

## **SECTION 4 NATURAL RESOURCES/OPEN SPACE**

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## **NATURAL RESOURCES/OPEN SPACE**

### **EXECUTIVE SUMMARY**

The natural environment in Carver is essential to the quality of life in the town. The agricultural lands and wide expanses of open space define the town's scenic rural character. About half of the town's area is covered by wetlands and surface waters which form part of an intricate network protecting and feeding the aquifer that provides drinking water for the town and beyond.

Undeveloped areas, both upland and wetland, serve as habitats for rare wildlife species.

Meanwhile, pollutants can easily travel through the town's sandy soils, degrading the quality of the essential groundwater. While the natural environment in Carver is still in balance, this could be upset by new development. The Town has the opportunity to protect its important natural and open space resources from adverse impacts if active steps are taken prior to the encroachment of land use changes which threaten them.

### **Inventory**

The Town of Carver is characterized by a unique ecosystem of sandy soils, wetlands, bogs, and surface waters. This ecology provides a special environment for cranberry agriculture, the town's most important industry. It also supports a special riverine as well as complementary forested environment of swamps and uplands which provide for the filtering and recharge of the groundwater and the maintenance of habitats for birds, animals and plants. This ecosystem is underlain and maintained by one of the largest and most productive aquifers in the state. From two drainage basins north and south of Route 44, the groundwater from this aquifer feeds some 39 ponds and reservoirs, three rivers, and numerous brooks and streams. Together these natural resources contribute to the economy, natural setting, scenic rural setting and quality of life in Carver.

### **Issues**

In contrast to the wealth of the natural environment, there is a shortfall in the inventory of protected and public recreation resources. Given a projected buildout that could lead to a two-fold increase in population, these resource areas could easily become overwhelmed by the pressures of development.

The Open Space Plan completed by the town in 1996 noted the deficiencies in the amount of area allocated to public beaches, playgrounds, and playfields as well as areas for passive recreation such as hiking and picnicking are limited. Without adequate planning, these deficiencies will increase leaving some newly developed areas without any public recreation facilities or open space.

As one might expect in a rural area with limited public resources, the natural environment is not adequately protected by the existing set of regulations. One half of the 24,000 acres which comprise Carver are unprotected developable land. A large percentage are the uplands surrounding the Cranberry bogs, which are zoned to permit residential use. Ponds, riverine and upland habitats, vernal pools, wetlands, and other sensitive and scenic environmental areas are likewise not sufficiently protected. Possibly of greatest concern is the protection of the Town's water resources. Without appropriate development controls, these will become increasingly at risk from pollutants as the sandy soil facilitates the transmission of contamination.

### **Goals**

Seven goals have been established (Page 4-16) to address the Town's concerns with resource protection, improving the regulatory processes, providing improved recreational facilities, and public education. Specific objectives relating to these goals become the basis for the open space plan.

## **Recommended Natural Resource, Open Space, and Recreation Plan**

The Town needs to pursue the following three broad strategies in order to achieve the goals of this plan.

### **1. *Public Education and Political Action:***

#### Vision Plan

A vision plan for open space protection has been prepared to serve as a guide for the regulation and acquisition of open space resources. This Plan establishes priorities for resource protection, linking local and regional open space assets, and thirdly retaining important agricultural resources and links to other critical resource areas.

#### List of Critical Resources

Carver residents must concur with the list of critical resource areas, scenic views, and recreation needs.

#### Public Action: Open Space Committees

Coalitions in support of open space and resource protection and recreation must be organized.

- An Open Space Committee must be formed to update the Open Space Plan
- A Land Trust should be formed to pursue the donation of lands for open space protection
- A Community Preservation Committee should be formed to make recommendations for local and State funding as well as the acquisition, creation and preservation of open space under the recently passed Community Preservation Act.

### **2. *Acquisition of Open Space Priority Parcels***

It is suggested that the Town acquire 160-300 acres for active recreation purposes and secure the protection of an additional 2,500-5,000 acres for conservation and resource protection. This may be achieved through acquisition, regulations, and voluntary actions by private landowners which can be encouraged through a non-profit land trust or with zoning tools. A matrix has been developed to assist the town in the ranking of priority open space parcels against a multiple set of goals.

### **3. *Protection of Resource areas***

A number of regulatory strategies have been proposed to protect critical resources. These include both amendments to existing as well as new bylaws and regulations:

- Nitrogen/Phosphorous Loading Limits: Zoning and/or Board of Health
- Cluster (Conservation Zoning): Amend dimensional standards, allow bonus
- Establishment of a Resource Protection District
- Transfer of Development Rights Zoning
- Reform of the sub-division regulations to facilitate stormwater protection and cluster subdivisions
- Adoption of wider buffers from resource areas. There is no consensus on this strategy. An alternative approach would require site specific analysis of resource impact issues. Recommended buffers in Table 4-1 provide substantial "flexible" buffers to allow for site specific controls, while expanded "firm" buffers reflect the need for interim protection given the Town's current staffing and technical limitations.

**Table 4-1  
Regulations Impacting Natural Resource Areas**

	Zoning	Subdivision Regulations	Wetlands Bylaw (Conservation Comm.)	Board of Health Regulations	State Regulations	Federal Regulations
Wetlands	Wetlands Overlay District: no buildings or structures in district	-	100' buffer (flexible) 65' buffer (firm)	150' buffer for septic systems	Wetlands Protection Act: 100' buffer (flexible)	Clean Water Act: Development subject to EPA review
			200' buffer (flexible) Develop standards	Increase buffer to 200'	Stronger enforcement by Con.Comm.	
Rivers	-	-	200' buffer (flexible) 65' buffer (firm)	150' buffer for septic systems	River Protection Act: 200' buffer (flexible)	CWA: Development subject to EPA review
			300' buffer (flexible) Develop standards	Increase buffer to 200'		
Ponds	-	-	100' buffer (flexible) 65' buffer (firm)	150' buffer for septic systems		CWA: Development subject to EPA review
			200' buffer (flexible) Develop standards	Increase buffer to 200'		
Habitats & Ecosystems	-	-	-	-	Sensitive resources designations (development with state/federal funding subject to agency review)	
			Vernal pools protection		Certify vernal pools, designate ACEC	
Flood Areas	-	-	100' buffer (flexible) 65' buffer (firm)	-		FEMA: Flood Insurance Program, standards for minimum local regulation
Groundwater	Water Resource Protection (entire town): regulates hazardous wastes, prohibits solid waste disposal facilities	Drainage (storm-water) and sewerage regulations	-	Septic system design standards, min. 200' from wellhead for septic	Title 5: Buffer and performance requirements for septic systems. Aquifer Protection: 400' buffer (firm) around public water supply, uses limited in contributing areas (Zone 2).	Safe Drinking Water Act: Regulates drinking water contaminants, review of federally funded projects in Sole Source Aquifer
		Regulations need revision		Max nutrient loading standards	Use actual recharge zones instead of radius for wellhead protection.	
Agriculture	Exempted from Water Resource Protection regulations	-	100' buffer Exempted from Water Resource Protection regulations	-		
Other	Erosion Control: SP for construction resulting in slopes >15%.	"Due regard for preservation and enhancement of natural features"	-	-		
	Improved cluster bylaw, TDR					

Existing  
 Recommended

Firm = No development permitted, Flexible = Subject to review of regulating agency

## 1. INVENTORY<sup>1</sup>

### NATURAL RESOURCES

#### Agriculture/Cranberry Bogs

At least 9,500 acres, or about 38% of the land in Carver is owned by agricultural users. (This estimate may be low.) Cranberry bog owners occupy about 2 acres of upland for every acre of productive bog. See Map 4-1, Agricultural Lands. There are approximately 5,500 acres of cranberry bogs in production, or about one-third of all cranberry acreage in the state. There are also close to 100 acres of land in Carver dedicated to non-cranberry agriculture. Most of the bogs in town are owned by small family farmers who own between 10 and 30 acres. Approximately 175 farmers are involved in this business<sup>2</sup>.

High cranberry prices encouraged a growth in productive cranberry acreage in the early to mid 1990s. A severe downturn in the cranberry market in the late 1990s has threatened the stability of Carver's agricultural community. Cranberry prices have dropped more than 80% since their peak in 1996 of almost \$70 a barrel. Although small and large growers alike may be strapped for cash, mid-sized growers are the hardest hit by this downturn, as they are the most likely to be in debt and to have higher labor costs than the family owned farms.

#### Water Resources

##### *Groundwater*

Its high-quality groundwater is one of the most important elements of Carver's infrastructure. See Map 4-2, Water Resources. Groundwater resources are almost entirely derived from a thick saturated layer of unconsolidated glacial material deposited over the underlying bedrock. This layer, composed of materials carried from the face of the glacier by melt water streams, varies from silt to coarse gravel, but is predominantly coarse sand. The layer is thickest, and the corresponding water supply the greatest, over pre-glacial valleys that are eroded into the buried bedrock surface. There are two large bedrock valleys in Carver: the largest starts under Point Street in west central Carver and runs southeast under Sampson's Pond and Cranberry Road towards Onset, with glacial deposits ranging from 15 to 50 feet in thickness. The second large bedrock valley starts in north central Carver near John's Pond and runs northeast to Plymouth Center, approximately under Purchase Street and Wenham Road, with glacial deposits of over a hundred feet in thickness. While the bedrock is too dense to yield significant supplies of water, there is an ample supply in the glacial deposit layer.

Thus Carver, along with areas from adjacent towns, contains one of the largest aquifers in Massachusetts. Known as the Plymouth-Carver Aquifer, it is estimated to hold 540 billion gallons of water and is constantly recharged through groundwater sources. Wells in this southern part, over the "Wareham Outwash Plain" have potential yields of over 300 gallons per minute. Wells in the northern half of Carver over the "Carver Outwash Plain," can be expected to yield between 100 and 300 GPM. The Plymouth-Carver Aquifer has been frequently studied as a potential water source for adjoining areas including Brockton and Boston. However, there is a

<sup>1</sup> The Town's 1996 Open Space and Recreation Plan provides an extensive description of the town's natural environment, from which much of the following inventory is derived.

<sup>2</sup> Assessor, Town Carver, defined by state use code.

strong need to ensure that local water supply needs are protected to serve anticipated population growth in the region<sup>3</sup>.

Because of its importance, the Plymouth-Carver Aquifer has been designated as a Sole Source Aquifer. The present quality of the water from this aquifer has been characterized as good by ongoing studies by U.S.G.S. However, the aquifer is quite vulnerable to contamination. Because of its highly permeable and transmissive character and large size, groundwater contaminants can travel long distances quickly, affecting a large area. For this reason, contamination of the aquifer has been Carver's greatest environmental concern. As yet, there has been no major aquifer-wide contamination of the Plymouth-Carver Aquifer, although some localized problems have occurred.

#### *Surface Water*

Carver's ponds, rivers and wetlands are a treasure and account for much of the appeal of the area. Besides providing beauty, and a habitat for a rich array of plants and animals, they provide opportunities for hunting, swimming, boating, waterskiing, skating and fishing.

Within the town of Carver are three small rivers and many brooks and small streams. The headwaters of most streams and rivers are either within the boundaries of the town, or a mile or two into Plymouth. The main drainage basins in Carver are along the Winnetuxet River which flows north, South Meadow Brook and Cranebrook which flow Southwest, the Weweantic River which flows south along the town's southwestern boundary, and the Wankinco River which flows south along the town's southeastern boundary.

Average stream flows are highest in late fall, winter and spring, and lowest in the summer and early fall. Minor flooding along streams occurs most every year, caused by rapid snow melt, or by high rainfall. Water quality is generally good, although a number of streams do exceed the recommended limits for iron, manganese, and color. The water is acidic and in places corrosive to metal.

Within each drainage basin is a complex pattern of wetland and cranberry bogs. The largest areas of wetlands are concentrated in the central and northern parts of the town. Great Cedar Swamp in the center of town covers over 1,000 acres. These wetlands are important to the town as wildlife habitat, for water recharge, and to reduce flooding in developed areas downstream.

There are 39 ponds and reservoirs in Carver, adding up to a total of about 1,339 acres. Water quality in the three town swimming ponds is regularly tested for coliform bacteria, and has been consistently good. There is no testing done for pesticides and other agricultural chemicals in the swimming ponds. The one exception to Carver's good clean pond water is Muddy Pond, which lies adjacent to the closed North Carver Landfill. Volatile organics in the groundwater flowing from the landfill have contaminated the pond.

#### **Habitats**

Map 4-3, Habitats and Ecosystems, depicts areas in Carver which have been identified as sensitive natural habitats, as well as sites which are thought to be home to vernal pools or rare and endangered wildlife species.

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<sup>3</sup> Controls now exist under the State's Inter-Basin Transfer Act and the Water Management Act helping to ensure that local water needs of water source areas receive full consideration and legal protection. Regulations prohibit the transfer of water to adjoining basins without full consideration of all potential local needs, and then only as a last resort.

Much of Carver is privately owned woodland, which provides a habitat for numerous species of animals and birds, as well as recreational opportunities for those who have access. This woodland consists of dry upland sites, mesic sites, and wooded swamp.

The scrub oak pitch-pine barrens that inhabit the southeast part of town are considered to be a unique habitat, according to the Natural Heritage and Endangered Species Program. Map 4-4 depicts the approximate extent of the pine barrens, although a thorough identification of this resource has yet to be completed. Other unique environments include the "coastal plain ponds" that dot the town, Federal Road, the large cedar swamps, the river corridors, and some of the areas that have older-growth tree species. The cranberry bogs also provide a unique environment for many different species of animals and plants.

The 1996 Open Space and Recreation Plan provides a detailed description of vegetation, fish and wildlife which inhabit or pass through the town. One endangered animal species, the Plymouth Red-bellied Turtle, was mentioned in the Open Space Plan, although other rare endangered species which have not yet been identified may also inhabit the town. Vernal pools and "Riparian Corridors" along rivers and streams provide habitats for many rare species of plants and animals. Although the town of Carver likely contains numerous vernal pools, none have been certified as of this time.

## **OPEN SPACE & RECREATION**

See Map 4-5, Open Space and Recreation Facilities.

### **Protected Open Space**

Currently, the only protected land in the town consists of about 2,200 acres of state-owned land in the Myles Standish State Forest and the Carver State Forest, and around 1,200 acres of town-owned land including Great Cedar Swamp, as well as some random parcels of land which have been deeded to the town over the years. There is no privately-owned land in Carver with permanent protection status.

### **Unprotected Open Space**

Approximately 80% of the total land in Carver is unprotected open space, with the greatest amount of that being cranberry land. Approximately 12,600 acres, or 50% of the town's total area is vacant land not utilized for cranberry agriculture. Some of the land is presently maintained for such uses as forestry, other types of agriculture, and recreation, while much of the unprotected open space simply vacant, undeveloped land. Although wetlands and soil quality pose constraints in some areas, the development in unprotected areas could have a tremendous impact on the town. See Map 4-5, Developable Open Space.

Land used for cranberry agriculture represents a substantial portion of the town's unprotected open space. In FY2000, there were approximately 6,800 acres enrolled in Chapter 61A, under approximately 80 different owners. This statute allows agricultural uses to be assessed at a fraction of their full value for as long as they remain in agricultural use. Landowners participate in this program for a fixed period of time, after which it is taxed at the full value. Should the property be developed or sold within that period, the landowner would owe the full amount of taxes that would have been paid for the prior five years. Also, if the property is to be sold, the town would have the first right of refusal to acquire the property at market value. Much of this land is not developable because it is wetlands (active cranberry bogs) or uplands directly used in

the process of cranberry production. But as much as 10-20% of the actively used agricultural land (not including forested upland holdings) could be developed if cranberry production ceased<sup>4</sup>.

Chapters 61 and 61B are similar programs to protect forestry and recreational uses. In FY2000 there were about 600 acres and 250 acres enrolled in these programs, respectively. Most of these areas could potentially be developable.

An additional 4,600 acres of open space and agricultural land are not protected under any program. (This does not include lands with buildings or other development used for agricultural purposes.) Out of these, about 2,000 acres of land used for agriculture and mining, 100 acres of land used for outdoor recreation, and 2,500 acres of vacant land, much of which may be developable at any time.

### **Recreation Facilities**

See Map 4-6, Open Space and Recreation Facilities. The National Recreation and Park Association suggests that a town like Carver, with a population of about 11,000, should have somewhere between 70 and 115 acres of developed park land, divided into units of varying sizes and distances from residences, equipped with playgrounds, playing fields, trails, beaches, etc. The town currently has about 40 acres for this purpose. There is potential for development on an additional 165 acres of town-owned land, although most of this land is limited in use by wetlands (the Great Cedar Swamp), or by current contamination problems (the covered landfill bordering Muddy Pond).

Carver's ponds rivers and wetlands provide opportunities for hunting, swimming, boating, waterskiing, skating, and fishing.

### **REGULATORY FRAMEWORK**

Table 4-1 in the Executive Summary provides a summary of local, state and federal regulations pertaining to natural resource protection. Many protections are overlapping, while some natural resources receive very little protection at all.

#### **Federal Regulations**

##### *Safe Drinking Water Act*

Under the Safe Drinking Water Act, the Environmental Protection Agency (EPA) regulates contaminants in the nation's drinking water. This act established the Sole Source Aquifer (SSA) Protection Program, which oversees protection of the Plymouth-Carver Aquifer covering most of the town of Carver. The EPA defines a sole source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where there is not alternative drinking water source which could potentially supply all those who depend on the aquifer for drinking water. In order to obtain SSA designation, a petition must be submitted to EPA. Proposed federal financially-assisted projects which have the potential to contaminate the designated sole source aquifer are subject to EPA review. Proposed projects that are funded entirely by state, local, or private concerns are not subject to EPA review. SSA designation also helps to increase public awareness on the nature and value of local groundwater resources by demonstrating the link between an aquifer and a community's drinking water supply.

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<sup>4</sup> This figure could be higher if some cranberry bogs created in uplands revert back to upland conditions after their agricultural use is abandoned.

### *Clean Water Act*

The Federal Clean Water Act protects all wetlands and surface water bodies from degradation through development or other activities. The EPA and the Army Corps of Engineers both take part in implementing and enforcing the provisions of this Act. Anyone undertaking development which takes place within a wetland area must first obtain a permit from the Army Corps of Engineers. The presence of wetlands is determined by soil and vegetation in the area, and must be determined by the developer. Development below a threshold can submit a general permit application, while development above the threshold must submit a site-specific permit, which has more stringent requirements. Activities which trigger the need for a site-specific permit include those which involve the loss of at least 5,000 square feet of wetlands or which impact Outstanding Resource Waters or Rare and Endangered Species Habitat. The EPA reviews all permit applications and investigates cases where proper permits have not been obtained. Those found in violation of the Act are subject to fines.

## **State Regulations**

### *Aquifer Protection*

Aquifers identified by USGS hydrological survey are defined under the Massachusetts Contingency Plan (MCP) as Potential Water Supply Areas. Under DEP regulations, hazardous waste sites must be cleaned up to meet drinking water standards. See Map 4-7 for the location of these areas in Carver.

The DEP has established Zones I and II to protect from contamination actual public water supply sites throughout the state. Within these zones are located public water supply points of cities and towns, and the boundaries of the aquifer and recharge areas which supply public water. Zone I is a 400 foot radius around the public water supply well. Zone II is the zone of contribution that directly feeds a public water supply. Uses within these zones are regulated by the state. The uses that are prohibited under 310 CMR 22.21 2 (a) are required to be included in the Town's zoning by-laws. In compliance with the State regulations, the Town's Zoning By-law contains a Water Resource Protection Overlay District, which covers most of the town. All public water systems (defined by a volume threshold) must comply with the state's "Guidelines and Policies for Public Water Systems."

Regulation 310 CMR 12.00 governs the protection of groundwater sources of public drinking water supplies from non-point source pesticide contamination. This regulation states that pesticides may not be used within a Zone II without the adoption of an integrated pest management program approved by the DEP.

### *Rivers Protection Act*

The Rivers Protection Act, effective in August, 1996, protects rivers and streams from inappropriate development. A riverfront area is defined as the area of land within 200 feet of the river's annual high-water line. Applicants proposing work in a riverfront area must obtain a permit from the local conservation commission or from DEP. Projects must meet performance standards which require that there are no significant adverse impacts on the riverfront area and that there are no substantially equivalent economic alternatives to the proposed work with less adverse effects.

### *Wetland Protection Act*

The Wetland Protection Act requires that a notification of intent be submitted to the local Conservation Commission before dredging or filling activities may take place in any wetland or

riverfront area. A public hearing is then held, after which the Conservation Commission may grant approval for the proposed activity, or may impose conditions in order to protect the wetland resource.

#### *Sensitive Environmental Areas*

Several state programs offer varying levels of protection to sensitive environmental resource areas. Some of these types of resources have been identified in Carver, as shown on Map 4-3.

Areas of Critical Environmental Concern (ACEC) have been designated by the Secretary of Environmental Affairs of Massachusetts. ACECs are those areas within the Commonwealth that have unique clusters of natural resources which are of "critical concern to the Commonwealth," and for which policies concerning acquisition, protection and use must be developed. ACECs are used to protect marine and aquatic productivity, surface and groundwater quality, habitat values, storm damage prevention or flood control, historic and archeological resources, scenic and recreational resources, and other natural resources. ACECs are administered by the Massachusetts Department of Environmental Management (DEM), which coordinates with private citizens, communities, environmental organizations and other state agencies. All federal, state, and local agencies, as well as private parties must submit development plans to the DEM to ensure that activities which would impact the ACEC are carried out as to protect the natural resources.<sup>5</sup> Municipal boards and commissions are encouraged to implement local regulations and actions to protect and sustain ACEC areas.

Within the Town of Carver, no areas have yet been designated under the ACEC program, although some locations might well qualify to be placed under this protection program.

Priority Sites of Rare Species Habitats (PSRH) represent estimations of the most important natural communities and state-listed rare species habitats in Massachusetts. These habitats are based on rare species population records maintained by the Natural Heritage & Endangered Species Program (NHESP). Program scientists draw estimated habitats by analyzing population records, species habitat requirements, and available information about the landscape. Habitat sites are selected for biodiversity significance. Significance is determined by the global and state rarity of the species or communities present, as well as the quality of those species populations or communities. There are five levels of significance: outstanding, very high, high, moderate, and of general biodiversity interest. Priority sites are not afforded any protection by the state government, but the rare species that reside in these habitats are protected by the Massachusetts Endangered Species Act.

Vernal Pools are wetland areas that are intermittently submerged at certain times of the year. These sites can be certified through NHESP. Although no vernal pool sites have been certified in Carver to date, a substantial number of potential sites have been identified (see Map 4-3). Certified vernal pools are protected under the Massachusetts Wetlands Protection Act.

### **Local Regulations**

#### *Water Resource Protection*

Section 4300 of the town's Zoning Bylaw pertains to Water Resource Protection. As no districts are defined, the regulation applies to the entire town. Agricultural uses are exempt from the

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<sup>5</sup> Procedures for ACEC designation and the general policies governing the effects of designation are contained in 301 CMR 12.00. For more information on the ACEC datalayer, contact the ACEC program at 617-727-3160 ext. 552 or 554.

provisions of Section 4300. The regulation prohibits solid waste disposal facilities, and the storage and disposal of hazardous wastes. Uses requiring a special permit include underground storage of petroleum products, storage of road salt, manufacture or storage of toxic or hazardous materials, motor vehicle service stations and other businesses which use toxic or hazardous materials on site, and any use where more than 10,000 square feet of any lot would be rendered impervious. Design and operation standards require that provisions be made to protect against the discharge or accidental release of toxic or hazardous materials, and include regulations for stormwater runoff.

Applications for special permits are submitted to the Planning Board. They are then referred by the Board of Health, the Conservation Commission and the Department of Public Works, who review the applications and submit their recommendations to the Planning Board.

*Wetland District*

Section 4400 of the Zoning Bylaw pertains to the Wetland Overlay District. A map of the Wetland District was last amended in 1992. Only uses of low flood damage potential are allowed by right in this district, including agricultural, forestry, and outdoor recreation. Any other use permitted in the underlying district may be permitted by special permit by the Board of Appeals. Any activity that would result in a change in the flood levels during the occurrence of a 100 year storm is prohibited.

Buffer requirements are described as "firm", meaning that development is prohibited within the defined area, or "flexible", meaning that development is subject to review by some government body.

*Wetlands Protection Bylaw*

Carver's Wetlands Protection Bylaw is intended to protect wetlands, water resources, and adjoining land from adverse impacts. Activity within these areas, including removing, filling, dredging, building upon, or otherwise altering the land, requires approval by the Conservation Commission. Agricultural uses are exempted from this regulation. The definition of resource areas and their buffer requirements is not clearly stated within the bylaw. Wetland resources are defined as wetlands, marshes swamps, bogs, beaches, meadows, ponds or lakes, rivers and streams, and land within the 100 year flood plain. To date, these resources have not been adequately mapped. No development may take place within 65 feet of any wetland or water resource. Buffer areas of 200 feet (flexible) are required for rivers and streams, while buffers of 100 feet (flexible) are required for all other resource areas.

## **4.2 NEEDS/ISSUES ANALYSIS**

The following needs analysis and goals are derived largely from the 1996 Town of Carver Open Space and Recreation Plan.

### **Protection of Agriculture**

The cranberry industry keeps a large percentage of land area in Carver (approximately 12,500 acres, or about 49% of the town) in an natural or agricultural condition and out of development. Of this land, around 5,500 acres or 44% are in active bog or other productive use, while 7,000 acres are owned by growers as related agricultural land (buffers, reservoirs, recharge areas, etc.) or forested upland. This ratio of swamps and woods to actual bog is highly beneficial to the town: "adjacent" lands provide a habitat for a rich diversity of plants and animals and contribute to the scenic value of the area.

Much of the forested upland owned by cranberry growers is developable land. (The State's wetlands regulations apply for cranberry bogs, restricting development within 100 feet of all wetlands.) The recent fall in prices contributes to the temptation of growers to sell off excess land. Increasing land values and a growing market for development in the region is also a significant impetus behind this growing trend, exemplified by the A.D. Makepeace development initiative. In the past, Carver had approximately 3 acres of "adjacent" land per 1 acre of cranberry bog. The amount of related open land has already substantially declined in recent years to about 2 acres of upland per acre of bog. Carver can potentially lose much more of its agricultural land and related open space. This raises several issues of concern:

Fiscal Impacts. Agriculture, even more so than commercial uses is helping to keep down Carver's tax rates. For each \$1.00 of revenue raised by agricultural land uses, it costs the town \$0.31 to provide services to agricultural uses, compared with \$0.38/\$1.00 revenue to provide services to commercial/industrial uses and \$1.14 to provide services to residences. Agricultural uses currently comprise about 11% of the town's tax base, while commercial uses are about 8%. (See Appendix 4-1, Open Space Fiscal Impacts Analysis.)

Incompatible Uses. Residential uses and cranberry bogs are not ideal neighbors. Homeowners can be disturbed by night and early-morning pumping, aerial spraying, and dust blown from sand pits. Bog owners, in turn, have problems with vandalism, ATV riders, and the complaints of abutters about normal cranberry practices. They have also become concerned about the effects of the nitrate flow from large subdivisions.

### **Water Resources Protection**

Surface water and groundwater resources are closely related, and both are threatened by the same potential sources of pollutants. Water flows between groundwater and surface water bodies, while wetlands provide a filter that helps to protect the purity of surface and ground waters. Contamination threats come from both "point sources" and "non-point sources". Aside from producing contaminants, development may physically upset the ecological and hydrologic system which give form to the town's water resources. The impacts from development may not appear for several years after contamination has begun because of the time it takes for water to travel through the ground.

Point Source Contamination. Point sources of contamination in Carver come primarily from specific sites where polluting land uses have occurred. Within Carver D.E.P. has confirmed eight contaminated sites, four rated as "priority", and four "non-priority" or "non-classified." The most notorious site has been the closed North Carver Landfill, where a plume of contamination has

spread under a number of homes and affected Muddy Pond. Affected residents had to be hooked up to public water from Middleborough while the cleanup of this site was underway. The site has been remediated, and will be capped by the town, costing approximately \$3-4 million (funded with SRF loan from the state). Approximately 25 acres will become available for recreation, animal shelter, or other such use, or alternatively an industrial site with access off Route 58.

Another plume of contamination has been discovered down the road at the privately owned Ravenbrook Demolition Landfill. While this plume has not yet affected any housing, nearby neighbors have been hooked up to the Middleborough water main as a precaution. This site (categorized as Tier 2), has been capped and is being monitored. The threat from this site has been minimized. The other priority sites include two closed gas stations at the intersection of Route 44 and Route 58, which have been leaking gas and waste oil from underground tanks. Both owners are bankrupt; the Town plans to acquire these properties for back taxes and possibly remediate them. The non-priority sites are the Bardon-Trimont Asphalt Plant, Lakeville Readimix, and Holman's garage. Monitoring of these sites is taking place.

Carver needs to protect the quality of its water resources from contamination from existing and future waste treatment facilities. Despite the prohibitions under local regulations, Carver is host to both the regional dump and a regional septic processing plant. In addition, out-of-town dumping at several now-closed landfills has led to pollution of the immediately surrounding aquifer. One of Carver's challenges in the future will be to figure out how to provide needed infrastructure while maintaining high standards to protect its groundwater resources.

Non-Point Source Contamination. The two greatest non-point source threats to groundwater and surface waters are septic treatment facilities and stormwater. Because of the town's sandy soils which allow rapid flow of water through the ground, the potential for contamination from untreated waste water or stormwater is magnified. Contamination from these sources might include solid particles, bacteria and viruses, metals, volatile organic compounds, and nutrients. These contaminants may leach through the soils or they may be deposited into surface water through runoff or discharge pipes. Such pollutants can affect drinking water quality, productivity of agricultural uses, and the ecological function of wetlands, ponds and streams.

The town's current Subdivision, Zoning, and Board of Health regulations do not adequately address these two concerns. The subdivision regulations, for example, direct stormwater to be deposited untreated into "the nearest open stream channel". This violates the state's updated standards for stormwater management. Given the reliance on individual wells to provide drinking water for the town's residents, it is essential that protection extends to the entire town. Best management practices (BMPs) and model bylaws have been developed to deal with these issues.

### **Recreation**

The 1996 Open Space Plan identified high, medium, and low priority recreational needs based upon citizen responses to the Open Space Survey. Top among high priority needs are passive, nature-based facilities, such as picnic areas, hiking trails and beaches, as well as playgrounds/tot-lots and playfields. Other forms of active recreation, including outdoor skating areas, baseball fields, swimming pools, and soccer fields were identified as medium priorities. The lowest priority was given to golf courses, beach parking, tennis courts, and boat ramps.

Specific needs highlighted in the 1996 plan are included in the text box which follows. Many of these concerns are still valid, and the Town should continue seeking ways to implement the recommendations that were made at that time. While the prior plan focused on what is required to meet the existing population, there will be a great need to provide facilities for the town's

future population. Projections estimate that the population could grow by 50% by 2020 (see Housing Section for details), and could double at full buildout. A balanced plan needs to be developed so that different parts of the town are each well served by recreational facilities. Substantial progress, as identified below, has been made since the completion of the 1996 Plan.

**Recreational needs identified in the 1996 Open Space and Recreation Plan:**

Passive recreation. An 8 acre parcel was acquired by the Town for expanding the town's conservation land on Savery Avenue into a natural, scenic park.

The Town should make a high priority of expanding and improving its holdings on the ponds and rivers wherever possible. The Town land overlooking Muddy Pond would make an excellent recreational area once the state-mandated landfill cleanup is complete. (If contamination is limited to volatile organic compounds, the water should restore itself quickly.) Plans have been drawn up but no funding is presently available.

Playgrounds and tot lots. With a 1990 population of 852 pre-schoolers and 1,368 children enrolled in grades K-6, Carver now has two playgrounds. A new playground was recently constructed with broad citizen help adjacent to the Library. It is open to the public during school hours. National standards state that Carver should have three to five one-acre playgrounds.

Skating and swimming. The town already has many natural areas for outdoor skating (on the ponds and bogs), but weather patterns make them usable only a few days a year. Residents wish to have the reliability and safety of a man-made rink for hockey and recreational skating. The nearest rinks are located about twenty minutes away in Bourne and Plymouth. Similarly, there are no public indoor or outdoor pools in Carver. The nearest pool is at the Middleboro Y, about 20 minutes away.

Playfields. About 80% of Carver's families are involved in some kind of team sport. Currently, Carver - with a combined total of 18 fields (including those on school property) - actually exceeds national standards. However, because of the extreme popularity of field sports, these fields are just barely able to accommodate the games and practices of the youth and adult sports teams, even with a great deal of juggling. It is clear that more fields will be needed soon. Meanwhile the existing fields are in poor shape and need much upgrading. The Open Space Plan includes an inventory of specific upgrading needs. Two soccer fields, a baseball field, and a football field which are actually on private property, even though the town has been using them for 25 years, may soon be lost. In the past year the town developed the Purchase Street site for a soccer and baseball field. The Town must also look ahead to the future needs of its growing population to provide additional fields.

**Zoning for Open Space Protection**

Open space protection will provide economic, environmental, and recreational benefits to the town, as well as helping to preserve the town's rural character. Land can be protected through regulatory means such as cluster development or wetlands protection bylaws, private donation or purchase by a land trust organization, or acquisition by the town. None of these methods alone can succeed in achieving all of the town's open space protection goals. A combined strategy can effectively target limited funding to the sites of greatest open space value, while taking advantage of opportunities to protect as much land as feasible.

Zoning regulations in Carver could go much further towards encouraging the protection of open space and natural resources than they currently do. There are a variety of zoning alternatives that can be used to promote open space preservation, including density controls, critical resource protection, and incentive zoning. Following are some options that might be appropriate for Carver. (Additional tools for managing growth and protecting open space are described in the Land Use Section, 1-3). See Appendix 4-2 for graphic illustrations of some of these concepts:

- Large Lot Critical Resource District - increase minimum lot sizes to 3 acres in areas where warranted by sensitive environmental conditions.
- Transfer of Development Rights - designate "sending areas" and "receiving areas", and allow the sale of development rights from parcels in sensitive to increase the allowable density elsewhere.
- Conservation Subdivision - provide incentives for developers to set aside more open space or higher value open space through cluster subdivision design.
  - Increase base lot size and upgrade infrastructure requirements so that cluster becomes more attractive than traditional subdivision design.
  - Allow cluster subdivision as of right, rather than requiring special permit.
  - Require submission of cluster site plan along with traditional site plan.
  - Mandatory cluster in critical resource areas.
  - Offer bonuses for proposals which provide greater benefit to the town.

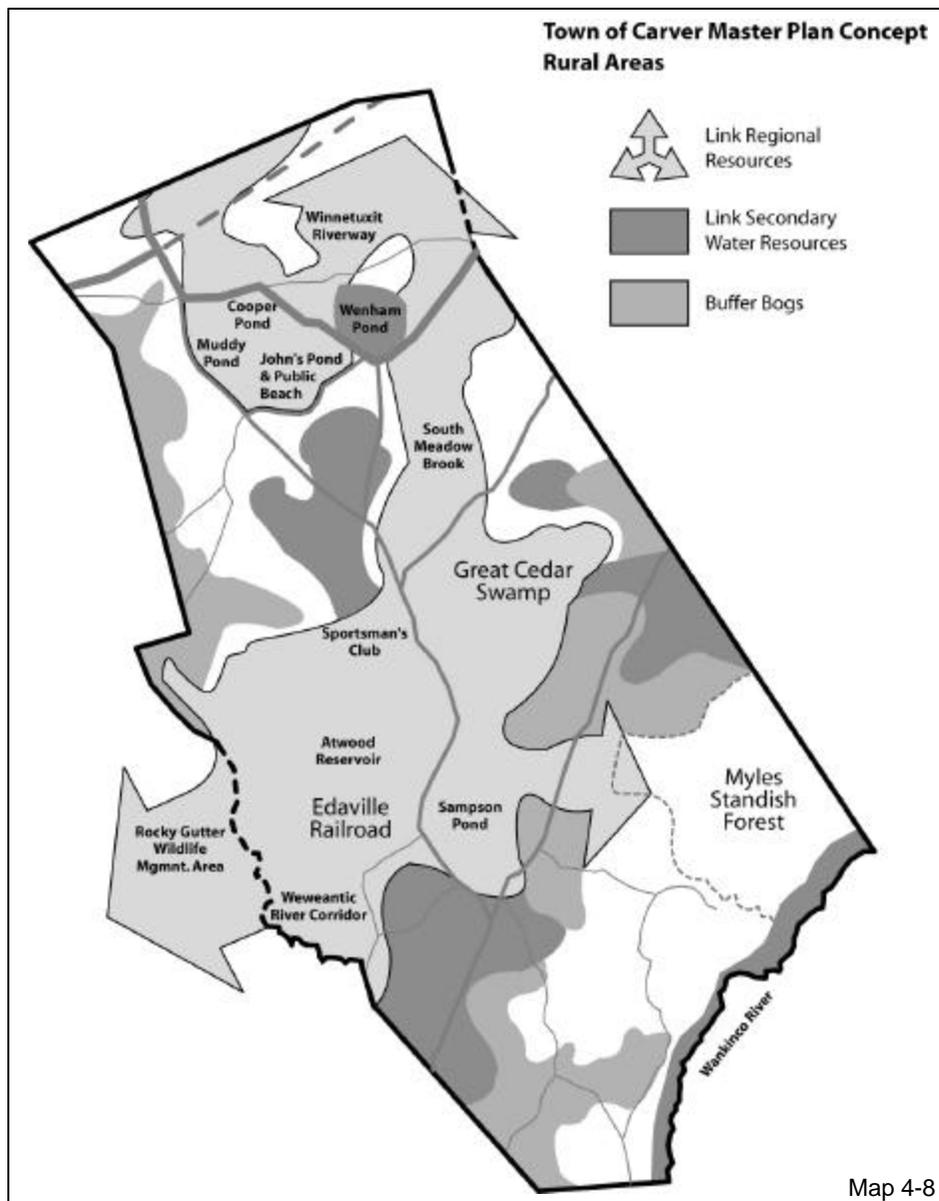
Even with innovative zoning tools, the possibility of protecting targeted open space parcels through regulatory means is quite limited. The Town needs to develop a methodology by which individual parcels can be evaluated for their open space value. The table in Appendix 4-3 provides a preliminary scheme for prioritizing parcels. This needs to be honed to accurately reflect the town's goals and concerns. Potential parcels then need to be identified and can be contrasted using this weighting system. Priority parcels may be acquired by the Town or targeted for donation or purchase by a nonprofit land trust organization.

Acquisition of open space may be more economical to taxpayers than allowing land to be developed, as demonstrated in the Cost/Benefit Analysis of Open Space Acquisition in Appendix 4-1. The tax increase due to the cost of providing services to new residents exceeds the fiscal cost of the Town purchasing the same parcel.

### 4.3. VISION/GOALS

The needs identified in Section 4.2 have set the framework for the creation of an open space vision and the policy goals and action recommendations to carry it out.

*Carver will protect its rich natural heritage of unique, endangered, and abundant ponds, rivers, wetlands, woods, forests, and agricultural lands in a manner to continue to offer its residents diverse opportunities for an active outdoor lifestyle of swimming, hiking, hunting, fishing, and bike riding in an inter-connected network of resource areas and parks and a rural lifestyle of scenic views, open lands, and agricultural activity. New residential growth will be focused into existing village areas and new centers for planned growth where adequate infrastructure can be provided. Major resource areas including Myles Standish Forest, Sampson Pond, the Edaville Railroad, Rocky Gutter Wildlife Management Area, will be linked in a regional system of trails and bogs which will extend north connecting the Great Cedar Swamp, to South Meadow Brook, local ponds and the Winnetuxit Riverway. Important secondary water resource areas which abut this regional pathway will be protected as will the adjacent bogs.*



## Goals/Objectives

### **1. Continue to maintain a high ratio of open space to developed land for the protection of environmental resources, scenic character, and the economic health of the town.**

#### Objectives:

- a. Support zoning and planning policies that control population growth.
- b. Continue vigorous enactment of existing regulations which protect open space, the environment, and the scenic character of the town.
- c. Encourage retention of existing cranberry grower-owned lands as wildlife habitats, water recharge areas, etc.

### **2. Identify and protect environmentally sensitive areas, including areas along ponds and rivers, water recharge areas such as cedar swamps, parcels that impact potential public water supplies, and scenic areas as well as trails and areas needed by the town and region for recreation.**

#### Objectives

- a. Update the Town's Open Space Plan.
- b. Continue cataloguing and evaluating open parcels for environmental importance.
- c. Prioritize land for open space protection.
- d. Establish policies for purchase of critical lands, Chapter 61 lands, and tax title takings.
- e. Encourage land donation and adoption of conservation restrictions.

### **3. Improve regulation of resource areas, including rivers, lakes and ponds, wetlands and critical resources.**

#### Objectives

- a. Improve existing wetland and water resource regulations.
- b. Utilize zoning to create incentives for open space and resource protection.

### **4. Identify historic, cultural and scenic resources; identify and develop tools to protect these resources.**

### **5. Improve public access into open land for nature-based recreation.**

#### Objectives

- a. Develop walking trails, bike paths, and picnic areas on public lands.
- b. Expand and upgrade recreational opportunities on ponds and waterways.

### **6. Expand and upgrade facilities for active recreation**

#### Objectives

- a. Upgrade all facilities to ensure access for the disabled.
- b. Acquire additional recreation lands as available.
- c. Develop several more playgrounds and tot lots.
- d. Develop strategies for maintaining properties and preventing vandalism.
- e. Encourage private industry to develop additional recreational areas such as golf courses, skating rinks, etc.

### **7. Undertake a program of public education regarding resource protection and buffering.**

## 4.4 RECOMMENDATIONS

### Open Space Concept

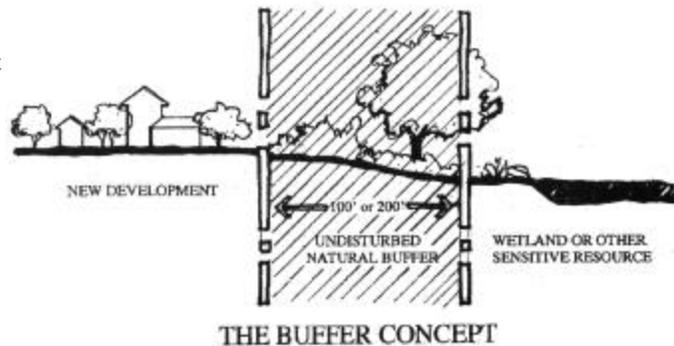
The Open Space Concept is a plan that provides a guide for evaluating parcels for future acquisition or proposals for regulatory protection. Previously, a map of open space preservation corridors was developed as part of the 1996 Open Space and Recreation Plan for a similar purpose. This map loosely indicates "greenbelts" linking critical open space parcels and natural resource areas. The availability of more detailed natural resource and land use mapping contributed to the present refinement of the Open Space Concept.

A set of priorities were developed that reflect the town's goals relating to natural resource protection. Areas corresponding to these protection priorities were identified and summarized as shown on the Open Space Concept Map 4-8. The highest priority designation in the Open Space Concept is to link local and regional open space assets. Sites depicted on the map include the Myles Standish State Forest, the Great Cedar Swamp, and numerous other protected and unprotected open space areas. Second priority is to link adjacent, secondary water and resource areas and views. The area shown on the map includes wetlands, flood plains, ponds, streams, and wildlife habitats. The third priority is to retain important agricultural bogs and resources. The map includes several of the town's larger contiguous agricultural parcels.

Specifically defining the critical natural resources for priority protection is a policy decision that will require further discussion. Various state and federal regulations restrict development within buffer areas around streams, ponds, and wetlands. The extent of buffer zones and the types of restrictions vary and are, in some cases, subject to interpretation. Improved mapping of regulated natural resources, especially wetlands and vernal pools, would help to clarify and extend protection status to all of the town's resource areas.

### Buffers

There is no clear scientific guidance as to what constitutes a sufficient buffer to protect water resources. But without a stated purpose with the support of scientific evidence, local regulations have the likelihood of being overturned in court. Thus, to the extent possible, buffer requirements should address specific health and environmental concerns and they should be tailored to the type of land use and site conditions.



- The Massachusetts Resource Identification Project (MRIP) under the U.S. E.P.A. has identified "riparian corridors" encompassing land within 100 meters of all streams, rivers and ponds to protect ecological systems and provide corridors for wildlife migration. Like any arbitrary designation however, this may be insufficient or more than necessary for a specific site. Arbitrary buffer requirements frequently do not stand up when challenged in court.
- Many contaminants are not effectively filtered through soil, and will eventually seep into the groundwater below. The direction of groundwater flow, which can only be determined by site-specific analysis, will determine where the pollutants travel once reaching the water table. To protect water resources, a site specific analysis should be undertaken to determine the zone of contribution, rather than relying on arbitrary buffer zones. For some contaminants, such as nitrogen and phosphorous, maximum loading requirements would be more effective than buffers in protecting water resources.
- Viruses are one contaminant for which a scientifically-based buffer can be established. In the region's climate, viruses have been found to survive in soil for 120-200 days. In sandy soils such as Carver's, water typically travels at a rate of 1 foot/day, thus a sufficient buffer would be 200 feet from the water resource.

Strict enforcement of existing regulations by the town could represent a minimal standard for protecting water resources. Alternatively, the town could seek to protect a broader area through local regulation. Expanding the town's jurisdiction over water resources through flexible buffers allows for more site specific protection, but this will require the development of appropriate standards and a defined planning process through the various Boards in order to ensure adequate protection. In Table 4-1, flexible buffers are recommended to be extended substantially, in order to allow for greater sensitivity to site conditions, while expansion of firm buffers is also recommended to provide interim protection until the Town has the capacity to effectively implement flexible buffers.

Map 4-9 provides a composite sketch of the natural resource areas in Carver which need protection. These resources include ponds, streams, wetlands, riparian corridors, agricultural lands, wildlife habitats, and protected open space. A single protection district could be established to cover the areas shown on the map, or a system of different regulations could address specific concerns within this framework.

### **Additional Recommendations**

Many of the following recommendations come from the 1996 Open Space and Recreation Plan. The town should continue to implement the policies and projects outlined in the five-year plan. An updated Open Space and Recreation Plan should be prepared within the coming year, reflecting steps that have been taken since the prior plan, and outlining specific future actions. The Buzzards Bay National Estuary Project can offer assistance in the preparation of the Town's Open Space Plan and in seeking grants to fund resource protection projects.

Open Space. Three committees should be organized to assist in carrying out an open space protection strategy.

- Open Space Committee:  
Under the Master Plan committee, an effort must be made to update the Town's Open Space plan, establish a matrix for the prioritization of open space parcels, and begin to identify priority parcels for acquisition. As part of an updated plan, a complete inventory of the town's protected/unprotected open space resources and recreational facilities would be a valuable tool.
- Community Preservation Committee  
The selectmen should designate a Community Preservation Committee that would pursue open space, conservation, and recreation objectives in addition to those relating to historic preservation and housing as specified in the Community Preservation Act. Tasks of this group would include:
  - Pursue funding for open space acquisition under the Community Preservation Act.
  - Raising public awareness of Carver's open space, both in terms of recreational opportunities and environmental benefits. Tasks might include publishing a guide which maps and describes recreational opportunities available in Carver, directed to newcomers, visitors and townspeople.
  - The Town should acquire small parcels adjacent to town beaches and make other priority acquisitions as land and money become available.
- Carver Land Trust  
A local group of landowners and respected citizens should be formed to accept donations of land. This trust will need to obtain tax exempt status so they can receive these donations. Tasks would include:

- Pursuing small and large acquisitions. This would include evaluating land in tax title to see if deals should be pursued with owners.
- Initiate dialogue with large-scale landowners regarding preserving open space and increasing public access to it. Landowners concerns such as vandalism, liability, and land taxation would be addressed, as well as the possibility of landowners adopting conservation restrictions, granting easements for access, making land donations, etc.

Water Quality. In addition to implementing the Open Space Concept Plan discussed above, steps should be taken to protect the town's valuable groundwater resources. Encourage use of landscaping and agricultural practices which minimize erosion and nutrients from fertilizers entering surface and groundwater. Enact stricter oversight of storm runoff from development sites and agriculture. Appendix 4-4 provides a summary of some Best Management Practices, as well as nutrient loading standards that can be used to protect water quality.

Stormwater runoff has been identified as one of the most pervasive sources of contaminants into surface and groundwater resources. To reduce the impacts from runoff, natural hydrologic functions of a site should be maintained through retaining natural contours and vegetation to the maximum extent possible. Construction practices utilized with attention to controlling erosion and compaction of soil. The amount of impervious area is a fair measure of the impact that development will have on environmental resources. Flexible zoning and subdivision regulations can be targeted toward minimizing the impervious surface coverage and/or relating the extent of infrastructure requirements to development thresholds. Subdivision regulations can be changed to reduce required road widths on local service roads, and require drainage systems such as constructed wetlands which provide for stormwater treatment.

Potential Well Sites. In the 1980's, the town designated an area in the southeast corner of town adjacent to Miles Standish State Forest as a future source of public water. If tapping into this resource is to remain a possibility, great care must be taken to protect it. Besides this location, other potential well sites for future public water supply need to be identified and steps taken to protect their contributing recharge areas as soon as possible.

Growth management. Maintain density requirements for new residential construction. Develop town water and/or sewer only in limited areas such as commercial, village, and industrial zones.

Support cranberry industry. Encourage tax policies that will support the financial viability of the cranberry industry. Encourage responsible cranberry practices and discourage harmful ones.

The production of cranberries to be marketed as fresh fruit, as well as organic cranberries are exempted from federal volume regulations. These crops are of higher value than typical production methods, although they also entail higher production costs. Grants are available through the Northeast Region Sustainable Agriculture Research and Education Program for farmers wishing to explore techniques of sustainable agriculture and innovations in marketing. See appendix for information.

Nature-based recreation. Expand and upgrade beaches and beach parking. Acquire land which gives access to Wewentic and Winnetuxet Rivers; develop fishing spots and canoe passages. Explore recreational uses for public land on Muddy Pond. Begin development of land along Savery Avenue into a park with hiking trails and picnic sites.

Active recreation. Apply for grant to upgrade King Street ballfields, develop field house, Apply for a grant to bring recreational areas up to ADA standards.

Bike Ways. The Open Space Advisory Group should begin a study for possible bikeways to link areas of the town, and to link Carver with adjacent towns. Apply for grant to develop bikeways in town.

## **APPENDICES**

- Appendix 4-1 Open Space Fiscal Impacts Analysis
- Appendix 4-2 Zoning Illustrations
- Appendix 4-3 Methodology for Rating Priority Parcels for Open Space Protection
- Appendix 4-4 Best Management Practices & Nutrient Loading Standards

## Appendix 4-1 Open Space Fiscal Impacts Analysis

### Cost/Benefit Analysis of Open Space Acquisition

As an example, a 100 acre parcel in the Residential zoning district is considered for acquisition for open space conservation. The following analysis shows what the fiscal cost is to the town a) if the land is developed for single-family residential use; or b) if the land is acquired for open space. The fiscal cost for land that is developed includes the cost of added services that will need to be provided to the new households less the increase in tax revenues that results from the development. The fiscal costs for acquiring land include the cost of financing the purchase and the loss in tax revenue. The cost of acquiring the land is computed for land taxed at its full assessed value as well as for Chapter 61A land for comparison. (Although actual cost of acquisition will depend upon market conditions at the time.) The following table shows how the tax rate would increase as a consequence of development or Town acquisition of the same parcel of land. The result is a higher tax increase from development than if the land is acquired.

#### Comparison of the Tax Rate Impacts After Development/Acquisition of Land

Land Use Scenario	Tax Rate Increase	Annual Tax Increase for Average Homeowner
<u>Development of 100-acre parcel</u>	\$0.05/1000 <sup>(1)</sup>	\$6.77
<u>Acquisition for open space of 100-acre parcel under Chapter 61A land</u>	\$0.04/1000 <sup>(1)(2)</sup>	\$5.75
<u>Acquisition for open space of 100-acre parcel taxed at full assessed value</u>	\$0.04/1000 <sup>(2)</sup>	\$5.75

#### Fiscally Neutral Development

The same calculations were used to determine the value of a new home which would produce just enough revenue to cover the cost of services to the new residents. If the town adopts a flat tax rate, whereby both residential and commercial property are taxed at the same rate, the cost of a break-even house would increase as shown below.

Break-Even House	Value
With children, Tax shift	\$263,300
With no children, Tax shift	\$52,850
With children, Equal rate	\$340,000
With no children, Equal rate	\$67,200

<sup>(1)</sup> This does not include the fiscal impact of the repayment of back taxes in the case of the sale of Chapter 61 land.

<sup>(2)</sup> The fiscal impacts from the purchase of open space vary dramatically with the sale value of the land being purchased and the terms of a bond used to finance the purchase. See Part 2 for details.

Inputs:

a) 1998-99 school enrollment (School Dept.)	2,139
b) Total number of homes in 1997 (assessor)	2,797
c) School children per s.f. unit (Carver, 1990 U.S. Census)	1.47 <sup>(1)</sup>
d) Average assessment of new homes	240,000
e) Average single-family assessment	139,570

(From FY00 Town Budget)	\$	
A) Tax levy	11,019,985	
B) Residential tax levy	7,656,804	
C) Total valuation of residential property	454,949,723	
D) School portion of appropriation	14,952,472	
E) State aid for Schools	7,512,158	
F) School portion of residential tax levy	5,169,610	[(D - E) * (B / A)]
G) Residential tax rate	16.83/1000	
H) School portion of tax rate	11.36/1000	[(F / B) * G]
J) Non-school portion of tax rate	5.47/1000	(G - H)
K) Non-school portion of residential tax levy	2,487,194	(C * G)
L) School tax (residential) per student	2,417	(F / a)
M) Non-school services tax (res.) per household	889	(K / b)

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Part 1 – Cost of Development

If the land were developed, it could accommodate up to 58 single-family homes, yielding 85 additional school children.

- I. The total assessed value of new homes is \$13,920,000 ( $d * 58$ ).
- II. The annual school cost for the development is \$205,431 ( $L * 85$ ).
- III. The school portion of the tax rate increases by \$0.10 ( $IIIa - H$ ).
- IIIa. New school portion of tax rate = \$11.46  $[(II + F) / (I + C)]$
- IV. The annual school revenue generated by development is \$159,576 ( $I * IIIa$ ).
- V. The net annual school cost from development is \$45,855 ( $II - IV$ ).
- VI. The non-school services cost of development is \$51,576 ( $M * 58$ ).
- VII. The non-school services portion of the tax rate decreases by \$0.05 ( $VIIa - J$ ).
- VIIa. New non-school portion of tax rate = \$5.42  $[(VI + J) / (I + C)]$

---

(1) This estimate differs from the estimate provided by DHCD that is used for the buildout analysis. For the buildout analysis a lower estimate is used that is closer to the projected average household size. For the purposes of this exercise an estimate is used that more closely approximates the size of families that occupy new homes in the present market.

- VIII. The annual non-school revenue generated by development is \$75,372 ( $I * VIIa$ ).
- IX. The net annual non-school gain from development is \$23,796 ( $VI - VIII$ ).
- X. The net tax rate impact from the new development is \$0.05 ( $III + VII$ ).
- Xa. New tax rate = \$16.88 ( $G + X$ )
- XI. The average homeowner's taxes will increase by \$6.77 ( $e * X$ ).
- 

Part 2 – Cost of Acquisition

Assume the assessed value for the undeveloped land is \$350,000. Assume that if the land is protected under Chapter 61A the taxable value is \$20,000. Assume the cost to purchase the land is \$1,000,000.

- Ia. At full assessed value, the increase in the tax rate due to the loss in tax revenue would be \$0.02 [ $B / (C - \$350,000)$ ].
- Ib. For Chapter 61 land, the increase in the tax rate due to the loss in tax revenue would be \$0.02 [ $B / (C - \$20,000)$ ].
- II. The annual payment for the land purchase over 20 years would be \$93,036 (1,000,000 raised by 20 year bond at 7% interest).
- III. The new tax levy including the appropriation for land payment is \$11,084,627 [ $A + (II * (B/A))$ ].
- IV. At full assessed value, the cost of payment for the acquisition would raise the tax rate by \$0.02 [ $III / C$ ].
- Va. At full assessed value, the total tax rate increase after the acquisition would be \$0.04 ( $Ia + IV$ ).
- Vb. For Chapter 61 land, the total tax rate increase after the acquisition would be \$0.04 ( $Ib + IV$ ).
- VI. The new tax rate would be \$16.87. The average homeowner's taxes would increase by \$5.75 as a result of purchasing the land for open space.

**Appendix 4-2**  
**Zoning Illustrations**

### Appendix 4-3

#### A Methodology for Rating Priority Parcels for Open Space Protection

#### Land Protection Priorities

Comparing Open Space Values	Priority Open Space Parcels						
<b>Protect/Enhance Town Character</b>							
Historically significant							
Enhance scenic vistas on streets or trails							
Protect familiar, valued open parcels							
Provide active/passive recreation							
<b>Protect Natural/Agricultural Resources</b>							
River, lake or stream frontage							
Well site recharge areas							
Unique ecosystem (rare/endangered species habitat)							
Other habitats: vernal pools, pine barons							
Agricultural protection							
Multiple use areas							
<b>Connect New and Existing Open Space</b>							
Links to existing and future open space							
Improve public access to existing open space							
Make regional trail connections							
Riparian corridor connections							
Make local trail /sidewalk connections							
<b>Economic Impact</b>							
High risk liability or contamination							
High build-out potential							

**Appendix 4-4**  
**Best Management Practices and Nutrient Loading Standards**