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WATER QUALITY PROTECTION THROUGH GROWTH MANAGEMENT IN BUZZARDS BAY

INTRODUCTION

The Buzzards Bay Program was established in 1985 as a part of the U.S. Environmental Protection Agency's National Estuarine Program. The first phase of the program was to characterize and assess water quality problems in Buzzards Bay. The program is now entering its second phase, aimed at developing management recommendations through a regional plan to protect water quality in the communities located within the watershed of the Bay. This paper describes many of the growth management options available to local and regional officials to ensure that future development within the Bay's watershed does not result in degraded water quality

The Buzzards Bay communities have available to them hundreds of zoning ordinances and bylaws, subdivision and health regulations. Yet, few would argue that Buzzards Bay is healthier today than in the past. Widespread shellfish closures, declining eelgrass beds and the presence of highly contaminated sediments are but three of the many factors that illustrate that something is wrong with mechanisms currently being employed to protect the Bay.

This paper focuses on a group of mechanisms that has not, been widely employed to protect the Bay. Generically labelled as regulatory tools, techniques such as nutrient loading limitations and health regulations have not been given enough attention by Bay area communities.

The paper is presented in four sections with the generalized goal of assisting Bay communities to effectively and collectively manage Buzzards Bay. Section One presents a brief introduction to the issue of carrying capacity and provides the framework for Sections Two, Three and Four. Section Two introduces the concept of critical area identification as a basis for growth management. Section Three provides lessons from three case study

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examples--examples where innovative approaches have been used to protect water quality and advance growth management goals similar to those shared by the Buzzards Bay communities.

Section Four presents a variety of regulatory techniques that Buzzards Bay communities could adopt to protect critical areas through effective land use controls.

SECTION ONE: APPROACHES TO GROWTH MANAGEMENT: AN INTRODUCTION TO CARRYING CAPACITY

Land use planning in the United States has evolved over the past 100 years to include several innovative strategies for land development and resource protection. Despite these advances, the land development process and thus the land regulation process can be summarized by the following four words, listed in hierarchical order: PLANNING, ZONING, SUBDIVISION, PERMIT.

Because of the tone and language of the Commonwealth's enabling legislation, once a community "programs" itself through zoning and subdivision control, it is bound by that program as witnessed by the issuance of individual building permits. Unfortunately, because Massachusetts statutes do not contain a requirement for planning prior to zoning, many communities have found that their programs call for land development that exceeds the carrying capacity of their natural resource systems.

The underlying assumption of growth management is that there are limits to the amount of growth which an area can withstand without serious harm to public health, safety or the environment. The premise is that environmental systems, and specifically coastal embayments, reach their limit--their carrying capacity--when they can no longer absorb the impacts from additional or more intensive growth without degradation or impairment. Of specific concern in Buzzards Bay, particularly within the Bay's poorly flushed embayments, is nitrogen loading. A ubiquitous constituent of sewage effluent and lawn fertilizers, in its nitrate form, nitrogen is highly mobile in ground water.

Through the use of growth management tools, Bay communities can ensure that their regulatory programs do not allow development that exceeds the carrying capacity of Buzzards Bay. It is important to note, however, that the historic approach to growth management for Buzzards Bay, as well as other regional resources in the country, has been to rely on individual town efforts, ignoring the fact that the resource transcends corporate boundaries. The success of a growth management program for Buzzards Bay is critically dependant on cooperation from all the Bay communities. The enactment of strong regulatory controls in only a handful of Bay municipalities is clearly inadequate to meet the overall goal of an improved Buzzards Bay.

SECTION TWO: IDENTIFYING CRITICAL AREAS FOR PROTECTION

Many of the issues related to growth and resource management in the Buzzards Bay estuary revolve around the identification of resource areas considered critical for protection purposes. In other words, which land areas need to be managed differently from others in order to protect the Bay? What parcels should be considered critical, and further (and perhaps more importantly), is it possible to identify and protect critical land areas while simultaneously allowing for the fulfillment of other community goals.

The identification and delineation of critical areas involves an understanding of various environmental resources, including geology, ground water, lakes and wetlands. Correlating these resources with land use development patterns is the first step in identifying critical areas.

Sources of contamination within critical resource areas have been well documented and include stormwater drainage, septic systems, lawn fertilizers. At issue is which land uses and which land parcels contribute to the physical, biological and chemical degradation of water quality.

While it can be generalized that Buzzards Bay's semi-enclosed embayments are vulnerable to degradation from several sources, the degree of degradation differs depending on the location within the embayment, the tidal flushing rate and the source of contamination. This is <u>particularly</u> true with nitrogen and has given rise to the concept of "nitrogen-sensitive embayments." These portions of the estuary appear vulnerable to excessive nitrogen loading and require a different degree and different *kind* of protection than other portions of the estuary. The Buzzards Bay Management Plan will focus and prioritize nitrogen sensitive embayments requiring various forms of management.

<u>Identifying Critical Areas</u>

Most of Buzzards Bay's freshwater is derived from ground water discharge and surface water runoff. These ground and surface water contributions are derived from specific land areas that ignore municipal boundaries. Unfortunately, few of the regulations developed by the Bay area communities have targeted these specific land areas for protection. Instead, many of the regulations developed to protect Buzzards Bay have fallen short in protecting critical Bay resources while possibly"overprotecting" portions of the community not in need of the same level of protection.

It is clear that a more sophisticated approach is necessary to ensure that the Bay's critical land areas are safeguarded from inappropriate land uses

resulting in eventual Bay contamination. Protecting Buzzards Bay can be approached in two ways: where will development be allowed (such as with traditional zoning that "programs" a community with no linkage to resource protection) or, more importantly, where and how should growth and development occur so as to protect critical resource areas. By first identifying "critical" lands that should be protected, it will be possible for communities to answer the questions of where to allow development, how much of it can occur and how best to regulate potentially detrimental future land uses.

Components of Critical Areas

The delineation of critical resource areas for the Buzzards Bay estuary includes the following components, each dictating a different degree and type of protection: primary, secondary and tertiary contributing areas.

This mapping approach (see Figure 1) was used to delineate the primary, secondary and tertiary contributing areas to Buttermilk Bay, a coastal embayment within the Buzzards Bay system.

"Primary" resource areas are the surface watershed areas that contribute overland flow or runoff directly to Buzzards Bay (i.e. stormwater discharge pipes and waterfront lawns). These areas are sources of bacteria, viruses, hydrocarbons, metals and nutrients and are identified using storm drainage and topographic maps.

"Secondary" resource areas are land areas that contribute recharge to ground water that eventually discharges directly to Buzzards Bay. The recharge includes precipitation, fertilizers, septic system discharges, and road runoff captured in catch basins. "Tertiary" resource areas are those land areas which contribute recharge to ground water that discharges to streams and vegetated wetlands prior to discharging into Buzzards Bay. Uptake of nutrients in the organic wetland soils can occur, lowering the overall loading to the Bay. Land development within secondary and tertiary areas is a source of nutrients, and possibly viruses, to the Bay. Because of the continual flow of ground water from these resource areas, the total loading of contaminants is commonly greater than that from the primary resource areas.

The secondary and tertiary resource protection areas are delineated using information on ground water flow directions, rates, and volumes. This information is in turn dependent on the local geology and the actual volume of ground water entering the Bay.

At issue is who should conduct the delineation of various watersheds (as well as who should pay for it) and how best to use the information generated. Experience throughout New England has proven that financially constrained communities are unlikely to expend local funds for critical area mapping. Options for conducting critical resource area delineations, as well as the buildout analysis presented within Section Three include:

1. **Require the private sector to conduct the study**. Falmouth, for example, requires developers within specified locations to conduct a complete nitrogen loading assessment for their development, as well as the impacts for *all* potential development in the watershed. Similarly, communities could require developers over 20 residential units, for example, to delineate the surface/ground water recharge areas to downgradient water systems.

2. **Collaborative with abutting communities.** While the Buttermilk Bay Study is using federal and state funds to delineate critical areas, the concept of a tri-town venture to focus on shared natural resources provides an important precedent. Communities within the Buzzards Bay region could collectively raise the funds to delineate sensitive areas that one or two towns could not accomplish on their own.

3. **Seek assistance from the respective regional planning commissions**. A much overlooked source of technical expertise, the Bay's regional planning commissions should be tapped for their money and expertise to help delineate sensitive areas.

4. **Seek assistance from Coastal Zone Management, U.S. Geological Survey and other state and local agencies**. Contrary to popular belief, there exists a tremendous amount of information on Buzzards Bay, all available to communities to assist in the protection of the Bay's resources.

SECTION THREE: IMPLEMENTING A CRITICAL AREA PROTECTION PROGRAM: CASE STUDY EXAMPLES

The challenges faced by the Bay's communities have been successfully confronted by scores of other communities throughout the country. Three of these case studies are discussed below. At issue, and in light of the lessons learned elsewhere, is whether the Bay cities and towns and indeed the state, can take effective action to protect Buzzards Bay from a slow and persistent decline in water quality.

Falmouth, Massachusetts: Nutrient Loading Bylaw

Falmouth, Massachusetts, located on the southwest corner of Cape Cod is a partner in the family of communities attempting to protect Buzzards Bay. For a variety of reasons, mostly to do with the protection of the town's fresh and coastal waters, the town adopted a zoning bylaw and subdivision regulation designed to regulate development in accordance with its relative impact upon receiving waters. The heart of this regulatory approach is that development is analyzed and essentially judged based upon the net impact it will have on water quality. The concept of cumulative loading thus replaces the standard approach of reviewing development proposals one at a time, in a vacuum and without benefit of understanding the eventual impact on a receiving resource. While the Falmouth regulatory approach focuses on all the town's water systems--not solely estuarine--it is nevertheless applicable to the protection of Buzzards Bay.

History of the Falmouth Nutrient Loading Approach

Falmouth's water systems, similar to Buzzards Bay, is threatened by numerous contaminants, almost all associated with land development. The greatest management obstacle is identifying the ability--or capacity--of specific embayments to assimilate various levels of contaminants. These include nutrients, bacteria and toxins associated with sewage, underground fuel storage tanks, road drainage, industrial discharges and overland runoff. Nutrients, particularly nitrogen, are particularly difficult to control as they may enter the water systems as both surface run-off, ground water discharge and direct inputs. Plant and algae growth in coastal bays and estuaries is controlled, in large part, by the availability of nutrients.

In Falmouth's estuaries, as in Buzzards Bay and most coastal ecosystems, nitrogen is the nutrient which causes the most rapid growth. Although algae growth is not necessarily undesirable, excessive nitrogen loading may result in intense algal blooms. These blooms can limit eelgrass production which in

turn may seriously impact shellfish resources. Furthermore, algal blooms are generally considered unsightly, can lead to oxygen depletion, accumulated organic matter, unpleasant odors and fish and shellfish kills.

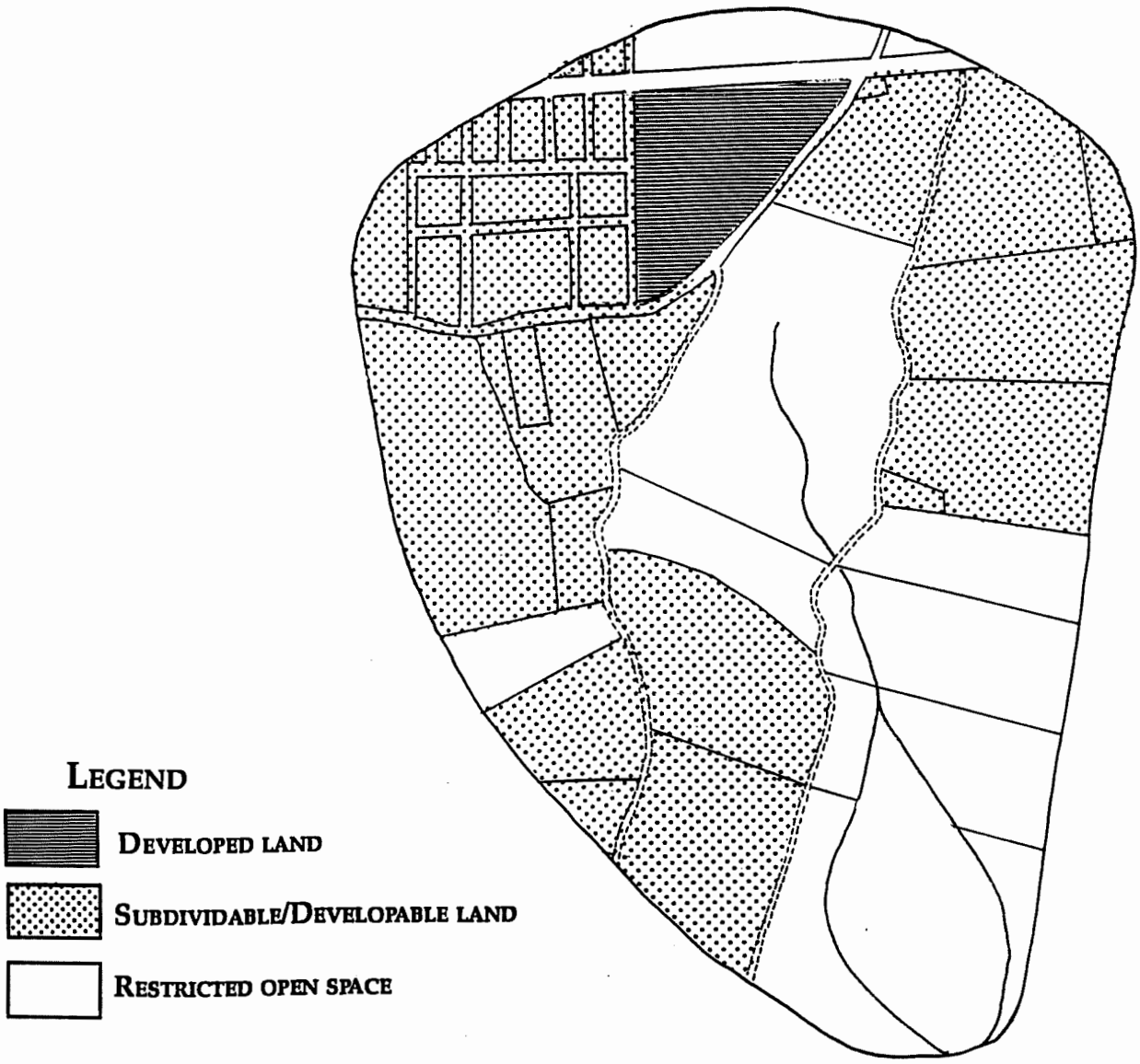
Although nitrogen levels within coastal waters can be directly measured in an analytical laboratory, the results may be misleading on several counts. First, laboratory analyses of water do not account for the large quantities of nitrogen bound up in macroalgae and eelgrass. Secondly, laboratory analyses do not address lag effects: it may take many years for nitrogen from existing development to reach coastal waters. Finally, future water quality conditions cannot be predicted from sampling results. With the above noted discussion in mind, the Town of Falmouth developed a four-step procedure to gauge and eventually regulate the impacts of development upon water resources. These four steps were completed in Falmouth as part of the development of the bylaws, and have been revised several times since the passage of the bylaw in 1984.

First, the contributory area to the estuary assumed to be impacted by the development was delineated. Once identified and delineated, an assessment of the nitrogen contributed by each land use and contamination sources was assessed in order to determine the potential threats to the resource and, ultimately, to develop effective management strategies.

After the delineation was completed, a maximum acceptable nitrogen concentration was established for the receiving waters. This concentration threshold was the subject of much discussion and debate, particularly insofar as the literature is incomplete regarding the capacity of estuarine waters to assimilate nitrogen.

The third step involved the completion of a developable lot or "buildout" analysis to determine the number of residential and commercial units which could ultimately be constructed within the watershed. This number is obtained by summing existing development and potential development within the study area. The number of existing units can easily be determined from assessors maps and tax data. Potential development can then be assessed based on existing zoning and subdivision rules and regulations. The number of "grandfathered", vacant lots must also be included in this analysis. The results of a typical developable lot analysis are illustrated in Figure 2.

The final phase involved the translation of the collected information into an impact assessment analysis using a nitrogen loading model. A model developed on Cape Cod in 1988 refined the 1984 Falmouth approach in that it allows for the comprehensive computation of nitrogen loading rates from



CATEGORY	ACRES	UNITS
Developed land	31	95
Subdividable/Developable Land	337	219
Restricted Open Space	243	-
Total	**611**	**314**

FIGURE 2: Developable Lot Analysis of a Estuary Recharge Area

sewage (residential, commercial and industrial), lawn fertilizers, road runoff and background precipitation. The new nitrogen loading model also evaluates the amount of recharge or dilution entering the resource area from natural precipitation as well as artificial sources such as sewage and road runoff. This model can be used to predict nitrogen inputs to Buzzards Bay as a result of existing and potential development within the Bay area. Moreover, the nitrogen loading model can be used to assess the carrying capacity of specific portions of Buzzards Bay, allowing Bay communities to determine the level of response needed to protect the resource.

The result of the efforts in Falmouth was the establishment of a nutrient loading program. Falmouth's program works to supplement federal and Massachusetts state laws, which fall short in protecting water supplies from many sources of non-point pollution. Developers are required to determine the nutrient loading of their proposed developments compared to the carrying capacity or critical levels in the receiving waters. Developers must determine the probable impact of a proposed development on the receiving waters. To ensure that all developments are treated equally, the town has set standards to be used to calculate the level of nutrient loading. To assess impact, the town set critical eutrophic levels, based on research, for freshwater and salt water, and critical standards for drinking water. The developer must implement mitigating measures to reduce the nutrient output generated by the development if the analysis indicates it will cause the receiving waters to meet or exceed critical levels, or if the receiving waters are already exceeding the critical levels established.

The greatest advantage of this program is that it allows the Town's regulatory boards to identify areas in which the density allowed under zoning is inappropriate, since that density would exceed the carrying capacity of the receiving waters. The program has also established a means by which the town can determine which developments will contribute more than their "fair share" of nutrients. This allows the town to objectively and equitably scale down the density. The program is designed so that the private sector shoulders the major costs of implementation. The town is not forced to conduct exhaustive town-wide land use studies to allocate and regulate growth. Instead, the program is triggered on a lot by lot basis, and the developer is responsible for determining the impact of future development.

The program does have its limitations. First, it assumes that the critical levels used are appropriate. As research continues to determine the effects of water contaminants on aquatic organisms and man, these critical levels will need to be revised. Second, short-term or one-time measurements are currently used to determine the condition of the waters being investigated.

The effect of seasonal fluctuation in water quality upon these readings is not evaluated and long-term testing is not conducted by the town due to cost. Third, and perhaps most importantly, the Falmouth bylaw points up the weaknesses of zoning to regulate land uses and water quality in Massachusetts. As discussed in greater detail in Section Four, zoning has inherent flaws as a management tool, primarily because of extensive "grandfather" provisions, but also because of strict procedural requirements for ratification and adoption.

Approximately two years after the Falmouth bylaw was adopted, the Town of Brewster Board of Health adopted a similar bylaw under their powers as authorized by MGL Chapter 111. As discussed in Section Four, boards of health have broad powers to regulate land uses in the Commonwealth; powers that are significantly less constrained than those embodied by zoning ordinances or bylaws. A comparison of the success of the Falmouth and Brewster bylaws illustrates several interesting facts.

Because the Falmouth bylaw focuses on nitrogen loading at a "higher" level of land development (zoning as compared to permit issuance), it is likely to be more effective in preventing a water system from reaching its assimilative capacity. However, because of the extensive protections afforded land owners by zoning, the Falmouth bylaw has had, and will continue to have, limited applicability. Conversely, the Brewster bylaw regulates land development at the permit issuance stage only, the point at which land owners are least likely to negotiate with town officials. Ironically, the Brewster bylaw, because it is a health regulation, is far more powerful than Falmouth's zoning bylaw, yet regulatory strength cannot be used until the subdivision and building permit stage. It appears as if the most effective approach is a combination of the Falmouth and Brewster regulatory strategy: adoption of a nutrient loading zoning bylaw, subdivision rule and regulation and health bylaw. This strategy ensures the satisfaction of the carrying capacity goal at all levels of land permitting and development.

To date, the approach taken by Falmouth in 1984 and Brewster in 1986--to allow development within coastal waters only if the development will not exceed the receiving water's carrying capacity--has been replicated by many communities in New England. The goal of the bylaw, as well as the mechanics of its implementation appear well suited to the Buzzards Bay communities.

Comprehensive protection of the Bay resource can only occur if all the Bay communities adopt and implement water protection programs that target the heart of the issue confronting Buzzards Bay: the fulfillment of the

programmed growth of the Bay watershed irrespective of the Bay's ability to assimilate such growth.

Maryland's Chesapeake Bay Critical Area Program

The Chesapeake Bay Critical Area Program was established in 1984 to address the problem of non-point source runoff in the Chesapeake Bay and its tributaries. The program allocates the location and intensity of growth based upon the existing pattern of development in the region. The approach taken to alleviate the problem of non-point source pollution in the Chesapeake can be easily transferred to Buzzards Bay. While this program was adopted at the state level, it is implemented at the local level, and its general approach could be adopted at the local or regional level for Buzzards Bay.

The Chesapeake Bay program arose out of concern about the decline of certain natural resources of the Bay. Recent studies by the U.S. EPA have shown that this decline is related to the intensity of human activities within the Bay watershed. The program makes use of many growth management techniques discussed in Section Four, including performance standards, large lot zoning, surface water buffers, transfer of development rights (TDR) and clustered development.

The Chesapeake Bay Critical Area Commission was established to develop criteria to guide local implementation of the program. It is the responsibility of each local jurisdiction to develop and implement an approved program. The program has three goals:

1) minimize adverse impacts of water quality that result from pollutants discharged from structures or from runoff on surrounding lands,

2) conserve fish, wildlife and plant habitats, and

3) establish land use policies for development in the Chesapeake Bay Critical Area.

The program claims jurisdiction of a 1,000 foot critical zone bordering the tidal waters of the bay.

Growth Allocation Process

The heart of the program lies in its growth allocation. The strategy is to locate new growth near existing development. The state implemented a regional land management strategy which classifies all critical area lands into one of

three categories of land use intensity: intensely developed areas, limited development areas and resource conservation areas. Development criteria and land use objectives are tailored to each of these areas. Local jurisdictions were responsible for categorizing and mapping lands within the 1000 foot critical zone. In general, intensely developed areas are those where residential, commercial and institutional development is concentrated and relatively little natural habitat remains. Limited development areas include areas currently developed with low or moderate intensity uses which still contain areas of natural plant and wildlife habitat, and where the quality of runoff has not been substantially altered or degraded. Resource conservation areas include areas predominated by wetlands, forests, abandoned fields, agriculture or fisheries.

The program requires that municipalities make every attempt possible to guide intense development outside of the critical area (1,000 foot zone). Where this is not possible, intense development is limited to the Intensely Developed Area. In order to guide growth to already developed areas, the program calls for density controls in the limited development and resource conservation areas. New development and infill in limited development areas is allowed only at the low and moderate intensities existing in those areas, and the prevailing character of the land must be maintained. In the resource conservation area, new growth is permitted if it is residential in nature and the resulting overall density will not generally exceed one dwelling unit per 20 acres. Only agricultural uses are allowed within 300 feet of shorelines in this zone, and farmers must use best management practices to limit runoff and application of fertilizers and pesticides. The locality must also ensure that the overall acreage of forest is maintained. Several jurisdictions have established a transfer of development rights program to provide equity relief to land owners holding large tracts of land within the resource conservation areas. Some jurisdictions are setting up TDR programs in resource conservation areas in an attempt to make growth limitations more equitable.

Density limits are not established in the intensely developed area. To prevent serious degradation of water quality in the area, the program sets performance standards which must be met by new development or re-development. All development and re-development must reduce stormwater runoff at the development site to 10% below its existing pre-development condition. In essence, this translates into a requirement that the concentration of phosphorous (the Bay's biggest problem pollutant) be reduced by at least 10%. The state's Sediment and Stormwater Division has a set of practices which they recommend to developers to meet this standard. Municipalities also require that future development use cluster development practices, to the

extent possible, to reduce impervious surfaces and maximize areas of natural vegetation.

Seeing the need to accommodate additional growth over time, the program allows a limited physical expansion of developed areas within the critical area. To determine the area of land which can be added to intensely developed areas and limited development areas, jurisdictions calculated the total acreage of land classified as resource conservation area when the program was first implemented. A total of 5% of that acreage may be reserved to allocate additional growth to the other two zones. When this land is developed, all future development in the jurisdiction must occur outside the critical area.

Since the program was established all but three jurisdictions have adopted and begun implementation of this program, and the last three programs will be adopted soon.[3] There have been no legal challenges to date.

The greatest drawback of this program is its limited jurisdiction. The program only regulates the development of uses and structures within 1,000 feet of the Bay and its tributaries, and ignores the potential impacts of activities existing within the watershed of the Bay, but outside the critical zone.

[3] Ventre, Tom. Chesapeake Bay Critical Area Commission. Telephone Communication. July 7, 1989.

Sanibel Island, Florida

Sanibel Island is a 12 mile barrier island located off southwestern Florida. Sanibel has established a coastal growth management plan which allocates growth based on environmental conditions, and which is implemented primarily by performance zoning. Like Buzzards Bay, the island's coastal community is largely dependent upon tourism for its economic base. Sanibel had experienced little growth prior to 1963, when a major causeway connecting the island to the mainland was constructed.

In 1974, Sanibel developed a comprehensive land management plan designed to control the amount and location of permissible development on the island. A land capability analysis was conducted to divide the barrier island into ecological zones. The carrying capacity of each zone was determined, allowing for the assessment of the maximum carrying capacity of the Island.

Performance standards were developed to manage growth and minimize environmental impacts in each zone. Proposed developments have to meet performance standards, established for the zone they will be located in, which define the level of permissible impact to a zone's geology, hydrology, and vegetation. In essence, the development of the man-made environment was permitted subject to the assimilative capacity of the natural environment.

An overall population threshold has also been established. At the time when the plan was created, Sanibel Island had approximately 4,000 residents. The island's current population is approximately 7,000.[4] Under the current zoning, the absolute population limit will be approximately 10,000 people.[5]

The island administrators initially faced difficulties in implementing the program due to its complexity; however, over time problems have been ironed out. The plan is currently being updated, but the environmental principles behind the plan remain.

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[4] Larsen, Sandy. Sanibel Planning Department. Telephone Communication. July 8, 1989.
[5] Ibid.

SECTION FOUR: APPLICATION OF GROWTH MANAGEMENT TOOLS TO THE BUZZARDS BAY COMMUNTIES

As noted in the Introduction, despite the widespread knowledge of the existence of regulatory tools for growth management and resource protection these tools have done little to protect Buzzards Bay from a slow but persistent decline in water quality. Explanations are numerous and range from the lack of a cohesive regional management plan to the reluctance of some Bay communities to adopt seemingly complex regulations, to the failure of Bay communities to logically connect land regulations with an identification of the critical resource areas discussed in Section Two. Whatever the reasoning, it has become clear that the adoption of growth management legislation on a community by community basis is essential for the long-term well being of Buzzards Bay.

Growth management tools can be divided into three general categories: regulatory, non-regulatory and legislative. Regulatory tools can be further divided into three sub-categories: zoning, subdivision control, and regulations governing health, wetlands, floodplains and other natural features regulated through non-zoning legislation.

This section focuses on zoning, subdivision control and health regulations as regulatory tools. These tools are available to Buzzards Bay communities now, as opposed to requiring further study. The techniques that follow have all been utilized successfully in other communities in the Commonwealth and other regions of the country. Many have been court tested. All have proven valuable in protecting resources such as Buzzards Bay from contamination.

Regulation as an Effective Management Tool

The validity of local government regulations is predicated on the broad concept of police power: the power of government to regulate for the advancement and protection of the health, safety and welfare of the inhabitants of the community.

In the Buzzards Bay area this broad authority has been typically exercised through zoning techniques such as dimensional requirements including lot size, setbacks and lot coverage. A handful of communities have expanded their zoning regulations to focus on the protection of water quality, and a smaller number have prioritized the protection of Buzzards Bay water quality in their respective zoning codes, subdivision regulations and health bylaws. Collectively, however, little has been accomplished to ensure that communities abutting each other or sharing the Bay resource have adopted

similar regulations. As noted earlier, the protection of a resource the size and complexity of Buzzards Bay requires cooperation among the communities sharing the resource.

Regulatory Tools for Buzzards Bay

The following zoning, subdivision control and health regulations represent those that each of the Bay communities could adopt, without elaborate and extensive analysis, to provide tremendous protection to Buzzards Bay.

Zoning Bylaws and Ordinances

1. Surface Water Buffer

   Stormwater runoff is a major source of non-point source pollution in surface waters. Studies have shown that undisturbed lands are generally more permeable, and as a result, allow higher levels of stormwater percolation and treatment of associated contaminants. Municipalities can require that undisturbed vegetative buffers be left adjacent to, and within a defined buffer area (e.g. 100 feet) of surface waters in order to promote natural stormwater treatment. Vegetative buffers are required in Nantucket, and have been used effectively to mitigate the impact of contaminant runoff to surface water systems.

2. Overlay Ground/Surface Water Protection Districts

   The adoption of overlay ground/surface water protection districts for contributing areas in each of the Bay communities is a logical first step in protecting Buzzards Bay. An overlay water protection district combines the concept of identifying critical areas (discussed earlier) with regulatory restrictions. These ordinances and bylaws, while varying in their approach toward resource protection (i.e. prohibition of various uses vs. special permitting and/or performance criteria), are similar in their goals of defining the resource by mapping watershed boundaries and enacting specific legislation for land uses and development within these boundaries. Examples of overlay water protection districts are numerous, however Duxbury, Yarmouth, Barnstable and Nantucket, Massachusetts provide good examples of the use of performance criteria.

3. Prohibition of Various Uses

Every city and town in the Bay area prohibits various land uses from certain sections of the community; although the rationale behind such prohibition may or may not be related to the protection of Buzzards Bay. While not the most creative nor effective approach toward water resource protection, prohibition of land uses such as gas stations, sewage treatment plants, landfills, or others involving the use, storage and disposal of toxic and/or hazardous materials within critical resource areas is an important step toward the development of a comprehensive water resource protection strategy for the Bay.

4. Special Permitting

Massachusetts General Laws, Chapter 40A, §9 provides for the allowances of certain uses and structures upon the issuance of a special permit. The special permit, contrary to public opinion, is to be issued only for "uses which are in harmony with the general purpose and intent of the . . . ordinance or bylaw" (MGL, Chapter 40A, §9, first paragraph).

If applied strictly, the special permitting process can be used effectively to regulate uses and structures that may potentially degrade water quality. For example, many communities use the special permitting process to prohibit underground storage tanks or limit lawn fertilizer within designated surface or ground water protection districts. Of critical importance, however, is the development of strict procedural and substantive guidelines for the issuance of special permits.

While all Bay communities have established some guidelines for the issuance of special permits, few have developed broad, inclusive language to ensure that the special permit granting authorities have the powers to protect Buzzards Bay from inappropriate uses or structures developed via a special permit.

5. Transfer of Development Rights

The idea of "transfer of development rights" (TDR) is based on the concept that a parcel of land has a bundle of different "rights" associated with it. The value of these rights, such as the right of possession, access, air rights, subsurface rights, and development type and density, are defined, in part, by governmental actions such as zoning. A TDR program allows a landowner to separate his or her

right to develop the land, as permitted by zoning, from the other rights associated with the land, and sell those development rights.

To implement a TDR program, a governmental entity such as the town would prepare a plan designating the parcels or districts from which development rights could be transferred (a "sending" or "donor" parcel), and the parcels or districts which would receive those development rights and develop at a higher density than allowed by the underlying zoning district (a "receiving parcel"). For example, a sending parcel or district could be those areas identified as providing recharge to Buzzards Bay.

A receiving parcel is able, both from a physical standpoint and in terms of the community's growth program, to accommodate additional development beyond that allowed as-of-right by zoning. In selling his or her development rights, a landowner would gain the cash value of whatever development rights the market associates with the land, and yet would keep the land in a less intensive use and, presumably, continue to enjoy lower property taxes. A perpetual easement or some other development restriction would be recorded with the deed of the sending or donor parcel. The purchaser of the development rights gains the ability to develop the receiving parcel at a higher density than allowed "as-of-right" and can recapture the cost of the development rights purchased through the more intensive use of the receiving parcel.

Three different-sized communities provide good examples of TDR bylaws: Sunderland, in western Massachusetts; Townsend, in central Massachusetts; and Falmouth, a Buzzards Bay community. Although similar in many respects, each was designed with different resource protection issues in mind. (Sunderland, agricultural protection; Townsend, scenic view and vista protection; and Falmouth, water resource protection).

6. Performance Standards

Performance standards as discussed in Section Three, are based on the assumption that any given resource has a threshold--carrying capacity--beyond which the resource's ability to function deteriorates to unacceptable levels. Performance controls assume that most uses are allowable within a designated area provided that the use or uses do not and will not overload the natural or man-made resources.

To apply this concept to Buzzards Bay, the carrying capacity of the Bay to assimilate nitrogen, among other contaminants, must be determined. Once determined, each community within the watershed would be allowed to contribute a defined percentage of nitrogen, relative to the total capacity of the Bay. By mutual agreement, no community would be allowed to exceed this percentage.

As unlikely as it may seem, this approach may be the only comprehensive mechanisms for equitably protecting Buzzards Bay from increasing contamination. The Bay's ability to assimilate contaminants is limited, and few social, economic or political arguments can effectively alter this fact. Establishing a threshold for contamination within the Bay and adopting performance based regulations in each of the Bay communities appears to be an exciting and imaginative mechanism for ensuring the Bay's long term viability.

Subdivision Control

Subdivision regulations as provided for in Massachusetts General Laws, Chapter 41 "fine-tune" zoning bylaws in that they focus less on land use and more on engineering concerns such as street construction (grade, width, intersection angles), utility placement, and traffic patterns of individual subdivisions. Protecting water resources via subdivision control, therefore, is far less effective than through zoning, particularly as it is the expressed intent of the Subdivision Control Law that plans that meet a community's subdivision rules and regulations are to be approved by the Planning Board. (See MGL, Chapter 41, §81-M).

1. Drainage Requirements

Drainage from roads and lawns within subdivisions contribute significant amounts of nutrients to water supplies. As part of the subdivision review process, Planning Boards have an opportunity to protect water supplies through the use of strong drainage requirements.

Standards for catch basin maintenance, specificity on the type of catch basins to be used and limitations on lawn fertilizer applications within designated resource areas are three examples of drainage standards Planning Boards can employ when reviewing subdivisions under Massachusetts General Laws, Chapter 41. Many communities have developed strong drainage requirements through their subdivision rules and regulations, but Falmouth and Manchester, Massachusetts have developed standards that are geared directly toward water resource protection.

2. Performance Standards

As noted above, Planning Boards have significant opportunities to ensure that new subdivisions do not contribute to water resource contamination during the subdivision review and approval process. One approach is to regulate subdivisions based upon the degree to which the subdivision will impact water quality assuming the subdivision is fully developed. For example, it is possible to determine the water quality impact of a 20-lot subdivision, calculating the nitrogen contribution from roads, lawns and septic systems. And, as discussed earlier, it is also possible to determine the "carrying capacity" or ability to absorb nitrogen and phosphorus loading of a receiving water system. Planning Boards can use this information to regulate subdivisions within critical resource areas by limiting subdivision development to the point that water quality will not be compromised. Falmouth was the first town in the Commonwealth to employ this concept in a subdivision regulation. Similar standards are currently in place in Mashpee, and under consideration in Duxbury, Scituate and Manchester.

3. Board of Health Review

Section 81-U of the Subdivision Control Law (MGL, Ch. 41) requires that Boards of Health review all subdivision plans to ensure that the plan does not pose any public health or other concerns typically the jurisdiction of Boards of Health under MGL, Chapter 111. Planning Boards are constrained from approving lots on a subdivision plan that the Board of Health stipulates are not suitable for construction because of public health issues. This review authority vests considerable power with the Board of Health, but also has the effect of encouraging Planning Boards to work with local health boards to ensure proper protection of water resources. When used appropriately, Board of Health review under Section 81-U can ensure that water quality-threatening uses, including nitrogen loading be minimized within specified watersheds.

Health Regulations

The development of health regulations as provided for in Massachusetts General Laws, Chapter 111, is an extremely effective method of rounding out the Buzzards Bay community's regulatory protection programs.

While zoning regulations adopted by town meeting or city council, and subdivision rules and regulations adopted by Planning Boards have limited ability to protect water resources, regulations adopted by Boards of Health can

become powerful mechanisms in protecting public and private water systems. This is due in part to the fact the regulations adopted under MGL, Chapter 111 provide for far less "grandfathering" protection than do regulations adopted under MGL, Chapter 40A or Chapter 41 (See MGL, Chapter 127-P for protections from health regulations). Below is a sampling of health regulations currently used in various communities within the Commonwealth.

1. Discharge to Ground Water Permits

Title 5 of the State Environmental Code (310 CMR 15.00) regulates the installation and impacts of individual septic systems. However, these requirements are often inadequate to regulate septic systems with higher than normal flows associated with a single-family house (330 gallons/day). While a flow of 15,000 gpd or greater triggers a number of additional regulations and the Department of Environmental Quality Engineering's review, the regulations dictate that a 14,000 gpd flow be treated the same as a 1,000 gpd flow. As a result, many communities have adopted more stringent regulations for medium-sized sewage discharges.

Yarmouth, Massachusetts, for example, requires on-site sewage treatment plants for projects in excess of 10,000 gpd, and provides little opportunity for a variance from this requirement.

2. Privately-Owned Wastewater Treatment Plants (Small Sewage Treatment Plants)

Privately-owned wastewater treatment systems (SSTP's) formerly referred to as "package treatment plants" have been utilized as a technological solution to overcome the natural capabilities of land and associated water resources to assimilate the disposal of wastewater. This technology has enabled the development of projects which exceed the carrying capacity of the land using proven conventional wastewater disposal technologies (Title 5). The effectiveness of SSTP's is dependent upon the proper functioning of more technological components than that associated with a relatively simple Title 5 conventional systems. They are also largely dependent upon a much greater level of supervised operation and maintenance. For these reasons, SSTP's are subject to a degree of uncertainty and malfunctioning. The systems are typically utilized in environmentally constrained sites. In these situations, a malfunction can result in serious environmental degradation (including drinking water contamination, contamination from excessive nitrogen loading, fish kills, and shellfish contamination). To eliminate these risks in critical water resource protection areas, many communities (Yarmouth,

Falmouth, Duxbury) have banned the use of SSTP's or prohibited their development within designated surface watersheds or zones of contribution to public supply wells.

3. Septic Cleaner Ban

Trace levels of volatile organic compounds have been detected in many municipal wells throughout the Commonwealth. These chemicals are likely to be the result of the cleaning of clogged septic systems with products containing synthetic organic chemicals. Alternatives include better maintenance of systems, Title 5 upgrades and hydrogen peroxide treatment or physical cleaning for clogged systems. To minimize the risk of future contamination of ground water by septic cleaners, many communities (mostly on Cape Cod) have prohibited the storage, use or disposal of septic cleaners containing synthetic organic chemicals.

4. Sewage System Upgrades

Many existing septic systems (including cesspools) do not meet Title 5 criteria. These systems are subject to a higher probability (and frequency) of failure. Failures may result in clogging (and subsequent cleaning with organic solvents), overflowing, and water contamination. To encourage more frequent upgrading of septic systems to Title 5 standards, numerous cities and towns that rely principally on septic systems for waste disposal have developed septic system inspection programs that are triggered upon a real estate transaction or the issuance of a building permit to expand, alter or change a pre-existing, nonconforming structure. One of the best examples of such a program was developed in Chatham, Massachusetts.

Non-Regulatory Techniques

As noted in the introduction, most New England towns have relied upon so-called "traditional" tools to protect water quality; zoning, subdivision and to some extent, health regulations. And, while these regulatory tools did serve a legitimate purpose, almost all New England cities and towns have recognized that over-reliance upon regulatory tools merely "programs" a municipality for development and allows little flexibility if the original program was inaccurate, or if better information has been made available since the program was devised.

Many communities in New England have taken advantage of non-regulatory options for resource protection, but perhaps the most comprehensive programs to date have been developed on Cape Cod, Massachusetts. All of

the Cape's 15 towns have engaged in some form of non-regulatory land protection, ranging from bond issues to conservation easements to the establishment of land trusts whose sole purpose is the stewardship of land for, among other reasons, the protection of public and private water quality.

An additional non-regulatory technique involves the use of private sector funds to analyze the impact of land development on natural resources. Yarmouth and Falmouth, Massachusetts, for example, have effectively used private sector funds to objectively study the impact of developments on drinking water supplies, fresh water lakes and estuaries including Buzzards Bay. In Yarmouth, developers seeking permit approval within zones of contribution to public supply wells are required to pay the cost of a development impact analysis prepared by the town's (not the developer's) consultant. In Falmouth, the Planning Board and Board of Appeals have often required developers within the Town's delineated watersheds to submit an analysis of their development's impact, as well as funds for the town to conduct their own impact analysis.

Legislative Techniques

Legislative growth management strategies include those created by individual state legislative bodies. As local governments do not possess inherent sovereign power, their jurisdiction rests almost exclusively with state constitutional provisions, charters, statutes, ordinances and regulations. Legislative growth management strategies focus on approaches that states deem appropriate for state-wide or regional land management. For example, the fifteen communities sharing the Buzzards Bay estuary have found that methods of protecting the water system from contamination vary from community to community. Town 1 may have enacted stringent land use controls within the watershed. City 2, however, facing an economic decline, may be encouraging commercial growth in the watershed, particularly as the locus has easy access to the interstate highway.

Legislative growth management strategies provide an ideal mechanism to ensure that resource protection issues, as illustrated above, are addressed on a regional, as opposed to a piece-meal, basis. To avoid the obvious planning concerns of the example cited, the Commonwealth could adopt a regional water management program requiring all communities sharing a common water resource to have adopted stringent watershed protection measures. For example, all fifteen communities within the Bay watershed could be required to adopt minimum lot size and use requirements commensurate with the goal of water quality protection. Moreover, the fifteen communities--precisely because they are required to do so--can share the cost of defining the

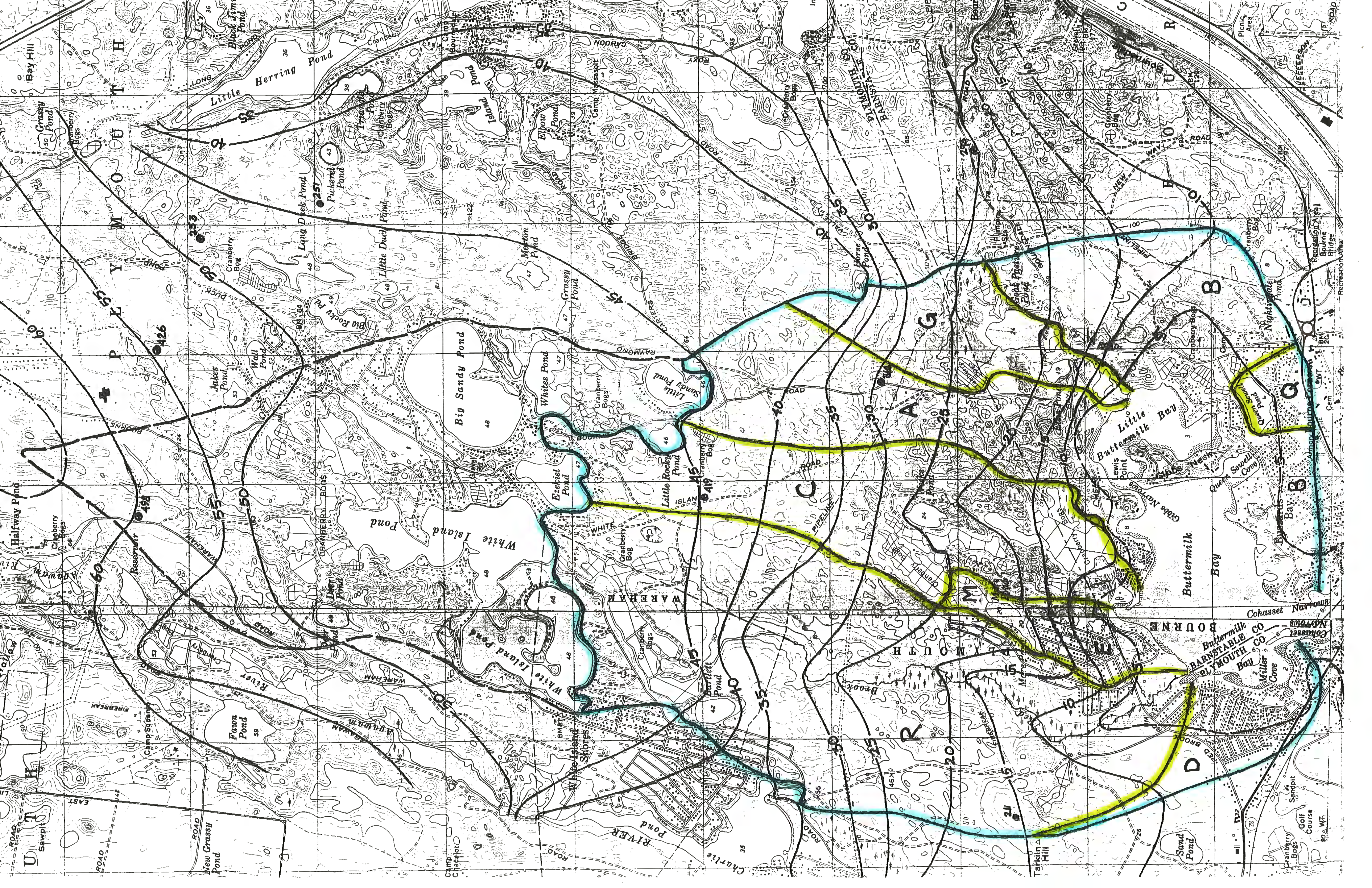
boundaries of the water resource and ideally assist each other in managing the area of concern. And while local governments may become concerned that their "home rule" authority is being usurped, history has proven clearly that critical natural resources cannot be adequately protected on the local government level alone.

Perhaps the most successful example of a legislative resource protection device in New England was enacted in 1983 for Nantucket County, Massachusetts (Nantucket County and the Town of Nantucket are one and the same) as the so-called "land bank". The Nantucket bill created a special commission empowered to acquire and manage a variety of unique natural resources throughout the Island. The commission is given the right to finance acquisitions by borrowing money from contributions and donations and from a 2% fee on the purchase price paid for the transfer of land or any interest in land situated in Nantucket, subject to a variety of exemptions. The Nantucket bill, as a regional resource protection program, provides an excellent example of how legislative initiatives can serve to protect critical resources from degradation.

CONCLUDING COMMENTS

The Buzzards Bay Management Plan provides the Bay area communities with a wonderful opportunity to speak out and reverse the many years of collective neglect of this diverse and unique resource. What happens next is up to the 15 communities who have the most to gain--as well as the most to lose--if the Bay's health and vitality is, or is not restored. This is more than just a theoretical exercise. The future of the Bay area communities may well hinge on the future of the Bay itself.

This paper outlines many of the steps the Bay communities can take now, as a collective and cooperative effort. Local officials and community residents cannot remain equivocal on the future of Buzzards Bay. They can not permit themselves the luxury of time. Unless the majority of Bay residents who support a clean and viable Bay system speak out and fight for action, the fundamental rights to enjoy the resource that is inexorably woven into the history of the Bay communities, may be lost forever.



Little Herring Pond
Big Sandy Pond
White Island Pond
Whites Pond
Little Sandy Pond
Little Rocky Pond
Ezekiel Pond
Big Rocky Pond
Long Duck Pond
Little Duck Pond
Grassy Pond
Pickerel Pond
Elbow Pond
Island Pond
Wall Pond
Jakes Pond
Halfway Pond
Fawn Pond
New Grassy Pond
Bartlett Pond
Sand Pond
Nightingale Pond
Goat Pasture Pond
Little Buttermilk Bay
Buttermilk Bay
Cohasset Narrows
Queen Sewell Cove
Gibbs Narrows
Lewis Point
Miller Cove
Cranberry Bogs
Cranberry Bog
White Island Shores
Tarkiln Hill
Camp Cachalot
Camp Squanto
Camp Kiwanis
WAREHAM
BOURNE
PLYMOUTH
BARNSTABLE CO
PLYMOUTH CO
Agawam River
Charlie River
Golf Course
Recreation Area
Bay Hill
Sawpit