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The Coast

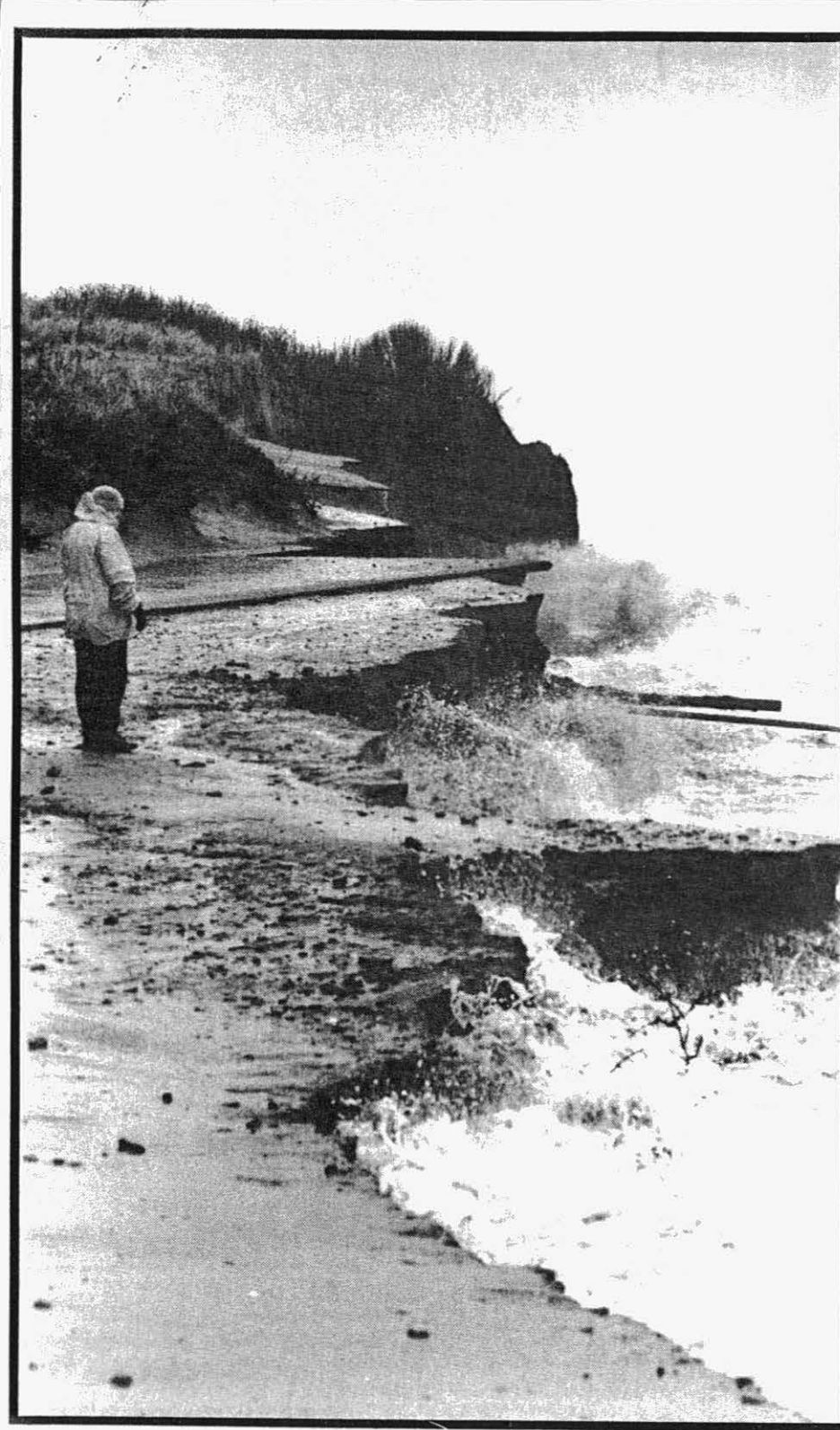
# We have met the enemy, and it is us

BY LISA HENDRICKSON AND GRAHAM S. GIESE

**I**t is estimated that 33 acres of Cape Cod upland are lost to the sea each year. Washed away, covered over, sunk by the sea. Gone.

At that rate, Cape Cod — about 395 square miles in size, or 252,800 acres — will be gone in about 7,660 years. So on or about the year 9653, anyone watching will see the last bit of Cape Cod poking above sea level finally crumble and disappear, like a sand castle succumbing to an incoming tide, and the Cape will join Georges Bank and Stellwagen Bank as a New England submarine feature. Gone.

Of course the reality of global climate changes makes certain that this rate of upland loss will vary. But who's counting? If there's a single coastal management lesson that has been learned over the past 25 years on Cape Cod — that is, over the time 825 acres were lost — it's that in "managing" the Cape's coastal features, we should aim to minimize our



disturbance of natural coastal processes. Because in doing so, we will also minimize the damaging effects of coastal processes on society.

We continue to spend billions of dollars on Cape Cod, trying to control natural coastal processes. Yet, coastal features can (at least theoretically) be managed by natural coastal processes at no cost to society. All we need to do is stay out of nature's way.

Managing the coast, then, means managing to keep under control our inclination to control the environment. That's not easy for some people, watching waves at work. But the reward will be worth it. We'll save money, personal property, habitat, time and effort, heartache and headaches, and give room to natural counter forces which rebuild the coast.

What is this "coast" that we are losing? For our purposes, "the coast" of Cape Cod is that band of land features, both wetlands and uplands, that abut the shoreline and that are, or will be within 100 years, controlled by coastal processes. This, then, includes such things as beaches, barrier beaches, dunes, salt marshes and sea cliffs. It also includes those uplands that will soon be converted into one or another of these features.

The coast of Cape Cod when the Europeans first arrived was primarily the result of submergence produced by relative sea level rise. Secondly, it was the result of dynamic coastal processes — the work of wind-generated waves and tides in eroding, transporting and depositing coastal sediment. The upland areas of Cape Cod were formed some 15,000 years ago of sediment left behind by the retreating ice lobes of the last glacial period.

Typically, this terrain had low slopes and consisted of easily erodible material. Advancing seas submerged vast portions of it, producing large shoal areas such as Georges Bank and Nantucket Shoals. Steeper regions, such as the eastern coast of Cape Cod, were eroded by a combination of wave action and sea level rise to produce coastal sea cliffs with broad, offshore wave-cut platforms. Sediment eroded from these shores to produce sandy beaches in front of the sea cliffs and the barrier beaches down-drift from them. Extensive salt marshes developed in the protected lagoons and bays that lay behind these barrier beaches. A good example of this is West Barnstable's Great Marsh system.

Sea level has risen some 300 feet since the glacial deposits that form Cape Cod were first laid down, and it continues rising today. While reported rates vary, an overall value of 3 millimeters per year — or just

over 1 inch every 10 years — is frequently used as an estimate of the present rate of relative sea level rise, or the surface of the sea with respect to the surface of the land. Along the shores of Cape Cod, approximately half of this rise results from rising global seas. The other half is due to local sinking of the earth's crust.

The primary result of this rise is submergence of coastal upland. Of course, the rate of this is dependent upon regional topography and is highest along the low-lying coastal outwash plains of the southern coast of Cape Cod. For example, Falmouth loses the most upland area, averaging 3.8 acres per year. A large percentage of submerged upland is converted to fringing marshland. Such areas of new marsh develop along the landward marsh margin and tend to offset losses due to erosion and sediment deposition at the seaward boundary of the marsh.

Relative sea level rise also contributes to upland loss through active coastal erosion along exposed sea cliffs. These losses are particularly large along the outer shore of Cape Cod where the long-term cliff retreat rate is about 2.5 feet per year. However, despite the dramatic appearance of the Cape's wave-eroded cliffs, overall upland loss due to active erosion is considerably less than that due to passive submergence. It has been estimated that of the 33 acres of Cape Cod upland lost to the sea each year, 24 acres (73 percent) are lost to submergence and only nine acres (27 percent) to erosion.

Yet the wave erosion of uplands should not be seen as bad. It is the only significant source of sediment for maintaining the beaches of Cape Cod. The Cape's barrier beaches maintain themselves in the face of sea level rise by "rolling over" themselves — they migrate landward through a combination of dune movement, storm wave overwash and tidal inlet deposition. Present barrier beach migration rates vary from very little to as much as several meters per year (in long-term average) at some locations, such as along sections of the Nauset Beach system.

### **DAMAGE OCCURS WHEN HUMANS INTERFERE**

Coastal lands serve a variety of users with a variety of interests. They serve a public safety value, as a buffer to storm and flood damage; an ecological value, as fisheries and wildlife habitat; a scenic value, as open space; a recreational value, where there exists public access; and historic and cultural values. Yet, human interference with natural coastal processes has reduced the functional values of the Cape's coastal features. Personal losses are a by-product of this interference.

State regulations enacted in 1978 have, since then, provided the primary means of reducing impacts from new development on coastal wetlands. However, much of the Cape's coastline had long since been developed, so newly-formed regulatory authorities inherited the problems caused by development on eroding coastal banks and shifting barrier beaches. Waterfront homes had been built without regard for erosion, sea level rise and other natural coastal processes and many seawalls and bulkheads were built to "protect" eroding waterfront property. Jetties, breakwaters and groins, in place prior to 1978, continue to disrupt coastal processes.

Yet, construction in coastal hazard areas such as barrier beaches, dunes and eroding coastal banks is still occurring on Cape Cod, and increased recreational use of coastal lands places additional pressure on these fragile areas. These coastal features generally lie within coastal hazard zones which are subject to flooding and wind and wave damage. Storm damage to coastal features and personal property continues because existing regulations allow it. Cumulative impacts and long-term impacts on coastal wetlands have gone unaddressed by regulatory authorities because projects are reviewed on a case-by-case basis. Federal and similar state regulations allow new construction and reconstruction in coastal hazard zones, provided that the minimum standards for reducing storm damage are met. However, this approach does not address the root of the problem, which is allowing development in hazard-prone areas, both future and existing.

To be blunt, we are losing our beaches on Cape Cod! This beach loss will continue because state wetlands regulations permit the construction of seawalls on eroding coastal banks in order to "protect" buildings which predate the regulations (August 10, 1978). This involves a large number of buildings on Cape Cod. We are losing our beaches because seawalls and other shoreline structures starve them of their sediment supply by preventing their receipt of sand from eroding coastal banks.

In addition, the cumulative impacts from multiple seawalls, on adjacent and downdrift beaches, are not addressed by these regulations. For example, a large expanse of beach located in Eastham, between Sunken Meadow Beach and the Herring River, has been lost due to the construction of seawalls. Since these regulations have been in effect, authorities have even permitted seawalls to be built on vacant lots and on lots containing buildings which are not "grandfathered." Orleans has

documented more than one mile of seawalls along its shoreline and many other Cape towns face similar situations.

Cape Codders must ask themselves, do we want to continue this pattern of revetting our shorelines until we have built a virtual Berlin Wall around the peninsula?

We are also preventing the landward growth of our salt marshes! As salt marshes erode at their seaward edge, they maintain themselves by forming new marsh at their landward edge. However, state wetlands regulations allow construction of seawalls and bulkheads on land located behind salt marshes. Such structures prevent the landward formation of new marsh, resulting in habitat loss, increased flooding and the landward penetration of saltwater. In addition, cumulative salt marsh losses occur from small, legal and illegal fills and the natural processes of erosion and sea level rise.

Cape towns have not adopted adequate bylaws to minimize storm damage in coastal hazard areas. By permitting cottages of the pre-regulatory period to be rebuilt in coastal hazard areas, we are continuing the erosion/reconstruction cycle. In addition, the federal National Flood Insurance Program perpetuates this cycle by supplying waterfront homeowners with insurance money to rebuild dwellings located in coastal storm hazard areas. This false sense of protection encourages people to build in these areas. Following Hurricane Bob and the 1991 Halloween northeaster, many towns permitted the reconstruction of dwellings, stairways and other structures along eroding shorelines. These decisions have economic, as well as environmental consequences. Storm damage costs state and local public works, health, safety and environmental agencies a lot of money. Ultimately, building in coastal hazard zones becomes everyone's problem in terms of increased taxes and utility rates.

### **A FRAMEWORK FOR CHANGE**

During the past 25 years, we have begun to take responsibility for managing our coastline and protecting its values. Federal, state and local governments regulate activities in coastal areas to some extent. However, enforcement responsibilities are spread across so many agencies that the effectiveness of existing regulations is diminished and the necessary development of new, more stringent regulations is hindered.

On a federal level, projects which occur in tidal waters and wetlands

have been regulated by the U.S. Army Corps of Engineers since 1986. Additional review, for impacts to coastal species habitats, is provided by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Since 1979, the Federal Emergency Management Agency (FEMA) has administered the National Flood Insurance Program (NFIP), which was formed in 1968. All 15 Cape towns participate in this program, and through their local zoning bylaws regulate building in the 100-year flood plain (A-zone) and the coastal velocity zone (V-zone). Amendments to the NFIP, which establish standards for building in erosion zones (E-zones) were resubmitted for legislative review after they failed to become law in 1990.

The importance of protecting coastal resources was acknowledged by the U.S. Congress in 1972 with the passage of the Coastal Zone

***'The relocation of existing structures, to areas outside of flood hazard and erosion zones, should be required in more places.'***

Management Act. This Act in 1978 authorized funds to establish the Massachusetts Coastal Zone Management Program, administered by the state Office of Coastal Zone Management (MCZM). MCZM, the authority responsible for managing the coastal zone in Massachusetts, was established in 1983. This office functions as a policy/planning group rather than a regulatory body, networking to see that the 27 MCZM Program Policies are implemented by federal and state agencies.

Reauthorization of the CZM Act in 1990 created the Coastal Zone Enhancement Program. As part of this five-year program, MCZM has been assessing existing means of protecting coastal wetlands, reducing impacts from development and reconstruction in coastal hazard areas, increasing coastal public access, and developing procedures to assess and control cumulative and secondary impacts from coastal growth and development. The adoption of special coastal area management plans is also being investigated.

MCZM played a key role in creating the state's 1978 coastal wetlands regulations. Administered by town conservation commissions and the state Department of Environmental Protection, these regulations are the primary means of reducing development impacts on coastal

features. They establish work performance standards for storm and flood damage protection for projects altering coastal features. In 1987, these regulations were amended to include wildlife habitat protection, including no adverse impacts to "rare" coastal species habitats. As well, all Cape towns have benefited from the state Coastal Wetlands Restriction Act, which limits development in coastal wetland areas. The state Wetlands Conservancy Program defines restricted coastal wetland boundaries in property deeds, and disallows all development there other than catwalks for water-dependent uses.

With coastal overdevelopment have come conflicts resulting from people anxious to use the coast, but shut out from ways to get there. A majority of the Massachusetts coastline, down to the low tide line, is privately owned and inaccessible to the public. This prompted the state in 1990 to revise its waterways regulations. Private coastal development projects not dependent on water are now required to provide public access to the waterfront, limit new fill and development in waterfront areas, and promote projects with water-dependent uses. Building designs must incorporate sea level rise and withstand 100-year storm forces.

Massachusetts Environmental Policy Act regulations give some coastal projects, especially large-scale ones, additional state and public review. For example, armoring of a coastal bank and projects proposed in a designated coastal Area of Critical Environmental Concern (ACEC) require filing an Environmental Notification Form for multiple state agency review. Seven of the state's 13 coastal ACECs are located on Cape Cod, including the extensive Sandy Neck barrier beach and salt marsh system in Barnstable.

The toughest Capewide coastal policies are home-grown, included in the Cape Cod Commission's Regional Policy Plan which became effective in 1991. This Plan is important because it deals with managing our coastline as a continuum, rather than segments existing within town boundaries, and it establishes the most aggressive limitations to date on development in coastal hazard areas. The Plan does not permit development or redevelopment in FEMA velocity zones, on coastal dunes or barrier beaches. It does permit reconstruction in these areas, but only with no increase in floor area or use intensity. The Plan sets performance standards for development in FEMA flood plain and velocity zones which take into account sea level rise and increased storm intensity. These policies, in turn, can serve as a framework for

developing more stringent coastal hazard policies by Cape towns in their Local Comprehensive Plans. The Commission provides each town with Geographic Information System (GIS) base maps and planning guidance and review.

### **ACTION HAS BEGUN IN HOME TOWNS**

Town government has the primary responsibility for the development and enforcement of flood hazard mitigation policy in Massachusetts. This issue has been difficult to address because it falls under the jurisdiction of multiple town commissions and boards, each with its own set of regulations. For example, the National Flood Insurance Program requirements are implemented through town zoning bylaws and town building inspectors enforce state Building Code. Sanitary system requirements are established in the state Sanitary Code and enforced by town boards of health. Development is regulated through enforcement of state wetlands regulations by town conservation commissions, and through enforcement of subdivision bylaws by town planning boards. The zoning bylaws and state Building Code define flood hazard zones as the FEMA flood plain and velocity zones.

Although state regulations have reduced development impacts on coastal lands, more effective local control has come with the adoption of more stringent local bylaws. For example, wetlands bylaws adopted in some Cape towns have established fees for hiring consultants to review project impacts, established "no build" zones and increased building setback distances from wetlands, tightened work performance standards, and expanded jurisdiction limits. Bourne, Barnstable, Chatham, Yarmouth, Orleans and Falmouth have adopted bylaws which require 35 to 50-foot building setbacks from various types of wetlands. Dennis and Yarmouth bylaws require a 50-foot building setback from coastal banks to account for erosion.

Chatham and Wellfleet have adopted the most aggressive zoning bylaws for reducing coastal hazard damage. Both towns prohibit new buildings within their flood hazard zones, which are defined by a zoning overlay district. Chatham's jurisdiction extends 100 feet from its Coastal Conservancy District, which includes the 100-year flood plain and extends to the top of the coastal bank. New development requires a 50-foot setback from this boundary. Expansion of existing structures in this district requires a special permit from the Zoning Board of Appeals and the Conservation Commission. Wellfleet also prohibits such

expansion in its Special Flood Hazard District, as does Dennis. Most of the other Cape towns rely on the limited restrictions of the state Building Code. No town bylaws specifically address sea level rise.

Additional local regulatory control will be gained by towns which prepare Harbor Plans and Local Comprehensive Plans. Waterfront use and development policies in Harbor Plans can be enforced by a town through state waterways regulations. Since 1989, the MCZM Harbor Plan Program has provided grants and technical assistance to prepare such plans. Truro, Wellfleet and Dennis have received such grants through this program and Provincetown, Chatham, Falmouth, Barnstable and Mashpee are preparing harbor plans using other funding sources. With financial and technical assistance from the Cape Cod Commission, all of Cape Cod's towns except Dennis, Provincetown and Chatham had in mid-1993 begun to prepare Local Comprehensive Plans (LCPs). Using the Regional Policy Plan as a framework, these LCPs can be used to limit new construction and reconstruction in coastal hazard areas. Once complete, bylaws can be adopted which implement the LCPs' policies.

Public education programs across the Cape have broadened the appreciation of coastal lands. Public and private non-profit groups like the Cape Cod Museum of Natural History, the Center for Coastal Studies, Massachusetts Audubon Society, Sea Grant, Cape Cod Cooperative Extension Service and the Association for the Preservation of Cape Cod (APCC) have offered teacher-training programs and designed curricula, nature hikes, lectures and management workshops focusing on coastal features, processes and values. In 1990, APCC prepared a "Critical Habitats Atlas" which identifies barrier beaches, dunes, and other coastal plant and wildlife habitats on Cape Cod. Many of these organizations also produce newsletters and fact sheets which feature articles about coastal resource protection. For example, the Extension Service has prepared a fact sheet about the use of plantings for erosion control.

Another way to keep coastal land from being developed is to have it owned or managed by non-profit land conservation groups. Today, numerous private land conservation organizations play a vital role in this regard. For example, the Massachusetts Audubon Society manages the Wellfleet Wildlife Sanctuary along Cape Cod Bay and Dead Neck barrier beach in Osterville-Cotuit along Nantucket Sound. The Compact of Cape Cod Conservation Trusts, Inc. has played a key role in assisting

municipal land trusts with the acquisition of open space.

Town, state and federal governments also manage shoreline areas on Cape Cod. Barnstable, for example, manages the seven-mile-long Sandy Neck barrier beach. South Cape Beach in Mashpee, and Scusset Beach in Sandwich are managed by the state. Since 1961, the National Park Service (NPS) has managed the Cape Cod National Seashore, consisting of more than 43,000 acres of federal, state and private land. According to a state inventory, 145 miles (or 34 percent) of Cape Cod's shoreline frontage is publicly-owned, including 38 miles of public beach.

The National Seashore is the largest contiguous area of park land on Cape Cod and includes most of the eastern Cape coastline and a portion of Cape Cod Bay shoreline. Thus, its coastal management policies can have wide-ranging effects on the six Cape towns contained within the park. The NPS is currently in the process of preparing a 10-year General Management Plan which includes coastal management measures. Within the Plan are provisions for siting new facilities away from eroding shorelines, moving existing facilities (e.g. Highland Lighthouse) away from eroding shores, and the consideration of removing existing groins and revetments located at Herring Cove Beach.

Recently, we have begun to document the changes along our shorelines. This information is necessary to develop management plans and make informed regulatory decisions. MCZM, for example, is currently in the process of updating a series of shoreline change maps which can be used to calculate erosion rates. Working with the state Department of Environmental Protection, they are drafting a policy which uses erosion rates to determine whether construction of a seawall on an eroding coastal bank should be permitted to "protect" a building that pre-dates the state wetlands regulations. An MCZM Task Force is also developing work performance standards for projects in coastal flood plains.

Falmouth and Bourne, through the Buzzards Bay Program, recently studied the impacts from existing shoreline development and those expected at total build-out. From these studies, a Comprehensive Conservation and Management Plan (CCMP) was produced for Buzzards Bay which includes model bylaws with increased building setbacks and lot sizes. Following this lead, 11 of the 15 Cape towns have been participating in the development of a similar CCMP, for Cape Cod Bay, through the MA Bays Program. This Plan proposes ways to improve coastal public access, coastal habitat protection, and addresses

sea level rise. Both programs encourage citizen involvement through Citizen's Advisory Committees.

We need no more evidence that a Capewide coastal development problem exists! Research resulting from the MA and Buzzards Bay Programs has linked the degraded water quality conditions of our bathing and shellfishing waters to excessive coastal development. Furthermore, the destruction and costs resulting from unmanaged development in coastal hazard areas recently became clear on Cape Cod. The number of structures located in the 100-year flood plain, for all Cape towns combined, totaled 12,744 in 1991. During the summer of that same year, damage from Hurricane Bob resulted in public expenditures on Cape Cod of approximately \$12 million. Two months later, these figures were substantially increased as a result of damage from the Halloween coastal storm. It's storms like these that remind us that coastal development on the Cape poses a serious risk to public safety, the local economy and the natural environment.

Every resident and visitor to Cape Cod reaps the benefits of living near the coast. Even those who don't recreate or make their living from the sea or tourism are provided with a mild coastal climate, fresh seafood and a beautiful landscape. To enjoy the maximum benefits, the challenge to Cape Codders is to fix past coastal development mistakes, where possible, and to adopt tougher regulations and policies for managing coastal land use in the future.

For one thing is for certain: erosion is constant and will continue to occur.

A new course of action is required to save our coast!

### **REGULATE AGAINST HUMAN INTERFERENCE**

As residents of Cape Cod, we need to recognize our role in accelerating coastal resource damage by viewing this problem as human interference with nature, rather than nature's interference with human activities and development. We also need to take responsibility for this role by developing local plans and implementing regulations which address this issue.

Coastal land-use regulation is the key to accomplishing this goal. Existing federal and state regulations do not adequately address existing or future development in coastal hazard areas. They require an overhaul. As well, Cape towns need to take it upon themselves to adopt new bylaws that reduce the impacts from existing coastal development and



that prohibit reconstruction and limit new construction in hazard areas.

The Federal Emergency Management Agency (FEMA) appears to be slowly moving in the right direction, by recently incorporating the effects of coastal dune erosion in its methodology for establishing flood plain boundaries. However, federal flood insurance legislation which establishes coastal erosion zones and limits development in coastal hazard areas has failed to become law in the past. Although we can lobby our Congressmen for support for these amendments, which have been resubmitted, Cape towns can't afford to wait for the outcome of this lengthy process.

It's uncertain whether towns should wait for the state either. Cape Cod contains 40 percent of the publicly-owned shoreline in the state. Therefore, more state resources should be dedicated to helping Cape towns manage these areas. Yet, one of the primary reasons that coastal hazard mitigation is not adequately addressed by the state is because it falls within the jurisdiction of 22 agencies. MCZM has the primary responsibility for establishing coastal development policy implemented by these agencies. And as one of its present priorities, MCZM is recommending changes to the wetlands regulations which set work performance standards for building in the 100-year flood plain. This is a step in the right direction. But MCZM, the major common coastal link between state and federal agencies, has no regulatory power. Impacts from existing coastal development are not being addressed and reconstruction in flood hazard zones continues to be permitted. Existing state regulations allow new construction of seawalls and shoreline structures, to the detriment of our beaches and salt marshes, and do not address the cumulative and long-term impacts resulting from society's interference with natural coastal processes.

Cooperation between federal, state and local regulatory authorities will be required to address these complex coastal land-use and development issues. Due to the large number of agencies involved, it would help if a "Coastal Hazards" standing committee was formed, made up of representatives from these agencies, to collectively address this coordination and cooperation issue in Massachusetts. Spearheaded by Sea Grant, or a similar non-regulatory group, this committee could provide technical guidance to communities and address the inadequacy of existing regulatory controls.

Bylaws adopted and enforced at the local level may be the most expedient and effective means of addressing shoreline management.

Regulation of new development in coastal hazard zones is important, but it is not sufficient for Cape towns with densely-developed shorelines. New town bylaws must address coastal hazard impact prevention, and this means prohibiting new development in these areas, as well as impact reduction, by prohibiting reconstruction and expansion of existing structures.

This can be accomplished in towns' Local Comprehensive Plans. "Coastal hazard" zoning overlay districts can be defined and towns can utilize existing GIS maps, in conjunction with town planimetric maps and building and subdivision plans, to inventory the location and type of structures located in coastal hazard areas. Policies regarding new development, expansion and redevelopment in these areas can become amendments to local zoning bylaws. MCZM has drafted a model zoning bylaw regarding coastal erosion which may be used in conjunction with its updated shoreline erosion maps. Wetlands and other local bylaws can also be amended to incorporate hazard mitigation regulations.

These new bylaws must be aggressive and enforceable. New construction, including seawalls and shoreline structures, ought to be prohibited seaward of a defined boundary which takes into account flooding, erosion and sea level rise hazards, not just wetlands protection. Building setbacks from this "no-build" zone are also needed, and must account for local erosion rates and relative sea level rise. For example, based on a case study conducted in Mashpee, the Army Corps of Engineers recommends that 1 to 2 feet be added to 100-year flood elevations when planning for short-term (30 to 40-year) impacts from relative sea level rise.

### **CHANGE OR REMOVE THE WALLS**

There are several things that can be done about existing coastal development. The relocation of existing structures, to areas outside flood hazard and erosion zones, is frequently done along the Cape's eroding outer shores and this should be required in more places. Structures that can't be moved should not be permitted to be expanded or reconstructed. Bylaws should require that structures which are uninhabitable, or damaged beyond minor repairs, be removed. However, this would require some means of compensating the landowner for this loss. Seawalls and other shoreline structures should be evaluated for removal from some coastal banks which supply sediment to coastal beaches or that lie behind salt marshes. In some cases, vegetative

stabilization and beach nourishment may be considered, but the objective should be to allow coastal features to adjust naturally to coastal processes.

On a regional level, there's not enough technical assistance available to Cape towns. The Cape Cod Commission should hire a coastal geologist to provide help and to serve on the "Coastal Hazards" standing committee. Using its District of Critical Planning Concern (DCPC) designation process, the Commission might establish a "Coastal Hazard" DCPC as a pilot project in a single town, which could later be adopted by other Cape towns. The Martha's Vineyard Commission has already established this type of DCPC along with implementing regulations.

Such regulatory changes can save towns and coastal homeowners money. For example, the FEMA Community Rating System Program offers flood insurance premium rebates to homeowners for adopting measures which reduce flood hazards. These measures, in turn, reduce the town labor required to assess and repair storm damage. As well, few Cape towns have taken advantage of funding provided by the FEMA Hazard Mitigation Grant Program. Sandwich is one town that did; it is being partially reimbursed for building a large coastal dune designed to reduce future damage to inland properties.

Most of the Cape's existing groins and jetties were constructed long ago by state and federal agencies to protect coastal areas from wave damage and navigation channels from filling in. However, the jetties were not equipped with sediment by-pass devices to permit the longshore transport of sediment necessary to maintain downdrift beaches.

The state, in conjunction with the Army Corps of Engineers, should inventory and evaluate the impacts that these structures have on the Cape's coastline and determine which structures should be removed or modified. In addition, each town should inventory the size and type of its existing shoreline structures and plot the locations of such structures on town planimetric maps. These maps can be used by conservation commissions to assess cumulative impacts from such structures and the effects of their removal on downdrift beaches. For example, Cape Cod National Seashore is currently exploring the possibility of removing the groins located at Herring Cove Beach in the Provincelands.

The construction of tide gates and culverts has restricted tidal flows into some Cape wetland areas, resulting in the replacement of productive salt marsh habitats with Phragmites-dominated brackish marshes of

lesser habitat value. Conservation commissions should identify such areas and initiate studies to determine whether salt marsh habitats could be restored by modifying or removing these man-made structures. For example, the Army Corps of Engineers and the state are assessing the removal of a culvert, located behind Scusset Beach in Sagamore, to restore 250 acres of salt marsh habitat. Some wetlands, however, which have reverted to productive, valuable freshwater marshes may best be left as is.

### ACQUIRE MORE SHORELINE

Many of the rare species on Cape Cod inhabit coastal lands and most of this land is currently in private ownership and available for development or redevelopment. Cape towns should seek to increase the length of conserved shoreline, both to reduce existing and future development impacts and to increase public access to the waterfront. The acquisition of both developed and undeveloped parcels as open space should be considered.

The state Department of Environmental Management (DEM) is completing a GIS map which delineates conservation and recreation open space in Barnstable County. It contains information about ownership, level of protection, public accessibility, and activities occurring at each site. Cape towns should review this map and send updated or missing information to DEM for inclusion in this database.

Using this map, towns can inventory shoreline parcels and prioritize them for future acquisition according to their ecological, public safety, recreational, cultural and historic values. Historic rights-of-way and easements can be used to gain additional public access to the coast. And conservation restrictions, particularly through the state Wetlands Conservancy Program, can be used to preserve coastal open space.

In addition to state grants, coastal open space or storm-damaged properties could be purchased with funds from a new annual "coastal hazard tax" paid by the owners of land located in such hazard areas. Revenues from such a tax would serve to offset the money that towns spend to assess and repair damage to infrastructure and roads in these areas following coastal storms. This taxation would place the financial burden on the coastal property owners instead of all taxpayers. Furthermore, seawalls and similar shoreline structures are constructed to protect private property at the expense of beaches, salt marshes and other natural resources which are important for their public benefits.



The amount of such a "coastal hazard tax" might be assessed on the size or value of each structure constructed, thus producing tax reduction incentives by encouraging fewer structures of smaller size. As a construction disincentive, undeveloped lots would not be subject to this tax and shoreline lots developed prior to 1978 could receive tax rebates if no shoreline engineering structures are added.

### **TEACH MORE PEOPLE ABOUT THE COAST**

Despite the Cape's recent hurricane and storm damage, a lack of understanding continues to exist about the nature of coastal processes and the hazards of living along the coast. Public education is not a solution that will stop the development of coastal lands. However, it can reduce impacts from human activities, such as off-road vehicle use, or the mowing of salt marshes or other damage done within private property boundaries. In addition, all Cape Codders live within several miles of the seashore, so educating Cape youngsters about this issue makes sense in an effort to produce well-informed future stewards of the Cape's coast. Public education is also necessary to garner support for implementing local bylaws which address coastal hazard mitigation.

Science teachers must be educated about human interference with natural coastal processes in order to present the correct technical information to children in the Cape's school systems. The Center for Coastal Studies and the MA Bay Marine Studies Consortium have offered courses in coastal studies to educators. Ideally, a coastal processes and human impacts curriculum could be developed for all of the Cape's school districts, using town-specific coastal sites as examples for study. The curriculum, integrating math and science, could be developed by the science and math subcommittees of the Cape Cod Consortium. Technical assistance with curriculum development could be supplied by the Woods Hole Sea Grant Program, the Center for Coastal Studies, MA Marine Educators Association, and Cape Cod Extension Service. "A Directory of Cape Cod Coastal Outreach Organizations," published recently by the Woods Hole Sea Grant office, provides descriptions of the services that each organization offers.

Fact sheets could also prove to be a useful public education tool. One suggestion is a fact sheet which describes the financial benefits to coastal homeowners if they choose to relocate their homes outside of hazard zones, or permit property buy-out, as opposed to the cost of implementing shoreline "protection" measures. MCZM is currently

preparing a fact sheet, to be distributed to prospective home buyers by real estate brokers, regarding questions to ask when purchasing coastal properties. However, distribution of this information is voluntary.

Making the release of this information mandatory would seem to be the only way to ensure that prospective purchasers of coastal property get the facts necessary to make informed decisions. An amendment to state law filed for legislative review in 1993 would, if enacted, require sellers of residential real estate located in areas designated as the coastal zone to inform potential buyers about the risks associated with the flooding frequency and erosion rates at those sites. The effectiveness of this law could be increased by requiring this information to be filed at the county Registry of Deeds.

### **'MANAGE' PUBLIC ACCESS**

Providing adequate public access to the Cape's developed shoreline is important. However, coastal land management plans are needed in order to eliminate or moderate the damage that can come from public access and use. In addition to managing public access areas, careful planning consideration must be given to where these accesses are located. For example, the routing of pedestrian and vehicle traffic on beaches must consider things such as bird nesting sites, vegetation destruction and increased erosion.

Coastal public access policies can be incorporated into a town's Local Comprehensive Plan. A starting point is using the DEM open space map to inventory the location and type of existing public access areas. An assessment of their condition and usage should then be conducted in order to determine whether existing management plans are adequate to protect coastal features and critical habitats.

MCZM has proposed to develop a Capewide coastal trail to provide public access. Cape citizens need to decide, from a regional standpoint, whether this is necessary or whether existing federal, state and town public accesses to the coast are already adequate. Additional impacts to coastal habitats and resources may not outweigh the public benefits from such a project.

In conclusion, there are 16 hurricanes predicted to hit the southern coast of Massachusetts every 100 years, with an 80 percent probability of at least one hurricane occurring every 10 years. When the potential ecological and property damage from "northeasters" is also considered, Cape Codders should be well aware of the need for developing coastal

hazard prevention plans before these disasters occur.

Coastal storm damage occurs because we put ourselves and our homes in the way of predictable natural hazards. It's time to get out of the way and take more responsibility for what we do to our coasts, and to ourselves.

# STATE<sup>OF</sup><sub>THE</sub> CAPE 1994

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Preservation*

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**Edited by Dana Hornig**

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The Association for the Preservation of Cape Cod is an independent, grassroots environmental advocacy group serving all of Cape Cod and dedicated to preserving the Cape's natural resources and unique character. APCC's independence and influence depend on its base of paid memberships. To join in support of APCC's work, please call or write APCC for membership information.

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## About Our Book Cover

The view of Cape Cod shown on the cover of *State of the Cape, 1994* is not a photograph, but rather a digital satellite image corrected, enhanced, and produced through a series of computer and photographic processes known collectively as remote sensing.

The image was created by Eastman Kodak Company, which owns it and holds exclusive rights to its use. It is reprinted here courtesy of Eastman Kodak Company.

A natural color composite, this Cape Cod view was made from Landsat 5 Thematic Mapper data acquired over the area on June 12, 1984.

A number of satellites in space continuously scan the earth's surface collecting reflectance information of various features. Trees, water, land, etc., all reflect light in different wave lengths resulting in unique "spectral signatures." This reflectance information is transmitted to earth and recorded on computer tape.

It can then be used in a variety of ways. For example, it can be put through a series of computer and photographic processes to produce a hard copy image — as on this book cover — or possibly interpreted and analyzed for resource management purposes such as forest inventories and land-use planning. Oil and mineral exploration companies are currently using remotely sensed data extensively in their exploration efforts.

***“A viable future needs its champions, those who will defend not only their own self-interest but function and belonging in nature.”***

— John Hay  
Brewster, MA

(from “In Defense of Nature”)

***“Sustainability is an ecologic concept with economic implications. It recognizes that economic growth and human well-being depend on the natural resource base that supports all living systems.”***

— Lester R. Brown

“State of the World” project director  
The Worldwatch Institute