

OAK RIDGES MORaine CONSERVATION PLAN

Technical Paper Series

11 - Water Conservation Plans

1 Purpose and Overview

This technical paper provides guidance to assist upper-tier and single-tier municipalities of conservation authorities in developing water conservation plans to implement the water provisions of Section 25 of the Oak Ridges Moraine Conservation Plan (ORMCP). Subsection 24(3)(a) of the ORMCP states that a water conservation plan as set out in Section 25 must form part of a watershed plan.

There is significant history and active practice of water conservation in southern Ontario and internationally. As a result, much guidance and experience is already available on many aspects of water conservation. It is not the intent of this technical paper to provide comprehensive guidance on all aspects of water conservation; where appropriate, the reader will be directed to existing guidance and references.

2 Related Considerations

When preparing Water Conservation Plans, it is suggested that the reader also review the highlighted, associated topic areas as discussed in the ORMCP, as shown in Figure 1 below.

Clean Water Act, 2006

The *Clean Water Act, 2006* was passed on October 19, 2006. Associated regulations, Director's Rules and technical modules are currently being developed. Readers of this technical paper should take note that the requirements of the *Clean Water Act, 2006* may have implications to initiatives undertaken to implement the ORMCP. Information concerning the *Clean Water Act, 2006* is available at: www.ene.gov.on.ca/en/water/.

Further Reading

Please also refer to the additional list of resources and references listed at the end of this technical paper.

Figure 1 ORMCP Topic Areas and Linkages with Technical Paper 11 - Water Conservation Plans



3 Requirements of the Oak Ridges Moraine Conservation Plan

The Oak Ridges Moraine Conservation Plan (ORMCP) states:

25.

- (1) *Every upper-tier municipality and single-tier municipality shall, on or before April 22, 2003, begin preparing a water budget and conservation plan, in accordance with subsection (2), for every watershed whose streams originate within the municipality's area of jurisdiction.*

- (2) *A water budget and conservation plan shall, as a minimum,*
- a) *quantify the components of the water balance equation, including precipitation, evapotranspiration, groundwater inflow and outflow, surface water outflow, change in storage, water withdrawals and water returns;*
 - b) *characterize groundwater and surface water flow systems by means of modeling;*
 - c) *identify,*
 - (i) targets to meet the water needs of the affected ecosystems,*
 - (ii) the availability, quantity and quality of water sources, and*
 - (iii) goals for public education and for water conservation;*
 - d) *develop a water-use profile and forecast;*
 - e) *evaluate plans for water facilities such as pumping stations and reservoirs;*
 - f) *identify and evaluate,*
 - (i) water conservation measures such as public education, improved management practices, the use of flow-restricting devices and other hardware, water reuse and recycling, and practices and technologies associated with water reuse and recycling,*
 - (ii) water conservation incentives such as full cost pricing, and*
 - (iii) ways of promoting water conservation measures and water conservation incentives;*
 - g) *analyze the costs and benefits of the matters described in clause (f);*
 - h) *require the use of specified water conservation measures and incentives;*
 - i) *contain an implementation plan for those specified measures and incentives that reconciles the demand for water with the water supply;*
 - j) *provide for monitoring of the water budget and water conservation plan for effectiveness.*

This technical paper covers the water conservation planning portions of Section 25. The water budget portions, subsection (2) (a), (b), and (c)(i) and (ii), are covered in a separate technical paper (10) regarding Water Budgets.

The ORMCP requires all upper-tier and single-tier municipalities within the area to which the ORMCP applies to begin preparing water budgets and water conservation plans on a watershed basis by April 22, 2003. Water conservation plans must address both municipal piped service and efficiency of private systems.

As of April 22, 2007, major development will only be permitted if a water budget and water conservation plan have been prepared in accordance with the ORMCP by the approval authority. The part of the Regional Municipality of York that is served by the Yonge Street Aquifer must have its water budget and water conservation plans in place by April 22, 2004 in order that major development may proceed. An application for major development must demonstrate, in the context of the water budget and water conservation plan, that the water use projected for the development is sustainable without compromising the ecological integrity of the Oak Ridges Moraine (ORM).

4 Rationale for the Requirements

The ORM has clean and abundant water resources. The Moraine is a vital storage reservoir and recharge zone for groundwater, which feeds wetlands, lakes, streams, and rivers. As such, it provides clean drinking water for more than 250,000 residents, as well as water supplies for agricultural, industrial, commercial and recreational facilities. The demand for water supplies from the Moraine must be balanced with the need to maintain ecological integrity on a watershed basis.

Water conservation planning contributes to a sustainable and healthy resource by recognizing water as a valuable, finite resource to be utilized efficiently, wisely and cost-effectively to sustain a high quality of social, environmental, and economic well being, for the present and the future.

Efficient water use can have major environmental, public health and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water sources. Water quality and quantity affect aquatic ecosystems and their biological integrity.

Water conservation systems can help owners and operators avoid, downsize, or postpone water and wastewater projects. The facilities used to treat and deliver water and wastewater are sized to meet demand; if the level of demand is inflated by wasteful use, people may pay more in capital and operating costs than necessary to provide safe and adequate water and wastewater services. When costs are reduced, financial resources can be used to meet other needs.

Water conservation can also prevent pollution by reducing waste flows, recycling industrial process water, and reclaiming wastewater. Energy use by consumers and utilities can be reduced, saving money and reducing emissions of greenhouse gases. Water quantity is protected by reducing water withdrawals. This helps improve water quality, maintain ecosystems, and protect water resources overall. For example, runoff from the excessive watering of golf courses, and lawns can introduce harmful contaminants such as salts, sediments, pesticides, herbicides, nutrients, chemicals, metals, oil, viruses, bacteria, and other pollutants into our streams, rivers, and lakes, and degrade water quality.

5 Implementation of the Requirements

Currently, most water conservation measures are undertaken based on political boundaries (i.e. at the municipal level). Given that the conservation authorities have extensive experience in watershed management, and conservation plans are part of the watershed plans, approval authorities should include the Conservation Authorities and other approval authorities in the same watershed in the conservation planning process. It should be remembered that information compiled as part of the conservation plan and evaluation process will likely be tracked at the municipal as well as the watershed scale, and therefore, information should be transferable between them.

The process of developing a water conservation plan can be separated into three phases: defining conservation needs, choosing appropriate measures and incentives, and drafting the plan.

Phase I: Defining Conservation Needs

Water Conservation vs. Water Efficiency

Water efficiency – a reduction in water demand that is sought in order to achieve an economic benefit. Also, the accomplishment of a function, task or process using the minimum amount of water feasible.

Water conservation – any beneficial reduction in water loss, waste or use. Main intention may be to result in an environmental benefit. Reduces water demand but may result in increased costs or reduced revenues not offset by financial savings.

Water conservation needs are generally thought of as equivalent to the shortfall between demands upon the water supply system versus the amount that system can provide. However, a watershed approach to conservation planning requires that the approval authority think beyond infrastructure capacity, and consider the availability of water resources within the local environment. Conservation planning aims to ensure that the withdrawal of water resources occurs at a rate that does not cause a detrimental impact on ecological integrity. (Approval authorities and Conservation Authorities may want to consider any linkages to municipal water supply systems off but near the Moraine area). The following two steps make up the first phase of a watershed-based conservation plan.

Keys Steps in Developing a Water Conservation Plan

Phase I: Defining Conservation Needs

1. Develop Water Use Profile and Forecast
2. Identify Water Conservation Goals - Link to Water Budget Analysis

Phase II: Choosing the Appropriate Measures and Incentives

3. Identify and Evaluate Water Conservation Measures
4. Identify and Evaluate Water Conservation Incentives
5. Analyze Relative Benefits and Costs of Measures and Incentives
6. Select Conservation Measures and Incentives

Phase III: Drafting the Plan

7. Prepare Water Conservation Plan - plan should be a written account of the previous 6 steps **PLUS** include:
 - Illustration of anticipated effects of conservation measures and incentives on water demand and supply capacity;
 - An implementation plan, and
 - A plan for monitoring and evaluating effectiveness

Phase IV: Revising the Plan

8. Review and re-evaluate the plan to ensure water conservation goals are being met.

5.1 Develop Water Use Profile and Forecast (Defining Demand)

Knowing the total current and projected future demands upon your water supply system to serve the municipality is the first step in developing conservation needs. Forecasting water use, or demand, can range from simple projections based on expected population growth to complex models. The following should be done when developing a water-use profile and forecast:

- Identify any existing water conservation plans or municipal water conservation plans or programs that may be in use within the ORM Area.
- Develop a water-use profile analyzing current and historical water-use characteristics of residential, commercial, industrial, public/institutional, landscape irrigation, agricultural and other sectors. This should include numbers of users; indoor versus outdoor use; and total annual, seasonal and daily peak demands.
- Determine and evaluate unaccounted-for water (such as system leaks and losses, meter inaccuracies, unmetered uses, theft) and lost revenue resulting from unaccounted-for water.
- Evaluate forecast of anticipated future water demand (increases or decreases). The longer the planning horizon, the greater will be the uncertainty of the forecast. Forecasts should be updated on a regular basis. Forecasts can be done for a 20-year horizon.
- If applicable, determine impact of existing conservation efforts and regulatory requirements (plumbing codes, lawn watering by-laws, etc.) on water demand. Anticipated effects on water demand from new measures contemplated in the conservation plan should not be included.

5.2 Identify Water Conservation Goals (Link to Water Budget Analysis and Availability)

Water conservation goals are dependent upon local circumstances. The outcome of the water budget analysis and the identification of water availability are the key determinants of water conservation needs when developing a watershed-based plan. Various aspects, however, of a water conservation plan can be developed while a final water budget analysis is being completed. Modeling various land use and water conservation strategies can help determine the optimal combination that will meet ecological targets (see technical paper on Water Budgets for more on ecological targets). After determining ecosystem needs through the watershed planning and water budget processes, water conservation goals should then reflect forecast water demand as identified in Step 1.

Goals may be designed to reflect:

- Timeframe and planning horizon (i.e. long-term demand reduction, reduction of peak demand);
- Maintenance, improvement, or restoration of ecological and hydrological integrity of the Oak Ridges Moraine (e.g. meeting targets set for ecosystem);

- Avoidance or deferral of capital costs associated with expansion of water and wastewater facilities as well as reduced operating costs associated with treatment chemicals, energy for pumping, treatment and distribution of water and wastewater;
- Efficient and important use of water resources; and
- Increased stakeholder (farmers, citizens, organizations etc.) consultation and involvement in implementation.

Goals should be specific and measurable for evaluation purposes. Some sample goals are:

- Maintain aquifer withdrawals at sustainable levels by reducing average demand by 'x'% from base year (links to water budget and availability);
- Reduce peak-day water use by 'x'% by the year 'y' by focusing on landscape water use reduction;
- Avoid new source development costs; and
- Educate customers about the value of water and potential financial savings.

Managers should revisit the goals before finalizing the conservation plan and periodically thereafter, as the goals and the best means for achieving them will evolve.

The process of developing goals should involve the community, providing all affected groups with an opportunity to express their interests and concerns. Involving the community in goal development and in implementation also serves an educational function and can enhance the success of the program. Ongoing involvement helps maintain and build support for the water conservation effort, provides feedback on the level of satisfaction with the system's programs, and can assist in the monitoring of results and adjusting program implementation.

Phase II: Choosing the Appropriate Measures and Incentives

Conservation measures include both supply-side and demand-side management techniques for saving water, and range from relatively simple educational tools to advanced water-efficient technologies. Choosing the most effective combination of measures and incentives to reduce water use will depend upon the current water use patterns observed in the community. By-laws restricting lawn watering, for instance, may be most appropriate if water use tends to peak on dry, summer days. The following steps can be used to choose the most appropriate measures and incentives.

5.3 Identify and Evaluate Water Conservation Measures

- Identify all relevant water conservation measures (hardware devices and technologies as well as behaviour modification and management practices).
- Develop a potential matrix of measures for each sector (e.g. residential, industrial, commercial) including ways to minimize unaccounted-for water (leaks and losses).

- Evaluate measures according to potential water savings, benefits and costs, and implementation considerations. Criteria that could be used for evaluating conservation measures may include ease of implementation, cost-effectiveness, staff resources and capability, water rights and permits, timeliness of savings, environmental and social justice, legal constraints, public acceptance, and consistency with other programs.

5.4 Identify and Evaluate Water Conservation Incentives

- Identify incentives to encourage water users to use conservation devices and implement conservation measures (e.g. by-laws, rate structures and pricing , enforcement, public education).
- Evaluate incentives according to effectiveness, costs and acceptability.

5.5 Analyze Relative Benefits and Costs of Measures

- Estimate short-term, long-term, average-day, and peak-day water saving for each measure.
- Estimate benefits of conservation program, including reduced need for additional water supplies, deferred, downsized or eliminated new facilities, and mitigation of negative ecological impact.
- Estimate conservation program costs, including costs such as administration, consultants, hardware and materials, training, labour, marketing and education, financial incentives, program monitoring and evaluation.
- Determine cost-effectiveness of measures based on benefits and costs over the life of the program.

5.6 Select Conservation Measures and Incentives

Measures	
Technology-based:	Behaviour-based
<ul style="list-style-type: none">• Low-flush toilets• Water-efficient washers (for clothes and dishes)• Low-flow showerheads• Drought-tolerant turf and plants• Composting toilets• Process water and wastewater reuse• Leak repair	<ul style="list-style-type: none">• Turn off the tap once you have wet your toothbrush• Cut your shower time in half• Regularly service valves and connections• Run clothes and dish washers only when full• Water lawn only once a week• Practice water-efficient landscaping• Recycle water/rainwater

- Identify quantitative (e.g. water savings, cost effectiveness of measures, avoidance of capital costs) and qualitative (e.g. ease of implementation) criteria for selecting measures and associated program incentives.
- Evaluate and rank measures using quantitative and qualitative selection criteria.

Incentives

- Mailouts/pamphlets
- Demonstration gardens
- Children's Water Festivals
- Conservation rate structures
- Landscaping bylaw (e.g. that limits area of turf grass allowed in new development)
- Bills that include historical water use information
- Plumbing codes
- TV and radio ads
- Irrigation schedules/ restrictions
- Water audits
- Rebates

Phase III: Drafting the Plan

The final stage is drafting the plan. A written report, complete with an implementation strategy and monitoring and evaluation goals, is required. The following components should be included in the report:

WATER CONSERVATION PLAN - SAMPLE TABLE OF CONTENTS

1 INTRODUCTION AND SUMMARY

1.1 *Objectives/Goals and Scope of Plan*

1.2 *Rationale – Links to Water Budget and Availability*

1.3 *Summary of the Plan*

1.3.1 Projected demand (without conservation by sector)

1.3.2 Water supplies

a) Local sources of water

b) Limitations or opportunities for additional water

1.3.3 Components of water conservation plan

a) Residential measures and incentives

b) Industrial measures and incentives

c) Commercial measures and incentives

d) Institutional measures and incentives

e) Protection of key natural heritage areas, natural core areas and linkages that contribute to water storage & conservation (e.g. wetlands, fish habitat, habitat of SAR)

1.3.4 Projected impact of conservation measures on water use

2 WATER USE PROFILE AND FORECAST

2.1 *Existing and Historical Water Use*

2.1.1 Residential water use

a) Indoor water use patterns

b) Outdoor water use patterns

2.1.2 Industrial water use

2.1.3 Commercial water use

2.1.4 Institutional water use

2.1.5 Unaccounted-for-water

2.1.6 Total Maximum Day, Average Annual Day and Peak Demand

2.2 *Projected 20-Year Water Demand (based on population & economic growth)*

2.2.1 Residential

2.2.2 Industrial

2.2.3 Commercial

2.2.4 Institutional

2.2.5 Total

3 WATER SUPPLY

3.1 Outcome of Water Budget Analysis

3.2 Water Resource Availability

- 3.2.1 Groundwater supply
- a) Existing wells
 - b) Safe yield of source
 - c) Plans to expand capacity

- 3.2.2 Surface water supply
- a) Safe yield of source
 - b) Plans to expand capacity

3.2.3 Alternative new supply

3.3 Existing water system

3.3.1 Capacities

3.3.2 Deficiencies

3.3.3 Planned facilities and system additions

4 WATER CONSERVATION PLAN

4.1 Water Conservation Goals

4.2 Public Consultation – Activities and Feedback

4.3 Evaluation of Conservation Measures and Incentives

4.3.1 Evaluation of Conservation measures

a) Technology-based

- Residential
- Commercial
- Industrial
- Institutional

b) Behaviour-based

- Residential
- Commercial
- Industrial
- Institutional

4.3.2 Evaluation of conservation incentives

- a) Regulatory
- b) Economic
- c) Educational

4.4 Selected Conservation Measures and Incentives (based on water savings, costs/cost-effectiveness, feasibility and acceptability)

4.5 Anticipated Impact of Conservation Measures on Water Demand

and Supply

4.6 *Implementation Plan*

- 4.6.1 Schedule
- 4.6.2 Staffing needs
- 4.6.3 Budget
- 4.6.4 Financing
- 4.6.5 Promotional activities

4.7 *Monitoring, Evaluation and Reporting Plan*

APPENDICES

- A. Worksheets (any that were used to complete plan)
- B. Supporting Data (any that were used to complete plan)

5.7 Prepare Water Conservation Plan

Prepare a conservation plan that includes an account of the previous 6 steps plus describes conservation goals, measures and incentives.

- Incorporate an ecosystem (holistic) and an adaptive environmental management approach.
- Illustrate anticipated effects of conservation measures on water demand and supply capacity (e.g. as a result of reducing leaks and losses).
- Develop an implementation plan for the water conservation plan, including any barriers that may affect its implementation.
- Develop a plan for public consultation.
- Develop a plan for monitoring and evaluating effectiveness of the plan.
- Specify how results of plan implementation will be reported.

6 Monitoring

Figure 2 shows a suggested hierarchy of monitoring related to the water provisions of the ORMCP. The scope of monitoring will vary for each program or project based on the requirements of the ORMCP, environmental targets identified in a plan, and specific conditions of an approval.

It is suggested that details of the monitoring to be undertaken, such as the frequency at which samples will be collected or observations made, the locations to be monitored, the methods to be used, and the duration of monitoring be designed to suit the specific needs of the particular program or project.

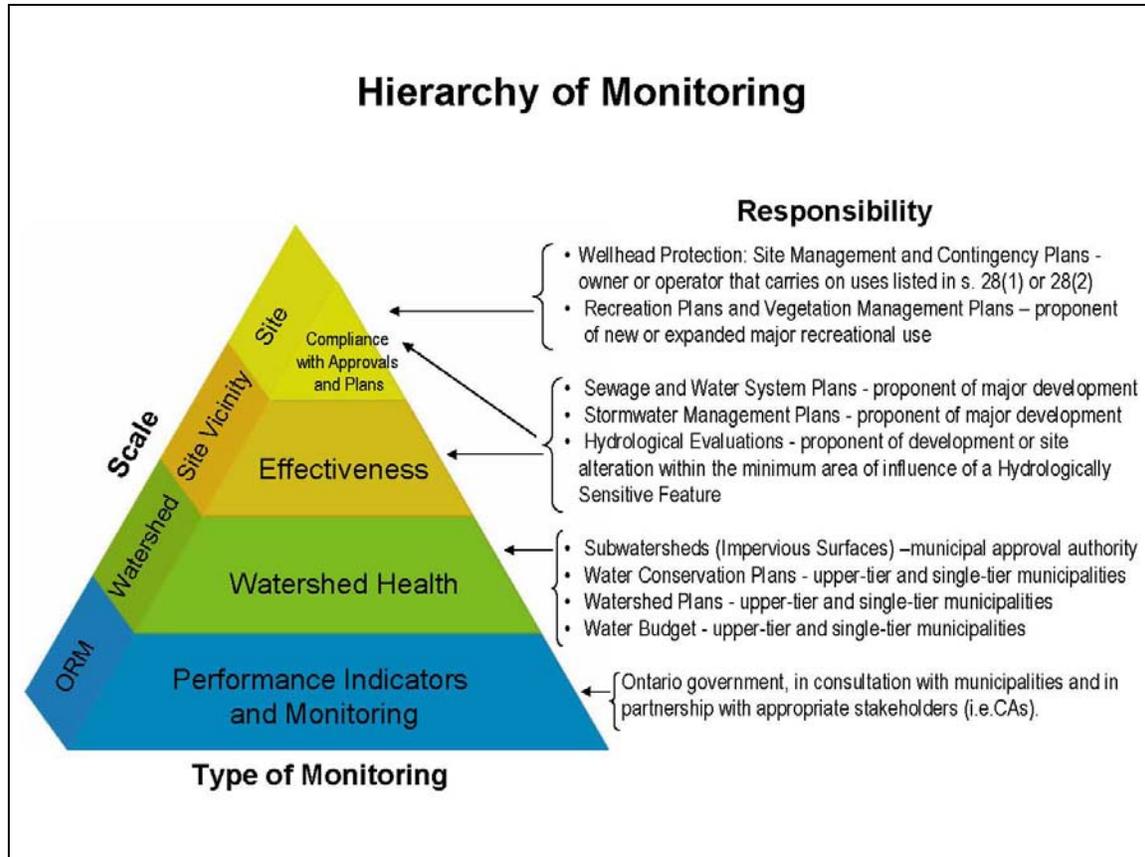
The Ontario government, in consultation with approval authorities, shall over time identify performance indicators for monitoring the effectiveness of the ORMCP (see the Implementation section of the ORMCP). The Province, in partnership with appropriate stakeholders, shall establish a monitoring network to collect, summarize, and evaluate performance indicator data to:

- assess changes in the ecological integrity of the Moraine;
- assess the effectiveness of the policies of the Plan in achieving the Plan's vision and objectives;
- help identify improvements that would address problems encountered in implementing the Plan.

In addition to satisfying the needs of local watershed plans or specific projects, monitoring at the other scales (i.e. at the site, site vicinity, and watershed scales) may provide valuable information that will contribute to the overall monitoring of the ORMCP.

When preparing Water Conservation Plans, upper-tier and single-tier municipalities should include in their plans an outline of proposed monitoring to be undertaken. The ORMCP, Section 25 (2), states that "a water budget and conservation plan shall, as a minimum, (j) provide for monitoring of the water budget and water conservation plan for effectiveness."

Figure 2 Hierarchy of monitoring related to the water provisions of the ORMCP



The monitoring to be carried out is at the watershed scale. The monitoring may involve evaluating the effectiveness of specific water conservation measures and incentives, such as:

- residential conservation measures
- industrial conservation measures
- commercial conservation measures
- institutional conservation measures
- regulatory conservation incentives
- economic conservation incentives
- educational conservation incentives

Monitoring should be conducted by upper-tier and single-tier municipalities to ensure that the objectives of the Water Conservation Plan are being met such as to maintain the ecological integrity of the plan area and to ensure sustainable water use.

7 Next Steps

Much background information and experience exists regarding the necessity for, application and results of water conservation initiatives. Preparing a Water Conservation Plan with all stakeholders on the Moraine is an essential step to raising awareness and launching water conservation initiatives.

The Province, in consultation with approval authorities, intends to identify performance indicators for monitoring the effectiveness of the ORMCP, and intends to establish a monitoring network to collect and evaluate performance indicator data. This would be done in time to feed into the legislated ten-year review. Within the ten-year review framework, however, approval authorities could actively monitor the results of conservation initiatives, as laid out in the Water Conservation Plan document that is developed. As part of adaptive environmental management, the plan must be regularly reviewed as information and science change. Plans could also be reviewed and updated in a five-year time frame linked to Official Plan review.

8 References and Resources

References

- Ontario Water Works Association (OWWA). 1999.
Water Efficiency: A Guidebook for Small and Medium-sized Municipalities in Canada.
- U.S. Environmental Protection Agency. December 1992.
Statement of Principles on Efficient Water Use.
www.epa.gov/OW-OWM.html/
- U.S. Environmental Protection Agency. August 6. 1998.
Water Conservation Plan
Guidelines www.epa.gov/OW-OWM.html/water-efficiency/pubs/guide.htm
- Vickers, Amy. 2001.
Handbook of Water Use and Conservation. Waterplow Press, Amherst, Massachusetts, United States.
- Waller, D.H., R.S. Scott, C. Gates and D.B. Moore, 1997.
Canadian Municipal Water Conservation Initiatives, Toronto: ICURR Publications, p.52.
- XCG Consultants Limited. March 1998.
Guide to Resource Conservation and Cost Savings Opportunities in the Municipal Water and Wastewater Sector. Prepared for the Ministry of the Environment (MOE), the Water Environment Association of Ontario (WEAO), and the Ontario Water Wastewater Association (OWWA).

Resources

a. Water Conservation Planning Documents

- Ontario Water Works Association. 1999
[Water Efficiency: A Guidebook for Small & Medium-sized Municipalities in Canada](#)
A Canadian adaptation of the American Water Works Association's Water Conservation Guidebook for Small and Medium-sized Utilities. Provides a general overview of water efficiency planning and describes steps that can be followed in designing a water efficiency program. Directed at municipalities servicing a population under 100,000. Worksheets provided.
- U.S. Environmental Protection Agency, 1999.
[Water Conservation Plan Guidelines](#)
August 6, 1998. EPA-832-D-98-001. 207pgs
www.epa.gov/owm/water-efficiency/wecongid.htm
Directed at water system planners, this document provides guidelines for planning and implementing effective and goal-oriented water conservation strategies. Guidelines, including sample worksheets, are given for systems serving fewer than 10,000 (basic), those serving between 10,000 and 100,000 (intermediate) and for those serving more than 100,000 (advanced). Appendices include details on water conservation measures, benchmarks used in conservation planning, and an extensive list of related information resources.

American Water Works Association (AWWA), 1996.
Guidelines for Implementing an Effective Integrated Resource Planning Process
1996. Catalog No. 90718
To order: www.awwa.org/bookstore
Describes successful methods of conducting and implementing integrated resources planning (IRP), a comprehensive water resource planning technique. Includes conceptual and working definitions of IRP and, through case studies, shows elements of successful methods used to achieve consensus and to acquire regulatory approvals and public acceptance.

b. Water Conservation Initiatives

D. Waller et al., 1997.
Canadian Municipal Water Conservation Initiatives. 120 pgs, ISBN 1-895469-48-1

Ontario Ministry of the Environment, March 1998
Guide to Resource Conservation and Cost Savings Opportunities in the Municipal Water and Wastewater Sector. ISBN 0-7778-6908-X

Canadian Water and Wastewater Association, 1997.
Municipal Water and Wastewater Rates Primer.
Municipal Water and Wastewater Rates Manual (2nd ed.)
To order: www.cwwa.ca

Using 12 in-depth case studies and a larger survey of municipalities, a team of researchers from the Technical University of Nova Scotia documents the reasons and financial aspects of initiatives undertaken by municipalities to reduce residential water consumption. These include the introduction of metering or of retrofit, the enactment of new by-laws and regulations, the modification of the rate structure, or the undertaking of infrastructure work. The study also assesses the effectiveness of the initiatives and of the accompanying public awareness programs.

Primer provides an overview of key topics on rate setting and outlines a basic approach to rate setting. It encourages reliance on user pay strategies as the most important available tool for cost recovery, and it recognizes the role that water and wastewater rates play in promoting water efficiency to manage the demand for service and the costs of providing that service. Manual provides a Canadian perspective on rate setting and promotes a simplified approach to rate making. It discusses the methods and theory underlying the logic and process of rate setting and comes with a fully documented rate setting software model.

American Water Works Association, 1999.
Effectiveness of Residential Water Conservation Price and Nonprice Programs.
Catalog No. 90747
To order: www.awwa.org/bookstore

Amy Vickers, 2001.
Handbook of Water Use and Conservation. WaterPlow Press, Amherst, MA.
446pp.
To order: (413) 253-1520 www.waterplowpress.com

Assesses the impact of price and non-price variables upon municipal water consumption. Presents a model of municipal consumption and statistically compares data from several metropolitan areas. Provides recommendations for municipal conservation programs designed to reduce summer exterior use, respond to acute drought or water supply shortage, and stimulate long-term efficient use of municipal water.

Companion report to *Residential Water Use, Rate, Revenue and Non-price Conservation Program Database Order 90748*

Provides in-depth guidance on planning a successful water conservation program and details on water use and efficiency measures for the residential/domestic, landscape, industrial, commercial and institutional and agricultural sectors.

c. Educational Materials

Ontario Clean Water Agency.

Beautiful Lawns and Gardens through Water-Efficient Landscaping

To order: www.ocwa.com, (416) 314-4623 or 1-800-667-OCWA (6292)

Creating new landscapes that protect the environment and conserve water, using native and other plants suitable to local climatic conditions, is known as water-efficient landscaping. The goal is to create attractive landscapes that require less than half the water of a lawn and, once established, should also require less maintenance than turf.

Environment Canada, 1993.

[A Water Conservation Plan for Federal Government Facilities](#)

To order: www.ec.gc.ca/water/en/info/pubs/arwcp/e_plan.htm

National Water Issues Branch: (819) 953-1515

Environment Canada.

[Manual for Conducting Water Audits and Developing Water Efficiency Programs at Federal Facilities](#)

To order: www.ec.gc.ca/water/en/info/pubs/manual/e_contnt.htm

Public Works and Government Services Canada.

[Water Management Protocol](#)

The primary purpose of the Water Conservation Plan is to provide federal departments with an understanding of the water conservation opportunity and to give them the information, tools, and support required to launch a successful water efficiency program for their facilities. Guidelines may be tailored to develop educational materials for non-government facilities.

Complements A Water Conservation Plan for Federal Government Facilities, 1993. A "how to" guide that assists facility managers and their Environmental Coordinators to make federal facilities water efficient in the most cost-effective manner. It complements the original Manual that accompanies the Water Conservation Plan for Federal Facilities. Although the protocol was intended for

Public Works facilities, it may be useful for other office building facilities.
Includes spreadsheet software for doing the necessary calculations.

Regional Municipality of Halton
Household Guide to Water Efficiency
www.region.halton.on.ca

National Round Table on Environment and Economy (NRTEE).
Publications on public education and social marketing
www.nrtee-trnee.ca/eng/Publications/index_e.htm

A comprehensive source of information on methods to conserve water, both in the home and in the garden. Produced in partnership with the Canadian Mortgage and Housing Corporation.

McKenzie-Mohr, Douglas.
Promoting a Sustainable Future – An Introduction to Community-Based Social Marketing

Kassirer and McKenzie-Mohr, D.
Tools of Change – Proven Methods for Promoting Environmental Citizenship

d. Web Resources

Environment Canada's Water Efficiency Web site
www.ec.gc.ca/water/en/manage/effic/e_weff.htm

Ontario Ministry of the Environment
Water Conservation Green Tips – Fact Sheets
www.ene.gov.on.ca/en/publications/water/index.php#2
Information for municipalities on water conservation initiatives. Includes links to other useful resources.

Professional Geoscientists Act, 2000:
www.e-laws.gov.on.ca/DBLaws/Statutes/English/00p13_e.htm

Professional Engineers Act, 1990:
www.e-laws.gov.on.ca/DBLaws/Statutes/English/90p28_e.htm

Region of York - Water for Tomorrow
www.water4tomorrow.com

Water Use Efficiency Catalogue for British Columbia
Last updated July 23, 1999
www.env.gov.bc.ca/wsd/plan_protect_sustain/water_conservation/index.html

Detailed information on 'hard' and 'soft' conservation measures undertaken in Canada federally, provincially, regionally and at the municipal level.

California Department of Water Resources
Urban Water Management Plan website
www.water.ca.gov/nav.cfm?topic=Water Use and Planning&subtopic=Urban

The *California Urban Water Management Planning Act* requires suppliers to

develop water management plans. Information found on this site includes:
2000 sample plan (City of New Albion – imaginary city of Population- 52,000)

- Plan, worksheets & checklists
- A cost-effectiveness tool to help with cost-effectiveness analysis
- A formula for urban water needs analysis

Canada-Ontario Farm Stewardship Program

www.ontariosoilcrop.org/cms/en/Programs/ProgramsAboutCOFSP.aspx?

Canada-Ontario Water Supply Expansion Program

www.adaptcouncil.org/current_programs/watersupply.asp

Rural Water Quality Program

www.grandriver.ca/index/document.cfm?Sec=25&Sub1=0&sub2=0

Greater Toronto Area Agricultural Action Plan

www.rpco.on.ca/RPCO+GTA+Caucus/Agricultural+Action+Plan+for+GTA.htm

Great Lakes Quality Agreement and Great Lakes Charter

www.mnr.gov.on.ca/mnr/water/greatlakes/index.html