TOWN OF MARSHFIELD
COMMONWEALTH OF MASSACHUSETTS

Conservation / Recreation
Open Space Plan

March, 2005
Revision 2 and Final

Prepared by:

The Marshfield Open Space Committee

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Terry Sinclair, Vice Chair	Recreation Commission
Susan Caron, Secretary	At Large
Laurie Baker	At Large
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John Kyler	Planning Board
Vacant	Community Preservation Committee
Robert Shaughnessy	Board of Public Works
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TABLE OF CONTENTS

1 Plan Summary

This fifth edition of the Marshfield Conservation/Recreation Open Space Plan is intended as a revision and an update to the 1995 plan. The committee would like to take a moment to thank all the original authors of all previous open space plans and acknowledge the excellent work done by them in their data gathering as well as their plans and goals. We look forward to attaining the new goals set out in the pages ahead.

Marshfield is fortunate to have a long history of conservation-minded citizens as members of town boards and commissions. As a result, we boast over 2,400 acres of open space and recreation areas today. But, there is much more to do. With this wonderful base of open space secured, we must now turn our priorities to protecting our most precious resource, water. As you read through the following sections, you will see how public well supplies are of utmost concern for us now. We have outlined areas of town that are of most importance to protect, including the following water supply well sites:

- Webster Street 1 and 2
- Furnace Brook 1, 2, 3 and 4
- Ferry Street and Church Street
- School Street and Union Street
- Spring Street

In addition, it is critical that major development projects are carefully reviewed and the best management practices are incorporated into each new development to ensure maximum protection of the town's water resources.

Even with the current inventory of over 2,400 acres of open space, there is still a need to protect additional areas. It is the overall goal of the Conservation Commission to preserve and protect existing land under their care and further expand inventory in areas where the most good will come from acquisition and protection, including:

1. Lands that surround current and potential public water supplies;
2. Parcels within or abutting existing conservation land that, if acquired, will create or extend greenbelts within and around town;
3. Salt marshes – one of the most important and productive ecosystems that our town is fortunate enough to have, and;
4. Habitat that is critical or unique for the survival of threatened or endangered species.

Each of these areas is critical to the ongoing health and diversity of our community as well as preserving its centuries-old character.

Finally, the Recreation Department is constantly challenged to meet the increasing demand for indoor and outdoor recreation facilities and ensure that all facilities are accessible to all residents of the town. To this end, the Department will

seek to increase the number of suitable outdoor playing fields for town residents, to meet the demand for increased participation as well as the increase in the number of various team sports for youth, adults, men and women. This will include the availability of rest rooms and lighted playing fields. This could also include new track, boating/paddling areas, nature trails as well as handicap access to the beach via boardwalks, and access to the town's various rivers. The department will seek to increase the number of opportunities for adults to utilize indoor facilities for various recreations needs, including sports, arts, and adult education options.

This plan for the next five years must be aggressive to meet the goals as summarized above and detailed in this document. It will take the unwavering support and coordination of many of the town boards to accomplish these important goals. It is expected that the newly formed Open Space Committee will be instrumental in providing that coordination for the town.

2 Introduction

2.A Statement of Purpose

This Fifth Edition Conservation/Recreation Open Space Plan – 2004 is intended as a revision and an update of Conservation/Recreation Open Space Plan of 1995 prepared by the Conservation and Recreation Commissions.

The purpose for developing this plan is two-fold:

1. To assess the existing conservation and recreational facilities, open space, and natural resources of the community, and;
2. To propose goals and plans that will lead to the best use of the facilities and land for the present and future population.

In short, the purpose and goal of the open space program is to provide a comprehensive, coordinated, strategic approach to land acquisition for conservation, recreation and water resource protection. This approach balances overall town desires with the most pressing of town needs. As part of this program, we have provided action plans to reach our goals which are designed to meet both immediate and future needs of Marshfield while allowing for the continued update and review of the critical needs of the town from year to year.

2.B Planning Process and Public Participation

Throughout the last 20 years, the town has been fortunate to have many open space advocates serving on town commissions that were very successful in protecting over 2,400 acres of conservation land throughout the town. Over the years, the amount of developable land has become very scarce in the town and it has become clear that the need to preserve key areas for water resource protection and recreational facilities has become paramount to the town's future. Remaining "developable" land is 2,112 less 450 acres with permits pending. Late in 2002, the Marshfield Board of Selectmen recognized the need for a comprehensive strategic plan for the town as it relates to open space land acquisition and appointed a nine member Open Space Committee that included one member from each of six town boards and three at large members from the town:

Community Preservation Committee – Vacant
Conservation Commission – Linda Varraso
Board of Assessors – John J. Cantwell
Board of Public Works – Robert Shaughnessy
Recreation Commission – Terry Sinclair
Planning Board - John Kyler
At Large – Laurie Baker
At Large – Susan Caron
At Large – Rebecca Walsh

Each of these nine members participated in the review, update and enhancement of the open space plan by preparing sections and reviewing each other's work. Through a series of monthly (or more) public meetings, a comprehensive open space plan meeting the State requirements has been completed and presented herein.

The nine members met over many months in a public meeting format with a public hearing conducted after the first draft release in February, 2004. Below is a list of meetings and other significant dates.

November, 2002 – Board of Selectmen vote to appoint an Open Space Committee

- February, 2003 – Final board members appointed
- March 11, 2003 – First meeting of the full committee
- April 3, 2003 – Public meeting of committee
- May 15, 2003 – Public meeting of committee
- June 5, 2003 – Public meeting of committee
- July 24, 2003 – Public meeting of committee
- August 21, 2003 – Public meeting of committee
- September 23, 2003 – Public meeting of committee
- November 16, 2003 – Public meeting of committee
- December 10, 2003 – Public meeting of committee
- January 11, 2004 – Public meeting of committee
- January 28, 2004 – Public meeting of committee
- February 18, 2004 – Draft sent
- March 24, 2004 – Public meeting of committee
- March 31, 2004 – Public Hearing Held
- April 25, 2004 – Public meeting of committee
- May 26, 2004 – Public meeting of committee
- June 27, 2004 – Public meeting of committee
- August 1, 2004 – Public meeting of committee
- August 22, 2004 – Public meeting of committee
- September 21, 2004 – Joint Public meeting of committee with Community Preservation Committee
- October 3, 2004 – Public meeting of committee
- October 17, 2004 – Public meeting of committee
- November 14, 2004 – Public meeting of committee
- January 9, 2005 – Public meeting of committee
- February 13, 2005 – Public meeting of committee
- March 13, 2005 – Public meeting of committee
- May 1, 2005 – Public meeting of committee
- May 9, 2005 – Public meeting of committee

With the completion of the plan, the Open Space Committee now focuses its full attention on the implementation and monitoring of the plan. It will serve as a review

board for all town acquisitions – ranking each candidate parcel according to the needs identified in the plan and serving as an advocate to the town for those parcels of high desirability. It will also conduct annual reviews of this plan to ensure that it continues to reflect the needs of the town for years to come.

3 Community Setting

3.A Regional Context

Marshfield is located on the coastline of Massachusetts Bay, 30 miles south of Boston, and 12 miles north of Plymouth. The town is in the northeast portion of Plymouth County, which is made up of 26 towns and one city, and is in the southeast corner of the Metropolitan Area Planning Council, which includes 101 communities surrounding Boston. An upper middle income Boston suburb with a rapidly increasing population, Marshfield has developed both as a town with its own economic opportunities and as commuter town for Boston. For those who do not seek employment in Boston and surrounding towns, Marshfield offers opportunities in retail, fishing, restaurants, and a summer tourist industry. The beautiful beaches and the North and South Rivers offer splendor and recreation opportunities. The rolling hills, tree lined streets, forested areas and broad meadows offer a peaceful, country like setting in an area that is only a short distance from the city.

The Town of Marshfield, in Plymouth County, is bounded by the Atlantic Ocean on the east, Duxbury on the south and southeast, Pembroke and Norwell on the west, and Scituate on the north. It comprises 31.75 square miles (28.5 land; 3.25 water). The town is hilly in the north and west, but fairly flat in the south. The North and South Rivers, the Green Harbor River, and many ponds scattered throughout the area add to the beauty of the town.

With the rapid growth pattern (12.5% in the last decade) and the continual development of recent years, the need for preservation of open space for water resources, recreation, preservation of forest and natural habitats is imperative. The available land is rapidly disappearing, forcing wildlife onto decreasing territory and endangering the water and land resources for this growing community.

3.B History of the Community[1]

Marshfield had an important part in the early development of New England. A brief study will help the understanding of its present status.

Generations of the Algonquin Indians, of which the local Wampanoags were a sub-tribe, lived in Missauchtucket, the area now known as Marshfield, hunting, fishing, tending their fields of corn, and raising their families. As they moved about from place to place, they left records of their existence and mode of life in the fields they cleared, the paths they made, and the relics they left. Shortly before the European settlers came to the New World, there was a disease, which decimated the local Indian Tribe at Plymouth. The sole survivor was Squanto, who befriended and aided the Pilgrims after their arrival. In March of 1621, Chief Sachen Massasoit of the Wampanoags and Governor Carver agreed to a peace treaty, which was kept for half a century.

The beginnings of Marshfield are bound inextricably with those of the Pilgrims who came to Plymouth on the Mayflower in 1620. Indeed the pilot of the Mayflower had been with John Smith when he anchored his ship in the North River on his voyage of exploration before the Pilgrims arrived, and it was said that he was looking for the mouth of the river when he brought his ship to rest in front of Plymouth in 1620. As time went on, and the original settlers in Plymouth began to look for better farmland, they were granted land along the fertile river valleys of Duxbury and Marshfield.

The church records of Plymouth indicate that there was a definite settlement in 1632 when some Plymouth people founded a church in Marshfield. Among the first settlers of the town was Edward Winslow, known as the founder of Marshfield. He was one of the outstanding men of Plymouth colony, an intellectual leader, and an ambassador for the group, with both the Indians as well as the authorities in England. After obtaining a grant of land, which he called “Careswell” in Green’s Harbor, he spent several summers here. In 1636, Edward Winslow moved permanently to “Careswell”, where he took part in the life of the church and town, as well as that of the colony. Three times a governor, Winslow was also the commissioner of the United Colonies of New England, a union solely for the defense in case of war or conflict with outside parties.

Four years after Edward Winslow moved to “Careswell”, Green’s Harbor was incorporated on March 2, 1640/41, the eighth town in Plymouth County, under the name of Rexhame, but was called Marshfield. Deputies were sent to the General Court in Plymouth as representatives from Marshfield.

In early times, the church was the town, and only church members were qualified voters according to the charter governing the colonies. However, raters, the forerunners of assessors, collected money needed for roads, ferries, bridges, schools, the minister’s salary, care of the poor, and other business of the town.

The idea of the selectmen was soon conceived. Those who represented the town at the General Court in Plymouth were empowered to act on behalf of the town.

It was not until 1692 that possession of land, not church membership, became the qualification for voting. At that time, Plymouth Colony was absorbed into Massachusetts Colony and henceforth representatives were sent to the General Court in Boston, rather than in Plymouth.

The North River played an important role from the beginning in the development of Marshfield. It was invaluable as a means of travel, as a source of salt meadow hay, for its clams and its fish, and from 1650 to 1850 as a ship building center known throughout the world. More than a thousand vessels were built and launched down the narrow, winding, tidal river. The Columbia, the first American ship to circumnavigate the globe, became the namesake for the Columbia River in Oregon. The Essex was sunk by an enraged whale, and the Smyrna was the first ship to carry the American flag into the Black Sea.

Marshfield was the chosen home of Daniel Webster, famous orator and three times Secretary of State. He was known as the “Farmer of Marshfield” and came here to his Green Harbor home where he loved to fish and hunt. He had an extensive 1500-acre farm where he experimented with new methods of agriculture, horticulture and livestock breeding. He is buried in the ancient Winslow Burying Ground close to his beloved estate.

Most changes in Marshfield’s population have been due to changes in the economic environment and changes in the modes of transportation. With the decline of the shipbuilding industry of an earlier era, many skilled people actually moved away to Boston and other areas where their skilled labor was urgently needed. When the railroad came to Marshfield in 1870 it brought many summer residents who were harbingers of future growth. Many of the summer residents of the early twentieth century stayed on even after the railroad passed on into history in 1939.

Historically, Marshfield’s industries have included farming, salt works, fishing, saw mills, grist mills, shipbuilding, iron industry, and nail factories. Presently, Marshfield is growing into a residential community, well within the metropolitan area, which still sags under the heavy weight of a very heavy summer population. The wholesale and retail trades are the major sources of local employment outside the construction and fishing industries, and the recently constructed industrial plant zones.

The constant improvement of the Southeast Expressway and Route 3 to the Cape lure unending streams of new residents both summer and year round. With the shortening of commuting time, and additions to mass transportation, Marshfield, although lacking in town-based industry, finds itself growing as one of the most desirable bedroom communities that surround Boston.

At the present time, change and growth are the most powerful forces at work in the lives of residents of Marshfield. They present complex and challenging problems such as the management of rapid population increases and the financing of town government. But a Town with Marshfield’s rich historical background should also be ever alert to maintaining the quality of life that was enjoyed by our forbearers – a life that included fine craftsmanship, individual initiative, appreciation of the natural beauties of this area, and thoughtful leadership in town and national affairs.

3.C Population Characteristics

Marshfield’s population changed little during the nineteenth century, and reduced slightly during the first years of the twentieth century. Since the 1940s the population has steadily increased due to the improved methods of transportation.

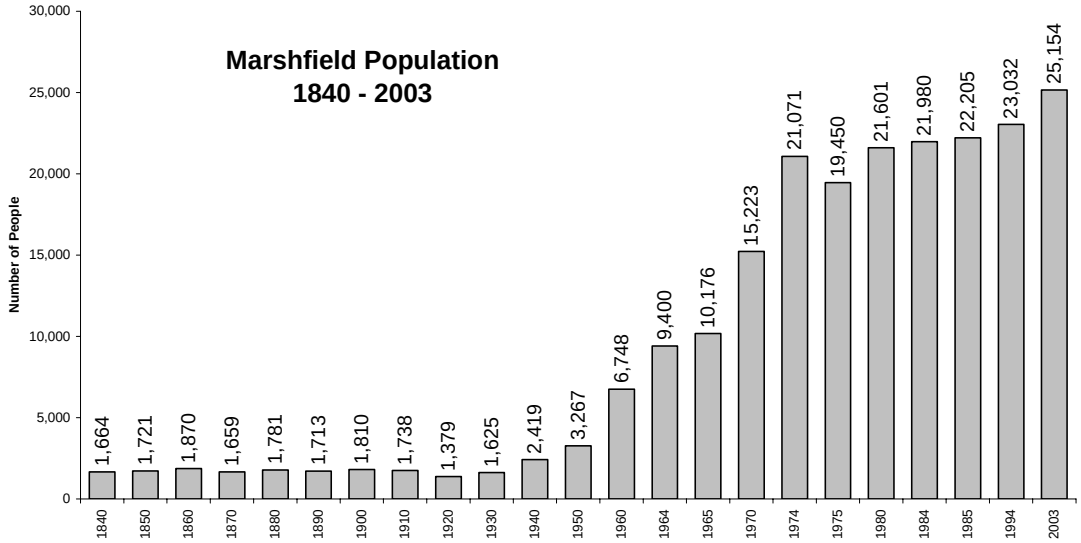
The population growth rate from 1964 to 1974 was 12%, averaging an annual increase of close to 1,200 persons for ten years. The greatest single year increase was

in 1971 with 2,749. The population figures took a major drop in 1975 and rebound with smaller drops in 1978 and 1981, until in 1984 when a 4% increase is reached in a ten year period, averaging annually a 91 person increase.

The building boom of the 1980s increased the number of subdivisions and dwellings in Marshfield significantly, creating additional stress on town services and on open space needs. During this period, the population of the town rose at a modest 5% rate, however, perhaps indicating that new home construction was being spurred on by current residents wishing to move onto new space and/or new residents not yet having children. Since the 1990 census, population has increased almost 17% with no indications of slowing in the near future. Marshfield continues to grow as one of the most desirable communities on the South Shore as it offers coastline, over 2400 acres of protected open space and easy interstate road access. These are the primary reasons the population increases in the summer by an estimated 20,000 people. It will become even more desirable to Boston commuters looking to move to a family/community setting when the Greenbush line is completed in the next few years.

The portion of the population that affects town taxes the most is the school enrollment. A long time ago, in 1872, the enrollment was 310 scholars, only 19% of the total population. During the close of 1975, school enrollment peaked at 5,827 students, which was 30% of the town's total population. Fifteen years later enrollment had dropped to a twenty year low of 3,930 students (1990 figure) , representing a 33% reduction and only 17% of the town's population. Presently, the student population is rising, with 4,491 students enrolling in Marshfield schools in 2002 – a 14% increase from 1990 – and with a projected enrollment of 4,900 in 2005 – an additional increase of 9%. This one statistic, alone, underscores the need for more and better recreational space for the town.

Population



Population Density

2003	25,154	People
	18,631	Acres
	28.5	Square Miles

Precinct	Voters	Pop (est)	Acres	Density
1	2,619	3,804	1,667	2.28 persons/acre
2	2,596	3,805	2,620	1.45 persons/acre
3	2,328	3,418	1,985	1.72 persons/acre
4	2,170	3,302	4,420	0.76 persons/acre
5	2,403	3,462	3,467	0.99 persons/acre
6	2,567	3,709	4,472	0.77 persons/acre
7	2,424	3,654	3,190	0.89persons/acre
Total	**17,117**	**25,154**	**18,631**	**1.35 persons/acre**

The population density in Marshfield varies from a little more than ¾ person per acre in the western ¼ of the town, to one person per acre in the east and central 1/3 of the town, and up to two persons per acre in the southeastern 1/3 of the town. The new precinct lines split regions of town previously voting in the same precinct.

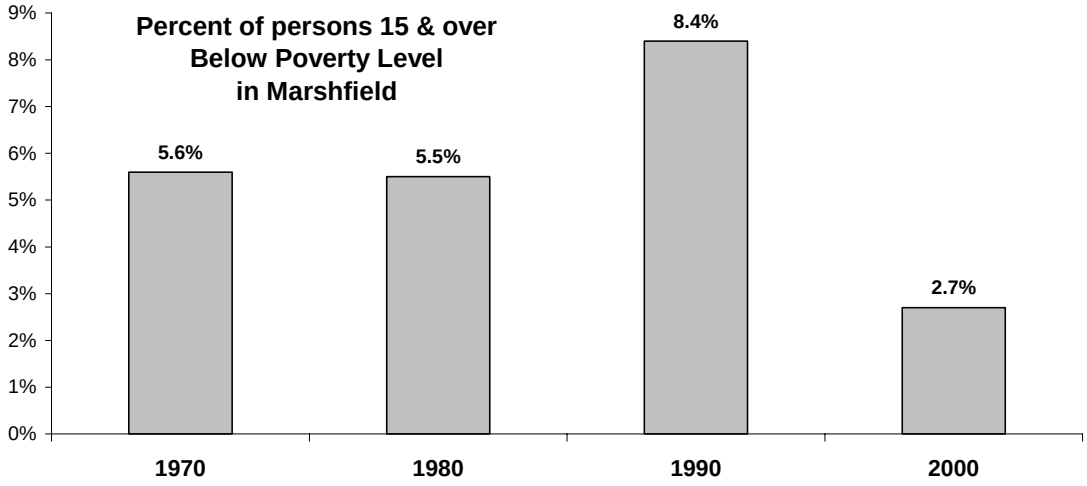
The highest population density occurs along Route 139 from the Pembroke line, east to the coast, then south and west to Webster Street. This high density is partly caused by the apartments, condominiums, and housing for the elderly in this area. In addition, higher population densities occur along the immediate coastlines. From Scituate to Duxbury the summer beach cottage areas are now used 50% as year round, thus a higher year-round density, as well as an increased density in the summer with an influx of thousands of summer residents or renters.

Socio-Economic Characteristics

The following tables and charts contain data on income levels, unemployment and comparative population, plus an abbreviated portion of the latest census results has been included.

Marshfield Comparative Socio-Economic Characteristics[2]

	1970	1980	1990	2000
Median family and unrelated person's income-	$10,984	$20,208	$48,986	$76,541
Median school years completed- all 25 and over	12.6	13.0	14.0	not avail
Total labor force	6,178	11,097	11,512	18,418

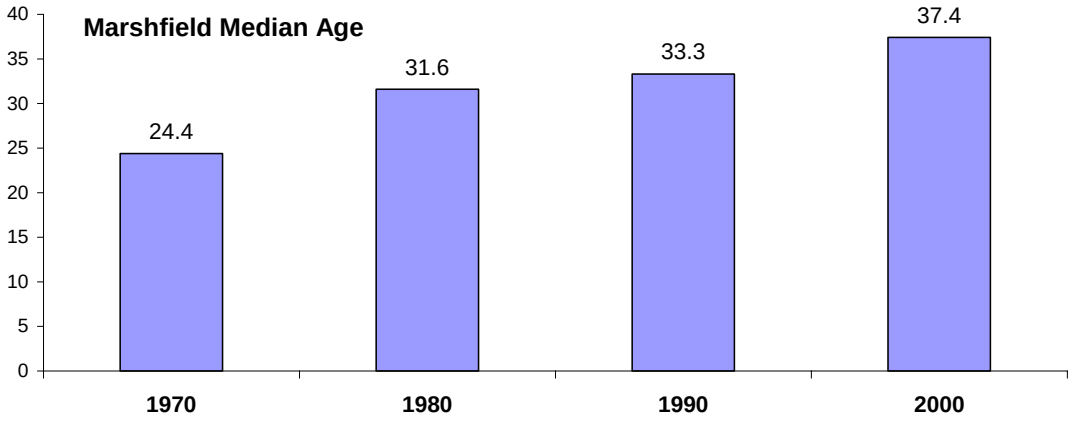


Unemployment Status[3]

	1970	1976	1982	1983	1984	1990	Nov 2001
Marshfield	5.5%	14.3%	7.4%	6.4%	3.1%	6.6%	2.7%
Massachusetts		12.3%	5.6%	4.3%	6.7%	3.7%	
National				8.1%	7.2%		

Marshfield Comparative Population Composition[4]

		1970	1980	1990	2000
Sex:	Male	49.3%	49.1%	49.3%	48.8%
	Female	50.7&	50.9%	50.7%	51.2%
Race:	White	98.7%	98.7%	98.3%	97.7%
	Other Races	1.3%	1.3%	1.7%	2.3%
Age:	Under 18 years	42.8%	33.0%	26.7%	29.5%
	18 to 65 years	50.5%	59.0%	64.9%	61.1%
	65 years and older	6.7%	8.0%	8.4%	9.4%



Additional Demographics[5]

Population Trends (M.I.S.E.R.)

	Persons	% Change
1980	20,916	
1990	21,531	+2.9
1995	22,451	+4.3
2000	23,371	+4.1
2003	25,154	+7.1

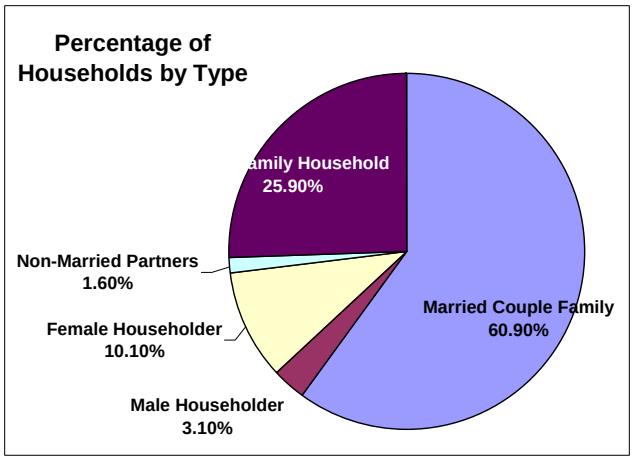
Persons by Sex (2000 US Census)

Male	11,869
Female	12,455
	24,324

Household Size (2000 US Census): 2.87 persons per household

Households by Type (2000 Census)

	Households
Married Couple Family	5,419
Male Householder	283
Female Householder	898
Non-Married Partners	391
Non-Family Household	2,305



Age Distribution (2000 US Census)

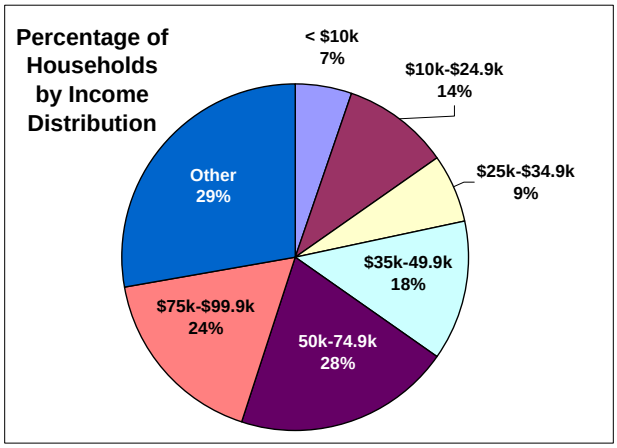
	Persons	%
5	1,924	7.9
5-14	3,727	15.4
15-44	9,993	41.1
45-64	6,380	26.2
65 & over	2,300	9.4

Race & Ethnicity (2000 Census)

	Persons	%
White	23,761	97.7
Black	201	0.8
Am. Indian, Eskimo, Aluet	83	0.3
Other	131	0.5
Hispanic Origin	163	0.7

Income Distribution (2000 US Census)

	Households
Less Than $10,000	497
$10,000-$24,999	932
$25,000-$34,999	596
$35,000-49,999	1,201
50,000-74,999	1,881
$75,000-$99,999	1,594



Households (2000 US Census)

1980	1990	2000	% Change 1990-2000
6,839	7,557	8,905	+17.8

3.D Growth and Development Patterns

1. Patterns and Trends

The Town of Marshfield began as a seaside community relying on the North River and Atlantic Ocean as resources for employment and trade. Its present picture is quite different. It has grown to be an extremely popular bedroom community for Boston commuters, continuing to experience heavy residential growth. The easy access to the Southeast Expressway has enhanced its popularity as a year round residential community and its seaside location continues to draw a large summer population. This combination has created year-round traffic congestion, which worsens during summer months. The increased population and traffic limits access to some beaches due to limited parking and congested roadways as well as discouraging business traffic in the downtown area. In addition, the planned expansion of the commuter rail line, via the Greenbush Line can be expected to increase the demand for residential development in Marshfield, although this impact is likely to be less dramatic than that experienced by towns with more distant locations that were previously considered not easily accessible to Boston.

The major growth in residential housing however has been in the area of high priced homes, making Marshfield an increasingly affluent community. This trend in building has left many lifelong residents and lower wage earners unable to purchase homes, and makes it difficult for many elderly to remain, as they cannot afford to make changes to more appropriate housing. As stated in the Marshfield Community Housing Plan, “at least one-quarter of Marshfield residents are currently living in housing that is by common definition beyond their means and unaffordable.” Prices continue to escalate with the availability of lower priced homes declining. MLS data from June 14, 2003 showed that only 5% of the single home sales included homes at or below

$200,000, which would be "…considered affordable to households earning at or somewhat below 80% of the area median income".[6] While condominium prices are more reasonable, there remains a pressing need for affordable housing. It is important to note that the Marshfield Housing Authority currently has a waiting list of almost 200 applicants. There are 13-year waits for available units, especially family units with little turn over. In addition, 40% of applicants are emergency requests because of homelessness or domestic abuse. [7]

Based on Massachusetts Department of Housing and Community Development's data, Marshfield has 361 out of 9117 year round residences defined as affordable, 3.96% of the total housing stock. Because Massachusetts State Law, Chapter 40B requires 10% of housing stock be deemed affordable, developers seeking to build in Marshfield may be successful in circumventing current zoning requirements by filing for comprehensive permits under 40B regulations. The Town of Marshfield is committed to finding solutions to the serious need for affordable housing. It currently has a Community Housing Study in draft form and is in the process of formulating a Housing Plan to create solutions to this serious problem without sacrificing the town's need to protect the environment, it's water supply and preserve those natural resources and historical qualities that make Marshfield a desirable community in which to live.[8]

2. Infrastructure

Increased roadway traffic is one of the largest issues facing Marshfield today. The two major roadways; Route 139 , that intersects with Route 3, and circles through town, as well as Route 3A have experienced increased traffic proportional to the population growth. Despite more convenient public transportation to Boston via the Old Colony Rail Line, with several stations within 25 minutes of Marshfield, and Commuter Boats leaving from Hingham, most commuters must still leave town via Routes 139 or Route 3A to reach metropolitan Boston. The planned extension for the Old Colony Rail Line via the Greenbush Line terminating in Scituate, will further exacerbate heavy traffic conditions on Route 3A during rush hours, although it could divert some traffic from Route 139. In addition, a large commercial project being proposed for Route 139 , adjacent to Furnace Street can be expected to generate even more traffic in an area that is already heavily traveled.

The town is currently pursuing improvements to Route 139 through a combination of public and private funding. At the Fall 2003 Special Town Meeting, funding was approved for a traffic study of the area. This funding will enable the town to qualify for state funding for roadway improvements and support ongoing mitigation with private developers. However, it may take years to assemble the necessary permitting and financing necessary to improve traffic flow on Route 139.

a) Transportation Systems

There is little public transportation in Marshfield. The town is currently considering ways to provide small scale local transportation. As part of a mixed-use development plan, Marshfield is seeking to integrate some local shuttle services in conjunction with the existing senior shuttle. There is also discussion of a Regional Transportation System, but there are no state or federal funds available for implementation at the current time.

The following public and private transportation exists:

Bus: Plymouth and Brockton Bus Service provides limited service to Marshfield and surrounding towns for transit to Boston.

Senior Bus: The Senior Shuttle is available through the Marshfield Council on Aging.

Taxi: Several private companies provide taxi service

Airport: Marshfield Municipal Airport: approximately 2,600 foot runway for business and private aircraft

Mass Transit: The MBTA subway system to Boston currently terminates in Braintree, 14 miles from the center of Marshfield.

The Old Colony Commuter Rail Line has several stations within 25 minutes of Marshfield center. These include Abington, Kingston, Hanson and Whitman, Braintree and Weymouth. There are plans to add a closer station servicing the South Coastal area, the proposed Greenbush line terminating in Scituate.

Water Transportation: Water Shuttle Service to Boston is available from Hingham, Hull and Quincy from the Mass Bay Commuter Lines

Town Roads: 160 miles link all parts of town with the following major routes: Routes 3A North and South goes through the center of town. Route 139 enters from the west and circles the southern part of town. Route 3 crosses the western corner of town, where it connects to Route 139, and is the major route to Boston. The town has a mix of state owned roads, town owned roads, private roads that the town maintains and private roads and common driveways closed to public passage. Many of the private roads maintained by the town are unpaved with substandard width and have inadequate stormwater/drainage control systems.

Sidewalks: The town presently has sidewalks along route 139, along some town-owned roads and within the newer housing developments. Sidewalks are lacking along many town roads. Connector sidewalks are needed to connect destination points throughout the town. At the 2003 annual town meeting, monies were authorized to develop a sidewalk plan for the town. The Board of Public Works appointed an advisory study group for prioritizing new sidewalk construction and pedestrian safety. The town

is currently studying the need to expand the connector sidewalk system to various destinations, i.e., downtown, schools, beaches, places of interest.

b) Water Supply Systems

The Town of Marshfield's municipal drinking water supply consists of six aquifers and fourteen gravel-packed overburden (the water bearing soils over bedrock) wells and well fields. The system is divided into two zones depending on land elevation – High Zone (North Marshfield) and Low Zone (Center Marshfield and beach area). The water system has 9,627 service connections and services four communities: Marshfield, parts of Scituate (Humarock), Duxbury (Duxbury Beach) and Pembroke (East of Route 3 along Route 139).

During the calendar year 2002, 1.1 billion gallons were pumped and delivered. The highest monthly total was 148.7 million gallons during the month of August with the maximum one day pumping of 6.88 million gallons. The average daily rate is 3.07 million gallons and the lowest maximum daily rate is 2.46 during February. Landscape irrigation is a major consumer of water during the summer months.

Unlike other towns with lakes and a possible hookup to the MWRA's supply, Marshfield must depend on its own internal underground sources. Also affecting the groundwater supply are the saltwater rivers in the town. This restricts the areas that can be tapped for water because the intrusion of salt into wells renders them unusable. No place in Marshfield is over two miles from tidal waters.

All of the town's water has some treatment at the well stations and then is pumped directly into the distribution system. Each well has its own pump station and lime feeder, pumping directly into the distribution system of water mains.

Three of the five wells in the Furnace Brook Aquifer require activated carbon filtration due to the presence of some volatile organic compounds (VOCs). The filtration effectively reduces the VOC concentration to below drinking water standards. This treated water must then be chlorinated for disinfection before it can enter the distribution system. In general, Marshfield's water is classified as "soft" with low manganese and iron content. Marshfield water has a trace amount of naturally occurring fluoride. Marshfield does not add fluoride to the water.

Our greatest concern for the quality of Marshfield's drinking water is impact from residential and commercial development and the septic systems located within the town's aquifers and near water supplies. Marshfield owns the minimum amount of land required by the state around each well and has protective zoning restrictions within the areas that contribute recharge (Zone II) to each of its sources of supply. Protecting these areas is critical to the town.

Marshfield's various boards and commissions continue to make efforts to minimize contamination from entering our aquifers through protective zoning and land

conservation measures. The VOC contamination plume migrating from sources along Route 139 and across the school complex has been delineated and steps are being taken to contain the plume and remediate the Furnace Brook Aquifer. In addition to the threat by the build up of VOCs, nitrate levels due to residential and commercial development have reached significant levels in the Furnace Brook and Webster Street well areas. The Ferry Street 40B Development approved by Marshfield Zoning Board of Appeals has the potential of affecting the water quality in the Little's Creek Aquifer.

The Little's Creek Aquifer has the lowest levels of nitrates of any of the aquifers in Marshfield. Under the best operating conditions, the nitrate level from the treatment system of the 30 lot subdivision will be 5 mg/l at the property line, which is within 400 feet of the town's Ferry St. municipal well. The town is in the process of developing a new source within this same aquifer.

Overdevelopment in the Blackmount area off Webster Street has adversely impacted the Webster St. Wells No. 1 and 2 increasing the nitrate levels. These wells require monitoring frequently. A recent study suggests that this area may require sewers in the near future. This problem, directly attributable to overdevelopment, underscores the need for protecting areas around our existing and potential well sites.

The town has approximately 200 residents (approximately 2% of the population) who are not on public water. These residents have private wells and are drawing from the same aquifer as the town's Supply. Below is a table showing the current 14 well locations in the two town zones and the treatment received at each location as well as water quality issues and wellhead protection strategies.

Well Site List

						Capacity					
Priority of Importance (GPM)	Well #	Well Capacity	Current Status	Date installed	Rated @ (GPM)	1990	2000	2003	Treatment	Water Quality Issues	Well Head Protection Strategy
High Zone											
1	W6	Union St #1	on-line		1000	1000	1000	1000	none		Land Controls
2	W13	Union St # 2	on-line	1989	350	350	350	350	none		Land Controls
3	W8	School St	on-line	1972	300	300	300	300	none	increased development - Title 5	Land Controls
4	W16	Spring St	on-line		275		275	275	none		Land Controls
5	W2	Furnace Brook #2	on-line	1992	700	600	500	700	Air Stripping - VOCs + disinfection	PCE Plume	Land Controls
			High Zone		**2625**	**2250**	**2425**	**2625**			
Low Zone											
1	W4	Furnace Brook #4	on-line	1961	1000	920	1000	1000	none -Below MCL	PCE Plume	Land Controls
2	W1	Furnace Brook #1	on-line	1946	700	620	600	600	carbon + disinfection	PCE Plume	Land Controls
3	W9	Church St	on-line	1982	575	525	350	350	none	increased development -	Land Controls

						Capacity					
Priority of Importance (GPM)	Well #	Well Capacity	Current Status	Date installed	Rated @ (GPM)	1990	2000	2003	Treatment	Water Quality Issues	Well Head Protection Strategy
										Title 5	
4	W10	Ferry St	on-line	1979	400	375	350	350	none	increased development - Title 5	Land Controls
4	W17	Ferry St (new)	on-line		350	0	0	0		increased development - Title 5	Land Controls
5	W7	South River St	on-line	1971	350	350	300	300	none	increased development - Title 5	Land Controls
6	W3	Furnace Brook #3	on-line	1995	300	300	300	300	carbon + disinfection	PCE Plume	Land Controls
7	W5	Webster St #1	on-line	1974	400	350	350	350	none	High Nitrates	New Sewer
7	W12	Webster St #2	on-line	1979	225	225	200	200	none	High Nitrates	New Sewer
8	W11	Mt. Skirgo	off-line	1927	400	220			none		Land Controls
9	W14	Parsonage #1	off-line			0			off line	salt water Intrusion	none
9	W15	Parsonage #2	off-line			0			off line	salt water Intrusion	none
				Low Zone	**4700**	**3885**	**3350**	**3350**			
				Totals	**7325**	**6135**	**8650**	**7750**			
				Millions Gallons per 24 hr day	**10.55**	**8.83**	**8.32**	**8.60**			

Safe Yield Calculations based on– all available sources pumping for 16 hours

Available Safe Yield Demand 5,889,600 gallons per day

Average Winter Day 2,400,000
2003 Summer (Wet) 5,000,000
2002 Summer (Drought) 6,000,000
2000 Summer (Highest Peak) 7,400,000

Water Quality Problems
Webster #1 Nitrates
Webster #2 Nitrates
FB #1,2,3 & 4 PCE Plume

The Water Department Master Plan projects that the current water supplies will peak in 2015. This build out statistic does not include the impact from high commercial or industrial water uses; high density 55+, or 40B housing. The DPW must acquire a new source of water to meet these future projections, meet peak hour demands and have a firm water supply capacity for continued community growth.

Total current supply capacity: 8.6 MGD (4.82 MGD Low zone; 3.78 MGD High zone)
Total current firm supply capacity 2.34 MGD (High zone) 3.38MGD (Low zone)

Total Build Out Projected (year) - Projected Maximum Day Demand By Year

	Total MGD	High Zone	Low Zone
2005	7.6	2.3	5.3
2010	7.9	2.4	5.5
2015	8.1	2.4	5.7
2020	8.4	2.5	5.9

- Maximum Day Demand will exceed current capacity and the system will be unable to meet demand at build out if the town continues to be impacted by dense development.
- Without new sources or loss of any existing wells the town will be facing water restrictions.
- Maintaining and acquiring undeveloped land around active, proposed and viable well sites are “key” to assuring that Marshfield continue to have adequate drinking water supplies the will require minimal treatment.

Water Distribution System

DEP regulations 310 CMR 22.10 (3)(a) requires that storage capacity be equivalent to the demand of at least two average days or an interconnection with another public water system approved by the Department. Although the town has limited (no direct connection – just over surface hydrant to hydrant connection) ability to tie into the Town of Duxbury's water supply, the system needs to increase storage capacity.

The fourteen wells and three storage tanks have the potential to supply in excess of 8.6 million gallons per day. However the system is vulnerable during periods of high demand when all of the sources of supply are needed and there are no back up supplies if a pump station is lost.

The water system works with a pump in each well creating pressure to supply household water and to fill storage tanks for the purpose of meeting peak demand periods and providing for fire protection.

The tanks and pumps are divided into two zones: The high zone serves the northwesterly portion of the town (40 percent of the total area) with an overflow level in the Forest Street Tank at elevation 300 ft above mean sea level. The low zone serves the remainder of the town, the middle interior and coastal areas, with an overflow level in the Telegraph Hill Tank and Pudding Hill Tank at elevation 235 and 270 ft above mean sea level respectively.

	Year built	Capacity (million gallons)
Forest Street	1972	2.1
Telegraph Hill	1990	2.3

Pudding Hill	1928	.67
	Total	**5.07**

The 196 miles of distribution main line needs an additional storage tank in the High Zone in order to meet summer peak demand due to landscape irrigation and additional summer population.

The Marshfield Water Department has a Water Supply Policy for sanitary loop. This policy is a public health standard for protecting the water quality within the distribution system by avoiding stagnation.

c) Wastewater Treatment

The current wastewater treatment facility is close to reaching its maximum processing capacity of 2.1 million gallons per day. After Sewer 2000 adds the planned 600 sewer units to the system, only 500 sewer units remain before the town reaches the capacity threshold where MA DEP requires that the town design a plan addressing increased capacity (sewer unit = 1 Residential Equivalent Unit [REU] or 225 gallons per day flow). This comprehensive sewer management plan will consider projected growth in Marshfield. With the influx of 55+ and Chapter 40B housing along the existing sewer area, work on this planning requirement will need to begin within the next few years.

Another area of impact is the Blackmount area of Marshfield. The area is located within the Webster Street aquifer, and the aquifer is showing increased nitrogen levels that may require sewer installations in the area. This effort would consume a significant portion of the wastewater plant's remaining capacity.

Existing Sewer Areas

The existing sewered areas consist of 32 miles and has 3,767 sewer service connections. Sewer service extends primarily in the southern end of town and serve the beach areas, where groundwater levels are high. Inflow/Infiltration from groundwater in the existing sewer lines has caused sewer flow fluctuation during wet conditions in low laying areas. There are no municipal drinking water wells within the current sewered area.

Wastewater Treatment Plant

This late-1970's plant has a design capacity of 2.1 mgd, with current sewerage treated at the plant ranging from 1.19 to 1.35 mgd, or utilizing approximately 57% to 64% of the plant's design flow capacity.

Sewer 2000 Project

This project added sewer connections to areas where many failed septic systems were discharging septage in the area of the South River. Issues with water quality and public health required that this be addressed.

The newly-sewered area is an extension of the existing sewer on Ocean Street from Old Colony Lane to Moraine Street, and includes the neighborhoods along this section.

The project added 8.7 miles of sewer line, two sewage pumping stations, 600 service connections, and added .21 mgd to the treatment plant. This brought current flow at the treatment plant to between 1.31 and 1.56 mgd, or 62% to 74% of the plant's design flow capacity.[9]

Future Sewer Areas

Potential candidates for sewer service would include areas such as Webster Street wells #1 and #2 that currently have high nitrate levels during a portion of the year (summer), thereby making this area a candidate for sewer installation as part of an overall wellhead protection strategy.

3. Long Term Development Patterns/ Zoning.

Zoning

The majority of Marshfield is made up of Residential Development governed by zoning. Residential development allowed under existing zoning includes: Accessory Apartments; Age Restricted Adult Villages, and; Single Family Detached Homes that are either in conventional subdivisions or Open Space Residential Developments. However, the town's housing stock also includes a substantial percentage of multi-family housing in condominiums and apartment developments that had been allowed under zoning until the early 1970s.

Marshfield's land use is regulated by an extensive Zoning Bylaw. In 1972, the major revision of the law included a zoning map that indicated wetland overlay zones, for both inland and coastal wetland. The result of the zoning has been to keep commercial activity to a corridor along Route 139 (Plain Street and Ocean Street) between the Pembroke line and the Fieldston Area by the ocean, in addition to commercial roads in downtown Brant Rock, and Humarock. Commercial development is the most intense between the Pembroke town line and the Marshfield Middle School on Route 139. Several parcels are currently under construction in that stretch, and more are in the planning stage. This growth is fueled by the proximity to the Exit 12 interchange on Route 3.

For Residential Development, the zoning in the northern part of Marshfield is as one acre, one-half acre, and one-quarter acre lots. The residentially zoned land has been developed both along existing roads and in new subdivisions. Average lot size in the town has increased, population has increased and average household size has

decreased, resulting in residential development that consumes more land per person than in the past. The advent of zoning bylaws requiring large lots and a demand by homeowners for more space than was required in the past have contributed to the infringement of housing on formerly undeveloped land. Many planners believe that supply has driven demand, (i.e. large-lot zoning, intended to limit growth) and created demand for large lots.

Open Space and Conservation Land has been added to the town's inventory through the efforts of past public officials and land protection advocates. Increased demand for housing, skyrocketing land values and the impact of Massachusetts General Laws Chapter 40B enacted to facilitate the development of affordable housing, has put the remaining open space at risk for development through overrides of existing zoning.

Besides zoning bylaws, there are several other laws governing land use. They include:

1. Gravel Removal Bylaw
2. Wetland Protection Act MGL Ch. 131 Sec. 40
3. Marshfield Wetland Protection Bylaw
4. Coastal Wetland Restriction MGL Ch. 130 Sec. 105
5. North River Protective Order MGL CH. 21 Sec. 17
6. Mass. Waterways Control MGL Ch.91
7. Corp. of Army Engineers Wetland Permit Control
8. Subdivision Control Law MGL CH. 41
9. Street Improvement Policy

The combination of the Wetlands Protection Act, and other water related laws, has controlled the erosion of the valuable salt marsh resources of town found in estuaries along our tidal rivers. Zoning bylaws address these issues with overlay districts relating to inland and coastal wetlands and flood plains. In inland wetlands, these laws have controlled development and prevented expansion into lowlands that have other pollution and flooding problems.

Current Development

In the early 1900s, much of the forest land of today was open fields and farms. Since World War II, the farms were abandoned and the fields reforested. However, in the last twenty years many acres of woodlands have been cleared again, but this time for new subdivisions.

The early 2000s has brought continued residential development in both small and large tracts of land, with a number of the more difficult tracts being developed or proposed for development.

Marshfield has become a desirable community, resulting in a growing population and an increase in single-family homes. While zoning and other protective

laws brought many of the spiraling changes of the ‘50s and ‘60s under regulation, they also contributed to the present day suburban sprawl that threatens many of the town’s valued natural resources. Numerous hiking and riding trails have disappeared because of new subdivision development, and many of the town’s aquifers are threatened with contamination. Although, Marshfield does have a Water Resource Protection District zoning overlay which relates to commercial and business zoning and is more restrictive that the State’s Title 5 Regulations, more protection is needed to safeguard the town’s water resource and open space. There also are fewer large contiguous open space parcels left that are needed for many types of wildlife, and many of the remaining large tracts of open space are threatened with development.

The Executive Office of Environmental Affairs Build out Analysis estimates that as of 1999, there were 2,112 acres of remaining developable land. Since the completion of that study, there have been 450 acres permitted for development, which leaves 1,662 acres at risk and in need of protection. Please see tables under “Pending Developments” section for further details.

It is important to note that this build out data can underestimate development as is does not take into account the following conditions: 1), the subdividing of existing large lots resulting in higher density than estimated; 2), Sale of existing properties resulting in increased population, and; 3), Chapter 40B exclusions to current zoning resulting in more density than predicted. On the other hand, the estimate may also include land that is found to be unbuildable due to environmental constraints, inappropriate soils or steep topography.

The ecological impacts under full build-out include the following:
-fragmentation and greater isolation of forest tracts;
-loss of interior forest habitat and increased "edge effects";
-loss of connectivity between forest tracts;
-increase in invasive plant species;
-increase in nest predators and nest parasites;
-impacts to existing sensitive resources (i.e., vernal pools, wetlands) with encroachment due to pollution and insufficient buffer zones;
-increased road mortality of native species with increased traffic, and;
-overall decrease in native flora and fauna biodiversity.

The impact of a full buildout of the current zoning plan would greatly strain the natural resources of the town, affect quality of life by creating further congestion of the roadways and have economic implications as well by requiring improvements to the infrastructure. The need to increase the water supply would be inevitable. Please refer to Section G – Environmental Challenges for further details.

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Although septic permits are regulated by Title 5 and the Water Resource Protection District bylaw, the increase in residential development brings with it further risk of contamination of existing well sites due to the unregulated discharge of household toxins and the inevitable fertilization of lawns. The cost to treat contaminated

water sources would fall to the rate payers. Given that there are already a significant number of residents in town that are finding it difficult to afford to remain in Marshfield, any changes to the town that will further exacerbate the rising cost of living should be undertaken carefully.

Pending Developments[10]

1 Downtown Commercial Development

The town has a major initiative underway to revitalize the commercial center of Marshfield. Most of the town center is privately owned, therefore progress will require the cooperation of the private property owners. The town has installed new sewerage lines throughout the downtown area in an effort to spur private property owners to upgrade their properties. The Downtown Revitalization Committee has encouraged mixed-use projects that would include housing and retail on many of the under utilized parcels. The goal is for existing businesses to stay and improve their appearances, and for new ones to open in order to better serve residents needs and to strengthen the tax base.

2 Residential, Age Restricted, Mixed Use, Commercial and Industrial Developments

Table – Pending and Approved Development on "Undeveloped" Land Shown on Jan. 2001 MAPC Buildout Maps

School District	Project	Type [1]	Acres	Housing Units	Status
Eames Way	Chestnut Hill	Subdivision	75	26	Approved
South River	Commerce Green	Subdivision/ PMUD SP	35.2		Pending
South River	Enterprise Park	Subdivision (Industrial)	88	N/A	Approved
Governor Winslow	James Way	Subdivision	~5	4	Approved
South River	Metuxet Woods	Comp. Permit	29.1	28	Approved, Under Appeal
South River	Mt. Skirgo Ridge	Subdivision	75.3	30	Approved
South River	Mt. Skirgo Reserve	Age-Restricted Adult Village	22.1	55	Approved
Martinson	North River Village	Comp. Permit	11	24	Pending
Martinson	Orchard River Road	Open Space Residential Development	17.9	13	Pending
South River	Pudding Hill	Age-Restricted Adult Village	42	66	Approved
South River	Rockwood Road	Subdivision (Industrial)	13	0	Approved
Governor Winslow	South Point Lane	Subdivision	13.6	2	Approved
South River	Spyglass Landing	Age-Restricted Adult Village	55	84	Approved
South River	Stonybrook Road Ext.	Subdivision	5.5	3	Approved

Table – Pending and Approved Development on "Undeveloped" Land Shown on Jan. 2001 MAPC Buildout Maps					
School District	**Project**	**Type [1]**	**Acres**	**Housing Units**	**Status**
Governor Winslow	Webster Point Village	Comp. Permit	26.3	N/A	Approved, Under Appeal
Daniel Webster	White Holland Estates	Subdivision	22.4	8	Pending

[1] Developed acreage for Street Improvements is approximate.

Table – Pending and Approved Development Since Jan. 2001 MAPC Buildout Maps					
School District	**Project**	**Type [1]**	**Acres**	**Housing Units**	**Status**
Daniel Webster	Beacon Properties*	Comp. Permit	31	150	Approved, Under Appeal
Eames Way	Chestnut Hill	Subdivision	75	26	Approved
South River	Cohasset/ Hingham* [2]	Street Improvement	~2	6	Approved
South River	Commerce Green	Subdivision/ PMUD SP	35.2		Pending
Eames Way	Eames Brook Farm*	Age-Restricted Adult Village	9.7 (+4.5)	20	Pending
South River	Enterprise Park	Subdivision (Industrial)	88	N/A	Approved
South River	Holyoke Ave.*	Street Improvement	.25	1	Pending
Governor Winslow	James Way	Subdivision	~5	4	Approved
South River	The Maples*	Age-Restricted Adult Village	12.3	22	Approved
South River	Marshhawk Way*	Subdivision	18.8	13	Approved
South River	Metuxet Woods	Comp. Permit	29.1	28	Approved, Under Appeal
South River	Mt. Skirgo Ridge	Subdivision	75.3	30	Approved
South River	Mt. Skirgo Reserve	Age-Restricted Adult Village	22.1	55	Approved
Martinson	North River Village	Comp. Permit	11	24	Pending
Martinson	Off Union Street*	Subdivision	32	1	Approved/In Litigation
Martinson	Orchard River Road	Open Space Residential Development	17.9	13	Pending
Martinson	Overlook Farm*	Age-Restricted Adult Village	7.8	10	Approved
Eames Way	Pauline Road*	Street Improvement	.25	1	Approved
South River	Peregrine Woods*	Age-Restricted Adult Village	20.8		Approved
Governor Winslow	Pownal Street*	Street Improvement	.5	1	Approved
South River	Pudding Hill	Age-Restricted Adult Village	42	66	Approved
South River	Rockwood Road	Subdivision (Industrial)	13	0	Approved
Governor Winslow	South Point Lane	Subdivision	13.6	2	Approved
South River	Spyglass Landing	Age-Restricted Adult Village	55	84	Approved
South River	Stonybrook Road Ext.	Subdivision	5.5	3	Approved

Table – Pending and Approved Development Since Jan. 2001 MAPC Buildout Maps					
School District	**Project**	**Type [1]**	**Acres**	**Housing Units**	**Status**
South River	Texas Street*	Street Improvement	.5	1	Approved
South River	Waltham Ave.*	Street Improvement	.5	2	Approved
Daniel Webster	Waterman Ave.	Street Improvement	.25	1	Approved
Governor Winslow	Webster Point Village	Comp. Permit	26.3	N/A	Approved, Under Appeal
Daniel Webster	White Holland Estates	Subdivision	22.4	8	Pending
Eames Way	Winter Wood Lane*	Subdivision	3.8	3	Approved

Notes: Open Space impacts do not include properties that were shown as "developed" on the Jan. 2001 MAPC Buildout Maps. [1] Developed acreage for Street Improvements is approximate.

Based on a review of development completed since the January 2001 MAPC Buildout Maps, the following calculations were completed:

Acreage of “developable” land on MAPC buildout maps: 2,112
Acreage of recent permitted residential development on “undeveloped” land: 450
Remaining “developable” land: 2,112 – 450 = 1,662 acres

Since the creation of the buildout maps, permits have also been issued for 86.9 acres of land already shown as “developed” on the buildout maps, including Beacon Properties (Comprehensive Permit), The Maples (Age Restricted Adult Village), Off Union Street (Definitive Subdivision), Overlook Farm (Age Restricted Adult Village), and Winter Wood Lane (Definitive Subdivision).

An additional 51.3 acres of “undeveloped” land is currently subject to permit applications, including North River Village (Comprehensive Permit), Orchard River Road (Open Space Residential Development) and White Holland Estates (Definitive Subdivision).

4 Environmental Inventory and Analysis

4.A Geology, Soils and Topography

See 4.B Landscape Character.

4.B Landscape Character

Topography/Landscape Character

The largest collection of hills is comprised of the Highlands in the northeast, made up of Holly Hill, Telegraph Hill, Snake Hill, and Ferry Hill, topped with Carolina Hill at 265 feet. The Marshfield Hills in the northwest has several places over 200 feet above sea level. Carolina Hill and Marshfield Hills are divided in the south by the valley of the Furnace Brook draining to the South River and in the north by Bare's brook, draining north through Macomber's Creek to the North River.

In the central part of the town, Mount Skirgo reaches 200 feet and Pudding Hill 145 feet, with lesser heights of Black Mountain and Cedar Crest (Gotham Hill) tapering off into the marshes of the southwest.

There are two areas of historically productive farm land: The "Two Mile Farm" bordering the North River, and the nearly level section of southeast of Marshfield Village between the Neck Rock (Ocean Street), Webster Street and Cut River. The Daniel Webster Estate and farm was on Webster Street. Although farming almost disappeared from the town, these two districts still offer fertile soil and some of the broadest open land in town.

"The Plains" lie between Forest, School, and Plain Streets. Its elevation of 100 feet is unlike that of other areas of similar height in that it is almost flat. The campus of the Middle and Senior High Schools is located here, as are many homes and businesses. In this plain on the south side of Plain Street, Marshfield's only White cedar swamp is located. It is 20+ acres, a low spot which is a rare and uniqe habitat for the region.

Countless wetland areas exist in town, either as perched water trapped by heavy clay or as springs seeping from the base of gravel deposits. These, in turn, create fresh water brooks and streams that drain into man-made impoundments or ponds. Forty artificial ponds constitute all the ponds in Marshfield excluding a few kettleholes, and one bog-like pond on Carolina Hill by Eames Way.

There are four major watersheds – the North River, the South River, the Green Harbor River, and the Duxbury Bay.

North River

The North River, of shipbuilding fame, is a tidal river for ten miles upstream from its mouth. At Marshfield's upstream starting point, the river meanders north approximately three miles before turning east at the "Elbow" above Union Street Bridge. At this point granite outcroppings create a tidal rip. The river turns and runs four miles east to the sea, widening considerably east of the 3A bridge. Starting upstream, tributaries to the North River are the Two Mile Brook, which has six ponds and is two miles in length; Bare's Brook, which flows through several ponds before joining Hannah Eames Brook at Murdock's Pond and entering the tidal Macomber's Creek.

South River

As a salt water tidal river, the South River stretches from the North River mouth, south and southwest six miles through extensive marshland and behind the barrier beach Humarock. It passes the old North and South River mouth which was filled since the storm of 1898 creating the present mouth between Scituate's Third and Fourth Cliffs. As a fresh water stream, Keene's and Phillip's Brook in Duxbury form the origin of the South River. From the Duxbury line, the river flows one half mile to Chandler's pond in Marshfield, from which the flow divides into the Twin Brooks. At this point the Furnace Brook joins the Twin Brooks and forms the South River at Memorial Park and 3A where the tidal influence is observed. The Furnace Brook is three miles long and is dotted with five ponds and although unimpressive in size is the major source of Marshfield drinking water. Several Smaller creeks enter the South river – the largest of which Is Little's Creek which flows through Keene's Pond and carries drainage from the eastern slope of Carolina Hill.

Green Harbor River

This river also starts at the Duxbury line. From Route 3A it winds north and east to the dike at Green Harbor (now route 139) for approximately five miles. The dike was constructed in 1872 to reclaim two square miles of land below sea level for agricultural purposes, thus creating a polder. The upper portion of the Green Harbor River is impounded to create reservoirs for cranberry cultivation. Bass Creek and Wharf Creek, also form tidal waters and feed into the Green Harbor River. Because of sluggishness of the water flow, the river is choked with vegetation and impassible at some points for boat travel. Only for the low quarter of the tide cycle, the Green Harbor River drains through the dike to the Green Harbor and the sea. The Cut River connects Green Harbor and Duxbury Bay along the original route of the Green Harbor River, which once entered Massachusetts Bay at the Duxbury-Marshfield line.

Duxbury Bay Basin

This basin contains many small tidal creeks that drain south into the Duxbury Bay.

Since there is little change in elevation, the flow in the tidal rivers is slow. They have developed complicated meanderings across their flood plains and enter the sea through an extensive estuary. In their sluggishness, they drop much silt carried upstream, which, when mixed with the materials brought in by the ocean tides, build mud flats favorable to shellfish. The surrounding marshes with their creeks and ditches are nurseries for several important fish species. These rivers and their attendant marshes have been evaluated by the Massachusetts Department of Natural Resources as being "exceptionally high in resources and human valuation".

The salt marshes of Marshfield have been put under the protection of the Coastal Wetlands Act. The total acreage of the Coastal Salt Marshes is:

North River	700 acres
South River	1,400 acres
Green Harbor & Cut River	180 acres
Duxbury Marsh (within Marshfield)	350 acres
	2,630 acres

In addition, the following is a former salt marsh and below sea level

Green Harbor Reclamation District	1,380 acres

The remaining category of Marshfield's natural features, and one of the most important, is its open coastline. On the east the town faces the sea from its boundary with Scituate south to the Duxbury line, a distance of more than four and one half miles. The structure of the coastline varies from the barrier beaches at Rexhame, Sunrise Beach, Esplanade, Bluefish Cove and Green Harbor, to the eroding coastal banks of Rexhame, Ocean Bluff, Brant Rock, and Blackman's Point and to the only two natural rock outcroppings: one at Brant Rock, and one at Bluefish Point. The constantly rising sea level is altering, changing and encroaching upon this fragile shoreline.

There are 39 acres known as Rexhame Beach near the northern end of the town's shoreline, which lie between the South River and the Ocean. This area is reserved for a bathing beach and recreation area for the residents of the town. In addition there are some public accesses to the water at other points, including Damon's Point, the South River ramp, the Town Pier, and Brant Rock. Marinas in the North and South Rivers in Green Harbor afford access to the open ocean for pleasures, and for sport and commercial fishing. On the shoreline, the only undeveloped area besides the town beach is a strip of land 1500 feet long in front of an area known as Old Rexhame. Unfortunately, this area has been scarred by the creation of the sewage system.

In summary, Marshfield is composed of glacial deposited hills surrounded by water and divided by rivers and marshes. Waters, both fresh and salt, are essential to its unique character.

Tides and Sea Level

The twice daily high and low tides range from an average, or mean, of nine feet (from low tide to high tide) to a maximum of 14 feet. These "spring" high tides refer to the twice-monthly higher tides that coincide with the full moon and new moon phases. For comparison purposes, the high tide during the Blizzard of 1978 was three feet higher than the spring high tide and would be rated as a 15-foot tide.

The relative sea level rise rate in the Cape Cod Bay area is approximately 10-12 inches per century. As a natural consequence of sea level rise, barrier beaches, dunes, and salt marshes move inland and coastal bluffs erode and supply sediment to the barrier beach systems. The causes of sea level rise include the melting of the polar ice caps due to global warming, the expansion of the earth's warming waters, and the shifting of the earth's tectonic plates. Some scientists postulate that global warming leads to an increase in the frequency and intensity of storm systems. Thus, with the combination of sea level rise and global warming, coastal communities can expect more rapid erosion of coastal bluffs and shorelines, including locations where homes and infrastructures presently stand.

Geology

Marshfield's geologic setting provides the foundation of the town's landscape and topography. The streams, ponds, wetlands, coastline and aquifers in Marshfield all reflect its geologic history. From a planning perspective, knowledge of Marshfield's geology provides the basic framework needed to understand the land's constraints and opportunities for development. Decisions related to important issues such as septic system suitability, watershed protection, and groundwater supply are dependent upon an understanding of Marshfield's geologic formations.

Bedrock Geology

The bedrock underlying the northern portion of Marshfield is mapped as the Rhode Island Formation, an assemblage of sedimentary rocks including sandstone, graywacke, shale and conglomerate (Zen, et al, 1986). A northeast-southwest trending transect marks the contact of the sedimentary rocks of the Rhode Island Formation to the north with the plutonic and metamorphic rocks to the south. This assemblage of intrusive rocks includes granite, gneiss, and schist.

Surficial Geology

New England's surficial geologic deposits are the results of the last continental glaciations approximately 18,000 to 20,000 years ago. Glacial processes deposited sediments ranging from unsorted mixtures of sand, silt, clay and boulders (till) to stratified sands and gravels (outwash).

Glacial till is the predominant surficial geologic deposit in Marshfield (Chute, 1965). Most of North Marshfield and Marshfield Hills (as well as Carolina Hill, Telegraph Hill, Ferry Hill, Holly Hill and Pudding Hill) are underlain by a compact till comprised of an unsorted mixture of sand, silt, gravel and boulders. Glacial till was molded by the continental ice sheet into smooth ellipsoidal hills and was also deposited as low, rolling, boulder-strewn ground moraine on slopes and in valleys. These deposits are generally characterized as fairly dense with low permeability, high runoff potential, and low water-bearing capacities. In many places, the underlying layer of till may be hard and compacted forming a hardpan, which limits the downward movement of water and roots. The presence of an impermeable hardpan can be an important factor in site planning since it can restrict the use of a site for on-site septic disposal.

Glaciofluvial deposits such as outwash plain, kame terrace, ice-channel, kames and kame plains underlie much of the central and southern portions of Marshfield. These deposits are comprised of well-sorted, coarse-grained to medium-grained sands and gravels. Glaciofluvial deposits are moderately to highly permeable with good water-bearing capacities and low runoff rates. Like most Massachusetts municipalities, Marshfield's water supply aquifers occur in glaciofluvial deposits.

Postglacial deposits, such as salt marsh and dune deposits, have also formed in Marshfield over the last several thousand years. The thickest salt marsh peat deposits have likely accumulated in the North River Estuary and the South River Estuary. The reworking of the glacial sediments by wind and wave action have formed coastal beaches along Marshfield's shoreline.

Soils

Soils are the thin layer of naturally-occurring unconsolidated materials overlying the glacial deposits described above. Soils in the Town of Marshfield were mapped and classified by the USDA Soil Conservation Service (currently the Natural Resource Conservation Service, NRCS) as part of the soil survey of Plymouth County (SCS, 1969). Soils in Marshfield can be grouped into five associations based on development limitations and future land use. The five associations identified in Marshfield and a brief description of their characteristics and uses follows:

Plymouth-Carver
Hinckley-Windsor-Deerfield
Montauk-Scituate-Norwell
Woodbridge-Paxton-Ridgebury
Ipswich-Pawcatuck-Hooksan

Plymouth-Carver

These are gently sloping to steep, excessively-drained soils formed in thick sand deposits and/or loose sandy ice-contact till on end moraines or recessional moraines (SCSa, 2003). Most areas of this map unit are forested with pitch pine, white pine and

scrub oak; some areas are used for home sites or croplands. Areas of this map unit are poorly-suited for woodland and cropland given the droughtiness of the soils. There are no major limitations that affect the use of these soils as building sites. This map unit is associated with groundwater recharge areas and precautions should be taken to protect the aquifer (SCSa, 2003).

Hinckley-Windsor-Deerfield

These are very deep, nearly level to steep, excessively-drained to moderately well-drained soils formed in glaciofluvial deposits on outwash plains, deltas, kames, and ice-contact deposits (SCSa, 2003). Most areas of this map unit are in woodland or mixed residential development; some areas are in cropland. These soils are generally well-suited to building/site development (SCSa, 2003). Deerfield soils have an apparent high water table between one and one half feet and four feet and require mounded septic systems. These soils occur in areas of aquifer recharge, thus caution should be taken to protect the aquifer. These soils are well suited for woodland and cropland productivity.

Montauk-Scituate-Norwell

These are very deep, gently sloping to steep, well-drained to poorly-drained soils formed in sandy loam Aeolian (windblown) material underlain by dense glacial till (SCSa, 2003). Most areas of this map unit are in woodland and mixed residential and industrial development; some areas are used for cropland. Montauk and Scituate soils are well-suited for woodland and cropland productivity whereas Norwell is poorly-suited due to wetness (SCSa, 2003). These soils are poorly-suited for sites as septic tank absorption fields since the slowly permeable, dense substratum does not readily absorb the effluent. Subsurface drainage is also a problem with these soils because the firm substratum causes a perched, seasonal high water table.

Woodbridge-Paxton-Ridgebury

These soils are very deep, gently sloping to steep, well-drained to poorly-drained soils formed in fine sandy loam Aeolian (windblown) material underlain by loamy, dense till (SCSa, 2003). Most areas of this map unit are in woodland and mixed residential and industrial development. Some areas are used as cropland. Paxton and Woodbridge soils are well-suited for woodland productivity and cropland; Ridgebury soils are poorly suited due to wetness. These soils are poorly-suited for septic absorption fields because the slowly permeable, dense substratum does not readily absorb the effluent. Subsurface drainage is also a problem with these soils because the firm substratum causes a perched, seasonal high water table.

Ipswich-Pawcatuck-Hooksan

These soils are steep, very deep, very poorly-drained and excessively-drained soils formed in organic and mineral marine deposits and Aeolian (windblown) deposits

along the coast (SCSa, 2003). Included in this map unit are areas of dunes and beaches. Areas of this map unit area vegetated by grasses and many areas are used for homes or recreation. Ipswich and Pawcatuck soils are best suited for wetland habitat and poorly-suited for other uses due to flooding, low soil strength, and wetness. Hooksan soils are poorly-suited for most uses due to droughtiness and high erosion and depositional events.

Soil Distribution

The above-referenced soil associations are distributed in specific parts of Marshfield. The poorly-drained to excessively-drained Ipswich-Pawcatuck-Hooksan Association occurs in the low-lying areas along the North River, South River, and Green Harbor River areas and their tributaries. The well drained to poorly-drained Woodbridge-Paxton-Ridgebury Association occurs in the North Marshfield and Marshfield Hills area. This association also comprises portions of the higher elevation shoreline of the Brant Rock, Cedar Crest, and Rexhame areas. The excessively-drained Plymouth-Carver Association and the excessively to moderately drained Hinckley-Windsor-Deerfield Association comprise the largest percentage of soil type in Marshfield. Numerous gravel borrow pits are currently or were formerly located in the two soil associations. The well-drained to poorly-drained Montauk-Scituate-Norwell Association is limited to the western portion of Marshfield along the Pembroke and Duxbury town lines.

Development Limitations

Consideration of soil type is important since soil-related limitations influence the development of sites for homes, schools, athletic fields and commercial/industrial development (SCS, 1969). The recent population growth in Marshfield has resulted in an increase in residential, commercial and industrial development resulting in intense competition for land. Much of the better agricultural land in this area has been converted to non-agricultural use (SCS, 1969). As a rule, soils that are best for agricultural are also best for other uses (SCS, 1969). Thus, a land use plan is critical to reserve the remaining productive soils for agricultural purposes. A brief description of land use/development limitations with respect to soil conditions follows.

***Septic systems*:** Many soils have properties that limit their use for subsurface disposal of sanitary waste. The major soil-related limitations influencing the installation and functioning of septic tanks include:

1) shallow depth to bedrock;
2) shallow depth to the water table;
3) slow percolation rate due to compact, impermeable soils or hardpan;
4) steep slopes, and;
5) periodic flooding (SCS, 1969).

Based on these criteria, the SCS has rated the soils in Plymouth County according to the suitability of septic systems. Approximately one third of the town falls within the category of "severe" or "very severe" indicating that soil properties generally preclude

the use of on-site disposal systems without major and costly corrective measures. However, approximately two-thirds of the town is serviced by private, on-site septic systems. Given these conditions, the town should give special consideration to the existing and potential problems associated with septic systems when planning for future growth. It should be noted that soil properties are not the only cause of such problems. Other contributing factors include housing density, poor maintenance of existing systems, and in previous years, inadequate sizing of new system designs.

Home sites: The main factors considered in rating limitations for home sites are:

1) depth to seasonal or high water table;
2) periodic flooding;
3) slope;
4) surface rockiness;
5) depth to bedrock;
6) depth to a slowly impermeable layer;
7) surface soil stoniness, and:
8) surface soils texture (SCS, 1969).

In addition, the limitations with respect to septic disposal apply for those areas where municipal sewerage is not available.

Schools: The increasing population in Marshfield has resulted in a need for new and/or enlarged school facilities. The main factors considered in rating limitations for school sites are:

1) potential for flooding;
2) depth to bedrock or a slowly impermeable layer;
3) depth to seasonal or high water table;
4) slope;
5) surface rockiness;
6) surface soil stoniness, and:
7) slope (SCS, 1969).

In addition, the location, size, shape of the site and the limitations of the site for sewerage disposal must be considered.

***Athletic Fields*:** The main factors considered in rating limitations for athletic fields include:

1) slope;
2) surface rockiness;
3) depth to bedrock;
4) depth to seasonal or high water table;
5) soil permeability and texture, and;
6) surface stoniness (SCS, 1969).

These same criteria apply to playgrounds and other intensively-used recreation areas.

Agriculture: The SCS has identified three categories of farmland including

1) prime farmland:
2) farmland of state and local importance, and:

3) cranberry bogs under production (SCS, 2003c).

The classification of prime farmland soils is based upon susceptibility to erosion and flooding, acceptable pH, lack of excessive stoniness, and favorable climatic conditions for agricultural purposes. Prime farmland soils must also be available for use as crop land, pasture land, or forest land and therefore, not be urbanized or under water. The aforementioned soil units that classify as prime farmland are Montauk, Scituate, Woodbridge, and Paxton (SCS, 2003b). State or locally important farmland soils are those that "…fail to meet one or more of the prime farmland, but are important for the production of food, feed, fiber, or forage crops. They include those soils that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods." Since the soils best suited for agriculture are generally well suited for competing uses, the preservation of productive soils, which are an important part of the town's identity and quality, requires the implementation of strong management policies.

4.C Water Resources

1. Watersheds

There are several non-municipal groups in and around town that have ongoing efforts to protect watersheds, including the North and South Rivers Watershed Association (NSRWA) and the South Coastal Watershed.

The Massachusetts DEP Water Supply Division reviewed the impact of Hazardous Waste sites throughout Marshfield as it affects drinking water supplies. The results and accompanying reports are attached as Appendix C. A list of all hazardous waste sites is also included in section 4G.

2. Surface water

The three large, tidally influenced river systems that occur in Marshfield are the North River, the South River and the Green Harbor River. Numerous streams, creeks, and ponds occur within the drainage basins of each of these rivers and ultimately discharge to one of these rivers. The North River forms the northernmost boundary of Marshfield. Streams that discharge into it include Two Mile Brook, Cove Creek and Macombers Creek, as well as streams in the Towns of Norwell and Scituate. The North River was the first designated scenic river in Massachusetts with the North River Commission established in 1978 by the Department of Environmental Management. Recreational use of the North River includes boating, canoeing, kayaking, fishing, and swimming. Access is available for canoes at a canoe launch at the Union Street bridge, and for boaters at Mary's Landing at the Route 3A bridge. Some town-owned and conservation lands in Marshfield provide landings for boaters for day use or picnicking.

The South River extends from the south-central portion of Marshfield eastward then north to its border with Scituate's Humarock Beach. Numerous tributaries

discharge into this river including Furnace Brook, Little's Creek, Broad Creek, and Branch Creek. Recreational use of the South River also includes boating, canoeing, kayaking, fishing, and swimming. Access is available for boaters off Ferry Street. Much of the low marsh lands of the South River between the old railroad bed and Rexhame Beach is Marshfield Conservation Land.

In the southern portion of Marshfield, the Green Harbor River flows east then south into Green Harbor and ultimately into the ocean. Its tributaries include Bass Creek and Wharf Creek. Recreational use of the Green Harbor River includes boating, canoeing, kayaking, fishing, and swimming. Access is available for boaters on the east and west sides of Green Harbor south of Route 139. A dike built in 1872 across the Green Harbor River at Route 139 created a two-square mile polder. Areas within this polder include Massachusetts Audubon's Daniel Webster Wildlife Sanctuary, the Green Harbor Golf Course, the Marshfield Airport, as well as residential areas.

3. Aquifer Recharge Areas

Aquifer recharge areas (area of contribution) are those that contribute water to the wells either directly through subsurface groundwater flow or indirectly by surface water drainage.

Three distinct areas of recharge are recognized by the Massachusetts Department of Environmental Protection (DEP), Division of Water Supply (DWS): Zone I, Zone II, and Zone III. The Zone I and II constitute the primary recharge area from which a well receives groundwater and surface water inflows, while the Zone III includes the secondary recharge area. All three areas contribute to the water quality of a water supply source and therefore should be delineated and appropriately protected.

Zone I is the protective radius required around a public water system. The Zone I is owned or controlled by the water supplier, and the activities within this area are restricted to water supply activities. All, but one, of Marshfield wells yield over 100,000 gallons per day (gpd) or greater and have the DEP-required Zone I 400-foot radius. Mt. Skirgo well requires a 250’ radius.

Zone II is the land area that contributes water to the well. The DEP defines this zone as “that area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated”[11] more specifically, after 180 days of continuous pumping at the safe yield and no recharge from precipitation. In all cases, if the limits of the Zone II coincide with hydrogeologic boundaries such as groundwater flow divide, a contact with till or bedrock, or a recharge boundary. The Zone II delineation has been made for all of the Marshfield water supply wells. Marshfield has established Water Restrictive Protection Districts in the Planning Bylaws and are mapped to control the business and commercial activities within the Zone IIs. There are no town controls for residential uses only Title 5 regulation for residential purposes.

Zone III encompasses the Zone I and II and further represents the area from which surface water and groundwater drain into the Zone II. The Zone III boundaries are delineated using regional surface topography and drainage basin divides. Marshfield has not defined the Zone IIIs. This delineation will need to be addressed especially as the Industrial Zone is developed to determine the long term effect on the Zone ll recharge area of the Mt Skirgo aquifer.

Also affecting the groundwater supply are the saltwater rivers throughout the town. No place in Marshfield is over two miles from tidal waters. This restricts the areas that can be tapped for drinking water because the intrusion of saltwater into the wells will render them useless. Salt use in treating roads in winter can also present problems, thus the town has established “NO SALT ZONES” adjacent to wells on town roads. Unfortunately, Route 3A, a state maintained road, is adjacent to four major wells and salted regularly.

The fourteen public water supply wells have potential to supply in excess of 8.6 million gallons a day. Future well sites are currently being developed and the town is investigating new sites for acquisition. New sources must be developed to meet the anticipated build out projections and to enhance the system’s reliability. The existing wells must be protected from the deleterious impacts of development.

Marshfield has already experienced contamination at three of the Furnace Brook wells and was forced to spend several million dollars to add treatment facilities to remove volatile organic compounds. The VOC contaminant plume migrating from sources along Route 139 and across the school complex has been delineated and steps are being taken to contain the plume and remediate the Furnace Brook Aquifer. In addition to the threat by the build up of VOCs, nitrate levels due to residential and commercial development have reached significant levels in the Furnace Brook no. 4 well and Webster wells 1 and 2. MA Drinking Water Regulations require the water supplier to increase monitoring when any MCL of a contaminate exceeds or is approaching 50% of that MCL. Further, the water supplier must plan to correct the situation. Webster Street is in this situation. The long-term strategy may require that the area surrounding the Webster wells be sewered to allow the aquifer to repair itself through natural attenuation. If new sewers are not installed in this area to eliminate the septic systems contamination, Marshfield stands to lose the Webster Street #1 and #2 wells from the water supply system.

In other Zone II areas, the Marshfield Conservation Commission’s acquisition of the land within the Furnace Brook watershed and portions of Carolina Hill was one of the major steps taken to protect the aquifer and water quality of the six public water supply wells in the Furnace Brook and Ferry Street areas.

Additional wellhead protection strategies will need to be implemented to protect the water system. These strategies range from land acquisition, conservation restrictions, land donations and remedial actions such as additional sewers, wellhead

treatment, storm water management practices and structures and public education on the proper use and maintenance of septic systems.

In summary, Marshfield's drinking water has been of excellent quality and of sufficient quantity. The VOC contamination that impacted supplies and created water shortages in the late 1980s will continue to be present within the Furnace Brook aquifer and the impacted wells will require treatment for some time to come. The system is adequate and will allow for continued moderate growth until build-out is reached in the year 2015. However, an acceleration of demand due to an influx of high commercial or industrial water users or from significant high-density housing (55+ and 40B) development will force Marshfield to acquire new sources at a faster rate than stated under the current Water Master Plan timelines. The quality of drinking water continues to diminish due to impacts from development. Impact to groundwater from overdevelopment in close proximity and upgradient to our numerous well fields is Marshfield's biggest obstacle to overcome to continue to enjoy the excellent quality of the town's drinking water.

The system serves the town's estimated 25,000 year round residents and, in addition, supplies water to portions of three surrounding towns : Duxbury, Scituate, and Pembroke by Route 3.

4. Flood hazard areas

Significant areas of Marshfield are flood hazard areas and are shown on the Federal Emergency Management Agency's Flood Insurance Rate Maps. The most recent versions of the FIRM maps were published in July 1992. Six individual maps cover the entirety of the town and are designated Community-Panel Numbers 250273-: 001D; 002D; 003D; 004C; 005C; and 006D. FEMA has contracted a study, done in 2000, to revise the FIRM maps, but new maps have not yet been published.

Marshfield's large coastal area borders Cape Cod Bay and is subject to frequent powerful coastal storms that often result in property damage. The "V-zone" encompasses most of the immediate coastal beach areas of the town and is an area subject to coastal flooding with wave energy. Much of this coast is protected with concrete seawalls or armored revetments requiring periodic repair. Immediately behind the "V-zone" is the "AO-zone", an area where coastal flooding from overwash flows through toward an estuary or polder. Low-lying coastal or inland areas that experience flooding without wave energy and without swift water flow are designated "A" or "B" zones. Predicted non-flood areas are "C" zones. About 1/3 of the Town of Marshfield is in one of the flood hazard zones.

5. Wetlands

Marshfield has a great deal of wetlands, the town is appropriately named. Extensive salt marshes exist along the North and the South Rivers and part of the

Green Harbor River. A large area of what used to be salt marsh is now a fresh or brackish water polder changed by virtue of a constructed dike and large gate valves that prevent the flooding of high tide.

Tight or poorly-drained soils exist in many parts of the town, creating fresh water wetlands and streams. Wetlands exist on many hillsides where ground water breaks out due to impervious soil layers, not just in low-lying areas or collection zones. Many of these up gradient wetlands do not connect to a stream or border a pond where the emergent ground water soaks into a more pervious soil layer beneath the clay layer. The local wetlands protection by-law now protects these isolated vegetated wetlands.

4.D Vegetation

Forest Land

The most recent Land Use Survey (MacConnell Land Use Survey 1999) estimated Marshfield's forest land at 7,115 acres--2,520 acres less than in 1985. Our forests are being consumed at an alarming rate, about 720 acres were cut down for development within the past five years. That is an area equivalent to 654 football fields Forests are one of our most important natural resources because they clean the air we breathe, reduce wind damage, and control stormwater. Trees help recharge the aquifers that supply water to the residents of Marshield, reduce flooding, and ***are the oldest "new trend" in stormwater treatment'.***

Over 2,100 acres of forestland has been permanently protected in Marshfield (Town of Marshfield Conservation Map, 2000). Some of this land is owned by the Conservation Commission, while other is considered quasi public conservation land. Additionally, about 4,200 acres of forestland throughout the town are privately owned. These forested areas provide essential wildlife habitat and contribute to the scenic beauty of the town. The Carolina Hill Reservation is of particular importance in this regard because of its contiguous 775 acres. Trails for hiking, horseback riding, and, in the winter months, cross-country skiing are found throughout Marshfield's forested conservation lands. These lands also are often used for scenic walks and wildlife observation. Hunting is prohibited on town owned conservation land, however.

Marshfield's forests are composed of both coniferous and deciduous trees, and contain a wide range of tree species. All of the trees are second growth. An older resident remembered that all the land from Union Street to the North River on the Garner Farm, just north of Cornhill Lane, was cleared and plowed for planting in 1919; now that land is covered with a stand of white-pine trees more than 60 feet tall, with the plow grooves still visible between their trunks.

Many species of shrubs, wild flowers, and ferns grow in our forests. Some of the plant species most frequently observed in Marshfield include: Please see Appendix 12.G.9 for some additional examples of plant species. The entire list from the

Biodiversity Days Visible Species Database can be found on the Massachusetts Executive Office of Environmental Affairs website, www.state.ma.us/envir/.

Agricultural Land

Agricultural land in Marshfield is limited to several small farms and cranberry bogs. There are eight working cranberry bogs (Marshfield Conservation Map, 2002) and 243 acres of agricultural land (Massgis, 2004) in Marshfield. Most of this agricultural land is currently enrolled in Chapter 61. This agricultural land has scenic value, particularly the cranberry bogs during the harvest season. The land also provides food and cover for our wildlife.

Wetland Vegetation

The town is characterized by large tracts of fresh and salt water wetlands. These wetlands include river corridors, ponds, marshland, and cranberry bogs. There are more than 1,000 acres of conservation wetlands (Marshfield Conservation Map, 2002). Additionally, the State of Massachusetts owns the English Salt Marsh Wildlife management Area in Marshfield, 166 acres of estuary on the North and South Rivers. A large variety of vegetation thrives in our wetlands. Some of the predominant trees are Red Maple, Swamp White Oak, Tupelo, and Atlantic White Cedar. Sweet-Pepper Bush, Swamp Loosestrife, Spicebush, and Juneberry also abound. Some of the most common grasses include the Saltmarsh Spike-Grass, Saltmarsh Wild Rye, Freshwater Cord-Grass, and Tall Salt-Hay. Royal Fern, Sensitive Fern, Cinnamon Fern, and Massachusetts Fern are some of the most frequently found wetland ferns. These wetland areas are essential to providing habitat for wildlife as well as significant scenic and recreational values to the town residents.

Unique Natural Resources

According to MassGIS, Marshfield has 6 state designated barrier beaches which total 235 acres. The beaches dot the shoreline from Rexhame in the north to Brant Rock and Green Harbor in the south. The town's barrier beaches protect the mainland from ocean storms and flooding. They provide habitat for wildlife and plants, including rare plant species on Rexhame Beach and offer recreational opportunities for sport fishermen and beachgoers.

Freshwater Tidal Mashes are considered very uncommon but Marshfield counts with some good examples along the North and South Rivers. Saltwater Marsh communities are important for protecting terrestrial areas from the ocean, as well as providing habitat to species that depend upon them, such as nursery areas for marine species and migratory stopovers for birds.

Eight plant species that grow in the wild in Marshfield are considered by the Massachusetts Natural Heritage and Endangered Species as either endangered, threatened, or of special concern. The Variable Sedge, Estuary Beggar-Ticks, Long's

Bitter-Cress, and Estuary Pipewort are considered endangered; the Seabeach Needlegrass and Rigid Flax are threatened, and the Philadelphia Panic-Grass and American Sea-Blite are of special concern. See Appendix 12.G.9 for additional information on Uncommon Natural Communities and vascaular plants

The Table below provides a list of the most common species found in Marshfield.

The Massachusetts Natural Heritage and Endangered Species Program

The program has identified 8 plants that are either endangered (E) (Variable Sedge, Estuary Beggar-Ticks, Long's Bitter-Cress, and Estuary Pipewort), threatened (T) (Seabeach Needlegrass and Rigid Flax), or of special concern (SC) (Philadelphia Panic-Grass and American Sea-Blite), and have been found growing in the wild in Marshfield.

The Massachusetts Natural Heritage and Endangered Species Program vascular plants list and some fact sheets along with fact sheets for the Uncommon Natural Communities appear in the appendices.

The following is a list of some of Marshfield's vegetation:

TREES	
Spruce – Norway	American Elm
Eastern Hemlock	Tulip-tree (Yellow Poplar)
Red Cedar	Sassafras
Willow Species	Sycamores
Trembling Aspen	Cherry – Black, Chokecherry
Walnut	Maple – Sugar, Red, Silver
Hickory – Shagbark,Pignut, & Swamp	Horsechestnut
Birch – Yellow, Sweet, Gray	Linden (American Basswood)
Hornbeam (Ironwood)	Tupelo
American Beech	Ash – White, Green
Oak Swamp White, White, Scarlet, Black	Pine - White, Pitch, & Jack, Red, Bear, & English
Atlantic White Cedar	American Holly
SHRUBS	
Sheep Laurel	Blueberry – Highbush and Low bush
Buttonbush	Swamp Azalea
Arrow-wood Virburnum	Sweet Pepper-bush
Poison Ivy	Spicebush
Sweet Fern	Bush Honeysuckle
Black Alder	Sumac – Staghorn, Poison, Smooth & Winged
FERNS AND ALLIES	
Grape Fern (Rare)	Hay – Scented Fern
Royal Fern	Sensitive Fern
Cinnamon Fern	Horsetail
Interrupted Fern	Tree Clubmoss
Bracken Fern	Ground Cedar Clubmoss
Lady Fern	Marsh Fern

FLOWERING PLANTS AND GRASSES	
Broad-Leafed Cattail	Arrow Head
Narrow--Leafed Cattail	Oriental Bittersweet
Jack-in-the-Pulpit	Striped Pipsissewa
Skunk Cabbage	Jewel Weed
Spiderwort	Queen Anne's Lace
Cat Brier	Bunchberry
Clintonia	Wintergreen
False Solomon's Seal	Indian Pipe
Canada Mayflower	Pine Sap
Indian Cucumber-Root	Beech Drops
Day Lily	Star Flower
Trout Lily	Milkweed
Blue Flag	Dodder
Aster Species	Forget-Me-Not
Pink Lady's Slipper	Vervain (Blue)
Smart Weed Species	Purple Nightshade
Arrow-leaved Tearthumb	Partridge Berry
Yellow Pond Lily (Bull Head)	Joe-Pye-Weed
Wood Anemone	Daisy
Tall Meadow Rue	Golderods
Marsh Marigold	Beggar-Ticks
Goldthread	Tansey
White Baneberry	Canada Thistle
Peppergrass	Bull Thistle
Wild Indigo	Hawkweeds Species
Cingefoil	Dandelion
Long's Bitter-Cress (E)	Estuary Pipewort (E)
Rigid Flax (T)	Seabeach Needlegrass (T)
Philadelphia Panic-Grass (SC)	American Sea-Blite (SC)
Marsh Azalea	

4.E Fisheries and Wildlife

Marshfield's inland and coastal habitats are some of the most unique in the state. The Massachusetts Natural Heritage and Endangered Species Program (NHESP) designated 11 areas as Estimated Habitat of Rare Wildlife, totaling 1920.62 acres. NHESP also designated 15 Priority Habitats of Rare Species areas in Marshfield comprising 2,043.44 acres. It is important that the town take steps to protect wildlife and their habitats by acquiring additional land for conservation, particularly land now designated by NHESP as Estimated Habitat of Rare Wildlife or Priority Habitats of Rare Species.

Some of the most important species of fish, marine life, and wildlife species found in Marshfield include . (See Appendix 12.G.9 for additional listings)

The town should continue to work toward improving the water quality of its rivers to enhance habitat for wildlife that lives in or frequents these waters.

Fisheries - The variety of aquatic animals is enhanced by having both salt and fresh water habitats throughout the town. The shoreline provides a transitional region with creatures from both the ocean and the rivers. Saltwater estuaries are the most productive habitat in the world. The saltmarsh serves as the nursery for the young fish of the sea and produces the source of nutrients that feeds the ocean creatures. Small fish, like mummichugs, live in the marsh, traveling in and out on the tides. The small fish start the food chain that will take the products of spartina grass of the saltmarsh out to the rivers, bays, and open ocean as the fish are preyed upon by larger and larger species. For a detailed account of the marine life, refer to "A Study of the Marine Resources in the North River" by Fiske, Watson, & Coates published by Developmental Natural Resources, 1996.

Marshfield has two fishways, one where the Green Harbor River flows into Green Harbor and another on the South River in Veterans Park. Fish can enter the Green Harbor River through the dike during high tide, but there is no information about the species that may use this fishway. The fishway in Veterans Park is not functional due to its design, however, it is currently being repaired.

There are fish runs and spawning habitat on the Second Herring Brook and the North and South Rivers. The runs and spawning habitat support Alewife, Blue Herring, Atlantic Salmon, and Rainbow Smelt.

Mass GIS shows 6 shellfish growing areas in Marshfield; all of the areas are currently closed to shellfish harvesting.

The Bridle Shiner is known to inhabit the waters of Marshfield and is listed by The Massachusetts Natural Heritage and Endangered Species Program as a species of special concern.

Wildlife - Some of the wildlife most frequently found in Marshfield are shown in the Table on 4-19. The Green Harbor Reclamation District has unique and rich wildlife habitats. Although this District is below sea level, it is separated from the sea by a dike. The wetness and wilderness of this region have enabled animals like foxes, muskrats, raccoons, and deer to survive. Also, it is the wintering grounds for many large hawks, including the Rough-Legged Hawk, Northern Harrier, Red-Tailed Hawk, and Kestrel. In the summer, the open farm meadows have an abundance of nesting Bobolinks and a few scattered nesting Upland Sandpipers, an endangered species. Surrounding the fields, the brush thickets provide refuge for singing White-Eyed Vireos, a bird at the northern limit of its range.

The town's upland forest has wildlife of a more reclusive nature: the Ruffed Grouse, the Great Horned Owl, as well as some of those mentioned above. The open fields found near the upland forests provide homes for a diversity of wildlife along their borders.

Wetlands, like ponds, cranberry bogs, marshlands, and river corridors, provide habitat for many local and migratory wildlife species. The North River marshes serve as the nighttime roost for the non-breeding blackbird population that reaches 100,000 birds each fall. Hundreds of nesting Marsh Wrens sing from the river corridors all day and night, though they are seldom seen. The elusive Rails are both migrants and breeders in our wetlands. Muskrats, turtles, frogs, spring peepers, and ducks are a few more species of animals that enjoy the lush growth of plant life in our wetlands.

Wildlife Corridors - Wildlife corridors enable wildlife to move from one habitat to another. They are particularly important as increasing development results in the increased fragmentation of existing forested tracts which reduce the areas available to wildlife for roaming and migratation . Wildlife use the town's numerous hiking trails, cart paths, river corridors, and power line clearings as corridors. However, the town has not identified these areas as actual wildlife corridors, nor has the town identified any natural wildlife corridors.

Marshfield's rare and endangered wildlife have been classified by The Massachusetts Natural Heritage & Endangered Species Program. The endangered species list includes the Upland Sandpiper, which is known to nest at the Massachusetts Audubon Society's Daniel Webster Wildlife Sanctuary, and the Least Bittern, a summer resident and probable breeder at the Home Bog in Webster's Wilderness. The Piping Plover, a nester on the sand spits at the North River's mouth, is on the threatened list. Seven species that have been documented to occur in Marshfield are on the special concern list. The reptile list includes the Eastern Box Turtle and Spotted Turtle. The Sharp-Shinned Hawk, Common Moorhen, and Least Tern are on the bird list. Four-Toed Salamanders are listed as an amphibian of special concern, and the Mystic Valley Amphipod is included as a crustacean of special concern. The Osprey is on the NHESP unofficial Watch List and has been observed in Marshfield.

Vernal Pools - The Massachusetts Natural Heritage & Endangered Species Program has certified 13 ()vernal pools in Marshfield. The town Conservation Commission estimates that there are another 30 vernal pools that have not yet been certified. Vernal pools are essential for the survival of certain species of salamanders, frogs, and other aquatic creatures. The vernal pools provide the only breeding habitat for many creatures and insure the continued existence of these species. It is important that Marshfield identify and certify all of its vernal pools and impose and enforce regulations necessary to protect these fragile and important areas. Maps, species lists, and some fact sheets from The Massachusetts Natural Heritage and Endangered Species Program BioMap, Priority Habitats, Estimated Habitats, and Protected Open Space and Potential Vernal Pools are located in Appendix 12.G.9.

Another protected species known to occur in Marshfield but not yet documented by the NHESP is the endangered Short-Eared Owl, a visitor to our marshes, dunes, and open fields. According to Massachusetts Audubon Society, 10 percent of the state's population of Short-Eared Owls winters at the Daniel Webster Wildlife Sanctuary.

Also on the list of undocumented threatened species are the Pied-Billed Grebe, a frequenter of ponds during migration, Northern Harrier, a year-round resident of the marshes and fields and probably a nester, King Rail, a secretive marsh bird, the Roseate Tern, a migrant that visits our shores, and the Long-Eared Owl, observed at the Daniel Webster Wildlife Sanctuary. Cooper's Hawk, Common Tern, Common Loon, American Bittern, Arctic Tern, Northern Parula, Blackpoll Warbler, and the Mourning Warbler are listed as undocumented species of special concern.

The following is a partial list of Marshfield's wildlife:

FISH, INVERTEBRATES, AND MOLLUSKS	
Chain Pickere	Bluegill
Striped Bass	Bridle Shiner (SC)
Blue Herring	Shad
Atlantic Herring	Mummichog
Bluefish	Atlantic Mackerel
Alewife	Maine Lobster
Green Crab	Atlantic Rock Crab
Big-eyed Sandhopper	Sideswimmers Scuds
Ribbed Mussel	Atlantic Surf Clam
Blue Mussel	Common Periwinkle
MAMMALS	
Virginia Opossum	Harbor Seal
Star-Nosed Mole	Woodchuck
Northern Short-tailed Shrew	White-footed Mouse
Little Brown Bat	Meadow Vole
Common Raccoon	Common Muskrat
Longtail Weasel	House Mouse
Striped Skunk	Woodland Jumping Mouse
Red Fox	Porcupine
Gray Fox	Eastern Cottontail
Eastern Chipmunk	White-tailed Deer
Northen Flying Squirrel	Red Squirrel
Eastern Gray Squirrel	Northern River Otter
Coyote	American Mink
REPTILES, AMPHIBIANS, AND CRUSTACEANS	
Snapping Turtle	Red-backed Salamander
Eastern Box Turtle (SC)	American Toad
Eastern Painted Turtle	Spring Peeper
Eastern Ribbon Snake	Bullfrog
Northern Black Racer	Green Frog
Common Garter Snake	Wood Frog
Spotted Turtle (SC)	Four-Toed Salamander (SC)
Mystic Valley Amphipod (SC)	

BIRDS: Birds listed by habitat and selected as most likely to be seen

OPEN SPACES (Fields and Roads)

Small (Sparrow size)	**Medium(Robin size)**	**Large (Crow size)**
Song Sparrow	American Robin	American Crow
Chipping Sparrow	Gray Catbird	Fish Crow
House Sparrow	Brown Thrasher	Northern Harrier (T)
American Goldfinch	Northern Mockingbird	
Barn Swallow	Northern Oriole	
House Wren	Brown-Headed Cowbird	
Yellow Warbler	Eastern Meadowlark	
House Finch	European Starling	
Dark-Eyed Junco	Mourning Dove	
Tree Sparrow	Eastern Kingbird	
Least Bittern (E)	Northern Cardinal	
	Killdeer	

WOODED AREAS (Forest and Wetland)

Small	**Medium**	**Large**
Black-Capped Chickadee	Blue Jay	Ruffed Grouse
Tufted Titmouse	Northern Flicker	Cooper's Hawk (SC)
White-breasted Nuthatch	Hairy Woodpecker	
Ovenbird	Eastern Towhee	
Black and White Warbler	Rose-breasted Grosbeak	
Yellow rumped Warbler	Wood Thrush	
American Redstart	Veery	
Red-Eyed Vireo	Crested Flycatcher	
Scarlet Tanager	Black-billed Cuckoo	
Eastern Wood Pewee	Sharp-Shinned Hawk (SC)	
Ruby-throated Hummingbird		
Cedar Waxwing		
Northern Parula (SC)		
Downy Woodpecker		
Morning Warbler (SC)		
Blackpoll Warbler (SC)		

AT NIGHT

Small	**Medium**	**Large**
Eastern Screech Owl	Whippoorwill	Great Horned Owl
Saw-whet Owl	Short-Eared Owl (E)	Barred Owl
	American Woodcock	
	Long-Eared Owl (T)	

WET AREA (Ponds, Marshes, and Rivers)

Small	**Medium**	**Large**
Tree Swallow	Redwinged Blackbird	Ringbilled Gull
Common Yellowthroat	Common Grackle	Herring Gull
Yellow Warbler	Belted Kingfisher	American Black Duck

Swamp Sparrow	Spotted Sandpiper	Mallard
Eastern Phoebe	Kng Rail (T)	Wood Duck
Marsh Wren	Common Moorhen (SC)	Greenbacked Heron
Virginia Rail	Least Bittern (SC)	Snowy Egret
	Pied-Billed Grebe (T)	Great Blue Heron
		American Bittern (SC)
OVERHEAD (Seen Flying Most of the Time)		
Small	**Medium**	**Large**
Chimney Swift	Nighthawk (evening)	Red-tailed Hawk
	Herring Gull	Great Black-Backed Gull Osprey (WL)
SHORE AND OCEAN		
Small	**Medium**	**Large**
Semipalmated Sandpiper	Common Tern (SC)	Common Loon (SC)
Sanderling	Black-Bellied Plover	Great Cormorant
Dunlin	Greater Yellowlegs	Common Eider
Purple Sandpiper	Least Tern (SC)	White Winged Scotor
Ipswich Sparrow	Roseate Tern (T)	Great Black-Backed Gull
Upland Sandpiper (E)	Arctic Tern (SC)	Great Egret
Piping Plover (T)		Black Crowned Night Heron
		Double-Crested Cormorant

4.F Scenic Resources and Unique Environments

Marshfield is rich in scenic resources and unique environments. Some of these areas are described below and identified on the attached Map 3.

1. Scenic Landscapes:

Marshfield has a tract of land designated by the State of Massachusetts as a Scenic Landscape. This salt marsh, the Duxbury Marsh, includes a large portion of the southern part of town, where Marshfield borders the Town of Duxbury, and stretches from Green Harbor to Duck Hill.

With the exception of Carolina Hill, at 265', the highest hilltop in Marshfield, the rest of the town's hilltops have been developed or are in the process of being developed. Although the developed hilltops provide some scenic values, the development has mostly destroyed the hilltops' natural scenic vistas.

Carolina Hill was protected from future development when the town purchased the hill and surrounding land for conservation.

The North River, South River, and Green Harbor River corridors and their surrounding marshland have immense scenic value. These areas are protected by State regulations and the State enacted North River Commission. The North and South

Rivers and their tributaries are also entitled to protection by the State as Outstanding Resource Waters. The North and South Rivers Watershed Association has been vital in educating and organizing citizens to protect the river corridors. It is important that the town continue to enforce the regulations protecting these waters to assure future generations of clean water, scenic views, and wildlife habitat.

The English Salt Marsh Wildlife Management Area, a Massachusetts Open Space Land area, is a 166-acre area at the mouth of the North and South Rivers. The area surrounds Tilden and Trouant's islands and is an exceptional scenic area for the islands' residents and others who venture to the islands.

There are many open meadows scattered throughout Marshfield, both upland and wet meadows. These areas are publicly and privately owned, with the majority of the larger tracts of meadows designated as conservation land. The largest upland and wet meadow is the Daniel Webster Wildlife Sanctuary, owned by the Massachusetts Audubon Society.

Most of the town's agricultural landscape is limited to cranberry bogs, although there are a few small farms, like Little's Farm and Nessralla Farm, and several horse farms.

Marshfield's coastline and barrier beaches provide scenic views of Cape Cod Bay. On clear days, the Pilgrim Monument in Provincetown can be seen from the town's coast.

The Marshfield Historical Commission has designated 34 streets throughout the town as Scenic Roads. The character and charm of these roads are protected by the Historical Commission and the town Planning Board. A map of Marshfield prepared by John Ford Jr. in 1838 shows that several of the town's scenic roads were in use at that time and some are much older than that. Not only do these roads have scenic value, they are also part of the dwindling preserved history of the town. A list of Marshfield's Scenic Roads is located in the appendices.

2. Major characteristic or unusual geologic features or other resources for potential protection and exploration:

Marshfield's extensive salt marshes, for which the town was named, are its most obvious characteristic. As much as two-thirds of the town's salt marshes have been filled and lost to development over the years. Although currently protected by both State and local regulations, increasing development pressures may reduce those protections. The town should purchase salt marsh whenever possible to avoid further losses of this critical and unique ecological resource.

Barrier beaches are also unusual geographic features in town. Most of the barrier beaches have been extensively developed, but the town should consider

enacting regulations limiting rebuilding of storm-damaged structures on barrier beaches, as the Federal government has in other coastal communities such as Scituate's Peggotty Beach through their buy-out program..

3. Cultural, Archeological and Historic areas:

The Daniel Webster Estate and the Winslow House are on the National Register of Historic Places and the Daniel Webster Law Office is one of only 2500 properties in the United States to be listed as a National Historic Landmark by the National Park Service.

The town owns several historical sites, among them, the Daniel Webster Estate and Law Office, the Training Green in Town Center, the original Winslow site, and a portion of the Pilgrim Trail.

There are several privately owned historical sites such as the Isaac Winslow House, the Winslow School, and the Hatch Mill.

Given Marshfield's long history, there are other older homes dotting the town. The town's Historical Commission has identified approximately 300 structures with historical value. These are listed on the state survey of historic properties and are on the state register. The town should take steps to preserve these properties as part of our shared history.

The Marshfield Historical Commission has identified seven areas as potential historic districts: the Training Green, the Main Street / Marshfield Fair area, Ocean Street in Brant Rock, Green Harbor Village, the Webster Estate and the Winslow House historical complex, Marshfield Hills Village, and Union Street in North Marshfield.

There are many endangered archeological areas in Marshfield and the town should make every attempt to preserve these. The Peregrine White Farm tops the Historical Commission's list of endangered areas. The Farm is currently being considered for demolition and development. Other areas are Duck Hill and the Duxbury Marsh, Grandview Avenue, the Old Canal area in Green Harbor, all of the land bordering the North River, parts of the Pilgrim Trail, the Governor Winslow School area, and the John Thomas / Adelaide Phillips Homestead site.

Given the town's long history, there are sure to be other archeological areas that have not yet been identified. However, many Native American archaeological and historical sites have been documented and there are other areas that are being brought to the attention of the state archaeologist.

One area in town that has been of concern to the Historical Commission for a long time is Blackman's Point. The site lies at the mouth of Green Harbor River and is currently used as a trailer park. It has been known as an archeological site since the

1860s with some of its artifacts placed at the Peabody Museum at Harvard University in Cambridge, MA.

Blackman's Point is also a major historical site. The world's first voice radio transatlantic broadcast was sent from Blackman's Point on Christmas Eve 1906. The site escaped development once and is always threatened by the potential of destruction for development in the future. The town should do whatever is necessary to protect this important site. The Town of Marshfield and its Historical Commission should be aggressive in its mission to protect its historical and archeological sites.

4. Unique environments:

Although Marshfield does not have any State designated 'Areas of Critical Environmental Concern', it does have several areas with unique environments. These areas include the town's numerous salt marshes, river corridors, harbors, and barrier beaches.

4.G Environmental Challenges

1. Hazardous Waste and Brownfield Sites

Under the 21E Database 56 sites are listed which had a reportable spill of oil or hazardous material. Of these, 14 sites have not been closed out of DEP's tracking database. Five of the 14 sites have a direct influence to the Zone 2 of the Furnace Brook Aquifer. These 5 sites are as follows:

1 Antons Cleaner, 668 Plain Street;
2 Briteway Car Wash, 535 Plain Street;
3 Gillespie Ford, 700 Plain Street;
4 Marshfield High School, 89 Forest Street; and
5 Settles Glass, 820 Plain Street.

Current List of Open 21 E Sites in Marshfield

Release Tracking Number(RTN)	Release Address	Site Name/Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type
4-0000866	668 PLAIN ST	ANTONS CLEANERS	NONE	2/1/1990	TIER 1B	1/23/1995	PHASE V		Hazardous Material
4-0012094	535 PLAIN ST	BRITEWAY CAR WASH	120 DY	11/25/1996	TIER 1C	3/9/2000	PHASE IV		Hazardous Material
4-0013222	700 PLAIN ST	GILLESPIE FORD DEALER FMR	120 DY	7/28/1997	DEF TIER 1B	7/14/1998			Oil
4-0011993	1896 OCEAN ST	GULF SERVICE STATION	120 DY	3/7/1996	TIER 1C	3/6/1997	PHASE II		Hazardous Material
4-0010528	969 OCEAN ST RTE 139	MARSHFIELD BP	72 HR	5/4/1994	STMRET	12/9/1996	PHASE II		Oil and Hazardous Material
4-0001210	PARSONAGE ST RTE 139	MARSHFIELD DPW	NONE	10/15/1992	TIER 1C	4/9/2001	PHASE II		

Release Tracking Number(RTN)	Release Address	Site Name/Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type
4-0001172	89 FOREST ST	MARSHFIELD HIGH SCHOOL	NONE	7/13/1993	TIER 1B	4/10/1995	PHASE III		Hazardous Material
4-0014025	714 WEBSTER ST	NO LOCATION AID	TWO HR	7/9/1998	DEF TIER 1B	7/16/1999			Oil
4-0015251	1901 OCEAN ST	NO LOCATION AID	120 DY	1/11/2000	TIER 1C	1/31/2002	PHASE II		Oil and Hazardous Material
4-0000889	CLAY PIT RD	PROPERTY	NONE	7/15/1993	DEF TIER 1B	8/11/1997			Oil
4-0006010	1933 OCEAN ST	PUBLIC PETROLEUM	NONE	12/13/1993	TIER 1C	5/21/1996	PHASE V		Oil
4-0017781	820 PLAIN ST RTE 139	SETTLES GLASS	72 HR	4/18/2003	UNCLASSIFIED	4/18/2003			Oil
4-0000378	95 CENTRAL ST	TAYLOR MARINE CORP	TWO HR	6/29/1987	REMOPS	1/15/2002	PHASE V		
4-0000866	668 PLAIN ST	ANTONS CLEANERS	NONE	2/1/1990	TIER 1B	1/23/1995	PHASE V		Hazardous Material
4-0013572	974 PLAIN ST	BAPTIST CHURCH	TWO HR	12/23/1997	RAO	12/2/1998		A2	Oil
4-0000372	975 PLAIN ST	BFI MAINTENANCE FACILITY	NONE	4/15/1987	RAO	5/18/1995		A1	Oil
4-0012094	535 PLAIN ST	BRITEWAY CAR WASH	120 DY	11/25/1996	TIER 1C	3/9/2000	PHASE IV		Hazardous Material
4-0001013	430 CARESWELL ST	CEDARVIEW SERVICE STATION	NONE	1/15/1991	RAO	1/11/2002	PHASE II	B1	Oil
4-0010263	SOUTH RIVER RD OFF RTE 3A	CENTRAL FIRE STATION	TWO HR	2/7/1994	RAO	11/14/1994			Hazardous Material
4-0000558	2139 OCEAN ST	CITGO SERVICE STATION	NONE	6/27/1988	RAO	6/10/1997		A2	
4-0001059	83 ENTERPRISE DR	COMMERCE CENTER TRUST	NONE	7/15/1993	RAO	4/30/2001	PHASE III	A2	
4-0010933	969 OCEAN ST	FRASCAS BP SERVICE STA	72 HR	11/18/1994	RTN CLOSED	11/27/1995			Oil
4-0014933	1399 OCEAN ST	GAS STATION	TWO HR	8/12/1999	RTN CLOSED	12/15/1999			Oil
4-0013222	700 PLAIN ST	GILLESPIE FORD DEALER FMR	120 DY	7/28/1997	DEF TIER 1B	7/14/1998			Oil
4-0000466	RTE 139	GREEN HARBOR MARINA	NONE	1/15/1988	DEPNFA	8/2/1996			
4-0010189	219 CANAL ST	GREEN HARBOR SECTION	TWO HR	1/10/1994	RAO	1/3/1995		A2	Oil
4-0011993	1896 OCEAN ST	GULF SERVICE STATION	120 DY	3/7/1996	TIER 1C	3/6/1997	PHASE II		Hazardous Material
4-0015098	1896 OCEAN ST	GULF STATION FMR	72 HR	10/29/1999	RTN CLOSED	11/23/1999			Oil
4-0013675	696 PLAIN ST	HEALTH STOP	120 DY	2/13/1998	RTN CLOSED	2/13/1998			Hazardous Material
4-0000210	220 MAIN ST	JONESIE SERVICE CTR	NONE	9/3/1986	DEPNFA	7/23/1993			
4-0010370	1919 OCEAN ST	LOT 21 OS ASSESSORS	120 DY	3/29/1994	RAO	5/31/1994	PHASE II	B1	Hazardous Material

Release Tracking Number(RTN)	Release Address	Site Name/Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type
		MAP H7							
4-0001238	923 PLAIN ST	MAGUIRE CHEVROLET INC	NONE	7/15/1993	RAO	8/11/1997		A2	
4-0010528	969 OCEAN ST RTE 139	MARSHFIELD BP	72 HR	5/4/1994	STMRET	12/9/1996	PHASE II		Oil and Hazardous Material
4-0001210	PARSONAGE ST RTE 139	MARSHFIELD DPW	NONE	10/15/1992	TIER 1C	4/9/2001	PHASE II		
4-0001172	89 FOREST ST	MARSHFIELD HIGH SCHOOL	NONE	7/13/1993	TIER 1B	4/10/1995	PHASE III		Hazardous Material
4-0017637	WEBSTER ST	MARSHFIELD PLAZA	TWO HR	2/12/2003	RAO	2/21/2003		A1	Oil
4-0001012	35 PARSONAGE ST	NE WILLIAMS MUNICIPAL GARAGE	NONE	10/15/1992	RAO	5/10/1996		A2	Oil
4-0013152	612 PLAIN ST	NEAR ENTERPRISE DRIVE	120 DY	6/13/1997	DPS	6/13/1997			Hazardous Material
4-0010378	682 UNION ST	NO LOCATION AID	TWO HR	10/1/1993	RAO	12/7/1998		A2	Oil
4-0010073	134 OLD COLONY AVE	NO LOCATION AID	TWO HR	11/3/1993	RAO	11/3/1994		A2	Oil
4-0010454	RTE 139 969 OCEAN ST	NO LOCATION AID	120 DY	5/4/1994	RTN CLOSED	6/27/1995			Oil
4-0012942	JUNE DR	NO LOCATION AID	TWO HR	4/4/1997	RAO	6/9/1997		A2	
4-0014025	714 WEBSTER ST	NO LOCATION AID	TWO HR	7/9/1998	DEF TIER 1B	7/16/1999			Oil
4-0015047	497 PLAIN ST	NO LOCATION AID	120 DY	10/4/1999	DPS	11/4/1999			Oil and Hazardous Material
4-0015170	1227 SOUTH RIVER ST	NO LOCATION AID	72 HR	12/8/1999	RAO	2/15/2000		A2	Oil
4-0015251	1901 OCEAN ST	NO LOCATION AID	120 DY	1/11/2000	TIER 1C	1/31/2002	PHASE II		Oil and Hazardous Material
4-0015673	1840 OCEAN ST	NO LOCATION AID	120 DY	8/9/2000	RAO	8/16/2001		A2	Oil
4-0016459	11 RIDGE RD	NO LOCATION AID	TWO HR	8/1/2001	RAO	8/9/2001		A1	Oil
4-0017094	739 SOUTH RIVER ST	NO LOCATION AID	72 HR	5/30/2002	RAO	8/1/2002		A2	Oil
4-0016068	35 PARSONAGE ST	NORTH DRY WELL	120 DY	2/14/2001	RAO	10/24/2001		A2	Oil
4-0016073	76 LITTLE LN	NORTH RIVER	TWO HR	2/21/2001	ADEQUATE REG	2/21/2001			Oil
4-0010416	200 MAIN ST	NYNEX FACILITY	72 HR	4/14/1994	RAO	3/31/1995		A1	Oil
4-0014967	1874 OCEAN ST	OPPOSITE WEBSTER ST	120 DY	8/20/1999	DPS	8/27/1999			Hazardous Material
4-0015787	PLAIN ST	POLE 18/58	TWO HR	9/28/2000	RAO	11/1/2000		A1	Oil
4-0010172	1948 OCEAN ST	PROCUT HAIR SALON	TWO HR	12/22/1993	RAO	11/28/1994		A2	Oil
4-0000759	SUMMER ST	PROPERTY	NONE	10/15/1989	LSPNFA	5/28/1996			

Release Tracking Number(RTN)	Release Address	Site Name/Location Aid	Reporting Category	Notification Date	Compliance Status	Date	Phase	RAO Class	Chemical Type
4-0000889	CLAY PIT RD	PROPERTY	NONE	7/15/1993	DEF TIER 1B	8/11/1997			Oil
4-0006010	1933 OCEAN ST	PUBLIC PETROLEUM	NONE	12/13/1993	TIER 1C	5/21/1996	PHASE V		Oil
4-0012962	4 ATINA RD	RESIDENCE	72 HR	4/22/1997	RAO	8/11/1997		A1	Oil
4-0016806	610 MORAINE ST	RTE 3A	TWO HR	12/26/2001	RAO	1/2/2003		A2	Oil
4-0017781	820 PLAIN ST RTE 139	SETTLES GLASS	72 HR	4/18/2003	UNCLASSIFIED	4/18/2003			Oil
4-0000753	2054 OCEAN ST	SUNOCO SERVICE STATION	NONE	1/15/1990	RAO	8/14/1996		A2	
4-0000378	95 CENTRAL ST	TAYLOR MARINE CORP	TWO HR	6/29/1987	REMOPS	1/15/2002	PHASE V		
4-0015523	95 CENTRAL ST	TAYLOR MARINE CORP	72 HR	6/2/2000	RTN CLOSED	6/5/2001			Oil
4-0014487	95 CENTRAL ST	TAYLOR MARINE INC	72 HR	1/27/1999	RTN CLOSED	1/27/2000			Oil
4-0000789	2170 OCEAN ST	TEXACO SERVICE STATION	NONE	10/24/1989	RAO	12/23/1996		A3	Oil
4-0013813	CLAY PIT RD	TOWN LANDFILL	TWO HR	4/17/1998	RAO	12/14/1999		A1	
4-0013083	1900-1920 OCEAN ST	WEBSTER ST	120 DY	6/5/1997	DPS	6/5/1997			Hazardous Material
4-0016069	35 PARSONAGE ST	WEST DRY WELL	120 DY	2/14/2001	RAO	10/24/2001		A2	Oil

2. Landfills

Marshfield had many small landfills/burn dumps in various sections of the town. The known small dump/landfills are located off Plain Street [between Main Street and Forest Street on the North Side of the street], Marshall Street that abuts the Green Harbor River and Pine Street [North side between Forest and Main Streets]. Marshfield's Municipal sanitary landfill located off Clay Pit Road west of Grove St. and North of South River Street. Marshfield also has a Commercial/ Construction Debris Landfill aka S.Ray Landfill off ClayPit Rd just North of the Municipal Landfill.

3. Erosion

Over the past 50 years, a significant amount of public and private money has been spent to construct seawalls and other structures to armor the shoreline to reduce the rate of erosion. The armoring of a coastline has a two-pronged effect of temporarily reducing the erosion in that area but also reducing the volume of sediment needed to nourish the beaches and keep pace with sea level rise. This sediment deficit results in a recession and narrowing of beaches and an increase in coastal storm damage during storm events. For example, much of the sand sources for Humarock Beach in Scituate have been eliminated due to seawall and revetment construction during the 1940s and 1950s. Consequently, the recent trend of erosion that began in the 1950s is not only continuing, it is accelerating (MCZM, 2003).

Based on analysis of historic shoreline locations tracked from the mid-1880s to 1994, the Massachusetts Coastal Zone Management Agency (CZM) produced maps of the Massachusetts shoreline to demonstrate long-term shoreline change (MCZM, 2003). These maps were prepared and distributed to the Conservation Commissions of coastal communities to aid local decision-makers in identifying coastlines that are prone to storm damage and significant erosion and to assess potential erosion. For Marshfield, rates of shoreline change ranged from a minimal 0.07 feet/year (at a transect location at Fieldston Beach) to approximately 0.5 foot/year (at transect locations at Sunrise Beach, Ocean Bluff, and Brant Rock) to approximately one foot/year (at a transect just north of Rexhame Beach (MCZM, 2003). A transect located at Green Harbor showed a beach accretion rate of 1.94 feet/year.

The challenge, therefore, is to site coastal development in a manner that allows natural physical processes, such as erosion, to continue (MCZM, 2003). To meet this challenge, coastal managers, property owners, and developers must work with erosion, not against it, by understanding the magnitude and causes of erosion, and applying appropriate management techniques that will allow its beneficial functions to continue.

4. Chronic Flooding

Marshfield has had Chronic flooding in the Brant Rock Esplanade area, Surf Ave/ Monitor Rd area, and Pleasant Street area. Marshfield addresses some of these areas in the Report Project Impact.

The DPW has a standing list of various site that are problem areas which include the following areas:

Brant Rock Esplanade	Flooding from seawater overtopping the sea walls and lack of runoff storage capacity.
Dyke Rd.	Major storm surges overtop road at Green Harbor Marina
Perigrine White Drive	Private Road washes out and culverts are undersized.
Cohasset Ave.	Major storm events impact area near South River St.
South River St.	Culvert near 1232 South River St. is under sized and flooding occurs during major storm events.
South River (Veterans Park)	The South River continues to flood in areas up gradient from the Veteran's park.

Riverside Circle	Poor draining soils in the area and perched water contribute to minor street flooding.
Humarock Area Bayberry St	Flooding from South River and Ridge Rd
Monitor Road – Rexhame	Low elevation within several feet of sea level, with chronic flooding

5. Sedimentation

As noted in the erosion section above, a significant beach accretion rate was estimated for a transect at Green Harbor. Concomitant with this accretion is the sediment deposition within Green Harbor such that Green Harbor has been dredged almost annually for the past 20 years[12]. Also noted was that the South River dredging project began in December 2003 for the section from the Sea Street Bridge to the mouth. This section has become shallow due to sedimentation since its last dredging approximately 30 years ago. In addition to the sedimentation of Marshfield's harbors and rivers, sedimentation is also a problem in Marshfield's streams and wetlands as a result of an antiquated road drainage system. In addition to the sediment load carried to the streams and wetlands, these systems carry pollutants including petroleum products, fertilizers, and pesticides.

6. Development Impact

High density housing (i.e., 40B development) within the town's Zone II recharge areas are a threat to the town’s water supplies.

Wastewater disposal systems of these high-density developments are often constructed to minimum State standards which offer little protection and designed with no margin for error or factor of safety to protect the town’s aquifers and water supplies. Even the nitrate loading from the current Title 5 septic systems exceed the five ppm planning goal required by the town and the DEP Division of Water Supply. This inconsistency in State regulations is the very reason why towns have implemented stricter local control. If the nitrate levels at the water supply exceeds ten ppm, the water supplier is required to shutdown and take the supply off line. The town has several wells that are located in developed areas that have consistently had nitrate levels in the four to five ppm range. Under certain pumping conditions, the levels have been higher. Nitrate levels at the Webster Well No. 2 have increased substantially from two ppm to four ppm due to additional development on Red Brick Road. Webster Well No. 1 has increased from four ppm to five ppm. Furnace Brook Well No. 4 has been consistently in the three to four ppm range over the past several years. There were previous years that were over five ppm. Several new homes have been built immediately upgradient of the well. The levels are expected to increase. Nitrate levels at the School Street Well are currently at two ppm. The 10-unit development Overlook Farm is located upgradient and within 1,000 feet of the well and is expected to increase the nitrate

levels one to two ppm. Nitrate levels will increase to three to five ppm level at the Ferry Street Well No. 1 which is currently less than one ppm, when the Metuxet Woods 40B development is constructed. The proposed wastewater treatment facility for that development will require an operator to run the facility. A private association will be required to fund and oversee the maintenance and operation of such a facility. The town is concerned about the longevity of such an arrangement and long-term protection of the town's Littles Creek aquifer and Ferry Street water supply well located approximately 400 feet downgradient of the development. The town is also concerned with other contaminants resulting from improper and bad housekeeping practices (i.e., disposal of household hazardous waste) and the application of deicing chemical and road salt in areas so close to the municipal water supply.

7. Ground and surface water pollution including both point and non-point sources

VOC contamination from a point source along Route 139 has impacted the Furnace Brook aquifer and treatment was required on three of four Furnace Brook wells. Water quality of Webster Street wells is being degraded by residential septic systems. The area has been identified as a priority for sewer expansion. Municipal water supply wells within the Furnace Brook aquifer along Rte 3A (Main Street) are being impacted by road salt. There are approximately 400 outfall pipes, 4,000 catch basins and numerous detention basins that comprise the town's stormwater system. As part of the Phase II NPDES permit; the town is required to identify points of discharge and to take steps to reduce stormwater pollution to the maximum extent practicable. Sediment from roadway runoff has accumulated in a vast number of these discharge points. The South River has been impacted by elevated fecal coliform counts in the area from Veteran's Park Rte 3A to the Willow Street Bridge. The town is conducting an investigation to determine appropriate mitigation measures. The town's sewer extension project "Sewer 2000", currently under construction, will address similar pollution to the South River from failed septic systems within the Southport subdivision.

8. Impaired water bodies, both in terms of water quality and water quantity (available through DEP).

Water Quality:

Significant problems exist in many lakes and river segments, often a result of "non point source" pollution (i.e., stormwater runoff.) These waters are considered impaired if they do not meet their designated uses. The following list of impaired waters has been developed by the Division of Watershed Management: (Section 303 (d) of Clean Water Act)

South Coastal Watershed

Category 3 (no uses assessed)
- Winslow House Pond (23 acres)
- Winslow Cemetery Pond (10 acres)

Green Harbor River (5.3 miles)
South River (3.9 miles)

Category 4c (Impairment not caused by pollutant)
Black Mount Pond (16 acres)

Category 5 (Waters Requiring a TMDL[13])
Green Harbor (-3 square miles)
Portions of the North River (.44 square miles)
South River (Main Street to confluence of the North River)

The town has recently been issued a Phase II NPDES permit managed jointly by the EPA and DEP. The Phase II permit requires the town to reduce the discharge of pollutants to the maximum extent practicable, protect water quality, and satisfy the appropriate water quality requirements of the Clean Water Act.

5 Inventory of Lands of Conservation and Recreation Interest

Marshfield currently has 5056.47 acres of open space that includes land under conservation restriction, land conditionally protected by Chapter 61 and public and nonprofit parcels that are used for a variety of recreational activities.

The value of continued protection of this land and the expansion of the inventory cannot be overstated. With the rapid development of our remaining buildable land, maintaining and increasing the conservation and recreation acreage is critical to preserving wildlife habitat, environmental protection of areas with water resource value, preservation of sensitive salt marshes and other wetlands as well as providing valuable passive and active recreation opportunities for a healthy community and a visually pleasing environment.

Expanding the current inventories, monitoring Chapter 61 land and conservation restrictions as they expire is a goal of the Open Space Committee as it's work moves forward. The Wildlands Trust, the Massachusetts Audubon Society, the North and South River Watershed Associations, the Marshfield Recreation Department, Conservation Commission, Planning Board, Department of Public Works and Open Space Committee are all working cooperatively to ensure these goals are achieved.

5.A Private Parcels

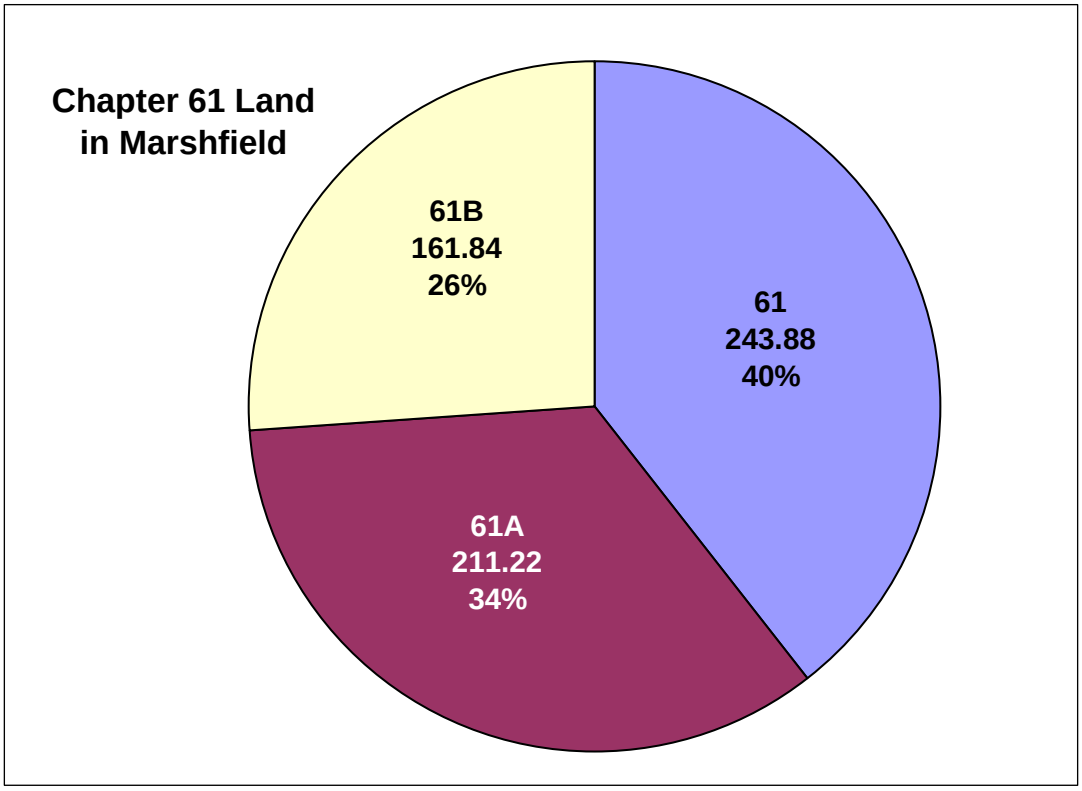
Water Resource Land

Marshfield has reviewed all parcels with development potential within the Zone IIs of the town's water supply wells that would have a detrimental effect if developed. This list is not available for public review at this time.

Chapter 61 Land

Chapter 61 is all land designated as forest land. Chapter 61A land is all land designated as agricultural/horticultural land that is in excess of 5 acres. Some examples of this land are cranberry bogs, orchards, grape vineyards, productive woodland (christmas trees, woodlots) and nurseries. Chapter 61B land is all land designated as recreational land. Some examples of this land are hiking trails or paths, camping, boating, golfing, fishing areas, and horseback riding trails.

The following is a chart and table detailing the current list of Marshfield's Chapter 61 lands, with the owner and acreage. Additional detail of this land is available from MassGIS.



Owner	Parcel	Parcel Reference	Acreage
Chapter 61			
Archer, Dean & Laurie J	J04-03-54D	Pilgrim Tr	10.22
Baker, Arthur Howland Jr.	H06-02-37	Moraine St	13.61
Cliggott, Catherine	H04-01-08	Moraine St	5.56
Costello, Esther M	F06-01-02	Off Pudding Hill Lane	35.75
Harlow, George D	D17-01-21	Highland St	22.23
McLarey, Thomas F & Donalda	D18-02-06	Main St	14.50
Moraine Realty Trust McGee, Carolyn Tr	H05-01-22A H05-01-23A	Moraine St	1.40 17.40
Nerger, George E & Natalie	G11-01-01A	Ferry St	20.30
Prouty, Stephen D	D17-01-02A	Highland St	21.03
Romano Childrens Trust David B Romano Tr	B13-01-14A	Off Union St	10.00
Little, Christopher & Marjorie	B16-02-04A	Union St	5.75
McGee, Frank J Jr & Frisbie, Lloyd B Jr	B14-01-04A	Union St	10.00
Nessralla Farms Inc	K09-01-01A	Ocean St	5.00
North, Theresa	C11-02-09A	Union St	6.00
O'Donnell, Bertram & Karen	G15-05-21 G15-05-23 G16-08-28B H16-01-38	Summer St	2.30 1.30 0.52 1.00
Rugani Family Trust	E15-03-03A	Main St	14.23

Owner	Parcel	Parcel Reference	Acreage
Salvetti, Aldo P	F15-02-12A	Pleasant St	5.00
Stephenson, Scott W	B13-01-10A	Union St	7.00
Whitford, Brad & Karen	F19-01-10D	Summer St	13.78
Chapter 61B			
Rolling Greens Realty Tr Manuel L Francis Tr	I06-05-13A	Webster St	161.84
Chapter 61A			
Abbot, Peter & Patricia	B16-01-22A B16-01-15A	Union St	14.53 11.95
101 Bakers Lane Realty Tr Laurie Baker Tr	G06-01-20B	Bakers Ln	30.50
Ceccarelli Union St Trust Ceccarelli, Anne B Tr	B16-01-17A	Union St	9.50
Chandler, Carelton & Barbara	H09-02-08A H09-02-02	South River St	10.19 32.00
Chandler, Howard	H10-02-03	South River St	19.50
Erickson, Alfred	G17-02-16B	Summer St	14.85
Goggin, Edward J	B15-01-02A	Union St	58.10
Hooper, Donald & Andrea	H05-01-05	Dudley Ln	10.10

Conservation Restrictions

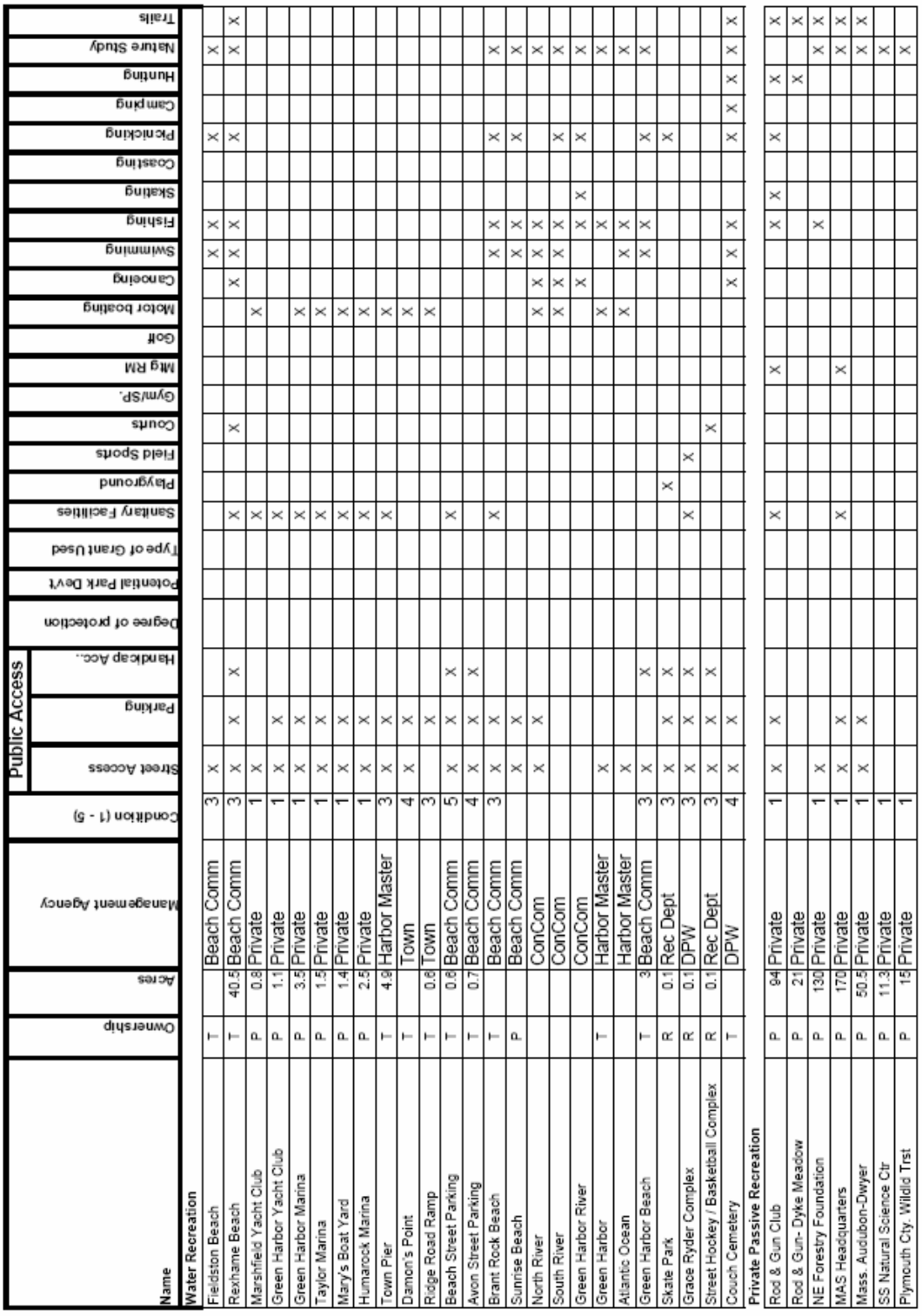
Conservation restrictions are an excellent way to protect land in perpetuity. Conservation restrictions will be encouraged as part of a viable land protection strategy. The following is the current list of Marshfield's conservation restricted lands (as of 5/13/04).

Parcel #	Owner	Address
G09-1-17	WM Stanton	New St
G09-1-3	Davis	New St R
G09-1-18	Farrell	Main St
F10-3-45	David, Cecil	Main St
F10-3-27	Kokoszka	Furnace St
F10-3-26	Bunszel	Furnace St
F10-3-24	Brannum	Furnace St
F10-3-46	Christmas	Main St
F10-6-7	Callahan	Furnace St
F10-6-6	Callahan	Furnace St
F11-1-4	Dahill	Ruggle Road
E12-5-10	Derr	Old Main St Ext
E12-2-2	Junior	Main St
D13-2-8	Yurgelun	Forest St Rear
D16-2-4	Doherty	Valley Path R
D16-2-7	Laura & Kyle Trust	Valley Path R

Parcel #	**Owner**	**Address**
H07-4-37	Curtlo	Snow Road
I02-1-5	Myers	Settlers Path
D17-2-17	Judy White Bradford	Highland St R
D17-2-18	Ronald Anderson	Highland St R

5.B Public and Non-Profit Parcels

Recreation Inventory



Name	Ownership	Acres	Management Agency	Condition (1 - 5)	Public Access: Street Access	Public Access: Parking	Public Access: Handicap Acc...	Degree of protection	Potential Park Dev't	Type of Grant Used	Sanitary Facilities	Playground	Field Sports	Courts	Gym/SP.	Mtg Rm	Golf	Motor boating	Canoeing	Swimming	Fishing	Skating	Coasting	Picnicking	Camping	Hunting	Nature Study	Trails
Water Recreation																												
Fieldston Beach	T		Beach Comm	3	X															X	X			X			X	
Rexhame Beach	T	40.5	Beach Comm	3	X	X	X				X			X					X	X	X			X			X	X
Marshfield Yacht Club	P	0.8	Private	1	X						X							X										
Green Harbor Yacht Club	P	1.1	Private	1	X	X					X																	
Green Harbor Marina	P	3.5	Private	1	X	X					X							X										
Taylor Marina	P	1.5	Private	1	X	X					X							X										
Mary's Boat Yard	P	1.4	Private	1	X	X					X							X										
Humarock Marina	P	2.5	Private	1	X	X					X							X										
Town Pier	T	4.9	Harbor Master	3	X	X					X							X										
Damon's Point	T		Town	4	X	X												X										
Ridge Road Ramp	T	0.6	Town	3		X												X										
Beach Street Parking	T	0.6	Beach Comm	5	X	X	X				X																	
Avon Street Parking	T	0.7	Beach Comm	4	X	X	X																					
Brant Rock Beach	T		Beach Comm	3	X	X					X									X	X			X			X	
Sunrise Beach	P		Beach Comm		X	X														X	X			X			X	
North River			ConCom		X	X												X	X	X	X						X	
South River			ConCom															X	X	X	X			X			X	
Green Harbor River			ConCom																X		X	X		X			X	
Green Harbor	T		Harbor Master		X													X									X	
Atlantic Ocean			Harbor Master		X													X		X	X						X	
Green Harbor Beach	T	3	Beach Comm	3	X		X													X	X			X			X	
Skate Park	R	0.1	Rec Dept	3	X	X	X					X												X				
Grace Ryder Complex	R	0.1	DPW	3	X	X	X				X		X															
Street Hockey / Basketball Complex	R	0.1	Rec Dept	3	X	X	X							X														
Couch Cemetery	T		DPW	4	X	X														X	X	X		X	X	X	X	X
Private Passive Recreation																												
Rod & Gun Club	P	94	Private	1	X	X					X					X					X	X		X		X		X
Rod & Gun- Dyke Meadow	P	21	Private																							X		X
NE Forestry Foundation	P	130	Private	1	X																X						X	X
MAS Headquarters	P	170	Private	1	X	X					X					X											X	X
Mass. Audubon-Dwyer	P	50.5	Private	1	X	X																					X	X
SS Natural Science Ctr	P	11.3	Private	1																							X	
Plymouth Cty. Wildld Trst	P	15	Private	1																								X

Name	Ownership	Acres	Management Agency	Condition (1 - 5)	Public Access			Degree of protection	Potential Park Dev't	Type of Grant Used	Sanitary Facilities	Playground	Field Sports	Courts	Gym/SP.	Mtg RM	Golf	Motor boating	Canoeing	Swimming	Fishing	Skating	Coasting	Picnicking	Camping	Hunting	Nature Study	Trails
					Street Access	Parking	Handicap Acc.																					
Coast Guard Station	R	40	Rec Dept	4	X	X	X		P				X	X			X						X	X	X		X	X
Hatch Mill	H	3.8	Private	1		X															X						X	
Winslow House	H	17	Historical Com		X	X	X				X						X											
Phillips Farm	P	405	Private	1		X																					X	X
Hoyt Hall Preserve	P	123																										
Two Mile Reservation	P	68			X	X																		X		X	X	X
Winslow School	H	0.2	Town	4	X	X	X																					
Active Recreation																												
Marshfield Country Club	P	101.6	Private	1	X	X										X	X							X				
Green Harbor Golf Course	P	159	Private	1	X	X										X	X											
Airport	T	128.4	Town	4	X	X					X																	
YWCA	P	9.2	Private	1	X	X					X	X		X	X	X				X				X			X	X
Fairgrounds	P	63	Private	1	X	X					X		X			X												
Webster House	H	18	Town	4	X	X					X																X	X
DPW																												
Union St. Well Site	DPW	20.2	DPW																									
Church St Well Site	DPW	52	DPW			X																					X	X
Lach Pit Well Site	DPW	29.9	DPW			X																					X	X
School St. Well Site	DPW	10.7	DPW																								X	
Tree Pit	DPW	8.8	DPW			X																					X	X
Furnace Brook Watershed	DPW	32.1	DPW			X																		X			X	X
Main St. Well Site	DPW	12.5	DPW			X																					X	X
Main St. Well Site	DPW	11.8	DPW			X																					X	
Black Mount Well Site	DPW	16.8	DPW			X																					X	
Ponderosa Pines Well Site	DPW	16.3	DPW			X																						
Hall Land Well Site	DPW	9	DPW																									
South River St. Wells	DPW	14.4	DPW																								X	X
Fair Well Site	DPW	15.3	DPW																								X	X
Parsonage St. Well Site	DPW	36.7	DPW			X																						
Old Mt. Skirgo Well Site	DPW	50.5	DPW			X																X					X	
Spring St. Well Site	DPW	19.9	DPW			X																X					X	
Winslow Cemetery	DPW	6.1	DPW			X																		X			X	X
Cedar Grove Cemetery	DPW	8.6	DPW			X																X					X	

Name	Ownership	Acres	Management Agency	Condition (1 - 5)	Public Access			Degree of protection	Potential Park Dev't	Type of Grant Used	Sanitary Facilities	Playground	Field Sports	Courts	Gym/SP.	Mtg RM	Golf	Motor boating	Canoeing	Swimming	Fishing	Skating	Coasting	Picnicking	Camping	Hunting	Nature Study	Trails
					Street Access	Parking	Handicap Acc.																					
Ferry St. Cemetery	DPW	0.5	DPW																								X	
Old Main St. Cemetery	DPW	6.5	DPW			X																						
Couch Cemetery	DPW	98	DPW			X														X	X	X			X	X		
Land Fill	DPW	58.4	DPW																								X	X
Waste Water Treatment	DPW	10	DPW			X																					X	
Plymouth Ave. Pump Stat.	DPW	0.8	DPW			X																					X	
Green Harbor Marsh	T	61	ConCom			X																X						
Peter Igo Park	R	17.3	Rec Dept	2	X	X						X	X	X										X			X	X
Tower Avenue Park	R	1.6	Rec Dept	3	X	X	X				X	X	X											X				
Marshfield Hills Playground	R	1.1	Rec Dept	3	X	X	X				X	X	X	X										X			X	
Wheeler Complex	T	17	Town	4	X	X	X				X	X	X															

Condition Key: 1 - Privately owned, 2 - Limited access, 3 - Accessible, limited or no expansion, 4 - Accessible, possible expansion, 5 - ideal street access, bathrooms, HCP accessible, developed to potential.

Conservation Inventory

		Acres	Management Agency MCC-Marshfield ConCom	Condition (1 - 5) 1=Natural, unspoiled 5=Heavily impacted, needs restoration	Public Access: Street Access	Public Access: Parking Avail (S=Street)	Public Access: Handicap Access	Degree of protection CR-Conservation Restriction DR-Deed Restriction	Potential Park Development (0= NONE, 5= VERY GOOD)	Type of Grant Used (SH-Self Help)	Recreation - "X" current - "p" = Potential: Walking trails	Mountain bikes	Horseback riding	Cross country skiing	Camping (w/permit)	Picnicking	Fishing	Canoe ramp	Wildlife sanctuary	Other
1	Union Street Woodland	41	MCC	2	Y	Y	Y	CR	3	SH	X		X	X		X			X	
2	Cornhill Woodland	123	MCC	2	Y	S		CR	4	SH	X		X		X	X			X	
3a	Mounce's Meadow and Woodlots	47	MCC	3	Y	Y	Y	CR	2		X			X		X			X	
3b	Blueberry Island	16	MCC	2					0						X	X	X			
4	Oak Street Woodland	48	MCC	3	Y	S		CR	2		X									
5	Highland Street Field (now forest)	5	MCC	2					2		X					X			X	
6	Brooks-Tilden Shipyard	15	MCC	3	Y	Y			1	SH	X					X	X	X		
7	Furnace Brook Watershed	287	MCC	2	Y	S		CR	1	SH	X				X		X		X	
8	Carolina Hill Reservation	775	MCC	3	Y	Y			4	SH	X	X	X	X						
9	Silver Pines Lots	7	MCC	4	Y	S			2		X					X			X	
10	Webster's Wildemess	128	MCC	2	Y	Y	Y		1	SH	X					X	X		X	
11	Bass Creek Meadow	32	MCC	2					0		X						X		X	
12	West Brook Meadow	40	MCC	2					0	SH							X		X	
13	Wharf Creek Woodland & Estes Woods	122	MCC	2	Y	S			1		X		X	X		X			X	
14	Brant Rock Marshes	6	MCC	2	Y	S			0										X	
15	South River Marsh	210	MCC	1	Y	S			0		X					X	X	X	X	
16	Sheanwater Marsh	18	MCC	1	Y	S			0								X		X	
17	Bourne Island And Marsh	81	MCC	1	Y	S			0							X	X		X	
18	Cut River Meadow	25	MCC	2	Y	S		CR	0							X			X	
19	Duxbury Marsh	85	MCC	2	Y	Y		CR	0								X		X	
20	North and South River Estuary	28	MCC	1					0										X	
21	Cove Creek Nature Area	2.4	MCC	2	Y	S			2		X						X		X	
22	Ferry hill Thicket	6	MCC	3	Y	S			2		X					X			X	
23	Wildcat Woodland	16	MCC	2				CR	2										X	
24	Taylor Fund Woodland	10	MCC	2	Y				3		X		X						X	
25	John F. Veader, Sr., Memorial Forest	12.7	MCC	2	Y	S		DR	2		X								X	
26	Drake-Powell Memorial Forest	4	MCC	2	Y				2										X	
27	Kent Park Woodlots	8.5	MCC	3	Y	S			3										X	
28	Green Harbor Lots	3.3	MCC	3		S		CR	0										X	
29	Rear Admiral Albert T. Sprague, Jr., Forest	29	MCC	2				CR	2										X	
30	Crowder's Woodland	4	MCC	2					0		X								X	
31	King Philips Esker	16.6	MCC	2	Y			CR	2		X								X	
32	Spring Street Lot	2	MCC	2					0										X	

					Public Access						Recreation - "X" current - "P" = Potential									
		Acres	Management Agency MCC-Marshfield ConCom	Condition (1 - 5) 1= Natural, unspoiled 5= Heavily impacted, needs restoration	Street Access	Parking Avail (S=Street)	Handicap Access	Degree of protection CR-Conservation Restriction DR-Deed Restriction	Potential Park Development (0= NONE, 5= VERY GOOD)	Type of Grant Used (SH-Self Help)	Walking trails	Mountain bikes	Horseback riding	Cross country skiing	Camping (w/permit)	Picnicking	Fishing	Canoe ramp	Wildlife sanctuary	Other
33	Edgewood Forest	8.3	MCC	2	Y				5		X								X	
34	South River Junctions	2.5	MCC	3	Y	Y	Y		4		X					X	X			Gazebo
35	North River Lot	5.9	MCC	2	Y	S		CR	0								X		X	
36	Fetlock Farm	26	MCC	3	Y	S			1		X								X	
37	Southport Lot	2.5	MCC	3	Y	S		CR	4										X	
38	Cooper's Hollow	3.2	MCC	2	Y	S			3		X						X		X	
39	Arrowhead Woods	8.4	MCC	2	Y	S		DR	3		X			X		X			X	
40	Sawyer Woods	4.3	MCC	2				CR	1										X	
41	Plainfield Valley	11	MCC	2	Y			DR	2										X	
42	Donald E. Shute Nature Preserve	10.6	MCC	2	Y	S		DR	2		X		X			X			X	
43	Lawrence Land	17.4	MCC	2				DR	0								X		X	
44	Heather Hill	3.5	MCC	3	Y	S			3							X			X	
45	Old Summer St. Railroad	2.3	MCC	4	Y	S		DR	2							X			X	
46	Dubois Woodlot	17	MCC	4	Y	S		DR	2			X	X	X		X				
47	Black Mount Woodlots	2.8	MCC	3	Y	S			1		X	X				X				
48	Stonybrook Woodlots	8.6	MCC	3	Y	S		DR	5										X	
49	Bourne Park Woodlots	4	MCC	3	Y	S			4							X	X	X	X	
50	Coastal Lot	0.3	MCC	4	Y			DR	4							X	X			
51	Dyke Road Lot	1.3	MCC	3	Y				0										X	
52	Eagles Nest Woodlands	33	MCC	2	Y	S			4		X	X	X	X		X	X	X	X	
53	Kelly/ Highland	1.5	MCC	2	Y	S			3		X					X	X		X	
		2,427.9																		

6 Community Vision

Marshfield has long been, and continues to be, a community that seeks to protect it's natural resources, plan it's growth, remain economically diverse, and enhance quality of life by providing recreational opportunities for people of all ages and abilities.

The elected officials and voters of Marshfield have consistently supported the preservation of open space, protection of historical landmarks, and safeguards for its water supply. The adoption of the Community Preservation Act, support at Town Meeting for conservation land purchases and the adoption of the Water Resource Protection District Zoning Overlay, which is more restrictive than State Title 5 Regulations, demonstrate a community vision of respect for the environment and concern for its citizens.

The Community's ability to provide clean drinking water is reliant on the protection of Open Space. Water Resource Protection is of major importance to the Town of Marshfield. To that end, the Conservation Commission has acquired almost 300 acres in the Furnace Brook and Ferry Street Zone II recharge areas for aquifer protection. Continued protection of water yielding land combined with the need for open space is Marshfield's goal and, as a result, the most heavily weighted section of our Land Acquisition Matrix. As the plans to purchase open space move forward, water protection will be a top priority.

The need for recreational opportunities has also been an important part of town planning. The Recreation Department, through the use of seasonal brochures, program participant surveys, web page comments and suggestions, and outreach by Recreation Commission members to various neighborhood groups, has obtained the needs of the community.

The Recreation Department has identified ambitious goals that include relocating the recreation administrative office and preschool program to facilities at Coast Guard Hill. Program goals include the following: 1) licensed child care program (ages 3-5) seeks to expand program offerings to meet increased demand; 2) the Extended Day Program, working with Superintendent of Schools to establish a program at the Gov. Winslow, Eames Way and Martinson Schools for September 2004. By September 2005, additional sites will be established at South River and Daniel Webster Schools. ; 3) establish a summer day camp at the Coast Guard site for Marshfield children and the children of Marshfield employees; 4) establish intern programs for our preschool, after school programs, as well as a general recreation intern; 5) Develop online registrations, brochure, and accept credit card payments by the end of 2004; 6) Expand the Furnace Brook Middle School (FBMS) After School Programs to include Before School opportunities and publish seasonal program brochure for FBMS; 7) hire additional key recreation staff to include a full-time Program Coordinator; 8) Create a new Skate Park for town residents, and 9) Improve recreation facilities and parks with neighborhood partnerships; 10) the Recreation Department has begun final discussions with the

Superintendent of Schools regarding offering; 11) Develop Adult Education programs at the new coast guard property that offers adult enrichment opportunities.

6.A Description of Process

Open Space Land Acquisition Framework

The members of the Open Space Committee spent a great deal of time working to develop a comprehensive framework for land acquisition and open space protection that reflected the overall values of the town. After ten months of work and ten public meetings, the committee has developed a rating system to be used in the analysis of any parcel being considered for purchase by the town. This rating system will become the basis of future acquisition considerations to ensure that any parcels being considered are in line with the open space and recreational needs determined in this plan.

The framework has five sections:

1. General (e.g., parcel size, funding sources)
2. Water Resource Protection (e.g., well head protection, significant water resource)
3. Conservation (e.g., wildlife habitats, wetland protection, scenic value)
4. Historical Significance (e.g., potential or existing historical site)
5. Recreational Value (e.g., passive or active recreation potential)

Each section is given a weight that reflects the level of value the community currently places on each. The value weight was determined by the Open Space Committee members and feedback from the boards and committees that each represent, as well as feedback sought from other town groups.

After several public meetings and much discussion and debate, a weighting system and framework was finalized and attached here as Appendix D. This framework will become a living document and a critical part of all future open space planning reviews and enhancements.

Recreation Department

The process to determine the community's needs is through the following means: program registration questionnaires; community needs surveys; web page responses, and; discussion with participants, parents, volunteers and staff during various programs. The response of individuals who register for a program(s), and the directors creativity and willingness to devote that time and energy to follow perceived or actual trends, consult with peers in the field, attend local state and regional conferences / workshops, and a willingness to strive to create a program and department, that is second to none. During the summer we had many more students register for Teen Tennis than one staff member could handle. Due to the response, we hired a second staff member and added

the students who were on the wait list. The present Before and After School survey will assist in determining the need for additional licensed extended day programs at the elementary school programs and the location for the pilot site. Residents provide feedback at community events and through phone calls and emails.

6.B Statement of Open Space and Recreational Goals

Recreation Department

The Recreation Department strives to meet the continued demand for indoor and outdoor recreation facilities/ opportunities that are accessible to all residents of the town.

The Department will seek to increase the number of suitable outdoor playing fields for town residents, to meet the demand for increased participation as well as the increase in the number of various team sports for youth, adults, men and women. This will include the availability of bathrooms and lighted playing fields. This will include new track, boating/paddling areas, and nature trails. Handicap access to the beach via boardwalks, and access to the town's various rivers. The department will seek to increase the number of opportunities for adults to utilize indoor facilities for various recreations needs, including sports, arts, and adult education options.

Conservation Commission

Marshfield takes its conservation responsibilities very seriously. The first commission was appointed in 1961 and has been a key component of the town's fabric ever since. The commissioners in the seventies and eighties were incredibly aggressive and successful in land acquisition and much of the wonderful character of our town can be credited to them. Marshfield is a highly desirable community, in large part due to the abundance of open space available to its citizens. It is up to the current commission and all future commissions to continue the fine work done by those who volunteered before us.

With a legacy of over 2,400 acres of open space acquired and cared for since 1961, the vision going forward seems clear. Simply put, it is the overall goal of the Commission to preserve and protect existing land under our care and to further expand the inventory in areas where the most good will come from acquisition and protection. Generally speaking, expansion will focus on the following areas:

1. Lands that surround current and potential public water supplies;
2. Parcels within or abutting existing conservation land that, if acquired, will create or extend greenbelts within and around town;
3. Salt marshes – one of the most important and productive ecosystems that our town is fortunate enough to have, and;
4. Habitat that is critical or unique for the survival of threatened or endangered species.

Each of these areas is critical to the ongoing health and diversity of our community as well as preserving its centuries-old character.

Water Resource Protection

The Board of Public Works, which oversees the Department of Public Works, is committed to protecting and ensuring that the drinking water in Marshfield meets or exceeds the state drinking water regulations. This task is becoming a challenge because of development in and around our wells and wellfields, Title 5 septic systems close to public water supply wells, the need for affordable high density housing, business growth and development, and the need for storm water management.

Water suppliers across the State are being faced with similar challenges. All public drinking water wells are susceptible to contamination for a variety of reasons. The quantity of water as well as potential options for new well locations are limited.

Marshfield needs to develop a Water Resource Protection Plan for the future quality of its drinking water. The benefits of a water resource protection plan are:

- Protects drinking water quality at the source,
- reduces monitoring costs,
- expensive water treatment costs can be reduced or avoided,
- prevents costly contamination clean-up,
- prevents contamination and saves costs of new source development, and
- stabilizes the water rate for the long-term.

The components of a water resource protection plan include water conservation, good housekeeping practices and implementation of a wellhead protection strategy including land acquisition, conservation restrictions and land management.

7 Analysis of Needs

7.A Summary of Resource Protection Needs

7.A.1 SCORP

As part of the review process, consideration was given to the Statewide Comprehensive Outdoor Recreation Plan (SCORP). The SCORP provides an invaluable tool for the town and state to use in planning for future need and uses of outdoor resources for public and relaxation.

The Town of Marshfield has invested time, money and energy into the Geographic Information System (GIS) to help track the inventory of all open space and recreation areas in the town by mapping the sites and storing the data. By doing so, the town has then been able to enter the data into the state's centralized computers to help produce maps displaying every protected open space or recreation site and a data base providing information on ownership, use, facilities and other relevant information.

Needs Assessment: The greatest statewide need is for trail-based activities, with walking and road biking in strongest demand. Marshfield has limited trail-based activity space in town and does fall short in this area of recreation. Field based activities rank second as priority need for facilities, with playground activity; tennis and golfing ranked at the top of the activity need list. Marshfield currently has numerous playgrounds and fields located around town, many of which reside on or close to school properties. Marshfield has 2 golf courses: One private and one public.

Usage of Outdoor Space: Coastal beaches and shorelines top the list (66%)*[14] of most widely visited sites by residents of the Southeastern region, of which Marshfield resides. Golf courses, neighborhood parks, and playgrounds are widely used, second only to coastal resources. The next group of resources that reached more than 25%* of the residents would include historical and cultural sites, ponds, rivers, and streams and forests. More than one in four* residents visited wildlife conservation areas, trails and greenways.

7.A.2 Conservation

As can be ascertained from the conservation land maps included in the appendices, Marshfield does have a great deal of land under its care and protection. However, there remain several areas around town that would benefit from protection. The four key areas of resource protection needs are:

1. The Polder: that area of Marshfield known as the Green Harbor Reclamation District;
2. Salt marshes along the South River;

3. In-holdings: those undeveloped parcels within or abutting existing conservation land, and;
4. Maintenance of existing conservation land holdings.

Each is addressed in more detail, below.

The Polder

Marshfield's coastal location brings with it some unique challenges such as the Green Harbor Reclamation District, known as the polder. This former salt marsh lies between Webster and Plymouth Streets east to west and Ocean and Careswell Streets, north to south. It is an area below sea level created by construction of a dike in 1872 to prevent the flood of high tide and create farmland from salt marsh. Although creating valuable farmland was initially successful, the polder has lead to many thorny problems. As agriculture waned, this lowland was developed through construction of beach cottages on tiny lots, which have steadily been improved into year-round single-family dwellings, placing residents in a flood-prone, dangerous, and unhealthy environment. Standing water remains in shallow drainage ditches providing breeding habitat for mosquitoes, gnats, and other insects. Yards and roadways are often flooded after moderate rainfalls or when the ocean overtops the seawall during coastal storms. Further development would serve only to exacerbate these already intractable problems. Purchase and/or restriction of undeveloped land (and perhaps some of the lowest elevation developed land) within this area would be beneficial.

Salt Marshes

Salt marshes are one of the world's most productive ecosystems. Marshfield is very fortunate to have acres of marshes along the South River and North River. While salt marshes are currently protected lands under the state and local wetlands protection laws, it is prudent to assume that this may not always be the case. One way to ensure that they remain in their natural, unspoiled state is to acquire the land for perpetual protection.

Marshfield has worked to protect these marshes in the past through projects such as the recently-completed sewer extension and stormwater drainage improvements resulting in noticeable improvement in water quality into the South River and through acquisition for conservation. It is expected that several extensive shellfish beds currently closed to harvesting due to bacterial pollution may reopen and provide recreational shellfishing opportunities.

In-holdings

There are several parcels throughout the town that should be considered for acquisition due to their location next to or within other protected lands. Several obvious parcels are within the Carolina Hill area as well as all along the Bridle Trail, an abandoned railroad bed that runs north and south through town and connects with the Pilgrim Trail into Duxbury and beyond. If purchased or protected, these lands adjacent

to the trail would assist in creating greenbelts so important to the character of the town and to the health and habitat of its wildlife.

Maintenance of Existing Conservation Lands

While Marshfield has been fortunate to acquire a great deal of conservation land, it now finds itself in the position of having to maintain it all with reducing budgets and minimal staff. As a result, there are many parcels that are suffering from abusive use (e.g., dirt bikes and ORVs) and also from erosion and sedimentation. With over 2,400 acres of conservation land, the continuous review and maintenance is more than a full-time job. Unfortunately, we do not have the luxury of such a staff position and must rely on volunteers and the limited "spare" time of our Conservation Agent to do the work. Without a regular maintenance plan or focus, the land available to the town for passive recreation could become less available and the ability to create new trails and educational opportunities for people almost impossible. There is a strong need for financial assistance in this area for either direct maintenance assistance and/or for the further development and promotion of a volunteer program called "Partners in Conservation", developed and sponsored by the Marshfield Conservation Commission.

7.A.3 Recreation

The need for additional recreation areas (i.e., ballfields) is critical. The town invested approximately $500,000 to renovate, repair and add several ballfields at the high school complex. Even with the additional three to four field that were created, the town does not have enough ballfields to meet the existing demand, not to mention future demand, from our residents. The lack of fields has been confirmed through discussions with the Athletic Director, DPW Cemetery, Trees and Greens Supervisor, youth and adult recreation league presidents, and through the office of the Recreation Director, who is responsible for all ball field scheduling. The fields within the high school complex are over used, the field (s) need to be rested for a season, and due to the expanse of the town's sports programs, we are unable to do this.

These concerns were further stated during the fall/spring ballfield meeting that the Recreation Department coordinated. Each youth president addressed field needs and growing enrollment. There is also a growing interest in adult sports, including soccer, and softball (men's and women's leagues), and a need to address this growing segment of the population.

The creation of additional ballfields, including lighted fields will allow the town to meet the needs of the residents, and at the same time allowing the town to better maintain and rest field(s) each season.

In the future, the town will need to develop additional recreation areas including outdoor volleyball courts, playgrounds, and fitness/walking trails. In the past year, the Recreation Department has collaborated with neighborhood groups to construct

playgrounds at Tower Avenue and Marshfield Hills. There is also interest for neighborhood playgrounds and outdoor volleyball courts.

The area near the high school (32 acres) is an ideal location for additional lighted ballfields, playground, basketball court, volleyball sand pits and fitness trail.

Coast Guard Hill (32 acres)

Through hosting public meetings, web site, surveys, and on-site special events, it was concluded that the public is interested in maintaining the open space at Coast Guard Hill. This area is part of the “green area” in a sea of single-family houses. It is important to maintain the area in its natural state. The Coast Guard site allows the Recreation Department to bring public recreation to a part of town where there is none. Sledding, kite flying, and nature studies are some of the activities which residents enjoy. Through meetings, email and web surveys, residents have voiced their interest in building recreation facilities for children, teens and adults to enjoy. A neighborhood playground, basketball court and walking trails are among the facilities favored by residents. The Recreation Department is working with neighbors to install basketball courts in the spring of 2004 and a neighborhood playground by 2005, all at no cost to the town.

The above areas are among the last remaining large tracts of open space in the town. As more houses are constructed, the importance of tracts of land such as these becomes even more important.

7.A.4 Water Supply Protection

The Board of Public Works and the DPW have a wellhead protection strategy based on minimizing the need to treat all drinking water in Marshfield. The wellhead protection strategy consists of :

1) Prioritization of land desirable for protection within the Zone II;
2) Land purchase of critical large parcels to limit development;
3) Improve public outreach and education regarding land use practices and septic system use;
4) Improve municipal communications between town boards and departments;
5) Conduct a land use survey (residential and commercial) within the Zone II;
6) Conduct environmental audits & implement Inspection and monitoring program for commercial and industrial activities within the Zone II, and where appropriate, establish groundwater monitoring and sampling programs;
7) Implement Best Management Practices related to stormwater, catch basins, Household Hazardous Waste Collection Day(s), drop off areas at the Recycling Center for oil and other hazardous waste;
8) Develop an Emergency Response Plan for hazardous waste spills and natural disasters.

7.B Summary of Community's Needs

7.B.1 Conservation

Marshfield is fortunate to have an abundance of open space and conservation land. However, much of that land is marshland or other land that is not usable for public recreation, passive or otherwise. Looking at the overall town landscape, the northern half of Marshfield is rich with conservation land and much of it is available to the community for passive recreation and enjoyment. These areas include Carolina Hill, the Furnace Brook Watershed, Cornhill Woodland and much more. Unfortunately, in the southern half of town, much of the open space is lowlands in the polder. Much less of this open space is available for passive recreation and community enjoyment due to its low, wet character.

7.B.2 Recreation

The assessment of the community needs has shown the desire for handicap accessible indoor and outdoor facilities. The desired indoor facilities include a swimming pool, ice skating rink, gyms to meet the demand of youth and adult activities, and a community meeting room for adult education, civic and neighborhood meetings. The desired outdoor facilities would include a skateboard park, lighted soccer, softball and athletic fields and bicycle paths.

7.B.3 Water Supply Protection

Marshfield depends on its own aquifers for water supply. Obtaining additional water from other communities is not an option. The tidal rivers within the town restrict the areas that can be tapped for water because the intrusion of salt into water supply wells.

In addition, three of the five wells in the Furnace Brook Aquifer require activated carbon filtration due to the presence of VOCs. Septic systems near the town's water supply wells are also a concern for the quality of Marshfield's water. A projected accelerated build out date requires Marshfield to develop a New Source of Water within the next two years while protecting and improving existing ones.

7.C Management Needs, Potential Change of Use

Marshfield is experiencing tough budgetary problems resulting in scant conservation budgets for the past two years. Seasonal help had been hired to manage conservation properties in previous years, but this has no longer been possible.

Volunteers and Scouts have helped to offset the lack of staff available for maintenance, but more could certainly be done.

Vigorous development has created a higher than usual case load for the Conservation office due, in part, to the fact that most of the easily-developed land has already been built upon and properties that are yet undeveloped tend to have problematic issues for the developer, such as wetlands. Consequently, a high percentage of building permits must be reviewed or permitted by Conservation. The increased workload hampers not only our efforts to maintain existing properties but also to be proactive and effective in land acquisition.

Marshfield has many potential vernal pools that should be researched and certified. Most of the 12 vernal pools certified in the past two years were not included in the MassGIS data layer for potential pools, showing that there are even more vernal pools than the many as yet uncertified potential pools noted by NHESP.

Endangered, Threatened, or Special Concern species have also been noted and reported from several locations, some prompting changes to the habitat maps published by NHESP. Much more survey and observation needs to be done before we can realize the full consequences of development or can act to protect biologically sensitive areas before they are gone forever.

Only two or three large parcels remain undeveloped and relatively unspoiled and appear to be very important in providing habitat for rare species. It is imperative that biological surveys be accomplished as soon as possible.

7.D Marshfield's History of Acquisition and Funding Sources

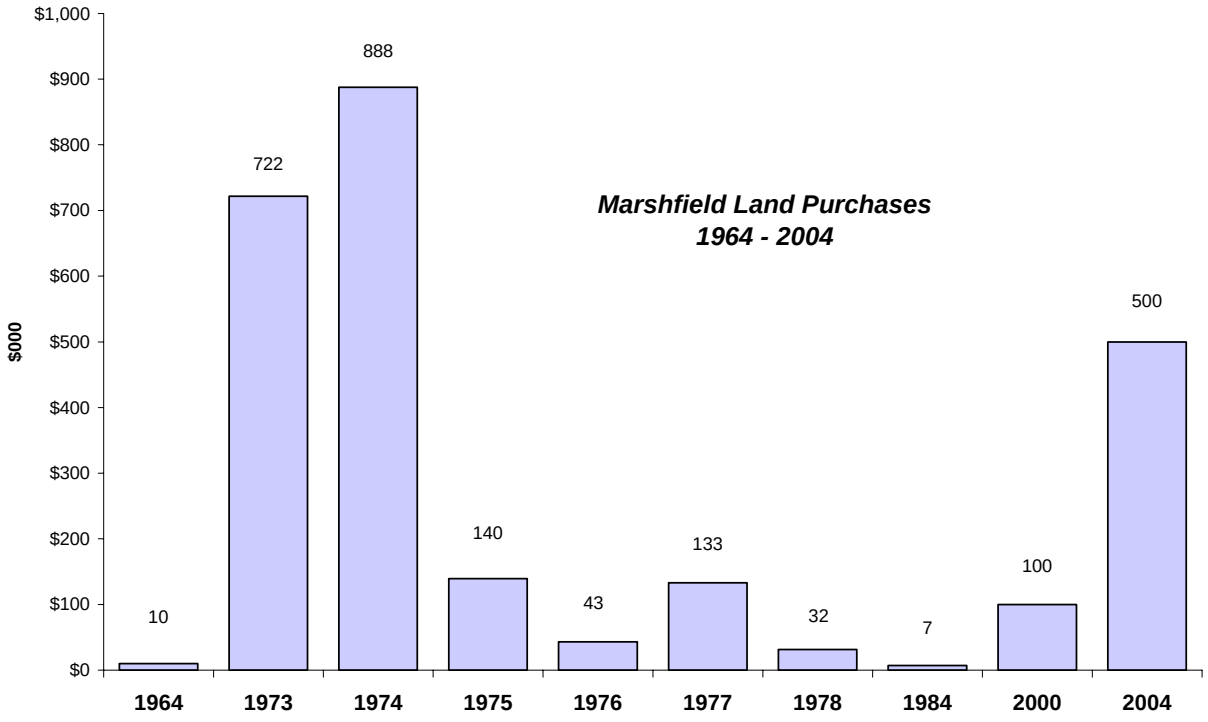
Marshfield's Acquisition History

The goal of this open space committee is to recommend the utilization of all potential sources of funding and not to rely solely on the funds from Community Preservation.

The graph indicates the years that purchases were made and what the town spent for these purchases. The Town of Marshfield has shown an appreciation for obtaining open space for passive recreation, water protection, and conservation.

The town voted to start the Community Preservation Act in 2001. Two purchases of open space for water protection and conservation were approved at the 2004 Town Meeting.

As depicted in the chart below, the history of obtaining open space has shown that the town made significant purchases through bonds, grants, taxes, etc.



With the exception of 2004, all funds were raised and appropriated through:

- Taxes
- Conservation Fund
- Borrow and Issue Bonds
- Apply for Federal and State Aid
- Ability to acquire by eminent domain, gift or purchase

The years 1973 and 1974 show the largest purchases to date. The purchases were mainly for the properties surrounding and encompassing the Furnace Brook Watershed area.

In the late 70's there were over 175 acres of land purchased throughout Marshfield. There was only one purchase in the 80s, none in the 90s and one purchase in the year 2000.

Land Acquisitions in the town of Marshfield are approved through town meeting.

Resources Available

One excellent resource tool available online for funding sources is:

Manomet Center for Conservation Sciences

Regional Conservation Planning Program
P.O. Box 1770
Manomet, MA 02345

http://www.manomet.org/programs/planning/resources/

A guide for funding land acquisition and management in southeastern Massachusetts and beyond

This booklet is organized into four sections:

1. Statute -based Programs;
2. Grants;
3. Other Programs; and
4. Useful Resources.

The Statute -based Programs section includes state programs intended to acquire open space or development rights, or to place voluntary restrictions on land use.

The Grants section describes a variety of competitive grant opportunities offered by the Commonwealth of Massachusetts, the federal government, philanthropies, and corporations for the acquisition and management of open space.

Other Programs describes mechanisms for protecting open space that are neither based in law nor operated as a grants program.

The final section, Useful Resources, includes references and links to other sources of information on grants, open space protection, and stewardship.

Explanations of possible funding sources[15]

Bonds

General Obligation bonds are instruments of local government capital finance. The government sells the bonds to raise funds, and then pays back the principal and interest on the bonds after a period of time has elapsed. Bonds require voter approval.

Easements

A conservation easement is a legally recorded agreement by which landowners may voluntarily restrict the use of their land. Provided that certain conditions are met, donors of easements may be eligible for certain income, estate, and property tax benefits. The income and estate tax benefits can be substantial, while the property tax benefits may or may not be substantial, depending largely on the relinquishment of development rights. To gain preferential tax treatment, the land to be protected must often provide a recognizable public benefit, such as protecting rare species, public water supplies, or scenic vistas visible from roads. Public access is not necessarily a requirement. Although the duration of a conservation easement can vary depending on

the desires of the landowner, tax benefits generally are available only for perpetual easements. A landowner that conveys a conservation easement retains all rights to use the land for any purposes that do not interfere with the preservation of the property as stated in the terms of the easement.

Public and Institutional Grants

Public and institutional grants may be used for both acquisition of open space and funding of operations. Historically, grants have ranged in value from as little as $100 to over $1 million. As noted previously, the resources available for grants are subject to normal economic cycles. Currently, the amount of awards and the frequency with which grants are awarded is decreasing. State governments across the country have de-funded many open space-related grants as public coffers shrunk in response to a slowing economy. However, as the economy strengthens, the level of grant funding should bounce back, and as part of a long-term strategy, grants should continue to be useful sources of funding. In the face of shrinking resources and increased competition for grant funding, knowledge of and experience with grants will be increasingly important for success. The retention of a full-time professional grant writer, and perhaps a development consultant, focused on open space and trails grants will be critical since specific experience and skill sets are useful in the grant writing and implementation processes.

8 Goals and Objectives

8.A Open Space Committee

The Marshfield Open Space Committee was formed to create a comprehensive, coordinated, strategic approach to land acquisition for conservation, recreation and water resource protection. This approach balances overall town desires with the most pressing of town needs.

Committee goals:

1. Identify, preserve and protect Marshfield's coastal, water, scenic and wildlife resources, it's historic sites and working farms, and to help provide passive and active recreation sites;
2. To protect Marshfield's wells, aquifer and potential drinking water sources, and;
3. To evaluate/rank land for possible acquisition or protection.

Committee objectives:

1. To research and identify funding sources for land acquisition
2. To assist the town and private conservation organizations in the acquisition of land for the purpose of conservation in accordance with the above goals.

8.B Conservation

1. Goal: Protect land that is essential for safeguarding the quality of the water supply
   - Objective: Expand town holdings by acquiring land that will protect the quality of the water supply

2. Goal: Ensure the existence of wildlife corridors
   - Objective: Expand town holdings by acquiring land to provide necessary habitat to support wildlife.

3. Goal Protect the Salt Marshes
   - Objectives
     a. Acquire land in salt march areas
     b. Protect land through conservation restrictions
     c. Educate the public about the importance of salt marshes to the environment.
     d.Educate the public about the proper disposal of hazardous wastes and the effects of their action on salt marshes.

4. Goal: Provide for the ongoing Stewardship of existing conservation land

- Objectives
  a. Leverage support of volunteer groups in town and create partnerships with Mass Audubon and Wildlands Trust and other interested parties
  b. Educate public about the care and protection of conservation land.

8.C Water Supply Protection

1. Goal. Ensure an adequate quantity and quality of the water supply to meet current and future needs.
   - Objectives:
     a. Expand water sources.
     b. Protect current sources
     c. Protect recharge capacity of the water supply
     d. Develop an enhanced nitrate management monitoring plan to provide for an early warning of contamination entering the well
     e. Provide education on water conservation and homeowners responsibilities in preventing runoff contamination
     f. Bring to Town Meeting a conservation By-Law to provide for enforcement against water supply abusers
     g. Improve water supply storage capacity to meet water needs during peak demand times and for fire protection.
     h. Purchase land in areas critical to protect water quality.

2. Goal: Prevent Flooding in low lying areas
   - Objective Expand town Holdings of land in areas that are critical to reducing flooding and poor drainage.

8.D Recreation

The Recreation Department plans, organizes, promotes, and provides worthwhile leisure programs and facilities to serve the physical, emotional, and social needs of the residents of our community, regardless of one's ability.

Department goals:

- Set up new programs as self-supporting and explore ways of generating additional revenue through grants, donations and fundraising.
- Continue to partner with youth groups, neighborhood associations, seniors, local realtors and businesses.
- Ability to expand programs with increased space, interest and staff.
- Meet the demand for after school programs and preschool education.

Department objectives:

- Coordinate recreational activity with the school department, youth groups, youth sports programs, and the senior citizens group.
- Involve as sponsors of recreation special interest groups, business organizations, neighborhood groups, professional groups and news media who are interested in helping improve Marshfield.
- Better utilize and upgrade parks, ball fields, and conservation land.
- Better utilize, protect, preserve, and beautify Marshfield’s beaches.

9 Five-Year Action Plan

9.A.1 Conservation

Goals and Objectives Tasks and actions	Responsible Party (1)	Time Frame	Priorities (2)	Possible Funding Sources
Identify Priority Parcels for Acquisitions	OSC,DPW, (Con Comm, WTSM)	2005-2010	1	CPA Administrative funds, DPW General Fund, Volunteer efforts, professional and technical assistance from non-profit organizations
Expand land holdings for water protection	OSC (DPW, WTSM)	2005-2010	1	CPA General Fund, Town monies, grant monies (e.g., self-help program, other state funds), donations
Expand land holdings for wildlife habitat protection, including green belts and salt marshes	OSC, Con Comm, (WTSM)	2005-2010	1	CPA General Fund, Town monies, grant monies (e.g., self-help program, other state funds), donations
Expand land holdings to resolve and/or limit drainage and flooding of the Polder	OSC,DPW, Con Comm,	2007-2010	3	CPA General Fund, Town monies, grant monies (e.g., self-help program, other state funds), FEMA or FAA funds
Update records and maps of conservation lands	Con Comm (OSC)	2007, 2010	3,5	Volunteer efforts, Conservation office staff
Network with Town Committees and local land trusts to further conservation efforts in Marshfield	Con Comm (OSC)	2005-2010	1	Conservation office staff, Conservation Commissioners
Expand Partners in Conservation Program	Con Comm	2005-2010	1	Conservation office staff, Conservation Commissioners
Measure and review progress in meeting the OS&R Plan Conservation goals and objectives	OSC (Con Comm)	2007, 2010	3,5	Volunteer efforts, Conservation office staff, Conservation Commissioners

Notes to table:
1 Responsible Party (ies) are named first and in parenthesis are listed any collaborators
2 Priority is ranked from 1-5 indicating the year the goals and objectives tasks and actions are to be initiated

9.A.2 Recreation

The Marshfield Recreation Department with a town vote for initial funding is working toward relocating their office and licensed preschool program to the Coast Guard Hill buildings.

The new Recreation Department location would be renovated and include a large indoor gross motor gym facility. A summer day camp would be created for residential children.

Additional needs are:

- To expand the teen tennis league.
- Establish a student intern program with neighboring colleges.
- Hire a part time program coordinator.
- Begin online credit card registrations.
- Increase specific recreation opportunities for Middle School students- develop youth council, whereby before and after school programs will be student directed.
- Create additional recreation facilities on the town land surrounding the impending ice-skating rink property. This location could include:
    - Fenced in lighted ball fields (adult/ kids soccer & softball)
    - Volleyball sandpits (2)
    - Tot play lot (water/sand table)
    - Lighted and fenced in tennis and basketball courts
    - Walking paths- fitness course (paved or stone dust)
    - Bathrooms
    - Amphitheater
- Expand licensed extended day programs to include each elementary school
- Offer Adult Education programs at the Coast Guard property
- Partner/co-sponsor one program a season with the Boys & Girls Club
- Purchase Facility Reservation & League Scheduling modules to assist with ballfield/classroom reservations and summer sports leagues
- Develop family concert and movie series at the skatepark
-

9.A.3 Water Supply Protection

The following describes priorities, funding sources and responsible parties for a Five-Year Action Plan for Water Resources Protection.

Marshfield Water Supply System

The Marshfield DPW Water Division is responsible for providing an adequate supply of safe water for Marshfield's needs, including water for domestic uses and fire protection. This responsibility involves the installation, maintenance and repair of water mains and service lines; the maintenance and operation of wells, pumps and related infrastructure; water meter installation and reading; and water sampling and management. The Marshfield DPW Water Division also conducts community outreach and education, including the promotion of water conservation. The Division is instrumental in providing for the future water requirements of the Town, and works closely with the Engineering staff to achieve stated goals.

The number of connections to the water system stands at 9,584. In FY 2004, the capacity / demand balance was determined to be:

	FY-04	FY-03
Current Safe Yield	4.3 MGD	4.3 MGD
Average Daily Use	3.0 MGD	3.1 MGD
Maximum Daily Use	5.9 MGD	6.7 MGD

Therefore, the average daily use (year round) is within safe yield. The current available water supply capacity is adequate to meet water demand requirements (maximum daily use). The supply/demand situation could be exacerbated on hot summer days or during drought conditions, and could threaten the availability of safe drinking water concurrent with adequate fire protection capacity. New sources of water supply, pumping, and storage may be required under those circumstances.

The Town is currently planning installation of new sources of water supply (pumps) and storage (tanks) to provide improved drinking water and fire protection capability, and to support expected growth in demand in the years ahead.

Current storage and pumping capacity is:

Tanks

Tank Location	Year Built	Capacity
Forest Street	1972	2.1 MG
Pudding Hill	1928	0.7 MG
Telegraph Hill	1991	2.3 MG

Pumps

Pump Location	Year Built	Rated Capacity	Actual Capacity
Church Street	1982	575 GPM	525 GPM
Ferry Street #1	1979	400 GPM	350 GPM
Furnace Brook 1	1946	700 GPM	620 GPM
Furnace Brook 2	1991	700 GPM	600 GPM
Furnace Brook 3	1956	300 GPM	300 GPM
Furnace Brook 4	1960	1000 GPM	920 GPM
Mt. Skirgo	1927	400 GPM	230 GPM
School Street	1972	350 GPM	300 GPM
South River St.	1971	350 GPM	350 GPM
Spring Street	2000	275 GPM	275 GPM
Union Street 1	1985	1000 GPM	1000 GPM
Union Street 2	1989	350 GPM	350 GPM
Webster Street 1	1974	400 GPM	350 GPM

Webster Street 2	1979	250 GPM	250 GPM

The Marshfield DPW is in the process of planning for siting, permitting, design and construction of a new storage tank, and upgrading the storage capacity of the existing Pudding Hill Tank. Also, the Marshfield DPW is refurbishing the Furnace Brook #1 Pump Station and getting permits for a new Pumping Station (Ferry Street #2).

The following are capital water projects that are expected to be funded by Town Meeting. Projects are part of the DPW Water Enterprise Account, and are paid for by water fees and not the Town's tax base. Annual Town Meeting has already approved the water Projects for FY-06:

FY-06	**FY-07**	**FY-08**	**FY-09**	**FY-10**
FB#1 Pump Station Construction	Water Tank Construction (new High Zone Tank)	2" to 8" Water Main Upgrades	Pudding Hill Tank Design (new Low Zone Tank)	Pudding Hill Tank Construction (new Low Zone Tank)
Prolonged Pump Test at Fairgrounds Aquifer	Telegraph Hill Tank Painting	Well Cleaning and Pump Station Rehab (2)	Well Cleaning and Pump Station Rehab (2)	Well Cleaning and Pump Station Rehab (2)
Well Cleaning and Pump Station Rehab (1)	Well Cleaning and Pump Station Rehab (2)	South River Street Water Main Replacement (Part 2)	Carlton Road Water Main Replacement	South River Crossing Water Main Replacement
Sea Street Water Main Replacement	Ferry Street #2 Pump Station Construction	Pine Street Water Main Replacement	Ireland Road Water Main Replacement	
South River Street Water Main Replacement (Part 1)	Highland Street Water Main Replacement		Preston Terrace Water Main Replacement	
Summer Street Water Main Replacement				
Pudding Hill Land Purchase (new Low Zone Tank)				
Water Master Plan Update				
Integrated Water Resources Management Plan	Integrated Water Resources Management Plan	Integrated Water Resources Management Plan		

Please note that in FY-06 the Town will be updating its Water Master Plan, last updated in the Year 2000. This Water Master Plan will assess the material condition of the water distribution system, and needed improvements to assure both adequate quantity and quality of water supply to meet future demand. The Integrated Water Resources management Plan will assess and model the effects of growth in water

supply and demand on the ability of the Town's aquifers to support the water supply required.

Land that is identified in the Water Master Plan and needed for new pumping stations and storage tanks will be procured using Water Enterprise Retained Earnings (Water Rates).

Land Acquisition for Drinking Water Resources Protection

The Town of Marshfield has developed a Draft Drinking Water Supply Land Acquisition Plan in October 2004 to identify properties that could be either purchased or taken for drinking water supply protection purposes. This Draft Plan is only the initial phase of a multi-faceted, multi-year program plan to obtain land for open space conservation and water resource protection purposes.

The Draft Drinking Water Supply Land Acquisition Plan has identified 14 parcels of land totaling over 228 acres that should be procured for the protection of the Town's drinking water resources. Procurement of these parcels would be done primarily using Community Preservation Act (CPC) funds. The Town has successfully used CPC funds for land acquisition in FY-05 and expects to do so in FY-06. The Town was also able to get a State EOEA Matching Grant for one of the 14 parcels.

The Town has also identified 12 - 16 parcels of land totaling over 51 acres with apparent Unknown Ownership that it is requesting CPC funding for title searches. If the title searches validate the unknown ownership of the parcels, then the Town will take the lands by eminent domain, and will eventually request land court approval of deeding the parcels to the Town. It is the intention of the Town to impose conservation restrictions on all of the parcels taken in this manner.

10 Public Comments

10.A Local Review

As required, the Open Space Committee distributed a draft copy of this plan to the following groups on February 18, 2004. A copy of the plan was also placed on the Town of Marshfield website for availability to the public. Marginal comments were received from most. Letters, emails, or transcribed comments were received from a few groups and are included in this plan as Appendix 12.F.

Letters of review and approval from the Board of Selectmen, Planning Board, Board of Assessors, Board of Public Works, Conservation Commission, the Manomet Center for Conservation Sciences (regional planning agency), Recreation Commission, and the Community Preservation Committee are included in this plan as Appendix 12.G

Distribution List

- Board of Assessors
- Board of Appeals
- Board of Health
- Community Preservation Committee
- Department of Public Works
- Town Clerk
- Town Administrator
- Board of Selectmen
- Town Accounting
- Town Treasurer
- Housing Partnership Committee
- Housing Authority
- Historical Commission
- Historical Society
- Wildlands Trust
- Trustee of Reservations
- North & South Rivers Watershed Association
- Recreation Department
- Massachusetts Audubon
- Marshfield Superintendent of Schools
- Habitat for Humanity
- Building Department

10.B The Approval Process

In Process – waiting for mandated letter of approval from Division of Conservation Services

Submission to DCS September 30, 2004.
Comments received from EOEA 3/14/05
Revised Submission to EOEA 6/4/05

11 References

The following is a list of references used in preparing this plan.

Bangs, Ned. Town of Marshfield, Recreation Department.

Chute, N.E., 1965. Geologic Map of the Scituate Quadrangle, Plymouth County, Massachusetts. United States Geological Survey, Washington, D.C.

Chute, N.E., 1965. Geologic Map of the Duxbury Quadrangle, Plymouth County, Massachusetts. United States Geological Survey, Washington, D.C.

Department of Environmental Management: www.state.ma.us/dem

Department of Fisheries, Wildlife and Environmental Law Enforcement: www.state.ma.us/dfwele

Department of Environmental Protection: www.state.ma.us/dep

Department of Food and Agriculture: www.state.ma.us/dfa

Executive Office of Environmental Affairs online at www.state.ma.us/envir.

Historical Commission, Town of Marshfield

Historical Society, Town of Marshfield

Jennings, Angus. Town Planner, Town of Marshfield.

Massachusetts Audubon Society: www.massaudubon.org

Massachusetts Coastal Zone Management, 2003. Massachusetts Shoreline Change Fact Sheet (via www.state.ma.us/czm/shorelinechange.htm).

Massachusetts Natural Heritage and Endangered Species Program (NHESP)

Massachusetts Statewide Comprehensive Outdoor Recreation Plan (SCORP) available online at www.state.ma.us/envir.

Massachusetts Geographic Information System: www.mass.gov/mgis

Metropolitan District Commission: www.state.ma.us/mdc

North and South Rivers Watershed Association: http://www.nsrwa.org/

The Open Space Planner's Workbook available online at www.state.ma.us/envir.

Soil Conservation Service, 2003a. Plymouth County Soil Survey, (via www.nesoil.com).

Soil Conservation Service, 2003b. Prime Farmland Soil Map Units in Massachusetts, (via www.nesoil.com).

Soil Conservation Service, 2003c. Important Farmland Soil Map Units in Massachusetts, (via www.nesoil.com).

Soil Conservation Service, United States Department of Agriculture, July 1969. Soil Survey Plymouth County, Massachusetts.

Town Of Marshfield, Massachusetts Conservation/Recreation Open Space Plan, 1995. Prepared by H. Warren Harrington, Conservation Administrator.

Wennemer, Jay. Conservation Agent, Town of Marshfield Conservation Commission.

The Wildlands Trust of Southeastern Massachusetts: www.wildlandstrust.org

The Trustees of Reservations, Massachusetts: www.thetrustees.org

Town of Marshfield, Community Housing Plan, January 22, 2004; Karen Sunnarborg, Housing Consultant.

Zen, E-an, editor, 1983. The Bedrock Geologic Map of Massachusetts. United States Geological Survey, Arlington, Virginia.

13 End Notes

[1] League of Women Voters of Marshfield – Town of Marshfield Booklet "All About Marshfield", 1976. With an update of employment
[2] U.S. Census of Population 1970, 1980, & 1990
[3] Massachusetts Division of Employment Security
[4] United States Census of Population 1970, 1980, 1990 & 2000
[5] United States Census of Population : 1990
[6] Marshfield Community Housing Plan, Draft. Karen Sunnarborg, Consultant, p. 26.
[7] Marshfield Community Housing Plan, Draft. Karen Sunnarborg, Consultant
[8] Ibid.
[9] Information provided from FST ATM 2000 and Marshfield's WWTF daily reports.
[10] Information provided by Angus Jennings, Town Planner
[11] DEP Regulation 310CMR 22.00
[12] Jay Wennemer, Marshfield Conservation Agent
[13] Total Maximum Daily Loading of the impairment caused by contamination
[14] Massachusetts Outdoors 2000 Statistics
[15] Alexandria Virginia Open Space Plan