Water Resources of The Buzzards Bay Watershed

Water Use, Hydrology, and Natural Resources

September 1995

Massachusetts Executive Office of Environmental Affairs
Department of Environmental Management
Office of Water Resources

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EXECUTIVE SUMMARY

The Buzzards Bay basin, located in southeastern Massachusetts, includes the northwest shore of Buzzards Bay (the coastal drainage) and eight subbasins drained by different rivers which flow into the Buzzards Bay shore estuaries. These subbasins are: East Branch Westport River, Paskamanset River, Acushnet River, Mattapoisett River, Sippican River, Weweantic River, Wankinco River, and Agawam River. There are fourteen communities with land area or water supplies in the basin. These are: Westport, Dartmouth, Fall River, New Bedford, Acushnet, Freetown, Fairhaven, Rochester, Mattapoisett, Marion, Carver, Wareham, Plymouth, and Bourne.

The 1990 federal census population for communities located within the Buzzards Bay basin was 373,690. Eighty-seven percent of the basin's population receive their water from eleven public water supply systems, nine of these have sources within Buzzards Bay basin.

Base water demand is the five-year (1986 to 1990) average day demand for each community. The base water use for water suppliers with sources in Buzzards Bay Basin was 26.40 mgd. Water needs are projected to increase to 32.30 mgd by 2020.

The Buzzards Bay basin is a net importer of water from surrounding basins. Of the water used by public water supply systems in the basin, 80% comes from other basins. Fifteen percent of all water used by public water suppliers was returned to the basin as wastewater.

Streamflows in the eastern part of the basin are relatively constant throughout the year due to a steady discharge of ground water from the underlying permeable deposits of sand and gravel. This type of deposit is not as widespread in the central and western portions of the basin, therefore streamflows in these portions are more variable.

Existing water yields are high in the Weweantic, Wankinco and Agawam River subbasins due to naturally high streamflows. The East Branch Westport, Paskamanset and Sippican subbasins have a moderate amount of available yield. The Acushnet and Mattapoisett River subbasins have very little available yields.

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INTRODUCTION

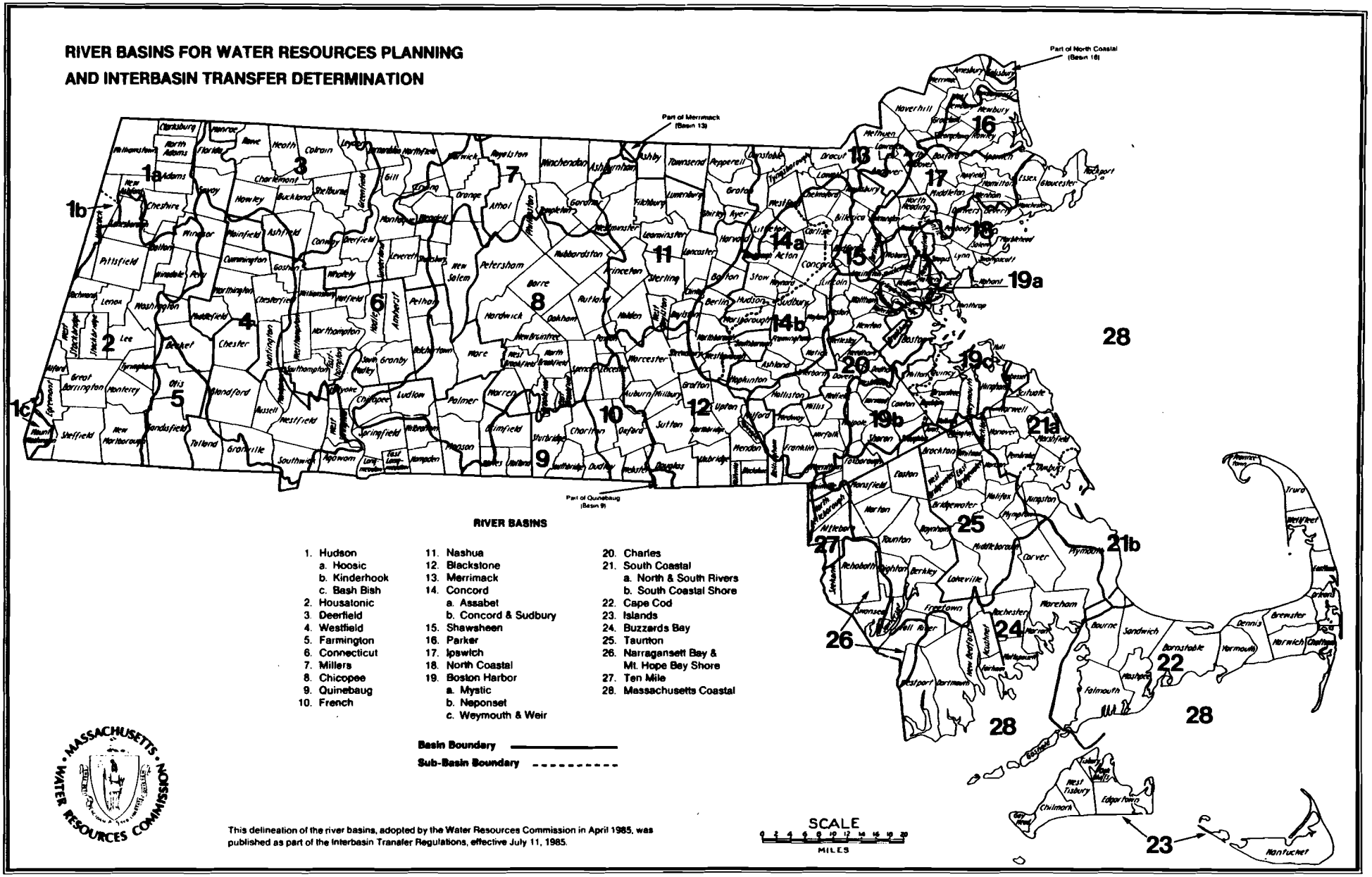
A. River Basin Planning Program: Purpose and Process

River basin plans are intended to provide a technical reference point for water resources planning, management, and decision-making at the local and basin-wide level. They provide the basic data and analysis needed to describe the hydrologic characteristics of the basin; to identify potential water resource problems; to resolve outstanding issues of resource use and protection; to inform regulatory activities; and to develop recommendations for community and regional water supplies and demand management activities.

The Massachusetts Water Resources Commission (WRC) has the primary responsibility for determining the state's water resources policy and directing the water resources planning activities for the Executive Office of Environmental Affairs. The Office of Water Resources (OWR), in the Department of Environmental Management, provides technical staff support to the Commission and is responsible, through the Commission, for long-range water resources planning for the Commonwealth.

Pursuant to the Water Resources Planning Regulations (313 CMR 2.00) adopted by the Commission, OWR develops basin plans for each of the twenty-seven major river basins in the Commonwealth (Figure 1). The basin planning program is part of the state's overall goal of insuring that water is available in sufficient quantity and quality to meet current and future consumptive and non-consumptive water needs. The basin planning process includes local, regional, and state assessments of water needs and the availability of water resources and reflects the state's water resources management policies:

- Supply Management Utilizing local sources (those within a river basin) first and protecting all sources of water supply;
- Demand Management Practicing water conservation, full-cost pricing and other measures described in the 1992 *Water Conservation Standards for the Commonwealth of Massachusetts*;
- Administrative Management Strengthening local water management through financial and technical assistance and planning guidance.



Executive Office of Environmental Affairs • Water Resources Commission

Prepared by the Department of Environmental Management • Division of Water Resources

Figure 1

Based on the information and technical analyses in the basin plan and additional available data, OWR staff works with local or regional groups and other state agencies to develop recommendations in response to specific water management problems or issues. Staff works with those groups or agencies to identify the potential impacts of various options on the physical systems, and to develop a recommended course of action.

B. Developing the Concept of Basin Planning

Massachusetts environmental agencies plan, manage, analyze, permit and regulate water resources in the context of river basins, as set out in four key legislative and policy mandates.

The **Massachusetts Water Supply Policy Statement--1984 update**, produced by the Water Resources Commission (WRC) and approved through the MEPA process, emphasizes the need for long-range, statewide planning (under the umbrella of 313 CMR 2.00--see below) and adopts supply and demand management policies in a balanced approach aimed at providing for multiple uses, protecting quality, assuring availability for consumptive and non-consumptive needs, and supporting local capabilities to plan, construct, manage and protect water supplies.

The **Water Resources Management Planning regulations** make the Water Resources Commission (WRC) responsible for developing "comprehensive water resources management plans for Massachusetts and to assure that such plans are based on local, regional and state assessments of water needs and water resources; are in conformance with the Massachusetts Water Supply Policy; and are based on adequate data, aggregated by river basins" (313 CMR 2.00, adopted in 1979 and updated 12/31/83).

The basin planning regulations promote the concept of a basinwide, comprehensive and integrated approach to all aspects of planning and management of the state's water resources. They provide that when the plans are adopted by the Commission, they "shall be considered by state agencies in all decisions relating to water resources management, including allocation of resources, expenditure of funds and the making of legislative recommendations affecting policies and programs. No such decisions contrary to said plans should be finally made without the concurrence of the Commission, and no proposed actions contrary to such plans shall be endorsed by the Commission".

The **Interbasin Transfer Act** (Ch. 658, Acts of 1983 and 313 CMR 4.00) was enacted to protect the water resources of each basin and promote its efficient use by requiring the WRC to regulate the transfer of water or wastewater between or among the basins. The 27 river basins of the Commonwealth are delineated in 313 CMR 4.00, the Interbasin Transfer Regulations and the accompanying map. Key components required that the applicant demonstrate that all viable sources within a basin had been investigated and protected; that all water conservation efforts had been implemented; and that a reasonable instream flow is maintained in the donor basin.

The **Water Management Act** (Ch. 592 Acts of 1985) and regulations (310 CMR 36.00) were

established within the Department of Environmental Protection to register and regulate the withdrawals of water above a threshold quantity in order to "document baseline water use in the Commonwealth and begin the process of comprehensive management of the surface and groundwater of the Commonwealth". The permit program was set up in the regulations to "assist the Department in the comprehensive management of the Commonwealth's water resources within its river basins in a manner which ensures an appropriate balance among competing water withdrawals and uses, as well as preservation of the water resource itself".

C. THE WATERSHED APPROACH

The Secretary of Environmental Affairs initiated a "watershed approach" to water resources planning and regulation in 1993. This Watershed Initiative, as it is known, has the overall goal to protect and improve water quality in the river basins of the Commonwealth, using the watershed as the basic planning unit. Under the Watershed Initiative, the regulated community and other interested "stakeholders" are brought together to discuss policy and management issues with state and federal agencies. Through the watershed approach, citizens, non-profits, state and federal agencies are working together to allocate the limited available resources to gain the most environmental benefit for the least cost.

D. STUDY AREA DESCRIPTION

The Buzzards Bay basin includes the northwest shore of Buzzards Bay (the coastal drainage) and eight separate subbasins drained by different rivers which flow into the Buzzards Bay shore estuaries (Figure 2). The basin is bounded by the Cape Cod Canal to the east, the South Coastal basin to the northeast, the Taunton River basin to the north, the Narragansett Bay and Mt. Hope Bay Shore basin and the Rhode Island border to the west, and Buzzards Bay to the south. The Buzzards Bay basin measures approximately 376 square miles. Elevations range from sea level to 384 feet above sea level. Mean annual precipitation is 45 inches. There are numerous wetlands and small lakes and ponds within the basin. Many of these wetlands are used to cultivate cranberries, a major product of this region. The many beaches, coves, harbors and inlets along the coast are widely used for both recreational and commercial purposes.

For the purposes of this study, the basin has been divided into the eight subbasins, based on the location of USGS partial record sites[1]. These subbasins are:

- East Branch of the Westport River
- Paskamanset River
- Acushnet River
- Mattapoisett River
- Sippican River
- Weweantic River
- Wankinco River
- Agawam River

[1] The U.S.G.S. conducted streamflow measurements at these sites; however, permanent stream gaging stations were not established.

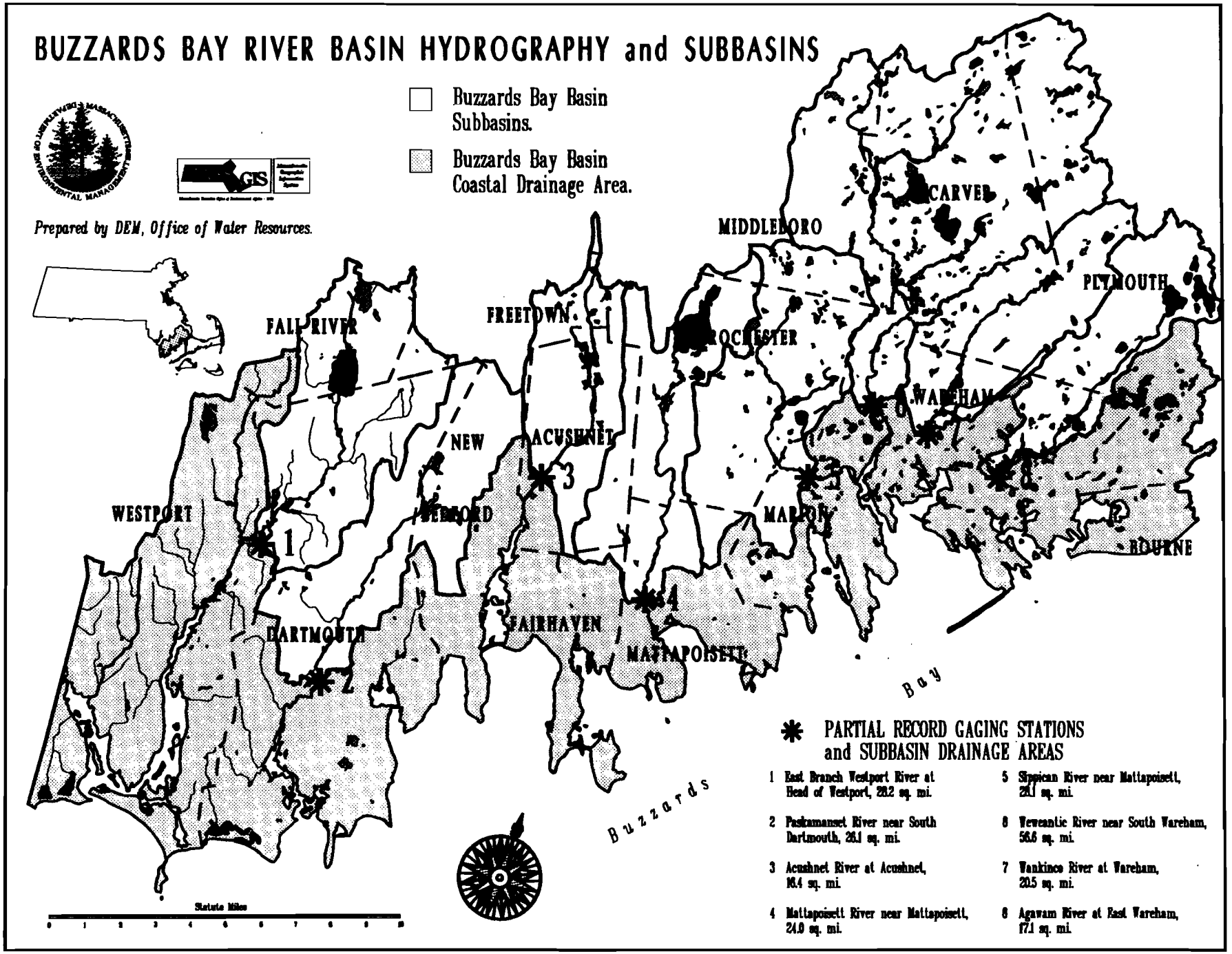

BUZZARDS BAY RIVER BASIN HYDROGRAPHY and SUBBASINS
Buzzards Bay Basin Subbasins.
Buzzards Bay Basin Coastal Drainage Area.
Prepared by DEM, Office of Water Resources.
GIS
FALL RIVER
FREETOWN
MIDDLEBORO
CARVER
PLYMOUTH
ROCHESTER
WAREHAM
NEW BEDFORD
ACUSHNET
MARION
WESTPORT
DARTMOUTH
FAIRHAVEN
MATTAPOISETT
BOURNE
Buzzards Bay
Statute Miles
0 1 2 3 4 5 6 7 8 9
PARTIAL RECORD GAGING STATIONS and SUBBASIN DRAINAGE AREAS
1 East Branch Westport River at Head of Westport, 28.2 sq. mi.
2 Paskamanset River near South Dartmouth, 26.1 sq. mi.
3 Acushnet River at Acushnet, 16.4 sq. mi.
4 Mattapoisett River near Mattapoisett, 24.9 sq. mi.
5 Sippican River near Mattapoisett, 28.1 sq. mi.
6 Weweantic River near South Wareham, 56.6 sq. mi.
7 Wankinco River at Wareham, 20.5 sq. mi.
8 Agawam River at East Wareham, 17.1 sq. mi.

Figure 2

A ninth subbasin, referred to as the Buzzards Bay Coastal Drainage, includes the area downstream of the partial record sites at the mouths of the eight subbasins. This area generally is along the immediate coast and the estuaries of the eight primary streams in the basin.

Streams in the basin flow between north-to-south trending hills to Rhode Island Sound and Buzzards Bay. In their lower reaches, the streams are affected by tides and bordered by tidal marshes. Streamflows in the eastern part of the basin are relatively constant throughout the year due to a steady discharge of ground water from the underlying permeable deposits of sand and gravel. Because sand and gravel deposits in the central and western portions of the basin are not as extensive, there is less ground water discharge to streams in these areas. Surface runoff to these streams is higher than in the eastern portion of the basin, resulting in more variable streamflows (Simcox 1992).

E. DEMOGRAPHIC PROFILE OF THE BUZZARDS BAY BASIN

The 1990 federal census population for communities located within the Buzzards Bay basin was 373,690. This is an eight percent increase from the 1980 Federal Census of 346,268. New Bedford and Fall River are the most populous of the basin's communities, with 1990 populations of 99,922 and 92,703, respectively. Rochester and Marion have the smallest populations, with 3,921 and 4,496, respectively.

The Southeastern Regional Planning and Economic Development District (SRPEDD) and the Massachusetts Institute for Social and Economic Research (MISER) project that the region's population will increase by thirteen percent, from 373,690 in 1990 to 420,866 by the year 2020. MISER furnished population projections for Bourne and Plymouth. Population projections for the remaining communities were furnished by SRPEDD. (Table 1)

Table 1
POPULATION PROJECTIONS
BUZZARDS BAY STUDY AREA

Community	1980 Federal Census	1990 Federal Census	2000	2005	2010	2015	2020	Change: 1990 to 2020
Acushnet	8,704	9,554	9,905	10,090	10,275	10,467	10,659	1,105
Bourne	13,874	16,064	16,625	17,557	19,166	21,135	23,675	7,611
Carver	6,988	10,590	12,483	13,667	14,851	16,274	17,697	7,107
Dartmouth	23,966	27,244	28,902	30,047	31,192	32,351	33,510	6,266
Fairhaven	15,759	16,132	16,575	16,797	17,019	17,240	17,461	1,329
Fall River	92,574	92,703	86,083	87,289	88,494	89,733	90,972	-1,731
Freetown	7,058	8,522	9,114	9,436	9,757	10,112	10,467	1,945
Marion	3,932	4,496	4,890	5,113	5,336	5,579	5,822	1,326
Mattapoisett	5,597	5,850	6,023	6,114	6,204	6,302	6,389	539
New Bedford	96,478	99,922	92,627	94,630	96,633	98,720	100,808	886
Plymouth	35,913	45,608	45,630	45,652	50,117	51,869	53,621	8,013
Rochester	3,205	3,921	5,173	5,484	5,795	6,132	6,470	2,549
Wareham	18,457	19,232	23,027	23,563	24,099	24,660	25,222	5,990
Westport	13,763	13,852	15,107	15,820	16,533	17,313	18,093	4,241
Totals	346,268	373,690	372,164	381,258	395,471	407,887	420,866	47,176

Population Projections were developed by SRPEDD, except for Bourne and Plymouth, which were developed by MISER

I. INVENTORY OF WATER RESOURCES AND USES

A. Natural Resources

1. Fisheries, Wildlife and Endangered Species

The Buzzards Bay basin provides habitat for a wide variety of water-dependent biotic resources. According to the Division of Marine Fisheries (DMF), the basin has many commercially and biologically significant anadromous fishery runs within its boundaries. The fisheries support both the freshwater system, through the return of nutrients and forage from the sea, and the estuarine and marine systems, as a critical base for many of the ocean food chains. Anadromous species are particularly responsive to water level fluctuations, flushing flows, water velocities and discharge volumes. They require attraction stimuli in the form of spring freshet flows to draw them back to their native streams, as well as sufficient flows for unobstructed passage to their spawning sites and to permit juvenile emigration to estuarine and marine environments. March, April and May are critical time periods for use of the rivers of the Buzzards Bay basin by bass, smelt, and herring. Juvenile herring begin their seaward migration anytime from July to November. Eels begin seaward migration for spawning in autumn, with juveniles returning in the spring. Tomcod migrate into the system to reproduce from November to early February (Brady, 1992). Rivers which support anadromous fisheries are: the Westport, Slocums, Acushnet, Mattapoisett, Weweantic, Wareham and Agawam Rivers. Recently, DMF, in partnership with the towns of Marion, Rochester, and Mattapoisett, and Alewives Anonymous, Inc., a private group, has been working to improve and expand the anadromous resources of the Mattapoisett River. DMF also has an active stocking program in the Slocums/Paskamanset river system. In addition to anadromous fisheries, the Buzzards Bay basin supports important shellfish, lobster and crab fisheries.

The Division of Fisheries and Wildlife has identified numerous lakes and ponds within the basin as being important fresh water fishery resources. A list of these water bodies is presented in Appendix A.

The largest North American breeding colony of Roseate Tern, a federally-listed endangered species, is located on Bird Island, near the mouth of the Mattapoisett River. The herring resources of Buzzards Bay basin are an important part of the diet of the Roseate Tern and many other bird species in the area (Buzzards Bay Project, 1994). A list of endangered, threatened, and special concern species, provided by the Massachusetts Natural Heritage and Endangered Species Program, appears in Appendix B.

Aquaculture is being investigated as a potential industry in the area. Currently there is a large aquaculture site, operated by Taylor Seafood, located off of West Island in Fairhaven. Expansion of the aquaculture industry is still in the planning stages. It is not known which type of species will be raised by other producers, nor what the water needs will be. This basin plan may provide useful hydrologic information to assist aquaculturalists and towns with siting decisions.

2. Wetlands

Numerous large wetlands, tidal marshes and cranberry bogs dot the landscape of Buzzards Bay basin. Wetlands provide important natural flood attenuation functions and habitat for a diversity of wildlife species. A partial listing of the larger named wetlands in the basin is shown in Table 2.

Table 2
Wetlands

Wetland Name	Location
Copicut Swamp	Fall River
Deerfield Swamp	Dartmouth
Colebrook Swamp	Dartmouth
Shingle Island Swamp	Dartmouth
Apponagansett Swamp	Dartmouth and New Bedford
Acushnet Cedar Swamp	New Bedford
Hobomock Swamp	New Bedford
Hathaway Swamp	Acushnet
Cedar Swamp	Carver
Maple Swamp	Wareham
Trowsers Swamp	Rochester and Mattapoisett
Haskell Swamp	Rochester and Mattapoisett
Logging Swamp	Rochester
Dry Swamp	Rochester
Cedar Swamp	Rochester
Forbes Swamp	Rochester and Middleborough
Bear Swamp	Rochester and Marion

Source: U.S.G.S.

The wetland resources of Buzzards Bay basin also provide ideal conditions for cranberry cultivation (See section I.B.3. Cranberry Growing and Agricultural Water Use).

3. Parks, Recreation and Open Space

The Buzzards Bay basin supports many opportunities to engage in active and passive water-based recreation. A map of parks and protected open space appears in Figure 3. The Department of Environmental Management[2] manages several properties in the area, including Horseneck Beach State Reservation in Westport, with its satellite properties

[2] The following information is from personal communications with DEM Forest and Parks Staff and the DEM GOALS program.

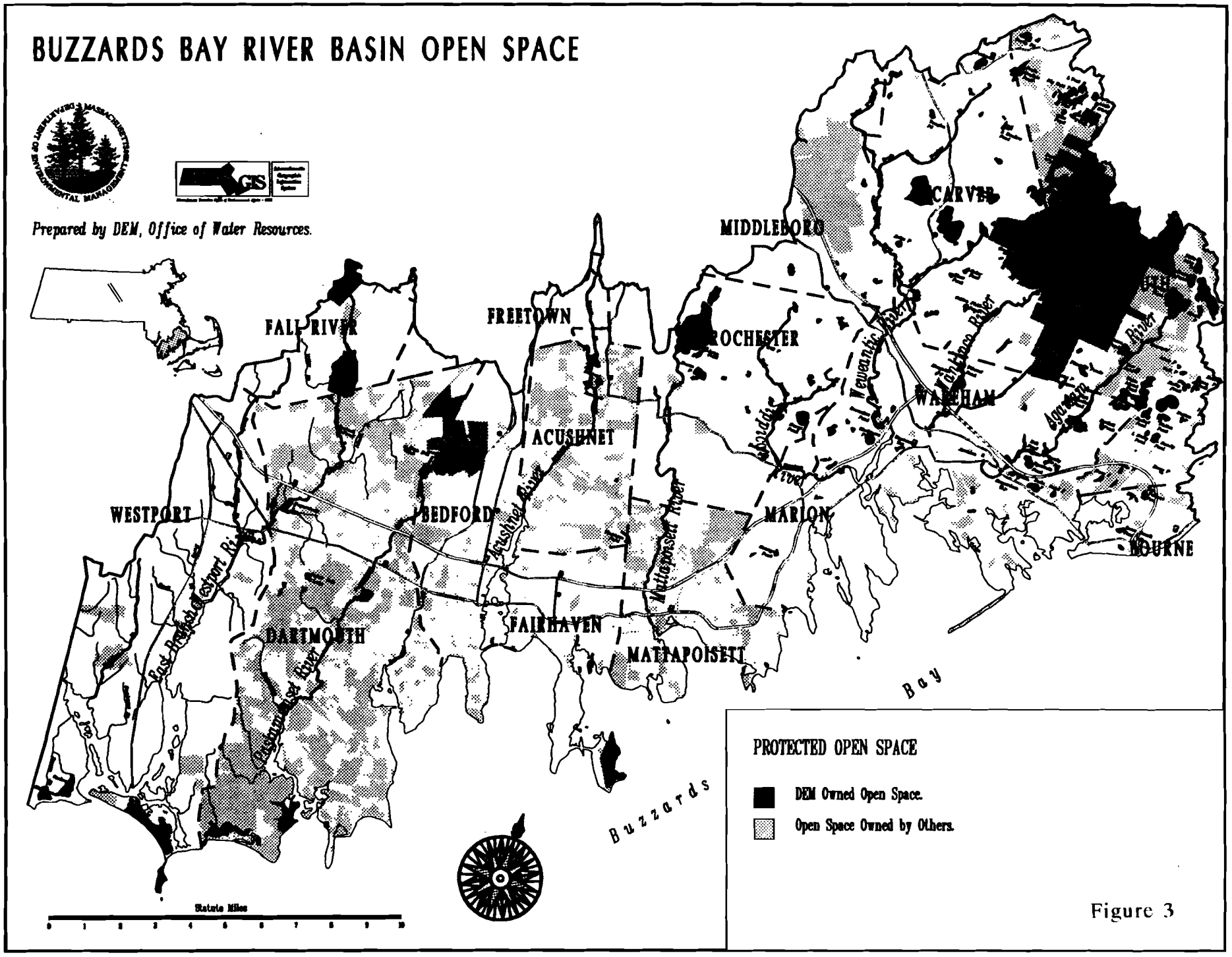

BUZZARDS BAY RIVER BASIN OPEN SPACE
Prepared by DEM, Office of Water Resources.
FALL RIVER
FREETOWN
MIDDLEBORO
CARVER
ROCHESTER
WAREHAM
ACUSHNET
WESTPORT
BEDFORD
MARION
MOURNE
DARTMOUTH
FAIRHAVEN
MATTAPOISETT
Buzzards
Bay
Statute Miles
PROTECTED OPEN SPACE
DEM Owned Open Space.
Open Space Owned by Others.

Figure 3

Gooseberry Beach and Great Island; Demarest-Lloyd State Park, in Dartmouth; Fort Phoenix State Park and West Island in Fairhaven, Acushnet Cedar Swamp in New Bedford and Dartmouth, and Myles Standish State Park in Plymouth and Carver.

Horseneck Beach State Reservation, in southern Westport, consists of an important barrier beach, sand dunes and salt marsh. Piping Plover nesting habitat is located here, and adjacent Westport Harbor has a significant nesting population of ospreys. Both these species are considered rare. The MA Natural Heritage and Endangered Species Program (MANHESP) has designated this property as habitat for rare wetlands wildlife, a high priority site of rare species habitat, and an exemplary natural community.

Horseneck Beach State Reservation is almost completely surrounded by salt water. The Atlantic Ocean lies along the south side, where the beach is located, and Westport Harbor and associated salt ponds and creeks are to the north. There is a sizable salt marsh along the north side, abutting Westport Harbor. The waters adjacent to the reservation support a good ocean fishery.

Recreational activities at Horseneck Beach center around the salt water. This is one of the busiest beaches in the state, with about 10,000 to 15,000 people using it on a hot summer day (the record has been around 18,000 people). The facility is used for sunbathing, swimming, picnicking, camping, boating, fishing, nature observation and beachcombing.

Demarest-Lloyd State Park in Dartmouth, is also a coastal property, with similar indigenous wildlife. It encompasses some oak woods, salt marsh, dunes and beach. This parcel has been determined by the MANHESP to be a habitat for rare wetlands wildlife, a high priority site of rare species habitat, and an exemplary natural community. Ocean fish use the waters surrounding the property.

Demarest Lloyd State Park is bordered on one side by the mouth of the Slocums River (which is the mouth of the Paskamansett River). This river flows into Buzzards Bay. Giles Creek and Georges Pond are located within the property. There is salt marsh adjacent to these tidal waters.

Recreational activities which occur at this park include picnicking, swimming, sunbathing, beachcombing and other activities that are associated with a beach property. On a busy summer day, this park can receive up to about 1,200 users.

Fort Phoenix State Park is a small state park located in Fairhaven, near the entrance to New Bedford Harbor. Like Demarest Lloyd, it is a coastal property and has wildlife that is associated with this kind of habitat. It is made up primarily of a coastal beach bordering Buzzards Bay and dunes. It also has a small area of mixed hardwood woodland and phragmites swamp. Ocean fish are present in the waters bordering this property.

Fort Phoenix State Park is bordered on one side by Buzzards Bay and by residential development on the other. There is also a small fresh water wetland located on the property. The same recreational activities which occur at Demarest Lloyd State Park occur here. A busy summer day may see about 500 people using the park.

West Island State Park is also located in Fairhaven, and encompasses about two thirds of West Island. This too, is a coastal property, with the associated wildlife. The upland part of this parcel consists of decadent oak, with pockets of tupelo and red maple. The many old, dying trees make good habitat for nesting birds and small mammals. A substantial shrub understory exists under most of this hardwood overstory. The woodland portion of this property has some areas with the water table near or at the surface of the ground.

The Park is bordered on two sides by Buzzards Bay and Nasketucket Bay. The transition zone between the coastal and forest habitats provides an excellent wildlife border. The coastal part of this land has been designated as a habitat for rare wetlands wildlife by the MANHESP. The entire property is declared a high priority site for rare species habitat and an exemplary natural community. Ocean fish abound in the adjacent waters. Salt marshes and potholes exist along part of the shoreline. A salt water pond, fed by Bass Creek, lies inside the main beach. Scattered small phragmites swamps border the salt marsh. Rocky and sandy beaches abut the bays.

Recreational activities include beach use, hiking, clamming, hunting, wildlife observation, fishing, and boating on the adjacent salt water. The state land gets some use associated with the adjacent town beach. Since parking is limited on the land owned by DEM, actual peak use of the parcel is somewhere around 50 people. The neighboring town beach may get up to 300 people in the summer.

Acushnet Cedar Swamp State Reservation is a fairly large property which lies between Dartmouth and New Bedford. Most of this land is made up of the Acushnet Cedar Swamp, proper, which is one of the most important Atlantic White Cedar swamps in Massachusetts. The other part is forested upland with some fairly large white pine. Several red maple swamps lie tucked away within the more well drained upland part. This large unbroken tract provides habitat for a number of plant and animal species. The cedar swamp has been designated a habitat for rare wetlands wildlife, a high priority site of rare species habitat and an exemplary natural community. It is also been designated a National Natural Landmark by the US Department of Interior. The MA Natural Heritage and Endangered Species Program has identified rare species here. This property is an excellent area for many types of nesting birds. Turner Pond, which lies within this property has a good population of warm water fish, including panfish, largemouth bass and pickerel. The adjacent cedar swamp provides an unusual wildlife habitat border for this pond.

The water resources on this property include the large cedar swamp, several set-off red maple swamps and Turner Pond. Together they are valuable in protecting and controlling the water levels in the Paskamanset River subbasin, since they make up the headwaters of this drainage system.

There is not much recreational use in this DEM facility since the access is limited by the swamps and there are few roads. Some passive uses, such as hiking, wildlife viewing, hunting, and fishing occur here. Small boats or canoes are allowed for fishing, however, there is limited parking at Turner Pond, so fishing pressure is light. On a peak day, there are probably not more than twenty to thirty people using this facility.

Forestry activities have been limited to hurricane salvage operations on the upland area. This land has otherwise been left to protect the valuable swamp and drainage system. Some low impact thinnings or fuelwood cuttings may be done in the future. Provided this is done properly, there should be no effect on the water resource values.

Myles Standish State Forest, located in Carver and Plymouth, is the largest DEM facility within the basin. Part of the Forest overlaps into the South Coastal Shore Basin. The Forest lies above the Plymouth-Carver Aquifer, a Sole-Source Aquifer.

This forest provides the most important endangered species and exemplary habitats of the DEM properties in the basin. Most of this facility is covered by Coastal Plain Pondshore and Pine Barrens communities. The Natural Heritage and Endangered Species Program has identified a number of species on the rare plant and animal list here. There are a substantial number of bird species associated with pine barrens habitat nesting here. Part of this land is managed by MA Division of Fisheries and Wildlife for hunting and other activities. Hunting is open for deer, upland game birds and mammals, and waterfowl. Fearings Pond is stocked with trout every year. All ponds have good populations of panfish. Most ponds are home to largemouth bass and several support smallmouth bass.

Myles Standish State Forest is one of the busiest DEM facilities, providing outdoor recreation for as many as 3,000 people. Most of the recreation use revolves around the ponds, including swimming, camping, fishing, private cottages leasing state land, hunting, picnicking, boating and wildlife viewing.

This facility also supports numerous forestry activities. Pine plantations were established by the Civilian Conservation Corps (CCC) in the 1930's. Many of these have provided timber as they have matured, and whole tree chips from thinning operations. More planting was done in the 1960's, due to the damage from the fires of 1957 and 1964. Pulp and sawlogs have come off the forest over the years. A system of prescribed burning to maintain the Pine Barrens is currently being tested and developed. DEM maintains a road access system to help with fire control efforts.

DFWELE's Division of Fisheries & Wildlife's (DFW) Southeast District office, located in Bourne, manages several properties within the Buzzards Bay basin[3]. These properties include the South Shore Salt Marshes in Fairhaven, the Acushnet Wildlife Management Area (WMA) in Fall River, the Ram Island Sanctuary in Mattapoisett, the Sly Pond Natural Heritage and Endangered Species Area in Plymouth, the Rochester WMA in Rochester and the Lake Snipatuit access also in Rochester. Unless noted otherwise, all DFW properties are open to passive recreational activities, subject to existing regulations.

The Southeast Wildlife District is located in the Town of Bourne. It serves as the Division of Fisheries & Wildlife's management headquarters for the entire southeastern part of the state, including all of Bristol, Plymouth, Barnstable, Dukes and Nantucket Counties.

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[3] Personal communication with DFWELE Division of Fisheries and Wildlife Staff.

Questions regarding fisheries & wildlife resources and management in the Buzzards Bay basin should be directed to the district headquarters.

The **South Shore Salt Marshes** in Fairhaven are an excellent wildlife area. Extensive mudflats with surrounding upland provide prime feeding areas and habitat for a variety of species. Commonly observed species on this area include least terns, willets, oyster catchers and osprey. A successful osprey nest has been established at this site. Although an excellent wildlife observation area, access to the South Shore Salt marsh is poor and requires a water approach or passage through private property.

The **Acushnet WMA** is the DFW's largest holding within the Buzzards Bay basin. At 356 acres, it forms a substantial holding along with other protected open space in this vicinity. It contains a variety of upland and wetland habitats including Atlantic White Cedar swamps and numerous acres of red maple swamp. Uplands are a mix of hardwood and softwood species with a predominance of white pine. All WMA's are open to a variety of passive recreational uses, including but not limited to hiking, nature study, fishing, hunting and trapping. All WMA's are subject to a set of Wildlife Management Area Regulations which outlines prohibited activities.

The **Ram Island Sanctuary** is one of the smallest, yet most interesting DFW areas in this vicinity. Located in Buzzards Bay, approximately one half mile off Mattapoisett, this island was a major roseate tern colony in the 1930's and 1940's. Over time, gulls replaced the terns, but recent management efforts have brought back the tern populations. There are now numerous nesting pairs of common terns, and in excess of 100 pairs of the rare roseate tern. Other interesting species include the least tern, black skimmer, willet and American oyster catcher. The Ram Island Sanctuary is **restricted during the nesting season**, which extends from the beginning of May through August. A set of sanctuary regulations also applies.

The **Sly Pond Natural Heritage Area** lies in the northwesterly section of DEM's Myles Standish State Forest in the Town of Plymouth. This tract is 192 acres and contains rare and endangered plant species. The Sly Ponds are coastal plain ponds. Introduction of the rare Plymouth Red Bellied Turtle is being considered here. This tract is also open for passive recreational use consistent with resource management and use.

The **Rochester WMA**, approximately 70 acres, is located along the Mattapoisett River, just south of Snipatuit Pond in the Town of Rochester. Formerly known as the "Freeman Bog", this tract was used as a fish hatchery prior the late 1960's when it was conveyed to the Commonwealth. The DFW does not maintain this tract for hatchery purposes, but manages it for the valuable and diverse habitat which it contains. It is open to the public for passive recreational use and is subject to the Division's Wildlife Management Regulations.

The Division maintains canoe and car-top boat access to **Snipatuit Pond**. This access is located along Neck Road in the Town of Rochester and is designed primarily for shallow and moderate draft canoes and boats. The facility is small, with parking for five vehicles.

B. Human Use

1. Public Water Supply Systems

There are fourteen communities with land area or water supplies within the Buzzards Bay basin. These are:

- Westport
- Dartmouth
- Fall River
- New Bedford
- Acushnet
- Freetown
- Fairhaven
- Rochester
- Mattapoisett
- Marion
- Carver
- Wareham
- Plymouth
- Bourne (Buzzards Bay section)

Eighty-seven percent of the basin's population receive their water from eleven public water supply systems, nine of which have sources within the Buzzards Bay basin and will be the focus of this study. Westport, Freetown, Rochester and Carver have no public water supplies, although sections of Westport are supplied by Fall River, and sections of Freetown are supplied by both Fall River and New Bedford.

New Bedford and Acushnet, which account for twenty-nine percent of the region's population, obtain all of their water supply from the Quittacas Pond complex within the Taunton River basin. For this reason, water needs forecasts for these communities are not included in this analysis.

Fall River's primary water supply source, North Wattupa Pond, is located in the Narragansett Bay and Mount Hope Bay Shore basin, with its secondary source, Copicut Reservoir, located in the Buzzards Bay basin. The City, which accounts for twenty-four percent of the region's population, receives approximately 70 percent of its public water supply from sources outside the Buzzards Bay basin.

Plymouth, with thirteen percent of the basin's population, has two wells within the Buzzards Bay basin, and seven wells in the South Coastal basin and receives 86 percent of its public water supply from sources outside the Buzzards Bay basin.

Water needs forecasts for the water supply systems with sources within the Buzzards Bay basin were developed in 1991 to coincide with DEP's Water Management Act permitting[4]. The base (1986 to 1990 average) water use for these water suppliers was 26.40 mgd. Of this amount, 12.13 mgd were withdrawn from the Buzzards Bay basin. The remainder (used by

[4] Water needs forecasts for most communities were developed in December 1991; because most of Plymouth's wells are located in the South Coastal basin, water needs forecasts for Plymouth were developed in September 1991 to coincide with permitting for the South Coastal basin. Projections were developed for Fall River in 1994 to coincide with permitting in the Narragansett Bay and Mt. Hope Bay Shore basin. These projections were approved by the Water Resources Commission in April 1995.

Plymouth, Fall River and Dartmouth) was withdrawn from surrounding basins (See Table 3). Water needs were projected to increase from a base demand 26.40 mgd to 32.30 mgd by 2020. With the exception of Plymouth, which had only one well in the Buzzards Bay basin during the base period, the relative proportion of water withdrawn by each community from the Buzzards Bay basin is expected to remain the same.

Total water demand in 1993 for these nine water supplies was 27.47 mgd, with 8.35 mgd withdrawn from the Buzzards Bay basin. Fall River had the greatest demand, 14.50 mgd, of which 0.51 mgd was withdrawn from the Buzzards Bay Basin. Buzzards Bay Water District had the smallest demand, 0.47 mgd, all withdrawn from the Buzzards Bay basin (See Table 4). To see how actual water use compares with near term (1995) projections, see Table 5.

With the exception of the Copicut Reservoir used by Fall River, all of the in-basin water supply sources used by Buzzards Bay communities are ground water sources. Figure 4 shows in-basin sources of water supply.

Water Management Act Permitting

The 1986 Massachusetts Water Management Act (WMA) (MGL Ch. 21G) and its regulations (310 CMR 36.00) calls for comprehensive management of the Commonwealth's surface and ground water resources in order to ensure an adequate supply of water for all citizens now and in the future.

The Act authorizes the Department of Environmental Protection (DEP) to regulate and monitor significant water withdrawals from Massachusetts ground and surface water supplies and gives DEP greater authority to manage water supply emergencies.

Implementation of the Act has taken place in two phases: registration of withdrawals from existing sources and permitting of the volume of water withdrawn from new sources. **Registered volume** refers to the average amount of water withdrawn from a community's sources between 1981 and 1985. All those withdrawing more than an average of 100,000 gallons per day (gpd) during the 1981-1985 period were required to register their withdrawals by January 4, 1988. Public water suppliers registered 11.94 mgd from the Buzzards Bay basin. **Permitted volumes** reflect withdrawals from new sources over 100,000 gpd or withdrawals from registered sources of 100,000 gpd above the volumes previously registered. Permits are issued for periods from 5 years to 20 years, with most being for a 20-year period. Permitting is being carried out by river basin, according to the regulations. Public water suppliers with sources in more than one basin registered their sources in each basin and will apply for permits as the basins are scheduled for permitting. The Buzzards Bay basin was permitted beginning in May 1992.

In addition to regulating the amount of water a supplier may withdraw, the WMA also imposes certain conditions concerning water conservation and other issues. A summary of the water conservation conditions for Buzzards Bay water suppliers, with an update on how they are being met, appears in Table 6.

Table 3
Water Needs Forecasts for Communities
With Sources in the Buzzards Bay Basin
Approved by the Water Resources Commission 1991
(mgd)

Community	Base ADD (1986 - 1990 Average)	Amount of Base ADD From Buzzards Bay Basin	Amount of Base ADD From Other Basins	1995	2000	2010	2020
Buzzards Bay WD	0.41	0.41		0.44	0.47	0.51	0.56
Dartmouth	2.11	0.97	1.14	2.59	3.15	4.00	4.66
Fairhaven	1.40	1.40		1.46	1.57	1.75	1.89
Fall River*	14.68	5.58	9.10	14.39	14.63	14.87	15.36
Marion	0.65	0.65		0.67	0.70	0.73	0.77
Mattapoisett	0.54	0.54		0.64	0.66	0.74	0.80
Plymouth	4.53	0.50	4.03	4.77	5.06	5.41	5.47
Wareham							
Wareham WD	1.50	1.50		1.66	1.75	1.95	2.14
Onset WD	0.58	0.58		0.58	0.59	0.62	0.65
TOTAL	26.40	12.13	14.27	27.20	28.58	30.58	32.30

DEM Office of Water Resources

* Includes water sold to Freetown; Base years are 1989 to 1993; Water needs forecasts were approved by the WRC in April 1995

Table 4
1993 Water Demand
Buzzards Bay Basin
(mgd)

Water Supplier	1993 ADD	Volume From Buzzards Bay Basin	Volume From Other Basins	Other Basins
Buzzards Bay WD	0.47	0.47		
Dartmouth	2.57	1.98	0.59	Taunton
Fairhaven	1.45	1.45		
Fall River	14.50	0.51*	13.99	Narragansett Bay and Mount Hope Bay Shore
Freetown	0.09		0.09	
Marion	0.54	0.54		
Mattapoisett	0.52	0.52		
Plymouth	5.19	0.74	4.45	South Coastal
Wareham				
Onset WD	0.56	0.56		
Wareham WD	1.58	1.58		
TOTAL	27.47	8.35	19.12	

DEM Office of Water Resources

* Fall River reduced its withdrawal from the Buzzards Bay Basin in 1993 due to technical problems. Normal usage resumed in 1994.

Table 5
Comparison of Actual Use and 1995 Projected Water Needs
Buzzards Bay Basin
(mgd)

	Actual Use		Projected Water Needs
	Base ADD	1993 ADD	1995 ADD
Buzzards Bay WD	0.41	0.47	0.44
Dartmouth	2.11	2.57	2.59
Fairhaven	1.40	1.45	1.46
Fall River*	14.68	14.59	14.39
Marion	0.65	0.54	0.67
Mattapoisett	0.54	0.52	0.64
Plymouth	4.53	5.19	4.77
Wareham			
Onset WD	0.58	0.56	0.58
Wareham WD	1.50	1.58	1.66
TOTAL	**26.40**	**27.47**	**27.20**

DEM Office of Water Resources

* Includes water sold to Freetown; Base years are 1989 to 1993; Water needs forecasts were approved by the WRC in April 1995

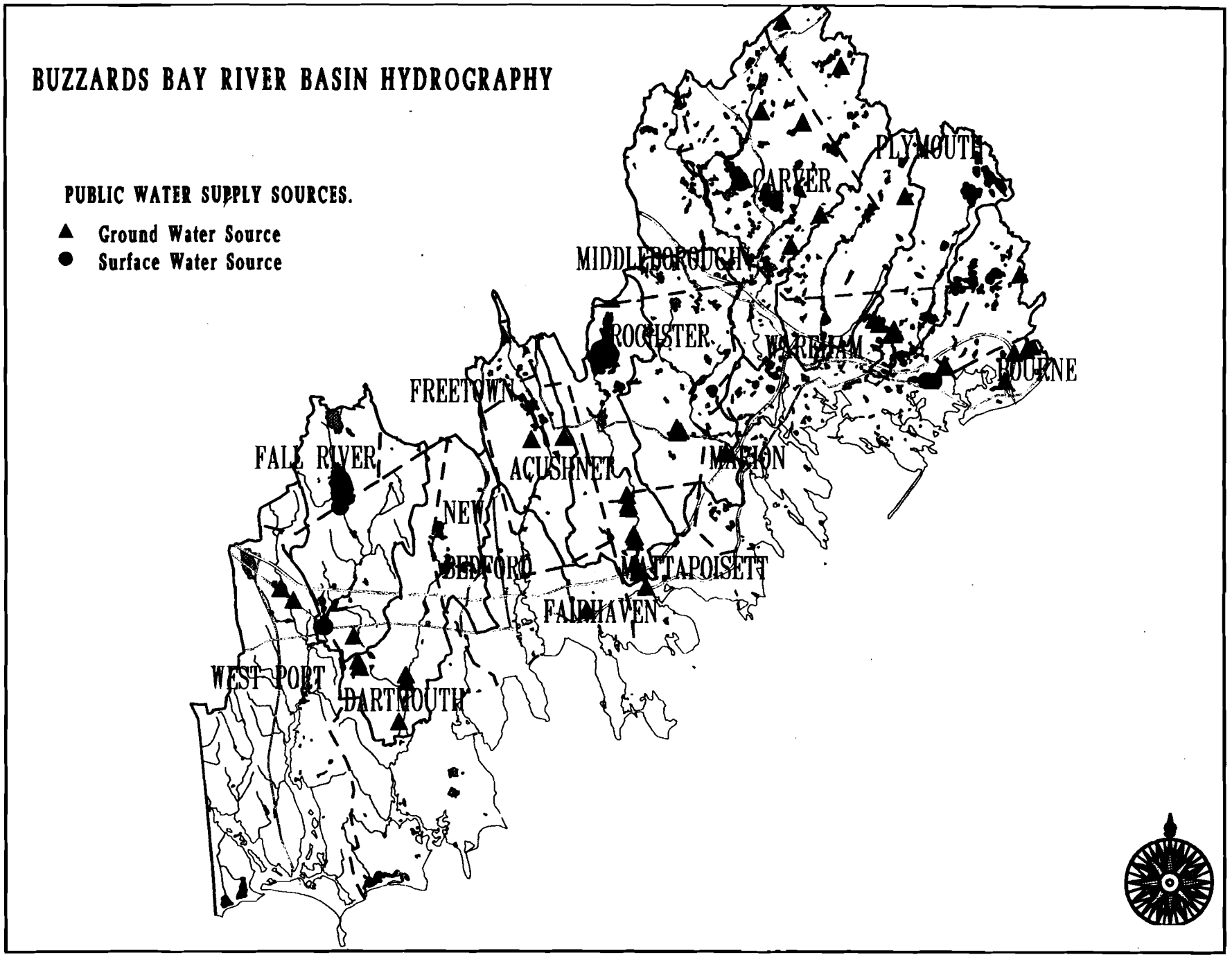
BUZZARDS BAY RIVER BASIN HYDROGRAPHY
PUBLIC WATER SUPPLY SOURCES.
Ground Water Source
Surface Water Source
PLYMOUTH
CARVER
MIDDLEBOROUGH
ROCHESTER
WAREHAM
BOURNE
FREETOWN
FALL RIVER
ACUSHNET
MARION
NEW
BEDFORD
MATTAPOISETT
FAIRHAVEN
WEST PORT
DARTMOUTH

Figure 4

Table 6
1995 Water Conservation Status
Buzzards Bay Basin

Water supplier	Water Management Act Permit Requirements	1995 Accomplishments	Meets State Water Conservation Standards?
Buzzards Bay WD	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Leak detection survey scheduled for early 1995	yes
	•100% metering, inc. public buildings	•100% metered	yes
	•Test all meters over 10 years old	•Had testing program in place but funding was cut; hope to replace funding this fiscal year	yes, when fully funded
Dartmouth	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Done annually in-house; Most recent water audit revealed 4% unaccounted-for water; about half of this goes for pipe flushing	yes
	•Retrofit public buildings	•Program is almost completed	yes
	•Bill Stuffers	•Conservation information printed on bills; Information packages (including dye tabs) sent to customers complaining about high bills	yes
	•Test all meters over 10 years old	•Implemented for town-owned meters; larger privately-owned meters are tested annually	yes
Fairhaven	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Water Audit completed in 1994; it is now under review. Leak detection program under investigation.	yes, when fully implemented
	•Actively enforce plumbing code	•Plumbing code is enforced by plumbing inspector	yes
	•Bill Stuffers	•Information bulletin with every bill	yes
	•Establish full cost water rates	•Full cost water rates	yes
Fall River	No Water Management Act Permit/Major source in Narragansett & Mt. Hope Bay Shore basin up for permitting in 1995	•Currently working to secure funding for water main replacement\upgrading	
		•Currently working to secure funding for a complete modernization program to replace all meters in the City to ARM in CY 1995	yes, when fully funded and implemented
		•Program under way to provide water saving devices to all services in City, including all public buildings	yes, when fully implemented
Freetown	No Water Management Act Permit/Purchases from New Bedford and Fall River	Not Available at this time	
Marion	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Requesting funding for Spring 1995 leak detection survey	yes, when fully implemented
	•Retrofit public buildings	•Plumbing inspector to provide specs; water dept to request funding April 95 Town Meeting	yes, when fully funded
	•100% metering, inc public buildings	•Aggressively working to achieve 100% metering; currently about 90% metered	yes, when fully implemented
	•Test all meters over 10 years old	•Aggressive meter testing program	yes

Table 6
1995 Water Conservation Status
continued

Water supplier	Water Management Act Permit Requirements	1995 Accomplishments	Meets State Water Conservation Standards?
Mattapoisett	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Ongoing leak detection program	yes
	•Retrofit public buildings	•Active retrofit program	yes
	•Actively enforce plumbing code	•Plumbing inspector rigidly enforces; water department gets copies of permits for inground sprinkler systems	yes
	•100% metering, inc public buildings	•All but 1 public building (highway dept) unmetered; otherwise system is 100% metered	yes, when fully implemented
	•Test all meters over 10 years old	•Aggressive meter testing program	yes
	•Bill Stuffers	•Conservation notes with bills	yes
	•Establish full cost water rates	•Enterprise Account (does not cover depreciation)	yes
	•Develop a public education program	•Program with schools	yes
Plymouth	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Water Audit completed 3/94; Leak detection survey to be conducted Spring 1995	yes, when fully implemented
	•Retrofit public buildings	•Has not been done to date	
	•Test all meters over 10 years old	•Have program underway to replace all meters	yes, when fully implemented
	•Bill Stuffers	•Will be providing information from AWWA	yes, when fully implemented
	•Establish full cost water rates	•Recently implemented increasing block rate	
Wareham			
Onset FD	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Contracted for full leak detection survey a few years ago, then purchased equipment; now has program to conduct in-house leak detection program	yes
	•Retrofit public buildings	•three public buildings in district have not been retrofit	
	•Bill Stuffers	•Conservation literature distributed in spring with annual report	yes
	•Establish full cost water rates	•Increasing block rate covers full cost	yes
Wareham WD	•Water audit/leak detection survey program every two years; Leak repair reports made available for inspection	•Leak detection training Spring '95; after that will implement inhouse program	yes, when fully implemented
	•Retrofit public buildings	•Water supt. is checking (new to District)	
	•Test all meters over 10 years old	•Meters recently changed over: most are less than 10 years old; master meters tested once per year	yes
	•Bill Stuffers	•Water supt. is checking (new to District)	
	•Establish full cost water rates	•District supported by a district tax and through revenues	

2. Nonresidential Water Uses

In 1993, nonresidential water use comprised approximately 33 percent, or 14.05 mgd, of the total water used by public water supply systems serving the Buzzards Bay basin. Nonresidential water use consists of water used by industry, commercial establishments, such as offices or markets, and municipal water use. In addition, two industrial and one institutional water user located in the Buzzards Bay basin registered withdrawals from private sources under the Water Management Act. Registered nonresidential water use in the basin is estimated to be 0.49 mgd.

3. Cranberry and Other Agricultural Water Use

Cranberry cultivation and processing have been an important part of the economy of Buzzards Bay basin for well over 100 years. Today the cranberry industry provides approximately 5,500 jobs to southeastern Massachusetts, while managing over 60,000 total acres of bogs, reservoirs, wetlands and forest land. It is estimated that there are approximately 7,100 acres of cranberry bogs in the basin (DEP WMA). Cranberry cultivation is a water-intensive process. Bogs are generally flooded several times during the year. In winter, flooding prevents desiccation or "winter kill"; in the fall, bogs are flooded for harvesting. An important but less common use of flooding occurs during the spring as a method of pest control. Historically, bogs were also flooded in the spring and fall for frost protection, but today, sprinkler irrigation has replaced this method. Most of this water use is non-consumptive, with the water being returned to the source after a short period of time.

DEP, working with the Cranberry Growers Association, developed an equation to estimate the amount of water used in cranberry cultivation, for the purposes of Water Management Act registration. The equation is based on a figure of 10 acre-feet of water per acre of cranberries under cultivation per year, or:

$$\frac{\text{acres} \times 10 \text{ af} \times 0.325851}{365} = \text{mgd}$$

Using registration information provided by DEP, OWR has estimated that registered growers in the Buzzards Bay basin use approximately 63.45 mgd annually from private water supply sources. In addition, in 1993, public water suppliers supplied 0.01 percent, or less than 0.01 mgd, to other agricultural concerns.

4. Wastewater Treatment And Inflow-Outflow

Fall River, Dartmouth, New Bedford, Acushnet, Fairhaven, Mattapoisett, Marion, Wareham, Plymouth, Buzzards Bay WD (via Wareham) all discharge at least part of their treated municipal wastewater to the Massachusetts Coastal Basin. Most of the remaining wastewater is discharged back to the basin via on-site septic systems. From data provided by the communities, it is estimated that in 1993, approximately 33.64 mgd was discharged to the Massachusetts Coastal Basin by Buzzards Bay communities via municipal sewage treatment systems.

The Buzzards Bay Basin is a net importer of water from surrounding basins. Of the water used by public water supply systems in the basin in 1993, 80%, or 33.56 mgd, came from other basins. Fifteen percent of all the water used by public water suppliers was returned to the basin as wastewater (Table 7).

5. Water Quality

In 1985 and 1986, DEP Division of Water Pollution Control conducted a water quality survey of the Buzzards Bay Basin. Because of the size of the basin, and staffing limitations, the basin was broken down into five subareas. The results of this survey are published in Buzzards Bay 1985 Water Quality Survey Data Part A and Buzzards Bay 1986 Water Quality Survey Data. The major water quality concerns of the surveys include:

- The Westport River suffers from nonpoint source pollution associated with agricultural production.
- The Paskamanset River has been experiencing water quality problems associated with the rapid urbanization between Routes 6 and 195.
- By far the most serious pollution problems have been documented in New Bedford Harbor, the estuary of the Acushnet River. In addition to the nonpoint source problems associated with a densely urbanized city, the harbor has had a history of point source pollution problems associated with industrial and municipal wastewater discharge. Because of the contaminated sediments found here, over 900 acres of the harbor have been designated as a U.S. Superfund Hazardous Waste Site by the Environmental Protection Agency (EPA).
- Other rivers and harbors within the Buzzards Bay basin suffer from nonpoint source pollution associated with runoff from urban development, discharges from failing septic systems and water craft, leachate from landfills and agricultural runoff.

In addition to studies being conducted within the basin by DEP, the Westport River Watershed Association has been sampling that river for fecal coliform. Results of their 1992 and 1993 sampling rounds, documenting coliform levels, were presented in the October 1994 issue of the Alliance's newsletter, River News.

Table 7
Inflow-Outflow Analysis
Buzzards Bay Basin

Community	Withdrawals (mgd)				1993 ADD	Discharges (mgd)				
	Buzzards Bay	Narragansett Bay and Mt. Hope Bay Shore	Taunton River	South Coastal		Buzzards Bay*	Narragansett Bay and Mt. Hope Bay Shore	Taunton River	South Coastal	Massachusetts Coastal
Acushnet			0.53		0.53	0.47				0.05
Buzzards Bay WD	0.47				0.47	0.02				0.45
Dartmouth	1.98		0.59		2.57	1.54				1.03
Fairhaven	1.45				1.45	0.58				0.87
Fall River	0.51	13.99			14.50		0.01			14.49
Freetown	0.00	0.07	0.02		0.09	0.01		0.08		
Marion	0.54				0.54	0.38				0.16
Mattapoisett	0.52				0.52	0.43				0.09
New Bedford			13.85		13.85	1.38				12.47
Plymouth	0.74			4.45	5.19	1.30			1.66	2.23
Wareham										
Onset WD	0.56				0.56	0.34				0.22
Wareham WD	1.58				1.58					1.58
TOTAL	8.35	14.06	14.99	4.45	41.85	6.46	0.01	0.08	1.66	33.64
Percent	20%	34%	36%	11%	100%	15%	0.02%	0.19%	4%	80%

DEM Office of Water Resources

*Column will not add up due to rounding

II. HYDROLOGY

The Buzzards Bay Basin consists of eight separate subbasins drained by coastal rivers flowing from north to south. The subbasin drainage areas, based on the areas delineated by the U.S. Geological Survey partial-record stations, range from 16 to 57 square miles (Table 8). The character of the basins vary from flat topography primarily covered by stratified drift in the east, to hilly topography, primarily covered by till in the west (Table 8). The eight rivers draining the Buzzards Bay Basin are, from east to west: Agawam River, Wankinco River, Weweantic River, Sippican River, Mattapoisett River, Acushnet River, Paskamanset River and East Branch Westport River (Figure 5).

Table 8
Drainage Areas and Percent Stratified Drift
for USGS Partial Record Sub-basins
of Buzzards Bay

Subbasin Name	Drainage Area mi^2	Percent Stratified Drift
East Branch Westport River	28.2	43
Paskamanset River	26.1	44
Acushnet River	16.4	54
Mattapoisett River	24.0	46
Sippican River	28.1	59
Weweantic River	56.5	87
Wankinco River	20.5	100
Agawam River	17.1	100

The hydrologic strength of a subbasin can be characterized by evaluating the streamflows which occur during the summer and other dry periods. Low flow characteristics vary in each of the eight rivers primarily due to two factors. The first factor is variations in stratified drift across the basin. For example, streams in areas of high stratified drift coverage in the eastern part of the basin have significantly higher streamflows during low flow periods than streams in the western part of the basin. The second factor is water use which varies for each subbasin. For example, the Mattapoisett and Agawam Rivers lose water due to municipal diversions which reduce flows, but the Weweantic River gains water due to discharges, which increases low flows. Several other factors affect the flow to lesser degrees, including the amount of pond and lake surface area from which water can evaporate and

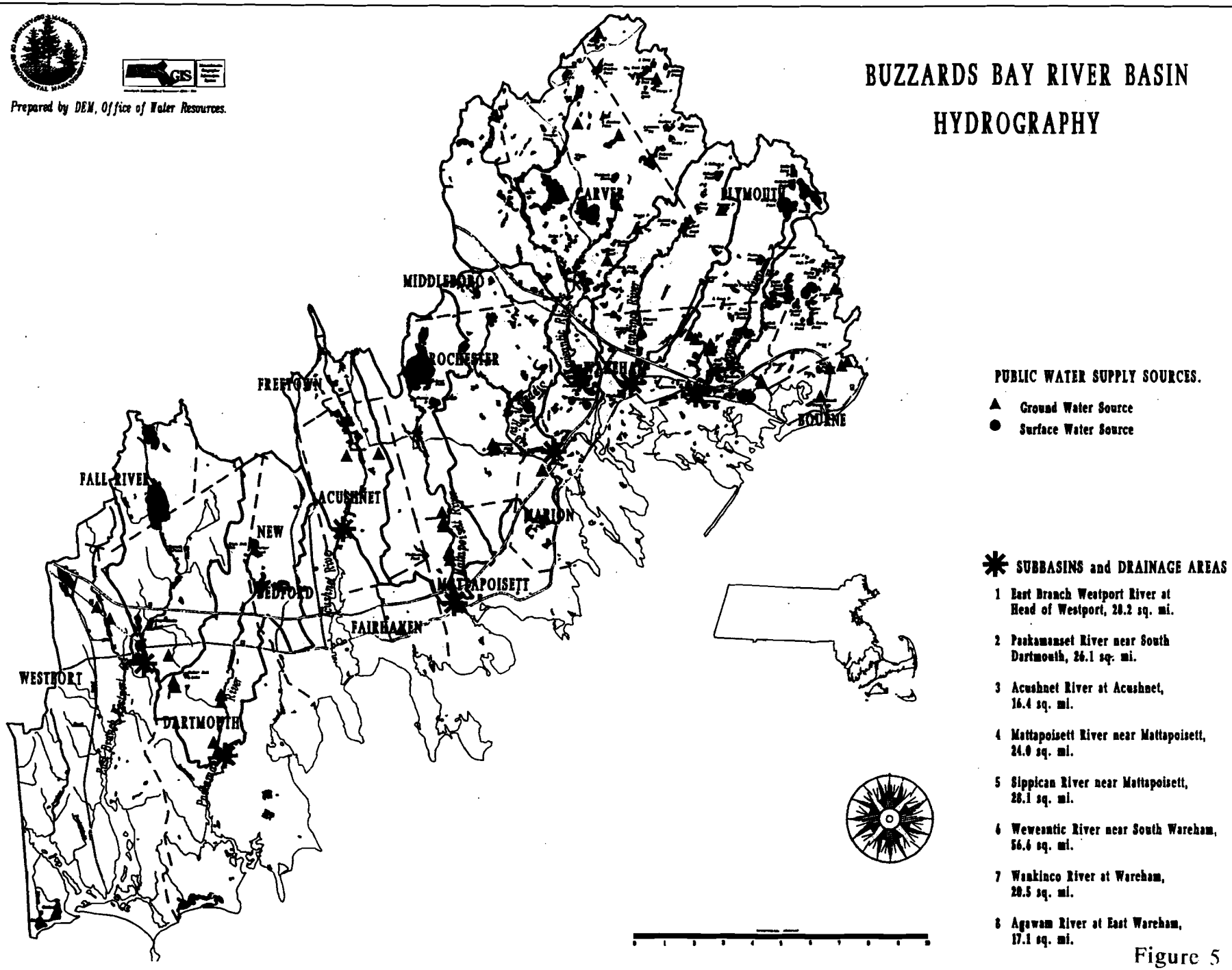
Prepared by DEM, Office of Water Resources.
BUZZARDS BAY RIVER BASIN
HYDROGRAPHY
CARVER
PLYMOUTH
MIDDLEBORO
ROCHESTER
FREETOWN
BOURNE
FALL RIVER
ACUSHNET
MARION
NEW
BEDFORD
MATTAPOISETT
FAIRHAVEN
WESTPORT
DARTMOUTH
PUBLIC WATER SUPPLY SOURCES.
Ground Water Source
Surface Water Source
SUBBASINS and DRAINAGE AREAS
1 East Branch Westport River at Head of Westport, 28.2 sq. mi.
2 Paskamanset River near South Dartmouth, 26.1 sq. mi.
3 Acushnet River at Acushnet, 16.4 sq. mi.
4 Mattapoisett River near Mattapoisett, 24.0 sq. mi.
5 Sippican River near Mattapoisett, 28.1 sq. mi.
6 Weweantic River near South Wareham, 56.6 sq. mi.
7 Wankinco River at Wareham, 29.5 sq. mi.
8 Agawam River at East Wareham, 17.1 sq. mi.

Figure 5

the amount of ground water flowing across subbasin lines due to continuous coverage of stratified drift.

In this study, the 95% and 98% flow durations are used to estimate the amount of water available for water supply withdrawals. A 98% flow duration means that a given flow is exceeded 98% of the time; conversely, streamflow drops below this flow 2% of the time. These flows are useful when planning for a reliable water supply withdrawal because they will be violated only 2% or 5% of the time. The 98% and 95% flows are low flows which consist primarily of ground water discharging into the river; there is little or no surface runoff component. Two periods of time are used in this study: 25 years from 1967 to 1991, and two years from 1980-1981, during which a moderate drought occurred. The most conservative flow used is the 1980-81 98% flow duration which is the flow which is equaled or exceeded 98% of the time during the drought (shaded column in Table 9).

There are no continuous stream gages in the Buzzards Bay basin to measure flows, however the U.S. Geological Survey estimated the 98% and 95% flows (Personal Communication, U.S. Geological Survey, October 1994) for the Office of Water Resources using data from gages in hydrologically similar basins, and measurements in the eight subbasins. The low flow statistics in Table 9 are virgin flows, that is they are estimated to occur in the river prior to existing withdrawals or discharges. The virgin flows in Table 9 can be used to compare the hydrologic strength of the subbasins because they are not affected by existing water uses. Statistics are estimated for 1980-1981 and 1967-1991 based on data from the gages for these periods.

Table 9
USGS Estimated 98% and 95% Streamflow Durations
for Buzzards Bay Subbasins

Virgin Flows, in cfs for Period of Record (1967-91) and 1980-81

Subbasin Name	98% POR*	95% POR	98% '80-81	95% '80-81
East Branch Westport River	2.76	4.11	2.29	3.05
Paskamanset River	1.80	2.89	1.50	2.17
Acushnet River	0.84	1.62	0.60	1.07
Mattapoisett River	4.37	5.08	4.12	4.42
Sippican River	5.02	6.97	4.04	5.02
Weweantic River	15.63	21.03	11.73	13.83
Wankinco River	14.70	15.90	11.30	10.70
Agawam River	28.80	30.95	22.71	21.63

*Period of Record

Estimated streamflows vary east to west in the Buzzards Bay Basin. The flows generally increase to the east as the percent of stratified drift increases. Figure 6 shows the flows per square mile and the percent of stratified drift for each subbasin.

The subbasins with the most water available are the eastern subbasins of the Weweantic, Wankinco and Agawam Rivers. The available water ranges from 0.60 cfs (0.39 mgd) in the Acushnet River basin to 22.71 cfs (14.7 mgd) in the Agawam River basin.

In order to evaluate the amount of water available in each subbasin, the existing water uses and discharges for each subbasin, also known as the net inflow/outflow, must be added to the virgin flows. The water use in the subbasins of the Buzzards Bay Basin is summarized in Table 10. When withdrawals are combined with discharges the result represents the loss or gain of water in the subbasin.

Table 10
Net Inflow/Outflow in mgd

Subbasin Name	Withdrawal	Discharge	NET I/O
East Branch Westport River	0.51	0.26	(0.25)*
Paskamanset River	1.98	1.78	(0.20)
Acushnet River	0.00	0.17	0.17
Mattapoisett River	2.44	0.13	(2.31)
Sippican River	0.07	0.14	0.06
Weweantic River	0.74	1.30	0.56
Wankinco River	0.00	0.00	0.00
Agawam River	1.58	0.00	(1.58)

* Numbers shown in parentheses are net losses.

The inflow/outflow analysis indicates that the East Branch Westport, Paskamanset, Mattapoisett and Agawam Rivers lose water due to municipal withdrawals. The Acushnet, Sippican and Weweantic Rivers gain water, and the Wankinco River has no net change due to public water supply activity.

These net inflows/outflows can be combined with the streamflow data to determine the extent to which inflow/outflow increases or decreases the available virgin yield in the subbasin. The results shown in Table 11, are the available yields after existing uses. The available water now ranges from 0.54 cfs (0.35 mgd) in the Mattapoisett River subbasin to 20.27 cfs (13.1 mgd) in the Agawam River subbasin.

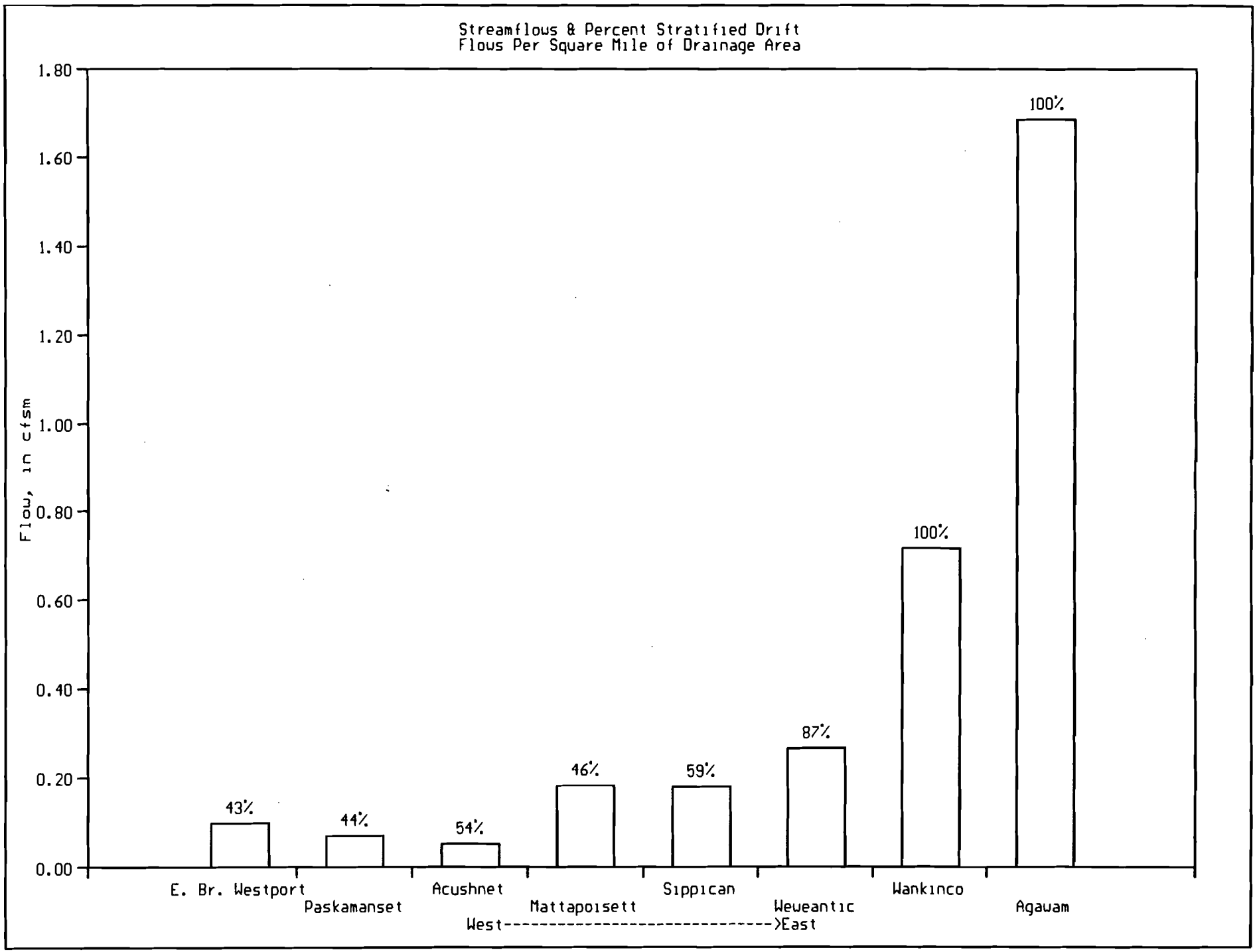
Streamflows & Percent Stratified Drift
Flows Per Square Mile of Drainage Area
Flow, in cfsm
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
43%
44%
54%
46%
59%
87%
100%
100%
E. Br. Westport
Paskamanset
Acushnet
Mattapoisett
Sippican
Weweantic
Wankinco
Agawam
West----------->East

Figure 6

Table 11
Adjusted Flows, in cfs for Period of Record 1967-1991 and 1980-81

Sub-basin Name	98% POR*	95% POR	98% '80-81	95% '80-81
East Branch Westport River	2.37	3.72	1.90	2.66
Paskamanset River	1.49	2.58	1.19	1.86
Acushnet River	1.10	1.88	0.87	1.33
Mattapoisett River	0.80	1.51	0.54	0.85
Sippican River	5.11	7.06	4.13	5.11
Weweantic River	16.50	21.90	12.60	14.70
Wankinco River	14.70	15.90	11.30	10.70
Agawam River	26.36	28.51	20.27	19.19

*Period of Record

The existing yields are high in the Weweantic, Wankinco and Agawam River subbasins due to the naturally high flows. The smallest of the three yields is 11.30 cfs (7.3 mgd) in the Wankinco river subbasin. (For the purpose of comparison, 11.30 cfs is enough water to meet half of Fall Rivers total demand of 14.53 mgd as shown in Table 3). The Agawam River subbasin loses 1.58 mgd, however this is a small percent of the remaining yield which is 20.27 cfs (13.1 mgd). The East Branch Westport, Paskamanset and Sippican River basins have a moderate amount of water available ranging from 1.19 cfs to 4.13 cfs (0.78 mgd to 2.6 mgd), which is enough water to supply a small community such as Mattapoisett or Marion. The Acushnet and Mattapoisett River subbasins have very little available yields. The Mattapoisett River is somewhat stressed due to the existing net loss of 2.31 mgd. The yields in these subbasins range from 0.54 cfs to 0.87 cfs (0.35 mgd to 0.56 mgd). These yields would not be sufficient to supply the existing demands of most of the basin communities.

LITERATURE CITED

Brady, Phillips, Division of Marine Fisheries. Memorandum, 9 January 1992.

Buzzards Bay Project. 1994. Herring Restoration Project Pre-Proposal.

DEP Division of Water Pollution Control. 1987. Buzzards Bay 1985 Water Quality Survey Data Part A.

DEP Division of Water Pollution Control. 1988. Buzzards Bay 1986 Water Quality Survey Data.

Glenn, Bob. 1994. "A Report on the Continuing Study of Fecal Coliform in the Westport River". WRWA River News 17, no. 8.

Mason, Austin, Department of Environmental Management. Memorandum, 3 March 1995.

Simcox, A.C. 1992. Water Resources of Massachusetts, U.S. Geological Survey, Water Resources Investigations Report 90-4144.

Appendix A: Lakes and Ponds with Important Fresh Water Fisheries

Table 1. List of ponds identified by the Massachusetts Divsion of Fisheries Fisheries and Wildlife as important inland fisheries resources in the Buzzards Bay Basin.

PALIS	Pond	Town	County	Acres	1950's MDFW Survey	Date of Last MDFW Survey	Trout Pond
95001	Abner Pond	Plymouth	PLY	10			
95002	Allens Pond	Dartmouth	BRI	188			
95003	Atwoods Reservoir	Carver	PLY	280			
95004	Barrett Pond	Carver	PLY	16	1951		
95005	Barrows Brook Pond	Plympton	PLY	5			
95006	Bartlett Pond	Wareham	PLY	10			
95007	Bates Pond	Carver	PLY	20		1961	
95008	Beaverdam Pond	Wareham	PLY	4			
95009	Bensons Pond	Carver	PLY	26			
95010	Betty Spring	Freetown	BRI	2			
95011	Big Sandy Pond	Plymouth	PLY	134	1951	1983	Y
95012	Big West Pond	Plymouth	PLY	40			
95013	Black Pond	Bourne	BAR	8			
95014	Blackmere Reservoir	Wareham	PLY	25			
95015	Blackmore Reservoir	Wareham	PLY	46	1952		
95016	Bourne Pond	Bourne	BAR	10			
95017	Braley Road Pond	Freetown	BRI	6			
95018	Bumps Pond	Plymouth	PLY	20	1952		
95019	Bumpus Bog Pond	Carver	PLY	9			
95020	Buttonwood Park Pond	New Bedford	BRI	12			
95021	Cedar Dell Lake	Dartmouth	BRI	24			
95022	Cedar Pond	Carver/Wareham	PLY	12			
95023	Center Cranberry Bog Pond	Rochester	PLY	28			
95024	Center St. West Pond	Carver	PLY	7			
95025	Charge Pond	Plymouth	PLY	23	1952		
95026	Clear Bottom Pond	Carver	PLY	5			
95027	Clear Pond	Carver	PLY	11			
95028	Clear Pond	Plymouth	PLY	12			
95029	Cockeast Pond	Westport	BRI	99			
95030	College Pond	Plymouth	PLY	53	1952	1980	
95031	Cornell Pond	Dartmouth	BRI	16			
95032	Cow Yard Pond	Dartmouth	BRI	9			
95033	Crane Brook Big Pond	Carver	PLY	37			
95034	Curlew Pond	Plymouth	PLY	43	1952		
95035	Darby Pond	Plymouth	PLY	37	1951	1962	
95036	Deer Pond	Plymouth	PLY	11			
95037	Destruction Pond	Dartmouth	BRI	6			
95038	Dicks Pond	Wareham	PLY	40	1952		
95039	Doctors	Plymouth	PLY	2			
95040	Douglas Corner Pond [N.B	Rochester	PLY	13			
95041	Douglas Corner Pond [S.B	Rochester	PLY	10			
95042	Dugway Pond	Plymouth	PLY	8			
95043	Dunham Pond	Plymouth	PLY	12			
95044	Dunham Pond	Carver	PLY	45	1951	1971	
95045	E. Br. Sippican R. Pond	Rochester	PLY	10			
95047	East Cranberry Bog Pond	Rochester	PLY	11			
95048	East Gibbs Bog Pond	Carver	PLY	6			
95049	Eel Pond	Mattapoisett	PLY	32			
95050	Ellis Pond	Plymouth	PLY	11			

Table 1. List of ponds identified by the Massachusetts Divsion of Fisheries Fisheries and Wildlife as important inland fisheries resources in the Buzzards Bay Basin.

PALIS	Pond	Town	County	Acres	1950's MDFW Survey	Date of Last MDFW Survey	Trout Pond
95051	Ezekiel Pond	Plymouth	PLY	36	1952	1965	
95053	Fawn Pond	Plymouth/Carver	PLY	33			
95054	Fearing Pond	Plymouth	PLY	24	1952		
95055	Federal Furnace Pond	Carver	PLY	129		1986	
95056	Five Mile Pond	Plymouth	PLY	29	1952		
95057	Forbes Swamp Pond	Rochester	PLY	8			
95058	Fuller Street Pond	Carver	PLY	21			
95059	Gallows Pond	Plymouth	PLY	43	1951		
95060	Georges Pond	Dartmouth	BRI	16			
95061	Glen Charlie Pond	Wareham	PLY	185		1978	
95062	Golden Field Pond	Carver	PLY	16			
95063	Goose Pond	Plymouth	PLY	3			
95064	Grady Pond	Carver	PLY	28			
95065	Grassy Pond	Plymouth	PLY	6			
95066	Grassy Pond	Plymouth	PLY	3			
95067	Grassy West Pond	Plymouth	PLY	20			
95068	Gravel Pit Pond	Wareham	PLY	13			
95069	Gurney Bogs Pond	Wareham	PLY	12			
95070	Hartley Mill Pond	Rochester	PLY	96			
95071	Hathaway Pond	Rochester	PLY	34			
95072	High Hill Reservoir	Dartmouth	BRI	8			
95074	Horseshoe Pond North	Wareham	PLY	10			
95075	Horseshoe Pond	Wareham	PLY	85			
95076	Huckleberry Corner Pond	Carver	PLY	7			
95077	Jakes Pond	Plymouth	PLY	5			
95078	Kings Pond	Plymouth	PLY	21	1950		
95079	Large Gibbs Bog Pond	Carver	PLY	17			
95080	Leonards Pond	Rochester	PLY	54			
95081	Leonards Pond West	Rochester		9			
95083	Little Clear Pond	Plymouth	PLY	10			
95084	Little College Pond	Plymouth	PLY	3			
95085	Little Duck Pond	Plymouth	PLY	5			
95086	Little Five Mile Pond	Plymouth	PLY	5			
95086	Little Five Mile Pond	Plymouth	PLY	5			
95088	Little Long Pond	Plymouth	PLY	45	1951		
95089	Little Long Pond	Wareham	PLY	19			
95090	Little Micajah Pond	Plymouth	PLY	10			
95091	Little Rocky Pond	Plymouth	PLY	11			
95092	Little Sandy Pond	Plymouth	PLY	29	1952	1982	
95093	Little West Pond	Plymouth	PLY	25			
95094	Little Widgeon Pond	Plymouth	PLY	7			
95095	Long Duck Pond	Plymouth	PLY	23	1952		
95096	Long Pond	Plymouth	PLY	211	1951	1990	Y
95097	Long Pond	Rochester	PLY	33	1951		
95098	Manters Hole	Plymouth	PLY	2			
95099	Maple Springs Bog	Wareham	PLY	16			
95100	Marys Pond	Rochester	PLY	81	1951	1984	Y
95101	Maxim Corner Pond	Middleborough	PLY	9			
95102	Micajah Pond	Plymouth	PLY	20	1952		
95103	Middle Gibbs Bog Pond	Carver	PLY	7			
95104	Mill Pond	Rochester	PLY	8			

Table 1. List of ponds identified by the Massachusetts Divsion of Fisheries Fisheries and Wildlife as important inland fisheries resources in the Buzzards Bay Basin.

PALIS	Pond	Town	County	Acres	1950's MDFW Survey	Date of Last MDFW Survey	Trout Pond
95105	Agawam Mill Pond	Wareham	PLY	150		1990	
95106	Little Pond	Plymouth	PLY	43	1951	1981	
95106	Morton Pond	Plymouth	PLY	10			
95107	Mosquito Pond East	Wareham	PLY	5			
95108	Mosquito Pond West	Wareham	PLY	3			
95109	Narragansett Pond	Plymouth	PLY	6			
95110	New Bedford Reservoir	Acushnet	BRI	219		1960	
95111	New Grassy Pond	Plymouth	PLY	5			
95112	New Long Pond	Plymouth	PLY	23	1952	1987	
95113	Noquochoke Lake [M.B.]	Dartmouth	BRI	110			
95114	North Rocky Meadow Brook Pond	Carver	PLY	24			
95115	Parker Mills Pond	Wareham	PLY	105			
95116	Raccoon Pond	Carver	PLY	3			
95117	Rock Village Pond	Middleborough	PLY	8			
95118	Rocky Meadow Brook Pond	Carver	PLY	11			
95120	Rose Brook Reservoir	Wareham	PLY	9			
95121	Round Hole	Plymouth	PLY	2			
95122	Round Pond	Plymouth	PLY	23		1987	
95122	Round Pond	Plymouth	PLY	23			
95123	Round Pond	Plymouth	PLY	10			
95124	Salters Point Pond	Dartmouth	BRI	50			
95125	Sampson Pond	Carver	PLY	310	1951	1983	
95127	Sand Pond	Wareham	PLY	15			
95128	Sandy Pond	Wareham	PLY	18			
95129	Sassaquin Pond	New Bedford	BRI	34	1952	1964	
95130	Saw Mill Pond	Acushnet	BRI	7			
95131	Sconticut Neck Pond	Fairhaven	BRI	13			
95132	Sherman Br. Pond North	Rochester	PLY	6			
95133	Sherman Br. Pond South	Rochester	PLY	12			
95134	Smalleys Bog Reservoir	Wareham	PLY	30			
95135	Smelt Pond	Kingston	PLY	44	1952	1983	
95136	Smith Mills Pond	Dartmouth	BRI	13			
95137	Snipatuit Pond	Rochester	PLY	710	1951	1978	
95138	Snows Pond	Rochester	PLY	58	1951	1984	
95139	South Meadow Br. Pond	Carver	PLY	25			
95140	South Meadow Pond	Carver	PLY	17			
95141	Southwest Atwood Bog Pond	Carver	PLY	14			
95142	Spectacle Pond	Wareham	PLY	42	1952		
95143	Spring Pond	Plymouth	PLY	5			
95144	Thomastown Cemetary Pond	Middleborough	PLY	6			
95145	Three Cornered Pond	Plymouth	PLY	14		1987	
95146	Tihonet Pond	Wareham	PLY	89			
95147	Tindale Pond	Hanover	PLY	3			
95148	Tinkham Pond	Mattapoisett/Acushne	PLY	20			
95149	Torrey Pond	Plymouth	PLY	3		1987	
95150	Tremont Mill Pond	Wareham	PLY	50			
95151	Turner Pond	New Bedford/Dartmout	BRI	55		1987	
95152	Union Pond	Wareham	PLY	25			

Table 1. List of ponds identified by the Massachusetts Divsion of Fisheries Fisheries and Wildlife as important inland fisheries resources in the Buzzards Bay Basin.

PALIS	Pond	Town	County	Acres	1950's MDFW Survey	Date of Last MDFW Survey	Trout Pond
95153	Vaughn Pond	Carver	PLY	22		1988	
95154	Village Cedar Swamp Pond	Carver	PLY	10			
95155	Wall Pond	Plymouth	PLY	12			
95156	Walnut Street Pond	Rochester	PLY	9			
95157	Waterman School Pond	Rochester	PLY	10			
95158	Wenham Pond	Carver	PLY	50	1951	1961	
95159	West Cranberry Bog Pond	Rochester	PLY	8			
95160	West Gibbs Bog Pond	Carver	PLY	8			
95161	West Glen Charlie Reservoir	Wareham	PLY	13			
95162	West Island Pond	Fairhaven	BRI	6			
95163	West Noquochoke Pond	Dartmouth	BRI	20			
95164	West Thomastown Cematary Pond	Middleborough	PLY	12			
95165	Weweantic River North Po	Carver	PLY	9			
95166	White Island Pond [E.B.]	Plymouth	PLY	159	1951		
95167	Whites Dairy Dam	Acushnet	8RI	14			
95168	Whites Pond	Plymouth	PLY	33	1952		
95169	Widgeon Pond	Plymouth	PLY	24	1952		
95170	Noquockoke Lake [S.B.]	Dartmouth	BRI	19			
95171	Noquochoke Lake [N.B.]	Dartmouth	BRI	17			
95172	Mare Pond	Plymouth	PLY	14			
95173	White Island Pond [W.B.]	Plymouth	PLY	125	1951		
95174	Fresh Meadow Pond	Carver/Plymouth	PLY				
95175	Copicut Reservoir	Fall River	BRI	800		1986	

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

24 October 1994

Michele Drury
DEM Div. of Water Resources
100 Cambridge Street
Boston, MA 02202

Re: Buzzards Bay Watershed
Cape Cod, MA
NHESP File No: 94-807

Dear Ms. Drury,

Thank you for contacting the Natural Heritage and Endangered Species Program for information regarding state-listed rare species in the vicinity of the above referenced site. Enclosed is a print-out of all the known occurrences of rare plants and animals and significant natural communities in the Buzzards Bay Watershed, listed by town. As you can see, each report which is considered a distinct occurrence of a species is listed separately. This includes the Osprey, which grew enough in numbers that it was delisted to our official Watchlist rather than being state-listed. I believe that you have our **1994 Natural Heritage Atlas**, in which you can find Estimated Habitats of State-listed, Rare Wetlands Wildlife and High Priority Sites of Rare Species Habitats and Exemplary Natural Communities for this area, by quadrangle. I hope that this information is useful to you.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. Should your site plans change, or new rare species information become available, this evaluation may be reconsidered.

Please do not hesitate to call me if you have any questions.

Sincerely,

Diane Lauber
Environmental Review Assistant

Natural Heritage & Endangered Species Program
100 Cambridge Street, Boston, MA 02202 (617) 727-9194, (617) 727-3151
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

Massachusetts Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife, 100 Cambridge Street, Boston, MA 02202
Rare Species and Natural Community Occurrences in the Buzzards Bay Watershed

Scientific Name	Common Name	DFW Rank	First Obs. Date	Last Obs. Date
*** Town Name: ACUSHNET				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1968	1968-SUMM
LIGUMIA NASUTA	EASTERN PONDMUSSEL	SC	1979	1979-09-12
*** Town Name: BOURNE				
MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	T	1991	1992-09
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1989	1989-05-28
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC		1986-08-20
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1991-08-12	1991-08-12
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1974-06-15	1974-06-15
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1984	1984-10-17
LYGODIUM PALMATUM	CLIMBING FERN	SC	1974	1992-08-26
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1975	1986
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1967	1993-09-01
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1993-08-30	1993-08-30
*** Town Name: CARVER				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1984	1984-06
PANDION HALIAETUS	OSPREY	- WL		1938
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1978	1982
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1979	1988
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1980	1984-06-15
LEPTODEA OCHRACEA	TIDEWATER MUCKET	SC	0000	0000
LIGUMIA NASUTA	EASTERN PONDMUSSEL	SC		0000
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1987	1987-
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE	E	1990	1990-10-20
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1986	1986-10-02
RHYNCHOSPORA INUNDATA	INUNDATED HORNED-SEDGE	T	1989-08-02	1993-09-21
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1980	1980-08-02
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1975	1993-09-21
*** Town Name: DARTMOUTH				
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1987	1988-10-14
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1988	1988-05-27
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	196-	1960 S
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1988	1988-09-09
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T		1988-10-13
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1988	1988-06-14
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T		1988-09-30
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW	SC	1977	1990-06-14
CHARADRIUS MELODUS	PIPING PLOVER	T	1992	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1989	1990

KEY TO DFW RANK:
E = Endangered, T = Threatened, SC = Special Concern.

Massachusetts Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife, 100 Cambridge Street, Boston, MA 02202
Rare Species and Natural Community Occurrences in the Buzzards Bay Watershed

Scientific Name	Common Name	DFW Rank	First Obs. Date	Last Obs. Date
CHARADRIUS MELODUS	PIPING PLOVER	T	1988.	1989
CHARADRIUS MELODUS	PIPING PLOVER	T	1916	1992
CIRCUS CYANEUS	NORTHERN HARRIER	T		1987-SPRIN
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1988-06-16
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-06-18
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1989	1990-04-16
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1988-04-19
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-07-20
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1991	1991-06-12
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1988-06-28
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1986	1993-07-27
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1990-04-16
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1989	1989-05-11
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-06-09
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1989	1991-10-19
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1987	1988-05-17
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1988	1988-10-13
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1988	1988-03-24
IXOBRYCHUS EXILIS	LEAST BITTERN	T	1993-05-17	1993-05-19
MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	T	1988	1988-06-07
MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	T	1980	1988-06-21
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	197-	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	965	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
RALLUS ELEGANS	KING RAIL	T		1988-06-14
STERNA ANTILLARUM	LEAST TERN	SC	1984	1992-06
STERNA ANTILLARUM	LEAST TERN	SC	1916	1979-06-20
STERNA HIRUNDO	COMMON TERN	SC	1988	1989-06
STERNA HIRUNDO	COMMON TERN	SC	1984	1990-06
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1993-07-28	1993-07-28
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1987	1987-06-30
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1988	1988-05-27
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1992-06-16	1992-06-16
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1973	1973-09
ABAGROTIS CRUMBI BENJAMINI	COASTAL HEATHLAND CUTWORM	SC	1984	1987-09-10
BAGISARA RECTIFASCIA	STRAIGHT LINED MALLOW MOTH	SC	1983	1987-05-30

KEY TO DFW RANK:
E = Endangered, T = Threatened, SC = Special Concern.

Massachusetts Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife, 100 Cambridge Street, Boston, MA 02202
Rare Species and Natural Community Occurrences in the Buzzards Bay Watershed

Scientific Name	Common Name	DFW Rank	First Obs. Date	Last Obs. Date
CATOCALA MULIERCULA	AN UNDERWING MOTH	-	1986	1986
CATOCALA VIDUA		-	0000	1986-09-23
CINGILIA CATENARIA	CHAIN DOT GEOMETER	SC	1987-10	1987-10
CINGILIA CATENARIA	CHAIN DOT GEOMETER	SC	1980S	1993-09-30
CINGILIA CATENARIA	CHAIN DOT GEOMETER	SC	1987	1988-08
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1986	1986-04-23
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1986	1986-04-23
EACLES IMPERIALIS	IMPERIAL MOTH	SC	1986	1986-07
ENALLAGMA DAECKII	ATTENUATED BLUET	SC	1993-07-13	1993-07-13
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1993-06-08	1993-06-08
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1989	1993-06-08
LIMNADIA LENTICULARIS	MASSACHUSETTS CLAM SHRIMP	SC	1985	1985
LITHOPHANE VIRIDIPALLENS	PALE GREEN PINION MOTH	SC	1986	1986-04-03
SYNURELLA CHAMBERLAINI	COASTAL SWAMP AMPHIPOD	SC	1986	1986-04-22
AGALINIS ACUTA	SANDPLAIN GERARDIA	E		1888-06-05
ARETHUSA BULBOSA	ARETHUSA	T	1903	1903-06-04
ASCLEPIAS VERTICILLATA	LINEAR-LEAVED MILKWEED	T	1904	1904-08-01
CUPHEA VISCOSISSIMA	BLUE WAXWEED	- H	1902	1902-09-05
ELEOCHARIS MICROCARPA	TINY-FRUITED SPIKE-SEDGE	E	1987	1988-07-09
GNAPHALIUM PURPUREUM	PURPLE CUDWEED	E		1889-07-11
HELIANTHEMUM DUMOSUM	BUSHY ROCKROSE	SC	1988	1989-10-06
MYRIOPHYLLUM PINNATUM	PINNATE WATER-MILFOIL	SC	1903	1903-08-04
MYRIOPHYLLUM PINNATUM	PINNATE WATER-MILFOIL	SC	1981	1981-08-06
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1987	1988-07-09
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1929	1929-09-28
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1984	1985-08-01
PLATANTHERA CRISTATA	CRESTED FRINGED ORCHIS	E	1905	1905-08-05
PLATANTHERA CRISTATA	CRESTED FRINGED ORCHIS	E	1987	1988-08-17
PLATANTHERA CRISTATA	CRESTED FRINGED ORCHIS	E	1908	1908-08-01
PLATANTHERA FLAVA VAR HERBIOLA	PALE GREEN ORCHIS	T	1907	1923-07-09
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1987	1987-09-06
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	18--	1983-08-21
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1984	1984-09-01
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1908	1936
SABATIA STELLARIS	SEA PINK	E	1900	1968-08-16
SCHWALBEA AMERICANA	CHAFFSEED	- H	1888	1900-07-22
SCIRPUS LONGII	LONG'S BULRUSH	E	1987	1989-10-06
SCLERIA TRIGLOMERATA	TALL NUT-SEDGE	E		1888-06-19
SETARIA GENICULATA	BRISTLY FOXTAIL	SC	1924	1993-08-21
SPIRANTHES VERNALIS	GRASS-LEAVED LADIES'-TRESSES	SC	1981	1981-09-03
SPIRANTHES VERNALIS	GRASS-LEAVED LADIES'-TRESSES	SC	1981	1981-08-06

*** Town Name: FAIRHAVEN

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BOTAURUS LENTIGINOSUS	AMERICAN BITTERN	SC	1993-06-23	1993-06-23
CHARADRIUS MELODUS	PIPING PLOVER	T	1992	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1992
MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	T	1988	1988-07-08
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
STERNA ANTILLARUM	LEAST TERN	SC	1984	1988
STERNA ANTILLARUM	LEAST TERN	SC	1978	1980-06-12
STERNA ANTILLARUM	LEAST TERN	SC	1992-06	1992-06
STERNA ANTILLARUM	LEAST TERN	SC	1984	1986-06
STERNA HIRUNDO	COMMON TERN	SC	1984	1992 06
STERNA HIRUNDO	COMMON TERN	SC	1986	1986-06
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1990	1990-08-25
ACHILLEA MILLEFOLIUM VAR LANULOSA	SEASIDE YARROW	-	1989	1989-07-16
CASTILLEJA COCCINEA	INDIAN PAINTBRUSH	- H		1891-PRE
DICHANTHELIUM MATTAMUSKEETENSE	MATTAMUSKEET PANIC-GRASS	E	1989	1990-06-17
POLYGONUM GLAUCUM	SEA-BEACH KNOTWEED	- WL	1989	1989-07-16
*** Town Name: FALL RIVER				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1988-06-02
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1988	1988-10-13
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1986	1986-09-30
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1985	1985
*** Town Name: KINGSTON				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1970-08-24
*** Town Name: MARION				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1989-05-28
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1988-05-22
MALACLEMYS TERRAPIN	DIAMONDBACK TERRAPIN	T	1964	1990-SUMMER
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
STERNA DOUGALLII	ROSEATE TERN	E	1974	1992-06
STERNA HIRUNDO	COMMON TERN	SC	1971	1992-06
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1987	1989-07
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1989	1989-08-19
ARISTIDA PURPURASCENS	PURPLE NEEDLEGRASS	T	1929	1929-09-22
*** Town Name: MATTAPOISETT				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1985	1985-04-26
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1990	1990-05
STERNA ANTILLARUM	LEAST TERN	SC	1992-06	1992-06

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STERNA DOUGALLII	ROSEATE TERN	E	1974	1974
STERNA HIRUNDO	COMMON TERN	SC	1911	1992-06
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1990-07-09	1990-07-28
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1988	1989-09-20
*** Town Name: MIDDLEBOROUGH				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1987	1987-08-14
LINUM MEDIUM	RIGID FLAX	T	1983	1983-08-03
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1988	1988-10-02
*** Town Name: NEW BEDFORD				
CARPHOPHIS AMOENUS	EASTERN WORM SNAKE	T	18--	18--
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1989	1991-10-19
STERNA PARADISAEA	ARCTIC TERN	SC	1897	1897-07-13
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1989	1989-07-16
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1986	1986-04-23
ENALLAGMA DAECKII	ATTENUATED BLUET	SC	1993-06-25	1993-08-03
LIMNADIA LENTICULARIS	MASSACHUSETTS CLAM SHRIMP	SC	1985	1985
LITHOPHANE VIRIDIPALLENS	PALE GREEN PINION MOTH	SC	1993-10-07	1993-10-07
LISTERA CORDATA	HEARTLEAF TWAYBLADE	E	0000	0000
SPHENOPHOLIS PENSYLVANICA	SWAMP OATS	T	1989	1989-06-06
SNE BASIN SWAMP, COASTAL ATLANTIC WHITE CEDAR ASSOCIATION			1971	1989
*** Town Name: PLYMOUTH				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1984	1992-05
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1979	1988
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1916	1988-SUMM
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1984	1984-07-28
PSEUDEMYS RUBRIVENTRIS BANGSI	PLYMOUTH RED-BELLIED TURTLE	E	1978	1978-08-11
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC		1986-05
ABAGROTIS CRUMBI BENJAMINI	COASTAL HEATHLAND CUTWORM	SC	1991	1991-09-24
ACRONICTA ALBAPUFA	BARRENS DAGGERMOTH	T	1970	1983-08
ACRONICTA LANCEOLARIA	A NOCTUID MOTH	-	1985	1985-05-31
ANAX LONGIPES	COMET DARNER	SC	1987	1987-06-24
ANISOTA STIGMA	STIGMA MOTH	-	1984	1987-07
APHARETRA PURPUREA	BLUEBERRY SALLOW	T	1993-07-14	1993-07-14
APHARETRA PURPUREA	BLUEBERRY SALLOW	T	1991	1991-07-18
APHARETRA PURPUREA	BLUEBERRY SALLOW	T	1982	1987-08-08
APLECTOIDES CONDITA	A NOCTUID MOTH	-	1985	1986-06-28
CATOCALA HERODIAS GERHARDI	GERHARD'S UNDERWING MOTH	T	1993-07-07	1993-07-14
CATOCALA HERODIAS GERHARDI	GERHARD'S UNDERWING MOTH	T	1970	1991-08-17

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CATOCALA HERODIAS GERHARDI	GERHARD'S UNDERWING MOTH	T		1991-07-31
CATOCALA PRETIOSA	PRECIOUS UNDERWING MOTH	-	1989	1989-08-05
CATOCALA SP 1	PINE WOODS UNDERWING	-	1986	1987-08-08
CHAETAGLAEA CERATA	A NOCTUID MOTH	-	1982	1984-11-03
CHYTONIX SENSILIS		-	1986	1987-08-08
CICINDELA PATRUELA	BARRENS TIGER BEETLE	SC	1992	1992-05-20
CICINNUS MELSHEIMERI	MELSCHEIMER'S SACK BEARER	T	1993-06-17	1993-06-17
CRAMBIDIA SP 2	A LICHEN MOTH	-	1983	1983-08
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC		1987-06-24
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1989	1989-06-12
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1989	1989-06-12
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1989	1989-06-12
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1989	1989-06-12
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1989	1989-06-12
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1989	1989-06-12
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1993-06-18	1993-06-18
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1989	1993-06-18
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1988	1988-06-16
ENALLAGMA RECURVATUM	BARRENS BLUET	T	1989	1989-06-12
ERYNNIS PERSIUS PERSIUS	PERSIUS DUSKYWING	T	1984	1985-05-22
ERYNNIS PERSIUS PERSIUS	PERSIUS DUSKYWING	T	197-	197-
EUXOA VIOLARIS	A NOCTUID MOTH	-	1982	1985-09-21
GLENA COGNATARIA	A GEOMETER MOTH	-	1982	1982-07-26
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1975	1986-10-23
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1989	1993-10-16
HEMILEUCA MAIA MAIA	COASTAL BARRENS BUCKMOTH	T	1991	1991-10-20
HYPOMECIS UMBROSARIA		-	1985	1985-06-04
INCISALIA IRUS	FROSTED ELFIN	-	1985	1985-05-24
INCISALIA IRUS	FROSTED ELFIN	-	1984	1985-05-22
ITAME SP 1	PINE BARRENS ITAME	SC	1993-07-01	1993-07-14
LEPTODEA OCHRACEA	TIDEWATER MUCKET	SC	1941	1981-07-05
LITHOPHANE GEORGII		-	1984	1985-03-23
LITHOPHANE THAXTERI	THAXTER'S PINION MOTH	-	1985	1985-10-14
LITHOPHANE VIRIDIPALLENS	PALE GREEN PINION MOTH	SC	1983	1985-10-14
METARRANTHIS PILOSARIA	COASTAL SWAMP METARRANTHIS MOTH	SC	1993-06-24	1993-06-24
METARRANTHIS PILOSARIA	COASTAL SWAMP METARRANTHIS MOTH	SC	1991	1991-06-20
PALEACRITA MERRIDATA	SPRING CANKER WORM	-	1984	1985-03-21
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1988	1988-09-20
PSECTRAGLAEA CARNOSA	PINK SALLOW	-	1982	1986-10-20
RENIA NEMORALIS		-		1987-08-08
SCHIZURA APICALIS		-	1983	1986-07-25
ZALE SP 1	PINE BARRENS ZALE	SC	1985	1986-09-30

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ZALE SP 1	PINE BARRENS ZALE	SC	1991	1991-05-28
ASCLEPIAS TUBEROSA	BUTTERFLY-WEED	- WL		1974-08-
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE	E	1918	1918-08-08
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE	E	1918	1985-08-09
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE	E	1990	1990-11-04
COREMA CONRADII	BROOM CROWBERRY	SC	1930	1988-03-31
COREMA CONRADII	BROOM CROWBERRY	SC	1865	1990
DICHANTHELIUM ACUMINATUM		-	1927	1985-08-09
DICHANTHELIUM ACUMINATUM		-	1990	1990-10-28
DICHANTHELIUM WRIGHTIANUM	WRIGHT'S PANIC-GRASS	SC	1927	1983-02-04
DICHANTHELIUM WRIGHTIANUM	WRIGHT'S PANIC-GRASS	SC	1933	1952-09-16
DICHANTHELIUM WRIGHTIANUM	WRIGHT'S PANIC-GRASS	SC	1987	1989-10-05
DICHANTHELIUM WRIGHTIANUM	WRIGHT'S PANIC-GRASS	SC	1990	1990-10-28
DICHANTHELIUM WRIGHTIANUM	WRIGHT'S PANIC-GRASS	SC	1927	1985-08-09
DROSERA FILIFORMIS	THREAD-LEAVED SUNDEW	- WL	1975	1981-07-23
DROSERA FILIFORMIS	THREAD-LEAVED SUNDEW	- WL		1980-06-20
DROSERA FILIFORMIS	THREAD-LEAVED SUNDEW	- WL	1975	1981-08-16
DROSERA FILIFORMIS	THREAD-LEAVED SUNDEW	- WL		1985-08-09
DROSERA FILIFORMIS	THREAD-LEAVED SUNDEW	- WL	1936-09-07	1981-07-23
ELEOCHARIS MELANOCARPA	BLACK-FRUITED SPIKE-RUSH	- WL	1981	1981-08-16
ELEOCHARIS MELANOCARPA	BLACK-FRUITED SPIKE-RUSH	- WL	1918	1918-08-08
ELEOCHARIS MELANOCARPA	BLACK-FRUITED SPIKE-RUSH	- WL	1981	1981-07-23
FUIRENA PUMILA	UMBRELLA-GRASS	- WL	1936-09-07	1981-07-23
FUIRENA PUMILA	UMBRELLA-GRASS	- WL	1980	1981-07-23
FUIRENA PUMILA	UMBRELLA-GRASS	- WL	1980	1981-08-16
ISOETES ACADIENSIS	ACADIAN QUILLWORT	E	1985	1985-10-01
ISOETES ACADIENSIS	ACADIAN QUILLWORT	E	1937	1989-07-14
LACHNANTHES CAROLIANA	REDROOT	SC	1985	1993-07-11
LACHNANTHES CAROLIANA	REDROOT	SC	1918	1985-08-09
LACHNANTHES CAROLIANA	REDROOT	SC	1975	1985-08-09
POLYGONUM PUNCTATUM	PONDSHORE KNOTWEED	SC	1985	1985-09-20
POLYGONUM PUNCTATUM	PONDSHORE KNOTWEED	SC	1918	1985-08-09
POLYGONUM PUNCTATUM	PONDSHORE KNOTWEED	SC	1985	1985-08-20
POLYGONUM PUNCTATUM	PONDSHORE KNOTWEED	SC	1965	1985-10-01
POLYGONUM PUNCTATUM	PONDSHORE KNOTWEED	SC	1913	1913-08-30
PSILOCARYA NITENS	SHORT-BEAKED BALD-SEDGE	T	1981	1981-07-23
PSILOCARYA NITENS	SHORT-BEAKED BALD-SEDGE	T	1985	1985-08-09
PSILOCARYA NITENS	SHORT-BEAKED BALD-SEDGE	T	1981	1981-08-06
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1980	1980-08-19
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1985	1985-10-01
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1980	1985-08-09
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1927	1927-09-21

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PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1981	1981-08-16
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1981	1981-07-23
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1975	1975-09-13
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1980	1985-08-20
PSILOCARYA SCIRPOIDES	LONG-BEAKED BALD-SEDGE	SC	1985	1985-09-09
RHYNCHOSPORA INUNDATA	INUNDATED HORNED-SEDGE	T	1918	1918-08-08
RHYNCHOSPORA INUNDATA	INUNDATED HORNED-SEDGE	T	1918	1985-08-20
RHYNCHOSPORA TORREYANA	TORREY'S BEAK-SEDGE	E	1989	1989-09-29
RHYNCHOSPORA TORREYANA	TORREY'S BEAK-SEDGE	E	1986	1986-09-17
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1975	1993-08-04
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1975	1993-07-11
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1990-10-28	1990-10-28
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1982	1982-09-16
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1975	1990-08-19
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1975	1985-06-25
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1990-10-28	1990-10-28
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1982	1987-08-20
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1935	1935-08-05
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1935	1986-09-17
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1985	1991-08-15
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1916	1916-09-15
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1913	1985-08-09
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1918	1985-08-09
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1935	1985-08-09
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1975	1986-09-17
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1975	1985-10-01
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1981	1990-11-04
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1975	1986-09-17
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1974	1974-07-19
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1975	1985-08-15
SAGITTARIA TERES	TERETE ARROWHEAD	SC	1986	1986-09-17
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL	1980	1981-07-23
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL	S	1990-08-19
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL	1981-07-23	1981-07-23
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL		1990-08-19
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL		1985
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL		1990-08-19
SCLERIA RETICULARIS	RETICULATE NUT-RUSH	- WL	1980	1981-08-16
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE	- WL		1913-08-21
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE	- WL		1988-08-20
UTRICULARIA SUBULATA	SUBULATE BLADDERWORT	SC	1990	1990-10-28
UTRICULARIA SUBULATA	SUBULATE BLADDERWORT	SC	1988	1988-10-25

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UTRICULARIA SUBULATA	SUBULATE BLADDERWORT	SC	1990	1990-10-28
UTRICULARIA SUBULATA	SUBULATE BLADDERWORT	SC	1985	1985-10-01
NEW ENGLAND PITCH PINE/SCRUB OAK BARRENS		-	1987	1988-10-05
CERTIFIED VERNAL POOL		-	1991	1991-03-31
*** Town Name: ROCHESTER				
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1985	1985-04-06
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-07-15
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1988-06-19
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1987	1987-05-26
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1987	1987-05-26
LEPTODEA OCHRACEA	TIDEWATER MUCKET	SC		0000
LIGUMIA NASUTA	EASTERN PONDMUSSEL	SC		0000
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1987	1987-
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1989	1989-09-07
ARETHUSA BULBOSA	ARETHUSA	T	1987	1987-06-01
PANICUM LONGIFOLIUM	LONG-LEAVED PANIC-GRASS	T	1987	1987-10-13
PANICUM PHILADELPHICUM	PHILADELPHIA PANIC-GRASS	SC	1985	1985-09-19
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1916	1935-08-07
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1980-08-08	1993-07-19
SWE BASIN SWAMP, COASTAL ATLANTIC WHITE CEDAR ASSOCIATION			1989	1989
*** Town Name: WAREHAM				
ACCIPITER COOPERII	COOPER'S HAWK	SC	1973	1988-SPRIN
ACCIPITER STRIATUS	SHARP-SHINNED HAWK	SC	1988	1988-SPRIN
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1984-06-02
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1990-05-29
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988-05-27	1993-07-05
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1988-09-20
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-04-09
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1988	1989-05-28
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1957	1988-07-25
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1984	1984-05-22
PANDION HALIAETUS	OSPREY	- WL	1977	1985-SUMM
PANDION HALIAETUS	OSPREY	- WL		1987-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC		1987-09-10
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1953	1987-09-28
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1989	1991-09-07

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TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1903	1993-06-10
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1988	1988-10-27
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC		1987-08-05
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1986	1986-06-01
APAMEA MIXTA		-	1965	1975-08-06
CATOCALA HERODIAS GERHARDI	GERHARD'S UNDERWING MOTH	T	1978	1978-08
CICINDELA PATRUELA	BARRENS TIGER BEETLE	SC	1921	1921-08-21
CICINNUS MELSHEIMERI	MELSCHEIMER'S SACK BEARER	T		1974-06-17
CINGILIA CATENARIA	CHAIN DOT GEOMETER	SC	1977	1977-09-20
CUCULLIA SPEYERI	A NOCTUID MOTH	-	1968	1978-PRE
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1987	1987-06-01
ENALLAGMA LATERALE	NEW ENGLAND BLUET	SC	1987	1987-06-01
HYPOMECIS BUCHHOLZARIA	BUCHHOLZ'S GRAY	T	1968	1968-07-04
ITAME SP 1	PINE BARRENS ITAME	SC	1968	1978-PRE
METARRANTHIS PILOSARIA	COASTAL SWAMP METARRANTHIS MOTH	SC	1978	1978-06
PAPAIPEMA APPASSIONATA	PITCHER PLANT BORER MOTH	SC	1971	1971-09-20
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1986	1987
PAPAIPEMA SULPHURATA	WATER-WILLOW STEM BORER	T	1968	1975-09-27
SCHINIA TUBERCULUM	GOLDEN ASTER FLOWER MOTH	T	1965	1978-08
SPARTINIPHAGA INOPS	SPARTINA BORER MOTH	SC	1977	1977-09-11
ARETHUSA BULBOSA	ARETHUSA	T	1887	1986-06-01
ARISTIDA PURPURASCENS	PURPLE NEEDLEGRASS	T	1913	1987-10-24
CARDAMINE LONGII	LONG'S BITTER-CRESS	E	1986	1990-07-06
CAREX STRIATA VAR BREVIS	WALTER'S SEDGE	E	1890	1986-07-09
COREMA CONRADII	BROOM CROWBERRY	SC	1978	1980-07-17
COREMA CONRADII	BROOM CROWBERRY	SC	1980	1988-03-31
COREMA CONRADII	BROOM CROWBERRY	SC	1950	1988-03-31
CRASSULA AQUATICA	PYGMYWEED	T	1928	1990-07-06
DICHANTHELIUM MATTAMUSKEETENSE	MATTAMUSKEET PANIC-GRASS	E	1950	1950-07-14
DICHANTHELIUM MATTAMUSKEETENSE	MATTAMUSKEET PANIC-GRASS	E	1913	1913-10-02
DICHANTHELIUM MATTAMUSKEETENSE	MATTAMUSKEET PANIC-GRASS	E	1990	1990-07-06
ERIOCAULON PARKERI	ESTUARY PIPEWORT	E	1929	1989-08-04
ERIOCAULON PARKERI	ESTUARY PIPEWORT	E	1928	1990-07-06
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1982	1989-08-10
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	SC	1974	1986-07-09
SAGITTARIA SUBULATA VAR SUBULATA	RIVER ARROWHEAD	E	1928	1990-07-06
SETARIA GENICULATA	BRISTLY FOXTAIL	SC	1989	1989-08-04
SPARTINA CYNOSUROIDES	SALT REEDGRASS	SC	1927	1988-05-24
SPARTINA CYNOSUROIDES	SALT REEDGRASS	SC	1989	1989-06-02
UTRICULARIA SUBULATA	SUBULATE BLADDERWORT	SC	1975	1975-06-21

Town Name: WESTPORT

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Scientific Name	Common Name	DFW Rank	First Obs. Date	Last Obs. Date
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1983	1983-04-09
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1984	1984-1985
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1989	1990
AMBYSTOMA OPACUM	MARBLED SALAMANDER	T	1950	1975
BOTAURUS LENTIGINOSUS	AMERICAN BITTERN	SC	1993-05-04	1993-05-04
CHARADRIUS MELODUS	PIPING PLOVER	T	1985	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1984	1992
CHARADRIUS MELODUS	PIPING PLOVER	T	1985	1991
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1989	1989-11-06
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1988-04
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	197-	197-
CLEMMYS GUTTATA	SPOTTED TURTLE	SC		1987-06-16
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1982	1982
CLEMMYS GUTTATA	SPOTTED TURTLE	SC	1960	1979
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1962	1973-07-16
HEMIDACTYLIUM SCUTATUM	FOUR-TOED SALAMANDER	SC	1962	1989-09-17
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	198-	198-
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	198-	198-
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1973	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM

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PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	198-	1981
PANDION HALIAETUS	OSPREY	- WL	1980	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1981
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1981	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
PANDION HALIAETUS	OSPREY	- WL	1984	1984-SUMM
STERNA ANTILLARUM	LEAST TERN	SC	1980	1986-06
STERNA ANTILLARUM	LEAST TERN	SC	1986	1992-06
STERNA ANTILLARUM	LEAST TERN	SC	1989	1992-06
STERNA HIRUNDO	COMMON TERN	SC	1988	1992-06
STERNA HIRUNDO	COMMON TERN	SC	1984	1992-06
STERNA HIRUNDO	COMMON TERN	SC		1990-06
TERRAPENE CAROLINA	EASTERN BOX TURTLE	SC	1989	1989-05-23
CICINDELA DORSALIS DORSALIS	NORTHEASTERN BEACH TIGER BEETLE	E	1904	1971-08-31
CRANGONYX ABERRANS	MYSTIC VALLEY AMPHIPOD	SC	1991	1991-04-04
ERYNNIS PERSIUS PERSIUS	PERSIUS DUSKYWING	T	1942	1942-05-28
SPARTINIPHAGA INOPS	SPARTINA BORER MOTH	SC	1987	1987-09-10
ARETHUSA BULBOSA	ARETHUSA	T	1981	1981-05
MYRIOPHYLLUM PINNATUM	PINNATE WATER-MILFOIL	SC	1983	1983-08-11
MYRIOPHYLLUM PINNATUM	PINNATE WATER-MILFOIL	SC	1910	1983-08-11
SETARIA GENICULATA	BRISTLY FOXTAIL	SC	1989	1989-08-14
TRIPSACUM DACTYLOIDES	NORTHERN GAMA-GRASS	E	1929	1929-09-28
TRIPSACUM DACTYLOIDES	NORTHERN GAMA-GRASS	E	1929	1993-08-29

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CERTIFIED VERNAL POOL		-	1990	1991-04-04
CERTIFIED VERNAL POOL		-	1991-11-19	1991-11-19
CERTIFIED VERNAL POOL		-	1989-06-28	1991-07-31
CERTIFIED VERNAL POOL		-	1990	1991-04-04
CERTIFIED VERNAL POOL		-	1990	1991-04-04
CERTIFIED VERNAL POOL		-	1991-05-03	1991-07-31
CERTIFIED VERNAL POOL		-	1990	1991-04-04
COASTAL HERON ROOKERY		-	1976	1977

81 Records Processed

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