



Massachusetts Department of Environmental Protection
Source Water Assessment and Protection (SWAP) Report
Massachusetts Water Resources Authority (MWRA)
Quabbin Reservoir, Ware River and Wachusett Reservoir

What is SWAP?

The Source Water Assessment and Protection (SWAP) Program, established under the federal Safe Drinking Water Act, requires every state to:

- inventory land uses within the recharge areas of all public water supply sources;
- assess the susceptibility of drinking water sources to contamination from these land uses; and
- publicize the results to provide support for improved protection.

Susceptibility and Water Quality

Susceptibility of a drinking water source does not imply poor water quality. Susceptibility is a measure of a water supply's *potential* to become contaminated due to land uses and activities within its recharge area.

Risk refers to the potential for a consumer to drink water of compromised quality.

Water suppliers protect drinking water by monitoring for more than 100 potential contaminants. Water suppliers also implement watershed land management and protection practices, as well as disinfect, filter and otherwise treat reservoir water to ensure that safe water is delivered to the tap.

Actual water quality is best reflected by the results of regular water tests. To learn more about your water quality, refer to your water supplier's annual **Consumer Confidence Report**.

Table 1: Public Water System Information
June 2002

<i>PWS Name</i>	Massachusetts Water Resources Authority (MWRA)
<i>PWS Address</i>	Charlestown Navy Yard
<i>City/Town</i>	100 First Avenue, Boston, MA 02129
<i>PWS ID Number</i>	6000000
<i>Contact</i>	MWRA Water Quality Line
<i>Phone Number</i>	617-242-5323

Introduction

We are all concerned about the quality of the water we drink. Reservoir watersheds may be threatened by potential sources of contamination, including stormwater runoff, road salting, and improper disposal of hazardous materials. Citizens and local officials can work together to better protect these drinking water sources.

Two types of reports across the country that talk about drinking water are the Source Water Assessment and Protection (SWAP) Program reports that discuss potential threats to drinking water, protection programs, and recommendations and the annual Consumer Confidence Reports (CCR) that discuss actual drinking water quality based on water testing.

Purpose of this report This SWAP report is a planning tool to support local and state efforts to improve water supply protection. By identifying land uses within water supply protection areas that may be potential sources of contamination, the assessment helps focus protection efforts on appropriate best management practices (BMPs) and drinking water source protection measures.

Findings of this report The Massachusetts Water Resources Authority (MWRA) and the Metropolitan District Commission (MDC) meet DEP's annual review of "Measures of Success" for implementation of Watershed Protection Plans and disinfection treatment processes. MWRA and MDC have implemented DEP-approved Watershed Protection Plans to protect source water reservoirs since 1991. The findings contained in this report document conditions as of June 2002. For updates on watershed programs, please visit www.mwra.com, www.state.ma.us/mdc/water.htm or call MWRA at 617-242-5323.

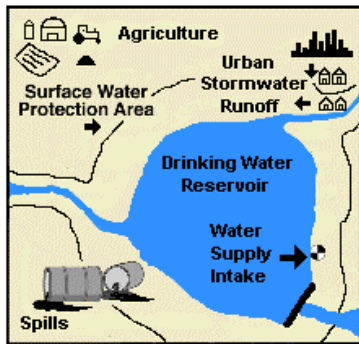
This report includes the following sections:

1. Description of the Water System;
2. Land Uses in the Watersheds;
3. Source Water Protection;
4. Recommendations;
5. Additional Resources Available for Source Protection; and
6. Appendices.

What is a Watershed?

A watershed is the land area that catches and drains rainwater down-slope into a river, lake or reservoir.

As water travels down from the watershed area it may carry contaminants from the watershed to the drinking water supply source. For protection purposes, watersheds are divided into protection Zones A, B and C.



Glossary

Protection Zones

Zone A: is the most critical for protection efforts. It is the area 400 feet from the edge of the reservoir and 200 feet from the edge of the tributaries (rivers and/or streams) draining into it.

Zone B: is the area one-half mile from the edge of the reservoir but does not go beyond the outer edge of the watershed.

Zone C: is the remaining area in the watershed not designated as Zones A or B.

The attached map shows Zone A and the watershed boundary.

Section 1: Description of the Water System

Massachusetts Water Resources Authority

Susceptibility: High

Successful Management Practices have substantially reduced the risk of contamination.

<i>Source Name</i>	<i>Source ID</i>
Wachusett Reservoir	6000000-01S
Quabbin Reservoir	6000000-02S
Ware River	6000000-06S

The Metropolitan District Commission (MDC), Division of Watershed Management (DWM), operates and manages three active reservoirs and their watersheds, and maintains one emergency reservoir, to supply drinking water to the Massachusetts Water Resources Authority (MWRA). MWRA in turn, delivers the water to an estimated 2.2 million customers in three western Massachusetts and 39 eastern Massachusetts communities. MDC is responsible for the collection and safe storage of the water, protection of reservoir water quality and management of the watersheds. MWRA is responsible for water treatment and transmission. A map showing the water system, communities served and watershed communities is included with this report.

Treatment of MWRA Reservoir Water

Water that enters the intakes at Quabbin Reservoir and Wachusett Reservoir receives primary disinfection with sodium hypochlorite (a form of chlorine) to inactivate any pathogens potentially present. MWRA must meet certain levels of required disinfection in order to kill 99.9% of *Giardia* and 99.99% of viruses potentially present. MWRA routinely meets this standard. Disinfected water then flows to three Chicopee Valley Aqueduct (CVA) communities directly from Quabbin Reservoir and 39 metropolitan Boston-area communities from both Quabbin and Wachusett Reservoirs.

Metropolitan Boston-area Communities

After this primary disinfection, the water's pH and alkalinity are adjusted for corrosion control to minimize the leaching of lead and copper from home plumbing. MWRA does this by adding sodium carbonate and carbon dioxide to the water. MWRA also adds fluoride to the water for dental health. Farther downstream in the metropolitan Boston system, MWRA adds a disinfectant called "chloramine" to ensure water stays disinfected as it travels through some 6,000 miles of local community water mains to homes in the service area.

Chicopee Valley Communities

After disinfected water leaves the CVA and enters the three local community systems, the water is then treated for corrosion control to minimize its ability to absorb lead and copper from home plumbing. Chicopee adds sodium bicarbonate and South Hadley Fire District #1 and Wilbraham add sodium silicate for corrosion control.

MWRA Distribution and Storage System

Almost the entire MWRA and community water systems are located underground in tunnels, covered storage tanks and pipelines. Access is extremely limited and protected. MWRA has redundant tunnels and pipes, as well as backup water supplies and regularly trains staff on emergency response actions. Critical areas are currently protected by the State Police, locks and alarms, MWRA staff, and video surveillance. MWRA closely watches water chemistry in the metro Boston area distribution network while community water departments conduct weekly testing.

MWRA's Integrated Water Supply Improvement Program and Security

MWRA's Integrated Water Supply Improvement Program is a \$1.7 billion program of major upgrades to watershed protection, water treatment, water transmission and storage, and distribution pipelines. In the next few years, the three largest components of this program will be brought on-line. The Walnut Hill Water Treatment Plant in Marlborough will switch MWRA over to the powerful disinfectant ozone and keep water quality well in compliance with the strengthened Federal Safe Drinking Water Act. The 18.6-mile long MetroWest Water Supply Tunnel will bring treated water from Walnut Hill into the metro Boston area some 400' underground and provide for long-term reliability in transmission. The 115 million-gallon Norumbega Covered Storage Facility in Weston along the Mass Pike will store MetroWest Tunnel water for use during daytime peak demand. These three projects, in conjunction with ongoing distribution pipeline projects in the MWRA and community systems, bring large improvements in water system security.

The remainder of this report addresses the active sources: Quabbin Reservoir, Ware River and Wachusett Reservoir.

In the 1930s, the Swift River was dammed to construct the Quabbin Reservoir. In 1941 water from the massive 412 billion gallon Quabbin Reservoir was first delivered to customers. The Quabbin Reservoir watershed includes all or portions of the towns of Athol, Barre, Belchertown, Hardwick, New Salem, Orange, Pelham, Petersham, Phillipston, Shutesbury, Ware and Wendell.

At specified river flow thresholds, water from the Ware River can be withdrawn during nine months of the year and delivered either to the Quabbin Reservoir or directly to the Wachusett Reservoir through the Quabbin Aqueduct. The normal operating procedure for the Ware River intake, however, is to deliver water to the Quabbin Reservoir. The Ware River watershed includes all or portions of the towns of Barre, Hubbardston, Oakham, Phillipston, Princeton, Rutland, Templeton and Westminster.

The MWRA delivers water from the Quabbin Reservoir directly to three western communities—Chicopee, South Hadley Fire District #1 and Wilbraham—through the Chicopee Valley Aqueduct and Nash Hill covered reservoir. Water transmitted to these communities is disinfected at the Quabbin Water Treatment Plant prior to delivery to the community systems.

Quabbin Reservoir water also flows to Wachusett Reservoir via the Quabbin Aqueduct. About half of the water serving 39 eastern communities is from Wachusett Reservoir and half is from Quabbin Reservoir. This water is disinfected at the Cosgrove Disinfection Facility at Wachusett with additional treatment downstream.

Benefits of Source Protection

- protects drinking water quality at the source
- reduces monitoring costs through the DEP Waiver Program
- treatment can be reduced or avoided entirely, saving treatment costs
- prevents costly contamination clean-up
- preventing contamination saves costs on water purchases and expensive new source development

Contact the DEP staff identified on page eight for more information on Source Protection and the Waiver Program.



Sample Watershed Sign

Construction of Wachusett Reservoir began in 1889 and the 65 billion gallon reservoir was completed and filled in 1908. For MWRA communities in eastern Massachusetts, water from Wachusett Reservoir is carried by the Cosgrove Tunnel to the distribution system. The Wachusett Reservoir watershed includes most of Boylston, West Boylston, Holden, Sterling and Princeton and parts of Clinton, Worcester, Paxton, Rutland, Hubbardston, Westminster and Leominster.

Both reservoirs were engineered to provide significant natural treatment of contaminants through residence time of water, settling, degradation and bacterial die-off through solar radiation. As a result, test results showing low values for these contaminants support the fact that the reservoirs are working as designed. This further minimizes threats from potential land use contaminants.

MDC has prepared and implemented DEP-approved Watershed Protection Plans for their watershed lands. Protection plans include an inventory of land uses and activities, a description of potential sources of contamination and actions that will reduce or eliminate the risk of contamination. Summaries of these plans and more detailed information about watershed protection can be found on MDC's web site at www.state.ma.us/mdc. Copies of the plans are available for review in the library and Town Hall in each watershed community.

Test results show that while there is a *potential* for contamination, watershed protection is working and the water quality is high. For results in any of the communities that receive water from the MWRA, please contact the MWRA at 617-242-5323, visit their web site at www.mwra.com, or review the annual **Consumer Confidence Report**.

Section 2: Land Uses in the Watersheds

Each watershed community's Board of Health, Board of Selectmen, Planning Board and Municipal Water System will receive a copy of their watershed map which shows land uses as of the date of this report. Maps can also be viewed by contacting the MWRA at 617-242-5323.

The Watershed Protection Act (Mass. General Law Ch. 92, s. 107A) applies to the watersheds of the MWRA/MDC system. This Act requires landowners to notify DWM and seek approval for many activities conducted on privately held land in the watersheds. It provides a mechanism to place requirements on land use activities to protect source waters.

Quabbin Reservoir

The watershed for Quabbin Reservoir covers 187 square miles. Over 90% of the land is forest and wetland. Small amounts of agriculture, commercial and low-density residential uses are also present. Seventy-five percent (75%) of the watershed is owned by MDC or is controlled by other government agencies or organizations that own and maintain the land as open space.

Ware River

Forest and wetland cover 85% of the 96 square miles of the Ware River watershed. Agriculture, residential, commercial and industrial land uses also exist. Fifty-seven percent (57%) of the watershed is owned and protected as open space.

Wachusett Reservoir

Sixty-nine percent (69%) of the Wachusett Reservoir watershed is undeveloped forest and wetland. The remaining 31% includes 7% agricultural, 10% residential, less than 1% commercial office or industrial and 13% in other uses such as highways, railways and recreation. Of the 117 square miles of watershed land, forty-six percent (46%) is owned and protected as open space.

Potential Source of Contamination vs. Actual Risk of Contamination*

Although a small number of land uses within the Quabbin, Ware River and Wachusett watersheds cause those sources to have a high susceptibility ranking, the Metropolitan District Commission (MDC) Division of Watershed Management (DWM)'s innovative and successful source water protection programs, described throughout this report, substantially reduce the risk of contamination.

Issues in the watersheds include :

<u>Land Use</u>	<u>Susceptibility</u>	<u>Potential Source of Contamination</u>
1. wildlife - birds	High	microbial contaminants
2. wildlife - aquatic animals	High	microbial contaminants
3. agriculture	High	manure management, improper handling or over-application of fertilizers or pesticides
4. transportation corridors (stormwater, spills)	High	metals, nutrients, fuels and hazardous materials in stormwater runoff; accidental leaks or spills; over-application or improper handling of pesticides
5. transmission (utility) lines	High	over-application or improper handling of corridor maintenance pesticides
6. residential land uses	Moderate	septic systems, storage tanks, lawn care, household hazardous waste

Note:

When specific potential contaminants are not known, typical potential contaminants or activities for that type of land use are listed. Facilities within the watershed may not contain all of these potential contaminant sources, may contain other potential contaminant sources, or may use Best Management Practices to prevent contaminants from reaching drinking water supplies.

***SUSCEPTIBILITY RANKING** - The rankings (high, moderate or low) represent the relative threat of each land use compared to other Potential Sources of Contamination (PSC). The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated by the PSC; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.

What are "BMPs?"

Best Management Practices are structural (e.g., oil & grease trap catch basin), nonstructural (e.g., hazardous waste collection day) or managerial measures that are used to protect and improve surface water and groundwater quality.

Additional Documents

To help with source protection efforts, more information is available by request or online at www.state.ma.us/dep/brp/dws including:

1. water supply protection guidance materials such as model regulations, Best Management Practices, and general water supply protection information;
2. MA DEP SWAP Strategy;
3. Land Use Pollution Potential Matrix; and
4. Draft Land Use/Associated Contaminants Matrix.

Watershed Issues

1. **Birds**, particularly gulls, are attracted to large open bodies of water such as the Quabbin and Wachusett Reservoirs. Although birds may increase coliform levels through the release of fecal matter into the water, and may also carry other bacteria and viruses, MDC's gull control program effectively limits potential contamination from birds. Appendix A contains a DEP fact sheet titled *What You Need To Know About Microbial Contamination*.
2. **Beaver and muskrat** may introduce the pathogens *Giardia* and *Cryptosporidium* into water through fecal matter. Because of their constant contact with the water, these aquatic mammals represent a potential threat to drinking water reservoirs. MDC conducts wildlife surveys and water quality monitoring and removes animals as needed to minimize the risk of contamination from this source.
3. **Agriculture** Although SWAP considers agricultural land uses to be a potential high threat to drinking water sources, agriculture in the Quabbin, Ware River and Wachusett watersheds is present in only very small percentages, 2%, 4% and 7%, respectively. Crops and hayfields are potential threats because of pesticide and fertilizer use. Animal wastes from stabling or grazing sites may be a source of bacteria. MDC completed a review of agricultural sites within the watersheds and identified BMPs that could be implemented. The list included dairy and livestock farms, grazed lands, crop farms such as orchards, field crops, nurseries and Christmas tree farms. There are also "hobby" farms and residential properties with horses. The Natural Resource Conservation Service and MDC have worked with farmers at prioritized sites to minimize the risk of contamination from these sources.

4. **Transportation Corridors**

Local Roads and Highways exist close to Quabbin Reservoir, Ware River and Wachusett Reservoir. Stormwater runoff from roads may contain metals, nutrients, motor oil, sediment and other potential contaminants. Vehicular accidents may cause spills of fuel, chemicals or other substances to flow into storm drains or directly into water bodies. Roads may be sites for illegal dumping of hazardous and other wastes. MDC has completed stormwater management studies and has taken steps to minimize the risk of contamination from stormwater runoff and spills.

Railroad Rights-of-Way are located within the watersheds. Rights-of-way are potential sources of contamination because of the possibility of spills of transported materials, chemical releases during track maintenance or the over-application or improper handling of herbicides during rights-of-way maintenance.

5. **Transmission (Utility) Lines** are located within the watersheds. These are potential sources of contamination because of the possibility of over-application or improper handling of herbicides during rights-of-way maintenance.

The Rights-of-Way Management Regulations (333 CMR 11.00) were designed to minimize any potential harmful effects of herbicides use for vegetation control along rights-of-way in Massachusetts. The regulations promote the use of an integrated pest management (IPM) approach to vegetation control and require application setback distances to protect drinking water sources and other environmentally sensitive areas. Utilities must submit a Vegetation Management Plan (VMP) and a Yearly Operating Plan (YOP) to the Mass. Department of Food and Agriculture for approval and to the municipalities into which herbicide application is proposed. MDC monitors the YOPs for herbicide application along rights-of-way within the Quabbin, Ware, and Wachusett watersheds.

6. **Residential Land Uses** are located in small amounts within the watersheds (Quabbin=1%, Ware River=4%, Wachusett=10%). Leaks from aboveground and underground fuel storage tanks; improper storage, use and disposal of lawn care fertilizers and pesticides; and failing septic systems are potential sources of contamination at residences. In addition, household hazardous wastes, such as used motor oil, antifreeze, oil-based paints, and medications, must be disposed of properly at a Household Hazardous Waste Collection Day or Center. Appendix A contains a fact sheet titled *Residents Protect Drinking Water*.

MDC DWM conducts many outreach programs for residents. In addition, The Watershed Protection Act (Mass. General Law Ch. 92, s. 107A) applies to the watersheds of the MWRA/MDC system. This Act requires landowners to notify and seek approval for many activities conducted on privately held land in the watersheds. It provides a mechanism to place requirements on land use activities in order to protect source waters. MDC DWM provides more information at www.state.ma.us/mdc/wspa.html.

When MWRA's Wachusett watershed sewerage program is completed in 2004, over one third of the homes and businesses will be able to connect to sewers flowing out-of-watershed. These connections will be very important to the protection of the drinking water.

Section 3: Source Water Protection

Although a small number of land uses within the Quabbin, Ware River and Wachusett watersheds cause those sources to have a high susceptibility ranking, MDC's successful source water protection programs have substantially reduced the risk of contamination.

MDC DWM is organized into Sections: Environmental Quality; Environmental Planning; Interpretative Services; Civil Engineering; Natural Resources; Forestry; and Watershed Rangers. Examples of their programs are described below. More information is provided at MDC's web site, www.state.ma.us/mdc.

Direct Control of Land - MDC DWM developed a Geographic Information Systems (GIS) based land acquisition model to prioritize undeveloped land in the watersheds on an on-going basis for protection. MDC currently owns 57% of the Quabbin watershed, 37% of the Ware River watershed and 26% of the Wachusett Reservoir watershed. In addition to direct acquisition, other effective options used by the MDC to protect land include conservation restrictions and memoranda of understanding with individual landowners, municipalities, state agencies and conservation groups that control land in the watersheds.

Regulatory Control - The Watershed Protection Act, MGL Chapter 36, was passed by the Massachusetts legislature in 1992 to regulate land uses and activities within the MDC watersheds. The regulations, 350 CMR 11.00, prohibit alteration of the land within 400 ft. of the reservoirs and 200 ft. of tributaries. This is called the Primary Protection Zone. The land between 200 and 400 ft. from the tributaries and certain other lands are designated as the Secondary Protection Zone and activities are subject to review through a formal process established by MDC DWM.

Pathogen Control Program - To reduce the risk of waterborne disease from pathogens, MDC DWM has established a very successful program that includes: discouraging gulls and other birds from landing or roosting on the reservoirs through the use of noise makers, visual objects, and habitat modification; removing muskrat and beaver as needed; recommending BMPs to owners of agricultural sites; sewerage areas with wastewater problems; installing stormwater BMPs; and adopting rules for public use of watershed lands.

Partnerships With Watershed Communities - MDC DWM staff realize that their programs need support and assistance from the watershed communities. They assist towns with the development of bylaws, present workshops on planning topics and attend local board meetings. A twice yearly newsletter, *Downstream*, is produced for landowners in the watersheds.

Educational Programs - MDC DWM staff conduct watershed educational programs for schools, residents, businesses and visitors to MDC lands. From 1996 to the present, over 600 educational programs have been conducted.

Emergency Planning and Response - MDC DWM conducted a Hazardous Materials Emergency Response Study to identify issues and implement improvements to minimize the threat of accidental spills from local roads, highways, utility rights-of-way and railroads. State and federal agencies provide on-going communication and consultation on watershed security issues.

Monitoring Programs - MDC DWM conducts extensive water sampling in the reservoirs and watersheds to continually assess water quality and performs regular watershed surveys, called sanitary surveys, to identify potential sources of contamination and to set priorities for their protection programs. MWRA performs extensive monitoring of water from the point where the water leaves the reservoir, through disinfection and treatment, to the consumer's tap. The annual Consumer Confidence Report summarizes the results of the water quality monitoring.

Research - MDC DWM sponsors many research projects, including work to assess pathogens, improve stormwater quality and update information on watershed hydrology.

Advisory Committees - MDC DWM staff meet regularly with the Water Supply Citizens' Advisory Committee, the Quabbin Watershed Advisory Committee, the Ware River Watershed Advisory Committee and the Wachusett Watershed and Sudbury Watershed Advisory Committees to obtain recommendations and feedback on issues specific to each of these watersheds.

Conclusion - DEP commends MDC DWM on their successful watershed protection programs.

Section 4: Recommendations

MDC DWM's watershed protection programs are very successful and greatly reduce the actual risk of contamination. MDC submits their watershed protection plans to DEP for approval and DEP staff conducts annual inspections to review how the plans are being implemented in the field.

DEP recommends that MDC DWM continue their successful programs to:

- | monitor and control birds and aquatic mammals;
- | work with farmers to incorporate best management practices into their operations;
- | implement projects to improve the control and quality of stormwater and reduce potential threats from spills;
- | stay aware of proposed new and expanding development within the watersheds;
- | provide technical assistance and educational programs;
- | encourage residents to connect to sewer system where available.

Section 5: Additional Resources Available for Source Protection

DEP staff, informational documents and resources are available to help build on this SWAP report and to help improve drinking water protection in watershed communities. Appendix A contains DEP fact sheets titled *What You Need to Know About Microbial Contamination, Water Suppliers Protect Drinking Water, and Residents Protect Drinking Water*. MDC DWM fact sheets can be obtained at www.state.ma.us/mdc/dwmfactsheets.htm.

Information about DEP Tier Classified Oil or Hazardous Material Release Sites within the watersheds can be obtained at DEP's Bureau of Waste Site Cleanup's web site, www.state.ma.us/dep/bwsc. Sites are identified on the GIS map that is being sent to watershed communities as part of this SWAP assessment and site specific information is available at www.state.ma.us/dep/bwsc/sitelist.htm.

Funding Resources

DEP's Source Protection Grant Program provides funds to conduct local source protection projects. Protection recommendations discussed in this document may be eligible for funding under the grant program. For additional information, please call Kathy Romero at 617-292-5727.

Section 6: Appendices

- A. Fact Sheets - *What You Need to Know About Microbial Contamination, Water Suppliers Protect Drinking Water, and Residents Protect Drinking Water*
- B. List of Regulated Facilities within the Water Supply Protection Areas (supplied to MWRA and MDC)

For More Information

www.state.ma.us/dep

The following DEP staff can be contacted for more information and assistance on improving watershed protection.

Catherine Skiba, 413-755-2119, DEP's Western Regional Office, Springfield
Josephine Yemoh-ndi, 508-792-7650, DEP's Central Regional Office, Worcester
Anita Wolovick, 978-661-7768, DEP's Northeast Regional Office, Wilmington
Kathy Romero, 617-292-5727, DEP's Boston office

MWRA and MDC can be contacted at:
www.mwra.com
www.state.ma.us/mdc/water.htm
617-242-5323