

Wetlands Regulations and Public Perceptions
In Massachusetts

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Purpose

This paper reports on the results of a 1979 survey of wetlands property owners in two Massachusetts coastal towns. The towns in which the survey was conducted were chosen to represent two trends perceived to be affecting the present course of shoreline development outside of large urban areas in the state. Shifting patterns of regional development along the Massachusetts coast over the past two decades are reviewed as a prelude to the report on the survey. The socioeconomic characteristics of the populations interviewed separate quite clearly into categories which mirror the general development trends outlined.

In addition to socioeconomic information, the survey gathered information on the characteristics of wetlands property and its ownership, on property owners' perceptions of wetlands and wetlands values, and their perceptions of and experience with wetlands regulations at the state and local level. The state and local mechanisms which regulate wetlands use and development in Massachusetts are described as contextual background for the latter portions of the survey. The survey results themselves are presented mostly in descriptive terms. Future work will focus on explaining apparent differences in property use and development and in attitudes and perceptions of wetlands value and wetlands regulations in terms of other characteristics described in the survey. The consequences of this information for wetlands regulation in Massachusetts are discussed briefly.

Regional Growth in the Massachusetts Coastal Zone

The coastal zone management problem is often framed in terms of the effect rapid population growth in coastal areas has on fragile coastal resources. Frequently cited statistics point, for example, to the fact that 42% of the United States' population lives in the 400 counties that the federal Office of Coastal Zone Management considers to be coastal and to the fact that the population continues to grow faster in coastal areas than in the rest of the U.S. (U.S. Department of Commerce 1978).

The population trends of the past two decades in the Massachusetts coastal zone illustrate several of the state's coastal zone management problems and pinpoint some of the factors which motivate

Table 1. Population and Percent Change by Coastal Region in Massachusetts, 1970-1977 (Source: U.S. Bureau of Census, Current Population Reports 1979).

	1970 Population	1977 Population	%Change
Plymouth Bay	32,241	48,941	51.8
Nantucket	3,774	5,469	44.9
Cape Cod	96,656	136,919	41.7
Martha's Vineyard	6,177	7,981	30.5
South Shore	58,139	68,502	17.8
Mount Hope Bay	156,218	166,643	6.7
Buzzards Bay	173,925	185,361	6.6
Upper North Shore	78,978	82,689	4.7
Boston Harbor	984,107	958,825	-2.6
Lower North Shore	259,451	240,881	-7.2

this research. The state Office of Coastal Zone Management has grouped for planning purposes the state's 74 coastal cities and towns into ten regions, each region comprised of towns of similar geographic and demographic characteristics (Figure 1). Table 1 above lists these regions in decreasing order according to percent population increase over the eight-year period from 1970 to 1977.

While Massachusetts as a whole experienced a 1.6% population increase during this eight-year period, its coastal region grew by 2.8%. Although such figures mirror the national trends, substantial differential growth patterns evident in Table 1 (ranging from a 51.8% regional increase to a 7.2% regional decrease) serve to define more clearly the nature of the pressure currently being brought to bear on the Massachusetts coast by demographic changes. The state's southeast shore, encompassing the Plymouth Bay, Cape Cod, Martha's Vineyard and Nantucket regions leads the rest of the state in growth

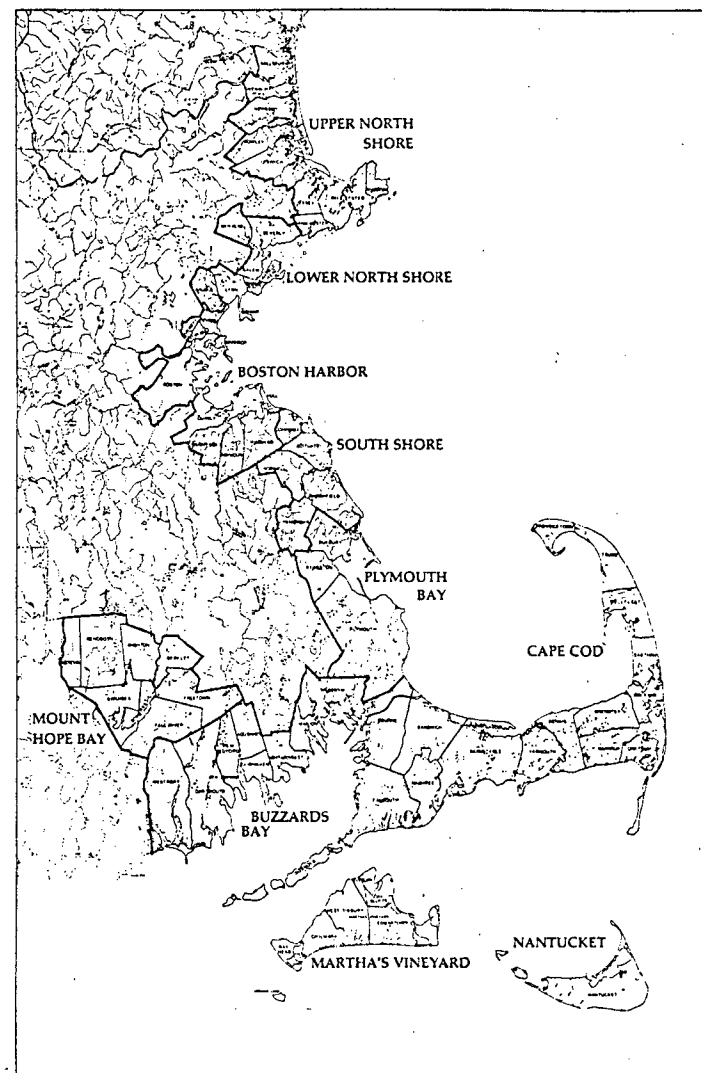


Figure 1. Planning regions in the Massachusetts coastal zone. Marshfield is located in the center of the South Shore region and Falmouth is in southwestern Cape Cod. Figure adapted from an illustration in the Massachusetts Coastal Zone Management Plan.

by a substantial margin. These four regions are characterized by abundant open space and ocean-related environmental amenities as well as by long-standing traditions as centers for tourism (Each of these regions is an easy day trip from most of the metropolitan Boston area.) On the other hand, the most heavily populated coastal regions, the urbanized Boston Harbor and the Lower North Shore regions, are the only coastal regions losing population. The modest growth exhibited by the Upper North Shore region, and the more substantial growth in the South Shore region, may reflect a mix both of suburbanization extending outward from the Boston area and of tourism and recreation-seeking activity.

The high growth areas on the Massachusetts southeastern shore also encompass the state's largest remaining reservoir of undeveloped wetlands and shorefront. The perceived threat of accelerating shorefront development to this resource motivated the passage of the state's pioneering wetlands legislation in the mid-1960's (the Wetlands Protection Act; see Table 3). The rapid colonization of the southeastern shore, strongly abetted by second and retirement home development, was already evident then: Cape Cod's population grew by 37.5% during the 1960's while Plymouth County, which includes the Plymouth Bay coastal planning region, grew by 39.4%. It is also worth noting that the size of the coastal area actively involved in rapid development has increased since the 1960's: the offshore islands of Martha's Vineyard and Nantucket, which grew by 30.5% and 44.9% respectively during 1970 to 1977, had annual growth rates which averaged only about .5% during the 1960's (U.S. Department of Commerce 1978).

A 1976 state survey showed nearly two-thirds of the Massachusetts coastline to be zoned for residential development: only about one-sixth of the shorefront was zoned in specifically conservation-oriented categories, including restricted wetlands zones (Massachusetts Office of Coastal Zone Management 1976). This was the situation in which the 1978 approval of the Massachusetts Coastal Zone Management Plan gave new impetus to the state's wetlands use regulation programs. Renewed emphasis was then placed on the enforcement and application of several existing wetlands regulation statutes (see Table 3). It is clear that the strongest development pressure on the shorefronts and wetlands of Massachusetts has come from housing development and that such development is likely to continue as the strongest source of pressure on wetlands resources into the future.

Motivations for Settling in the Coastal Zone

These changing coastal settlement patterns, as expressed through the differential regional growth rates summarized in Table 1, lead naturally to the questions behind the research described in this report. In the coastal area south and east of Boston, where our study sites are located, at least two kinds of waterfront settlement trends appear. One, in the distant suburbs of the metropolitan Boston area where open space including undeveloped waterfront and wetlands property is still plentiful, seems oriented toward "bedroom community" development which has an emphasis on waterside living.

The second more dramatic trend, in the more distant areas where

ocean-oriented recreational opportunities are greatest, seems oriented toward second and retirement home development as part of a general regional emphasis on coastal tourism. This phenomenon was well documented in a Cape Cod study (Booz, Allen & Hamilton Inc. 1972). The study found that at least 90% of Cape Cod's population increase from 1965 to 1970 was due to in-migration. Furthermore, the populations in the 45-to-64 and 65-and-over age groups were found to have grown at rates substantially greater than that of Cape Cod as a whole between 1960 and 1970, with the latter category showing a much larger increase than the former. The suggested pattern is one of retired persons seeking second or retirement homes at a distance from present or former jobs. Such regional differences in motivation for occupying the shorefront may also entail differences in attitudes and concerns related to shorefront property ownership. Such factors may partly explain regional variations in the acceptability of and participation in coastal planning initiatives which affect wetlands development.

The factors which influence attitudes related to coastal programs are difficult to determine - they are certainly not readily apparent in shorefront settlement patterns themselves. It is not surprising that in general little socioeconomic information has been incorporated into coastal planning programs for social equity and other considerations (Dickert and Sorensen 1974). Where wetlands management is concerned, such information can nevertheless help to define more precisely the environment to be managed, the concerns which can redirect the emphasis in wetlands management programs, and the attitudes and perceptions which may limit the ability of program managers to succeed in implementing some forms of regulation. The wetlands environment thus becomes an area defined by social and economic parameters as well as by physical ones.

The research described here was conducted to assess several kinds of information related to the twin themes outlined above. First, this report attempts to build a socioeconomic profile of wetlands property owners in two coastal areas which appear to be developing in response to different kinds of motivation for settlement. Second, it aims to delimit the extent to which socioeconomic and other factors might explain differences in attitudes towards wetlands and their management.

In order to obtain such information, a survey of wetlands property owners was conducted during the summer and fall of 1979. The socioeconomic data collected consisted of personal data on the property owners themselves (such as age, income and occupation) and of details of property ownership (such as length of ownership and pattern of use of property). Other information collected falls broadly into the following categories: 1) history of modifications made in wetlands areas, including future plans for such modifications; 2) knowledge of and attitudes toward state and local wetlands use regulation programs; 3) personal experience with the regulatory apparatus and the ways wetlands regulation influence future plans for property disposition and development; 4) concerns related to wetlands property ownership; and 5) perceptions of wetlands values and the effects of regulations on those values.

Study Areas

The survey information reported here was gathered in the town of Marshfield, located on the Massachusetts South Shore about 30 miles south of Boston, and in the town of Falmouth, located on western Cape Cod (Figure 1). (Table 2 summarizes population and land use characteristics of the two towns.) Although Falmouth is more than 50% larger than Marshfield in land area, the two are otherwise remarkably similar in terms of land use patterns: the two towns have roughly the same amount of wetlands area, their populations are nearly the same, and they have grown at roughly the same rate over the last decade. Also, in both towns, the developed shoreline is almost entirely given to housing. There is some evidence that growth has slowed in Marshfield over the last few years.

The principal difference between Marshfield and Falmouth may well lie in the characteristics of the in-migrants who have contributed to their respective rapid increases in population. The two towns appear to represent the poles of the differential trends in coastal settlement discussed above rather well: Falmouth is widely thought of in the region as a resort and retirement community with an abundance of ocean-oriented recreational opportunities, while Marshfield has long been viewed as a working community of Boston area exurbanites who place a high value on pleasant natural surroundings. These characteristics emerged to clearly differentiate the interview populations of wetlands property owners in the two towns in the survey.

The wetlands of Falmouth and Marshfield are regulated at the state and local levels through similar but not entirely equivalent mechanisms. (Table 3 summarizes information on the most important state and local regulatory programs.) The principal vehicle for wetlands protection in each town is the permit system for wetlands alterations run by the local conservation commission under the state Wetlands Protection Program. Both towns also participate in the federal Flood Insurance Program and both have local bylaws to implement the required floodplain building regulations.

The state-run Coastal Wetlands Restriction Program, which places absolute restrictions on certain kinds of activities in designated wetlands, was applied to some wetlands in Marshfield early in the Program's life. The more comprehensive Restriction Program, which has recently evolved from the Massachusetts Coastal Zone Management Program, is currently being applied to wetlands in Falmouth; the existing restrictions for Marshfield wetlands are to be updated considerably in the near future.

A unique natural resource of Marshfield is the scenic and surprisingly undeveloped North River corridor, which forms the town's northern and western boundary and which passes through five other towns. In the spring of 1979, this river became the first in the state to be designated a Scenic River under the state Scenic Rivers Program. Such a designation carries with it a restriction on certain kinds of building activity within a corridor of 300 feet on each side of the river. Our Marshfield sample includes several owners of property

Table 2. Land Use and Population Data for Marshfield and Falmouth.

<u>Land Use</u> ¹	<u>Marshfield</u>	<u>Falmouth</u>
Forest Land	9,498 acres	16,657 acres
Agr. or Open Land	1,144	3,069
Wetlands	3,469	4,053
Mining & Waste Disposal	280	364
Outdoor Recreation	359	816
Residential	3,524	5,658
Commercial & Industrial	226	656
Open & Public	178	231
GRAND TOTAL	18,678 acres	31,504 acres
Tidal Shoreline	18.5 miles	55.0 miles
Population, 1977	21,052	21,832
% Change, 1970-1977	38.3	36.9
Summer Peak Population, 1977	31,000 ²	54,100 ³

¹ MacConnell (1974).

² Town of Marshfield estimate.

³ Based on Cape Cod Planning and Economic Development Commission estimates.

whose land is newly restricted under this program.

The tradition of home rule is a strong one in New England towns, and its application is evident in wetlands management programs. The considerable power vested in local conservation commissions composed of citizen volunteers constitutes a most important acknowledgement of local decision-making power. Marshfield and Falmouth have both joined a growing list of Massachusetts towns which have passed local wetlands bylaws that mirror the language and intent of the state Wetlands Protection Program. While these bylaws generally extend the application of the Program by adding interests to those specified for protection, they also have the effect of localizing the decision-making process on wetlands permits. This happens because appeals of conservation commission decisions are directed under home rule charters to local courts rather than to the state administrative agency with oversight authority for the Program. This issue is attracting increasing attention in Massachusetts at present.

Table 3. Relevant State and Local Wetlands Protection Measures In Massachusetts.

<u>REGULATION</u>	<u>PURPOSE</u>	<u>ADMINISTRATION</u>
Wetlands Protection Program (MGLA Ch. 131, Sec. 40)	Protects seven interests: Public and private water supply, ground-water supply, flood control, storm damage prevention, prevention of pollution, protection of land containing shellfish, and protection of fisheries.	Local conservation commissions of citizen volunteers issue permits for projects in wetlands areas. Permission for proposed construction can be denied if a commission finds that any of the seven interests will be significantly degraded.
Wetlands Restriction Programs (MGLA Ch. 131 Sec. 40A, Ch. 130, Sec. 105)	To protect coastal and inland wetlands against environmentally harmful development. Designed to supplement the regulatory approach of the Wetlands Protection Program.	The state Department of Environmental Management is authorized to restrict development in designated coastal and inland wetlands areas.
Scenic Rivers Program (MGLA Ch. 21, Sec. 17b.)	To protect irreplaceable wild, scenic and recreational river resources, wildlife, fresh water fisheries, and public and private property.	The state Department of Environmental Management is authorized to designate, regulate and restrict the alteration of selected rivers and adjacent land for scenic and recreational purposes.

Table 3.

<u>AREA OF APPLICABILITY</u>	<u>PROCEDURE</u>	<u>APPEAL</u>
Regulated area extends to 100 ft. beyond either the landward edge of a wetlands or the 100 year flood, whichever is greater. Eleven resource areas are protected: land under the ocean, designated port areas, coastal beaches, coastal dunes, barrier beaches, coastal banks, rocky intertidal shores, salt marshes, land under salt ponds, land containing shellfish, and fish runs.	Any person or agency proposing to alter a wetlands must file a Notice of Intent with the local conservation commission. After a public hearing, the Commission issues an Order of Conditions that approves, conditions or prohibits the activity.	An applicant, an abuttor, an aggrieved person, any ten residents, or the overseeing state agency can appeal a local Order of Conditions to the agency. Other appeals are judicial.
Coastal and inland areas include all freshwater marshes, meadows, swamps, salt marshes, shellfish beds, salt ponds, flats or other lowland subject to tidal action or coastal storm flowage, and contiguous land that is deemed necessary to affect a protective order.	Proposed restricted wetlands are mapped from aerial photographs. After a public hearing the restrictive order, a copy of the map, and a list of permitted and prohibited uses is attached to the deed of each property containing a restricted wetland.	Any owner of land affected by a restrictive order can appeal the restriction to the Commissioner of Environmental Management within 60 days after receiving the order. A two-thirds vote of the Massachusetts Legislature can also repeal a restrictive order.
Includes all Department designated rivers and streams of the Commonwealth or portions thereof and such contiguous land not to exceed 100 yards on either side of the natural bank that is reasonably deemed necessary to be protected.	Same as for Wetlands Restriction Program.	Any property owner of land affected by a restrictive order can appeal to Superior Court to determine whether such order is so restrictive that it constitutes an unlawful taking of property without compensation.

Table 3.

<u>REGULATION</u>	<u>PURPOSE</u>	<u>ADMINISTRATION</u>
Local flood-plain bylaws	Congress created the National Flood Insurance Program to minimize annual flood losses through planning and low cost insurance.	Administered in the same manner as building codes and other zoning ordinances; enforcement is a local community's responsibility. New buildings must be flood proofed or elevated above required levels.
Local wetlands bylaws	To protect wetlands by controlling activities deemed to have a significant effect on wetlands values including but not limited to the following: flood control, erosion control, storm damage prevention, wildlife, recreation, and aesthetics.	Administered locally by town conservation commissions.
Other local zoning bylaws	Various purposes related to health, environmental protection, aesthetics, and other zoning related concerns. Subdivision control laws often dictate that 80%-90% of subdivided lots be upland or that wetlands not be included in satisfying minimum lot size requirements. Some towns have specific wetlands overlay zones. (See text.)	Purely local, under the State Zoning Enabling Act (MGLA Ch. 40A, Sections 1-22). Various town boards and offices participate, such as planning boards, health officers, and conservation officers.

Table 3.

<u>AREA OF APPLICABILITY</u>	<u>PROCEDURE</u>	<u>APPEAL</u>
U.S. Department of Housing and Urban Development provides flood prone communities with Flood Hazard Boundary Maps that outline flood prone areas within the community. In addition HUD provides Flood Insurance Rate Maps which show flood elevations and risks zones for insurance purposes.	After HUD provides a community with Flood Insurance Rate Maps and completes a detailed on-site survey that establishes flood levels, a community qualifies for the program by adopting comprehensive floodplain management measures (bylaws).	Appeals are generally directed to the town zoning board of appeals, and to district courts if necessary.
May differ from town to town. Generally the boundary extends to 100 ft. from any wetland or to 100 ft. from the 100 year storm line.	The interests protected by wetlands bylaws overlap the interests of the Wetlands Protection Program. The Notice of Intent filed with the local conservation commission satisfies the requirements of both regulations.	An applicant may appeal the commission's decision to Superior Court.
All town wetlands areas as defined by any other state or local regulation, or to specially defined districts.	Various procedures.	Variations can be granted by the town zoning board of appeals. Judicial remedies go through district courts.

The Marshfield zoning ordinances contain one feature not found in those of the town of Falmouth, but one shared by a number of other Massachusetts communities with substantial wetlands areas, namely that wetlands zones are explicitly superimposed over the other zoning districts on the town zoning maps. Though the associated zoning ordinance in principle does nothing more than apply existing state and local regulations to land in wetlands zones, in practice the ordinance adds a potentially important local administrative function to the wetlands regulation system. Proposed construction projects near wetlands in a town with such a regulation are often referred by the town building inspector or by the builders themselves to the town conservation officer for a "delineation" of the portion of the wetlands zone which lies on the property. Such a delineation process occasionally accompanies a proposed property sale, at the request of either seller or potential buyer, and the service is provided without cost. This process in effect constitutes an informal negotiation between potential builders and the town, often with the result that building plans are prescribed in a way that no dealing with the town conservation commission is then necessary. Table 4 below summarizes information on construction activity and associated regulatory activity in the two towns.

Table 4. Residential Construction Activity and Wetlands Regulatory Activity, Marshfield and Falmouth.

	<u>Marshfield</u>	<u>Falmouth</u>
Total housing units, 1979 ¹	7646	14823
Per cent increase since 1970	42.7	44.3
Total units authorized since joining Flood Insurance Program ²	111	1200
Total units authorized in floodplain since joining F.I.P. Conservation Commission cases, 1972-1979 ³	3	62
Marshfield Wetlands Delineations, 1976-1979 ⁴	64	164
Acres restricted under Coastal Wetlands Restrictions Program	77	--
Number of parcels restricted under Scenic Rivers Program	2167	965
	221	--

¹ 1970 U.S. Census figures plus units authorized by building permit, 1970-1979. 59% of Falmouth units are estimated to be year-round.

² Marshfield joined F.I.P. in 1978, Falmouth in 1977.

³ Includes both housing and non-dwelling structures.

⁴ Private surveyors did an unknown number of additional delineations not recorded in town records.

As might be expected, the boundaries which define regulated wetlands under the various federal, state, and local programs just discussed are far from coincident, leading to much confusion in administration and public perception of wetlands programs. While the floodplain probably constitutes the greatest regulated wetland area in either town, the definition of wetlands used under the state Wetlands Protection Program is also a comprehensive one which includes such "dry" features as dunes, beaches, and coastal banks, as well as some small isolated ponds and intermittent wetlands. These wetlands are defined in the legislation, but are not mapped. Because much of the local topography, particularly on Cape Cod, is determined by rolling glacial till, many waterfront "wetlands" are high enough to be out of the floodplain. The wetlands eligible for restriction under the state Wetlands Restriction Program have more restricted definitions, requiring that they be "subject to tidal action or coastal storm flowage" or be contiguous land whose protection is necessary to such wetlands (see Table 3). This has made the mapping and the designation of these wetlands a slow and difficult task for state officials.

Survey Methods

State and local records were surveyed to give a detailed picture of wetlands protection activity at the local level in both Falmouth and Marshfield. Special attention was paid to records of permit applications and reviews under the Wetlands Protection Program, building inspector's reports, assessor's maps and records, the Marshfield wetlands zone delineations and state determinations of critical wetlands habitats in private hands. State and local personnel connected with all phases of the governmental process affecting private property development near wetlands were interviewed or consulted, and public hearings related to wetlands protection activities attended.

This survey produced information about how wetlands protection functions at the local level. It also helped identify wetlands areas with varying degrees of development around them. Property owners were then selected for in-person interviews in "clusters" from areas in which modification activity either had or should have produced encounters with the regulatory system. The selection of interview subjects within clusters was essentially arbitrary, though all individual property owners in the area who had filed for wetlands alteration permits from the local conservation commission were included. One hundred and one Falmouth property owners were interviewed in person, usually in their homes, and 76 Marshfield property owners were interviewed either in person or by telephone. The survey was not limited to those actually known to have encountered wetlands regulations in some official way to ensure that a full range of opinions would be surveyed. Specific areas for interviews within each town were identified on assessor's maps to represent the diversity of shoreline development uncovered in the town hall surveys. Places where particular schemes of regulation of interest, such as the Massachusetts Scenic Rivers Program, were in effect were also selected. Local knowledge helped in Falmouth, while state and local officials assisted in Marshfield.

Beyond that, efforts were made to sample property owners in a given area in rough proportion to the area's total number of wetlands property owners. This notion of 'area' or neighborhood of interest seldom coincided with any convenient local boundary lines. In the one area selected which did coincide with the area represented on a local assessor's map, the sample interviewed was about 15% of the wetlands property owners on the map.

Efforts were made to control sources of bias; interviews were conducted on weekends and in the evening when necessary, during summer and fall, to avoid such problems as overrepresenting retired property owners or housewives, or underrepresenting weekend or seasonal residents. Owners of undeveloped property were sought out in their businesses or elsewhere, though these persons probably were underrepresented. All persons selected for interviews were sent a letter of introduction asking them to return an enclosed card to indicate their willingness to be interviewed. Some property owners who did not return cards consented to be interviewed when they were telephoned. Cooperation was generally very good. Cards returned comprised more than 40% of those mailed to Falmouth property owners, and more than 30% of those mailed to Marshfield property owners.

The term 'wetlands property owner,' as applied to the interview subjects selected for this survey, refers specifically to town residents whose property satisfied the following criterion with respect to the Wetlands Protection Program: at least a portion of their property had to fall within 100 feet of a wetlands resource area as defined by the legislation. In most cases the associated resource area was a salt or fresh water marsh, or open water.

Results of the Survey

Personal characteristics of the interview population.

The Falmouth and Marshfield property owner populations interviewed differed substantially in several ways. Sixty-seven percent of Falmouth interviewees were over age 55, while ages of Marshfield property owners were fairly evenly distributed. In Marshfield 33% were between the ages of 25 and 40, while only 9% of Falmouth interviewees were in this age category. The proportion of retired people in the Falmouth sample was more than twice that in Marshfield (49% vs. 20%).

Income distributions also differed substantially in the two towns. Fifty-eight percent of Marshfield property owners reported gross annual family incomes between \$20,000 and \$60,000, while 39% had incomes under \$20,000. Three percent reported incomes over \$60,000. In Falmouth nearly 40% reported incomes in the middle range, while 18% reported incomes greater than \$60,000, and 42% under \$20,000. In addition, many of the retired people in the Falmouth sample reported current retirement incomes which we judged to be much less than their most recent full employment incomes.

Of the interviewees for whom we determined level of educational attainment, comparable portions were high school graduates in both towns. While 48% of these individuals were also college graduates in Falmouth, 25% of those in Marshfield were college graduates. Likewise, for those for whom we determined present or former occupation 54% of Falmouth families had a member who was a present or former professional worker, while 44% of Marshfield families did. We interviewed a much higher proportion of males than females in Falmouth, but the situation was reversed in Marshfield. This suggests that a male member of the household was much more likely to have the discretionary time to be home when we appeared for interviews, usually during the day and during the week, in Falmouth than in Marshfield.

While 49% of Falmouth interviewees identified their developed wetlands property as their principal residence, 74% of Marshfield interviewees did so. We asked all interviewees who owned developed property to tell us what price they would like to obtain for it were they to sell it at the time of the interview (i.e. 1979). The mean of these property valuations was \$113,000 in Falmouth, while it was \$75,000 in Marshfield.

Thus Falmouth interviewees were older, more likely to be retired, better educated, had higher incomes and somewhat better jobs, had more money invested in their properties and were more likely to consider some other place (usually an inland location) as their principal residence than their counterparts in Marshfield. Though we did not ask respondents their place of employment, the available evidence suggests that Marshfield residents are more locally oriented than their counterparts in Falmouth in general.

Characteristics of wetlands property and its ownership.

We pointed out above that the Falmouth residents surveyed were 25% less likely to consider their in-town wetlands properties to be their principal residences than their counterparts in Marshfield. On the basis of our survey, developed waterfront and wetlands area properties in Falmouth not only have a stronger likelihood of having been acquired as second homes, but the dwellings on them now are more likely to have been built by their present owners. While 8% of those we interviewed in Falmouth presently own undeveloped wetlands property, only 36% of the sample had originally acquired developed property. The remaining 56% had built homes on wetlands properties they acquired as undeveloped land. In Marshfield on the other hand, 74% of those interviewed had property which was already developed when they obtained it.

In both towns, the primary reason given for choosing a wetlands property was related to the enjoyment of environmental amenities. Property owners seemed well satisfied with their investments in both towns; the owners of 68% of the developed properties in Falmouth planned to keep their property into the foreseeable future, as did the owners of 80% of the properties in Marshfield.

The fact that housing is generally older on the properties whose owners we interviewed in Marshfield partly explains the lower average

asking price reported above. The age of housing has other consequences more directly relevant to wetlands management as well. A higher proportion of residential septic systems, a potential source of coastal pollution, were located in close proximity to wetlands in Marshfield, where 51% of surveyed owners of developed property reported septic systems within 100 feet of wetlands, than in Falmouth (38%).

Despite the fact that the Marshfield wetlands area housing in the survey was generally older than that in Falmouth, Falmouth property owners were more than twice as likely to have built a shoreline modification structure of some kind, most likely a dock, boat slip, rip rap or sea wall. Fifty seven percent of properties in the Falmouth survey had some kind of modification of wetlands areas on their properties, versus 24% of surveyed properties in Marshfield. This difference may be accounted for by several factors, such as a greater emphasis on recreational activity, more disposable income, or more severe shoreline erosion problems, at least in the case of that portion of the Falmouth activity which was for shoreline stabilization. It is also possible that newer housing construction in a developing recreation-oriented market is more likely to include a general reworking of the whole property than was true in the past. This point is of interest because a significant number of enforcement problems under Massachusetts wetlands programs stem from this kind of small scale modification activity to wetlands.

We asked property owners to choose from a list of potential problems associated with owning wetlands property those which concerned them the most, in order of their concern. The choices presented to them were erosion, flooding, storm damage, sewage backup, insects, odors, invasion of privacy, drinking water supply, 'other', or 'none'. In Falmouth, erosion appeared among the first three concerns selected far more often than any other, while problems with insects led the choices by about the same margin in Marshfield. Falmouth's relatively more exposed tidal shoreline, typically with a fringing marsh at the base of a shallow bank, may indeed present a different set of management problems than that in Marshfield with its more sheltered expanses of open marshland, often forming a significant barrier between upland and open water.

Property owners and wetlands protection.

We asked property owners a series of questions about the value of wetlands, their perception of the need for laws to protect them, and their knowledge of and opinions about several types of wetlands protection measures in effect in their towns. In Marshfield many of these questions were asked only of the 26-person subsample which was interviewed in person. Thus care must be taken in comparing results from the two towns pending the outcome of tests of statistical significance which have not yet been done. Some comparisons of the two samples are nevertheless interesting and will be discussed here with this cautionary note.

Respondents were asked to rate on a numerical scale the degree to which the presence of wetland on or near their property enhanced or detracted from its value. Similar large majorities (77% Falmouth, 80% Marshfield) believed that wetlands enhanced or strongly enhanced the value of their property. Only 7% in Falmouth and 5% in Marshfield thought that wetlands detracted or strongly detracted from property value.

We also asked respondents what effect they thought the presence of restrictions on wetlands use and development had on their value. A majority in each town (58% Falmouth, 56% Marshfield) thought such regulations added or substantially added to wetlands value, while minorities (16% Falmouth, 14% Marshfield) thought regulations detracted or substantially detracted from wetlands value. Though the exact numbers are difficult to assess accurately, small minorities (3% Falmouth, 5% Marshfield) volunteered their belief that the effect on value depended on whether the property was already developed or not when regulations were imposed, or whether development options were foreclosed by the imposition of such regulations.

Some possible differences between the populations surveyed emerged over other issues related to wetlands protection. We tried to ascertain whether property owners felt the same about the need for protective laws and regulations to control use of the kinds of wetlands property they owned versus other types of wetlands resources generally thought of as "public" (i.e. beaches and dune areas). In Falmouth about the same percentage (about 90%) of property owners thought protective laws were necessary to protect the resource type they owned (typically waterfront with a fringing marsh) as they did beaches and dunes. In Marshfield, 73% of the subsample of those interviewed in person thought the kind of wetlands they owned (typically marsh) needed legal protection, while 85% of the subsample thought beaches and dunes needed such protection. We asked respondents to tell us in addition how they felt about the filling of marshes. Seventy two percent of respondents in Falmouth and 88% of the subsample in Marshfield thought marsh filling should be generally prohibited. In each case, however, about 65% of those who said marsh filling should be prohibited were willing to grant exceptions to this prohibition if a "public benefit" were involved.

It is not yet clear what if any significance can be attached to these differences, nor what factors in the survey best explain them. One possible interpretation is that fringing marsh is regarded as a nuisance by many property owners, while those who own or live near larger marshes both see more value in them and believe that they and their neighbors are adequate stewards for such land without additional protective regulations. In a more direct sense, the substantial majorities involved in all responses above indicate a strong belief in the need for environmental protection, albeit somewhat tempered by a sense that the public welfare must also be served.

We asked a number of more specific questions about state wetlands programs and alternative modes of wetlands protection. We tested respondents' knowledge of the state Wetlands Protection Program, the

chief wetlands program in the state, and judged the public level of information about its purpose and how its permit system works to be very low. Sixty-three percent in Falmouth and 75% in Marshfield were judged to have little or no knowledge of the Program. Thirty-three percent of our sample in Falmouth and 17% of the sample in Marshfield had been directly involved in local conservation commission cases under the Program, either as applicants for wetlands alteration permits or as abuttors appealing commission decisions. Substantial majorities of those with some degree of experience with the system judged it a fair system, despite complaints they had about it. Direct involvement in the permit process was no guarantee that an individual had much knowledge of how the system worked or what its intent was.

Of the other state and local wetland programs in effect, even awareness of their existence was minimal. About 90% of respondents in each town had never heard of the Wetlands Restriction Program. Sixty-five percent of the Marshfield subsample had not heard of the state Scenic Rivers Program, despite considerable publicity a few months earlier when the North River was officially so designated. The only wetland program which had general recognition was the federal Flood Insurance Program, about which half of all respondents in both samples had some knowledge. More than 70% of all respondents said that the presence of wetlands regulations did not materially affect their plans for use or disposition of their property. A comparable percentage of the 32 people we interviewed in the North River corridor in Marshfield also expressed this sentiment despite the relatively great controversy that attended its designation as a scenic river.

A final pair of questions attempted to deal with the issue of how the "ideal" system of wetlands protection should be run. When asked what level or combination of levels of government was "best" suited to run a wetlands protection program, straight local control led the other choices by substantial margins in both towns. State control was the second choice in Falmouth, while combined state - local control, essentially the present system, was second with the property owners in the Marshfield subsample. The federal government was not a popular program manager in either town. Interestingly, the reasons most often given for answers were negative ones, such as the state government being the best choice because local governments were controlled by special interests and the federal government too remote.

We were somewhat surprised by the response to our question as to who would make the best wetlands owners in the ideal world: private individuals, conservation trusts, local, state or federal governments. While 37% in Falmouth and 46% of the subsample in Marshfield chose private individuals, essentially the present system of ownership in Massachusetts, 31% in each town chose conservation trusts, the second most popular choice by far. This response may indicate a general sense of frustration with traditional modes of stewardship for environmental resources, namely government control of the use of resources held in private hands.

Summary

Falmouth and Marshfield have both experienced periods of rapid population growth in recent decades which mirror larger scale demographic changes in their surrounding coastal regions. Both have seen substantial housing development along their shorelines and wetlands as a result. Though a view of the developed portions of the shorelines in the two towns does not reveal it, substantial differences in motivation for occupying the shore separate the wetlands property owner populations in these two towns, reflective of the trends which have driven the development of their respective regions.

These differences are reflected not only in the socioeconomic character of the property owners themselves, but also in some characteristics of the property they own. The tendency to modify the shoreline, for example, seems in part coupled to several characteristics of those who own the property. The concerns people have for their environment and their relationship to it as property owners depend in obvious ways on the nature of the environment itself, and in less obvious ways on other factors. Their support for environmental protection of wetlands is strong, but not unqualified. Those wetlands resources which are viewed as public may evoke different sympathies than those which are viewed as private.

The public sense that wetlands resources are valuable and worth protecting is stronger than the public awareness of what the goals and procedures of existing state and local regulatory programs designed to protect wetlands are. The power to regulate matters such as wetlands use which are perceived to be of local concern is not easily relinquished to the state government in Massachusetts. Wetlands property owners in the state seem to support local initiatives to retain (and regain) some measure of control over wetlands.

The work remaining in the project will be aimed at determining which factors, among all the information uncovered in this survey of wetlands property owners, are most and least strongly correlated. Such information should give a clear picture not only of what wetlands property owners want, but how their wants can be successfully accommodated within a regulatory framework which guarantees effective protection of the state's wetlands.

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BARRIER BEACH PROTECTION
IN MASSACHUSETTS

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ABSTRACT

Resource variability and complexity along 1200 miles of coastline in Massachusetts pose a unique management challenge for the protection of barrier beach environments. The North Shore, South Shore and Cape Cod Bay shoreline of Cape Cod comprise an area consisting of 64 mesotidal barriers exposed to a predominant storm influence of extratropical cyclones (nor'easters). In contrast, the Buzzards Bay shoreline, Martha's Vineyard, Nantucket and Nantucket Sound shoreline of Cape Cod comprise an area consisting of 93 microtidal barriers that are primarily influenced by tropical cyclones (hurricanes).

Despite the existence of state wetlands protection legislation since 1963, it was not until 1978 that the Massachusetts Coastal Zone Management Program was approved and there was a concerted effort to protect barrier beach resources. Currently, the Department of Environmental Management and the Department of Environmental Quality Engineering administer deed restriction and regulatory programs respectively. On a town-by-town basis, implementation of the Coastal Wetlands Restriction Act is completed when a list of permissible and prohibited uses is recorded on the property owner's deed. Additional responsibility includes production and distribution of orthophoto base maps having all wetlands greater than 1/2 acre in size typed and numbered. Implementation of the Wetlands Protection Act occurs on a permit-by-permit basis for all dredging, filling, altering, or removing within 100 feet of any coastal wetland. The permits, if approved, include performance standards which either minimize or create no adverse effects on the adjacent wetland.

Technical staff consisting of coastal geologists and marine biologists have the responsibility to interpret and apply research findings for the purpose of determining ecological significance of a barrier beach resource. Based upon an accepted understanding of the major resource functions and the physical and biological characteristics critical to their function, the interaction between barrier dynamics and land use is evaluated. Information required for substantive evaluation includes existing data sets and associated research findings, storm history and vulnerability, long term shoreline changes, overwash dominance and extent of structural development. For the purposes of

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