	5.6
Water is not clean	5	13.9
Access is difficult	4	11.1
Lack of time and unclean water	3	8.3
Lack of time and deteriorating shoreline	1	2.8
Water and shoreline not clean	2	5.6
Water is not clean and access is difficult	3	8.3
Other	5	13.9
Total	36	100.1

When transferring these concerns to the catch, half of the respondents (24) felt that all or part of the catch should be thrown back because of possible health problems associated with it (Table S-11). Since not all species are equally prone to contamination, we also asked the respondents to identify those species which they believed were suspect. In all, 52 responses were received and more than one third (37%) expressed concern about all catches (Table S-12). This was followed by Striped Bass, a controversial species in Rhode Island for two reasons. First, this species has been subject to considerable conflict between the recreational and commercial fisheries.

More recently, high PCB loadings has resulted in officials advising the fish consuming population against high and frequent consumption of this species.

Surprisingly, shellfish was mentioned only once, while flatfish made up nearly 14 percent of the total response. We were also interested in identifying how the shorebased fishing community felt the marine environment was affected. Each respondent was provided an opportunity to cite up to three factors which were then categorized by the analyst into groups of environmental descriptors. The groups were defined on the basis of perceived common characteristics, rather than on the basis of some functional relationships (Table S-13). This

Table S-11

Respondent's Perception

Related to Contamination of Catch

	N	Percent
Respondents who felt part or all of the catch might be contaminated	24	49.9
Respondents who felt the catch was safe to eat	24	49.9
Total	48	99.8

Table S-12

Species Perceived to be Contaminated

	N	Percent
Blackfish, Tautog	4	7.8
Flounder and Other Flatfish	7	13.7
Bluefish	4	7.8
Mackerel	1	1.9
Striped Bass	12	23.5
Mussels and Other Shellfish	1	1.9
Everything is Contaminated	19	37.3
Eels	2	3.9
Menhaden	1	1.9
Total	51	99.7

categorization was also influenced by recent unreported research conducted in both Narragansett and San Francisco Bays.

The tabulation of these responses strongly suggests that the visual character of the water is the single most important variable (21%), followed by litter or trash (15%) and undefined sewage (13%).

Those factors which may not be immediately apparent such as contaminated fish, heavy metals, toxins and chemicals, constitute largely one-sixth of the responses (Table S-13). These pollutants may be more damaging, but because they are not readily identifiable may not be perceived as dangerous compared to floatables, odorous waters etc.

Not only is it important to estimate the user's perception of environmental quality/water quality, but it is equally important to obtain information about the perceived causes for the deteriorating quality of the Bay waters.

A number of tentative conclusions may be drawn from these responses. Concerning the perceived causes for the poor quality of the UNB, it is clear that the respondents had a difficult time identifying the culprits. First, out of the more than fifty respondents who might have answered this question, only a handful (14) elected to do so (Table S-14). Secondly, the responses break down between those who trace the origin of pollutants to organizations and those who believe the problem is related or associated with personal behavior.

The former may presumably be rectified by changes in the organizational structure responsible for generating the condition in the first place (poor management, better operated sewage treatment plants, and oil industries). The latter category includes those which are caused largely by individual behavior (inconsiderate people, and those which are generated by the boating public). Thirdly, the perceived causes are sometimes assigned to organizations, sometimes to individuals; in a few instances the causes are not being identified as pollutants in their own right (sewage) or products which in recent times have been associated with extensive water pollutants (oil production and the transportation of oil and gas across the marine environment).

Table S-13

In What Way is the Quality of the UNB Affected?

Variable Categories	N	Percent
Litter and Trash	7	14.9
Sewage	6	12.7
Toxins and Chemicals	5	10.6
Oil	3	6.3
Murky Water, Unclear Water, Colored Water	10	21.3
Presence of Algae and Bacteria	3	6.3
Metals	2	4.2
Floatables	2	4.2
Shipping	2	4.2
Contaminated Fish	1	2.1
Emergent Vegetation	1	2.1
Others	5	10.6
Totals	47	99.5

This subject was analyzed in greater detail by asking the respondents to rank the organizations, groups or governmental departments in terms of responsibility for creating the conditions in the first place. The private sector combines industry and business; the public sector is broken down into local, state, and the federal government; and finally,

individuals in terms of their collective responsibility for creating or contributing to the conditions previously in the nearshore in 1988 (Table S-15).

Perhaps not surprisingly, the sewage treatment plants were perceived as the organizations which as a group contributed most to the poor quality of Narragansett Bay. This group was followed by the private sector, municipalities, and private persons in that order.

We were also interested in identifying those agencies and organizations from either the private or public sectors which in the opinion of the shoreline fishery commonly had been most successful in improving water quality in the UNB.

A total of 75 responses were enumerated by the more than 50 respondents included in the survey (Table S-16). A number of interesting observations can be made from this analysis. First,

Table S-14

Perceived Causes for Deteriorating UNB Quality

Poor management	4	28.6
Sewage	1	7.1
Inconsiderate People	2	14.3
Oil Products	2	14.3
Boat (Recreational) Generated	1	7.1
Other	4	28.6
	14	100.0

Save the Bay, Inc., a private environmental group similar to the San Francisco Bay group of the same name, has a recognition factor which is nothing less than astounding. Nearly half of all of the responses mentioned this organization as one, if not the most effective in dealing with the Bay resources.

Table S-15

Which of the Following Jurisdictions Have Been Charged With Polluting UNB? In Your Opinion, How Effective Have These Been?

	Not Respon.		Mod. Resp.		Most Resp.	
	N	%	N	%	N	%
Industry/Business	3	7.1	11	26.2	28	66.7
Municipalities	6	19.4	14	45.2	11	35.5
Sewage Treatment Plants	3	6.8	9	20.5	32	72.5
State of Rhode Island	9	29.0	16	51.6	6	19.4
Private Persons	9	25.0	16	44.4	11	30.6
Federal Government	15	50.0	11	36.7	4	13.3
Other	2	40.0	1	20.0	2	40.0

The state agencies with primary responsibilities (RI Department of Environmental Management, Rhode Island Coastal Resources Management Council, and URI's Coastal Resource Center) together account for about 35 percent of the total. Of the

remaining agencies, only the National Marine Fisheries Service (NMFS) accounts for more than five percent of the responses.

The tabulation of these tables suggests that the agencies with primary responsibility for water quality have a very low recognition factor among a public constituency, which is very much dependent upon the agency's effectiveness. To the extent that the quality of UNB has improved as a result of upgraded and

Table S-16

In Your Opinion, Which Three Agencies Have Done Most To Improve the Quality of the Water in Upper Narragansett Bay?

Agency or Group	N	Percent
Coalition of Coastal Communities	1	1.3
Natural Marine Fisheries Service	4	5.3
R.I. Dept. of Environmental Management	10	13.6
U.S. Army Corps. of Engineers	0	0
City of Providence	1	1.3
R.I. Office of Statewide Planning		
R.I. Governor's Office	1	1.3
U.S. Coast Guard	3	4.0
U.S. Health & Human Service Adm.	2	2.6
Save the Bay	37	49.3
University of Rhode Island, Coastal Resources Center	9	12.0
R.I. Coastal Resources Management Council	7	9.3
Total	75	100.0

more efficient sewage treatment, it would appear that those agencies have done a poor job in communicating their accomplishments to the sportsfishing community.

In light of a relatively diminished Federal role in water quality improvement and a corresponding increase in the State's environmental management responsibility, it would appear advisable that those agencies communicate their accomplishments to the general public. This is especially important in Rhode Island where funds for environmental improvements in recent years have been obtained through public referendums and associated bonding.

BOAT USE ON UPPER NARRAGANSETT BAY

We have conservatively estimated that 846 slips have been placed in UNB[3], yet this part of the Bay system is not perceived as an active boating area by the down Bay and out-of-state user. That is to say, the rate at which visiting recreational vessels use this portion of the Bay is relatively speaking limited and often viewed as a means to an end, i.e., as a place to keep the vessel while not in use and when it is used, a means to get to more favorable water as soon as possible. Unlike many other coastal cities including Boston, Baltimore and San Francisco where urban water fronts and harbors have been revitalized. It appears as though Providence and its neighboring municipalities have not yet capitalized on the UNB waterbody by providing local boating opportunities to its residents.

In recent years a number of waterfronts along the Eastern Seaboard have undergone a very significant decline both socially and economically. These developments have affected the value of these resources and the way they have been utilized. Unlike several other large cities in both the U.S. and Europe which have begun to revitalize the urban waterfront by providing public ramps, marinas (private and public), Providence and East Providence have only now begun to address these issues in earnest. While these observations are not based on formal research, they are based on the author's services to the State

of Rhode Island in consulting, teaching and research as they pertain to present and potential recreational usages within the coastal zone.

The boat facilities which presently exist in this part of the Bay have been developed primarily by the private sector as opposed to facilities operated by the public sector (city and state), yacht, sail and boat clubs. These and other questions included in the analysis will be further elaborated upon below. Before doing so, the profile of the UNB boat user will be made.

Table B-1

Boat Respondent's Occupations

Occupation	N	Percent
Blue collar employees	20	20.4
White collar employees	26	26.5
Managers and professionals	40	40.8
Homemakers	1	1.0
Retired	10	10.2
Students	1	1.0
Total	98	100.0

Table B-2

User Characteristics

Average Travel	N	Mean	Std. Dev.
Average travel times between respondent's home & boating site	104	14.41	15.67
Average travel distance between respondent's home and boating site	102	8.16	11.17
Average number of household members	104	3.08	1.52

Table B-3

Transportation Means by Boat Users

	N	Mean
Car	89	86.4
Public transportation	13	12.6
Other	1	1.0
Total	103	100.0

The employment statistics are quite similar to those identified in the previous use sections (Table B-1). About one fifth (20%) are employed in blue collar jobs, while slightly more than one-quarter (26.5%) earn their living in white collar jobs. The largest employment group consists of managers and professionals consisting of approximately 40 percent of the total. Retired persons account for approximately ten percent. The average household size is slightly more than three persons, comparable to those recorded for the shorebased fishing community and passive users (Table B-2).

The vast majority of the respondents drive to the marina, yacht club or ramp, while approximately one-eighth (12%) utilize public transportation (Table B-3). The average distance between house and where the boat is kept (or trailered to) is slightly more than eight miles (Table B-2), while the time it takes to cover this distance is a little less than 15 minutes.

Both data sets appear skewed to the right, probably because of the inclusion of a few out-of-state respondents in our survey.

Boat Use Characteristics

Like the previous two surveys we were interested in identifying the extent to which the boating community uses the UNB shores for activities other than boating. Not surprisingly, boating was the preferred activity by this group, with swimming and bathing coming in at a very distant number two. Two possible interpretations may account for this. Boating may

represent a single activity user group, unlike some of the other groups which appear to be engaged in a variety of waterfront-related pursuits (Table B-4). A second more likely interpretation suggests that boating represents a more inclusive activity within which a host of other recreational pursuits are engaged. In the minds of most boaters, swimming, fishing, sightseeing etc. are all part and parcel of boating and not considered independent activities.

Table B-4 includes information about the number of hours the respondents spent or expected to spend in their primary (boating) and secondary marine recreational activities at the time the survey was distributed.

The time spent in each of the six activities identified is close to what one would expect. Only swimming and bathing as a shorefront activity exceed the time spent boating, which is almost eight hours and seven hours respectively.

The last data set included on Table B-4 describes the number of days since the respondent last went boating. Not surprisingly, very wide discrepancies appear in the tallies. This is due in large part, to different lengths of seasons for each of the activities. Thus, the boating season is considered to last between three and five months, while the fishing fleet season is closer to six or seven months. To some extent, the duration of a given season is related to both physical factors, such as the probability of severe storms occurring and the concomitant need to insure boats while still in the water. Other considerations are the temperature and probability of

severe storms which affect the decision to lay up the boat usually before November[4]. This poses a dilemma for many recreational fishermen as many of the most attractive species are returning to the bays and estuaries in the late Fall. Another consideration with a bearing on this question is the time the respondent answered the questionnaire. Most of the surveys were deposited immediately before the 4th of July holiday, where many boaters were in the process of gearing up for the coming season. Consequently, the number of days since the boater last went boating may have been unduly long.

The overwhelming number of respondents obtained their boating experience from privately owned (as opposed to chartered) vessels (Table B-5). The average size of these vessels was slightly smaller than 24 feet Length Overall, and the majority used their boats primarily for fishing purposes. In fact, 99 out of 103 respondents indicated that they fished at least occasionally from their boats. The average number of times the boat was in use during the year totalled 33, of which approximately one quarter (8) were fishing trips. Nearly 62% of the boating time occurred within the UNB, which suggests that this waterbody is used primarily by in-state boaters. This is, supported in part by the average size of the vessels (24 feet). The average number of participants total 2.65 (Table B-6). Before looking more closely at each type of activity, we were interested in identifying the constraints which prevent the boater from using the UNB more frequently. These tallies appear in Table B-7.

Table B-4
Favorite Activities

	Total # Hours to be Spent at the Survey was Taken			Number of Days Since Last Participated			Average # Hours Spent on Activity		
	N	X	SC	N	X	SD	N	X	SD
Swimming & bathing	3	5.0	1.73	3	5	3.61	2	7.75	6.01
Shorefishing	2	3.0	1.41	2	4	4.24	2	4.00	1.41
Sightseeing & Nature Walks	1	6.0	N/A	1	10	N/A	1	2.0	N/A
Jogging	1	10.0	N/A	1	3.0	N/A	1	.50	N/A
Walking	1	8	N/A	1	12.50	7.78	1	2.0	N/A
Boating	80	6.27	6.60	81	24.88	90.22	78	6.75	6.03
Other	3	21.0	23.52	3	180.6	165.96	2	11.50	2.12

Boating Characteristics

The previous analysis has already indicated that the UNB boating population consists of at least two sub-populations--one interested in fishing and one in more general boating activities.

Again, lack of time and other personal factors were the most important reasons cited for not using the boat more frequently. This accounted for nearly 31% of the responses; however, environmental quality (beach and nearshore) may prove to be equally, if not more, important as it was cited together with other reasons a total of 37% of the times. In instances where two were cited, we decided to allocate the responses evenly between the two factors.

Fishing is an important reason for getting involved in boating, and it may well be that the boat is of only secondary interest to a substantial number of fishermen included in the sample.

Unfortunately, no specific question was included in our survey to address this problem, although a number of indications may be cited in support of this contention.

Table B-5
Boat Ownership

	N	Percent
Private	103	98.1
Other	2	2.0
Total	105	100.0

Table B-6
Boat Use Characteristics

	N	Mean	S.Dev.
Boat use frequency on UNB (frequency of use in user days)	103	33.04	29.45
Fishing from boats on UNB	99	8.34	18.01
Proportion of total fishing time spent on UNB (per cent)	100	61.95	31.10
Size of private boat in feet	102	23.98	6.21
Charter fishing frequency	61	.36	1.38
Average number of trip participants	37	2.65	1.18

Table B-7

Factors Cited for Not Using UNB More Frequently

Factors and Reasons	N	Percent
Lack of time & other personal factors	32	30.8
Water not sufficiently clean	22	21.2
Lack of time and water not sufficiently clean	11	10.6
Unsafe, socially or environmentally	1	1.0
Access is difficult	4	3.8
Lack of time & difficult access	1	1.0
UNB too crowded and water not sufficiently clean	1	1.0
Water and shore not sufficiently clean	7	6.7
Water not sufficiently clean and unsafe socially and environmentally	1	1.0
Water not sufficiently clean and access is difficult	2	1.9
Other	22	22.1
Total	104	100.0

Table B-8

Boat Use Characteristics

	N		Mean		Std. Dev.	
	Fish	Boat	Fish	Boat	Fish	Boat
Number of trip participants	19	18	2.89	2.39	.94	1.38
Total time to be spent on site (Hrs.)	18	74	3.85	7.60	2.13	8.49
Frequency of boat use on UNB	20	82	36	32.23	20.97	31.40
Frequency of fishing on UNB	19	79	17.21	6.3	15.59	18.09
Proportion of time spent within UNB	20	79	66.35	60.99	34.51	30.49
Boat size in feet	19	82	21.53	24.49	4.10	6.51
Travel time from house to site (min.)	20	83	6.8	16.3	4.66	16.9
Travel distance from house to site (mi.)	20	81	4.19	9.15	4.73	12.24
Number in household	20	83	3.35	3.02	1.50	1.53

Table B-9
Boat Statistics

	N	Mean	Std. Dev.
Number of household members who fish regularly	5	1.40	.55
Number of household members who visit/use UNB regularly	32	1.89	1.50
Number of days since last fished	25	50.00	150.00

Table B-10
Catch Statistics

	N	Mean	Std.Dev.
Number of fish caught	39	3.79	
Average size of catch	40	15.1	
Average weight of catch	34	19.2	
Number of servings	15	4.37	4.75
Value of equipment less boat & motor	21	364.62	343.22
Cost of bait	21	8.40	21.73

Table B-11
Catch Disposition

	N	Percent
Meals	13	61.9
Returned to sea	5	23.8
Frozen and eaten	1	4.7
Eaten and given away	2	9.5
Total	21	99.9

The total number of boating respondents were divided into two groups on the basis of their investment in fishing equipment. Those who responded to this question (20) were classified as boat fishers, while the balance (83) were classified as general boaters. A comparative analysis of the two subgroups appears in Table B-8. No statistically significant differences were identified between the two data sets.

The number of participants on the fishing boats is somewhat higher (2.9 vs. 2.4) compared to the general boat population. An even greater difference is the time spent on the water. The average trip for the fishing population lasts slightly less than four hours, while the general boater spends more than 7-1/2 hours aboard. This is countered by the frequency of use which is somewhat higher for the fishing population (36 vs. 32 trips).

A picture of different usage pattern does emerge when further comparing the two subgroups. Thus, the boater tends to spend somewhat more of his boating time outside the UNB compared to the boat fishers (66% versus 61%). The different usage pattern is also corroborated by the differences in boat sizes. The average size of the fishing boat is 21.5 feet compared to the general boat group which is 24.5 feet.

Based on travel distance and travel time, it appears that the fishing population resides closer to the shore (4.2 miles), with a considerably shorter travel time (slightly less than seven minutes) compared to the general boating population (9.2 miles and 16 minutes, respectively).

Since the fishing sub-population makes up a considerable proportion of the total, it was decided to analyze this group in greater detail. The results appear in Tables B-9 through B-11.

Although approximately 30 members of the boating group fish regularly, comparatively few (1.4 persons) of the household members participate in this activity (Table B-9). This is especially interesting when compared to the number of people who are on board the average fishing trip (Table B-8) which totals nearly 3. There may be two possible explanations for these apparent discrepancies. One suggests that other than family members are on board when fishing. A second possible answer is that several of the trip participants are passive in the sense that they do not actively engage in the fishing activity.

The number of days since the participants last went fishing is 50 days (std. dev. 150). This variable is not normally distributed and is probably a function of the timing of the survey which was relatively early in the season (Table B-9).

The average number of fish caught totalled 3.8 fish, which were about 15 inches long and weighed 19 lbs (Table B-10). The extraordinary discrepancy between average size and weight is believed to be due to a few large size catches which appear to skew the distribution to the right. Information on the average value of the respondent's fishing equipment were included as a variable to discriminate the general boater from those primarily interested in fishing. The disposition of the catch is also interesting. All but 20% was consumed by the boater and given to family or friends; one-fifth of the catch would be thrown back

(Table B-11). The number of servings produced from the catch is comparatively small, totalling a little more than 4-1/3 meals (Table B-10). The relatively low tally on this variable may be because much of the catch is given away, which was not included in the number of meals generated.

As one would expect, the most popular sportsfish in Narragansett Bay during the summer is the bluefish comprising about 65% of the total catch. This is followed by flatfish, tautog and shellfish (Table B-12). Although a relatively small number of fish were returned to the sea (20%), we were interested in identifying the relationship between catch behavior and perceived water quality. This topic is addressed below.

Table B-12
Species Caught by Boat Fishers

	N	Percent
Shellfish	2	6.9
Tautog	2	6.9
Flatfish	4	13.8
Bluefish	19	65.5
Menhaden	1	3.4
Striped Bass	1	3.4
Total	29	100.0

Table B-13
Respondents' Perceptions Related to Health Hazards and Catch

	N	Percent
Believe UNB catch is contaminated	15	68.2
Believe UNB is not contaminated	7	31.8
Total	22	100.0

Table B-14
Species Believed to be Contaminated

	N	Percent
Blackfish	1	3.1
Shellfish	5	15.6
Flounder	2	6.3
Striped Bass	10	31.3
All Catch	12	37.5
Bluefish	2	6.3
Total	32	100.0

Water Quality Analysis

We were also interested in the respondent's quantitative assessment of the water quality of the UNB. While such scales may not be correlated with the biochemical and physical quality of the UNB, it does provide an indication of how the users perceive the

quality of the water and may be useful for comparative purposes. With these limitations in mind we included a question requesting each respondent to rate the quality of the water on a scale of 1 - 10 with one signifying the highest quality. This group ranked the UNB water 5.5. This rating may account for the manner in which the catch was utilized. Nearly two-thirds (65%) thought part or all of the fish in the UNB contaminated (Table B-13). What is especially interesting is that relatively few fishermen had an opinion on this question. Only 22 of the 32 boatfishermen responded to this question. Nearly one-third of the fishermen did not have any opinion. This suggests a need by government agencies and public interest groups to find ways to better communicate their accomplishments to the users of the UNB, including boaters. When asked to identify the specific species suspect (Table B-14), more than one third (38%) claimed all species contaminated. Of the specific species, striped bass and shellfish were cited more frequently (31% and 16%, respectively). These responses are probably influenced by the widespread discussion in the media concerning high PCB levels in striped bass and shellfish closure of the southern portion of the UNB following heavy rain due to CSO runoff into Narragansett Bay.

The relatively low rating given the UNB water begs two questions--How does the low water quality manifest itself, and in what way do the respondents assign causes for these conditions?

Not surprisingly, there is considerable overlap is the response patterns between the two populations. To address these issues, several questions were included in the survey instruments,

Table B-15
Manifestations of Deteriorating Water Quality

	Number	Percent
Litter and Trash	8	4.4
Sewage	20	11.0
Chemicals and toxins	11	6.0
Oil and gas	8	4.4
Sludge, sediment	6	3.2
Water colored, unclear	32	17.6
Algae and bacteria	9	4.9
Metals	6	3.3
Floatables	10	5.5
Contaminated fish	12	6.6
Water and beach environment dirty	16	8.8
Water not swimable	4	4.4
Smell	20	11.0
BOD	5	2.7
Nitrogen	3	1.6
Visually impacted	3	1.6
Other	7	3.8
Runoff	1	.5
Vegetation	1	.5
Total	182	100.2

Table B-16
Principal Cause for Water Quality Deterioration

Poor management	3	1.6
Sewage	85	44.0
Inconsiderate population	6	3.1
CSO, Runoff	24	12.4
Chemical discharges	8	4.1
Industry	47	24.4
Other	7	3.6
Metals	3	1.6
Oil	4	2.1
Boat generated	2	1.0
Fertilizer	2	1.0
Shallow water, natural causes	2	1.0
Total	193	99.9

some of which were posed open-ended and some of which were categorical. The manifestation of the deteriorating water quality emphasizes those factors which are directly evident to the senses (Table B-15). Water color and lack of clarity account for more than 17% of the responses, followed by smell and sewage (each 11%). The hidden factors are often the real culprits and include

metals, nitrogen, BOD, etc. The respondents only cited these factors less than 16 percent of the time. Water quality appears to be influenced by two factors: (a) sensing, i.e., the extent to which it impacts upon the senses, and (b) the effect which such factors may have on the intended usage of the nearshore marine environment.

Table B-17
Departments', Organizations' and Private Citizens'
Perceived Responsibility in Affecting Water Quality

	Not Respon.		Mod. Respon.		Very Respon.	
	N	%	N	%	N	%
Industry & commerce	9	13.8	15	23.1	41	63.1
Municipalities	19	37.3	13	25.4	19	37.3
STP's	4	6.2	9	13.8	52	80.0
State of RI	19	63.3	9	30.0	2	6.7
Private person	26	61.9	11	26.2	5	11.9
Federal Government	11	47.8	9	39.1	3	13.0
Other	2	40.0	1	20.0	2	40.0

Table B-18
Agencies and Organizations Who Rated High in Environmental Effectiveness

Coalition of Coastal Communities	4	1.9
National Marine Fisheries Service	10	4.6
RI DEM	38	17.6
US Army Corps. of Engineers	1	.5
City of Providence, Dept. of Public Works	2	.9
RI Coastal Resources Management Council	24	11.1
RI Office of Statewide Planning	1	.5
RI Governor's Office	3	1.4
US Coast Guard	12	5.5
US Health and Human Services Administration, Shellfish Branch	9	4.2
Save the Bay, Inc.	85	39.4
URI Coastal Resources Center	27	12.5
	216	100.1

The evidence of poor or marginal water quality is only one dimension related to environmental management. Another consideration is the perceived cause of the deteriorating environment and a third, the way the users attribute responsibility for managing the quality of the nearshore environment. Sewage is clearly perceived as the main culprit by the boating community (44

percent), followed by industry (24%) and combined sewer overflows (CSO) and runoff (12%). Nearly all of the remaining factors include pollutants or groups of pollutants as being responsible causes or processes (Table B-16). In part, this was anticipated when the questionnaire was first established; consequently, it was decided to include a question which sought to gauge the respondent's awareness of the effectiveness of the private sector and key local, state, and federal agencies with respect to UNB water quality.

Again, a certain degree of overlap exists between this and the previous questions (Table B-17). Thus, the Sewage Treatment facilities are seen by most (80%) as being very responsible for the water quality conditions in the UNB. This is followed by industry and commerce (63%). Looking at the other end of the continuum it is clear that the boating community, unlike some of the other user groups, does not consider the private citizens and the federal government to be major environmental culprits.

These tallies are interesting in that the prevailing perception appears not to have caught up with the considerable improvements which have occurred in recent years among most of the UNB's sewage treatment plants and private industries (Hennessey and Robadue, op cit.).

How well do specific agencies, organizations, and offices fare when the respondents were asked to identify those which, in their opinion, had been most effective in improving the water quality of UNB?

The answers to this question closely followed those of the passive and shorebased fishing community. Nearly 40 percent cited

Save the Bay, Inc. as the organization which had been most effective. This was followed by the Rhode Island Department of Environmental Management (18%), the University of Rhode Island's Coastal Resources Center (12%), and the Rhode Island Coastal Resources Management Council (11%) (Table B-18).

While Save the Bay, Inc. is a public interest group with no direct management and/or regulatory functions, it has established itself as a highly successful public watchdog organization. Given

Table B-19
Other Areas Visited by the Respondents

Narragansett	3	3.4
East Greenwich	1	1.1
Bristol	3	3.4
Newport	24	30.3
Jamestown	3	3.4
Foster	1	1.1
Coventry	1	1.1
Tiverton	2	2.2
New Shoreham (Block Island)	2	2.2
Lower Bay	43	48.3
Massachusetts	4	4.5
Total	89	100.0

Table 20

Summary of UNB Users and Usage

	Passive Users	Shorebased Fishers	Boaters
Predominant Soc. Group	Blue Collar	White and Mgrs	White and Mgrs
Recreational Hinterland	Local	Local	N/A
Hours spent in Activity	3.5	4.7	6.2
Number of times per year	7 - 124	57	33
Most Important Reason for Not Using UNB more was Lack of Time expressed as percent of total	35.4	30.6	30.8
Principal Sector Resp. for UNB deterioration	Industry	STP	STP
Most Effective Organization working for UNB clean-up	Save the Bay	Save the Bay	Save the Bay
Number of Fish Caught	N/A	3.6	3.7
Number of Servings prod. from catch	N/A	4.7	4.3

the state's projected increased share of underwriting environmental clean-up and the responsible agencies' low perceived profile, it would appear that these agencies could do a better job in communicating their accomplishments to the general public. Since much of Rhode Island's environmental programming is funded through referendums mainly sponsored by DEM, a low recognition factor by this agency may result in a less successful rate of support in future environmental/outdoor recreational bond issues.

The final question included in this part of the analysis sought information about other areas visited by the boater (Table B-19). More than three quarters indicated that Newport and the lower Narragansett Bay were significant points of destinations.

No other area visited exceeded five percent of the total. While the reason for visiting Newport and environs was not pursued, it is reasonable to expect that improved water quality in the lower Bay is a contributing--perhaps major--factor in the popularity of this part of the Bay

Table 20 provides a summary of the similarities and major differnces between the three user groups with respect to their use of the UNB resources

Quantitative Analysis

The usage of the UNB shore and nearshore is by any measure low, considering the length of shoreline, type of facilities including beaches, ramps, marinas, yacht clubs, parks and other informal recreational spots. This conclusion is based on a data collection effort undertaken during the spring, summer, and extending into the late Fall of 1987 by one full-time and one part-time graduate student.

A total of 15 parks, beaches, ramps and other recreational sites were identified not including 12 marinas, and yacht clubs during our preliminary (1986) shore and nearshore surveillance. Since the majority of these are used only very infrequently, we decided to concentrate our facility schedule on eleven sites (Table Q-1), each of which met a minimum requirement of eight visitors in at least one activity each time surveyed. The elimination of the least used facilities were based in part on cost and efficiency considerations and in part on the relatively few additional users which would have been added to the total UNB user estimate. The cut-off point of eight visitors was arbitrary and decided upon following the first few weeks of fieldwork.

Our original intent was to randomize all land based survey efforts (shorebased fishing and passive usage); however, with the exception of special events such as the 4th of July celebration and other social and ethnic festivals occurring on

several UNB sites, usage in all but a few of the facilities appears low and infrequent.

Consequently, our original plan had to be modified from a purely random survey to a procedure where the major sampling efforts were made on those facilities where the probability of encountering recreationists would be the greatest. During the early weeks of our field work many visits were made to facilities with very few or no visitors at all. Consequently, further sampling was undertaken during those periods (early morning, early and late afternoon) where experience had taught us users would be present. Towards the middle of the summer we decided to abandon surveying on days with inclement weather, since even shore-based fishermen appeared to abandon their chosen activity on such days. Initially, the surveyors were in the field daily, an effort which also had to be cut back as it was found that the same users were sampled on different days and sometimes on different sites.

To overcome these problems it was decided to undertake a tally on both small and large facilities. This facility survey would form the basis of the study's user estimation efforts. In all, 130 facility reports were completed. Some activities occur unevenly throughout the day. For instance jogging appears to be concentrated during early morning and late afternoon while beachgoers tend to visit the beach during late morning extending into the mid- to late afternoon and early evening. As a result, we scheduled the interviewer's visits from daybreak to sunset.

In all, 2,866 passive and active users were observed and counted during the 132 individual visits. This averages slightly less than 24 visitors per site. The categorization of the nine groups appears in Table Q-2, while the average for each site appears in Table Q-1.

Not all sites cater to an equal number of activities. To illustrate the recreational diversity on the eleven sites, a table was prepared summarizing activities provided at each of

Table Q-1

Sites Used for Facility Survey

Facility	Number of Facility Reports	Total Number of Visitors	Average Number of Visitors
Conimicut Point	4	123	30.8
Sabin Point	13	138	10.6
India Point	17	291	17.1
Barrington Beach	18	412	22.9
Colt State Park	25	1392	55.7
Haines	14	349	24.9
Warren Town Beach	4	92	13.1
Hundred Acre Cove	13	155	11.9
Bold Point	8	131	16.4
Fox Point	3	117	39.0
Rumstich Point	1	28	28.0
Total	115	2832	20.7

Table Q-2
Total Number of Recreational Shore Users
Along UNB Based on Facility Report

User Category	Number of Participants	Mean Number of Visitors per Site	Std. Dev. of Visitors/ Site
Beach & Park Visitors*	1106	16.5	37.6
Strollers	625	10.7	10.5
Cars (Parked)**	580	12.1	19.2
Shorebased Fishermen**	503	5.7	8.0
Trailers***	292	5.6	6.6
Cyclists	132	4.6	5.7
Joggers	89	3.0	2.5
Boardsailors	13	2.6	1.3
Sightseers	6	1.2	1.1

*Beach and Park Visitors include those who are not engaged in any of the other activities included in the table. Thus strollers refer to visitors who are walking through the park, while visitors refer to people who may be picnicing or engaged in other (passive) recreational activities

**Data not normally distributed (Std. Dev. > Mean)

***Trailers refers to boaters who trailered their vessels to the ramp

the eleven sites selected for more detailed analysis. These tallies appear in Table Q-3.

Table Q-3

Activity by Facility

Facility	Beach/Park Visitors	Strollers	Cars	Fishing	Trailers	Cyclists	Joggers	Sailors	Sight-seers
Colt State Park	405	403	97	242	70	78	49	4	4
Barrington Beach	179	21	145	52			6	9	
Haines Park	100	41	96	6	76	28	2		
India Point	146	45	48	22	1	12	14		
Hundred Acre Cove	13		45	34	62				
Sabin Point	58	4	32	35	9				
Bold Point	3	1	23	36	62	6			
Fox Point	40	23	53	1					
Conimicut Park	38	18	31	29	4		3		
Warren Town Beach	84	1		7					
Rumstich Point		13				4	11		
Total*	1066	576	570	466	275	128	82	13	4

The differences in the summaries between tables Q-1 and Q-3 are due to the fact that Q-1 includes tallies from all facility reports, whereas the data summarized in Table Q-3 includes only the information obtained from the eleven sites included in the detailed analysis.

Not surprising, beach and park related activities are the most popular. This supports the findings of numerous national and regional outdoor recreational studies (ORRRC, 1962 and RI Office of State Planning, 1986). The popularity of such activities appear to be related to the relatively low cost of participation, the absence or very low initial investment costs in equipment, and the lack of specialized skills required to participate. Contrasting this with the highly specialized skills required to participate in boating or scuba diving undoubtedly reduces the number of participants. Strolling and walking for pleasure also rank high and are commonly enhanced by a marine environmental location. These activities are followed by fishing, boating, cycling, jogging, board sailing, and sightseeing, in that order.

An analysis of the eleven sites suggests a positive correlation between physical size of the facility, number of users, and activities which can be accommodated within the site[5]. This finding supports the nested hierarchy model (central tendency) in Geography which suggests that the size of places (urban areas) is a function of the number of services

Table Q-4
Weather and Activity Participation
(measurements in user day equivalents)

Activity	Sunny			Partly Sunny			Showers			Continuous Rain		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Beach Activities	386	11.0	*14.2	463	27.2	*70.8	92	13.1	11.4	7	7.0	N/A
Strollers	357	11.9	*12.2	152	11.7	9.7	21	4.2	2.8	37	12.3	10.9
Cars	119	7.4	6.9	273	21.0	*34.7	101	11.2	3.8	16	8.0	N/A
Shorebased Fishermen	235	6.0	*10.5	105	5.8	5.5	46	3.3	2.3	30	10.0	7.0
Trailers	131	5.7	*7.1	68	5.2	4.7	14	3.5	2.9	3	1.5	.7
Cyclists	56	3.7	3.3	62	6.8	9.1	5	N/A	N/A	2	1.0	N/A
Joggers	59	2.8	2.3	19	3.8	*4.1	0	N/A	N/A	2	N/A	N/A
Board Sailors	7	2.3	1.5	2	2.0	N/A	0	N/A	N/A	0	N/A	N/A
Sightseers	5	1.7	1.2	1	N/A	N/A	0	N/A	N/A	0	N/A	N/A

*Standard Deviation greater than the Mean

offered at the urban place. The model has been applied to recreational research as well where attendance at ski resorts is related to the number (and types) of lifts, trails etc. The popularity of amusement parks is also a function of the number of individual activities offered. In the context of shorebased recreational facilities, one would expect a greater number of users at those areas which offer more facilities such as beach, shorebased fishing, boating, jogging, etc.

Before discussing how we arrived at the usage estimate for the UNB, some additional summary statistics will be presented. The specific variables included have been selected because marine recreational researchers have suggested that these play an important role in the individual's recreational decision-making process.

Weather is obviously an important criteria influencing the individual decision-maker's recreational choice (Adams, 1971). Weather parameters have been quantified in various comfort indices for many years, yet since these are quite difficult to measure in the field, we decided to collect this information in the form of categorical (non-parametric) data. Four weather classes were recognized ranging from sunny through partly sunny, occasional showers to continuous rain. It is not believed that the categorization of these data has materially reduced their analytical value. It should be kept in mind that what really influences the user's decision to visit and participate in a particular activity is his or her perception

Table Q-5
Activity Participation and Temperature

Activity	Forties			Fifties			Sixties			Seventies			Eighties		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Beach/Park	170	15.5	16.7	64	12.8	5.3	73	5.2	7.0	529	21.2	58.6	270	22.5	19.9
Strollers	117	9.0	8.9	37	9.3	10.9	107	8.9	9.4	22[illegible]	11.5	9.3	87	17.4	20.5
Cars	77	7.7	7.9	6	N/A	N/A	88	7.3	4.5	307	20.5	32.4	102	10.2	5.2
Shorefish.	102	6.0	6.1	39	5.5	4.7	65	3.0	3.4	140	5.4	4.4	157	9.8	15.6
Trailers	78	6.5	8.5	15	3.0	1.9	27	3.0	2.1	67	4.2	4.5	105	10.5	8.6
Cyclists	7	3.5	2.1	11	3.7	1.5	26	3.3	4.5	79	5.6	7.4	9	4.5	.7
Joggers	15	2.1	1.1	11	N/A	N/A	18	3.0	2.1	39	2.8	2.5	6	3.0	N/A
Boardsail.	4	N/A	N/A	6	3.0	1.4	0	N/A	N/A	0	N/A	N/A	3	1.5	.7
Sightseers	4	2.0	1.4	0	N/A	N/A	0	N/A	N/A	2	.7	.6	0	N/A	N/A

Table Q-6
Activity Participation and Wind Condition

Activity	Calm			1-5			5.1-10			10.1-15			15.1 @ >		
	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Beach/Park	67	4.2	5.3	224	14.9	15.4	327	54.5	120.3	203	13.5	14.8	95	19.0	10.8
Strollers	144	12.0	15.1	117	11.7	11.1	42	14.0	15.7	145	9.1	6.4	68	9.7	12.0
Cars	31	4.4	3.7	55	7.9	5.2	0	N/A	N/A	148	10.6	8.5	219	27.4	43.0
Shorefish.	79	4.9	8.8	96	4.4	3.4	34	5.7	3.4	85	5.0	5.8	93	13.3	20.3
Trailer	50	5.	5.9	40	3.6	2.4	11	2.2	1.3	73	8.1	7.7	39	9.8	9.8
Cyclists	10	2.0	1.4	33	5.5	4.5	3	1.5	.7	41	5.9	8.6	35	5.8	7.1
Joggers	22	2.0	1.5	19	6.3	4.2	3	1.5	.7	25	3.6	3.4	5	2.5	.7
Boardsailors	0	N/A	N/A	7	2.3	1.5	0	N/A	N/A	2	N/A	N/A	0	N/A	N/A
Sightseers	4	2.0	1.4	0	N/A	N/A	0	N/A	N/A	1	N/A	N/A	1	N/A	N/A

or expectation of the physical and social conditions prevailing on the site. The manager's normative "knowledge" of the ideal environmental conditions, while often governing the day-to-day management of the facility, should be placed in a subservient role relative to the users as long as the integrity of the environment is maintained[6].

We are especially interested in seeing to what degree the various activities encountered along the UNB shoreline were affected by the weather (Table Q-4). Although no great surprises are revealed in this table in terms of the impact which weather has on the nine activities commonly observed along the UNB, several passive recreational activities are not normally distributed. These include strollers, park, and beach visitors. In addition, both shore fishers and trailer boaters are not normally distributed in one or two of the weather categories. This finding does raise a number of questions concerning the homogeneity of the participants within some of the activities. Is it possible that beach and park visitors and other user groups may be made up of two or more sub-populations? One group may be attracted to the site because of the sunny conditions, while another subgroup may decide not to visit the site perhaps because the conditions prevailing are perceived to be too hot and uncomfortable. While this finding is still highly tentative and subject to verification, substantiation could provide both opportunities and obligations for coastal management in Rhode Island and other coastal states, a point which will be discussed in greater

detail in the conclusions.

We also categorized usage on the basis of temperature and wind velocity. These results are found in Tables Q-5 and Q-6. Both variables were grouped in intervals of 10°F and 5 mph, respectively.

As in the previous analysis, several of these categories are not normally distributed. Again, this is especially true for the more frequently engaged in activities (beach and boat use, strolling, and fishing). The skewed data complicates the user estimates immensely as regression type models may be questionable.[7]

The overall utilization of the UNB shoreline and water is very low by any standards, which further complicates any attempts to develop forecasting models. Notwithstanding the distribution of the data sets, linear regression models were run--one for each of the major recreational activities (stroller, beachgoer, shorebased fishing, jogger, bicyclist, trailer boater, boardsailor, and sightseer) against weekday weather, temperature and wind velocity. Only the model forecasting fishing activity was marginally significant.

The inability to develop conventional forecasting (regression) models poses serious problems which are not easily overcome. To enable an approximate estimate of the overall usage of the recreational facilities located along the shore, the following approximation was used. The estimates which will be derived below are based on the following conditions and assumptions:

1. Sampling (interviewing) was undertaken regardless of environmental conditions (temperature, weather, wind velocity, etc.).

2. The recreational day lasts approximately five hours.

3. Turnover estimates surveyed are reasonable estimates of the visitor's length of stay within the facility.

Model:

The most common measure of recreational facility usage is the visitor day defined as the number of visitors using a given facility regardless of the length of stay. While there are obvious deficiencies in this measure, its advantage lies in the relative ease with which it can be applied especially when accurate tallies can not be obtained from attendance records. Most of the facilities located along the shore of the UNB are small and not serviced by gate attendants, and are often only infrequently used which makes any usage estimation difficult, cumbersome, and/or very expensive.

Visitor censuses conducted from each of the eleven sites were for budgetary reasons, out of the question. This meant that other means of obtaining visitor estimates had to be developed.

The empirical model finally adopted, while simple and intuitively sound, is intended to provide the Narragansett Bay Project management team with a first approximation of actual numbers of visitor days spent along the shores of UNB. The results derived from the model should however be interpreted cautiously.

The model takes the following form and estimates the total user days for each of the eleven sites for the 90 day recreational season:

$$UE_f = \frac{T_{su} \times D_u \times S_u}{H_u} \qquad U:1$$

where:

UE_f = Estimation of Seasonal Users within a given facility

T_{su} = Total number of visitors sampled (estimated) at facility "f"

D_u = Average length of the recreational day for a given activity, here set unilaterally at 5 hrs. for all activities in every facility[8]

H_u = Mean number of hours spent by the users,[9] here computed at 3.8 hours

S_u = Length of recreational season for a given activity,[10] here set unilaterally at 90 days

The model is based on the notion that usage varies with respect to activity and is a function of the perceived attractiveness of the park, beach, ramp or other official or unofficial recreational site. We assume that the user breakdown observed during the facility survey visit, is representative of the average user composition throughout the season including those times the facility is not surveyed. The model allocates the estimated seasonal user days to each activity in accordance with what has been observed. In other words, an assumption is made that the surveyors had visited a given site seven times during the season and had observed the following aggregated visitation numbers:

305	Beach and Park Visitors
207	Strollers
39	Fishers
11	Trailers
3	Joggers
0	Boardsailors
1	Sightseer
12	Cyclists
21	Cars
599	Total Users

In this instance a total of 599 users were observed during the five visits. Using model U:1, the seasonal user estimate was computed as follows:

$$UE_f = \frac{599 \times 5 \times 90}{3.8} = 70.934$$

The estimate would be allocated in accordance with the proportion of users observed during the five surveys as follows:

	Obs. N	Per Ctn.	Proj. Visit.
Beach & Park Visitors	305	50.9	36118
Strollers	207	34.6	24513
Fishermen	39	6.5	4618
Trailers	11	1.8	1302
Joggers	3	.5	355
Boardsailors	0	0	0
Sightseers	1	.1	118
Cyclists	12	2.0	1421
Cars	21	3.5	2487
	599	99.9	70932

Discussion

Tables Q-7 and Q-8 are estimates of the visitor days by facility and activity, respectively, while Tables Q-9 through Q-19 forecast the visitor days for each activity for the eleven most important facilities within the study area.

On the average summer day, slightly more than 4,000 recreational users visit the shores and waters of the UNB engaging in nine different activities within eleven official and semi-official state and local facilities (Q-7). In addition, a number of infrequently utilized areas offer additional recreational opportunities to an unknown number of recreationists. Because of their small sizes and overall low user intensity, we were not able to estimate usage for these facilities.

Table Q-7

Total Projected Users by Facility

	Daily	Seasonal
Conimicut Point	164	14,802
Sabin Point	182	16,341
India Point	383	34,458
Barrington Beach	542	48,789
Colt State Park	1,779	160,105
Fox Point	154	13,853
Haines Park	459	41,327
Rumstich Point	37	3,314
Hundred Acre Cove	203	18,353
Warren Town Beach	121	10,895
Bold Point Park	172	15,512
Total	4,197	377,749

Table Q-8

Total Projected User Day by Activity

	Daily	Seasonal
Beach & Park Visitors	1,403	126,306
Strollers	750	67,532
Fishers	611	55,001
Trailers	376	33,875
Joggers	112	10,070
Boardsailors	17	1,540
Sightseers	8	710
Cyclists	168	15,158
Cars	750	67,556
Total	4,197	377,749

Table Q-9
Colt State Park

Total User Days = $\frac{1352 \times 5 \times 90}{3.8}$ = 160,105

	N	%	Count
Beach & Park Visitors	405	29.9	47,960
Strollers	403	29.8	47,723
Fishers	242	17.9	28,658
Trailers	70	5.2	8,289
Joggers	49	3.6	5,803
Boardsailors	4	.3	474
Sightseers	4	.3	474
Cyclists	78	5.8	9,237
Cars	97	7.2	11,487
Total	1,352	100.0	160,105

Table Q-10
Barrington Town Beach

Total User Days = $\frac{412 \times 5 \times 90}{3.8}$ = 48,789

	N	%	Count
Beach & Park Visitors	179	43.4	21,197
Strollers	21	5.1	2,487
Fishers	52	12.6	6,158
Trailers	0	0	0
Joggers	6	1.5	710
Boardsailors	9	2.2	1,066
Sightseers	0	0	0
Cyclists	0	0	0
Cars	145	35.2	17,171
Total	412	100.0	48,789

Table Q-11
Haines Park

Total User Days = $\frac{349 \times 5 \times 90}{3.8}$ = 41,327

	N	%	Count
Beach & Park Visitors	100	28.6	11,842
Strollers	41	11.7	4,855
Fishers	6	1.7	710
Joggers	2	.6	236
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	28	8.0	3,316
Cars	96	27.5	11,368
Total	349	99.8	41,327

Table Q-12
India Point

Total User Days = $\frac{291 \times 5 \times 90}{3.8}$ = 34,458

	N	%	Count
Beach & Park Visitors	146	50.2	17,289
Strollers	45	15.5	5,328
Fishers	22	7.5	2,605
Trailers	3	1.0	355
Joggers	14	4.8	1,658
Boardsailors	0	0	0
Sightseers	1	.3	118
Cyclists	12	4.1	1,421
Cars	48	16.5	5,684
Total	291	99.9	34,458

Table Q-13
Hundred Acre Cove

Total User Days = $\frac{155 \times 5 \times 90}{3.8}$ = 18,353

	N	%	Count
Beach & Park Visitors	13	8.4	1,539
Strollers	0	0	0
Fishers	34	21.9	4,026
Trailers	62	40.0	7,342
Joggers	0	0	0
Boardsailors	0	0	0
Sightseers	1	.6	118
Cyclists	0	0	0
Cars	45	29.0	5,328
Total	155	99.9	18,353

Table Q-14
Sabin Point Park

Total Projected User Days = $\frac{138 \times 5 \times 90}{3.8}$ 16,309

	N	%	Count
Beach & Park Visitors	58	41.9	6,836
Strollers	4	2.9	473
Fishers	35	25.4	4,145
Trailers	9	6.5	1,066
Joggers	0	0	0
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	0	0	0
Cars	32	23.2	3,789
Total	138	99.9	16,309

Table Q-15
Bold Point Park

Total Projected Visitor Day = $\frac{131 \times 5 \times 90}{3.8}$ = 15,512

	N	%	Count
Beach & Park Visitors	3	2.3	355
Strollers	1	.7	118
Fishers	36	27.5	4,263
Trailers	62	47.3	7,342
Joggers	0	0	0
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	6	4.5	711
Cars	23	17.6	2,723
Total	131	99.9	15,512

Table Q-16
Fox Point

Total Projected Visitor Day = $\frac{177 \times 5 \times 90}{3.8}$ = 13,853

	N	%	Count
Beach & Park Visitors	40	34.2	4,736
Strollers	23	19.6	2,723
Fishers	1	.8	118
Trailers	0	0	0
Joggers	0	0	0
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	0	0	0
Cars	53	45.3	6,276
Total	117	100.0	13,853

Table Q-17
Conimicut Point

Total Projected Visitor Days = $\frac{125 \times 5 \times 90}{3.8}$ = 14,802

	N	%	Count
Beach & Park Visitors	38	30.8	4,573
Strollers	18	14.6	2,166
Fishers	29	23.6	3,490
Trailers	4	3.3	481
Joggers	3	2.4	361
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	0	0	0
Cars	31	25.2	3,731
Total	123		14,802

Table Q-18
Warren Town Beach

Total Projected Visitor Day = $\frac{92 \times 5 \times 90}{3.8}$ = 10,895

	N	%	Count
Beach & Park Visitors	84	91.3	9,947
Strollers	1	1.1	120
Fishers	7	7.6	828
Trailers	0	0	0
Joggers	0	0	0
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	0	0	0
Cars			
Total	92	100.0	10,895

Table Q-19
Rumstick Point

Total Projected Visitor Day = $\frac{28 \times 5 \times 90}{3.8}$ = 3,314

	N	%	Count
Beach & Park Visitors	0	0	0
Strollers	13	46.4	1,539
Fishers	0	0	0
Trailers	0	0	0
Joggers	11	39.3	1,302
Boardsailors	0	0	0
Sightseers	0	0	0
Cyclists	4	14.2	473
Cars	0	0	0
Total	28	99.9	3,314

Attempts were made to verify our estimates with records maintained by local and state authorities. Unfortunately, attendance records are only maintained by one park (Colt State Park), and estimates from other beaches, parks, and ramps are not regularly maintained. In a few instances we were able to check our estimates with 'questimates' made at the municipal level. While no scientific test for 'goodness of fit' could be applied, our derived estimates seems to be reasonable.

We did obtain attendance estimates from Colt State Park where attendance is recorded on the basis of the number of cars entering the facility. The park administration is basing their estimates on a car occupancy rate of 3.2 persons and estimates using this model suggests that 136,451 people visited the facility during the 1983 season. While the Colt State Park season is estimated slightly differently, the user estimate computed in the present study compares favorably with the DEM estimate[11]. The differences in the two estimates are on the order of 17.3 percent. Considering the nature of the data, we believe our model is quite reliable which gives us some confidence that our estimates on the eight remaining facilities are reasonable as well[12].

Nonetheless, the projections are approximatr and subject to future adjustments when more thorough and better information becomes available. With improved data it should be possible to measure the impact of a host of variables hypothesized to affect the individual recreationist's decision to engage in these pursuits. These variables include, but are not limited, to the following: weather

parameters including insulation, cloudcover, temperature, wind and humidity, environmental factors including perceived quality of the shore and nearshore, social conditions, including the user's perception of the overall quality of the environment. Finally, we hypothesize that a host of accessibility variables are important considerations in the recreationists' decision making process. These include parking, availability of public transportation, in addition to the direct and indirect costs of using the various facilities.

Based on the projected figures, the UNB offers shorebased recreational opportunities to a considerable number of both urban and suburban residents. Perhaps more importantly, with improved management this resource undoubtedly could serve an even larger clientele.

Similarly, it should be possible to improve the accuracy of the estimate by incorporating the variations in the individual group's recreational season, visit length, and frequency of usage.

The estimate provided here is in visitor days, which does not measure the number of people who are being served by the facilities. Similarly, we did not realize at the onset of the study that a considerable number of users drive into the park and beach and apparently never leave the car, but spend from a few minutes to an hour or more observing the scenery and activities. This represents a low-level recreational opportunity to a substantial number of citizens. Consequently, we did not include in our survey the number of people in the cars. In this study we counted each car as one user, which is a conservative measure and could be adjusted

should more accurate car occupancy rates become available in the future. However, without an estimate of the average number of occupants in the cars, such projections could not be made in the present project. A comparable problem relates to trailer count where we also limited the number of users to the number of trailers counted in the lot. We know the user group is larger than the number of trailers except we do not know by how much.

Finally, the aim of future research addressing the quantitative aspects of shore and nearshore recreational usage of an urbanizing shoreline should be towards the use of parametric statistics.

BIBLIOGRAPHY

Adams, J., Weather, Weather Information, and Outdoor Recreation Decision: A Case Study of the New England Beach Trip, unpub. Ph.D. dissertation, Graduate School of Geography, Clark University, Worcester, MA, 1971

Brown, M. (et.al.), Narragansett bay Issue Assessment: Public Perceptions, Report submitted to the Narragansett Bay Project, by Center for Environmental Studies, Brown University, Providence, RI, Jan., 1987

Bryan, H. "The Sociology of Fishing: A Review and Critique," in Stroud, R. and Clepper H. (eds.) Marine Recreational Fisheries, International Game Fish Assoc., the Nat. Coalition for Marine Conservation and the Sports Fishing -Institute., Washington, DC, 1976

Clawson, M. and Knetsch, J.L., Economics of Outdoor Recreation, The Johns Hopkins University Press, Baltimore, MD, 1966

Collins, C. Sedwick, S. Recreational Boating in Rhode Island's Coastal Waters: A Forward Look, URI Mar. Tech. Rep. # 75, CRC, Narragansett, RI, 1976

Coppock, J.T. & Duffield, B.S., Recreation in the Countryside, St. Martins Press, New York, 1975

Edwards, S. An Introduction to Coastal Zone Economics: Concepts, Methods, and Case Studies, Taylor and Francis, New York
1988

Hale, S.O. Narragansett Bay: A Friend's Perspective, Marine Advisory Service, University of Rhode Island, Kingston, RI, (no date)

Heatwole, C.A. & West, N., "Mass Transit and Beach Access in New York City," Geog. Rev. (April, 1980),70,2, 210-217

Heatwole, C.A. and West, N., Shore-based Fishing in New York City, Draft Final Report Submitted to the New York Sea Grant Institute and Office of Oceanography and Marine Assessment, NOAA, USDOC, New York City, 1985

Hennessey, T. & Robadue, D., The Governance of Estuaries: Agenda Setting and Institutional Choice in Narragansett Bay, Paper presented at the First National Symposium on Social Science and Resource Management, Oregon State University, Corvallis, OR, May 12-16, 1986

Hershman, M. et.al., Under New Management: Port Growth and Emerging Coastal Management Programs, University of Washington Press and Washington Sea Grant Program, Seattle, WA, 1978

Hurtt, A.C. & Quinn, J.G., "Distribution of Hydrocarbons in Narragansett Bay Sediment Cores, Env. Sci. Tech. (1979), 13, 829

Hoffman, E.J., Falke, A.M. & Quinn, J.G., "Waste Lubricating Oil Disposal Practices in Providence, Rhode Island: Potential Significance to Coastal Water Quality," Coastal Zone Mgmt. Jour., (1980),8, 337

Hoffman, E.J. (et.al.), Inputs of Pollutants into Rhode Island Rivers via Urban Runoff, Report to Rhode Island Department of Environmental Management, Division of Water Resources, (March, 1983)

Interface: Providence Design Team, Interface: Providence, RI School of Design, Providence, RI, 1974

Martin, B.K. & Robadue, D., "Estuarine and Combined Sewage and Storm Water Flows from the City of Providence, CRC, URI, Narragansett, RI (Jan., 1983

Myers, E.P. & Harding, E.T. ((eds.) Ocean Disposal of Municipal Wastewater: Impacts on the Coastal Environment, Vol. 2, MIT Sea Grant Publication MITSG 83-33, Cambridge, MA, 1983

Olsen, S. & Lee, V., A Summary and Preliminary Evaluation of Data Pertaining to the Water Quality of Narragansett Bay, Coastal Resources Center, URI, Kingston, 1979

Oviatt, C.A., "Some Aspects of Water Quality and Pollution Sources to the Providence River, Report for Region I, EPA, September, 1970-1980, Graduate School of Oceanography, URI, Narragansett, RI, 1980

Outdoor Recreational Resources Review Commission, "Water For Recreation-Values and Opportunities, ORRRC Study Report # 10, USGPO, Washington, DC, 1962

Rhode Island, Coastal Resources Management Program, CRMC, Providence, RI, 1983

Rhode Island Office of State Planning and Rhode Island Department of Environmental Management, Ocean State Outdoors: Recreation and Conservation Strategies for Rhode Island, Providence, RI, May, 1986

Robadue, D. Providence Harbor: A Special Area Management Plan, Coastal Resources Center, URI, Kingston, RI, 1983

Schultz, D.M. & Quinn, J.G. "Suspended Matter in Narragansett Bay: Fatty Acid and Hydrocarbon Composition," Organic Geochemistry, (1977),1,27-36

Spaulding, I. A., Factors Related to Beach use, URI, Mar. Tech. Rep. # 13, URI, Kingston, RI, 1973

Spaulding, M.L., "Laterally Integrated Water Quality Model for an Estuary," Jour. of Fluids Engineering, (1974) #74-FE-A

Swanson, J.C. & Spaulding, M.L. A Two-Dimensional Estuarine Water Quality Model: Application to the Providence River, Appendix E to Water Quality Benefits of Proposed CSO Project for Providence, RI, Metcalf and Eddy Contract, 68-04-1009, (1983)

Turner, C., Tidal and Subtidal Circulation in the Providence River, unpub. MS Thesis, Department of Ocean Engineering, URI, Kingston, RI, 1984

Tyrrell, T., Travel, Tourism and Research Report, (March, 1989),6,1

West, N., "Estuarine Quality, Use and Public Perception," paper presented at the CZ87 Conference, Seattle, WA, May 26-29, 1987, published in the Proceedings, 770-783

West, N., "A Preliminary Review of Water Quality Parameters and Recreational User Perceptions of Nearshore Water Quality," Jour. of Coast. Research, (Summer, 1989),5,3,563-572

FOOTNOTES

1 Two of the respondents came from out of state and reported 2 to 2-1/2 hours travel time and more than 140 miles, respectively. For purposes of estimating the travel times for the sample, these two observations were not included in either the travel distance or travel time estimates.

2 Since the standard deviation is well below the mean, the data is assumed to be normally distributed, thus representing the statistical universe from which it was drawn. For additional comments see footnote 6 and 7.

3 This estimate was made from the Boating Almanac Vol. 2 covering Long Island, Connecticut, Rhode Island and Southern Massachusetts. No estimate was made of the number of moored boats as this would have required an overflight, but it is believed to be considerably smaller than the number of slips. Published by the Boating Almanac Company, Inc., Severna Park, Maryland, 21146

4 Insurance companies commonly require that recreational boats be hauled before November 1 as severe storms increases the risk of loss.

5 A Spearman Rank Correlation Coefficient corrected for ties was computed $r_s = .83$, with an alpha .01 between number of users and number of activities engaged in.

6 In this report the 'satisficing' decision model has been used to account for the various uses of the UNB shoreline and water. While this model retains elements of the rational behavioral model used by most economists, it also recognizes that the individual decision maker (user) does not necessarily behave (use the resource i.e. the beach and/or water) from a purely profit maximization point of view. Satisficing behavior recognizes that users are influenced by a host of physical, social and economic factors and where the selected choice is base on the maximization of the **user's perceived** options. This model differs fundamentally from the normative model which posits that all potential decision makers (users) will behave similarly by maximizing their profits (benefits). The interested reader should consult Simon H. Models of Man: Social and Rational; Mathematical Essays on Rational Behavior in Social Settings, John Wiley and Sons, New York, 1957. See also Firey, W. Man, Mind and Land, Glencoe Free Press, Glencoe, IL, 1954.

7

Regression models are used first and foremost as a forecasting tool. Most social scientists view their disciplines as part of a nested hierarchy where the first and lowest level consists of descriptions. Examples of disciplines which until recent times fell in this category is Geography, History, Astronomy and the Space Sciences including Astronomy. This stage is followed by a phase where the phenomenae are being classified. Examples of disciplines which largely fall into this category is besides Taxonomy, Regional Geography and certain aspects of Geology. The last stage in the evolution of a discipline is when the scientists (social as well as physical and biological) begin to forecast events in time and in space. Most, but not all of the physical and biological sciences have reached this level. The social sciences are generally farther behind. Because of the underlying assumptions guiding economics, this is the social science which is involved in forecasting the most. However, the ability to project economic events in time and space is difficult at best and subject to a host of poorly understood factors. It is fair to say that there is considerable disagreement among most social sciences related to the issue discussed above. In this study, in very large part because social behavior, especially since recreational settings are so poorly understood, it was decided to forego regression analysis and use an empirically derived model, which in the three areas we were able to test seem quite capable of projecting attendance. For further information on this point, the reader is referred to Abler, R. Spatial Organization, Prentice Hall, Inc., Englewood Cliffs, NJ, 1971 pp 3-21. Given that the topic dealt with in this report represents an ideographic research which findings are specific to the area being studied it should be clear that the most important objective is to describe (understand) the activities in terms of type, location and intensity which take place along the UNB. The number of studies dealing with urban waterfront recreation broadly stated are few and the studies dealing with specific types of activities fewer still. The decision to treat the responses as distribution free seems warranted, particularly in light of the fact that some of the data sets were small with similar variances (as a condition of homeoscedasticity). For further discussion on this point the reader is referred to David Harvey, Explanation in Geography, p 280ff, St. Martins Press, New York, 1970. See also Philip McCarthy, Introduction to Statistical Reasoning, p 265ff, McGraw Hill Book Comp., New York, 1957 and Sidney Siegel, Non Parametric Statistics, McGraw Hill Book Comp., New York, 1988.

8 This estimate was decided upon without the benefit of actual measurements and observations. We are, of course, aware that some activities occur throughout the day, jogging has been mentioned above. Other activities are engaged in unrelated to any specific part of the day. Fishing which peaks according to the Lunar Cycle is another example. Many fishers with flexible work schedules engage in this activity when the tides are favorable for fishing.

9 While the time spent in the different activities varies as indicated by the user surveys discussed above, 3.8 hours was decided upon as it represents the median time of the nine activities included in the detailed analysis.

10 Different activities have different seasons; bathing, for instance, is largely limited to the period Memorial Day to Labor Day. Fishing, on the other hand, is considerably longer and may have several peaks depending upon the species sought. The 90 day season was selected as an approximation in that it does appear to coincide with the period of heaviest coastal and nearshore usage. More detailed studies should be undertaken if year-round user estimates are to be developed.

11 We obtained this information from an Inter-Office Memo from Mr. Kevin O'Malley, Regional Manager, Parks and Recreation in charge of Colt State Park. The Colt State Park season and thus the attendance records count vehicles only on weekends until the third week of June, thereafter every day starting at 7:30 in the morning and terminating at 4:00 in the afternoon.

12 Attempts were made to check our estimates with attendance figures in Bristol and Barrington (besides Colt State Park). Neither town maintains attendance records on a daily or seasonal basis. However in checking with town officials no serious discrepancies were identified with the best town 'guestimate' and our estimates. Based on Colt State Park, Barrington and Bristol we believe the estimations developed in this study are reasonably reliable.

APPENDICES A & B

APPENDIX A

PASSIVE USER SURVEY

1) Where did this interview take place? Please indicate by letter 'O' on the map of the Upper Narragansett Bay, found on the reverse of this survey.(P14)..... _____

2) What is today's date? (P1) _____

3) How many hours have you been here today?.(P2)..... _____

4) How many additional hours do you expect to spend here today?.(P3)..... _____

5) From the list of recreational and leisure time pursuits identified below, please circle those you have participated in on around the Upper Narragansett Bay during the past year. (P4)

Swimming and bathing:..... _____
Fishing from shore..... _____
Sightseeing, nature watching..... _____
Jogging..... _____
Walking..... _____
Bicycling..... _____
Picnicking..... _____
Boating..... _____
Other:_____ _____

6) Which of these are your favorite activities. By favorite we mean those you participate in the most along the shores of Upper Narragansett Bay? Please start with your first choice. (P5)

6a) First Choice: (P5a) _____

6aa) When was the last time you participated in this activity? Month: (P5b)_____ _____
Year: (P5c)_____ _____

6ab) About how many times did you engage in this during the past year?.(P5d)..... _____

6ac) Not counting todays visit and again referring to your most favorite activity, approximately, how many hours do you engage in this activity when you go?.(P5e)..... _____

6b) Second Choice: (P6a)_____

6ba) When was the last time you participated in this activity? Month: (P6b)_____ _____
Year: (P6c)_____ _____

6bb) About how many times did you engage in this during the past year?.(P6d)..... _____

6bc) Referring to your second choice, approximately, how many hours do you engage in this activity when you go?.(P6e)..... _____

7) Please rank the water quality of the Upper Narragansett Bay on a scale of 1 - 10 with '1' indicating a very high water quality and '10' a very low water quality: (P7)

I___I___I___I___I___I___I___I___I___I
1 2 3 4 5 6 7 8 9 10

8) What prevents you from using the Upper Narragansett Bay more than at present? (P8)

Lack of time and other personal factors.(P8)..... _____
Upper Narragansett Bay is too crowded..... _____
Upper Narragansett Bay water is not clean..... _____
Deteriorating quality of the shoreline..... _____
Upper Narragansett Bay is not a safe environment to visit because of personal safety..... _____
Access to the shore is difficult..... _____
Other:_____ _____
_____ _____

9) Please place a letter 'R' in those areas you visited the last time you were relaxing or recreating along the shores of Upper Narragansett Bay (P18)

10) On the same map, please indicate by letter 'S' those areas of the Upper Narragansett Bay you visit regularly (P19)

11) How many came with you on this trip?.(P24)..... _____

12) How many in your household visit the shores along the Upper Narragansett Bay on a regular basis?.(P26)..... _____

13) Please draw a line around those areas of the Upper Narragansett Bay shore you believe offer the best recreational opportunities. (P21)

14) The following sectors of society have been charged with polluting many bays and estuaries in this country including Upper Narragansett Bay. Please indicate the extent to which each of the sectors have contributed to the pollution problem in the Upper Narragansett Bay: (P41)

	Not Responsible	Moderately	Very
Industry, Business	____	____	____
Local Municipalities	____	____	____
Sewage Treatment Plants	____	____	____
State of Rhode Island	____	____	____
Private Persons	____	____	____
Federal Government	____	____	____
Others:	____	____	____
_____	____	____	____

15) In what way is the quality of the water affected? Please try to be as specific as possible (P40)

_____
_____
_____

16) Please indicate on the list below, the three agencies and/or organizations you believe have been most effective in improving the water quality in the Upper Narragansett Bay. Please number your first choice # 1. (P42)

Coalition of Coastal Communities..... _____
National Marine Fisheries Service.... _____
R.I. Department of Environmental..... _____
Management..... _____
U.S. Army Corps of Engineers..... _____
City of Providence, Department of.... _____
Public Works..... _____
Rhode Island Coastal Resources
Management Council..... _____
Rhode Island Office of Statewide
Planning..... _____
Rhode Island Governor's Office..... _____
U.S. Coast Guard... ..... _____
U.S. Health and Human Services
Administration, Shellfish
Branch..... _____
Save the Bay, Inc..... _____
U.R.I. Coastal Resources Center..... _____

17) Besides Upper Narragansett Bay, what other areas in Rhode Island do you visit for recreation at least once every year: (P43)

A_____
B_____
C_____

18) In what municipality (city or town) do you live? (P44)

_____

19) How did you get here today? (P45)

Driving..... _____
Public Transportation..... _____
Walking..... _____
Bicycling..... _____

20) How long does it take you to get from your home to this location (in minutes).(P46)..... _____

21) What is the distance (by road) between your home and this location?.(P47)..... _____

22) Besides yourself, how many are there in your household?.(P48)..... _____

23) Would you mind telling us what you do for a living? (P49)

_____

24) What is the weather today: (Please Check) (P50)

Sunny.....	_____	_____
Partly Cloudy.....	_____	_____
Overcast.....	_____	_____
Showers.....	_____	_____
Rain.....	_____	_____

25) What is the temperature today?..... _____ _____ (P51)

26) What is the wind velocity (mph) today?.... _____ _____ (P52)

27) Interviewer (P16)_____..... _____

Shorebased

SHOREBASED FISHING SURVEY

1) Where did this interview take place? Please indicate by letter 'O' on the map of the Upper Narragansett Bay, found on the reverse of this survey (S14)

2) What is today's date? (S1)_____ _____

3) How many hours have you been here today?.(S2).... _____

4) How many additional hours do you expect to spend here today?.(S3)..... _____

5) From the list of recreational and leisure time pursuits identified below, please check those you have participated in on or around the Upper Narragansett Bay during the past year. (S4)

Swimming and bathing:..... _____
Fishing from shore..... _____
Sightseeing, nature watching..... _____
Jogging..... _____
Walking..... _____
Bicycling..... _____
Picnicking..... _____
Boating..... _____
Other_____ _____

6) Which of these are your favorite activities. By favorite we mean those you participate in the most along the shores of Upper Narragansett Bay? Please start with your first choice. (S5)

6a) First Choice: (S5a)_____ _____

6aa) When was the last time you participated in this activity?
Month: (S5b)_____ _____
Year: (S5c)_____ _____

6ab) About how many times did you engage in this during the past year? (S5d)..... _____

6ac) Not counting todays visit and again referring to your most favorite activity, how many hours do you engage in this activity when you go?.(S5e)..... _____

6b) Second Choice: (S6a)_____ _____

6ba) When was the last time you participated in this activity?
Month: (S6b) _____ _____
Year: (S6c) _____ _____

6bb) About how many times did you engage in this during the past year? (S6d)..... _____

6bc) Referring to your second choice, how many hours do you engage in this activity when you go?.(S6e)..... _____

7) Please rank the water quality of the Upper Narragansett Bay on a scale of 1 - 10 with '1'indicating a very high water quality and '10' a very low water quality: (S7)

I___I___I___I___I___I___I___I___I___I
1 2 3 4 5 6 7 8 9 10

8) What prevents you from using the Upper Narragansett Bay more than at present? (S8)

Lack of time and other personal factors_____
Upper Narragansett Bay is too crowded..._____
Upper Narragansett Bay water is not clean..... _____
Deteriorating quality of the shoreline..... _____
Upper Narragansett Bay is not a safe environment to visit because of personal safety..... _____
Access to the shore is difficult..... _____
Other:_____ _____
_____._____

THE NEXT FEW QUESTIONS PERTAIN TO FISHING. IF YOU DO NOT GENERALLY FISH THE UPPER NARRAGANSETT BAY, PLEASE GO TO QUESTION 21

9) On the chart found on the other side of this questionnaire, please place a letter 'F' along those areas of the Upper Narragansett Bay shoreline you fish regularly (S15)

10) Were the Upper Narragansett Bay closed to fishing because of water quality problems and/or lack of access, how far would you be willing to travel to fish? (S53)

Less than 5 miles..... _____
5.1 miles - 10 miles..... _____
10.1 miles - 15 miles..... _____
15.1 miles - 20 miles..... _____
20.1 miles - 25 miles..... _____
More than 25.1 miles..... _____

11) On the same chart, please indicate by letter 'S' those areas of the Upper Narragansett Bay shores which you believe have the best fishing (S20)

12) How many came with you on this trip?.(S24)..... _____

13) How many in your household besides yourself fish regularly?.(S26)..... _____

14) How many hours is your average fishing trip when you fish along the shores of the Upper Narragansett Bay?.(S27)..... _____

15) How many days ago did you last fish on the shores of the Upper Narragansett Bay?.(S28)..... _____

16a) What did you catch the last time you went fishing on the Upper Narragansett Bay (Please check) (S32)

Species	Number	Approximate Size (inches)	Approximate Weight (lbs)
A_____	____	_____	_____
B_____	____	_____	_____
C_____	____	_____	_____

16b) What did you do with the catch (Please circle appropriate answers for each specie of fish: (Please check) (S33)

	Species A	B	C
Make into meals.....	___	___	___
Throw it back.....	___	___	___
Freeze.....	___	___	___
Give it away.....	___	___	___
Other_____	___	___	___

16c) If you ate it yourself, how many person meals did you get from the catch referred to above?.(S34)..... _____

17) How much would it cost to replace your fishing equipment you use when you fish along the shore, including equipment you have not brought with you today?.(S35)..... _____

18) About how much did you spend on bait and tackle to go fishing today?.(S36)..... _____

19) Are there any fish caught here which should not be eaten because they may be contaminated by water pollution (Please circle) (S37)

Yes No _____

If no go to question 21

20) What kind of fish should not be eaten because of possible contamination? (S38)

A_____
B_____
C_____

21) The following sectors of society have been charged with polluting many bays and estuaries in this country including Upper Narragansett Bay. Please indicate the extent to which each of the sectors have contributed to the pollution problem in the Upper Narragansett Bay: (S41)

	Not Responsible	Moderately	Very
Industry, Business	____	____	____
Local Municipalities	____	____	____
Sewage Treatment Plants	____	____	____
State of Rhode Island	____	____	____
Private Persons	____	____	____
Federal Government	____	____	____
Other:			
_____	____	____	____

22) In what way is the quality of the water affected? Please try to be as specific as possible (S40)

_____
_____
_____

23) From the following list, please rank the three agencies and/or organizations starting with the one which you believe has been the most effective in improving the water quality of the Upper Narragansett Bay (S42)

Coalition of Coastal Communities..... _____
National Marine Fisheries Service..... _____
R.I. Department of Environmental Management..... _____
U.S. Army Corps of Engineers..... _____
City of Providence, Department of Public Works..... _____
Rhode Island Coastal Resources Management Council..... _____
Rhode Island Office of Statewide Planning..... _____
Rhode Island Governor's Office..... _____
U.S. Coast Guard..... _____
U.S. Health and Human Services Administration, Shellfish Branch..... _____
Save the Bay, Inc..... _____
U.R.I. Coastal Resources Center..... _____

24) Besides Upper Narragansett Bay, what other areas in Rhode Island do you visit for recreation at least once every year: (S43)

A_____
B_____
C_____

25) In what municipality, city or town do you live? (S44)

_____ _____

26) How did you get here today? (S45)

Driving..... _____
Public Transportation..... _____
Walking..... _____
Bicycling..... _____
How long does it take you to get from your home to this location (in minutes)..... _____

27) How long does it take you to get from your home to this location (in minutes)? (S46)..... _____

28) What is the distance by road between your home and this location?.(S47)..... _____

29) Besides yourself, how many are there in your household?.(S48)..... _____

30) Would you mind telling us what you do for a living? (S49)_____ _____

31) What is the weather like today (Day of Interview)? (S50)

Sunny.....	_____	_____
Partly Cloudy.....	_____	_____
Overcast.....	_____	_____
Showers.....	_____	_____
Rain.....	_____	_____

32) What is the temperature the day of the Interview?.(S51)..... _____

33) What is the wind velocity the day of the interview (S52)..... _____

34) Interviewers (S16)_____..... _____

Boat (fishing)

Dear Respondent:

This survey is sponsored by the Narragansett Bay Project which for the past two years or so has been deeply involved in studying the quality of the Narragansett Bay, the manner in which it is being managed and used by the public.

We would like to ask your cooperation in answering a few brief questions about the way you use the Upper Narragansett Bay. The answers you give should relate to the last time you spent time relaxing around the Upper Bay. The answers you provide us with will in no way be associated with you, but will be tabulated and analyzed at the end of our study.

We would be happy to answer any questions you may have. Please call or write me at your convenience. I may be reached at (401) 792-2596. Thank you for your help.

Sincerely yours,

Niels West, PI
Department of Marine Affairs
University of Rhode Island
Kingston, RI 02879

Where did this interview take place? Please indicate by letter 'O' on the map of the Upper Narragansett Bay, found on the reverse of this survey

What is today's date?_____ _____

How many hours have you been here today?..... _____

How many additional hours do you expect to spend here today?..... _____

From the list of recreational and leisure time pursuits identified below, please check those you have participated in on or around the Upper Narragansett Bay during the past year.

Swimming and bathing:..... _____
Fishing from shore..... _____
Sightseeing, nature watching..... _____
Jogging..... _____
Walking..... _____
Bicycling..... _____
Picnicking..... _____
Boating..... _____
Other_____ _____

Which of these are your favorite activities. By favorite we mean those you participate in the most along the shores of Upper Narragansett Bay? Please start with your first choice.

First Choice:_____ _____

When was the last time you participated in this activity?
Month:_____ _____
Year:_____ _____

About how many times did you engage in this during the past year?.. _____

Not counting todays visit and again referring to your most favorite activity, how many hours do you engage in this activity when you do?..... _____

Second Choice:_____

When was the last time you participated in this activity?

Month: _____ _____

Year: _____ _____

About how many times did you engage in this during the past year?..... _____

Referring to your second choice, how many hours do you engage in this activity when you go?..... _____

Please rank the water quality of the Upper Narragansett Bay on a scale of 1 - 10 with '1' indicating a very high water quality and '10' a very low water quality:

I___I___I___I___I___I___I___I___I___I
1 2 3 4 5 6 7 8 9 10

What prevents you from using Upper Narragansett Bay more than at present?

Lack of time and other personal factors.... _____
Upper Narragansett Bay is too crowded..... _____
Upper Narragansett Bay water is not clean.. _____
Deteriorating quality of the shoreline..... _____
Upper Narragansett Bay is not a safe environment to visit because of personal safety..... _____
Access to the shore is difficult..... _____
Other: _____ _____
_____ _____

Approximately how many times did you go boating on the Upper Narragansett Bay last year..... _____

Of these, how many were fishing trips?..... _____

What proportion (percent of total boating time) is spent within Upper Narragansett Bay?.... _____

Do you use Upper Narragansett Bay primarily for passage to other boating areas within or beyond Narragansett Bay? (Please circle)

Yes No

On the chart of the Upper Narragansett Bay, please indicate by letter 'A' where your boat trip started from

On the same chart, please draw the approximate course you too the last time you went boating on the Upper Bay

What kind of boat do you use when on the Upper Narragansett Bay?

Privately owned (yours, family, friends or associates..... _____

Average size of boat (in feet)..... _____

Charter, Party or Head Boat..... _____

How often did you fish last year from Charter and/or Head or Party boats?..... _____

THE NEXT FEW QUESTIONS PERTAIN TO FISHING. IF YOU DO NOT GENERALLY FISH THE UPPER NARRAGANSETT BAY, PLEASE GO TO QUESTION ____

On the chart found on the other side of this questionnaire, please place a letter 'X' in those areas of the Upper Narragansett Bay you fish regularly

On the same chart, please indicate by letter 'S' those areas of the Upper Narragansett Bay you fish regularly

How many came with you on this trip?..... _____

How many in your household fish regularly..... _____

How many hours is your average fishing trip when you fish Upper Narragansett Bay?..... _____

When did you last fish in the Upper Narragansett Bay?..... _____

Please draw a line around the areas of Upper Narragansett Bay you believe offer the best fishing opportunities. Please draw a diagonal cross ('X') in this area

What did you catch the last time you went fishing on the Upper Narragansett Bay (Please check)_____

Species	Number	Approximate Sizes (inches)	Approximate Weight (lbs)
A_____	____	_____	_____
B_____	____	_____	_____
C_____	____	_____	_____

What did you do with the catch (Please circle appropriate answers for each specie of fish: (Please check)

	Species A	B	C
Make into meals.....	___	___	___
Throw it back.....	___	___	___
Freeze.....	___	___	___
Give it away.....	___	___	___
Other_____	___	___	___

If you ate it yourself, how many person meals did you get from the catch referred to above?..... _____

How much would it cost to replace your fishing equipment (excluding boat and engine) which you now own?..... _____

About how much did you spend on bait and tackle to go fishing today?... ..... _____

Are there any fish caught here which should not be eaten because they may be contaminated by water pollution (Please circle)

Yes No _____

IF YOU ANSWERED YES TO THE PREVIOUS QUESTION, PLEASE CONTINUE, OTHERWISE GO TO QUESTION ____

What kind of fish should not be eaten because of possible contamination?

_____
_____
_____

In your opinion, what is the principal cause of the poor quality of this body of water?

_____
_____
_____

In what way is the quality of the water affected? Please try to be as specific as possible

_____
_____
_____

Please indicate on the list below, the three agencies and/or organizations you believe have been the most effective in improving the water quality of the Upper Narragansett Bay. Please number your first choice # 1

Coalition of Coastal Communities..... _____
National Marine Fisheries Service..... _____
R.I. Department of Environmental Management..... _____
U.S. Army Corps of Engineers..... _____
City of Providence, Department of Public Works..... _____
Rhode Island Coastal Resources Management Council..... _____
Rhode Island Office of Statewide Planning..... _____
Rhode Island Governor's Office..... _____
U.S. Coast Guard..... _____
U.S. Health and Human Services Administration, Shellfish Branch..... _____
Save the Bay, Inc..... _____
U.R.I. Coastal Resources Center..... _____

Besides Upper Narragansett Bay, what other areas in Rhode Island do you visit for recreation at least once every year:

_____
_____
_____

In what municipality, city or town do you live?

_____

How did you get to where the boat was moored/slipped or trailered to the water?

Driving..... _____
Public Transportation..... _____
Walking..... _____
Bicycling..... _____

How long does it take you to get from your home to this location (in minutes)..... _____

About how many miles is that?..... _____

Besides yourself, how many are there in your household?..... _____

Would you mind telling us what you do for a living? _____ _____

APPENDIX B

FACILITY TRIP REPORT

Facility:_____ _____

Today's Date:

Weekday:_____ _____

Date:_____ _____

Arrival Time:---------- _____

Departure Time:---------- _____

Estimated Total Number of Visitors:

Strollers:---------- _____

Joggers:---------- _____

Beachgoers/Park Visitors:---------- _____

Shorefishers:---------- _____

Trailers:---------- _____

Sightseers:---------- _____

Others:_____---------- _____

_____---------- _____

_____---------- _____

Climatic Information:

Weather:_____---------- _____

Temperature:_____---------- _____

Wind Velocity:_____---------- _____

Interviewer:_____---------- _____

APPENDIX

C

Upper Narragansett Nearshore Mapping Final Report

Niels West
Department of Marine Affairs
University of Rhode Island
Kingston, RI 02881

November, 1988

Executive Summary

This report is the first part of Part II of a project entitled "User Activities, Perceptions, Environmental Quality and Management of Narragansett Bay," which was modified in two ways. The area of investigation was limited to the Upper Narragansett Bay (UNB), and the scope of work enlarged to include a "drive-through survey" of the landuses in the first tiers inland of the shoreline. An additional ad-on in the delivery comprised an unsupervised Landsat Thematic Mapper (TM) classification of the cities and municipalities bordering the UNB.

In light of the differences between the two objectives the final report was divided into two parts. The first part entitled "Qualitative and Quantitative Analysis of Shore and Nearshore Users of the Upper Narragansett Bay, Rhode Island" analyzed the results of several user surveys and facility reports conducted during the Spring, Summer, and Fall of 1987.

The second part of the Final Report consists of (a) eight maps depicting the land use and land cover of the area immediately adjacent to the shoreline, and (b) an unsupervised Landsat Thematic Mapper (TM) classification of the landcover of the cities and towns bordering the UNB.

Introduction

The mapping of Upper Narragansett Bay was undertaken with two objectives in mind -- to identify coastal areas used for passive and active recreation. This information is incorporated in the locater map in the first part of the final report entitled "Qualitative and Quantitative Analysis of Shore and Nearshore Users of the Upper Narragansett Bay, Rhode Island."

While many areas are used for recreation outside of designated parks, beaches, marinas and walkways, usage is low and infrequent.

A second objective of mapping this area in greater detail is that this may provide groundtruth for the unsupervised Landsat TM analysis should it be decided eventually to conduct a supervised classification.

Procedures

Most of the concern expressed by federal, state and local governmental officials concerning Narragansett Bay have addressed the physico-biological quality of the Bay. Compared to other coastal cities on the Atlantic seaboard, Providence and other cities and towns bordering the UNB have done relatively little in terms of revitalizing the urban waterfront. Most of the efforts and investments made along the Greater Metropolitan Providence waterfront have been undertaken in an attempt to retain the Providence Port as a viable commercial enterprise. The revival effort which has been carried out in Providence, for

instance, has been concerned with areas away from the port and port-related facilities. The changes that have been occurring for the most part have been incremental and, as a result, often more difficult to discern by the casual observer.

The current coastal mapping was undertaken in an effort to obtain a generalized picture of the landuses and land covers in the immediate area of the shoreline. These areas represent some of the most valuable pieces of the UNB real estate, and are opportunities for both the private and public sectors to invest, develop and manage for either private profit or public benefit.

In agreement with the Narragansett Bay Project Administration it was decided to undertake a "drive-through verification" of the Landuses within the immediate area of the shoreline. Such efforts are commonly made to provide a regional overview of the type of land cover and landuse. The procedure is simple and is based on an evaluation of existing map resources between the time the original data was collected and the present (Summer 1987).

A field base map was drawn from the U.S. Coast and Geodaetic Survey, Navigational Charts of the Providence Harbor. In addition, we were able to access photo-orthoguads which are intermediate-level airphotos often reproduced at a scale of 1:24,000 or 1:36,360. These are often made to coincide with the U.S.G.S. 7-1/2 minute topographic map series which covers all of Rhode Island.

Information observed in the field was mapped and verified from the photo-orthoguads. Where changes were observed, these were noted on the field maps. No efforts were made to verify apparent use with actual usage.

The field work was undertaken by a graduate student in the Department of Marine Affairs who completed this part of the mapping effort during the Fall of 1986. First draft land use and cover maps were completed during the Winter and Spring of 1987 on one map. The finished maps were done commercially during the Summer and Fall of 1988.

Since the scale of both the field and working maps was rather large, measuring approximately 2 x 4 feet, it was decided to disaggregate the finished map into eight different plates, in addition to one locater map identifying the relative location of each of the eight plates.

Findings

The coast was classified into the following ten classes:

Residential

Mixed Residential/Commercial

Commercial

Industrial

Institutional

Recreational

Undeveloped

Bait Shops

Marina/Ramps

Eight classes covered areas with two (Bait Shops and Marina/Ramps) identified specific marine-related land uses.

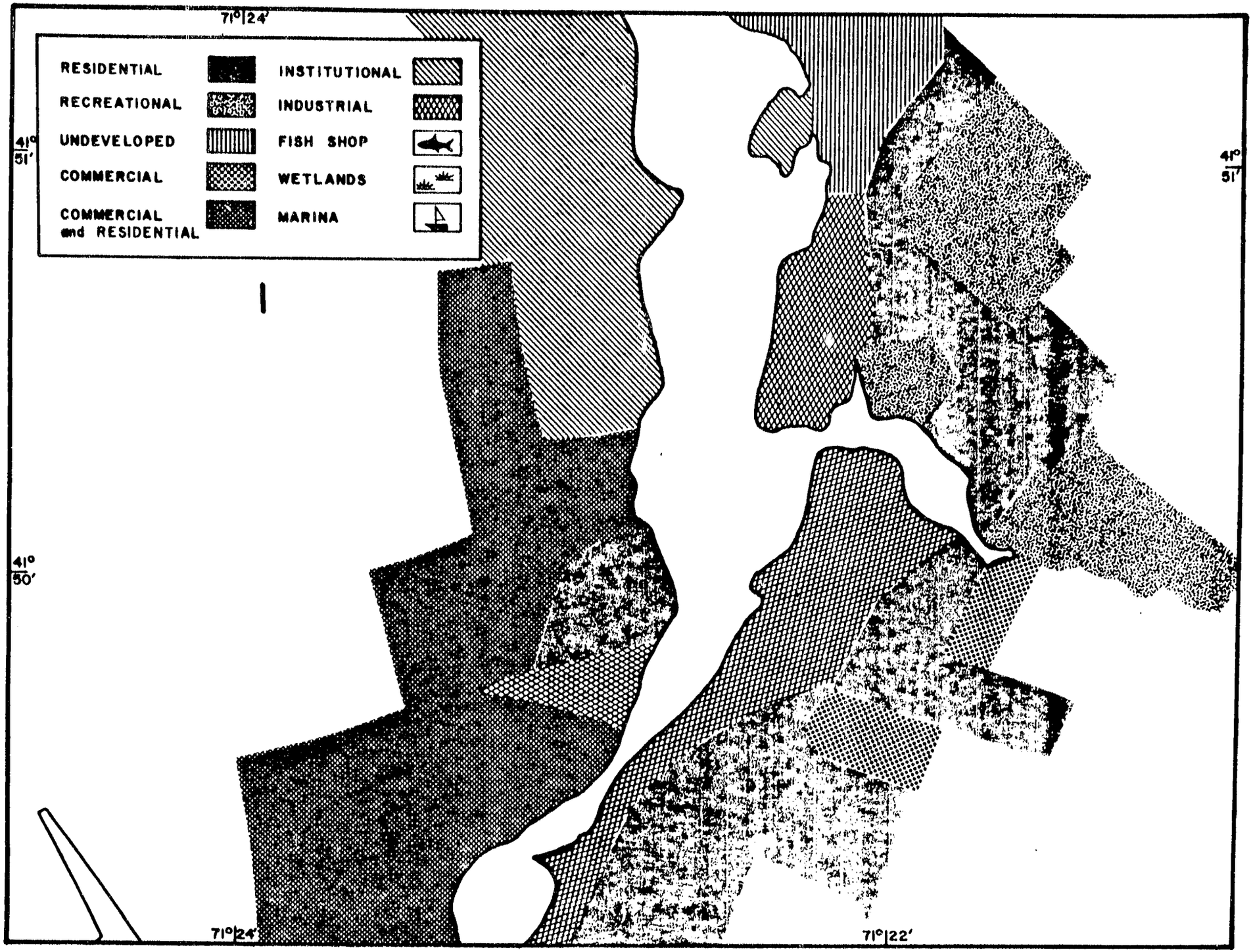
Significance and Recommendations

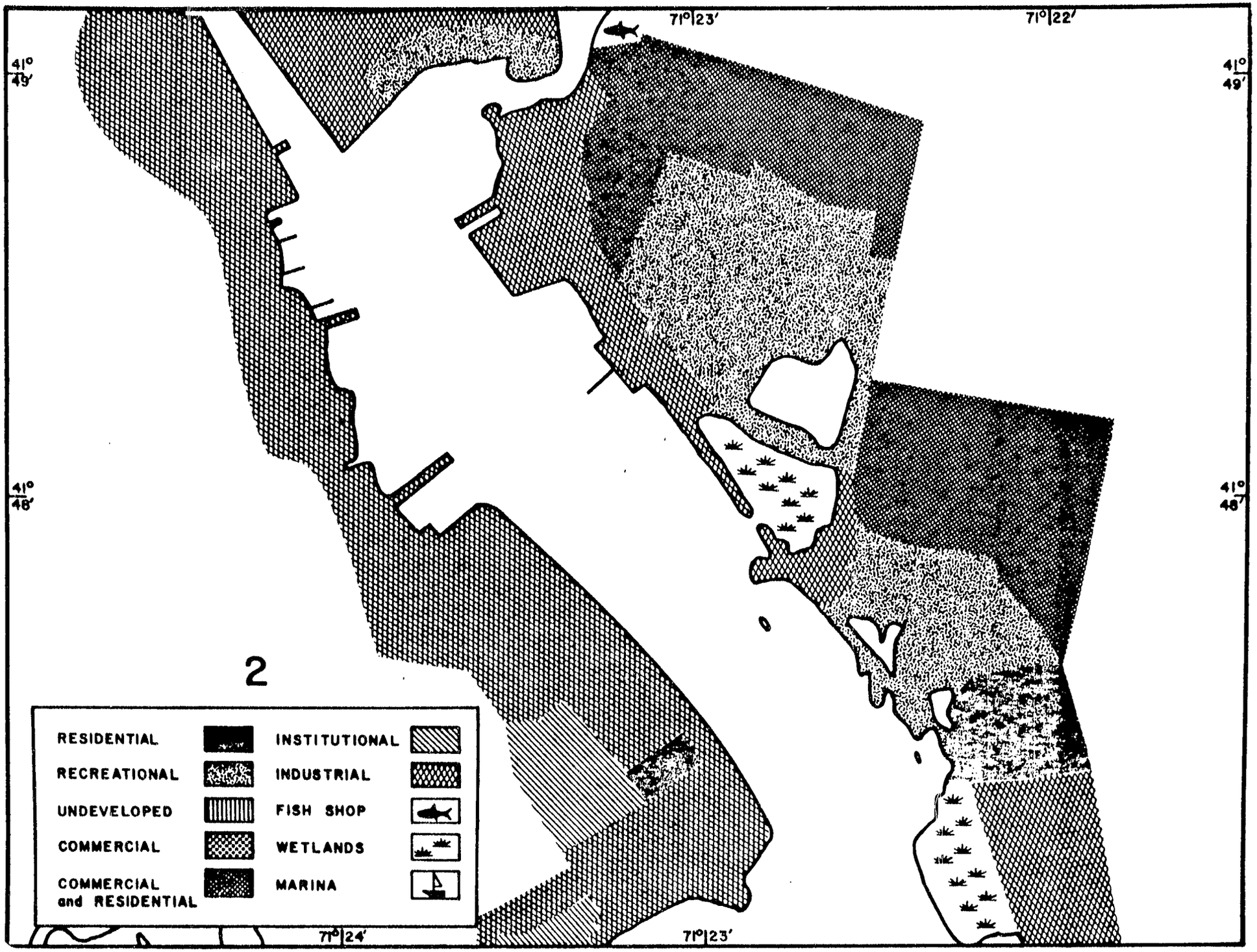
This mapping effort may be used as a preliminary step in groundtruthing Landsat remote sensing efforts discussed above; however, additional interior locations should be selected to insure reliability of classes generated some distances from the shore. Other potential uses of the maps include promotional materials which the administration staff at the NBP headquarters may decide to undertake.

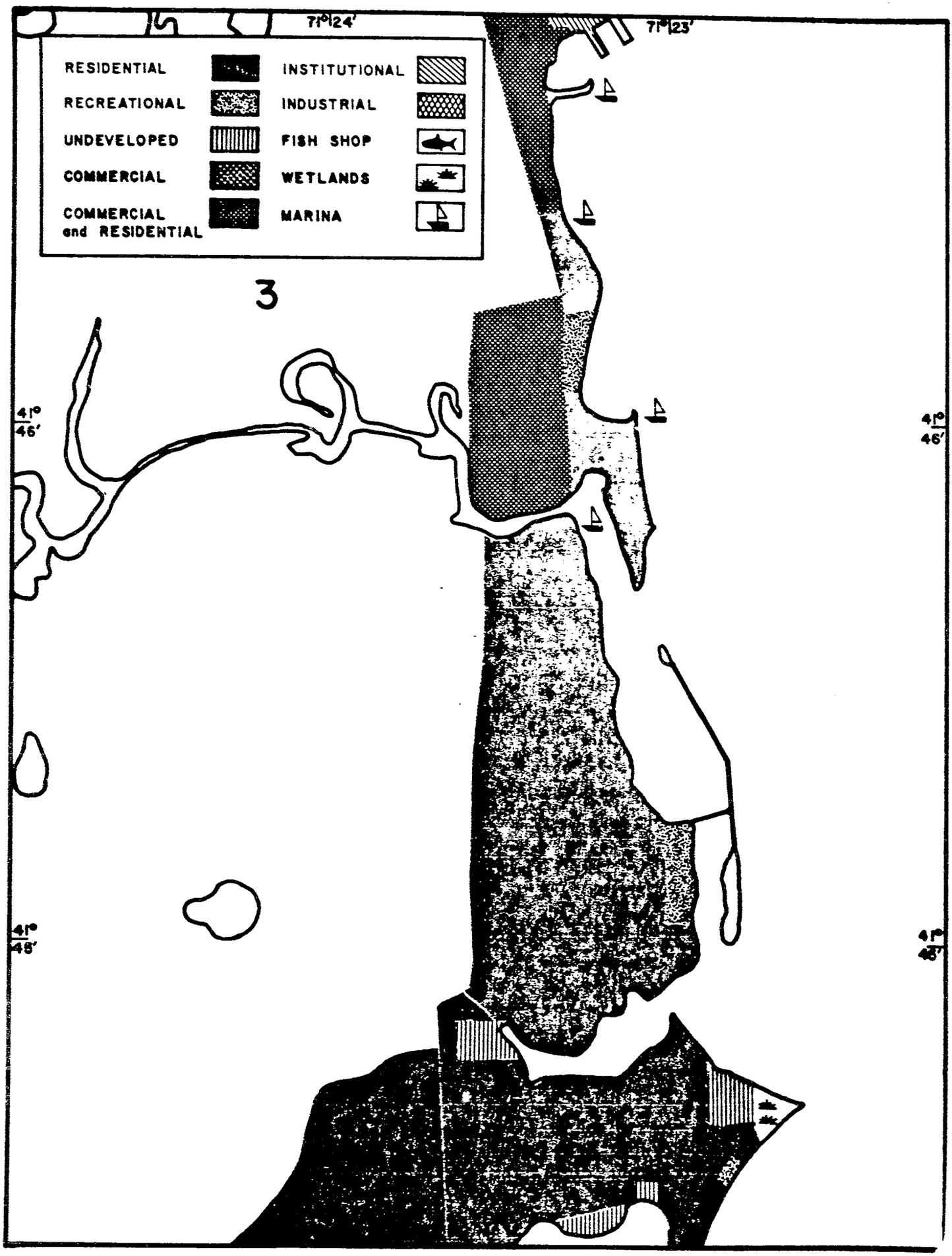
Maps are created for a specific purport. Cadastral maps are intended to show property lines only, while tax maps emphasize size and site characteristics of the property. The eight maps included here would be useless in this context; however, they do describe in a regional context the distribution of major landcover/use types. When unrelated to other socio-environmental information including but not limited to population, income, age distribution, transportation facilities, etc., such maps may help to locate additional recreational facilities.

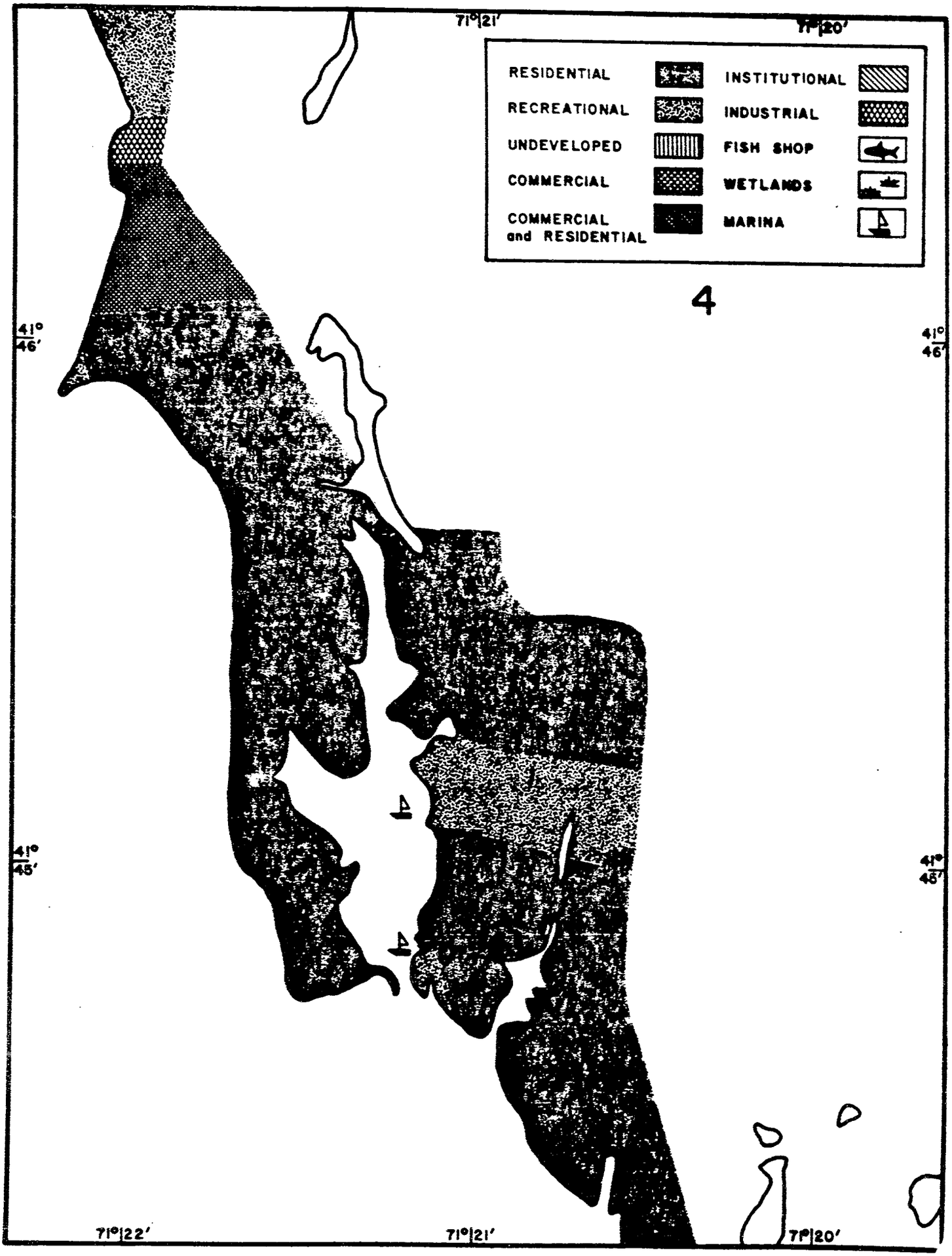
Although the maps cover a relatively small geographical area, it is a very important one from both an ecological and recreational point of view. Two recommendations follow. Given the creation of the ARC/Info Lab at URI, it is recommended that the information incorporated on the maps be included within the

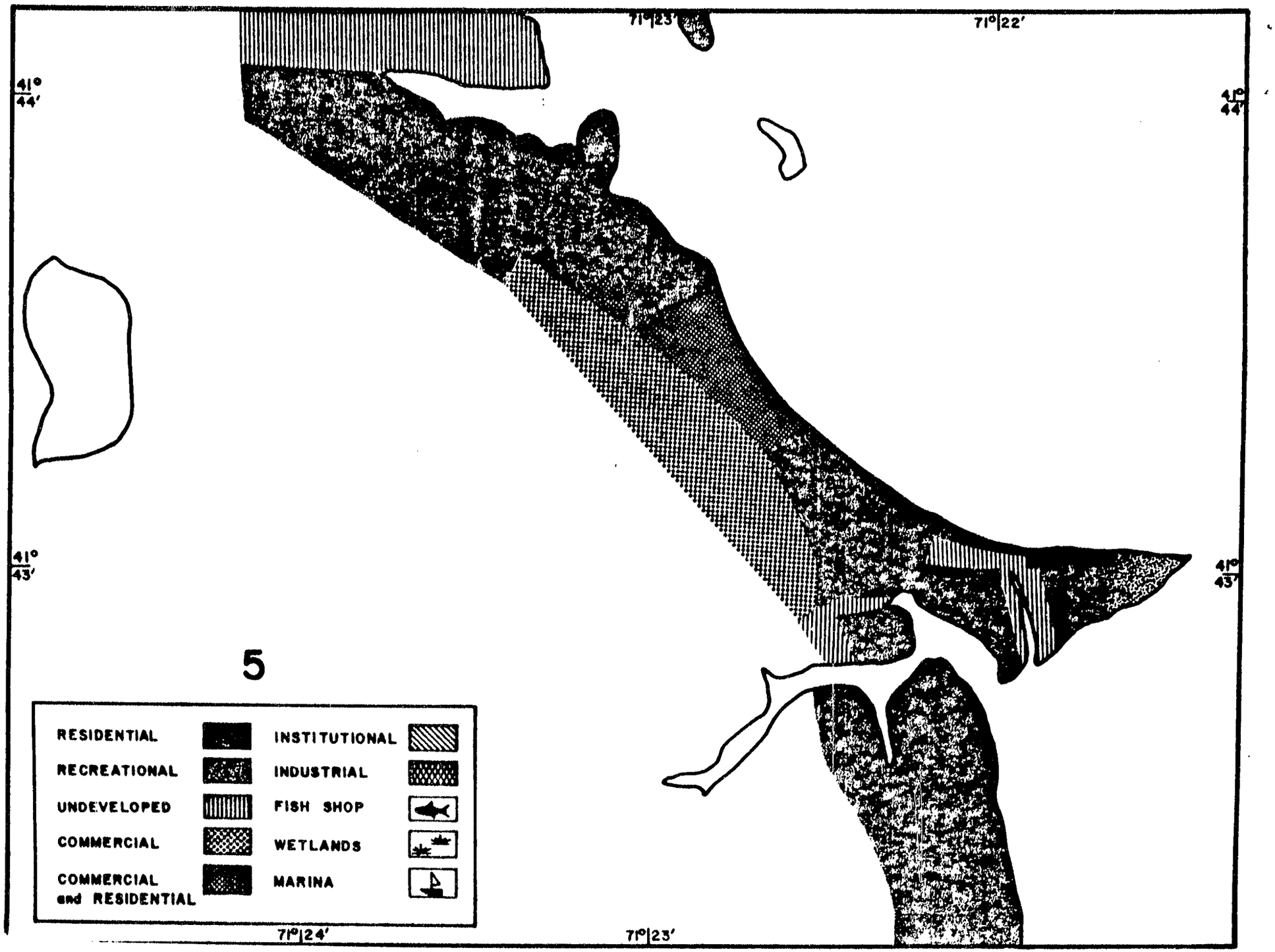
Rhode Island Comprehensive Mapping effort, assuming the proportion used here (Mercator) can be changed to conform with the projection adopted by the Department of Environmental Management and the University of Rhode Island.

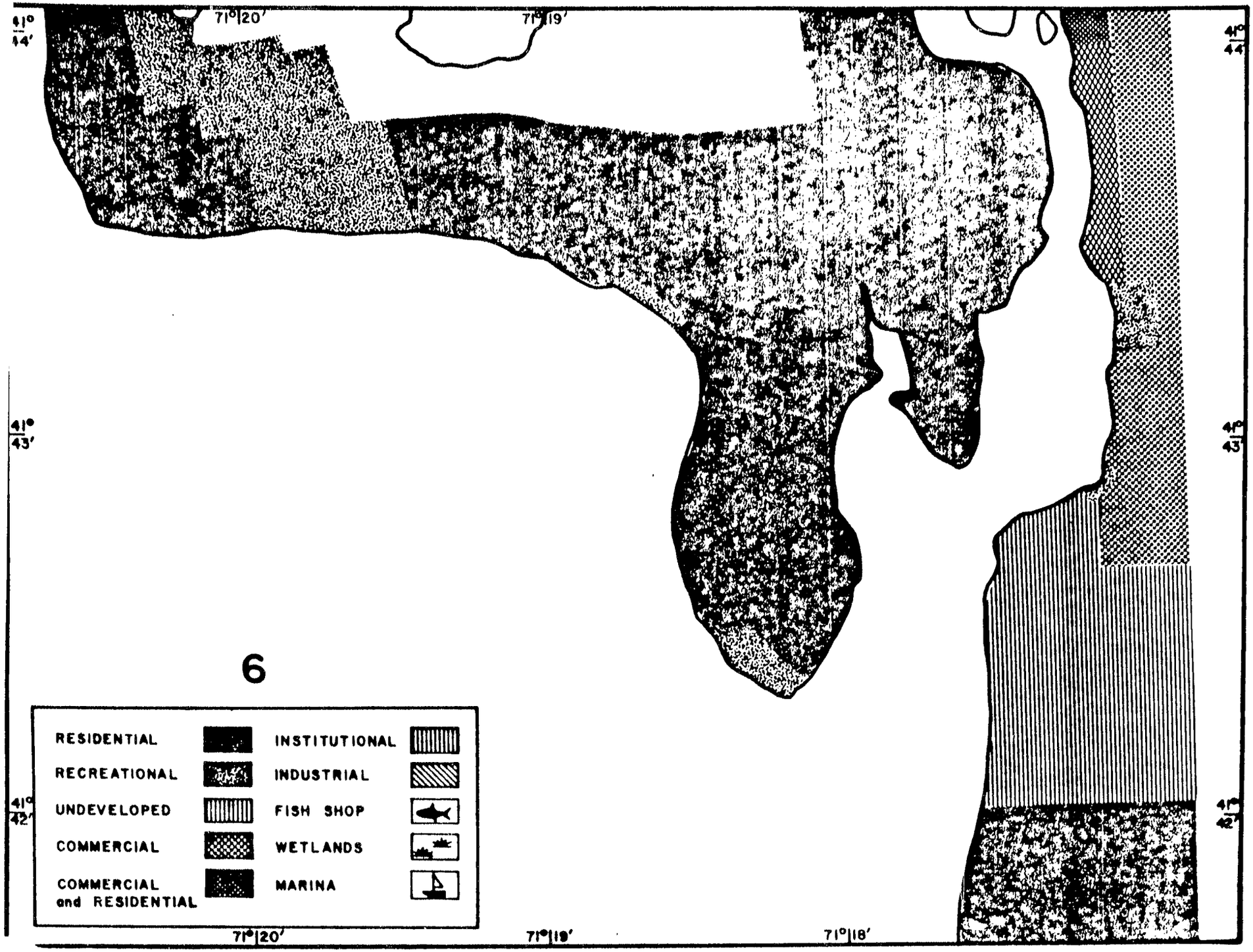

71°24'
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
41° 51'
41° 50'
71°24'
71°22'

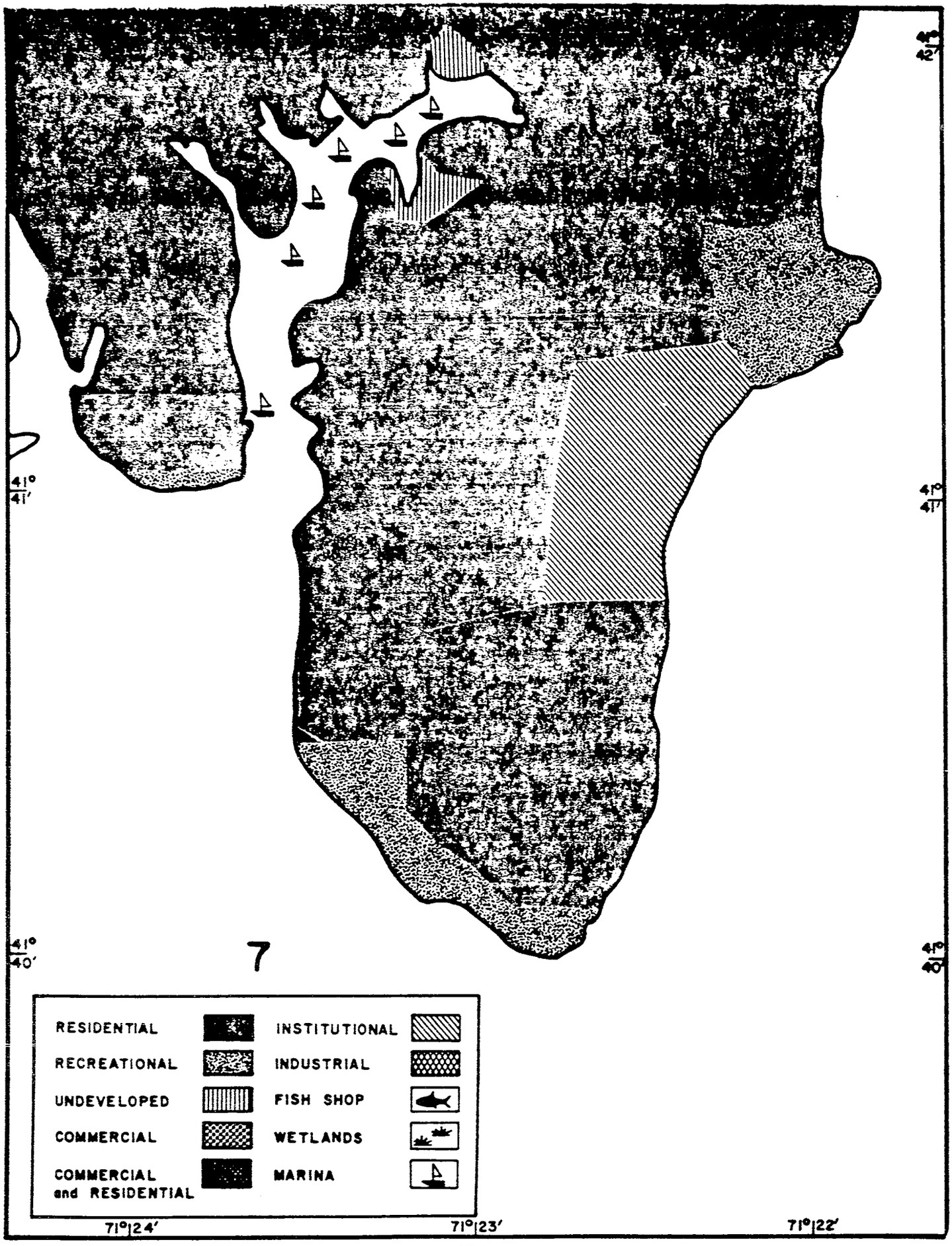

71°23'
71°22'
41°49'
41°48'
2
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
71°24'
71°23'

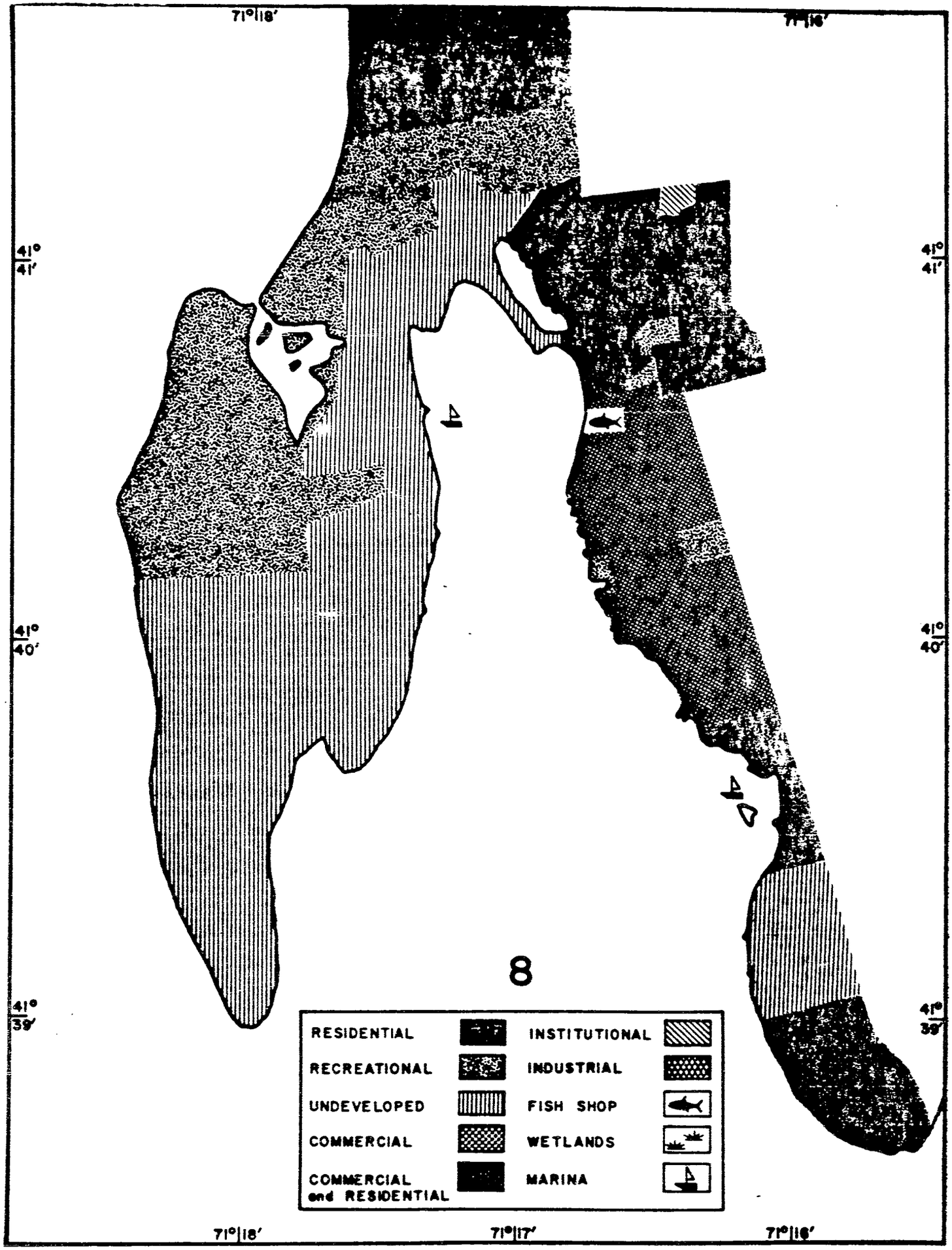

71°24'
71°23'
RESIDENTIAL
INSTITUTIONAL
RECREATIONAL
INDUSTRIAL
UNDEVELOPED
FISH SHOP
COMMERCIAL
WETLANDS
COMMERCIAL and RESIDENTIAL
MARINA
3
41° 46'
41° 46'
41° 48'

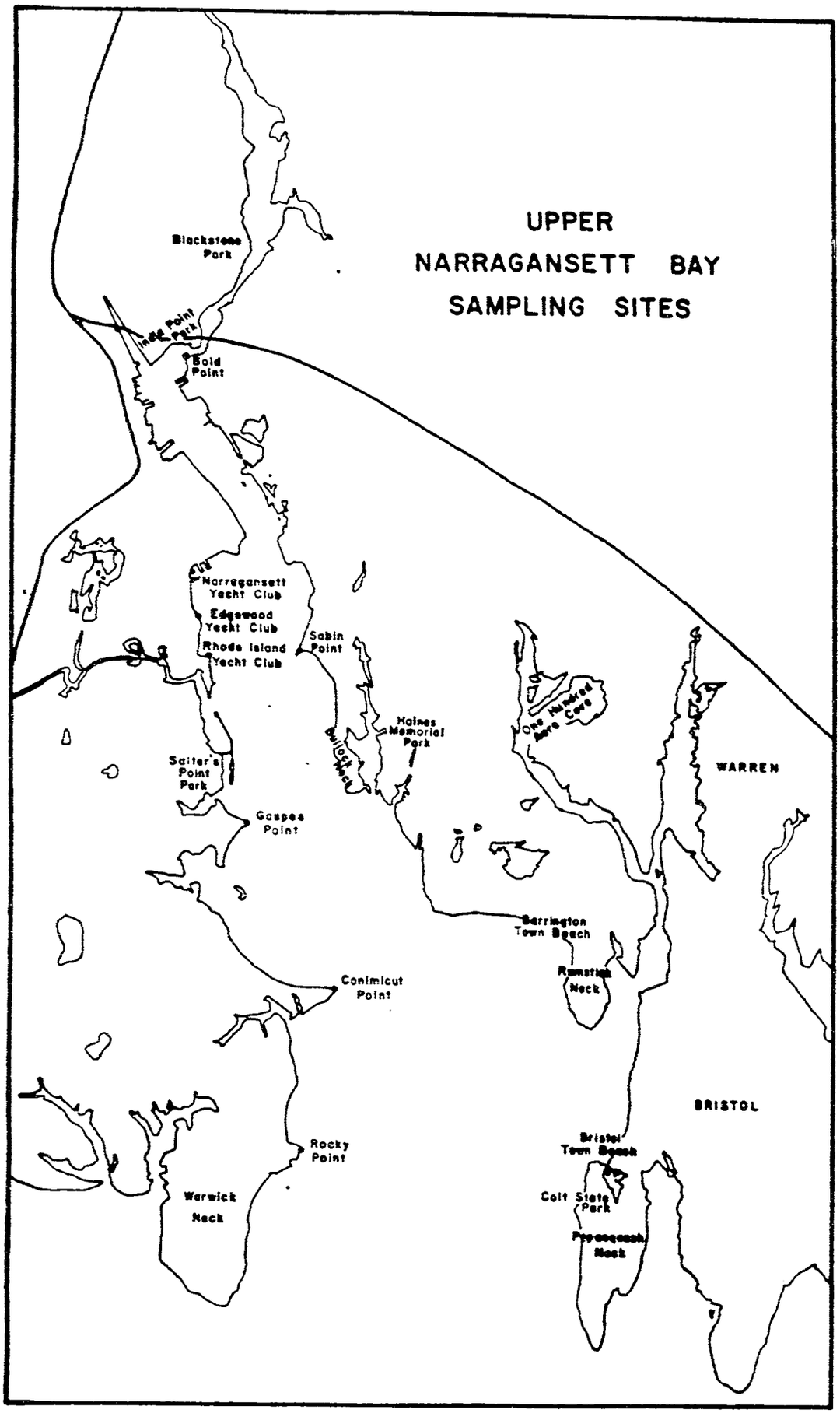

71°21'
71°20'
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
4
41° 46'
41° 45'
71°22'
71°21'
71°20'

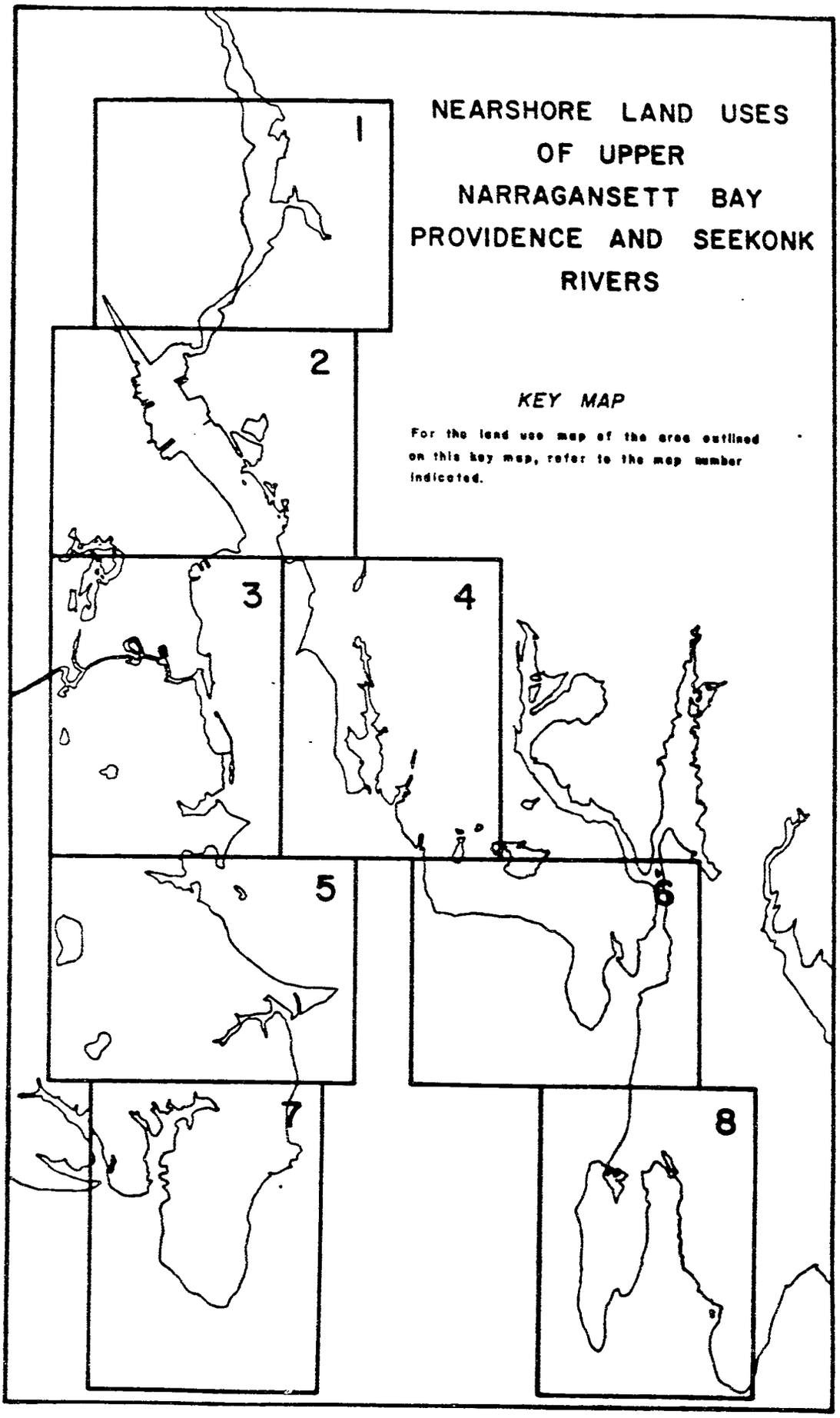

71°23'
71°22'
41°
44'
41°
43'
5
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
71°24'
71°23'


71°20'
71°19'
41°44'
41°43'
41°42'
6
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
71°20'
71°19'
71°18'


41° 41'
41° 40'
7
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
71°24'
71°23'
71°22'


71°18′
71°16′
41°
41′
41°
40′
41°
39′
4
4A
8
RESIDENTIAL
RECREATIONAL
UNDEVELOPED
COMMERCIAL
COMMERCIAL and RESIDENTIAL
INSTITUTIONAL
INDUSTRIAL
FISH SHOP
WETLANDS
MARINA
71°18′
71°17′
71°16′


UPPER
NARRAGANSETT BAY
SAMPLING SITES
Blackstone Park
India Point Park
Bold Point
Narragansett Yacht Club
Edgewood Yacht Club
Rhode Island Yacht Club
Sabin Point
Haines Memorial Park
Bullock Neck
Salter's Point Park
Gaspee Point
Conimicut Point
Rocky Point
Warwick Neck
Ohio Shore
Nayatt Cove
WARREN
Barrington Town Beach
Ramstick Neck
BRISTOL
Bristol Town Beach
Colt State Park
Poppasquash Neck


NEARSHORE LAND USES
OF UPPER
NARRAGANSETT BAY
PROVIDENCE AND SEEKONK
RIVERS
KEY MAP
For the land use map of the area outlined on this key map, refer to the map number indicated.
1
2
3
4
5
6
7
8