



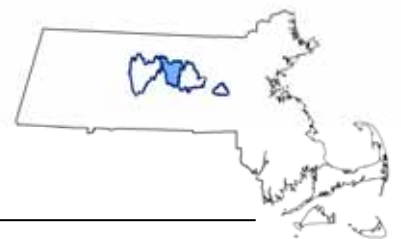
# 2008 Watershed Protection Plan Update

## Volume IIB

### Ware River Watershed



December 2008



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Massachusetts Department of Conservation and Recreation  
Division of Water Supply Protection  
Office of Watershed Management

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# 2008 Watershed Protection Plan Update

## Volume IIB: Ware River Watershed

### Table of Contents

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	THE WARE RIVER WATERSHED IN THE WATERSHED SYSTEM .....	1
1.2	THE ROGER H. LONERGAN INTAKE WORKS .....	3
1.3	THE 2008 UPDATE.....	4
<b>2</b>	<b>WATERSHED DESCRIPTION.....</b>	<b>5</b>
2.1	BASIN LOCATION .....	5
2.2	NATURAL CHARACTERISTICS .....	5
2.2.1	<i>Topography</i> .....	5
2.2.2	<i>Geology and Soils</i> .....	5
2.2.3	<i>Vegetation</i> .....	9
2.3	LAND USE/LAND COVER/DEMOGRAPHICS .....	9
2.3.1	<i>Land Ownership</i> .....	9
2.3.2	<i>Land Use/Land Cover</i> .....	11
2.3.3	<i>Demographics</i> .....	14
2.4	HYDROLOGY .....	14
2.5	WATER QUALITY .....	16
2.5.1	<i>Districts and Sub-districts</i> .....	16
2.5.2	<i>Sampling Program</i> .....	18
2.5.3	<i>Water Quality Conditions</i> .....	18
<b>3</b>	<b>SOURCES OF POLLUTION AND THEIR ASSESSMENT.....</b>	<b>21</b>
3.1	PREVIOUS PLANS AND ASSESSMENTS.....	21
3.2	WILDLIFE .....	26
3.3	PUBLIC ACCESS/RECREATION .....	28
3.4	TIMBER HARVESTING.....	29
3.5	WASTEWATER .....	30
3.6	ROADWAYS/RAILWAYS/ROWS.....	33
3.7	AGRICULTURE .....	36
3.8	CONSTRUCTION SITES .....	36
3.9	COMMERCIAL, INDUSTRIAL, AND GOVERNMENTAL SITES.....	37
3.10	RESIDENTIAL SITES .....	38
3.11	SOLID WASTE FACILITIES .....	39
3.12	FUTURE GROWTH.....	41
3.13	CLIMATE CHANGE.....	43
3.14	ASSESSMENT SUMMARY .....	44
<b>4</b>	<b>PROGRAMS TO CONTROL POTENTIAL SOURCES OF POLLUTION.....</b>	<b>47</b>
4.1	LAND PROCUREMENT AND LAND PRESERVATION .....	49
4.2	LAND MANAGEMENT .....	50
4.3	WILDLIFE MANAGEMENT.....	52
4.4	PUBLIC ACCESS MANAGEMENT .....	53
4.5	WATERSHED SECURITY .....	57
4.6	INFRASTRUCTURE.....	58
4.7	WATERSHED PROTECTION ACT .....	58
4.8	TECHNICAL ASSISTANCE AND COMMUNITY OUTREACH .....	60
4.9	INTERPRETIVE SERVICES .....	60

4.10	WATER QUALITY MONITORING .....	61
4.11	ENVIRONMENTAL QUALITY ASSESSMENTS .....	62
4.11.1	<i>Compliance with Environmental Regulations</i> .....	63
4.11.2	<i>Wastewater Management</i> .....	63
4.11.3	<i>Stormwater Management</i> .....	63
4.11.4	<i>Agriculture</i> .....	63
4.11.5	<i>Hazardous Materials and Waste</i> .....	63
4.12	EMERGENCY RESPONSE .....	64
<b>5</b>	<b>IMPLEMENTATION SCHEDULE AND WORK PLAN .....</b>	<b>65</b>
5.1	ADMINISTRATIVE AND TECHNICAL SUPPORT .....	65
5.2	ANNUAL WORK PLANS .....	65
5.3	FIVE YEAR WORK PLAN .....	66
<b>APPENDIX A: SUBWATERSHED ASSESSMENTS .....</b>		<b>77</b>
<b>APPENDIX B: PROTECTED OPEN SPACE BY SUBWATERSHED IN THE WARE RIVER WATERSHED .....</b>		<b>87</b>

## Tables

TABLE IIB-1:	DIVERSIONS FROM THE WARE RIVER WATERSHED TO QUABBIN RESERVOIR 1998-2007 .....	1
TABLE IIB-2:	PROTECTED OPEN SPACE IN THE WARE RIVER WATERSHED .....	9
TABLE IIB-3:	LAND USE IN THE WARE RIVER WATERSHED, 1999 .....	11
TABLE IIB-4:	LAND USE CHANGES IN THE WARE RIVER WATERSHED, 1971-1999 .....	13
TABLE IIB-5:	POPULATION DATA FOR WRW COMMUNITIES, 2000 TO 2007 .....	14
TABLE IIB-6:	2007 WATER QUALITY MONITORING PROGRAM FOR WARE RIVER WATERSHED TRIBUTARIES .....	19
TABLE IIB-7:	WATER QUALITY CONTAMINANTS AND THEIR MOST LIKELY SOURCES .....	21
TABLE IIB-8:	ASSESSMENT OF WATER QUALITY THREAT PRIORITIES IN WRW, 1991 AND 2000 .....	23
TABLE IIB-9:	WARE RIVER WATERSHED SUBWATERSHED ANALYSIS SUMMARY RANKINGS .....	26
TABLE IIB-10:	WARE RIVER WATERSHED SOURCE THREAT ASSESSMENT .....	45
TABLE IIB-11:	DCR WATERSHED PROTECTION GOALS, PROGRAMS, PLANS AND GUIDANCE DOCUMENTS FOR THE WARE RIVER WATERSHED .....	48
TABLE IIB-12:	POTENTIAL CONTAMINANT SOURCES AND WATERSHED CONTROL PROGRAMS .....	49
TABLE IIB-13:	WARE RIVER WATERSHED PUBLIC ACCESS POLICY SUMMARY .....	54
TABLE IIB-14:	WARE RIVER WATERSHED 5-YEAR WORK PLAN 2009-2013 .....	66

## Figures

FIGURE IIB-1:	DCR/MWRA WATERSHED SYSTEM .....	2
FIGURE IIB-2:	WARE RIVER DIVERSIONS TO QUABBIN RESERVOIR, 1973-2007 .....	3
FIGURE IIB-3:	TOWNS IN THE WARE RIVER WATERSHED .....	6
FIGURE IIB-4:	WARE RIVER WATERSHED HYDROGRAPHY AND TOPOGRAPHY .....	7
FIGURE IIB-5:	WARE RIVER WATERSHED SURFICIAL GEOLOGY .....	8
FIGURE IIB-6:	WARE RIVER WATERSHED PROTECTED OPEN SPACE .....	10
FIGURE IIB-7:	WARE RIVER WATERSHED LAND USE .....	12
FIGURE IIB-8:	WARE RIVER WATERSHED POPULATION DENSITY .....	15
FIGURE IIB-9:	WARE RIVER WATERSHED ENVIRONMENTAL QUALITY DISTRICTS AND SUB-DISTRICTS .....	17
FIGURE IIB-10:	WARE RIVER WATERSHED SUBWATERSHED DELINEATIONS .....	25
FIGURE IIB-11:	SEWERED PORTIONS OF THE WARE RIVER WATERSHED .....	32
FIGURE IIB-12:	WARE RIVER WATERSHED MAJOR TRANSPORTATION AND UTILITY CORRIDORS .....	34
FIGURE IIB-13:	WARE RIVER WATERSHED SOLID WASTE FACILITIES .....	40
FIGURE IIB-14:	POTENTIAL AREAS OF FUTURE GROWTH IN THE WARE RIVER WATERSHED .....	42
FIGURE IIB-15:	WARE RIVER WATERSHED SYSTEM DELINEATION .....	56
FIGURE IIB-16:	WATERSHED PROTECTION ACT PROTECTION ZONES IN THE WARE RIVER WATERSHED .....	59

## List of Acronyms

AST	Above Ground Storage Tanks
ATV	All Terrain Vehicle
BMPs	Best Management Practices
CGP	EPA Construction General Permit
CMP	Conservation Management Practice
CMR	Code of Massachusetts Regulations
DAR	MA Department of Agricultural Resources
DCR	MA Department of Conservation and Recreation
DEP	MA Department of Environmental Protection
DWSP	DCR Division of Water Supply Protection
EOEEA	MA Executive Office and Energy and Environmental Affairs
EPA	US Environmental Protection Agency
EQ	Environmental Quality Section
EQA	Environmental Quality Assessment
ICS	Incident Command System
MDC	Metropolitan District Commission
MEPA	MA Environmental Policy Act
MGL	Massachusetts General Law
MWRA	Massachusetts Water Resources Authority
NPDES	National Pollutant Discharge Elimination System
NR	Natural Resources Section
NRCS	US Department of Agriculture Natural Resources Conservation Service
ORV	Off Road Vehicle
OWM	DCR/DWSP Office of Watershed Management
PILOT	Payments in Lieu of Taxes
PPCP	Pharmaceuticals and Personal Care Products
ROW	Right-of-Way
SWAP	DEP's Source Water Assessment and Protection Program
UST	Underground Storage Tank
WPR	Watershed Protection Restriction
WsPA	Watershed Protection Act
YOP	Yearly Operational Plan

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# 1 Introduction

## 1.1 The Ware River Watershed in the Watershed System

The Ware River Watershed (WRW) is located between the Quabbin and Wachusett reservoirs (see Figure IIB-1), and essentially functions as a tributary to Quabbin Reservoir, or on rare occasions to Wachusett Reservoir, via a diversion structure along the Ware River in Barre. There is no permanent reservoir located in the WRW, although the U.S. Army Corps of Engineers maintains a flood control structure, the Barre Falls Dam, which on occasion holds back water in the Ware River, above the intake structure.

During certain times of the year, and certain flow conditions, water can be skimmed from the river, and sent to either reservoir via the Quabbin Aqueduct. However, legal restrictions governing diversion of water from the Ware River (Chapter 375, Acts of 1926) require that:

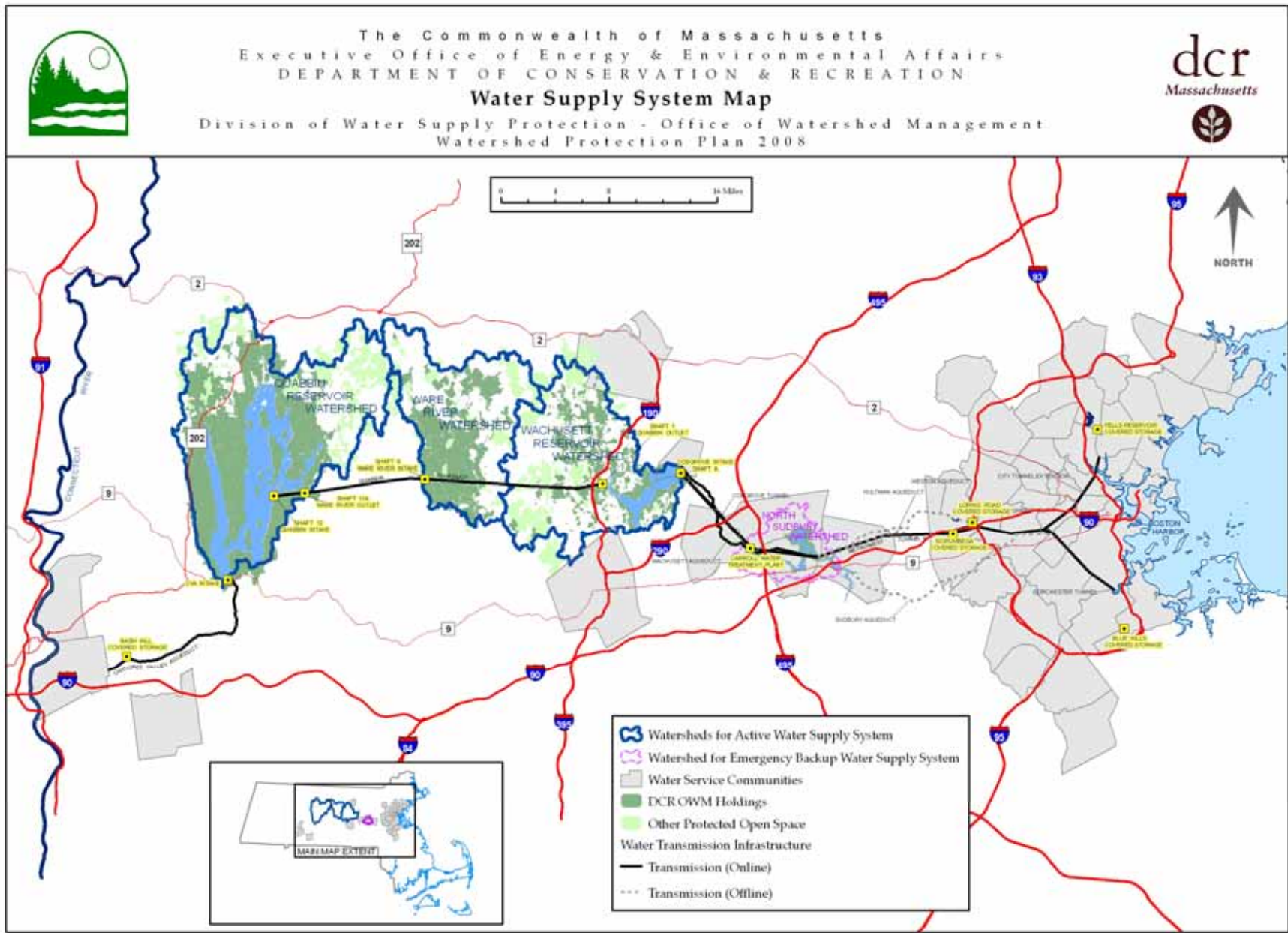
- No water may be diverted from the Ware River on any day when the natural flow of the river is less than eighty-five million gallons.
- A total of eighty-five million gallons of water must be released down the Ware River on each day during which diversion takes place.
- No diversion shall take place during the period between June 15 and October 15.
- Diversions from June 1-15 and from October 15-November 30 must have prior permission from the State Department of Public Health.

In addition, water from the Ware River is not always transferred to Quabbin Reservoir, even when it is legally possible to do so. For example, no water was diverted to Quabbin Reservoir in three of the past ten years (see Table IIB-1). Data for the past 35 years shows a significant decline since 1992 in the use of Ware River water (see Figure IIB-2).

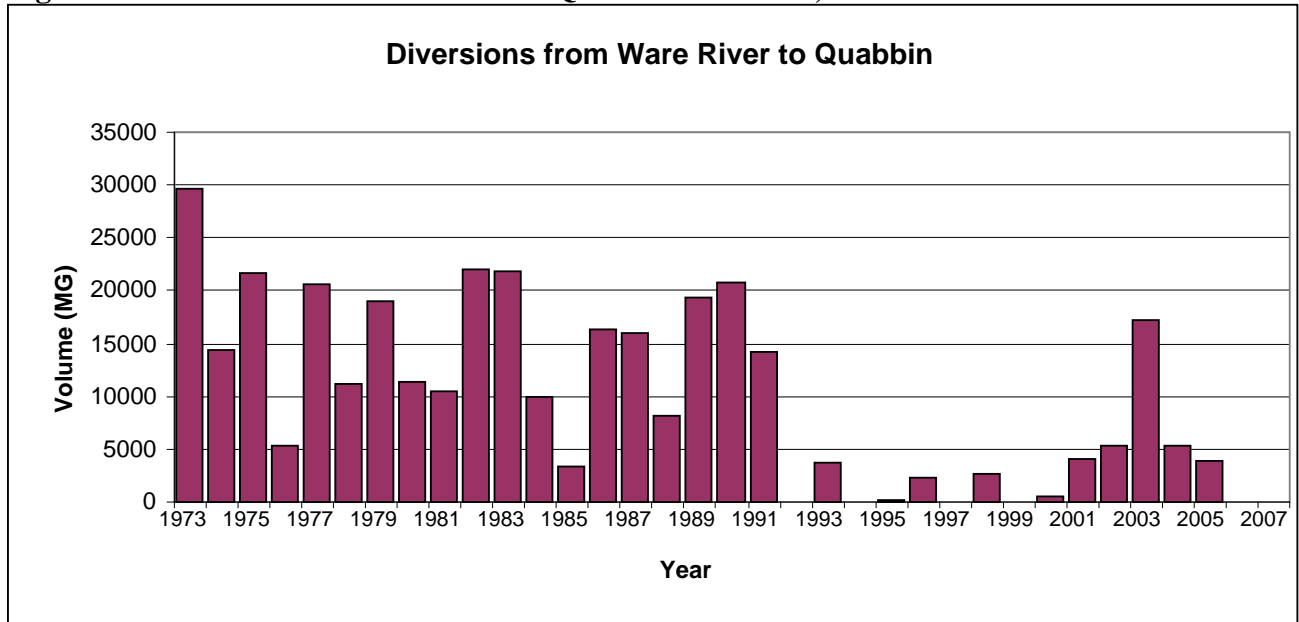
**Table IIB-1: Diversions from the Ware River watershed to Quabbin Reservoir 1998-2007**

<b>Year</b>	<b># of Diversion Days</b>	<b>Total volume of diverted water (MG)</b>
1998	9	2,708.9
1999	0	0
2000	6	603.8
2001	11	4,111.8
2002	75	5,405
2003	105	17,193.1
2004	21	5,335.3
2005	17	3,888.4
2006	0	0
2007	0	0

Figure IIB-1: DCR/MWRA Watershed System



**Figure IIB-2: Ware River Diversions to Quabbin Reservoir, 1973-2007**



Water is also occasionally diverted to Quabbin Reservoir for flood control purposes, when requested by the U.S. Army Corps of Engineers. For example, when Quabbin Reservoir has excess capacity, pressure on areas along the Ware River can be relieved, if necessary, below the diversion structure.

### ***1.2 The Roger H. Lonergan Intake Works***

Water from the Ware River is diverted to Quabbin Reservoir via the Roger H. Lonergan Intake Works (also known as Shaft 8, or the Ware River Intake) along Rt. 122 in Barre. The Intake is a siphon system. Water is drawn from above the dam into the Works through six siphon spillways. From the spillways the water enters the valve pit where four butterfly valves are mounted to regulate the amount of water entering the shaft. The total capacity is slightly less than 2.4 billion gallons daily, although under typical diversion conditions, the flow is generally closer to 550 million gallons. The valves direct the water onto cast iron plates with helical vanes mounted on the walls of the shaft. Centrifugal force maintains a smooth discharge of water from the valves around the circumference of the shaft.



The Roger H. Lonergan Intake Works

Water can then be gravity-fed through the aqueduct to either the Quabbin or Wachusett Reservoirs, although diversions normally goes to Quabbin Reservoir, where two baffle dams force the Ware River water (which is generally of lower quality than Quabbin Reservoir water, at least for drinking water purposes) away from the main intake structure to increase the time it has to mix with Quabbin Reservoir water.

### ***1.3 The 2008 Update***

Watershed Protection Plans (WPPs) for the DCR/MWRA water supply system are produced, in part, to meet the regulatory requirements of the Safe Drinking Water Act, Surface Water Treatment Rule (SWTR). The plans are intended to lay out the details of the watershed control programs that serve to protect source water quality in unfiltered water supply systems. (More detail on the regulatory background and requirements for watershed protection programs can be found in Volume I).

This Volume addresses the Ware River watershed, above the Shaft 8 Intake Works. Other volumes address the three other watersheds that are part of the system – Quabbin Reservoir, Wachusett Reservoir, and Sudbury and Foss Reservoirs.

The 2008 update of the Watershed Protection Plan for DCR's Ware River watershed is organized into five main sections. Following the introductory information presented in Section 1, a description of the watershed is provided in Section 2, then an assessment of the potential sources of water quality contamination is presented in Section 3. Building on the results of that assessment, Section 4 then describes the specific programs that have been put in place to address those contamination sources, including new initiatives and/or modifications to those programs to address new threats or issues of concern that were identified in Section 3. Finally, Section 5 presents an implementation plan for the action items identified in the previous chapters.

## **2 Watershed Description**

### **2.1 Basin Location**

The Ware River Watershed lies in the Central Uplands of north central Massachusetts, in the Lower Worcester Plateau and Worcester-Monadnock Plateau ecoregions. It is characterized by rolling hills separated by broad river valleys. The watershed occupies portions of seven towns, all in Worcester County (see Figure IIB-3).

The total watershed area, above Shaft 8, is approximately 61,737 acres (96.5 mi<sup>2</sup>). The Department of Conservation and Recreation, Division of Water Supply Protection (DCR DWSP) controls 23,313 acres of Commonwealth-owned land in the Ware River watershed. The Commonwealth holds Watershed Protection Restrictions (WPRs) on an additional 824 acres.

### **2.2 Natural Characteristics**

#### **2.2.1 Topography**

The rolling hills of the Ware River watershed range in elevation from 1,720 feet near the summit of Mt. Wachusett in the northeast corner of the watershed to 650 feet at the Shaft 8 Intake facility in the southwestern edge of the watershed (see Figure IIB-4)

#### **2.2.2 Geology and Soils**

The bedrock of the Ware River watershed consists of high-grade complexly folded metamorphic rock heavily intruded by pegmatite. The bedrock is separated into three formations: Partridge Formation, Paxton Formation, and Littleton Formation. Exposure of the bedrock is limited because it is veneered by glacial drift consisting of till and outwash.

Surficial geology is dominated by till and bedrock (80.5%), followed by sand/gravel (15.9%) and floodplain alluvium (3.6%) (see Figure IIB-5). WRW soils have been grouped into five classes for the purpose of watershed management, based upon soil depth and drainage characteristics: Excessively Drained Soils, Well Drained Thin Soils, Well Drained Thick Soils, Moderately Well Drained Soils, and Poorly to Very Poorly Drained Soils.

Natural Resource Conservation Service (NRCS) ratings indicate that most soils in the WRW are “not well suited” for the disposal of wastewater through septic systems, largely due to the high permeability of the soils, which drain effluent too quickly to act as an effective filter.

Figure IIB-3: Towns in the Ware River Watershed

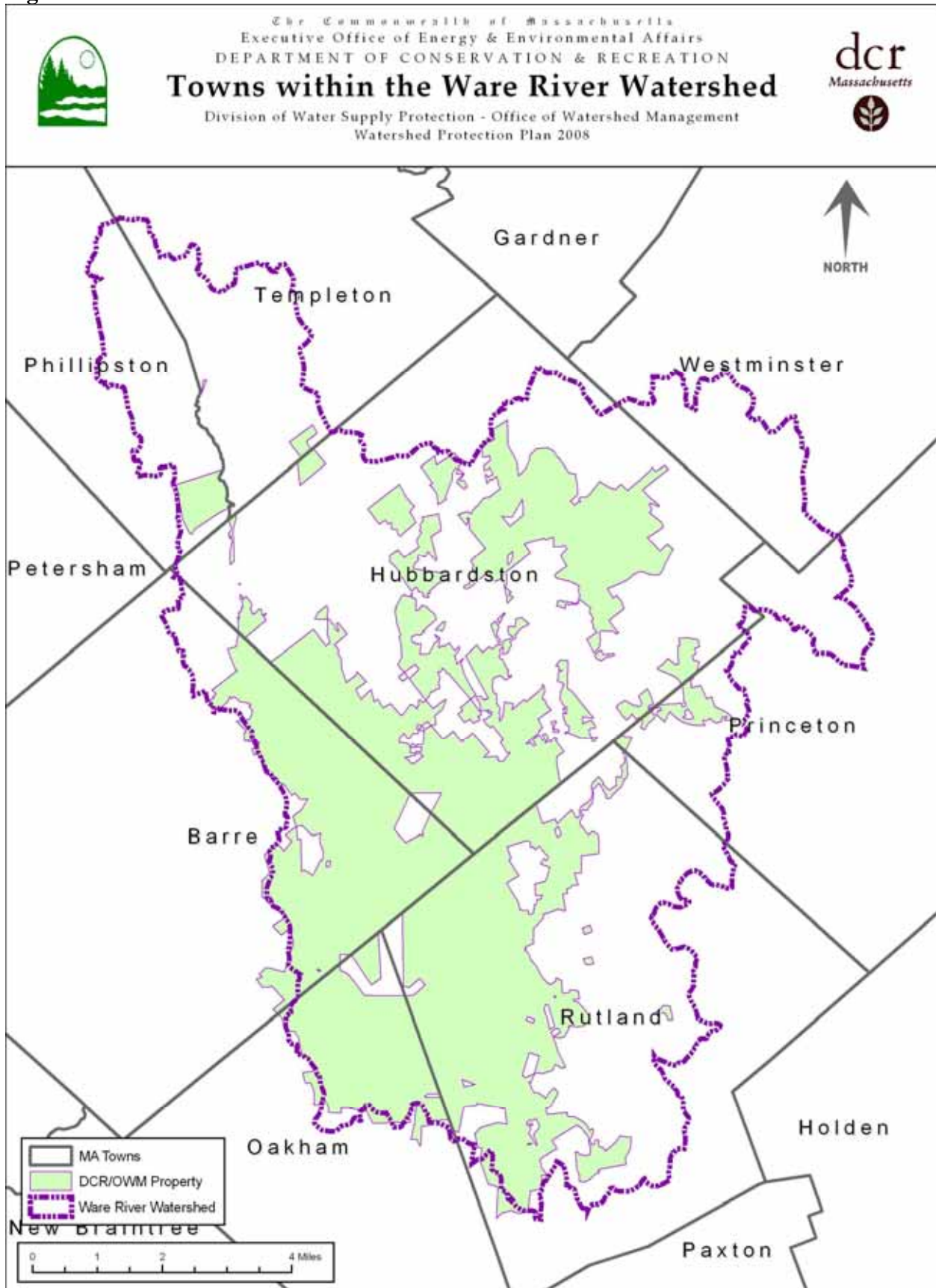
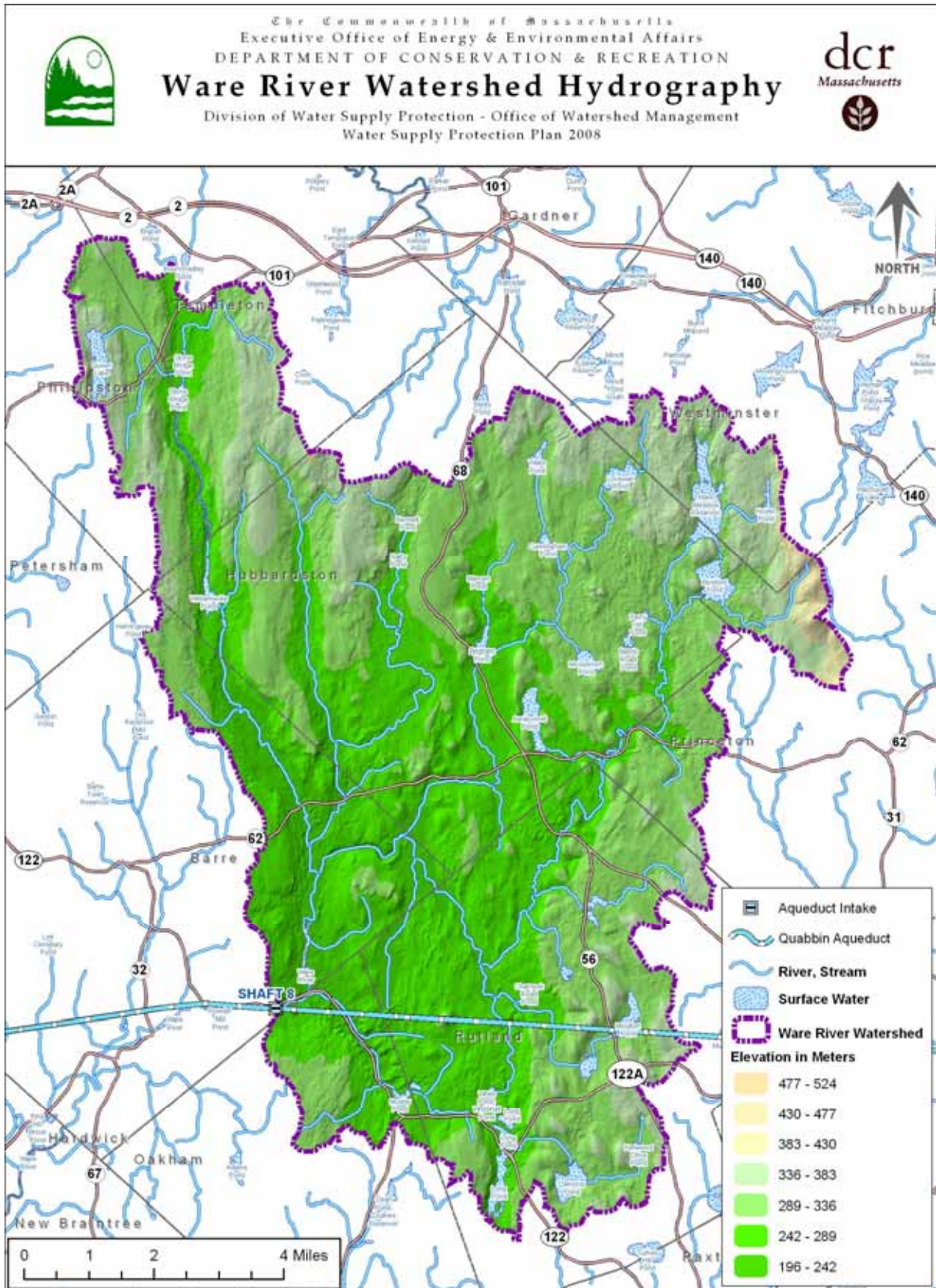
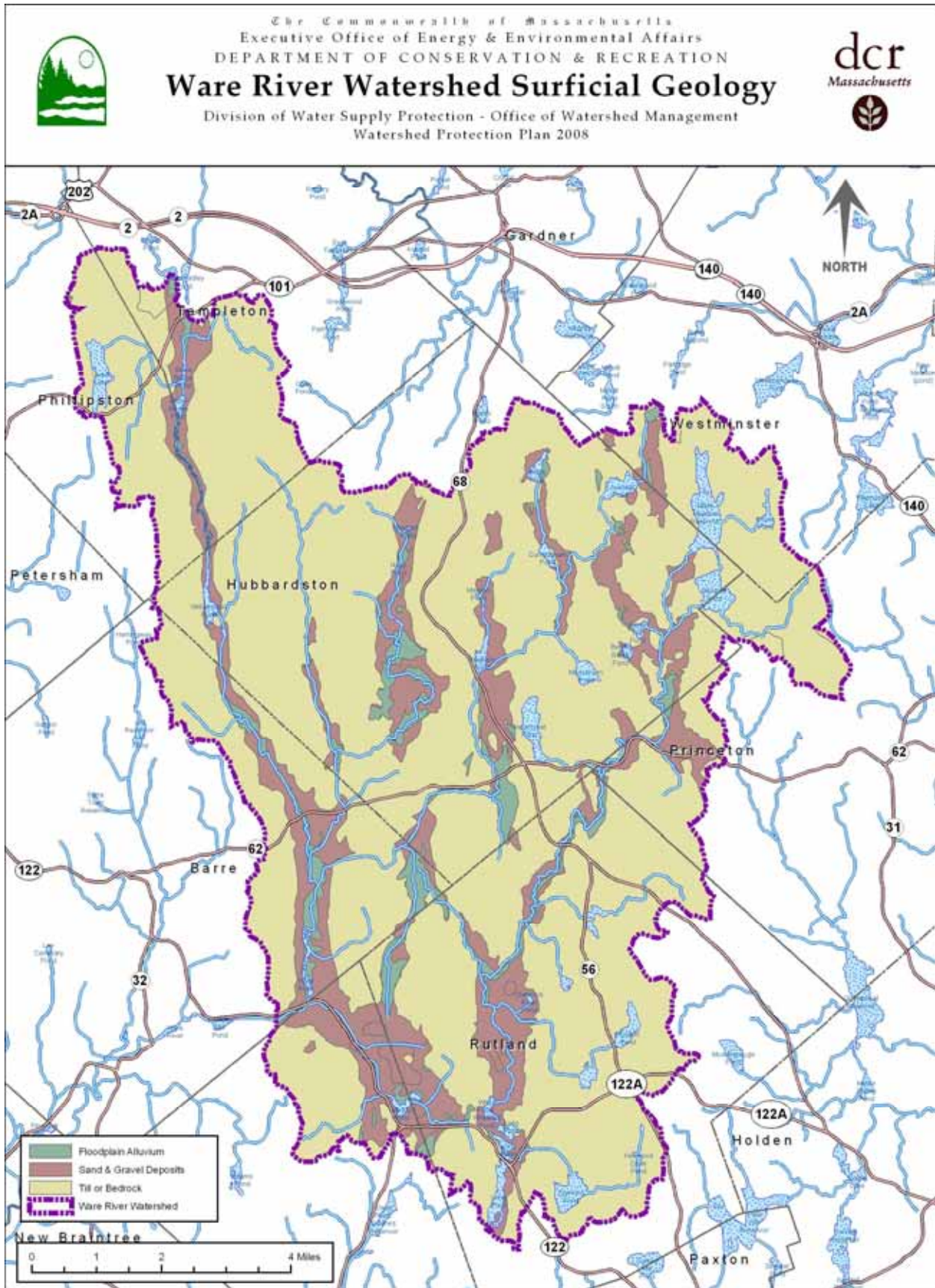


Figure IIB-4: Ware River Watershed Hydrography and Topography



**Figure IIB-5: Ware River Watershed Surficial Geology**



### 2.2.3 Vegetation

Vegetation in southern New England is largely influenced by geology, soils, and land use history. European settlement of the region began in 1715, and within a century most of the pre-existing forest had been cleared for agricultural purposes. Most of this agricultural land has been abandoned since the 1830s, resulting in a steady conversion from open agricultural habitat to forest cover, first dominated by white pine, and then, following broad-scale harvesting of the pine, by the present-day mixed forest. The watershed is currently approximately 81% forested, and that forest is largely composed of mixed hardwoods and pine.

## 2.3 Land Use/Land Cover/Demographics

### 2.3.1 Land Ownership

Of the 61,737 acres of watershed land area above the Shaft 8 Intake, approximately 29,724 acres (48.1%) are considered to be in public ownership. The remaining watershed land, approximately 32,013 acres, is privately-owned.

Approximately 30,669 acres are classified as protected open space (see Table IIB-2). Of this total, DCR controls approximately 26,192 acres, or 42.4%, of the WRW. The Division of Water Supply Protection (DWSP) owns approximately 23,313 acres in fee, with an additional 824 acres controlled through Watershed Protection Restrictions (also known as Conservation Restrictions).

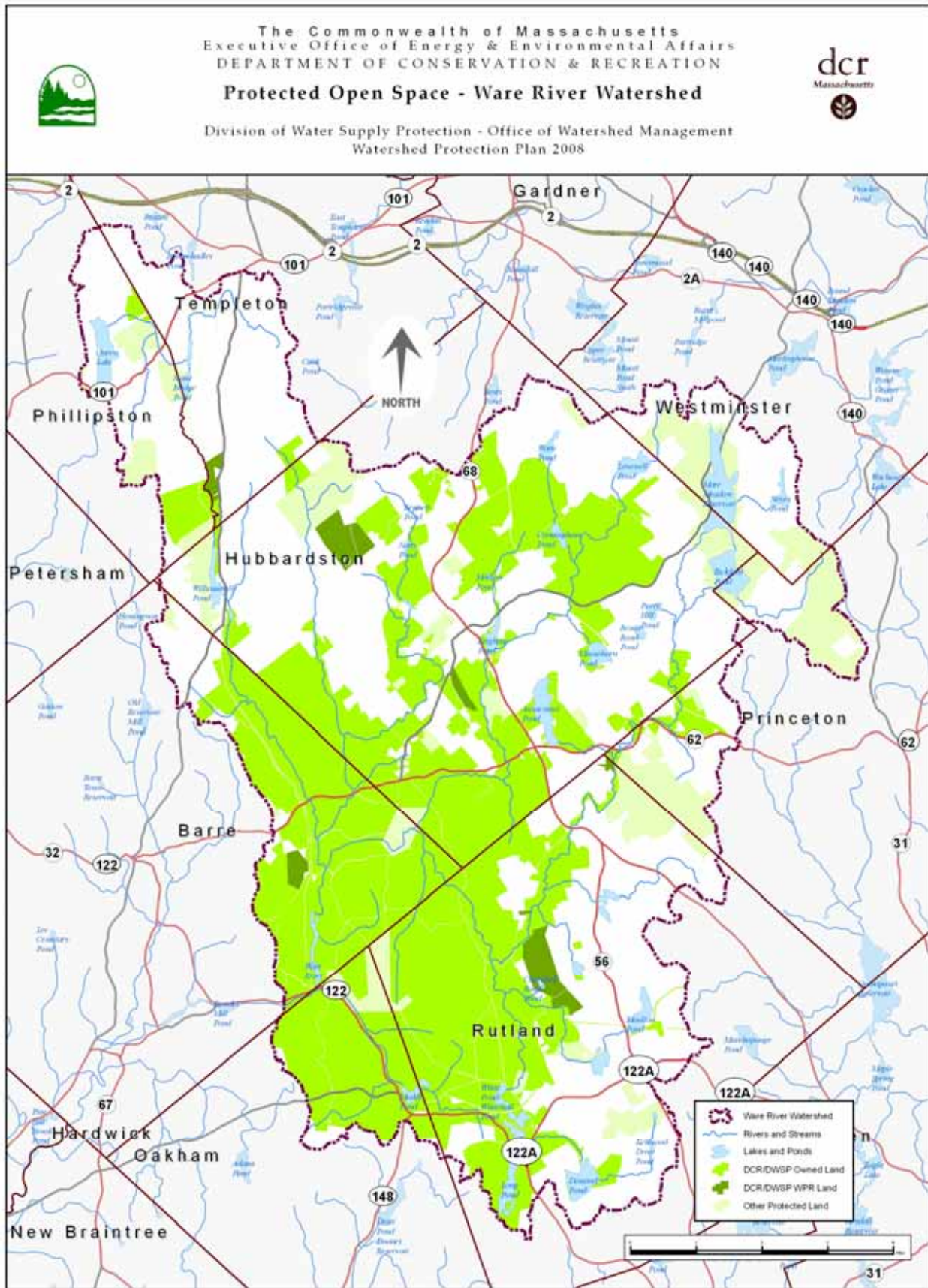
Other government agencies (MA Department of Fish and Game (DFG), MA Department of Agricultural Resources (DAR), US Army Corp of Engineers (ACOE)) control an additional 2,811 acres on the watershed, and Non-Governmental Organizations (e.g., MA Audubon Society (MAS), The Trustees of the Reservation (TTOR)) another 121 acres. Municipal governments own approximately 1,546 acres in the WRW (see Figure IIB-6). There is a long history of cooperation among these agencies and organizations in the watershed.

**Table IIB-2: Protected Open Space in the Ware River Watershed**

Owner	Acres	% of all protected	% of watershed
DWSP	24,136	78.7	39.1
DSPR	2,055	6.7	3.3
DFG	1,987	6.5	3.2
Municipal	4,546	5.0	2.5
ACOE	577	1.9	0.9
DAR	162	0.5	0.3
NGOs	121	0.4	0.2
Other	86	0.3	0.1
<b>Total</b>	<b>30,669</b>	<b>100.0</b>	<b>49.7</b>

Legend: DWSP = DCR Division of Water Supply Protection; DSPR = DCR Division of State Parks & Recreation; DFG = Department of Fish & Game; ACOE = U.S. Army Corps of Engineers; DAR = Department of Agricultural Resources; NGOs = Non-governmental organizations.

Figure IIB-6: Ware River Watershed Protected Open Space



Ownership patterns have changed in recent years for private lands, with average parcel size declining as larger parcels are subdivided for residential development or through the estate probate process as large landowners die and their land is passed on to multiple descendants.

### 2.3.2 Land Use/Land Cover

The WRW is still largely undeveloped and forested (81.3%), with approximately 3.9% of the land in agricultural use, 5.2% residential, and 6% in water or wetland. Only 0.5% is classified as commercial or industrial. Substantial variability is evident when land use is broken down by subwatershed (see Table IIB-3 and Figure IIB-7).

**Table IIB-3: Land Use in the Ware River Watershed, 1999**

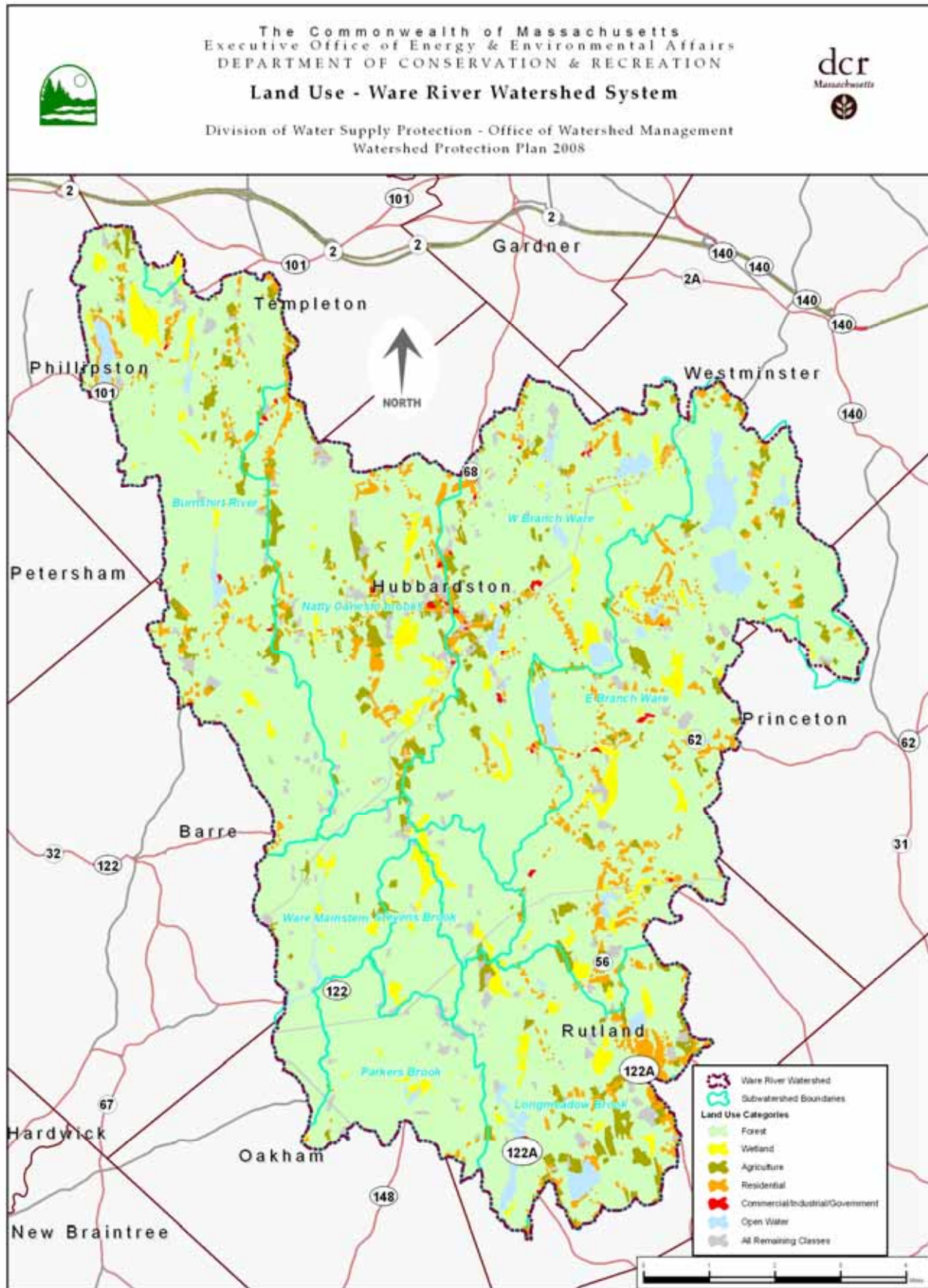
Land Use	Acres	% of Total
Cropland	1,262.6	2.0
Pasture	1,116.8	1.8
Forest	50,165.2	81.3
Wetland	2,054.3	3.3
Mining	145.4	0.2
Open Land	1,525.9	2.5
Recreation	107.9	0.2
Residential	3,211.9	5.2
Commercial	60.4	0.1
Industrial	74.8	0.1
Urban Open	232	0.4
Transportation	1.6	<0.1
Waste Disposal	30.5	<0.1
Water	1,694.8	2.7
Woody Perennial	48.5	0.1
Total	61,737	100

Source: MassGIS, 1999

The forest of the WRW largely originated from: 1) natural succession following the abandonment of agricultural lands in the 1800s; 2) heavy cutting, mostly of white pine stands, 60-100 years ago; and 3) forest management activities over the past several decades. Nearly all of the uplands controlled by the Division on the WRW are forested (99%), with the remainder in field. Ninety-four percent of the forest is more than sixty years old, and sixty percent is over eighty years old. Some older stands also have an age class that originated with the hurricane of 1938, making them two-aged. A small portion of the forest area is comprised of plantations, established by DCR's predecessor in the 1930s and 1940s. White, red, and Scotch pine, Norway and white spruce, and European larch were planted as monocultures or in various mixtures.

Most of these plantations have been converted to open land or regenerated to natural stands. The remaining forest originated from past land use and natural disturbance. The largest portion of the forest originated from agricultural lands abandoned in the late 1800s and early 1900s. These developed as understocked white pine stands ("old field white pine") that matured into low quality mixtures of pine and hardwood. Again, most are even-aged stands, but in some there is a

Figure IIB-7: Ware River Watershed Land Use



remnant of trees that were present in the original pasture or trees that regenerated following the 1938 hurricane, giving them a two-aged or multi-aged structure.

In terms of total basal area, white pine is the most abundant species (37% of total), followed by red maple (16%), red oak (14%), other oaks (16%), and hemlock (7%).

### **Land Use Changes**

Historically, the land use changes in the WRW were typical of much of southern New England: in pre-European settlement times, the area was largely forested, but during the 1700 and 1800s, settlers cleared the land, as much as 70%, for agricultural use. A decline in agriculture in the region in the mid 1800s precipitated large-scale farm abandonment, and much of the land began reverting back to white pine forest. As these stands matured in the early 1900s, new industries sprang up to make use of the abundant quantities of low-quality pine for wooden boxes and pails, matches, and woodenwares. As the pine stands were harvested, hardwoods that were more tolerant of low light conditions, and had thus established themselves in the understories of the pine forests, were released to form the next forest. Much of the forest on the watershed today originated from the large-scale harvesting of the white pine forest during this time period.

In more recent times, another major change in land use has been evident in the region – this one a result of human population growth. From 1971 through 1999, residential land uses on the watershed grew by 147%, from approximately 1,300 acres to more than 3,200 acres. Open land, much of which is likely associated with residential areas, increased by almost 80% (675 acres). Almost all of the increase in these two land uses came at the expense of forest cover, which decreased by more than 2,400 acres (5%) during that same period. These changes are summarized in Table IIB-4.

**Table IIB-4: Land Use Changes in the Ware River Watershed, 1971-1999**

<b>Land Use Category</b>	<b>% of Total</b>			<b>% Change</b>		
	<b>1971</b>	<b>1985</b>	<b>1999</b>	<b>1971-1985</b>	<b>1985-1999</b>	<b>1971-1999</b>
Commercial	0.08%	0.08%	0.10%	4.55%	23.95%	29.59%
Cropland	2.47%	2.52%	2.05%	2.04%	-18.85%	-17.20%
Forest	85.20%	83.40%	81.26%	-2.11%	-2.58%	-4.63%
Industrial	0.08%	0.10%	0.12%	23.17%	18.78%	46.30%
Mining	0.16%	0.19%	0.24%	20.17%	26.09%	51.52%
Open Land	1.38%	1.67%	2.47%	21.19%	47.89%	79.23%
Recreation	0.17%	0.27%	0.18%	56.70%	-31.27%	7.70%
Pasture	2.11%	2.38%	1.81%	12.91%	-24.01%	-14.20%
Residential	2.11%	3.11%	5.20%	47.76%	67.21%	147.07%
Urban Open	0.30%	0.32%	0.38%	6.57%	18.13%	25.90%
Waste Disposal	0.05%	0.06%	0.05%	23.57%	-19.59%	-0.64%
Water	2.77%	2.78%	2.75%	0.24%	-1.24%	-1.00%
Wetland	3.08%	3.06%	3.33%	-0.58%	8.73%	8.10%
Woody Perennial	0.05%	0.06%	0.08%	6.54%	36.23%	45.15%

Source: MassGIS

### 2.3.3 Demographics

The communities in the WRW are generally considered to be small and rural, with relatively little commercial and industrial activity (at least within the watershed). Population density is relatively low in the watershed, with the exception of the center of Rutland, on the eastern edge of the watershed (see Figure IIB-8).

Data from the U.S Census Bureau show that population size ranges from just over 1,600 in Phillipston to almost 7,400 in Westminster. Population change from 2000 to the 2007 ranged from about 4.2% for Princeton to almost 24% for Rutland. All watershed communities showed population growth rates that were significantly higher than the 1.4% statewide average; Rutland, Templeton, Phillipston, and Hubbardston experienced growth rates among the top 5% of all communities in the state. Population data for WRW communities is presented in Table IIB-5.

**Table IIB-5: Population Data for WRW Communities, 2000 to 2007.**

Town	2000 Population	2007 Population	% Population Change 2000 – 2007	Statewide Population Change Ranking
Barre	5,139	5,419	6.0	85
Hubbardston	3,942	4,461	14.1	15
Oakham	1,683	1,906	14.0	16
Phillipston	1,626	1,787	10.1	34
Princeton	3,367	3,494	4.2	113
Rutland	6,399	7,846	23.5	2
Templeton	6,836	7,783	14.5	12
Westminster	6,939	7,388	7.0	65
Statewide	6,363,190	6,449,755	1.4	

Source: US Census data.

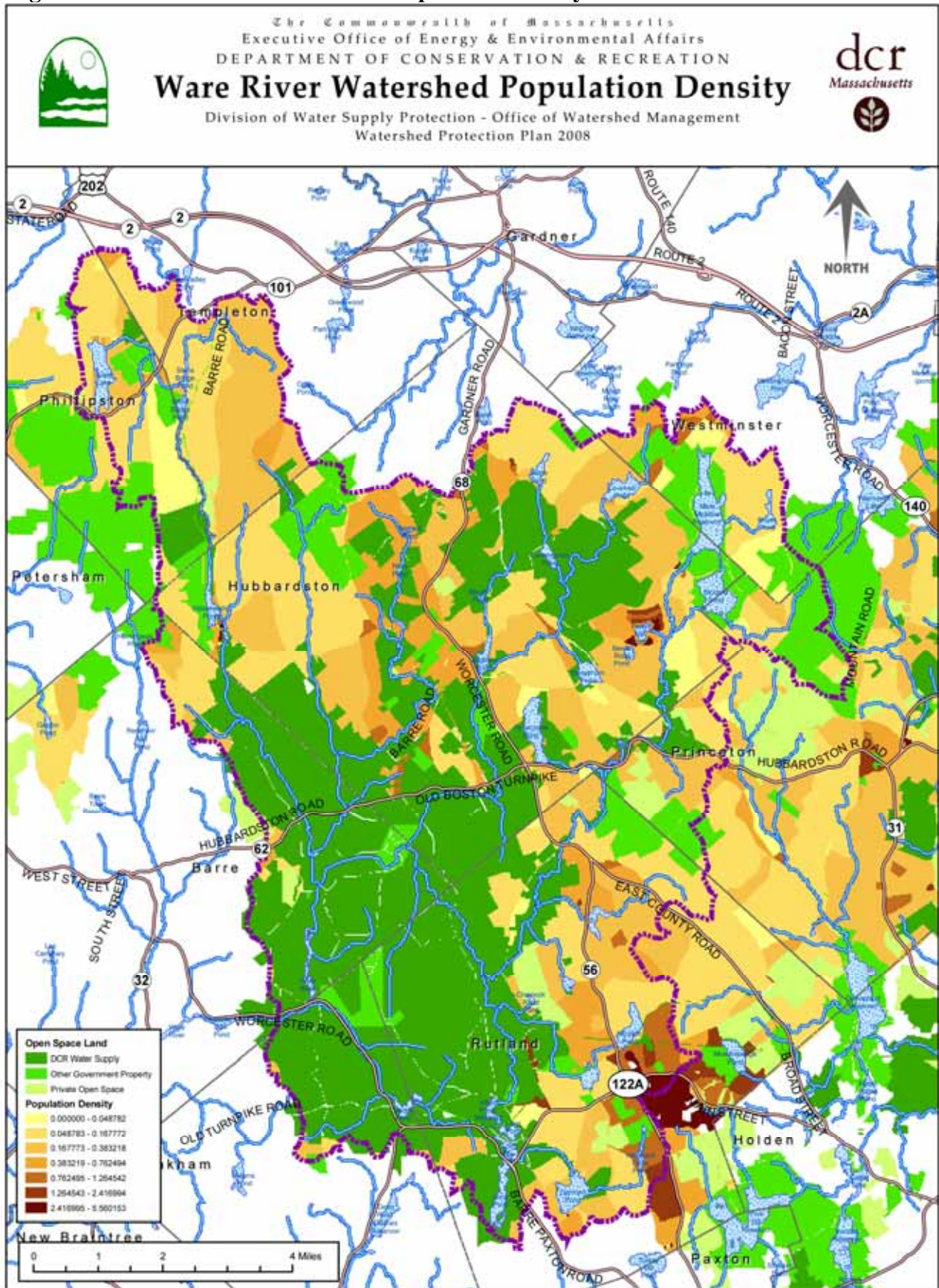
## 2.4 Hydrology

The WRW essentially comprises a major tributary to the Quabbin Reservoir, via the intake structure and diversion works at the Shaft 8 Intake Works that skim waters from the Ware River at certain times of year and under certain flow conditions, and sends that water to Quabbin Reservoir.

The Ware River at the Intake Works is a 4<sup>th</sup> order stream formed by the convergence of seven major tributaries, including the Burnshirt River (2<sup>nd</sup> order), the Canesto Brook (3<sup>rd</sup> order), Natty Pond Brook (2<sup>nd</sup> order), Longmeadow Brook (2<sup>nd</sup> order), Parkers Brook (2<sup>nd</sup> order), and the East and West Branches of the Ware River (3<sup>rd</sup> and 2<sup>nd</sup> orders, respectively). The general drainage pattern is from northeast to southwest, although there are some major deviations that are the result of the last glaciation (see Figure IIB-4).

Most of the tributaries in the watershed are warm water streams with low gradients, although there are segments of each where the gradients increase. Stream channel characteristics vary from entrenched to unconfined, but the greatest percentage is in the latter category. The channel pattern ranges from regular to tortuous meandering. In total, these tributaries travel about 77 miles to the Intake Works.

Figure IIB-8: Ware River Watershed Population Density



There are sixteen large ponds scattered over the watershed, ranging in size from about 30 acres to over 100 acres. DWSP controls the entire shoreline on four of these and part of the shoreline on an additional five. Two of the remaining seven ponds are maintained by the City of Fitchburg as a drinking water supply. The remaining five are privately owned and are developed to varying degrees.

Wetlands are a major part of this hydrologic system, accounting for more than 3,500 acres on Division lands on the Ware River watershed. They include coniferous and deciduous wetlands as well as those dominated by shrub and herbaceous cover. Over the past decade, a number of these have shifted from forested wetlands to shrub and open wetlands, as a direct result of an increase in beaver activity.

According to DCR and MWRA records, the average annual stream flow recorded at Shaft 8 and the weir below has been 39.3 billion gallons, or 53% of the average annual precipitation.

The impoundment at Roger Lonergan Intake at Shaft 8 in Barre is classified as a “run of the river reservoir.” Residence time is short and the water derives its character from water inputs including Barre Falls Dam, the Burnshirt River, Natty Pond Brook, and Parker Brook, as well as subsurface flow and small amounts of direct overland runoff from impervious surfaces. Each of these inputs contributes markedly different qualities to the water at the Intake.

Besides the impoundment at the Intake, the DCR owns or controls many small dammed ponds that were originally built to provide power for mills.

### **Yield**

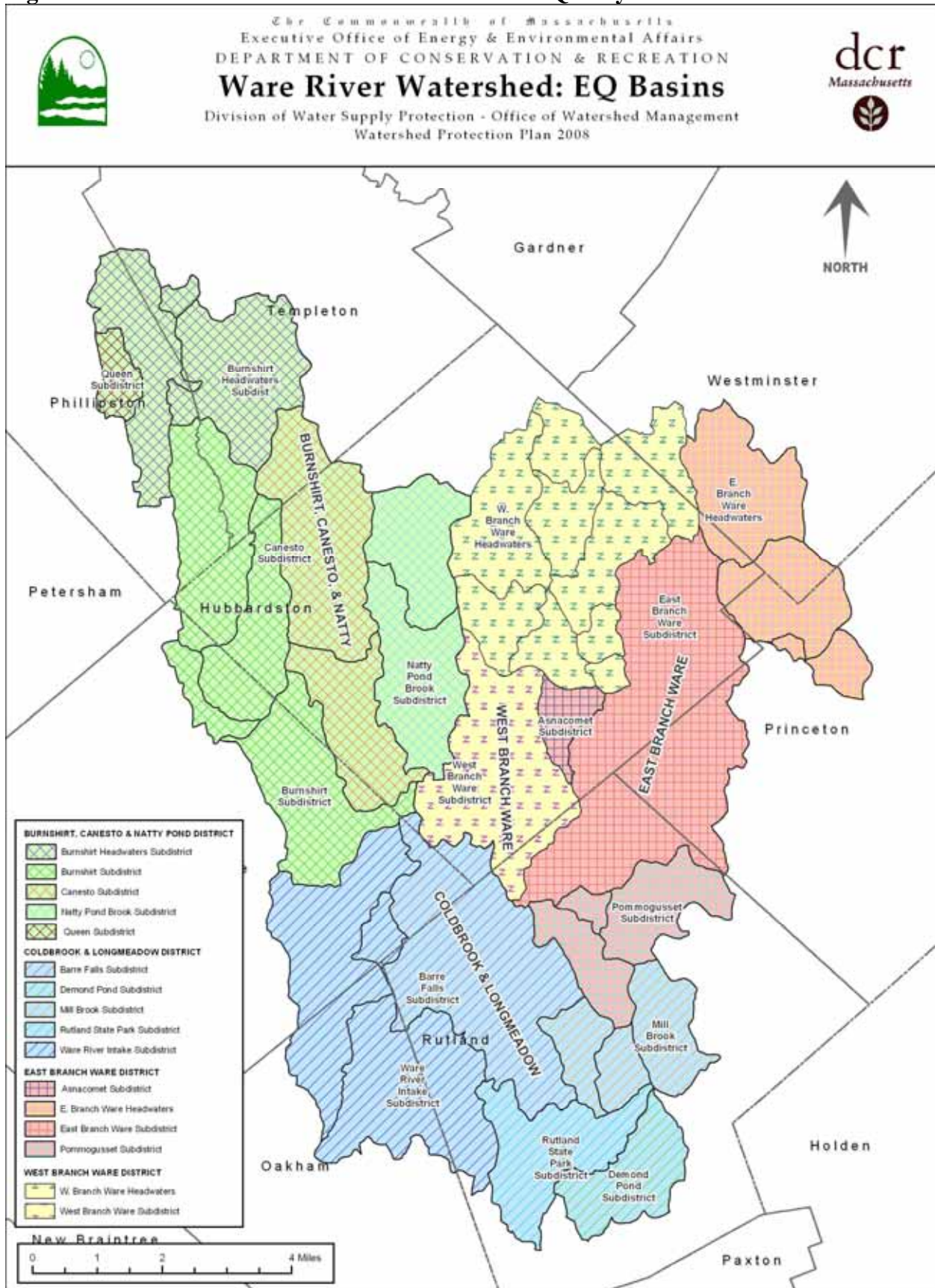
Precipitation on the Ware River watershed is fairly well distributed throughout the year. Average annual precipitation from DCR and MWRA data, recorded since 1931, has been 43.25 inches, or approximately 73 billion gallons received annually over the entire watershed. The average annual stream flow for this period recorded at Shaft 8 and the weir below has been 39.3 billion gallons, or 53% of the average annual precipitation.

## ***2.5 Water Quality***

### **2.5.1 Districts and Sub-districts**

DWSP programs have been administered for many years on the basis of geographical units referred to as Districts and Sub-districts. In the WRW, four Districts have been delineated, and these have been further divided into 16 Sub-districts (see Figure IIB-9). The Sub-districts are the primary management units on which staff identify problems, implement solutions, and generally administer watershed protection programs.

**Figure IIB-9: Ware River Watershed Environmental Quality Districts and Sub-districts**



### **2.5.2 Sampling Program**

Water quality (WQ) is monitored by Environmental Quality (EQ) staff according to a sampling schedule that provides for bi-weekly sampling for most parameters and quarterly sampling for others. Most samples from the Shaft 8 Intake structure are collected and analyzed weekly. Prior to 2004, sampling had occurred at 17 sites throughout the watershed. However, new sampling plan was developed in 2004 that included five core sampling sites that are sampled consistently, plus 4-6 additional targeted sites that are sampled for approximately one year prior to the preparation of an Environmental Quality Assessment. Table IIB-6 displays the sampling plan for 2007 in the Ware River watershed.

Samples are analyzed in several ways:

1. Physical parameters – temperature, DO, pH, and conductivity – are analyzed immediately in the field using multi-probe sampling equipment.
2. Bacteria, turbidity, and alkalinity samples are analyzed at the MWRA lab located in the Quabbin administration building.
3. The remaining samples of nutrients and UV254 are sent to the MWRA lab at Deer Island; results of these tests are generally not available until about one month after collection.

### **2.5.3 Water Quality Conditions**

Water quality conditions in the WRW are influenced by both natural and man made events, precipitation, time of year, and the natural topography of the watershed. The quality of water contributed by the different tributaries in the watershed can be markedly different; some of this water derives from clear forested streams, some from vast expanses of wetlands.

General statements about water quality within the watershed are difficult to make; a few general trends, however, have been observed. Natural background microbial activity increases during the spring, summer, and fall and then dramatically decreases during the colder winter and spring months. Heavy rainfall during or just preceding sampling increases the readings on most water quality parameters. Nutrient values between Quabbin Reservoir and Ware River are quite variable and not enough data has been collected in Ware River to make general characterizations.

A more detailed description of water quality is available in the Annual Water Quality Report for Quabbin Reservoir and Ware River Watersheds.

**Table IIB-6: 2007 Water Quality Monitoring Program for Ware River Watershed Tributaries**

<b>Station Location</b>	<b>DCR Site #</b>	<b>DO</b>	<b>Temp</b>	<b>pH</b>	<b>Cond</b>	<b>Flows</b>	<b>Alk</b>	<b>Turb</b>	<b>Fecal</b>	<b>Total</b>	<b>Nutrients</b>	<b>UV 254</b>
<b>Tributaries- Core Sites</b>												
Shaft 8	101	W	W	W	W	W	NA	W	W	W	Q	W
East Branch Ware River	108	BW	BW	BW	BW	BW	NA	BW	BW	BW	Q	BW
Burnshirt & Canesto River	103A	BW	BW	BW	BW	BW	NA	BW	BW	BW	Q	BW
West Branch Ware River @ Brigham Rd.	107A	BW	BW	BW	BW	BW	NA	BW	BW	BW	Q	BW
Thayer Pond - Inlet	121B	BW	BW	BW	BW	BW	NA	BW	BW	BW	Q	BW
<b>Environmental Quality Assessment Sites - Coldbrook &amp; Longmeadow Sanitary Sub-district</b>												
Barre Falls Dam	105	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW
Whitehall Pond-Outlet	110	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW
Mill Brook	121	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW
Britney Dr/Watson	121H	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW	BW
<b>Profile Site</b>												
Demond Pond	119P	Q+	Q+	Q+	Q+	Q+	Q+	Q+	Q+	Q+	Q+	Q+

Key: D = daily; W = weekly; BW = biweekly (every two weeks); M = monthly; Q = quarterly; Q+ = 2 spring, 2 fall, 1 winter, 1 summer; NA= not applicable  
 Source: DCR/DWSP

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### 3 Sources of Pollution and Their Assessment

Volume I of the 2008 Watershed Protection Plan Update provides an overview of the water quality contaminants of most concern in the DCR/MWRA water supply system, and the potential sources of those contaminants (also see Table IIB-7).

**Table IIB-7: Water Quality Contaminants and Their Most Likely Sources**

<i>Source</i>	<i>Contaminant</i>				
	<b>Pathogens</b>	<b>Nutrients</b>	<b>Turbidity</b>	<b>Hazardous Materials</b>	<b>Pesticides</b>
<b>Wildlife</b>	•	•			
<b>Public Access/Recreation</b>	•	•	•		
<b>Timber Harvesting</b>			•	•	
<b>Wastewater</b>	•	•		•	
<b>Residential Sites</b>	•	•			•
<b>Agriculture</b>	•	•	•		•
<b>Construction Sites</b>			•	•	
<b>Roadways/Railways/ROWS</b>				•	•
<b>Commercial, Industrial, and Government Sites</b>				•	
<b>Solid Waste Facilities</b>				•	
<b>Future Growth</b>	•	•	•	•	•
<b>Climate Change</b>	•	•	•		

This section presents assessments of the current status of these potential sources of contamination specifically for the WRW. Information is presented for each category of contaminant on the means of assessment, the current assessment itself, and the on the needs for additional work related to that contaminant. Table IIB-8 provides a summary of the relative importance of each potential source of pollution based on both available data and the professional opinions of DWSP staff.

Some activities occurring on the watershed, like the construction of new subdivisions, result in relatively “permanent” changes in the watershed, in comparison to others, like recreational activity or even small spills of hazardous materials, that might produce only temporary water quality impacts. It is important for DWSP to be particularly vigilant with those actions that produce long-term impacts, since it is possible that over time these impacts could degrade water quality to the point where it can no longer be safely used as a drinking water supply.

#### 3.1 Previous Plans and Assessments

Two previous Watershed Protection Plans, one in 1991 and in one 2000, have been developed for the WRW; both plans jointly covered the Quabbin Reservoir and Ware River watersheds.

The 1991 WPP was produced by a consultant, Rizzo Associates. It concluded that the main threats to water quality in the WRW were the result of increasing urbanization, along with the relative lack of awareness and inability of the towns in the watershed to control and mitigate the environmental impacts resulting from that growth. On-site Septic Systems, Future Development,

and Uncontrolled Releases along several major transportation routes in the watershed were all rated as potentially High Threats. Eleven other activities were considered to pose Moderate Threats.

The 2000 WPP was produced internally by DCR staff, and its assessments were largely based on staff experience and the results of water quality and contaminant source studies in the 1990s. It identified Recreation as the highest threat in the WRW, with 15 additional activities listed as Moderate Threats.

The threat priorities from these previous plans are summarized in Table IIB-8. DWSP updated the threat priority naming scheme in 2008 after a careful review of the source watersheds and protection programs. These revised categories are not related to DEP's Source Water Assessment & Protection Program (SWAP) ranking of potential threats (see Volume I, Section 3.17); DEP's SWAP land use matrix and assessment rankings remain in place.

Conducting Environmental Quality Assessments (EQAs; see Section 4.12 of Volume I) is DWSP's general approach to assess the watershed and thereby determine management priorities. Due to staffing limitations, in recent years EQAs have only been completed in two portions of the Ware River Watershed. As a result, the assessment of current conditions and management priorities in the WRW must be based on other sources of information, including staff experience and knowledge of conditions in the watershed, GIS and other data sources, and the use of a subwatershed-based assessment tool developed by MassGIS and DEP staff (see [www.mass.gov/mgis/vwr\\_wa1.htm](http://www.mass.gov/mgis/vwr_wa1.htm)).

### **Subwatershed Analysis**

Subwatershed-based analysis is being used increasingly on DCR watersheds for forest management and recreational planning, and as a tool to target limited resources on those areas considered to be of most importance, or at greatest risk, from a water quality protection standpoint.

The WRW was divided for assessment purposes into distinct drainage areas ("subwatersheds") on which various analyses were conducted (e.g., land use and protected open space calculations). This was performed by working upstream from the Shaft 8 Intake structure and delineating the drainage areas of all the major tributaries that entered the main stem of the Ware River along the way. This process resulted in seven major drainage areas on the watershed, along with a "residual" area that drained directly into the main stem itself (see Figure IIB-10).

For each subwatershed, the MassGIS Watershed Analyst tools were used to summarize land uses, derive estimates of imperviousness, and calculate potential pollutant loadings. The results of these analyses are presented in Appendix A, and are incorporated into the assessments of the potential sources of water quality contaminants below. The Land Use data that is available through MassGIS is from 1999; more recent land use information is being developed, but was not ready in time for this analysis. In addition, the percentages of each subwatershed that are in permanent protection along with an approximate percentages that are still "developable" were also calculated and included in the subwatershed summaries in Appendix A. Appendix B contains further analyses of protected land ownership by subwatershed.

**Table IIB-8: Assessment of Water Quality Threat Priorities in WRW, 1991 and 2000**

1991 and 2000 WPP Water Quality Threat Category	2008 WPP Water Quality Threat Category	Threat Level	
		1991 WPP	2000 WPP
Animal Grazing; Agricultural Runoff	Agriculture	M	M
Animal Population (Gulls and Beavers)	Wildlife	L	L
Barnyards and Feedlots	Agriculture	M	M
On-site Septic System	Wastewater	H	M
Uncontrolled Releases – Transportation	Roadways/Railways/ROW	H	M
Construction	Construction	M	M
Pesticide, Herbicide, and Fertilizer Use	Agriculture	M	M
Recreation	Public Access/Recreation	M	H
Urban Runoff	Commercial/Industrial/Government Sites; Residential Sites	M	M
Erosion	Construction	M	M
Gas/Petroleum Storage	Commercial/Industrial/ Government Sites	M	M
Gravel Mining	Commercial/Industrial/ Government Sites	M	M
Logging – Private	Timber Harvesting	M	M
Logging - MDC	Timber Harvesting	L	N/A
Uncontrolled Releases – fixed site	Commercial/Industrial/ Government Sites	L	L
Permitted Activities – Haz. Waste Generators	Commercial/Industrial/ Government Sites	N/A	M
Permitted Activities – NPDES/GW Discharges	Commercial/Industrial/ Government Sites	N/A	M
Permitted Activities – Solid Waste Facilities	Solid Waste Facilities	M	M
Road Salting (Road and Maintenance depots)	Roadways/Railways/ROW	L	L
Unauthorized Activities (clandestine activities)	Public Access/Recreation	L	M
	Future Growth	N/A	N/A
	Climate Change	N/A	N/A

Key: H = High threat; M = Moderate threat; L = Low threat; N/A – Not assessed.

The analyses show some similarities but also some marked differences between subwatersheds. All eight subwatersheds are still in very rural condition. Land use in all eight subwatersheds is heavily weighted towards “Forest,” which covers from 71.5% to 91.4% of the land cover. When

other “undeveloped” land uses – Wetlands, Open Land – are added to the forested acreages, those percentages range from 83.7% to 98.7%. Conversely, the more “developed” land uses – Agriculture, Residential, Commercial, Industrial – make up only 1.3% to 16.3% of the individual subwatersheds.

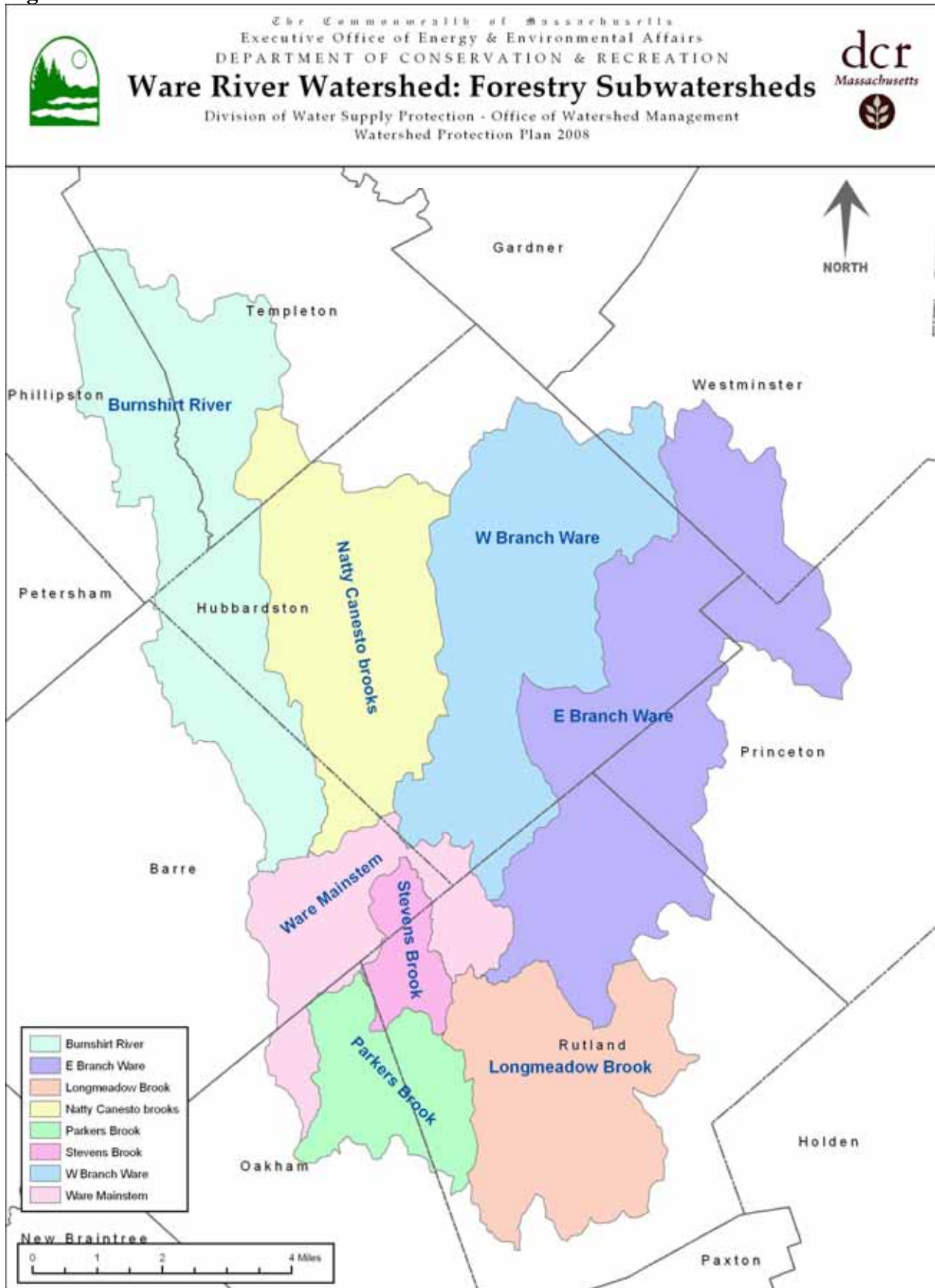
The relatively low percentages of Residential land use in all subwatersheds, ranging from 0% to 8.2%, confirms the statement made earlier in Section 2.3.3 that the WRW lies in a very rural part of the state. Commercial (0% to 0.2%) and Industrial (0% to 0.7%) land uses are both uncommon in all subwatersheds.

Land use data is also used to calculate estimates of pollutant loadings; the MassGIS tools used in these analyses provide estimates of nitrogen (N), phosphorus(P), and suspended solids (SS). These estimates, expressed in total pounds of pollutants, were converted to a “per acre” basis to allow for a more meaningful comparison among subwatersheds. For all three pollutants, the Longmeadow Brook subwatershed ranked highest in potential loadings (3.25 lbs/acre for N; 0.32 lbs/acre for P; 86.33 lbs/acre for SS), followed by Natty/Canesto (3.04 N; 0.25 P; 64.09 SS), E. Branch Ware (3.00 N; 0.25 P; 57.54 SS), and Burnshirt (2.91 N; 0.21P ; 49.02 SS).

The final analysis available through the MassGIS watershed analyst tools is related to imperviousness. Since many water quality problems are associated with stormwater runoff that picks up and carries potential pollutants into local waterways, it’s desirable to maintain a cover on watersheds that allows rainwater to infiltrate into the soil layers. Those land uses that are impervious to water infiltration are less-desirable as watershed cover. The literature provides permeability coefficients for different land covers, and the MassGIS tool uses those coefficients, along with the relative percentages of land uses in a drainage area, to calculate estimates of both “acres of impervious cover” and “percent imperviousness” for those drainage areas. Research has demonstrated that water quality degradation occurs when percent imperviousness exceeds 10% across the drainage basin. Based on the 1999 land use data used in the subwatershed analyses conducted for this plan, imperviousness levels are relatively low in all eight subwatersheds in the WRW, ranging from 1.0 to 2.3%.

Land use based analyses are helpful in assessing where water quality problems are most likely to occur, but in rural landscapes such as the WRW, these problems are not expected or evident. However, current land use conditions are exactly that – current – and are not necessarily indicative of future conditions on the watershed. Thus, additional subwatershed-based analyses were conducted to determine the degree of land protection in each subwatershed, as well as the amount of future development that could occur. The latter analysis was conducted using “build-out” data that was produced in 2000 for each community in Massachusetts by the Executive Office of Environmental Affairs.

**Figure IIB-10: Ware River Watershed Subwatershed Delineations**



A much wider range was evident among the WRW subwatersheds in terms of the percentages of both protected and developable lands. Protected land ranged from a low of 31.9% in the Burnshirt subwatershed to a high of 98.6% in Stevens Brook. Conversely, developable lands ranged from a high of 46.8% in the Burnshirt to a low of 0% in Stevens Brook. Other subwatersheds with relatively high percentages of developable land include the East Branch Ware River (43.7%) and Natty/Canesto (39.1%).

In general, the subwatersheds in the “heart” of the watershed – adjacent to and immediately upgradient from the Shaft 8 Intake – tend to have the highest level of protection, the lowest amount of developable land, and the lowest estimates of pollutant loads. These subwatersheds include Stevens Brook, Parkers Brook and the Main Stem of the Ware River.

At the other end of the spectrum are the more outlying subwatersheds where less land is protected, more is developed or developable, and pollutant loading estimates are higher. These include Longmeadow Brook, Natty/Canesto, the East Branch Ware River, and Burnshirt River. A summary of the analyses conducted on the WRW subwatersheds is presented in Table IIB-9.

**Table IIB-9: Ware River Watershed Subwatershed Analysis Summary Rankings**

<b>Subwatershed</b>	<b>Pollutant Loadings</b>	<b>% Imperviousness</b>	<b>% Protected</b>	<b>% Developable</b>	<b>Total</b>
Longmeadow Br.	1	1	3	5	10
Natty/Canesto	2	2	4	3	11
E. Branch Ware	3	4	2	2	11
Burnshirt	4	5	1	1	11
W. Branch Ware	5	3	5	4	17
Parkers Brook	7	6	6	6	25
Ware Main stem	6	7	7	7	27
Stevens Brook	7	7	8	8	30

The rankings used in this table reflect the relative degree of “desirability” of each variable from a watershed protection standpoint. The higher the ranking, the more desirable the conditions generally are for water quality protection.

### **3.2 Wildlife**

#### **Means of Assessment**

Data on the wildlife resources and their impacts in the WRW come from surveys (e.g., annual surveys of breeding birds, ruffed grouse, and vernal pools; recent monitoring of moose sign), staff reports (e.g., about beaver-plugged road culverts), observations made during EQAs, and via water quality sampling results. Additional data comes from the Division of Fisheries & Wildlife.

The Division does not conduct wildlife population censuses; there are no actual population estimates available for most species on the watershed. Rather, staff rely on more informal observations or surveys of wildlife to monitor general population trends and to identify wildlife problem areas or situations.

## **Current Assessment**

The wildlife community on the WRW is a function of the habitat conditions available, and thus is characterized by forest-adapted species on much of the DCR-controlled lands, and more early-successional species on those portions of the watershed containing fields, farms, and residential areas. Aquatic and semi-aquatic species are common in the extensive portions of the watershed covered with streams, ponds, and wetlands.

Wildlife issues, usually involving beaver, are dealt with on a case-by-case basis. Beaver problems mainly involve infrastructure, like flooded roads, rather than water quality concerns.

There is no wildlife pathogen control zone established at Ware River, as there is at Quabbin and Wachusett Reservoirs. This is largely due to the fact that there is no reservoir present. Designation of such a zone in the WRW has not been deemed necessary.

Deer and/or moose browsing is not presently considered to be a problem, but could become an issue in the future. Monitoring efforts have begun and may be expanded.

Gulls still use the Barre Landfill, an active landfill located adjacent to the Ware River, just downstream of the Shaft 8 Intake facility. It is believed that these gulls fly easterly in the evening, possibly to Wachusett Reservoir; more research on gull behavior and flight patterns in this area may be necessary.

It is likely that the resident Canada Goose population may be increasing in the watershed, as in many other parts of the state, but there's no indication that this is causing problems for the water supply.

Wildlife is considered a LOW threat to water quality in the WRW. Present needs regarding this source pertain mainly to data collection and dealing with problem situations on a case-by-case basis as they arise.

## **Needs**

- Initiate browsing surveys to monitor deer and moose impacts.
- Expand gull behavior study to include activity around Barre Landfill.
- Add wildlife observations to EQA field forms.
- Continue to work with UMass on moose population assessment, including monitoring moose exclosure.
- Continue to deal with beaver problems on a case-by-case basis.
- Gather more data on gull behavior and flight patterns to and from the Barre landfill.

### ***3.3 Public Access/Recreation***

#### **Means of Assessment**

Information on public access and recreation comes largely from Watershed Ranger patrols and staff observations. Additional data is also derived from monitoring requests for access and the issuance of group access permits, regular inspections of gates and barways, and input from local police departments and the Ware River Watershed Advisory Committee.

#### **Current Assessment**

Recreation in the WRW is an activity of particular concern to the DWSP, mainly related to uncontrolled motorized vehicle access and the expansion of snowmobiling and horseback riding. Substantial staff time is now spent dealing with recreational issues, including impact control, working with user groups to provide for safe, low-impact activity, and resolving user conflicts.

Public access can also result in dumping and vandalism problems on the watershed. Access to the more remote portions of the watershed is obtained when gates are open for legitimate DWSP activities.

Off-road vehicle (ORV) usage is occurring illegally in the watershed, and has resulted in soil erosion, direct water pollution from vehicles driving through streams, littering, and passage into areas not readily accessible to the public. All these impacts are potentially problematic. Snowmobile usage is increasing on the WRW. DWSP staff, however, have worked closely with snowmobiling groups to designate and maintain trails, control access, and resolve problems as they arise.

Horseback-riding has been increasing steadily in the watershed as more local residents acquire horses and word spreads among the riding community about the good riding opportunities present in the watershed. DWSP staff have established contacts with riding clubs, which have worked closely with the DWSP to designate trails, educate riders, and resolve problems as they arise.

One “rail trail” currently exists in the WRW and another is expanding into the watershed. The Ware River Rail Trail, managed by DCR’s Division of State Parks and Recreation, is currently open for multiple use from Coldbrook to Baldwinville. Wachusett Greenways has been working on the extending the Central Massachusetts Rail Trail into the WRW. This expansion will likely result in increased public access into the watershed; it has already increased demands on DWSP staff time. The Central Massachusetts Rail Trail is limited to pedestrian and bicycle activities, as government grants used to improve the trail prohibit the use of motorized activities.

Comet Pond beach and other swimming areas in watershed – Queen Lake, Rutland State Park, Demond Pond – do not appear to pose a threat to water quality at the present time.

Night-time partying has been an issue in recent years.

Public access/recreation is considered a MODERATE threat to water quality in the WRW, mainly as a result of those activities over which the DWSP cannot exert effective controls.

## **Needs**

- Control and guide future recreational and public access pressure.
- Increase Watershed Ranger presence on the WRW to enhance watershed security, including regular rounds of gate and lock checks.
- Re-evaluate the schedule for nighttime closing.
- Tighten up access points by adding or improving physical barriers: install new gates along Rail Trail; reduce number of access points whenever possible; block access to old logging roads once operations are finished.
- Enhance signage, including new boundary signs.
- Increase enforcement and education efforts.
- Continue to work with snowmobile and horseback riding clubs regarding access issues.
- Continue to investigate and prosecute dumping incidents.
- Improve coordination and communication with local enforcement departments.
- Involve local residents in monitoring and reporting illegal activities.

### ***3.4 Timber Harvesting***

DWSP has been conducting forest management on its watershed lands in the WRW since the 1960s. The overall goal of that management work is to produce and maintain a diverse, vigorous forest cover on the vast majority of its holdings to protect water quality. Additional goals and objectives related to forest management are included in the *Ware River Watershed Land Management Plan 2003-2012*.

## **Means of Assessment**

Forest management operations conducted on DWSP property are subject to a number of strict specifications, many of which are designed to protect water quality. Each operation is also supervised by a Division Forester, who visits all active harvesting sites on a regular basis. The Foresters also maintain records of forest conditions and harvest operations, in both hard copy and computerized formats.

Each spring, the Foresters develop and submit management operations plans for the coming year for an internal review by staff from other work units. These annual lot reviews provide an important opportunity for DWSP to discuss and identify potential problems or concerns about the planned operations.

Approximately once per decade, a Continuous Forest Inventory (CFI) is conducted on the watershed. This survey of fixed plots distributed across the watershed provides the Division's Foresters with current information about forest conditions. Such information allows for the regular monitoring of the health and composition of the watershed forest, and also provides some of the data that is necessary for planning future management operations. The latest round of CFI re-measurements will be conducted on the WRW during the fall 2009 and winter 2010.

Timber harvesting operations on non-DWSP lands, if they meet certain harvesting thresholds, are subject to regulations associated with the Forest Cutting Practices Act (Chapter 132). DWSP Forestry staff receive and review those cutting plans for timber lots that are adjacent to DCR lands submitted to the DCR Bureau of Forestry.

### **Current Assessment**

An active forest management program exists on the DCR portion of the WRW. These activities are regulated and/or guided by state regulations and the *Ware River Watershed Land Management Plan 2003-2012*, and thus are very well-controlled and supervised. As a result, they are not considered to pose a pollution threat to the watershed. On average, ten logging contracts are issued on the WRW in a typical year.

Timber harvesting on private lands in the watershed is also controlled by state regulations, with oversight by the Service Foresters in the DCR Bureau of Forestry. These foresters also do a good job of minimizing adverse impacts from those logging operations. The DWSP receives copies of the Cutting Plans required under the Forest Cutting Practices Act whenever timber harvesting is planned for private lands adjacent to DWSP property.

The main potential threats to water quality from timber harvesting are related to road construction, stream crossings, and leaks or spills of fuel, hydraulic oil or other hazardous substances from logging equipment.

Problems related to invasive plants on the WRW are not considered to be as serious as they are in the Quabbin Reservoir watershed, in large part due to the different histories of the watersheds with respect to deer control. However, invasives still occur on the WRW, and may need control measures in some situations.

Timber Harvesting, both on DCR and private lands, is considered a LOW threat to water quality in the WRW.

### **Needs**

- Finalize spill response plans and notification card for logging operations
- Offer spill response training to loggers.
- Implement invasive plant monitoring and/or control activities.
- Develop and implement a program to monitor forest regeneration in harvested areas.
- Implement a subwatershed-based harvest analysis, similar to the program described in the 2008 *Quabbin Land Management Plan*.

## **3.5 Wastewater**

### **Means of Assessment**

No comprehensive source of information is available on wastewater disposal in the WRW. Partial information, however, is available through local Boards of Health, Watershed Protection

Act filings, water quality sampling results, EQAs and MassGIS data on locations of sewer system service areas.

Property transfers provide an opportunity for inspection and upgrading of septic systems, and thus provide one source of partial information on those systems.

### **Current Assessment**

Most towns in the WRW rely on on-site septic systems, with the exception of the portions of Rutland and Templeton that are sewerred. DWSP estimates that there are approximately 2,500 private septic systems in the WRW. Staff believe that current Title 5 regulations do a fairly good job of protecting water quality related to those systems, although occasional failed systems do arise.

Sewer lines exist in only two relatively small parts of the WRW – in and around the center of Rutland and in a small portion of Templeton (see Figure IIB-11). In both cases, the wastewater collected in these systems is transported off the watershed. There are presently no sewerage treatment plants in the WRW.

There has been much recent discussion regarding sewer issues in Rutland, where rapid residential growth has pushed the limits and capacity of the existing sewer system. The issue of sewer lines in the watershed poses a dilemma for the Division, since the addition of sewer infrastructure often results in more and denser residential development. However, for individual homes, sewer systems are generally preferable to septic systems since they remove wastewater from the site and deliver it directly to a treatment plant, which in this case, is off-watershed.

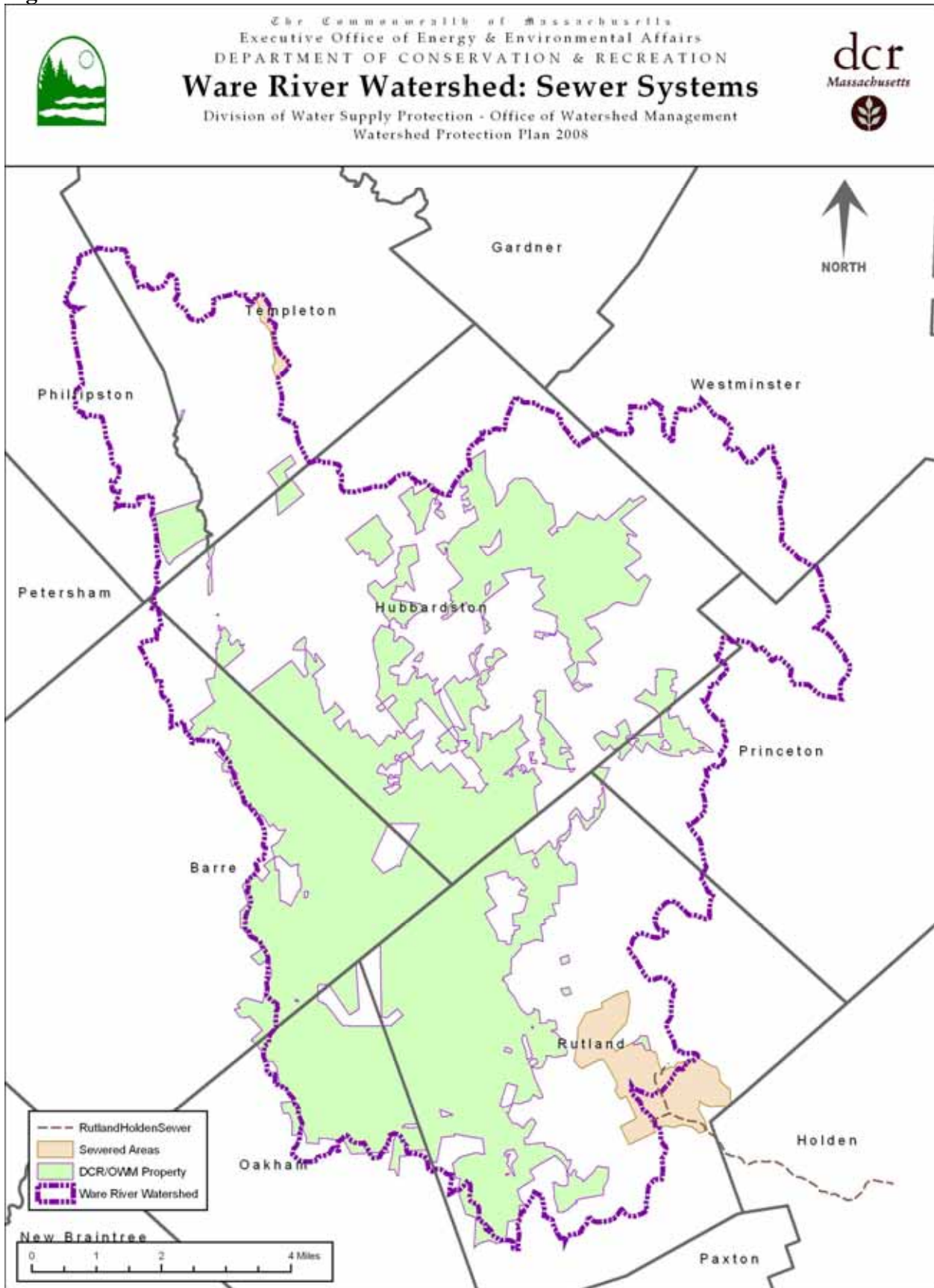
Recently, there has been increasing attention given to the role that Pharmaceutical and Personal Care Products (PPCPs) might play in drinking water quality. Although water sampling to date suggests that these compounds are not present in the water supply (at least not in detectable levels), there is nevertheless some concern about the potential for PPCP introduction into water supply via septic systems.

Wastewater Disposal is considered a MODERATE threat to water quality in the WRW, mainly as a result of the potential for failures in the many private septic systems in the watershed.

### **Needs**

- Add new field to WsPA database for septic system upgrades or replacements.
- Develop a new GIS datalayer for septic system locations.
- Continue education, outreach, and technical assistance to local Boards of Health.
- Focus more attention on larger systems that have inspection requirements – identify them first, then check to see if inspection requirements are being met.
- Monitor sewer issues in Rutland, Templeton, and other watershed communities.

Figure IIB-11: Sewered Portions of the Ware River Watershed



### **3.6 Roadways/Railways/ROWs**

The issues of concern related to roadways, railways, and other rights-of-way (ROW) mainly relate to fuel or other hazardous material spills and the application of pesticides to control vegetation growth along those corridors.

#### **Means of Assessment**

MassGIS data has been used to map the locations of roads, railways, and other rights-of-way in the watershed, and show their proximity to water bodies.

Pesticide issues are monitored through review of the Vegetation Management Plans (VMPs), and Yearly Operational Plans (YOPs) that are produced by highway departments, utility companies, and railroad operators.

Staff routinely check the *Environmental Monitor*, issued by the MEPA office, for notices of new road construction or reconstruction projects, and for the issuance of VMPs and YOPs.

DEP reports are reviewed whenever a spill or other accident occurs on the watershed.

Watershed Ranger patrols and EQA field visits area used to identify potentially harmful activities.

Road maintenance activities conducted by the DWSP on its watershed lands are guided by applicable sections in the *Ware River Land Management Plan*.

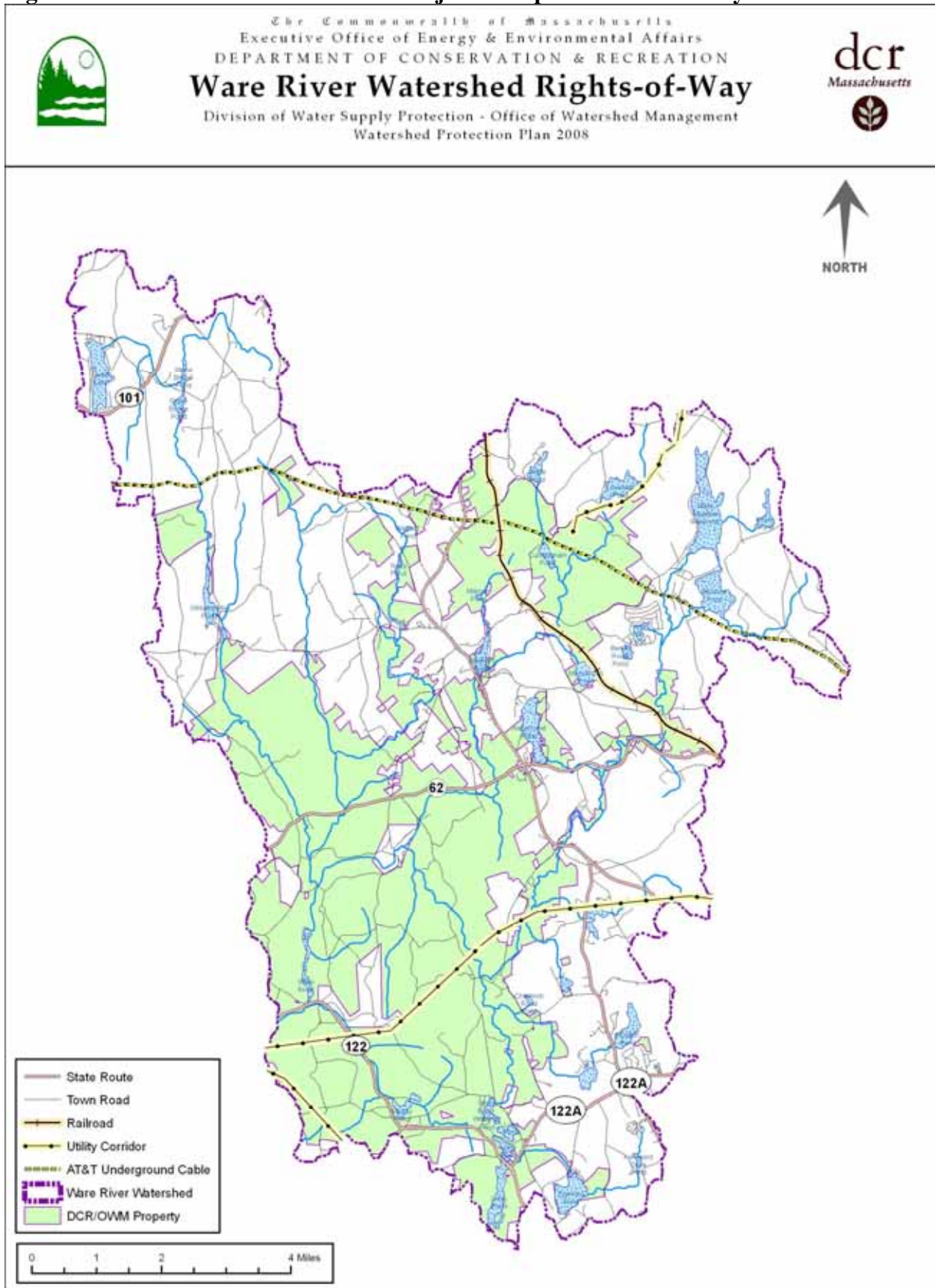
#### **Current Assessment**

Despite the fact that the WRW is situated in a relatively rural part of Massachusetts, there are still a number of transportation and transmission corridors that pass through the watershed. These include six numbered state highways, many town roads, one active railway, and several electrical transmission lines (see Figure IIB-12). GIS data indicates that there are approximately 272 miles of roadways in the WRW, seven miles of active railroad lines, 12 miles of above-ground utility transmission lines and another 12 miles of underground cable line.

These land uses represent linear access points (many of which cross or run adjacent to streams, rivers, wetlands, and other water bodies) into the heart of the watershed, and may also involve activities that are potentially harmful to water quality (e.g., vegetation control operations). As such, substantial staff time is devoted to this category, mainly in terms of monitoring what is happening along these corridors. Hazardous material transport – both along roadways and railways – are of particular concern.

Communication and cooperation with National Grid is generally good regarding pesticide applications along their ROW. Improved cooperation, however, is sought from the Providence & Worcester Railroad Company regarding rail transport across the WRW.

Figure IIB-12: Ware River Watershed Major Transportation and Utility Corridors



DWSP lands in the WRW have historically been much more open to vehicle access than its counterpart in either the Quabbin Reservoir or Wachusett Reservoir watersheds. This poses a particular challenge in regards to controlling illegal dumping, vandalism, and other access-related issues.

DCR roads receive (and require) constant maintenance attention, although resources allocated to this activity have not been adequate to keep up with the need. Staffing has recently been increased, but more heavy equipment is needed to supplement additional staff.

Highway reconstruction projects represent a potential concern, especially when they involve drainage changes and/or direct discharges to local water bodies. Road maintenance activities, such as sanding and salting, are also of concern, especially since tight highway department budgets often mean that these materials are not removed after the winter season.

Hazardous material spills are also of concern, especially along Rt. 122 near the Shaft 8 Intake Works, and in other portions of the watershed where state highways and other heavily-used roadways cross major tributaries. No formal spill response plan is currently in place to deal with such events.

The draft EQA for the Ware River Intake Subdistrict identifies highway runoff in the vicinity of the Shaft 8 Intake as an issue in need of attention.

Overall, Roadways/Railways/ROWs are considered a LOW threat to water quality in the WRW. However, in certain locations (e.g., along Rt. 122 adjacent to the Shaft 8 Intake) or situations (e.g., if a hazardous material spill occurred during the time of water transfer to Quabbin Reservoir), the threat could rise to HIGH.

### **Needs**

- Provide more equipment to enhance capacity for gravel road maintenance on DCR property.
- Work with MWRA to develop a spill response plan for the WRW, including improved communications with both MWRA and DEP.
- Check and upgrade, if necessary, road drainage structures along Rt. 122 near the Shaft 8 Intake.
- Push for early input into state and local road reconstruction projects to influence stormwater management design aspects.
- Conduct culvert survey along DWSP roads in WRW, similar to Quabbin Reservoir watershed project.
- Collect information on types of hazardous materials being transported through WRW, especially along Rt. 122 near Shaft 8 Intake, and on railroads.

### **3.7 Agriculture**

#### **Means of Assessment**

Agricultural activities on the WRW are assessed via MassGIS land use data, updated by more recent aerial photography, EQA field work, WsPA applications, CR monitoring reports and staff observations. Massachusetts DAR data is also used, when available.

#### **Current Assessment**

Agriculture is not a major concern in the WRW, largely because it represents such a small percentage of the total land use. MassGIS land use data from 1999 indicates that only 2.0% of the watershed was “cropland,” with another 1.8% in “pasture” (see Figure IIB-7).

The apparent increase in “hobby farms” in watershed communities bears watching. While no hard data exists on this activity, indications of its growing interest can be gleaned from recent increases in inquiries to and from local realtors; potential buyers frequently ask if the town allows horses to be kept at residential properties, as well as questions about the use of DCR property for horseback riding.

Agriculture is considered a LOW threat to water quality in the WRW.

#### **Needs**

- Continue to monitor agricultural activities through EQAs and regular fieldwork; incorporate locational and other data into GIS databases.
- Add a field to the WsPA database for agricultural activities.

### **3.8 Construction Sites**

#### **Means of Assessment**

Data sources include WsPA filings, NPDES General Construction Permit applications, town records (including building permit applications), the *Environmental Monitor*, EQA field work, water quality monitoring, and observations by field staff during routine operations.

#### **Current Assessment**

Some watershed towns have experienced rapid growth in recent years, at times overwhelming the ability of local boards to monitor and control construction activity. Further, a significant portion of the new construction is occurring on hillsides that are less stable, and thus more prone to erosion during the construction phase.

In recent years, there have been some stark examples of the potential erosion and sedimentation problems that can result from poorly-planned construction activity. These situations have required substantial staff time monitoring construction activity, meeting with developers and DEP officials, and developing plans for impact mitigation. An aerial view of one of these construction projects, and the impacts to an adjacent water body, is shown at right.

Land use changes and census data give some indication of the magnitude of this problem (see Tables IIB-4 and IIB-5; Figures IIB-7 and IIB-8).

Construction activity is considered a MEDIUM to HIGH threat to water quality in the WRW, depending on location.



Aerial view of a residential construction project in the WRW, and resulting water quality degradation in an adjacent pond.

### **Needs**

- Increase monitoring of construction activity, especially large subdivisions, that is beyond the jurisdiction of the WsPA.
- Develop clear procedures and internal thresholds regarding the review of EPA Construction General Permit Notice of Intent (CGP NOI) applications.

## ***3.9 Commercial, Industrial, and Governmental Sites***

### **Means of Assessment**

Information on Commercial, Industrial, and Governmental sites is obtained from MassGIS land use data, DEP databases (USTs; discharge permits), MEPA notices, EQAs, water quality monitoring, staff site visits, data from local fire departments, and from a search of other computerized databases (e.g., nursing homes).

### **Current Assessment**

The main concern related to these land uses involves the various potential sources of contamination/pollution that tend to be more common at these facilities, including higher incidence of impervious surfaces, storage of fuels and/or other hazardous substances, and greater concentrations of people along with their vehicles. For example, Division staff have been working with DEP to monitor ground and surface water in the vicinity of a gasoline leak at a combination gas station/convenience store in Rutland.

Another concern relates to the potential concentration of PPCPs that might be associated with certain commercial activities, including nursing homes, hospitals, prisons, and airports. Database searches, however, did not identify any such facilities in the WRW at the present time. This is likely due to the watershed's rural character and the relative lack of the infrastructure necessary to support commercial and industrial developments.

Most commercial and industrial establishments in the WRW are small retail establishments, primarily located in the towns of Hubbardston or Rutland. There is no evidence of any water quality concerns related to these facilities.

There are a variety of governmental offices and other facilities in the watershed, including schools, town halls, libraries, fire stations and town garages. In addition, there is a MassHighways maintenance facility located on the shore of Long Pond in Rutland that could be of concern if a spill should occur there.

Overall, Commercial, Industrial, and Governmental Sites are considered a LOW threat to water quality in the WRW.

### **Needs**

- Develop a new database, integrating DEP information on permitted discharges, 21E sites, hazardous waste generators, NPDES data, and USTs.
- Develop better communication lines and procedures with DEP staff regarding notifications of spills in watershed.

### ***3.10 Residential Sites***

Concerns about Residential Sites on the watershed relate to a variety of activities and practices that often occur around homes and yards, including the use of lawn care products, pet waste, and the potential flushing of the resultant pollutants into local water bodies during storm events.

### **Means of Assessment**

Locations of residential areas on the watershed have been obtained from MassGIS land use data. Additional information about residential activities is gathered as part of the EQA process. Finally, data is also collected during WsPA filings and as a result of water quality monitoring.

### **Current Assessment**

Overall, residential land uses occur on approximately 5.2% of the WRW. However, the occurrence is highly variable when analyzed by subwatershed. The percentage of subwatershed classified as residential in 1999 ranged from 0% in the Steven's Brook subwatershed (which is mostly owned by DCR) to 8.2% in the Longmeadow Brook subwatershed.

There are no indications of significant issues related to residential sites in the WRW, except for occasional septic system failures or other localized problems. Encroachments are occasionally a concern, as homeowners adjacent to state land sometimes "extend" their property onto that state land, but those issues are generally rectified as they arise.

One possible future concern related to residential development involves the conversion of summer cottages to year-round residences. There is the potential for water quality impacts, at least localized, since this often occurs along lake shores.

The WsPA minimizes potential impacts from residential development in its primary and secondary protection zones.

Residential Sites are considered a MODERATE threat to water quality in the WRW, especially those sites that are within the WsPA buffers, or otherwise hydrologically close to water bodies.

### **Needs**

- Increase homeowner education efforts, especially targeted at people living on lakes and ponds or along tributaries in the watershed.
- Develop an improved database of Watershed Preservation Restrictions, other deeded restrictions, and encroachments; ensure that monitoring reports are distributed to appropriate staff.
- Utilize WsPA and other means to monitor and influence plans for the expansion and/or conversion of existing properties to minimize potential water quality impacts.

## ***3.11 Solid Waste Facilities***

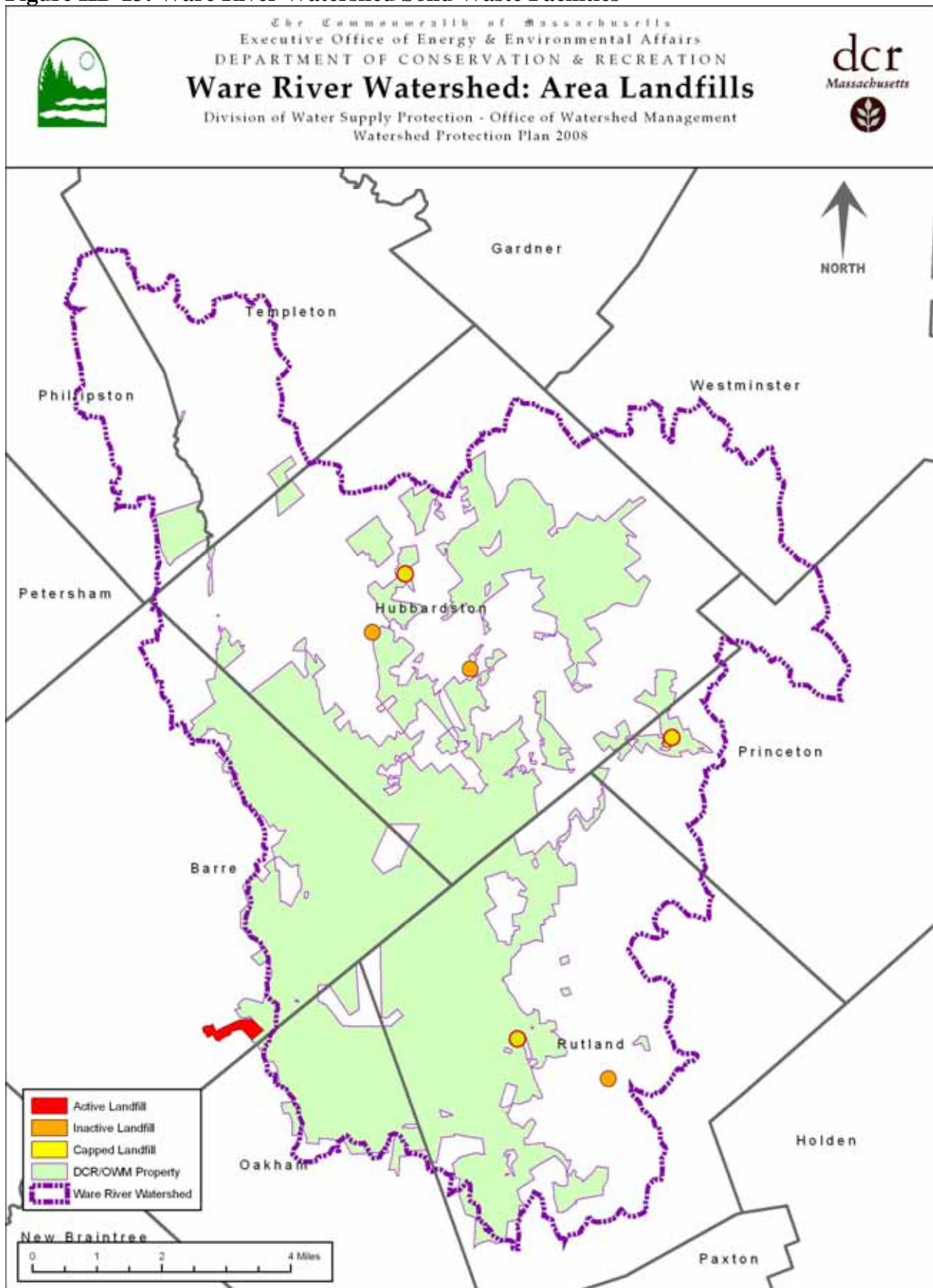
### **Means of Assessment**

Locations of solid waste facilities in the watershed are derived from MassGIS and DEP data. The current status of these facilities can be ascertained from the landfill monitoring reports that must be produced by owners on a periodic basis.

### **Current Assessment**

There are no active solid waste facilities in the WRW at the present time. However, there are six old sites (see Figure IIB-13) on the watershed: three "closed" facilities – one in Hubbardston, one in Princeton and one in Rutland; and three "inactive" landfills in the WRW – two in Hubbardston and one in Rutland.

Figure IIB-13: Ware River Watershed Solid Waste Facilities



DEP considers closed facilities to be “not operating and not likely to operate in the future.” In general, these are landfills that were in use during the past couple decades, but at present have been properly closed and capped. Inactive facilities are “not operating, but not completely closed” according to DEP’s classification system. In most cases, these are older landfills that were closed prior to 1971, and thus were not subject to DEP’s formal closure and capping requirements.

There is one active landfill just off the watershed downstream of the Shaft 8 Intake. While this does not appear to pose a direct water quality problem, it is still of concern because it attracts gulls, which may end up roosting on Quabbin or Wachusett reservoirs, and truck traffic to and from the landfill often pass through the watershed, including along Rt. 122 immediately adjacent to the Intake structure.

Solid Waste Facilities are considered a LOW threat to water quality in the WRW.

### **Needs**

- Request copies of all landfill monitoring reports.
- Re-check old landfills in watershed for potential water quality issues, and assess adequacy of their monitoring programs.

### ***3.12 Future Growth***

Future growth represents a potential water quality issue since it involves development of land in the watershed that is currently in a natural landscape. Future growth could result in additional acreage of many of the potential sources of contamination addressed above, as well as increased public access pressures on the watershed.

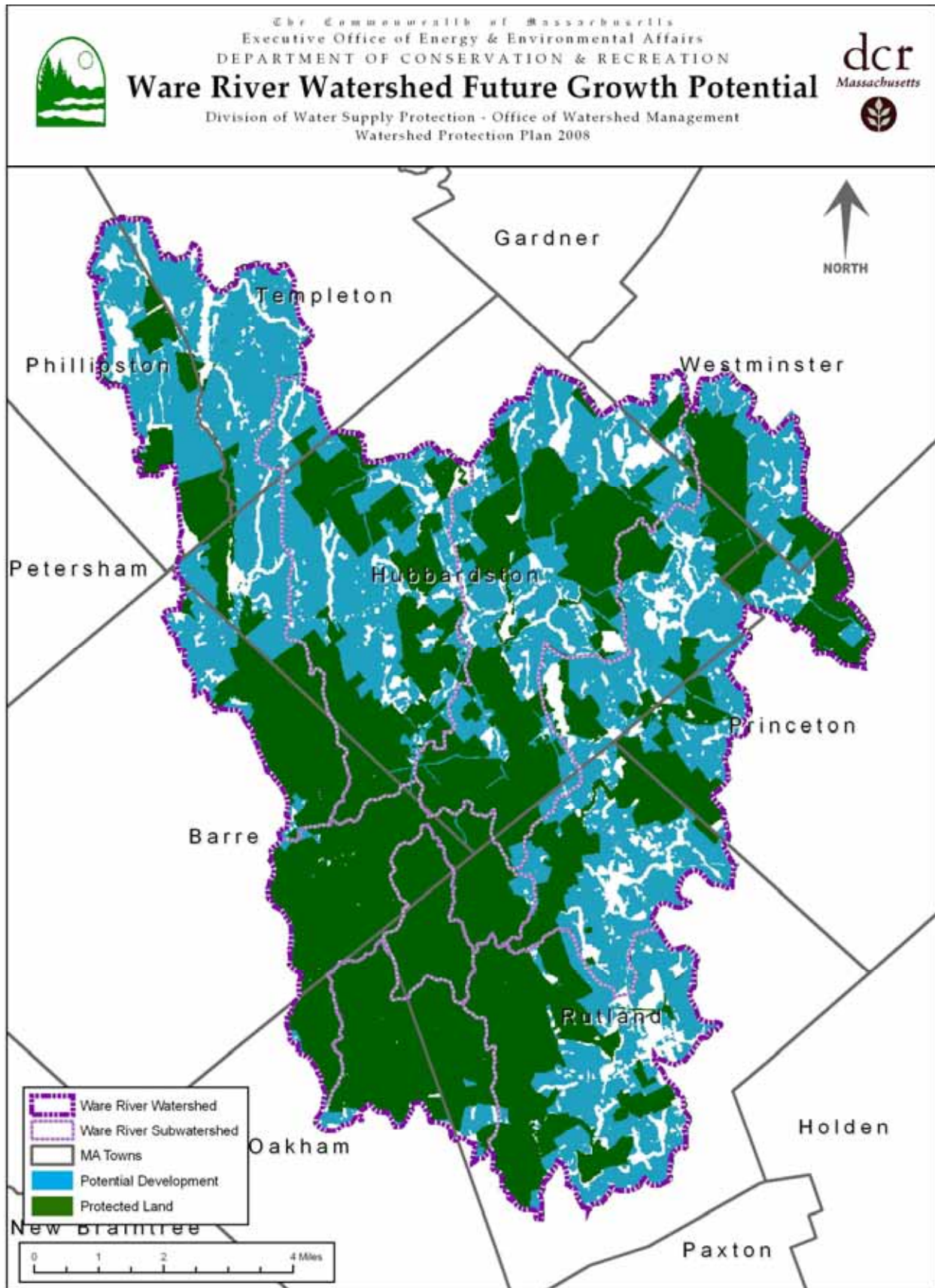
### **Means of Assessment**

Future growth is obviously difficult to predict since it can be affected by a variety of factors, including statewide and local decisions related to zoning and land use practices, economic conditions, and open space protection programs. For purposes of this assessment, data was obtained from MassGIS and the Buildout Analyses that were conducted by EOEEA in the early 2000s. Other sources of information on future growth include town Master Plans, zoning maps, and census data.

### **Current Assessment**

Analysis of the EOEEA Buildout data for WRW towns suggests that almost 23,000 acres in the watershed are potentially available for future growth. This represents about 37% of the watershed. While much of this land is located in the upper reaches of the watershed, significant acreages of developable land is also available in relatively close proximity to the major tributaries (see Figure IIB-14).

Figure IIB-14: Potential Areas of Future Growth in the Ware River Watershed



When analyzed by subwatershed, the East Branch Ware River and the Burnshirt subwatersheds have the highest percentages of developable lands, and thus the greatest potential for future growth. It is also predicted that portions of the watershed with easy access to Rt. 2 in Templeton and Phillipston are likely to experience significant growth in the future.

It should be noted, however, that since most towns still rely on septic systems and private wells, growth in those communities will likely be slow at best. That fact will also limit commercial and industrial growth, as those types of development often require public water and sewer services. Further, sewer and water capacity may be limited in most watershed towns in the immediate future. Rutland, for example, instituted a moratorium on new sewer hookups in 2008 (see Section 3.10).

Still, some communities, Rutland and Hubbardston in particular, have experienced fast growth in recent years, due in part to their desirable location in relation to major highways, relatively low housing costs, and/or good employment opportunities.

Future Growth is considered a MODERATE to HIGH threat in the WRW, especially in those subwatersheds with significant amounts of developable privately-owned lands. DWSP's land acquisition program is unlikely to devote many resources to the WRW, so the potential impacts of future growth will have to be dealt with in other ways.

### **Needs**

- Conduct a cumulative buildout analysis for watershed communities (using existing EOEEA buildout data, if still available).
- Maintain a library of current copies of Master Plans for watershed communities
- Provide for staff attendance at local board meetings.
- Check local newspapers to monitor plans for new developments and growth, including town plans for water and/or sewer expansions.
- Continue to assist watershed towns in planning for future growth.
- Continue land protection efforts, as appropriate, primarily through gifts or other no-cost options.
- Find other, creative, low-cost ways to protect land in the WRW.

## ***3.13 Climate Change***

### **Means of Assessment**

The effects of climate change occur over such a large geographical area that the primary means of assessment is well beyond the ability or feasibility of DWSP staff to actually measure or monitor. Thus, a primary means of “assessment” will be to monitor new regional, national and international developments on this topic.

DWSP has a long history of data collection on its watersheds that can also be used to assess more local changes that may be related to climate change. These include temperature measurements made as part of the water quality monitoring program and indices of forest health that are gathered during Continuous Forest Inventory measurements.

### **Current Assessment**

The most likely impact of concern on WRW related to climate change involves possible changes in the frequency and intensity of rain events that could result in increased runoff, streambank erosion, sedimentation and thus water quality. Another possible impact could be an increase in droughts that results in a greater need for transfers of Ware River water to Quabbin Reservoir. The importance thus remains of maintaining a high level of water quality in the WRW.

Possible impacts on forest health and conditions are also of concern since the watershed forest represents a “protective cover” that holds the soil in place, filters pollutants, and serves as the backbone of the forest ecosystem that the Division strives to maintain on all its watershed lands.

Climate Change is considered a LOW threat to water quality in the WRW during the present planning period.

### **Needs**

- Monitor new findings and predictions on climate change impacts.
- Develop mitigation plans for dealing with potential streamflow and water quality impacts that could result from climate change.
- Begin planning for possible future scenarios, such as extended droughts, that might necessitate increased usage of Ware River water.

### ***3.14 Assessment Summary***

The source assessments in this chapter have identified several issues that are considered to be of primary importance in the WRW (see Table IIB-10). The potential sources considered to pose the highest threats to water quality in the watershed involve Construction and Future Growth (both rated M-H). Substantial staff time has been spent on monitoring large residential subdivisions in recent years, and several of these have caused serious water quality issues. The rapid pace of residential development in several watershed communities, combined with the potential for significant future growth, has led to this high threat ranking.

Development is occurring throughout the WRW, but has been particularly rapid in Rutland and Hubbardston. Such development can result in increased pollution during the actual construction process, as increased runoff can cause sedimentation and carry various pathogens, nutrients and other pollutants into nearby water bodies. It also can exacerbate the problems related to many of the other potential pollution sources, since most of them increase with new developments.

Roadways/Railways/ROW also ranked potentially high, mainly because of the potential consequences of a hazardous material spill close to the Shaft 8 Intake. There could be serious ramifications if such a spill happened to occur during a time when water was being diverted to Quabbin Reservoir from the Ware River. Railway and ROW corridors in the watershed are considered to pose a Low threat to water quality. Transportation issues could become more of an issue with continued population growth in the watershed.

**Table IIB-10: Ware River Watershed Source Threat Assessment**

<b>Source</b>	<b>Importance</b>
Wildlife	Low
Public Access/Recreation	Medium
Timber Harvesting	Low
Wastewater Disposal	Medium
Roadways/Railways/ROW	Low/ High (if accident occurs)
Agriculture	Low
Construction	Medium to High
Commercial/Industrial/ Governmental Sites	Low
Residential Sites	Medium
Solid Waste Facilities	Low
Future Growth	Medium to High
Climate Change	Low

Recreational pressures are also increasing in the WRW, and will probably continue to do so as population growth in the watershed communities continues and more and more people look for outdoor recreational opportunities close to home. Thus, Public Access and Recreation was considered to be a Moderate threat.

Wastewater Disposal and Residential Sites were also considered of Moderate importance, mainly because of their potential for introducing pollutants into waterways. The remaining Sources – Wildlife, Timber Harvest, Agriculture, Solid Waste Facilities, Commercial/Industrial/Governmental Sites, and Climate Change – were all considered to be of Low importance for this planning period.

The assessments of the individual sources of contamination are used to identify what the main issues are that will need to be addressed in the coming years in the WRW. DWSP staff can also determine where issues are most likely to need attention by utilizing the results of the subwatershed analyses described in Section 3 and Appendix A.

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## **4 Programs to Control Potential Sources of Pollution**

DWSP has put in place various programs to address the potential threats to water quality posed by the various source categories. These programs generally fall into four main groupings, each of which relates to a specific watershed protection or management goal (see Table IIB-11).

Table IIB-12 summarizes how these programs provide multiple controls for the contamination threats described in Section 3. These programs, for the most part, are well-established, have been staffed and implemented for a number of years, and will continue throughout the planning period covered by this Plan. More details on each of the programs is provided in Volume I.

This Section provides brief summaries of the programs as they are implemented in the WRW. Specific Action Items are identified that represent new initiatives, components, or particular areas of focus for the next five years.

The first of these goals is to protect land through ownership or agreement. This is accomplished through the DWSP Land Acquisition and Land Preservation programs.

The second major goal of the DWSP's watershed protection and management programs is to manage DCR-owned properties to protect and enhance water quality. The specific programs that address that goal include Land Management, Wildlife Management, Public Access Management, Watershed Security, and Infrastructure Management.

The third major goal of the DWSP's watershed protection and management programs is to work with communities to foster watershed protection principles on land in private ownership. This is accomplished in several ways, including through the implementation of the Watershed Protection Act regulations (350 CMR 11.00-11.08), by providing Technical Assistance and Outreach to watershed communities, and through Interpretive Services programs designed to educate watershed residents and visitors about water quality protection issues.

The fourth major goal of the DWSP's watershed protection and management programs is to monitor and mitigate potential or existing water quality problems throughout the watersheds. This is accomplished through the following three programs: Water Quality Monitoring, Environmental Quality Assessments, and Emergency Response.

**Table IIB-11: DCR Watershed Protection Goals, Programs, Plans, and Guidance Documents for the Ware River Watershed**

<b>Goal</b>	<b>DCR Watershed Protection Program</b>	<b>Applicable Plans, Reports or Guidance Documents</b>
<b>Protect land through ownership or agreement.</b>	Land Procurement	Land Acquisition Panel; WsPA; DCR/MWRA MOU
	Land Preservation	Land Acquisition Panel; WsPA; DCR/MWRA MOU
<b>Manage DCR-owned properties to protect and enhance water quality, and provide stewardship of natural resources.</b>	Land Management	<i>Ware River Watershed Land Management Plan 2003-2012</i> ; DCR/MWRA MOU
	Wildlife Management	<i>Ware River Watershed Land Management Plan 2003-2012</i>
	Public Access Management	<i>Ware River Watershed MDC/DWM Public Access Management Plan Update – 2000</i> ; 350 CMR 11.09(2); DCR/MWRA MOU
	Watershed Security	Watershed Ranger Patrol schedule; <i>Ware River Watershed Land Management Plan 2003-2012</i> ; DCR/MWRA MOU
	Infrastructure	<i>Ware River Watershed Land Management Plan 2003-2012</i> ; Dam Inspection Reports; DCR/MWRA MOU
<b>Work with watershed communities to foster watershed protection principles on land in private ownership.</b>	Watershed Protection Act	Watershed Protection Act and 350 CMR 11.00-11.08; DCR/MWRA MOU
	Technical Assistance and Community Outreach	Watershed Protection Act
	Interpretive Services	Interpretive Services Plan (pending)
<b>Monitor to identify potential or existing water quality problems.</b>	Water Quality Monitoring	<i>Water Quality Sampling and Analysis Plan 2004</i> ; DCR/MWRA MOU
	Environmental Assessments and Mitigation	Various state and federal regulations
	Emergency Response	Quabbin Region Emergency Response Handbook; DCR/MWRA MOU; Emergency Action Plans for dams

**Table IIB-12: Potential Contaminant Sources and Watershed Control Programs**

Source	Control Program or Measure												
	Land Acquisition	Land Preservation	Land Management	Wildlife Management	Public Access Management	Watershed Security	Infrastructure	Watershed Protection Act	Technical Assistance & Community Outreach	Interpretive Services	Water Quality Monitoring	Environmental Quality Assessment	Emergency Response
Wildlife			●	●	●						●	●	
Public Access/ Recreation			●	●	●	●	●			●	●	●	
Timber Harvesting			●				●				●	●	●
Wastewater	●	●						●		●	●	●	
Roadways/ Railways/ ROWs											●	●	●
Agriculture	●	●						●	●		●	●	
Construction	●	●						●	●	●	●	●	
Commercial, Industrial, and Governmental Sites	●	●						●	●	●	●	●	●
Residential Sites	●	●						●	●	●	●	●	
Solid Waste Facilities	●	●						●		●	●	●	
Future Growth	●	●	●	●	●			●	●	●	●	●	
Climate Change	●	●									●	●	●

**4.1 Land Procurement and Land Preservation**

Staffing resources for these programs on the WRW include the Division-wide Land Acquisition Coordinator, who receives input from Forestry and EQ staff assigned to the Oakham office, plus additional input from the Quabbin Section EP and ATS staff, and the RD. Other NR staff are involved in the monitoring of Watershed Preservation Restrictions (WPRs) in the watershed. From 1985 through 2005, DCR increased its land holdings in the WRW from approximately 19,300 acres to more than 23,500 acres, a 22% increase of about 4,200 acres. These acquisitions were discussed and approved by the Land Acquisition Panel (LAP), using the guidance provided by a Watershed Land Sensitivity Model developed by the University of Massachusetts Natural Resources Conservation Department. That model identified lands in the Burnshirt River, Canesto River and Natty Pond Brook subwatersheds as the highest priorities for acquisition or protection since waters in those drainages has the shortest travel time to the Shaft 8 Intake.

LAP has classified the WRW as a lower priority for fee acquisition, in part due to its present level of protection and the fact that the Ware River contributes water to the system seasonally, irregularly, and only on an as-needed basis.

While acquisitions in the WRW are still possible, they are subjected to a very stringent assessment that considers opportunities for boundary consolidation, access enhancement and/or compelling needs to mitigate existing water quality threats. As a result, fee acquisitions in the WRW will likely be uncommon during this planning period.

Instead, future land protection efforts in the WRW will rely mainly on low- or no-cost options such as gifts, protection through other funding sources (e.g., the Forest Legacy Program), and other creative means. As is the case with the DWSP Land Acquisition program in recent years, acquisitions of development rights via Watershed Preservation Restrictions are generally favored over outright fee acquisitions, which carry the additional long-term costs of payments in lieu of taxes (PILOT).

A number of leases of DWSP lands are presently in effect on the WRW. These include leases with MassHighways, the Division of State Parks & Recreation, the Department of Fish & Game, and the US Army Corps of Engineers. Some of these have not been updated for many years, and will be reviewed during this planning period.

#### **Action Items for 2009-2013**

- Pursue low- and no-cost land protection opportunities, especially in more sensitive portions of the watershed
- Pursue WPR acquisitions as appropriate opportunities arise.
- Monitor existing WPRs on a regular basis, and distribute monitoring reports to appropriate staff.
- Review and update lease agreements, as appropriate, with other agencies.
- Consider land swaps, when and where appropriate opportunities arise.

## ***4.2 Land Management***

For purposes of this Plan, Land Management is considered to consist mainly of forest management activities, but also includes watershed road maintenance, fire protection, field management, and cultural resource protection. Other components of the *The Ware River Watershed Land Management Plan 2003-2012*, such as Land Protection and Wildlife Management, are addressed elsewhere in the Plan.

Staff resources for this program in the WRW include: a Forester II, a Maintenance Equipment Operator (MEO II), and a Laborer II.

Timber harvesting on DWSP lands is a carefully monitored and regulated activity that is designed to enhance the ability of the watershed to protect water quality. All management activities are conducted under the supervision of a Watershed Forester, and abide by the current

Massachusetts Forest Cutting Practices Act regulations and additional guidelines and restrictions outlined in the DWSP's *Ware River Watershed Land Management Plan 2003-2012*.

Substantial research, staff discussion and effort go into the development of the Land Management Plans for the DWSP watershed reservations, and as a result, they represent well-reasoned and rational approaches to managing watershed forests. *The Ware River Watershed Land Management Plan 2003-2012* will continue to guide DWSP forest management activities on the WRW during the next planning period, with the continued goal of establishing a diverse and resilient watershed protection forest.

*The Ware River Watershed Land Management Plan 2003-2012* outlines a number of specific goals for the Division's land management activities. These include:

- Provide long-term water quality protection with minimal intervention by developing a vigorous, low-maintenance forest.
- Provide a vigorous forest cover, diverse in species composition and tree sizes and ages, and therefore able to resist and recover from disturbance and to retain available nutrients.
- Maintain the ability of the forest to regenerate following disturbance.
- Prevent erosion of sediments and nutrients from the watershed forest through carefully applied Conservation Management Practices.
- Comply with or exceed all environmental regulations governing forest management activities and water resources protection on Division watershed properties.
- Apply forest management practices that maintain current water yields from the watershed.
- Without compromising primary goals for water quality protection, promote the secondary goals of improving the growth and quality of the forest resource, protecting and enhancing habitat for native wildlife species, and maintaining and enhancing biological diversity.

Road maintenance requires substantial staff time and effort. The DWSP controls and maintains approximately 57 miles of gravel roads in the WRW. Many of these are open for public use during much of the year, and thus require regular maintenance and occasional major reconstruction.

### **Action Items for 2009-2013**

- Provide regular supervision of private loggers working on the watershed, with particular focus on minimizing impacts from road and log landing construction, and at stream crossings.
- Finalize the grouping and mapping of soil types to help guide land management decisions.
- Institute a subwatershed-based approach to timber harvest planning, similar to the system described in the *Quabbin Reservoir Watershed System: Land Management Plan 2007-2017*.
- Develop Spill Response Plans for each new logging operation, giving loggers clear instructions on what to do and who to call in the event of a spill.
- Work with the DCR Bureau of Forestry to enhance the oversight of logging operations on private lands in the watershed. In addition, develop a better database and tracking system for monitoring logging activities on private lands adjacent to DWSP properties.
- Institute a regular forest regeneration monitoring program on DWSP lands in the watershed.
- Continue routine monitoring of forest conditions, and consider instituting invasive plant and/or forest insect and disease surveys.
- Utilize Conservation Management Practices in all forest management activities, and update those practices as new information becomes available.
- Periodically review and update, as appropriate, Timber Sale Permit specifications.
- Submit planned timber harvest operations for internal review by other Section staff.
- Focus road maintenance on BMPs, and ditch and basin cleaning.
- Begin planning for the next version of the Ware River Land Management Plan.
- Assess and monitor status of encroachments onto DWSP property, and take appropriate follow-up actions.

### **4.3 Wildlife Management**

Wildlife management activities on the WRW are planned and administered by the Natural Resource (NR) staff, with assistance from the local Forester and, as needed, the Watershed Maintenance (WM) work unit. No specific wildlife program staff are stationed in the WRW; rather, NR staff from both Quabbin Reservoir and Wachusett Reservoir are available, as needed, to work in the watershed.

The wildlife management program in the WRW is described in *The Ware River Watershed Land Management Plan 2003-2012*, and includes the following general goals:

- Mitigate adverse impacts of wildlife on water quality, infrastructure, and other watershed resources.
- Protect uncommon, rare and otherwise significant wildlife species and habitats wherever they exist on Division lands.
- Assess and mitigate impacts of watershed management activities on wildlife through a process of notification, site visits, review of records and literature, and recommendations to appropriate management staff.

- Actively manage for selected wildlife species that are considered to be common, rare, or unique on a regional or statewide basis.

Wildlife on the WRW is not considered to pose a significant threat to water quality, but continued monitoring is necessary for the early detection of potential problem situations. Still, in general, less emphasis is placed on wildlife monitoring and issues in WRW since there is no reservoir, and wildlife impacts are considered to be of Low importance.

#### **Action Items for 2009-2013**

- Institute browsing surveys and exclosure studies to provide baseline data on deer and moose impacts on the watershed.
- Monitor and address beaver problems on a case-by-case basis.
- Monitor gull activity near the Barre landfill, and provide technical assistance, if necessary, to landfill operators on gull control.
- Collect additional data on gull behavior and movements in the vicinity of the Barre landfill.
- Incorporate wildlife observations into EQA field work.

#### ***4.4 Public Access Management***

The WRW is widely accessible to the public for much of the year, and public access issues occupy substantial staff time. While no staff members are assigned specifically and exclusively to deal with public access issues, staff from the Watershed Rangers, EQ, and WM work units are most involved in those activities. Watershed Rangers respond to specific problem situations regarding public access, and are also involved in periodic patrols of the watershed. They also monitor boating permits at Long Pond, and check in with the DSPR Lifeguards at the Comet Pond Beach during swimming season.

Public access and recreation on the WRW is presently governed by the *Ware River Watershed MDC/DWM Public Access Management Plan Update* (2000). While that document still provides appropriate policy and guidance for the public access, it is becoming outdated, and needs to be updated in the near future. Public access planning is primarily an EQ function, although input from most other work units is also incorporated into those plans.

The 2000 Public Access Plan outlines a number of policies and guidelines for recreational activities and other public access on the watershed reservation (see Table IIB-13). It also includes a Master Policy Statement regarding public access on the WRW. That statement strives for a balance between appropriate recreational activities and the need to protect water quality and the natural, cultural, and historical values of the watershed lands.

**Table IIB-13. Ware River Watershed Public Access Policy Summary**

<b>Activity</b>	<b>Ware River Reservation</b>	<b>Ware River Off-Reservation</b>	<b>Ware River Intake</b>
<b>VEHICLE ACCESS</b>			
<i>Motorized</i>			
<b>Driving</b> – vehicles registered for public roadways	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>1</sup>	<input checked="" type="checkbox"/>
<b>Snowmobiling</b> – DCR/DWSP designated trails only	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>2</sup>	<input checked="" type="checkbox"/>
<b>Operating ATVs</b> – dirt bikes, ORVs, etc.	<input checked="" type="checkbox"/> <sup>3</sup>	<input checked="" type="checkbox"/> <sup>3</sup>	<input checked="" type="checkbox"/>
<i>Non-Motorized</i>			
<b>Bicycling</b> – DCR/DWSP designated roads and trails only	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>4</sup>	<input checked="" type="checkbox"/>
<b>FOOT ACCESS</b>			
<b>Bird Watching/Nature Study</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Hiking/Walking/Snow-shoeing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Cross-country Skiing</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Hunting &amp; Trapping</b>	<input type="checkbox"/> <sup>5</sup>	<input type="checkbox"/> <sup>5</sup>	<input checked="" type="checkbox"/>
<b>Ice Fishing/Ice Skating</b>	<input type="checkbox"/> <sup>6</sup>	<input type="checkbox"/> <sup>6</sup>	<input checked="" type="checkbox"/>
<b>Shore Fishing</b>	<input type="checkbox"/> <sup>6</sup>	<input type="checkbox"/> <sup>6</sup>	<input checked="" type="checkbox"/>
<b>Fires &amp; Cooking</b> – includes gas grills	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Dog Walking</b> – includes hunting with dogs	<input type="checkbox"/> <sup>13</sup>	<input type="checkbox"/> <sup>13</sup>	<input checked="" type="checkbox"/>
<b>Horseback Riding</b> – DCR/DWSP designated trails	<input type="checkbox"/> <sup>14</sup>	<input type="checkbox"/> <sup>14</sup>	<input checked="" type="checkbox"/>
<b>WATER ACCESS</b>			
<b>Boating (motorized)</b>	<input checked="" type="checkbox"/> <sup>7</sup>	<input type="checkbox"/> <sup>8</sup>	<input checked="" type="checkbox"/>
<b>Boating (non-motorized)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Swimming/Wading</b>	<input type="checkbox"/> <sup>9</sup>	<input type="checkbox"/> <sup>10</sup>	<input checked="" type="checkbox"/>
<b>Operating PWC</b> (personal watercraft are jet skis)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>OTHER ACTIVITIES</b>			
<b>Overnight Camping</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/> <sup>15</sup>	<input checked="" type="checkbox"/>
<b>Organized Sports</b>	<input type="checkbox"/> <sup>11</sup>	<input type="checkbox"/> <sup>11</sup>	<input checked="" type="checkbox"/>
<b>Programs/Assemblies</b>	<input type="checkbox"/> <sup>12</sup>	<input type="checkbox"/> <sup>12</sup>	<input checked="" type="checkbox"/>
<b>Fishing Derbies</b>	<input type="checkbox"/> <sup>11</sup>	<input type="checkbox"/> <sup>11</sup>	<input checked="" type="checkbox"/>
<b>Trail Marking/Advertising</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Trail Clearing</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Possessing Alcoholic Beverages</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Collecting/Metal Detecting</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Target Shooting</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Other</b>	Check with Quabbin Visitors Center		

LEGEND:  Prohibited;  Allowed with general restrictions; <sup>#</sup> Allowed with specific restrictions.

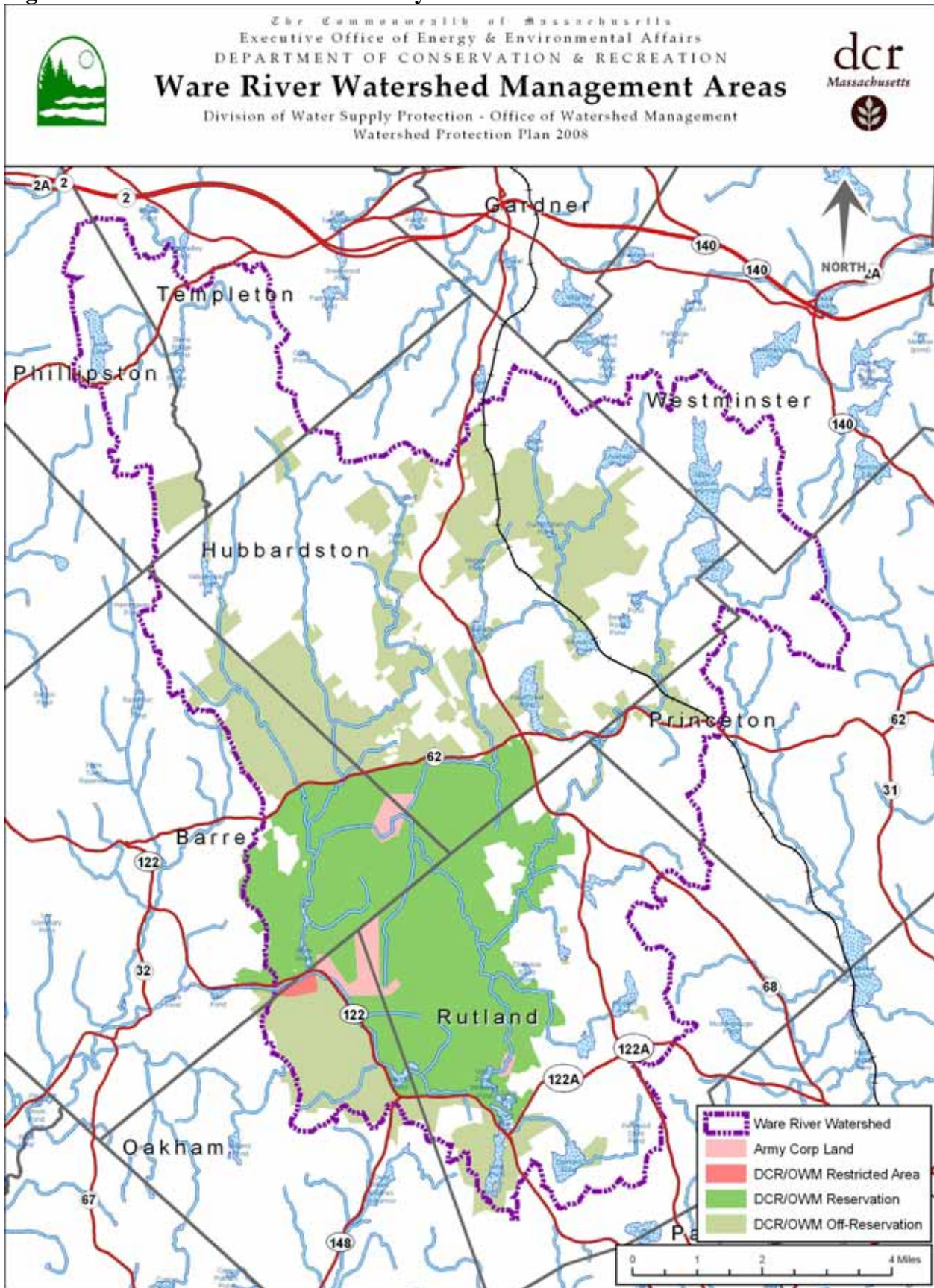
General public access on DCR/DWSP lands is allowed through gates/barways in designated areas only. Any activity which injures or defaces property of the Commonwealth is strictly prohibited. Night access is allowed on DCR/DWSP lands in the Ware River watershed. These policies are based on DCR/DWSP regulations.

<b>DCR Division of Water Supply Protection Public Access Summary</b>	
<b>Specific Restrictions for Public Access on DCR/DWSP Lands in the Ware River Watershed</b>	
<input type="checkbox"/> <sup>1</sup>	Registered motorized vehicles are those registered for operation on public ways. Their access is restricted to certain maintained DCR roads at open gates. Motorized vehicles are prohibited on DCR roads beyond closed gates or barways.
<input type="checkbox"/> <sup>2</sup>	Snowmobiles are allowed with specific restrictions on DCR/DWSP designated snowmobile trails only. Restrictions include season, snow depth, mph, etc. DCR/DWSP Designated Snowmobile Trail Map is available from the Quabbin Visitor Center, Ware River Field Office, or DCR/DWSP web site.
<input type="checkbox"/> <sup>3</sup>	The operation of all-terrain vehicles is prohibited on DCR/DWSP lands and roads.
<input type="checkbox"/> <sup>4</sup>	Bicycling is allowed on DCR/DWSP designated bicycle roads and trails and public roadways. Off-road bicycling and off-road trail riding is prohibited. Bicycling is prohibited during mud season when DCR/DWSP roads and trails are closed by gates or signs. DCR/DWSP Designated Bicycle Trail Map is available from the Quabbin Visitor Center, Ware River Field Office, or DCR/DWSP web site.
<input type="checkbox"/> <sup>5</sup>	Hunting is allowed with a valid Massachusetts hunting license according to State regulations. State regulations prohibit hunting on Sundays.
<input type="checkbox"/> <sup>6</sup>	Fishing access is allowed with a valid Massachusetts fishing license according to State regulations.
<input type="checkbox"/> <sup>7</sup>	Motorboat use within waters of the Ware River Reservation (e.g., Whitehall Pond) is prohibited.
<input type="checkbox"/> <sup>8</sup>	Motorboat access from DCR/DWSP lands in the Ware River Off-Reservation is allowed with these restrictions: <ul style="list-style-type: none"> <li>➤ Motorboat access facilities (ramps) are provided only on DCR/DWSP lands at the following locations: Brigham Pond, Demond Pond, Comet Pond, and Long Pond.</li> <li>➤ Boat motor size off DCR/DWSP ramps is limited to 20 hp (2 stroke) and 25 hp (4 stroke).</li> <li>➤ DCR/DWSP annually issues a limited number of DCR/DWSP Long Pond Access Permits for boats with motors greater than 20 hp. This permit allows the holder to use a 20+ hp motor on Long Pond from Memorial Day to the last day I September and between 10 AM and 6 PM. Contact the Quabbin Visitors Center for more information.</li> </ul>
<input type="checkbox"/> <sup>9</sup>	Limited swimming access is allowed within a designated area of Rutland State Park, a DCR/Division of State Parks and Recreation managed facility. See posted restrictions.
<input type="checkbox"/> <sup>10</sup>	Limited swimming access is allowed in a designated are on Comet Pond, according to posted restrictions and during the designated season.
<input type="checkbox"/> <sup>11</sup>	These activities are allowed only by written permission from the Regional Director, DCR/DWSP Quabbin/Ware Section.
<input type="checkbox"/> <sup>12</sup>	Groups up to 25 individuals are asked to notify the DCR/DWSP prior to access on DCR/DWSP lands. Groups exceeding more than 25 individuals or 15 horseback riders with horse (in the Ware River watershed only) are required to submit a DCR/DWSP Group Access Permit application at least 3 weeks prior to planned access. Contact the Quabbin Visitor Center, Ware River Field Office, or DCR/DWSP web site for an access permit application.
<input type="checkbox"/> <sup>13</sup>	DCR/DWSP requests visitors to pick up and properly dispose of any fecal waste within 100' of a tributary or surface waters.
<input type="checkbox"/> <sup>14</sup>	Horseback riding access is allowed on DCR/DWSP Designated Horseback Riding Road and Trails only in the Ware River Watershed and according to specific restrictions (e.g., no riding during mud season, permit required for group rides of 15 or more, no watering of horsed in tributaries, etc.) See Fact Sheet. DCR/DWSP Designated Horseback Riding Roads and Trails Map is available from the available from the Quabbin Visitor Center, Ware River Field Office, or DCR/DWSP web site.
<input type="checkbox"/> <sup>15</sup>	Camping includes the use of tents, trailers, lean-tos, and motor homes. Camping access is prohibited within the Ware River Reservation. Limited camping on DCR/DWSP Off-Reservation is allowed with written permission from the Regional Director only. Contact the Ware River Filed Office for more information at (508) 882-3636.

Contact information:

- Quabbin Visitor Center – Visit the Center at the Winsor Dam in Belchertown open 9-4:30 daily. (413) 323-7221
- Ware River Field Office – Contact the DCR/DWSP field staff at (508) 882-3636
- DCR/DWSP Watershed Rangers – Contact the Watershed Rangers at (413) 323-0191
- Massachusetts State Police – Report violations/emergencies to the State Police at (413) 323-7561 or \*SP
- See DCR/DWSP's Home Page – [www.mass.gov/dcr/waterSupply.htm](http://www.mass.gov/dcr/waterSupply.htm).

**Figure IIB-15: Ware River Watershed System Delineation**



A permit system is in place for organized recreational activities on the WRW. Permits are usually issued through the Quabbin Visitor Center. In recent years, approximately 12 permits per year have been issued for horseback riding outings or general natural history trips.

Continued population growth in WRW communities, plus continued expansion of interest in outdoor pursuits, such as horseback riding, snowmobiling, mountain biking, will likely lead to increased recreational pressure.

#### **Action Items for 2009-2013**

- Update the 2003 Public Access Plan.
- Enhance signage along boundaries and major access points.
- Improve trail marking, where necessary.
- Enhance or maintain communication channels with major user groups and the Ware River Watershed Advisory Committee.

#### ***4.5 Watershed Security***

Watershed Security is a vital function in an unfiltered public water supply system, but given the location and somewhat limited role of the WRW in the overall system, not as much attention and resource allocation has been given to the WRW as to other parts of the system. No Watershed Rangers are assigned specifically to the WRW; personnel from the Quabbin Ranger Station are assigned to WRW patrols on an irregular basis.

Ranger activity in the WRW is largely seasonal and on an as-needed basis, usually responding to reports of infractions or requests for assistance. Occasional targeted patrols are planned to address specific concerns, or simply to inject a degree of unpredictability into the patrol schedule.

Security checks of the Oakham field office are made during all Ranger patrols, along with checks of MWRA and ACOE facilities made under agreements with those agencies. The area immediately surrounding the Shaft 8 Intake Works is identified as a high security zone, and thus receives special attention. In addition several shafts leading to the Quabbin Aqueduct are located in the WRW. While these are controlled by the MWRA, they nonetheless represent high security areas that require DCR Watershed Rangers' and other staff's vigilance.

#### **Action Items for 2009-2013**

- Improve physical access control structures, as necessary, and implement a maintenance program.
- Establish a structured schedule of Watershed Ranger patrols in the watershed, targeted at structural facilities and other sensitive parts of watershed.
- Improve record-keeping and documentation of incidents on watershed involving responses by DCR Rangers as well as local PDs and other enforcement personnel.
- Maintain and/or enhance working relationships and information-sharing among local enforcement personnel, Watershed Rangers and Oakham office staff.

## **4.6 Infrastructure**

This program involves inspections and/or maintenance of DCR-owned buildings, small dams, and bridges. WM staff deal with the buildings, while Civil Engineering (CE) staff conduct or coordinate the inspections of the other structures.

New dam safety regulations require regular inspections on dams considered to be “high hazards.” Dam inspection reports from recent consultant contracts indicate that several of the small dams in the WRW that are under the control of the DWSP are in need of attention.

### **Action Items for 2009-2013**

- Work to resolve structural and maintenance problems with particular small dams in the watershed, such as Brigham Dam and Coldbrook Dam, in accordance with recommendations in dam inspection reports.
- Evaluate the feasibility of removing or repairing unsafe small dams in the watershed.
- Assure that all DWSP-owned small dams in the WRW are in compliance with Massachusetts dam safety regulations.

## **4.7 Watershed Protection Act**

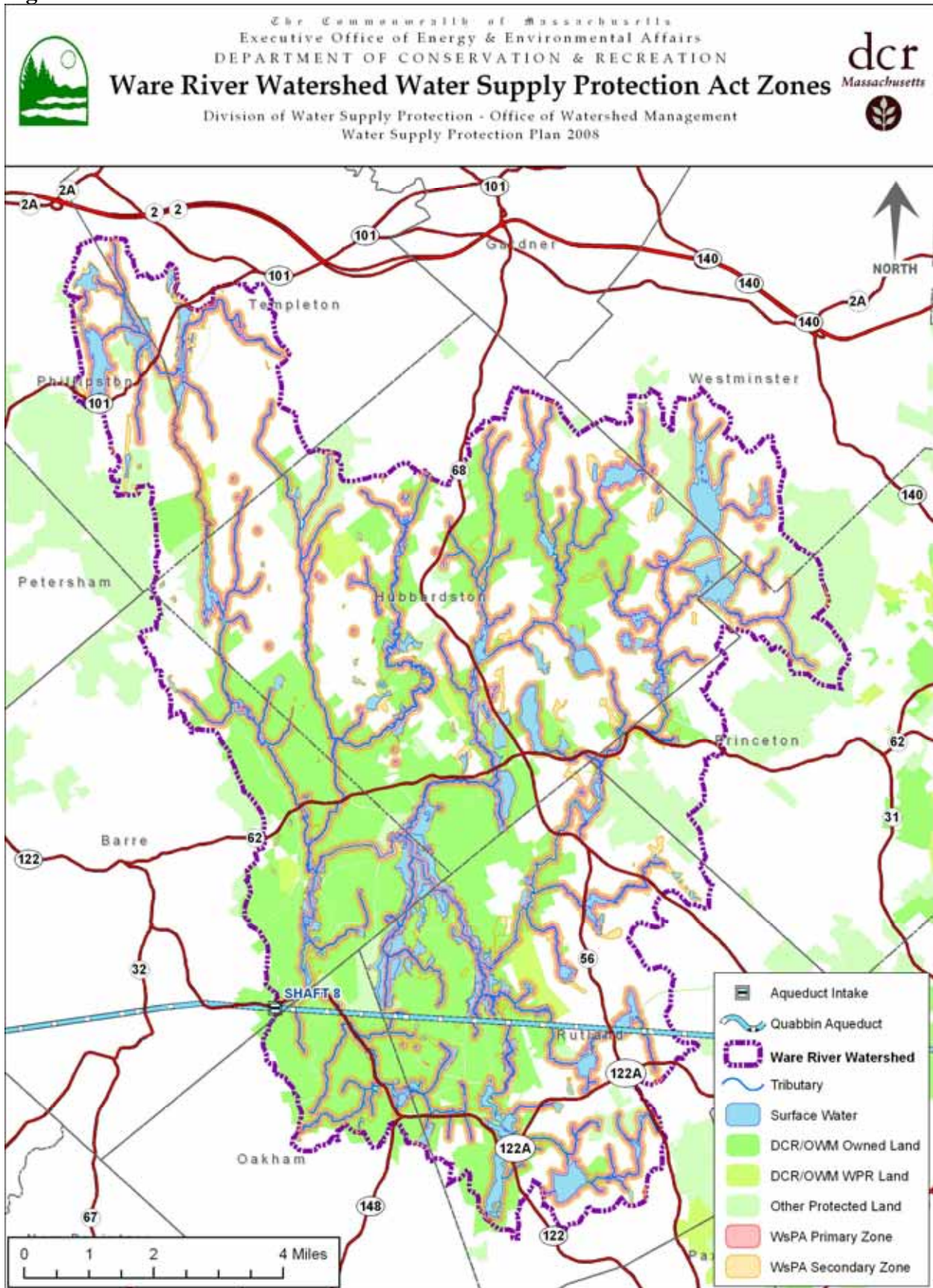
The Watershed Protection Act (WsPA) established restrictions on certain land uses in sensitive areas of these watersheds, in order to protect water quality. Regulations derived from the Act are administered for the WRW by the Environmental Planning (EP) staff in the Quabbin Section, along with the Regional Director (RD). Landowners proposing certain construction or other land use activities within established buffer zones along the rivers and streams of the WRW must apply to the DWSP for either a determination of non-jurisdiction, or for a variance that allows them to proceed with their plans (possibly with certain restrictions).

The WsPA has helped to control potentially harmful water quality impacts. However, the Act’s exemptions still allow for a substantial amount of new development within the buffer zones of watershed tributaries.

One potential difficulty in administering the WsPA is that neither the Act itself, nor the corresponding regulations, require landowners to contact the DWSP prior to conducting regulated activities on their land. As a result, the Division depends upon having good relationships with town boards, building inspectors, realtors, and others to inform landowners about the law and their obligations.

During the past five years, an average of 44 applications under the WsPA have been made to the DWSP for lands within the WRW.

**Figure IIB-16: Watershed Protection Act Protection Zones in the Ware River Watershed**



### **Action Items for 2009-2013**

- Expand the WsPA database to include data on septic system upgrades and agricultural activities.
- Use GIS analyses and other data to determine where future growth and development pressures are most likely to occur on the watershed.
- Maintain good relations with building inspector and other town permitting staff to enhance the notification of potentially affected parties of WsPA requirements.

### ***4.8 Technical Assistance and Community Outreach***

The WsPA requires DCR to provide a program of technical assistance to watershed communities that includes such services as planning studies, zoning bylaw studies, health bylaw studies and subdivision by-law studies. This service is provided primarily by the EP work unit, and has resulted in significant assistance to a number of WRW communities, including some that have been struggling with the impacts of rapid population growth in recent years.

EQ staff also provide technical assistance, generally in regards to engineering or other technical plans (e.g., involving road reconstruction).

Technical assistance has been provided in the past through a grant program that enabled communities to temporarily hire or contract for professional planning assistance, paying for training sessions for town board members, reviewing technical drawings for proposed construction projects, and providing legal documents and resource books on zoning, planning, and wetland protection.

### **Action Items for 2009-2013**

- Continue to provide Technical Assistance to local towns to enhance local zoning regulations that could result in increased watershed protection.
- Develop and implement educational programs for watershed residents and business owners regarding various sources of pollutants that they might be using.
- Target those towns, and those issues for which future growth and development have the greatest potential for adverse water quality impacts.

### ***4.9 Interpretive Services***

This program provides public education for students, local residents, and visitors on the importance of watershed protection. Services are mainly provided by Interpretive Services (IS) staff based at Quabbin Reservoir, and NR staff from West Boylston.

There is no Visitor Center in the WRW, so this program's goals are primarily accomplished through presentations to school groups, information posted on kiosks in the watershed, Watershed Ranger contacts with the general public, occasional interpretive walks led by DWSP

staff, and the *Downstream* newsletter that is mailed to selected watershed residents several times per year.

### **Action Items for 2009-2013**

- Offer guided interpretive walks and school group presentations.
- Develop an Interpretive Plan for the WRW.
- Distribute the *Downstream* newsletters to watershed residents.
- Use Watershed Ranger patrols in the watershed as a vehicle for public education.
- Maintain informational kiosks in the watershed with up-to-date information.

### ***4.10 Water Quality Monitoring***

The DWSP has a comprehensive water quality monitoring program that is used to screen for potential pollutants, to measure the effectiveness of watershed management programs, to better understand the responses of the reservoir to a variety of physical, chemical, and biological inputs, and to assess the ecological health of the reservoir and the watershed. DCR monitoring is entirely for internal assessment purposes, and is conducted by EQ staff based both in the Oakham and Belchertown offices. All system monitoring for compliance with SDWA is done by the MWRA.

The water quality sampling program currently implemented on the WRW is described in detail in Section 2.6. The DWSP sampling program is largely based on the assumption that the management work DCR conducts on the watershed lands under its control results in good water quality. The Division, therefore, tends to focus more on private lands when establishing sampling station locations.

Sampling programs are also designed to be able to characterize water quality in the different drainages of the WRW. An annual water quality report is produced by the EQ staff that summarizes sampling results.

### **Action Items for 2009-2013**

- Expand sampling and/or inspections in the vicinity of the Shaft 8 Intake Works during periods of water diversions.
- Implement the sampling program outlined in the 2004 Water Quality Sampling and Analysis Plan.
- Keep abreast of new developments regarding emerging contaminants, and adjust, as needed, the monitoring program.
- Conduct targeted sampling, as appropriate, at specific problem sites (e.g., new subdivisions).

#### ***4.11 Environmental Quality Assessments***

Environmental Quality Assessments (EQAs) provide an important means of assessing conditions on specific portions of the watershed, and these help guide testing, enforcement or mitigation actions. The EQAs are based on field inspections, water quality data review, a review of records, and other available information. They are generally conducted on a district or subdistrict basis by the EQ staff.

Four districts and 16 subdistricts have been delineated for the WRW (see Figure IIB-9). In general, assessments are completed on a five year cycle. In the WRW, EQAs have recently been completed on the Ware River Intake and the West Branch Ware River Proper subdistricts.

EQAs are a vital first step in assuring water quality protection, but just as important is the follow-up mitigation of problem situations uncovered during the assessments. DWSP staff felt, that in the past, attention was focused on major water quality issues, but that many of the “lesser” mitigation recommendations were falling through the cracks. Accordingly, a decision was made for this planning period to give equal consideration of both the assessment and the mitigation components of this program.

DEP staff share information on a monthly basis with DCR on permit applications that are filed with all bureaus in MassDEP Central Region. This procedure provides DCR and DEP staff the opportunity to communicate during the permitting process, and is another way that DCR can track new and on-going projects in the watershed, including waste generators, solid waste and recycling facilities, as well as other EQA related issues such as wastewater permits and water treatment facilities.

As described in Section 4.12 of Volume I, there are five primary categories that are generally considered part of the EQA process: Compliance with Environmental Regulations, Wastewater, Stormwater, Agriculture, and Hazardous Materials and Waste. The programs and activities that address these issues are described in Volume I, while additional action items for this planning period are included below.

#### **Action Items for 2009-2013**

- Identify sufficient staffing resources to support the WRW EQA process.
- Complete EQAs on all four Districts in the WRW.
- Revise and update the EQA database.
- Work with the DCR Lakes & Ponds program to implement a program aimed at reducing the threats from non-native aquatic invasive species in WRW ponds.
- Coordinate with staff who may have additional information to include in the EQAs.

#### **4.11.1 Compliance with Environmental Regulations**

##### **Action Items for 2009-2013**

- Develop a mitigation policy that will guide decisions regarding enforcement and educational activities related to problems discovered during the EQA process.

#### **4.11.2 Wastewater Management**

##### **Action Items for 2009-2013**

- Develop a new datalayer for septic system locations, utilizing information from WsPA applications and other data sources.
- Focus particular attention in the WRW on larger systems that have inspection requirements under DEP regulations.
- Add a new field to the WsPA database for septic system upgrades or replacements.

#### **4.11.3 Stormwater Management**

##### **Action Items for 2009-2013**

- Further evaluate the stormwater drainage structures along Rt. 122 near the Shaft 8 Intake Works, and develop plans, if appropriate, for mitigation strategies.
- Strive for early input into state and local road reconstruction projects to more effectively influence stormwater management design aspects of the projects.
- Conduct culvert survey along WRW roads, similar to the Quabbin Reservoir project.

#### **4.11.4 Agriculture**

##### **Action Items for 2009-2013**

- Develop a database of agricultural activities on the WRW.
- Add a field to the WsPA database for agriculture.

#### **4.11.5 Hazardous Materials and Waste**

##### **Action Items for 2009-2013**

- Collect data on the types of hazardous materials that are being transported through the WRW, in particular along Rt. 122 near the Shaft 8 Intake Works.
- Increase homeowner education efforts; target people living on or near lakes, ponds or major tributaries in the watershed.
- Develop a new database for known or potential hazardous material sources on the watershed, using data from DEP for 21E sites, USTs, etc., as well as other sources, including updated MassGIS land use data.
- Request and review copies of monitoring reports for the closed or inactive landfills in the watershed.

## ***4.12 Emergency Response***

Despite the best efforts to implement control over forestry, public access, maintenance and other activities on the watershed, emergency situations – especially those involving spills of hazardous materials – can result in immediate threats to public drinking water supplies. Accordingly, DWSP staff strive to identify and control potentially hazardous situations in the watershed, including undergoing training and other preparation to deal with hazardous materials spills.

The components of this program include training, purchase, and staging of spill response materials, development of Standard Operating Procedures for emergency situations, and follow-up procedures. Responsibility for emergency response in the WRW is divided among several work units: Administrative and Technical Support (ATS) staff are responsible for developing response plans and training; the Assistant Regional Director (ARD) serves as the Incident Commander during actual emergency situations; the Watershed Rangers are often the first responders in emergency situations, and thus have additional training and response equipment; and staff from most other work units obtain training so they can conduct boom deployment and other spill response tasks.

### **Action Items for 2009-2013**

- Provide additional Incident Command System (ICS) training of Section staff and maintain records of the levels of training received by those staff members.
- Develop an emergency response handbook for the WRW, similar to the one currently being produced for Quabbin, including emergency contact information.
- Maintain inventories of emergency response equipment and supplies, and stage them at appropriate locations in the WRW.
- Produce spill response plans and spill notification cards for logging operations, and continue to offer spill response training, with continuing education credits, for loggers working on the watershed.
- Develop emergency spill response kits that can be deployed at logging sites.
- Develop a spill response plan, in conjunction with MWRA, for sensitive locations, such as the vicinity of the Shaft 8 Intake Works.
- Plan and conduct spill response training sessions for appropriate staff on the WRW.

## **5 Implementation Schedule and Work Plan**

### ***5.1 Administrative and Technical Support***

The success of the water quality protection work outlined in this plan is largely dependent on having a knowledgeable and well-trained staff that has the necessary administrative, technical, and logistical support necessary to carry out their responsibilities. This support is provided by various other staff members who, for example, oversee payroll and personnel functions, deal with ordering, budgeting and other financial matters, maintain vehicles, and provide technical services such as GIS and IT support.

#### **Action Items for 2009-2013**

- Continue to upgrade the Oakham field office with phone, computer, and related technology needs that will allow the professional staff to be more efficient in their communications, database entries and retrievals, etc.
- Provide appropriate training to staff on computer software, GPS use, and other technology that will enhance their job performance.
- Provide GIS support services, as required, to field staff.

### ***5.2 Annual Work Plans***

Implementation of the priorities and tasks identified in this Plan occurs mainly through the Annual Work Plans (AWPs) that are developed towards the end of each calendar year as specified by the Memorandum of Understanding between DCR and MWRA. The AWPs are reviewed by MWRA staff and ultimately approved by the Water Supply Protection Trust (see Volume I, Section 6.2). The AWPs break down the general goals and priorities that are outlined in the various plans produced by the Division, including Watershed Protection Plans, Land Management Plans, Public Access Management Plans, and Wildlife Management plans, into specific tasks aimed at achieving those goals and priorities in the coming year.

A new component of implementation that will be instituted during this planning period is the linking of AWP tasks to individual employee work function descriptions (Form 30) and job performance evaluations (EPRS form). These connections will give staff a better understanding of how their job duties relate to the Division's watershed protection and management goals.

#### **Action Items for 2009-2013**

- Link Annual Work Plan tasks to the specific duties listed in employees' Form 30s and EPRS forms.

### 5.3 Five Year Work Plan

The new action items described in this Plan are combined with the ongoing tasks from recent AWP's into a "5-year Work Plan" presented in Table IIB-14. This Work Plan will guide DWSP watershed management activities on the WRW from 2009 to 2013.

**Table IIB-14: Ware River Watershed 5-Year Work Plan 2009-2013**

**Key to Work Units in Quabbin/Ware River Region:**

ATS = Administration and Technical Support; CE = Civil Engineers; EP = Environmental Planning; EQ = Environmental Quality; F = Forestry; GIS = Geographic Information Services (in Boston and West Boylston offices); IS = Interpretive Services; NR = Natural Resources; RD = Regional Director, Assistant Director; WM = Watershed Maintenance; WR = Watershed Rangers.

Task Description	Lead Section	Additional Staff	Product(s)
<b>A. Land Procurement</b>			
Acquire control of important watershed lands through no- or low-cost options. Coordinate due diligence and other services from DCR staff to complete survey, title, engineering, and negotiation activities, as appropriate.	NR	GIS	Protected land
Assess all new acquisitions to document the existing condition of forests, roads, and boundary markings. Integrate new properties into existing land management and public access programs.	NR	F CE	Completed parcel assessments
Attend quarterly LAP meetings, if appropriate, to prioritize land and WPR purchases. Conduct local assessments on WRW parcels.	EQ	F EP ATS	<ul style="list-style-type: none"> <li>▪ Prioritized parcel list</li> <li>▪ Parcel specific assessment</li> <li>▪ Coordination before purchase</li> </ul>
Develop individual parcel presentation materials and meet with MWRA Board for approval of critical purchases.	NR	GIS	Presentation reports with GIS maps
Support watershed land preservation groups regarding land protection in watershed to acquire land through gifts or through cooperation with other land trusts. Investigate possible funding sources to supplement MWRA resources for land procurement.	NR	RD ATS	Other protected land
<b>B. Land Preservation</b>			
Complete NR baseline inspections for all new WPRs within six months of acquisition. Forward to Quabbin Reservoir staff for review. Investigate all proposed WPRs that will allow agricultural uses to ensure that all permitted uses comply with applicable rules and regulations.	NR	EQ	<ul style="list-style-type: none"> <li>▪ Reports reviewed with local knowledge</li> <li>▪ Improved post-purchase coordination</li> </ul>

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Conduct annual NR inspections of all property under an existing WPR to ensure compliance with original agreement. Forward for review to Quabbin staff. Determine if action is necessary. Enforce restrictions, if necessary.	NR	EQ	<ul style="list-style-type: none"> <li>▪ Inspection reports with local knowledge</li> <li>▪ Interagency coordination</li> <li>▪ Compliance</li> </ul>
Maintain an up-to-date inventory, map, and database of lands protected by DWSP, other agencies, organizations, or individuals, including CRs. Coordinate with other agencies on their monitoring efforts.	NR GIS	EQ ATS	<ul style="list-style-type: none"> <li>▪ Current maps/database of “Protected lands”</li> <li>▪ Improve monitoring/coordination</li> </ul>
Review and update, as necessary, lease agreements with other state and federal agencies for the use of DWSP lands in the WRW.	NR	RD ATS	Updated lease agreements
<b>C. Land Management</b>			
Implement the <i>Ware River Watershed Land Management Plan 2003-2012</i> . Conduct periodic reviews and monitoring of current land management activities to assure consistency with the Land Management Plan and DCR policies, and to minimize potential adverse impacts on water quality.	F	NR others	Consistency of land management activities with Land Management Plan
Manage silvicultural activities – bid/contract preparation, timber marking, monitoring – in accordance with the <i>Ware River Watershed Land Management Plan 2003-2012</i> and all other applicable regulations.	F	NR	Regeneration on 400 acres/year on carefully selected parcels without negative water quality impact
Maintain boundaries as necessary, including clearing, posting, and surveying. Document and pursue encroachment issues	F	CE WM WR	<ul style="list-style-type: none"> <li>▪ Maintained property boundary;</li> <li>▪ Encroachment reports</li> </ul>
Collect data and maintain databases, GIS datalayers, and related maps on forest structure, composition and regeneration, deer browsing, rare and special plant communities, forest roads, boundary information, and other data to guide the land management program and lot review process.	F	NR ATS	<ul style="list-style-type: none"> <li>▪ GIS coverages</li> <li>▪ Functional and accessible forestry database</li> </ul>

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Conduct DWSP road maintenance and repair – grading, culvert, and ditch maintenance – according to road prioritization to improve drainage and functionality. Continue to collect data on road conditions and culvert locations for future planning.	WM	F	Maintained roads with functional stormwater CMPs Road repair and maintenance prioritization system
Institute a subwatershed-based approach to timber harvest planning, similar to the system described in the <i>Quabbin Reservoir Watershed System: Land Management Plan 2007-2017</i> .	NR	F	Improved watershed protection through better planning of harvest operations
Work with the DCR Bureau of Forestry to improve oversight of logging operations on private lands in the WRW. Develop a computerized database and tracking system for monitoring logging activities on private lands adjacent to DWSP property.	F	NR	Improved oversight over private logging operations on the WRW
Conduct terrestrial invasive species control.	NR	F WM	<ul style="list-style-type: none"> <li>▪ Inventory of affected areas</li> <li>▪ Control of invasive terrestrial species in critical areas</li> </ul>
Begin process of data collection and other preparations for updating the Ware River Watershed Land Management Plan.	NR	F	<ul style="list-style-type: none"> <li>• Initiation of Plan update</li> </ul>
<b>D. Wildlife Management</b>			
Monitor area landfills for feeding gulls. Work cooperatively with landfill operators to ensure DEP landfill regulations are being followed. Identify opportunities and assess feasibility of controlling food sources.	NR EQ		<ul style="list-style-type: none"> <li>▪ Reduction of gulls food supplies</li> <li>▪ Inspection reports</li> </ul>
Complete comprehensive study of the movements, behavior, and feeding patterns of ring-billed, herring, and great black-back gulls in central Massachusetts.	NR	EQ	<ul style="list-style-type: none"> <li>▪ Database</li> <li>▪ Study report</li> <li>▪ Recommendations</li> </ul>
Monitor and address beaver problems on a case-by-case basis. When appropriate, remove beaver and muskrat from sensitive areas within watershed. Utilize habitat modifications to discourage the re-occupation of those sites.	NR	WM	Damage reduction

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Continue long term monitoring and assessment of moose. Obtain aerial moose survey data. Continue hunter surveys. Assess ability to distinguish moose browse from deer. Continue to follow Moose GPS telemetry study. Monitor and evaluate existing moose exclosures.	NR	WM	Survey report with recommendations
Monitor significant wildlife species and coordinate with the Mass Wildlife Endangered Species and Natural Heritage Program.	NR	F	Monitoring data and reports
Improve system for incorporating wildlife observations that could affect water quality into EQA field work.	NR	EQ	Improved EQA data
<b>E. Public Access Management</b>			
Implement and evaluate the current <i>Ware River Watershed Public Access Management Plan Update</i> .	WR		Plan implementation
Revise and update the <i>Ware River Watershed Public Access Management Plan</i> .	EQ	Others	Updated Plan
Implement Watershed Ranger Plan as designed to enforce rules and regulations and to provide education and outreach to the general public.	WR	RD	Updated Regional Watershed Ranger Plan
Develop and conduct orientation and training materials for staff, seasonal staff, and state and local police for consistent interpretation of rules and uniform enforcement.	IS WR	Others	DVD and training manual
Continue, and modify as necessary, sanitation program based on the needs of the <i>Ware River Watershed Public Access Management Plan</i> .	EQ	ATS	Sanitation program
Centralize, update, and maintain electronic permit database for permit issuance, tracking, monitoring, and coordination between sections.	ATS	IS WR F	Integrated permit database
Evaluate and implement Universal Accessibility projects throughout the Region.	RD		ADA Compliance
Enhance signage along boundaries and major access points in the watershed.	WM	WR	Improved watershed signage
Establish or maintain communication channels with major recreational user groups and the Ware River Watershed Advisory Committee.	EQ	WR RD	Improved communication

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
<b>F. Watershed Security</b>			
Maintain Watershed Ranger program with appropriate training to provide watershed security. Provide more regular patrols and security checks at key access points and at MWRA facilities. Use daily logbooks to record all encounters and violations. Produce periodic reports. Partner with MWRA, state police, EPOs, and local police.	WR		<ul style="list-style-type: none"> <li>▪ Visible presence</li> <li>▪ Daily logbooks and database</li> <li>▪ Incident reports</li> <li>▪ Partnerships</li> </ul>
Inspect, maintain, and monitor gates and barways throughout watershed for security and access control. Install barriers (e.g., guardrails, fences, remote monitoring, intrusion alarms), as needed, to protect properties and control public access where appropriate.	WM	WR CE	<ul style="list-style-type: none"> <li>▪ Hard security</li> <li>▪ Surveillance</li> <li>▪ Notification</li> </ul>
<b>G. Infrastructure</b>			
Provide supervision, coordination, oversight, and assistance for all engineering, construction, and renovation work. Employ energy efficiency measures in maintenance and repair work.	CE		Records of construction and maintenance operations
Maintain historic records related to watershed operations, facility construction, and land ownership including verification.	CE	EQ F	Records maintenance
Inspect, maintain, and ensure compliance with all dam safety requirements for all small dams on Division lands.	CE		Inspection Reports Cost estimates
Evaluate the feasibility of removing unsafe or unnecessary small dams in the watershed.	CE	RD	Possible dam removal
Continue routine maintenance of grounds around administration building, including grass mowing, road maintenance, snow removal, and public access enhancements.	WM		Mowings, plowing; grounds maintenance
Develop a program for the substitution of vegetable based fluids in hydraulic equipment.	WM		Reduction of hydraulic fluids on watershed lands
Continue all support staff activities, including payroll and other financial matters, running the administrative offices, and overseeing all vehicle and equipment leases, and purchases. Prepare work plans, budgets, progress reports, and program goals.	ATS RD	Others	<ul style="list-style-type: none"> <li>▪ Annual Work Plan</li> <li>▪ Quarterly summaries</li> <li>▪ Annual budgets</li> </ul>

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
<b>H. Watershed Protection Act</b>			
Administer the Watershed Protection Act regulations by reviewing applications, holding hearings, responding to requests for information, and maintaining a database and associated GIS datalayer for all WsPA applications and associated projects. Work with DWSP General Council to update WsPA regulations.	EP	ATS EQ	<ul style="list-style-type: none"> <li>▪ Application processing</li> <li>▪ Decision issuance</li> <li>▪ Field work</li> <li>▪ Database management</li> </ul>
Expand the WsPA database to include data on septic system upgrades and agricultural activities.	EP	ATS	Expanded database
Inspect sites with conditional approval throughout the duration of any activity to ensure regulatory compliance.	EP		Enhanced compliance
Evaluate public notices, compile building permits from watershed towns, and review local board agendas and minutes to search for additional jurisdictional activities.	EP		Enhanced compliance
Participate in Watershed Protection Act Working Group meetings.	EP	RD EQ	Improved intra-agency and regulatory communication and coordination
Update or develop, as needed, new information, forms, regulations, and guidance documents related to the Watershed Protection Act.	EP		Updated and new educational materials
Investigate updating parcel maps for watershed towns.	GIS	EP ATS	Updated WsPA parcel GIS coverage
<b>I. Technical Assistance and Community Outreach</b>			
Provide direct technical assistance support to local planning boards and community organizations through contact at board meetings and the regulatory review processes. Assist communities, upon request, in obtaining state-sponsored grants for planning projects.	EP	EQ	Community planning assistance
Develop and implement educational programs to educate watershed residents and business owners about issues related to pesticides, fertilizers, storm water management, pharmaceuticals and personal care products, household hazardous waste, and drinking water protection. Educate realtors, prospective buyers, and local homeowners on WsPA regulations and agricultural activities, in particular horse related rules.	EP	EQ	Public education

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Assist communities in developing local wetland bylaws. Review watershed town by-laws for commercial and industrial activities with respect to watershed protection strategies.	EQ EP		Enhanced regulatory compliance
<b>J. Interpretive Services</b>			
Develop an Interpretive Plan for the WRW.	IS		Interpretive Plan
Arrange for staff members with particular expertise in a variety of environmental, water resource, wildlife, and watershed protection issues to speak, when appropriate, to outside groups and organizations. Offer educational programs to visiting groups, including college classes and loggers.	IS	Others	Speakers and educational programs
Continue established program of public education, including school programs, field trips, and interpretive programs on Division properties. Expand, as appropriate, watershed curriculum using materials developed by MWRA, DEP, EPA, ProjectWild, Project Learning Tree, Project WET, and other watershed related educational resources. Continue to support watershed school system teachers through in-service workshops and day-long offerings for schools in the watershed.	IS	NR WR	Public education
Maintain educational displays at kiosks and bulletin boards. Include maps that clearly show appropriate areas for bicycling, hunting, and fishing to help direct these activities away from sensitive resource areas. Target educational efforts at non-permitted groups.	IS	WR WM GIS	Maintained bicycling, cross-country skiing, fishing, hiking maps
Expand orientation and training for seasonal staff and local law enforcement.	IS	WR	DVD and manual
<b>K. Water Quality Monitoring</b>			
Maintain routine and non-routine tributary sampling, including physical, chemical, and biological parameters. Compile and interpret data in an annual report. Continue analysis for nutrients and metals on selected tributaries. Revise and update baselines of chemical, physical, biological, and flow parameters to better monitor changes over time using monthly and quarterly water samples collected from established historic sites. Continue to monitor new developments related to effects of Climate Change.	EQ		<ul style="list-style-type: none"> <li>▪ Weekly reports</li> <li>▪ Annual water quality report</li> <li>▪ Annual EQA</li> <li>▪ Baseline assessments</li> </ul>
Increase inspections and/or monitoring activities in the vicinity of the Shaft 8 Intake Works prior to and during periods of water diversions.	EQ	WR MWRA	Periodic monitoring reports

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Keep abreast of emerging contaminants. Investigate further when necessary.	EQ	MWRA	Monitoring Program
Periodically review and evaluate the Division's routine water quality monitoring schedule and make appropriate modifications to sampling locations, frequency, and parameters. Consult with Water Quality Sampling and Analysis Coordination Team (WQ-SAT).	EQ	MWRA	Sampling plan and schedule
Develop a working group, in coordination with MWRA, to assess the need for expanded weather and other environmental data collection and analysis.	CE EQ	MWRA	Improved data collection
<b>L. Environmental Quality Assessments</b>			
Identify sufficient staffing resources to support the WRW EQA process.	RD	EQ	Improved staffing for EQAs
Complete four Sanitary District based Environmental Quality Assessment in the next five years.	EQ		Completed EQAs
Use site inspections, Environmental Quality Assessments, local board meetings, and information from staff to identify possible violations.	EQ	Other staff	<ul style="list-style-type: none"> <li>▪ Field reports</li> <li>▪ Mitigation</li> </ul>
Implement EQA recommendations and oversee, as necessary, remedial actions. Develop a mitigation policy encompassing enforcement and education.	EQ		<ul style="list-style-type: none"> <li>▪ Mitigation Policy</li> <li>▪ Annual Mitigation Report</li> </ul>
Revise and update the Environmental Quality database.	EQ		EQ Database
Coordinate with other agencies to exchange information and review of projects in watershed.	EQ		Project summaries
Work with DCR Lakes and Ponds Program to implement a program aimed at reducing the threats from non-native aquatic invasive species in watershed ponds.	EQ		Inventory of watershed ponds
Update and assess land use/land cover statistics for watershed, sanitary districts, and sub-districts when new GIS coverage is available. Include impervious surface analysis.	ATS	EQ	Updated Land Use/Land Cover statistics
<b>L-1. Compliance With Environmental Regulations</b>			
Enforce all Watershed Protection regulations and coordinate with the DCR General Counsel, DEP and EPA regulators, and other agency officials to promote compliance with 350 CMR 11.00 and other regulations.	EQ	RD	Regulatory compliance

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Use site inspections, environmental assessments, attendance at local board meetings, and information from watershed rangers to find possible violations of state and federal regulations. Monitor progress using the EQ file tracking system.	EQ	WR	Enhanced identification of violations and regulatory compliance
Review MEPA's <i>Environmental Monitor</i> each month; investigate and comment on projects when applicable.	EQ	RD	Input into project design and other decisions
<b>L-2. Wastewater Management</b>			
Review local records, water quality data, and other pertinent information while conducting EQAs to identify potential problem wastewater sites or areas. Special attention will also be given to wastewater plans that are part of WsPA filings. Track repaired septic systems in database starting with WsPA cases and adding paper records from towns. Track and monitor wastewater situation within town centers and complexes.	EQ	EP ATS GIS	<ul style="list-style-type: none"> <li>▪ Inventory of existing systems</li> <li>▪ Septic system database</li> </ul>
Monitor and enforce the provisions of Title 5 with Boards of Health and the DEP. Maintain a good working relationship with all local Boards of Health and provide technical assistance, when requested, on wastewater management issues. Monitor septic system research. Apply newer, more efficient technology for replacement systems as needed.	EQ		<ul style="list-style-type: none"> <li>▪ File reports</li> <li>▪ Meeting minutes</li> <li>▪ Improved conditions</li> </ul>
Provide direct engineering-related technical support, upon request on a case-by-case basis, to watershed communities for stormwater, wastewater, and other projects that could result in enhance water quality protection.	EQ		<ul style="list-style-type: none"> <li>▪ Technical assistance</li> <li>▪ Better water quality protection via better-designed projects</li> </ul>
<b>L-3. Stormwater Management</b>			
Coordinate with DEP on stormwater regulations compliance in watershed communities. Review stormwater permitting applications for projects larger than a single family dwelling. Advise local boards on stormwater management issues related to construction activities.	EQ	EP RD D	<ul style="list-style-type: none"> <li>▪ Reviewed applications</li> <li>▪ Advice as needed</li> <li>▪ Brief annual report</li> </ul>
Design and implement state-of-the-art stormwater BMPs to address erosion and sedimentation due to public access, stormwater runoff, and shoreline erosion. Construct stormwater BMPs on DCR property in accordance with set priorities.	EQ	WM, CE	Constructed stormwater BMPs

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
Collect data on and map culverts and other stormwater conveyance structures in key areas.	WM GIS	EQ	Database and maps
Work with state and local highway departments to improve stormwater infrastructure during all reconstruction projects; eliminate direct discharges whenever possible. Integrate stormwater management controls in Division road paving projects.	EQ		Better stormwater project design
<b>L-4. Agriculture</b>			
Identify, map, and monitor at least once every five years through the EQA process locations of agricultural operations, including hobby horse farms and other small-scale operations, that could impact water quality. Update inventory of all agricultural sites and continue to look for others in the field as part of routine watershed inspections.	EQ		<ul style="list-style-type: none"> <li>▪ Annual EQA</li> <li>▪ Updated agriculture database</li> </ul>
Meet, on a case by case basis, with owners of agricultural operations that threaten water quality to discuss the problems and possible solutions.	EQ		Updated agriculture database
<b>L-5. Hazardous Materials and Waste</b>			
Complete and update a database of all facilities using, storing, or generating hazardous materials or wastes, including transfer stations and UST/AST. Monitor DEP databases regularly for new 21E information. Review the status of each site once every five years as part of the rotating EQA schedule.	EQ		Hazardous waste database Annual EQA
Follow all responses to an accidental or dumping release of hazardous materials with a coordinated monitoring effort, in cooperation with DEP, to ensure that appropriate cleanup and assessment protocols are followed.	EQ	WR	File reports
Review periodic monitoring reports on closed landfills in the watersheds.	EQ		EQA
Require, monitor, and support the development and understanding of Spill Response Plans for all Cutting Plans and Timber Harvesting on Division lands.	F	EQ	Spill Response Plans
Review, field verify, and comment on yearly operational plans related to pesticide use near water resources.	EQ	GIS	<ul style="list-style-type: none"> <li>▪ Updated Sensitive Area/Buffer Maps</li> <li>▪ Field verification</li> <li>▪ Annual letter to DAR</li> </ul>

<b>Task Description</b>	<b>Lead Section</b>	<b>Additional Staff</b>	<b>Product(s)</b>
<b>M. Emergency Response</b>			
Develop an Emergency Response Handbook for the WRW, with up-to-date contact information, emergency procedures and roles/responsibilities. Formalize Standard Operating Procedures for spill cleanups and define DCR staff roles in both assessment and cleanup. Obtain emergency response trailers and other spill response supplies and equipment.	ATS	EQ WR RD WM	<ul style="list-style-type: none"> <li>▪ Emergency Response Handbook</li> <li>▪ Contact Lists</li> <li>▪ Updated Response Plan</li> </ul>
Provide annual training for staff, including specialized training for selected staff and annual drills.	ATS	EQ WR WM MWRA	<ul style="list-style-type: none"> <li>• Staff training</li> </ul>
Evaluate, monitor and oversee responses to any spills that impact or threaten water resources on Division property. Work with the appropriate local, state and federal agencies to ensure that the containment, cleanup and mitigation of the spill proceeds in a manner that protects water quality.	RD	EQ	<ul style="list-style-type: none"> <li>• Enhanced spill response and follow-up</li> </ul>

## **APPENDIX A: Subwatershed Assessments**

The following pages include the results of the land use-based analyses conducted on the eight subwatersheds that were delineated on the Ware River watershed. Data sources for these analyses include: MassGIS Land Use coverage from 1999; MassGIS and DWSP data on protected open space; and EOEAA data from the individual town build-out analyses that were conducted in 1999 and 2000.

For each subwatershed, information is presented on protected versus developable land, the proportion of the drainage area that is owned by the DWSP, percentages in each of nine general land use categories, estimates of pollutant loadings for nitrogen, phosphorus and suspended sediments, and an estimate of imperviousness for the subwatershed.

More information about the analyses and the results is presented in Section 3.0 of this Plan.

**West Branch Ware River Subwatershed**

Total acres: 30,747  
 % Protected: 50.4  
 % Developable: 33.4

DWSP-controlled:  
 4,908 acres, or  
 46.1% of subwatershed

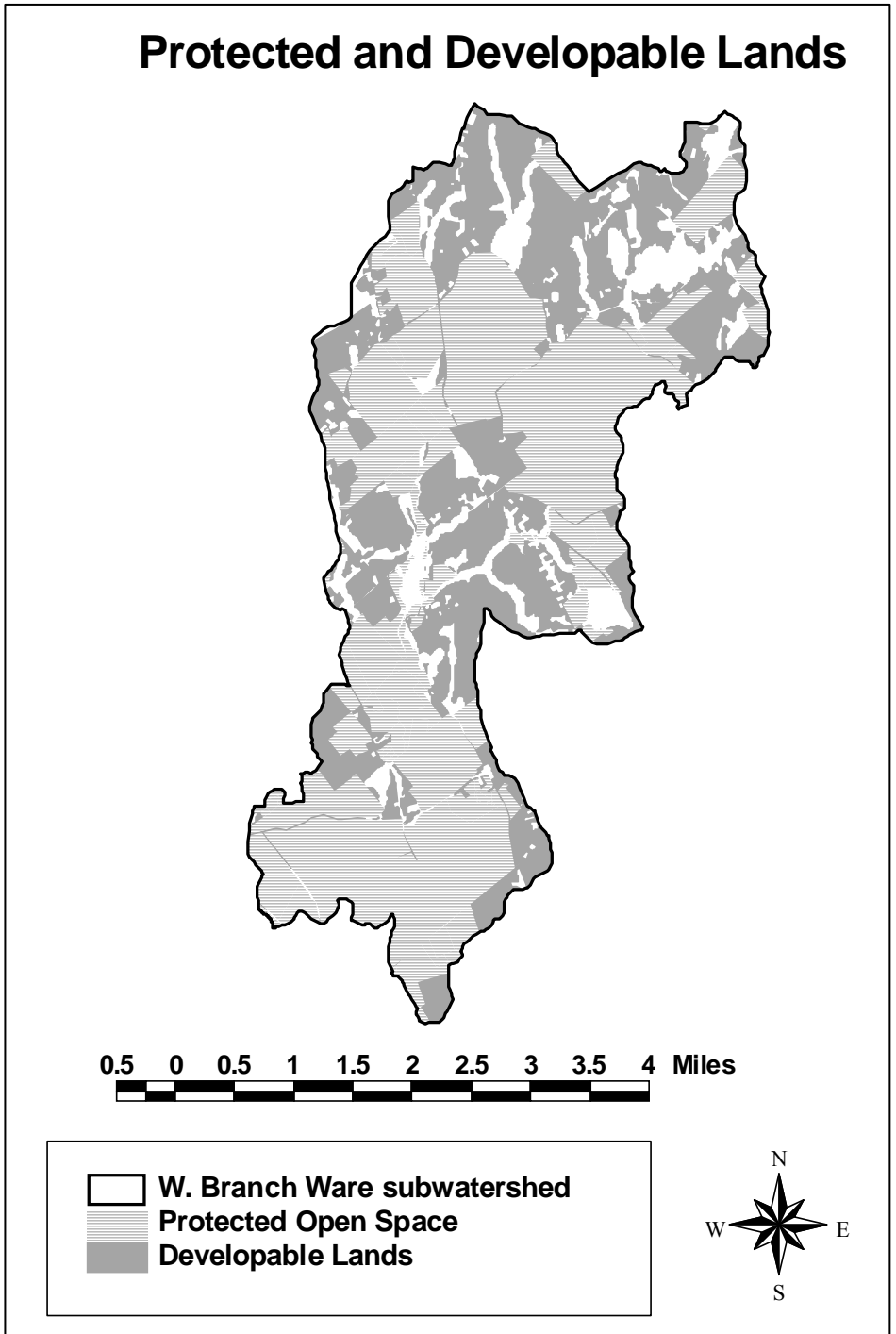
Land Use:

Agriculture	3.1%
Forest	83.1%
Wetlands	2.7%
Open Land	3.2%
Residential	4.5%
Commercial	0.2%
Industrial	0.3%
Transportation	0.0%
Water	2.8%

Loading Estimates:

Nitrogen	2.63 lbs/acre
Phosphorus	0.12 lbs/acre
Susp. Solids	29.18 lbs/acre

Imperviousness:  
 186.9 Acres, or 1.8%



**East Branch Ware River Subwatershed**

Total acres: 14,288  
 % Protected: 37.2  
 % Developable: 43.7

DWSP-controlled:  
 1,941 acres, or  
 13.6% of subwatershed

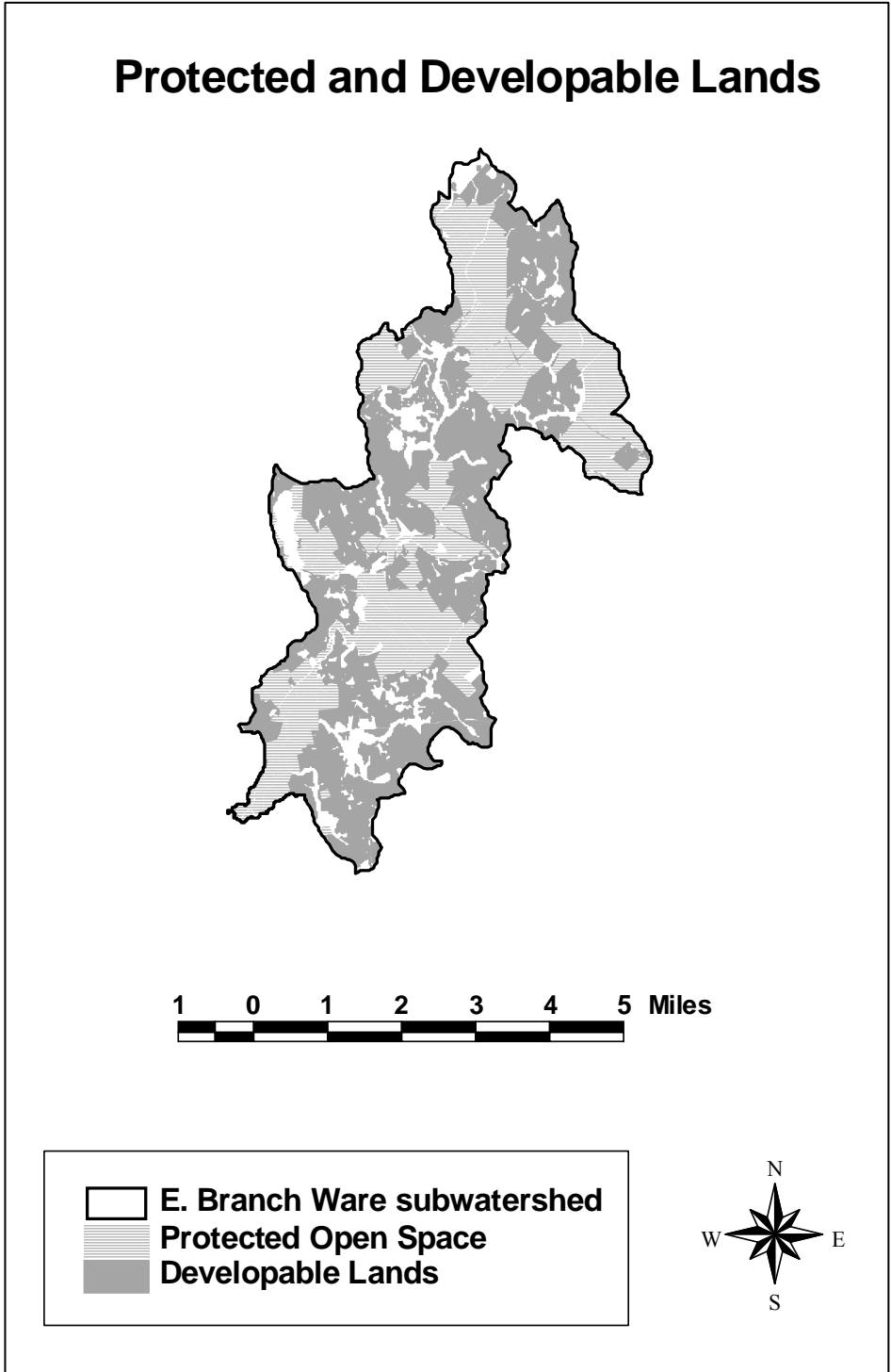
Land Use:

Agriculture	3.3%
Forest	79.6%
Wetlands	3.3%
Open Land	1.8%
Residential	6.6%
Commercial	0.0%
Industrial	0.5%
Transportation	0.0%
Water	5.0%

Loading Estimates:

Nitrogen	3.00 lbs/acre
Phosphorus	0.25 lbs/acre
Susp. Solids	57.54 lbs/acre

Imperviousness:  
 248.4 Acres, or 1.7%



**Stevens Brook Subwatershed**

Total acres: 1,478  
 % Protected: 98.6  
 % Developable: 0

DWSP-controlled:  
 1,317 acres, or  
 89.1% of subwatershed

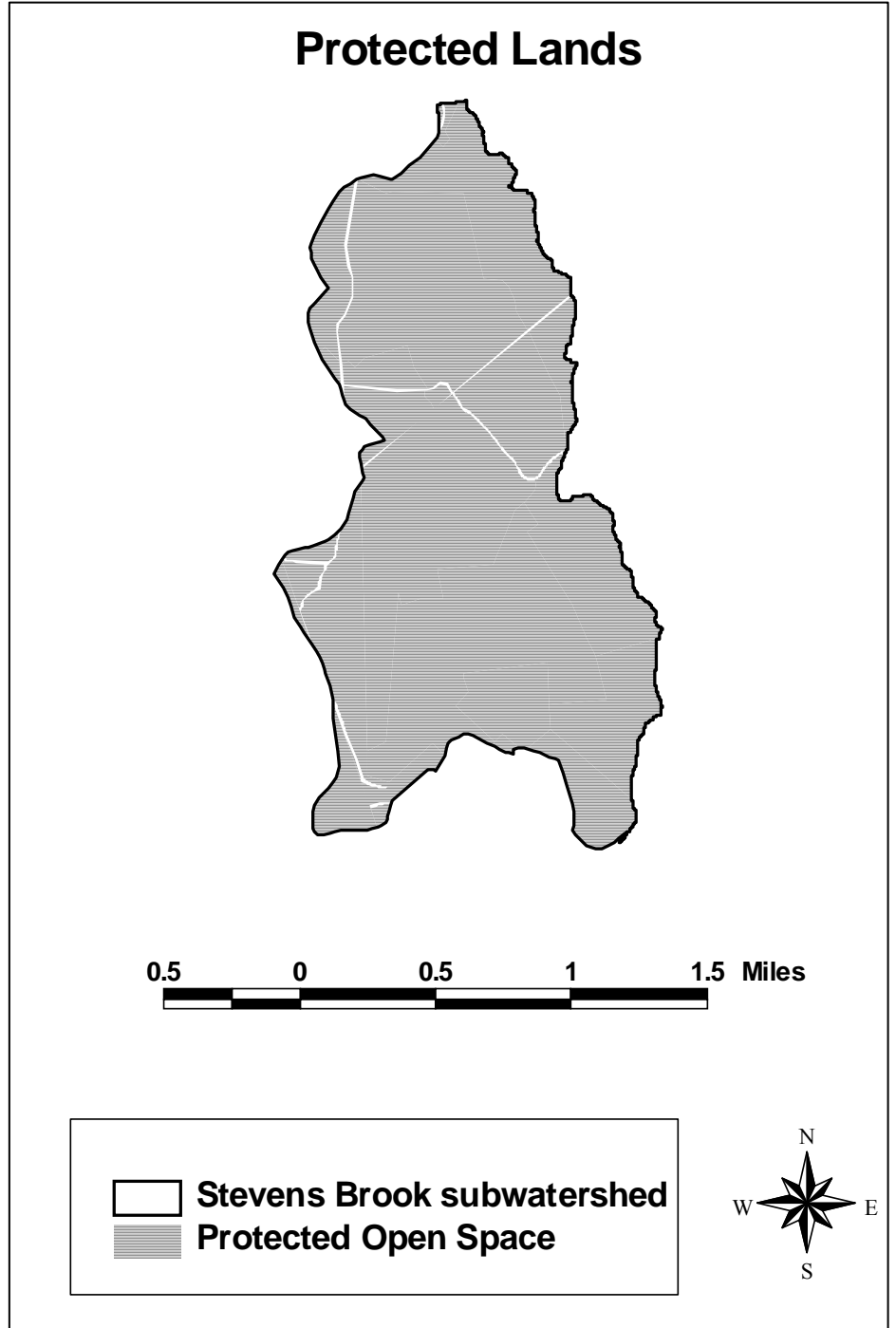
**Land Use:**

Agriculture	1.3%
Forest	86.4%
Wetlands	8.3%
Open Land	3.9%
Residential	0.0%
Commercial	0.0%
Industrial	0.0%
Transportation	0.0%
Water	0.1%

**Loading Estimates:**

Nitrogen	2.68 lbs/acre
Phosphorus	0.11 lbs/acre
Susp. Solids	25.23 lbs/acre

Imperviousness:  
 14.8 Acres, or 1.0%



**Parkers Brook Subwatershed**

Total acres: 3,526  
 % Protected: 88.4  
 % Developable: 6.3

DWSP-controlled:  
 2,905 acres, or  
 82.4% of subwatershed

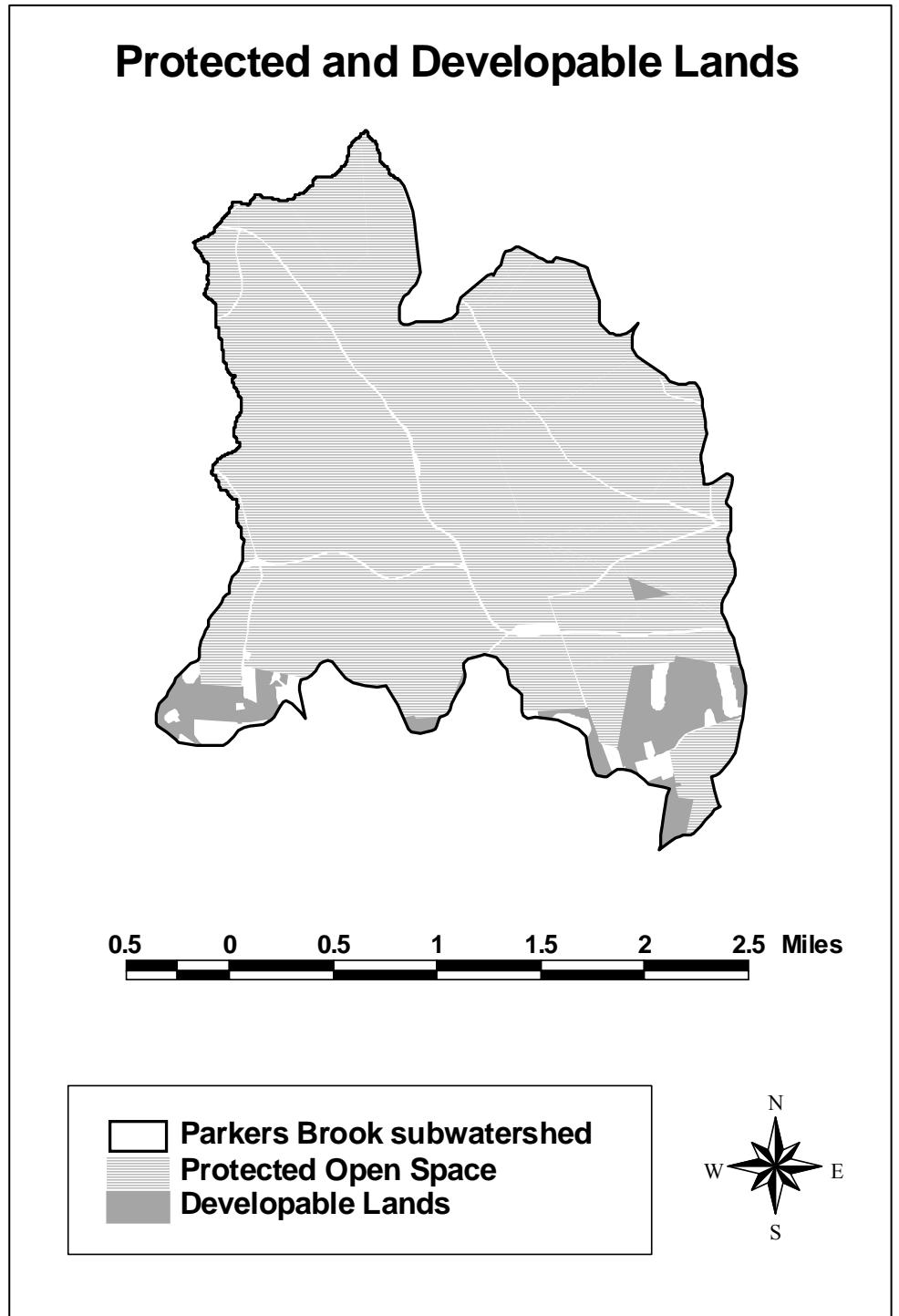
Land Use:

Agriculture	0.4%
Forest	91.4%
Wetlands	1.7%
Open Land	4.7%
Residential	0.7%
Commercial	0.0%
Industrial	0.3%
Transportation	0.0%
Water	0.7%

Loading Estimates:

Nitrogen	2.61 lbs/acre
Phosphorus	0.12 lbs/acre
Susp. Solids	26.1 lbs/acre

Imperviousness:  
 38.1 Acres, or 1.1%



**Longmeadow Brook Subwatershed**

Total acres: 7,312  
 % Protected: 46.3  
 % Developable: 26.1

DWSP-controlled:  
 2,955 acres, or  
 40.4% of subwatershed

**Land Use:**

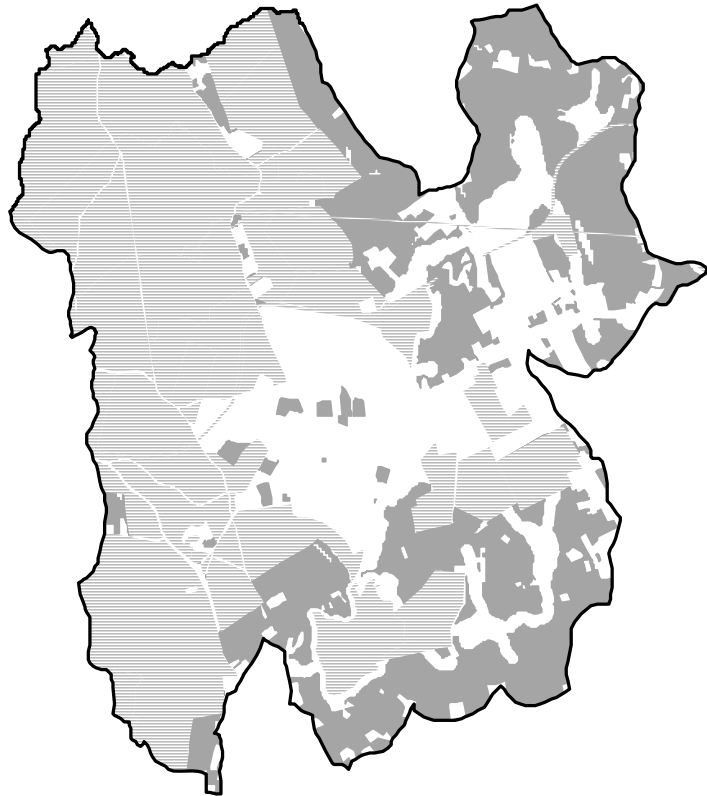
Agriculture	7.6%
Forest	71.5%
Wetlands	3.7%
Open Land	3.9%
Residential	8.2%
Commercial	0.2%
Industrial	0.2%
Transportation	0.0%
Water	4.7%

**Loading Estimates:**

Nitrogen	3.25 lbs/acre
Phosphorus	0.32 lbs/acre
Susp. Solids	86.33 lbs/acre

Imperviousness:  
 167.1 Acres, or 2.3%

**Protected and Developable Lands**



**Burnshirt River Subwatershed**

Total acres: 11,248  
 % Protected: 31.9  
 % Developable: 46.8

DWSP-controlled:  
 2,596 acres, or  
 23.1% of subwatershed

Land Use:

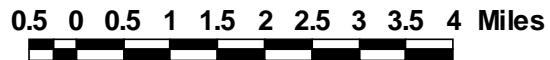
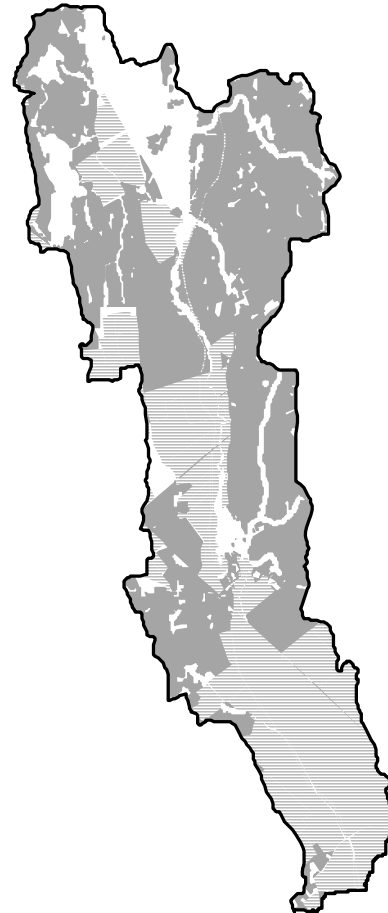
Agriculture	3.5%
Forest	83.6%
Wetlands	3.3%
Open Land	2.1%
Residential	4.7%
Commercial	0.0%
Industrial	0.7%
Transportation	0.0%
Water	2.2%

Loading Estimates:

Nitrogen	2.91 lbs/acre
Phosphorus	0.21 lbs/acre
Susp. Solids	49.02 lbs/acre

Imperviousness:  
 175.6 Acres, or 1.6%

**Protected and Developable Lands**



**Natty/Canesto Subwatershed**

Total acres: 8,475  
 % Protected: 46.6  
 % Developable: 39.1

DWSP-controlled:  
 3,213 acres, or  
 37.9% of subwatershed

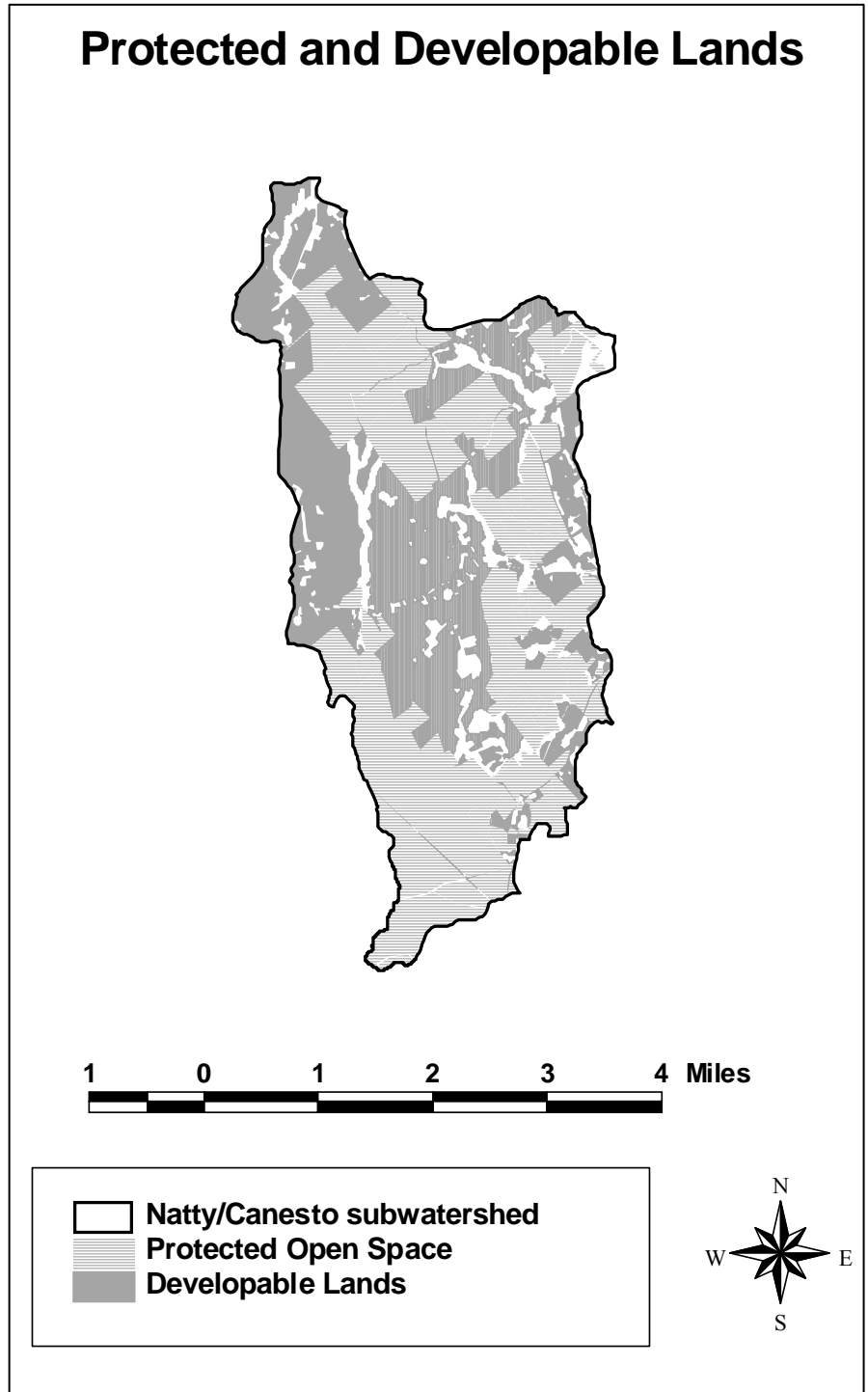
**Land Use:**

Agriculture	5.7%
Forest	78.2%
Wetlands	3.4%
Open Land	4.4%
Residential	7.4%
Commercial	0.2%
Industrial	0.5%
Transportation	0.0%
Water	0.1%

**Loading Estimates:**

Nitrogen	3.04 lbs/acre
Phosphorus	0.25 lbs/acre
Susp. Solids	64.09 lbs/acre

Imperviousness:  
 170.1 Acres, or 2.0%



**Ware River Main Stem Subwatershed**

Total acres: 4,768  
 % Protected: 94.5  
 % Developable: 2.8

DWSP-controlled:  
 4,304 acres, or  
 90.3% of subwatershed

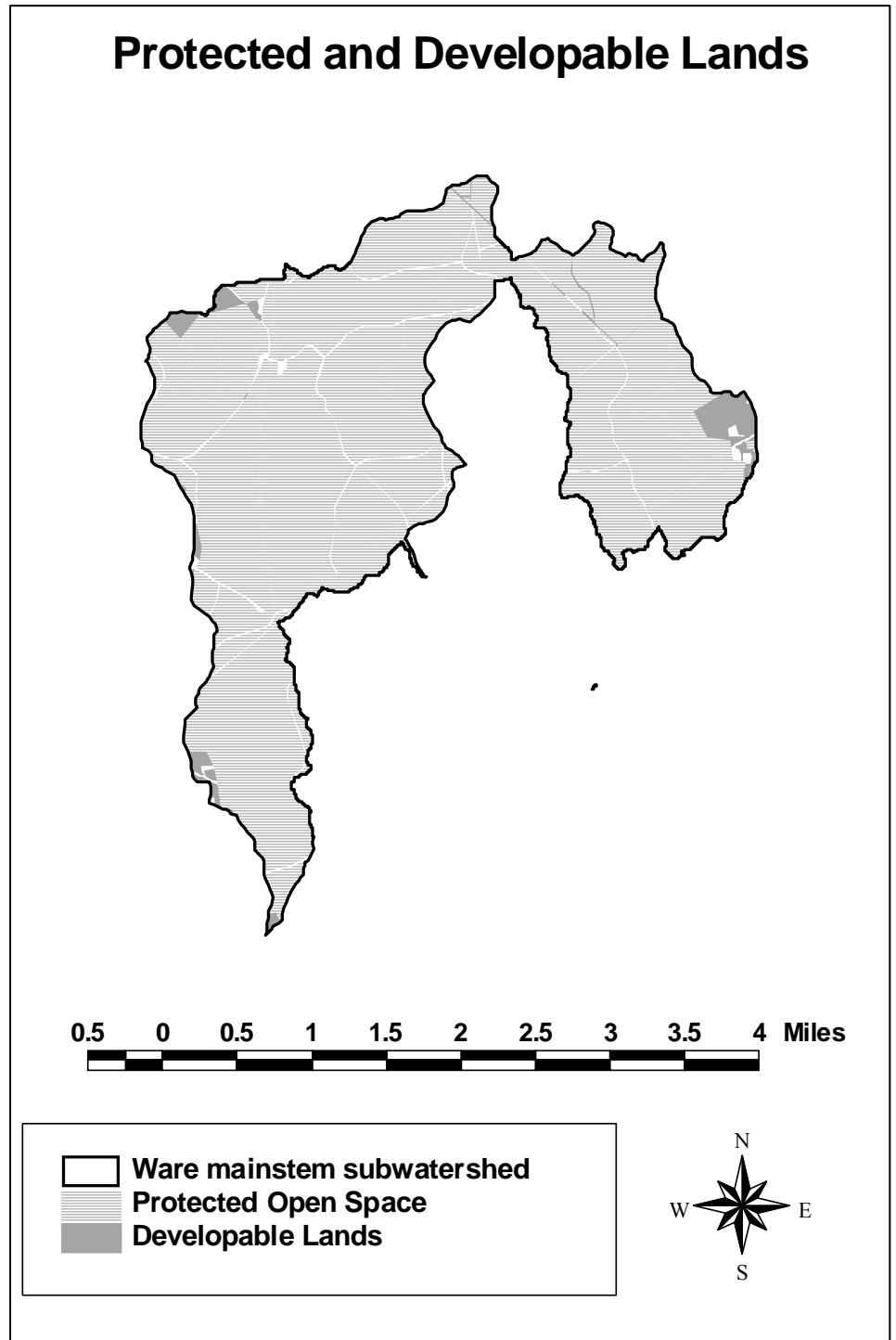
**Land Use:**

Agriculture	2.2%
Forest	88.2%
Wetlands	3.8%
Open Land	4.3%
Residential	0.2%
Commercial	0.0%
Industrial	0.0%
Transportation	0.0%
Water	1.3%

**Loading Estimates:**

Nitrogen	2.63 lbs/acre
Phosphorus	0.12 lbs/acre
Susp. Solids	29.18 lbs/acre

Imperviousness:  
 48.5 Acres, or 1.0%



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## Appendix B: Protected Open Space by Subwatershed in the Ware River Watershed

Subwatershed	DWSP	DSPR	DFG	COM	DAR	ACOE	FED	M	NGO	Total Protected	Total Acres	% protected
<b>Burnshirt</b>												
Acres	2,595.5	250.1	698.1	0.9	0	0	0	7.7	34.2	3,586.5	11,248.1	31.9%
%	72.4%	7.0%	19.5%	0.0%	0.0%	0.0%	0.0%	0.2%	1.0%			
<b>E. Branch Ware</b>												
Acres	1,940.9	902.7	1,061	0	0	0	0	1,322.4	86.5	5,313.5	14,291.8	37.2%
%	36.5%	17.0%	20.0%	0.0%	0.0%	0.0%	0.0%	24.9%	1.6%			
<b>Longmeadow Brook</b>												
Acres	2,954.9	6.9	130.2	0	116.1	0	85.1	88.7	0	3,381.9	7,312	46.3%
%	87.4%	0.2%	3.8%	0.0%	3.4%	0.0%	2.5%	2.6%	0.0%			
<b>Natty/Canesto</b>												
Acres	3,213.1	631.8	93.3	0	3.1	0	0	8.9	0	3,950.2	8,474.5	46.6%
%	81.3%	16.0%	2.4%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%			
<b>Parkers Brook</b>												
Acres	2,904.5	6.7	0	0	0	206.4	0	0	0	3,117.6	3,525.7	88.4%
%	93.2%	0.2%	0.0%	0.0%	0.0%	6.6%	0.0%	0.0%	0.0%			
<b>Stevens Brook</b>												
Acres	1,316.8	0	0	0	0	140.2	0	0	0	1,457	1,478.3	98.6%
%	90.4%	0.0%	0.0%	0.0%	0.0%	9.6%	0.0%	0.0%	0.0%			
<b>W. Branch Ware</b>												
Acres	4,907.5	238.9	3.9	0	42.5	45.8	0	118.2	0	5,356.8	10,638.9	50.4%
%	91.6%	4.5%	0.1%	0.0%	0.8%	0.9%	0.0%	2.2%	0.0%			
<b>Ware Main Stem</b>												
Acres	4,303.2	18.3	0	0	0	184.1	0	0	0	4,505.6	4,768.8	94.5%
%	95.5%	0.4%	0.0%	0.0%	0.0%	4.1%	0.0%	0.0%	0.0%			
<b>Total</b>	<b>24,136.4</b>	<b>2,055.4</b>	<b>1,986.5</b>	<b>0.9</b>	<b>1,61.7</b>	<b>576.5</b>	<b>85.1</b>	<b>1,545.9</b>	<b>120.7</b>	<b>30,669.1</b>	<b>61,738.1</b>	<b>49.7%</b>
% of protected lands	78.7%	6.7%	6.5%	0.0%	0.5%	1.9%	0.3%	5.0%	0.4%			
% of watershed	39.1%	3.3%	3.2%	0.0%	0.3%	0.9%	0.1%	2.5%	0.2%	49.7%		

Key: ACOE = US Army Corps of Engineers; COM = Commonwealth of MA (other than cited agencies); DAR = MA Dept. of Agricultural Resources; DSPR = DCR Division of State Parks and Recreation; DWSP = DCR Division of Water Supply Protection; DFG = MA Dept. of Fish and Game; M = Municipalities; NGO = Non-governmental, non-profit organizations; FED = Federal government (other than ACOE).