OPPORTUNITIES AND CHALLENGES FOR STATE IMPLEMENTATION OF WATER CONSERVATION UNDER THE GREAT LAKES COMPACT: A REPORT AND TOOLKIT

Jodi Habush Sinykin[*]

Donna L. McGee[**]

2006 MICH. ST. L. REV. 1193

TABLE OF CONTENTS

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* J.D., Harvard Law School. Of Counsel, Midwest Environmental Advocates. Member, Wisconsin Legislative Council's Special Committee on the Great Lakes Water Resources Compact. The authors wish to thank Melissa Kwaterski Scanlan, Executive Director of Midwest Environmental Advocates, for her guidance and editorial assistance with this Article.

** J.D., New York University. Office of Legal Affairs, University of Wisconsin-Milwaukee. Donna McGee previously worked as a contract researcher for Midwest Environmental Advocates.

INTRODUCTION

The Great Lakes–St. Lawrence River Basin Water Resources Compact (Compact) provides a valuable opportunity to bring water conservation to the forefront in the eight Great Lakes States of Wisconsin, Illinois, Michigan, New York, Pennsylvania, Indiana, Minnesota, and Ohio. Under the Compact, each Great Lakes state will be required to develop its own water conservation objectives consistent with articulated basin-wide goals and to implement a water conservation and efficiency program within two years of the effective date of the Compact.[1] As further impetus, the Compact provides that communities seeking diversions of Great Lakes water must meet the Exception Standard, which, in addition to other criteria, requires the applicant to demonstrate that the proposed diversion will incorporate "Environmentally Sound and Economically Feasible Water Conservation Measures to minimize Water Withdrawals or Consumptive Use . . . ."[2] As such, state and community policymakers across the Great Lakes region will need to begin marshaling resources and brainpower toward the development of water efficiency and conservation goals as well as programs in keeping with the Compact's clear conservation ethic.

Yet, many states across the region may find themselves in a similar position to Wisconsin, which demonstrates only modest progress in the realm of water conservation despite the fact that significant portions of the state's economic and population enclaves are currently experiencing growing water quality and quantity problems.[3] Why are Wisconsin's policies lagging in this respect? An examination of Wisconsin laws and regulatory systems in Part I of this Article reveals that no state law addresses water conservation in a way that requires the actual implementation of conservation measures and, in fact, certain Wisconsin laws and regulations actually impede water conservation at the state and local level.

Other Great Lakes States may find valuable lessons in the examination of the gaps and opportunities for conservation existing under Wisconsin law. For example, Section 281.35 of the Wisconsin Statutes requires con-

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1. The Compact states:

> Within two years of the effective date of this Compact, each Party shall develop its own Water conservation and efficiency goals and objectives consistent with the Basin-wide goals and objectives, and shall develop and implement a Water conservation and efficiency program, either voluntary or mandatory, within its jurisdiction based on the Party's goals and objectives. . . . [And then] report to the Council and the Regional Body and make this annual assessment available to the public.

Great Lakes–St. Lawrence River Basin Water Resources Compact, Dec. 13, 2005, § 4.2(2), http://www.cglg.org/projects/water/docs/12-13-05/Great_Lakes-St_Lawrence_River_Basin_water_resources_Compact.pdf [hereinafter 2005 Great Lakes Compact].

2. *Id.* § 4.9(4)(e).

3. *See infra* text accompanying note 16.

servation practices for new or increased large-scale water withdrawals; however, the threshold used to trigger the conservation requirement—a "water loss" above two million gallons per day—is set so high that, practically speaking, only a handful of large-scale water withdrawals have been large enough to require conservation in the twenty years since the law's enactment.

This high threshold is self-defeating for the state in the long run. As demonstrated by the small number of water loss permits granted over the statute's twenty-year history, the statute fails to deter inefficient water waste on the part of most of the state's water users. The law's failure will continue to hinder Wisconsin's ability to mitigate local water shortages, like those presently arising in critical portions of the state. If these shortages are not appropriately managed, they have the potential to strain state resources further and to require more regulatory oversight.

Other than Wisconsin's Wellhead Protection Program, the state of Wisconsin has no specific program that requires, funds, or otherwise promotes water conservation.[4] Yet, Wisconsin's Wellhead Protection Program, while identifying water conservation as an objective, fails to require communities seeking a new well to actually implement a water conservation program. With no financial incentives provided to communities and no implementation or enforcement parameters, the Program's conservation component is little more than a paperwork requirement.

Part I also examines gaps in state laws and regulations regarding the use of reclaimed or recycled water.[5] Reuse of treated wastewater may provide a number of benefits germane to conservation, including groundwater recharge and demand reduction. Unlike other states, Wisconsin has yet to enact any state regulations or guidelines specifically addressing water reuse for purposes other than limited irrigation applications. Further inquiry is needed to determine whether and to what extent existing state water quality regulations serve to restrict the use of large-scale water recycling systems in Wisconsin.

Next, this Article evaluates shortcomings in the state's land use laws and policies in terms of water conservation. Without appropriate prioritization of groundwater concerns and the commitment to undertake integrated water management plans under the state's "Smart Growth" program, Wisconsin communities' efforts to protect water supplies and to forge an environmentally sustainable future will be compromised.[6]

The Article next examines Wisconsin's Public Service Commission's (PSC) role in creating a clear financial disincentive to conservation. The Wisconsin PSC has the authority to set the rate structure for the state's wa-

4. *See infra* Part I.B.
5. *See infra* Part I.C.
6. *See infra* Part I.D.

ter utilities and has selected the declining block rate as its state-wide pricing structure.[7] Under this rate structure, the more water that is used, the less a customer pays per unit, thereby creating a disincentive to conserve water. Consistent with this rate selection, the PSC is virtually silent on the topic of water conservation.[8] Given the reality of Wisconsin's increasing water concerns in highly populated portions of the state, the PSC would be wise to take a closer look at the state's present rate structure and adopt alternatives that favor water conservation. Yet another potential impediment to conservation is the state's failure to prohibit large-scale water users from "opting out" of available municipal systems.[9] The legal ability to opt out of a municipal system deters and undermines utilities' implementation of water conservation measures, given the buying power yielded by large industrial users that may opt out of the system if such measures are required.

In counterpoint to the gaps and disincentives identified under Wisconsin state law, Part Two explores water conservation opportunities for Wisconsin and the other Great Lakes States under the Compact and assesses how state implementing legislation can best achieve the Compact's conservation ethic. It concludes with a Water Conservation Toolkit to guide Great Lakes Basin decision makers committed to designing and implementing conservation plans at the regional, state, and community level. Thus mindful of the directives of the Great Lakes Compact and the lessons gleaned from Wisconsin, Great Lakes policymakers can direct their respective conservation policies toward the common goal of an environmentally sustainable future.

I. GAPS AND OPPORTUNITIES FOR CONSERVATION IN WISCONSIN

A. Introduction

Wisconsin's water conservation policies are lagging, even though the conservation of the state's natural resources remains a core value of its citizens. The ready explanation is that, like the other Great Lakes, Wisconsin is water rich, with thirty plus inches of precipitation a year and extensive groundwater resources.[10]

Yet, there is no denying that significant portions of Wisconsin are experiencing both water quality and water quantity problems.[11] The scientific

7. *See infra* Part I.E.

8. *See infra* Part I.E.1.

9. *See infra* Part I.E.3.

10. Wisconsin's Water Library, Water Facts, Water Underground, http://www.aqua.wisc.edu/waterlibrary/facts.asp (last visited Apr. 1, 2007).

11. One such area experiencing groundwater quantity and quality problems is Southeastern Wisconsin, designated a "Groundwater Management Area" under the 2004 Groundwater Quantity Act. *See* 2003 Wis. Act 310 (2004); Press Release, Tim Asplund,

community has helped educate the public about the depth of our water shortages, and the public discourse has increasingly reflected anxiety about water security.[12] Many renowned conservationists, including Wisconsin's Aldo Leopold, have promoted the idea of living within the carrying capacity of the land.[13] One essential means to reaching this objective is conservation.

Water conservation has been defined as the actions taken to reduce water use by improving the efficiency of various uses of water.[14] Its aim is to preserve quantities of water sufficient to sustain economic and agricultural uses, drinking water supplies, and water-dependent ecosystems within our environment.[15] As part of the overall management of water, conservation is commonly associated with water demand management strategies aiming to reduce human consumption and demand for water.

Another less common approach to water conservation focuses on the reuse and reclamation of water as an alternative to standard "once-through" water systems, where water is withdrawn, used once, treated, and discharged. This approach optimizes the numerous beneficial uses of treated wastewater or "gray water" for groundwater recharge, irrigation, wetlands restoration, and industry.

Despite increasingly publicized accounts of global water shortages and contamination problems, many people persist in viewing water as something that will always be available, something to take for granted. Even when people recognize the logic inherent in water conservation measures, they may continue individual behaviors adverse to conservation. This ultimately requires policymakers to establish laws and devise rules that deter certain conduct and encourage others. Wisconsin law is riddled with gaps and provisions that actually discourage water conservation. This Section will highlight those gaps so those interested in water conservation can take action to promote better stewardship of our water.

Wisconsin DNR Bureau of Drinking Water and Groundwater, Summary of Wisconsin's New Groundwater Quantity Legislation, 2003 Wisconsin Act 310, June 10, 2004, *available at* http://dnr.wi.gov/org/water/dwg/gcc/WWAarticle.pdf. The area's groundwater demonstrated a decline in groundwater levels in the deep sandstone aquifer of five to ten feet per year. *See* SOUTHEASTERN WIS. REG'L PLANNING COMM'N, GROUNDWATER RESOURCES OF SOUTHEASTERN WISCONSIN CH. IV (2002). *See also* Ken Bradbury, Research Hydrologist, Wisconsin Geological and Natural History Survey, Groundwater Use and its Consequences in Wisconsin, presented at the Groundwater Advisory Committee Meeting (Apr. 1, 2005), http://dnr.wi.gov/org/water/dwg/gac/presentations/bradbury040105.pdf.

12. *See id.*

13. *Id.*

14. Rebecca Lameka, *Summary of Current Water Conservation Practices in the Public Water Supply Sector of the Great Lakes–St. Lawrence Region* 2 (Great Lakes Comm'n Briefing Paper, Mar. 31, 2004).

15. *See infra* notes 68-69.

B. Gaps and Opportunities for Conservation Under Wisconsin Law

1. *Statutory Background: Inadequate Incentives for Conservation*

On the federal level, water conservation is promoted through two laws: the Energy Policy Act of 1992 and the Safe Drinking Water Act. The Energy Policy Act of 1992 established national maximum allowable water use rates for plumbing fixtures in new and renovated residential and non-residential facilities.[16] By 2020, the date by which most existing fixtures will be replaced, it is estimated that the Act will save six to nine billion gallons of water a day and reduce national water consumption by three to nine percent.[17]

Additionally, amendments to the Safe Drinking Water Act promote water conservation by requiring the U.S. Environmental Protection Agency to publish guidelines to assist public water systems' development of water conservation plans. At their discretion, states may require water systems to submit water conservation plans consistent with these federal guidelines (or any other guidelines) as a condition of receiving a loan from the Drinking Water State Revolving Fund.[18]

However, Wisconsin does not require its utilities to meet this conservation condition, and the nominal funds available in the state's Drinking Water Revolving Fund fail to provide an economic incentive sufficient to offset the federal loan's substantial paperwork requirements.[19] Moreover, there is no Wisconsin law that requires water suppliers or end users to implement conservation measures or to have a formal conservation plan in place. It is against this limited federal statutory backdrop that we consider Wisconsin's implementation of the Great Lakes Charter.

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16. Energy Policy Act of 1992, 42 U.S.C. § 6295(j)-(k) (2000) (mandating the maximum water use allowed for toilets: 1.6 gallons per flush; urinals: 1.0 gallons per flush; showerheads and faucets: 2.5 gallons per minute).

17. AMY VICKERS, HANDBOOK OF WATER USE AND CONSERVATION 20 (2001).

18. Safe Drinking Water Act, 42 U.S.C. § 300j-15(b) (2000) (amended 1996); VICKERS, *supra* note 17, at 17, 20; Lameka, *supra* note 14, at 16.

19. According to the Wisconsin DNR, while the costs associated with a local governmental unit's voluntary development of a conservation plan may be loan eligible, the amount of money available in the State Revolving Fund for Wisconsin drinking water systems does not approach identified needs. E-mail from Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. DNR, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (Oct. 26, 2005) (on file with Midwest Envtl. Advocates); Telephone interview with Dan Duchniak, Waukesha Water Util. Manager (Oct. 18, 2005) (on file with Midwest Envtl. Advocates).

2. *The Great Lakes Charter's Legacy in Wisconsin: Conservation Plan but No Implementation*

In 1985, the governors of the eight Great Lakes States signed the "Great Lakes Charter," a voluntary agreement to provide consistent Great Lakes water policies among the jurisdictions.[20] Among other things, the Charter encouraged water conservation and consultation among the states. After Governor Anthony Earl signed the Great Lakes Charter, Wisconsin acted to implement the Charter by creating a statute governing water withdrawals.[21] This statute went beyond the Great Lakes Charter in that it also applied to Mississippi River Basin waters. A first for Wisconsin, the statute directed Wisconsin's Natural Resources Board to create a "water quantity resources plan for the protection, conservation and management of the waters of the state."[22]

It is unclear, in hindsight, whether the statute's top-down approach requiring planning with no implementation mandate was ineffective or whether there was a lack of political will. Regardless, it became apparent after several years that although the Natural Resources Board fulfilled its statutory duty and created a plan, little headway was made towards implementing the conservation plan.[23]

Policy Recommendation: State conservation planning requirements should be accompanied by implementation requirements.

3. *The Great Lakes Charter's Legacy in Wisconsin: A Paper Tiger Regarding Water Withdrawals*

At least on paper, Wisconsin's law requires conservation for major water withdrawals, whether new or increased. Section 281.35 of the Wisconsin Statutes requires that persons seeking new or increased withdrawals resulting in a "water loss" averaging more than 2 million gallons per day in any 30-day period obtain a water loss permit.[24] The statute further requires that, as a condition precedent to obtaining a water loss permit, applicants

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20. The Great Lakes Charter: Principles for the Management of Great Lakes Water Resources, Feb. 11, 1985, http://www.cglg.org/projects/water/docs/GreatLakesCharter.pdf.

21. WIS. STAT. § 281.35 (2006).

22. *Id.* § 281.35(8).

23. *See generally* Lynn MCINTOSH & ALLEN SHEA, WIS. DEP'T NATURAL RES. WIS. WATER QUANTITY RES. MGMT. PLAN (1987).

24. WIS. STAT. §§ 281.35(4)(b)(1)-(2) (2006). In the case of increased withdrawals, a person must obtain a water loss permit if such person proposes to increase an existing withdrawal that will result in a water loss averaging more than two mgd in any thirty-day period above the person's authorized base level of water loss. *Id.* § 281.35. "Authorized base level of water loss" is statutorily defined in WIS. STAT. § 281.35(1)(b) (2006).

must describe the "conservation practices" they intend to follow.[25] Among the various grounds for approval, the applicant must show that its current water use "incorporate[s] reasonable conservation practices."[26] As an additional ground for approval, if the withdrawal is an inter-basin transfer, the state or province to which the water will be diverted must demonstrate that it "has developed and is implementing a plan to manage and conserve its own water quantity resources, and that further development of its water resources is impracticable or would have a substantial adverse economic, social or environmental impact."[27]

Despite this strong conservation language, over the past twenty years, no water users triggered the two million gallons per day water loss threshold until two years ago.[28] Even then, the Department of Natural Resources (DNR) did not require the handful of large power plants that, in fact, met the threshold over the past two years to have conservation measures in place as a condition of permit approval.[29]

Accordingly, activation of the state's provisions has proven remarkably elusive. The statute's conservation provisions were not triggered by either the joint request in 1988 of the Village of Pleasant Prairie and the City of Kenosha to divert over three million gallons of water per day out of the Great Lakes Basin or the recent request by the Manitowoc Public Water Utilities to increase the amount of Lake Michigan water it withdraws by up to thirty million gallons per day.[30] Even the proposed Oak Creek power

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25. *Id.* § 281.35(5)(a)(15).

26. *Id.* § 281.35(5)(d)(3).

27. *Id.* § 281.35(5)(d)(7)(a) (2006). For purposes of this section, "inter-basin diversion means a transfer of the waters of the state from either the Great Lakes basin or the upper Mississippi River basin to any other basin." *Id.* § 281.35(1)(g) (2006). Note that this is much broader than the definition of inter-basin diversion in the draft Charter Annex Implementing Agreements. Great Lakes—St. Lawrence River Basin Sustainable Water Resources Agreement, Dec. 13, 2005, http://www.cglg.org/projects/water/docs/12-13-05/Great_Lakes-St_Lawrence_River_Basin_Sustainable_Water_Resources_Agreement.pdf [hereinafter 2005 Great Lakes Agreement].

28. *See infra* note 37.

29. In the last two years, a number of power plants that use cooling towers, rather than once-through cooling systems, have exceeded the threshold and thereby required water loss permits. Telephone Interview with Duane Schuettpelz, Section Chief, Wastewater Permits & Pretreatment, Wis. DNR (Oct. 31, 2005). The DNR did not require conservation measures as part of their approval, explaining that such measures do not readily lend themselves to water use for power production as the primary use of the water is for cooling purposes. *Id*.

30. *See* Memorandum from C.D. Besadny, Sec'y, Wis. DNR, to the Honorable Tommy G. Thompson, Governor of Wis. (Aug. 13, 1987) (on file with Midwest Envtl. Advocates); Telephone Interview with Duane Schuettpelz, *supra* note 29; WIS. DNR, MANITOWOC WITHDRAWAL EVALUATION (2004) [hereinafter MANITOWOC EVALUATION] (on file with Midwest Envtl. Advocates).

plants did not prompt enforcement of these provisions.[31] Indeed, the threshold used to trigger the conservation requirement—a water loss averaging in excess of two million gallons per day in any thirty-day period—is set so high that, practically speaking, the majority of new or increased water withdrawals are excluded from the statute's conservation requirements.[32]

Beyond the fact that Wisconsin Statute section 281.35 is ineffective as a means to achieve water conservation, the statute's reliance upon complicated and unclear water loss calculations has resulted in a confusing and unnecessary regulatory process. In order to calculate water loss for purposes of determining whether water loss averages exceed two million gallons per day over any given thirty-day period, the statute requires the calculation of consumptive water use.[33] "Consumptive use" is defined in the statute as

> a use of waters of the state, other than an interbasin diversion, that results in a failure to return any or all of the water to the basin from which it is withdrawn. "Consumptive uses" include, but are not limited to, evaporation and incorporation of water into a product or agricultural crop.[34]

Limited guidance is provided under NR 142.04(1)(g) regarding how to determine consumptive use. Consumptive use determinations vary based on the intended use of the withdrawn water; for instance, thermoelectric power generation, public use, irrigation, or industrial use.[35] However, most of these determinations rely on the use of water loss coefficients. For example, NR 142.04(1)(g) provides as follows:

> If a person is making a withdrawal for the purpose of operating a public water system, a coefficient to be determined by each person operating such a facility shall be used to determine consumptive use. By March 1, 1989, each person to which this paragraph applies shall provide the department written documentation specifically identifying the consumptive use coefficient, and the method, calculation, formula or device used in determining the coefficient.[36]

No further guidance is provided in the relevant rules and regulations regarding how to calculate this coefficient, and it does not appear that the DNR

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31. *See id.*

32. *See supra* notes 29-31.

33. WIS. STAT. § 281.35(1)(L) (2006) (defining "water loss" as "a loss of water from the basin from which it is withdrawn as a result of interbasin diversion or consumptive use or both."). An "interbasin diversion" is defined as "a transfer of waters of the state from either the Great Lakes basin or the upper Mississippi [R]iver basin to any other basin." WIS. ADMIN. CODE § NR 142.02(10) (2000). For the definition of "consumptive use," see the text accompanying note 34.

34. WIS. STAT. § 281.35(1)(c) (2006). "Consumptive use" has the meaning designated in section 281.35(1)(c) of the Wisconsin statute. WIS. ADMIN. CODE § NR 142.02(3) (2000).

35. *See* WIS. ADMIN. CODE § NR 142.04 (2000).

36. *Id.* § NR 142.04(1)(g).

has required persons making withdrawals to provide the agency with these prescribed coefficients.

An argument can be made that the DNR should adopt clearer rules for developing these coefficients and require that they be kept on file in accordance with NR 142. However, given the current statutory scheme, such measures would serve a very limited purpose. As demonstrated in the case study below,[37] it is not necessary for the DNR to even conduct a water loss analysis to determine if a water loss permit is required except in those rare instances involving the very largest water withdrawals. Given that most of the municipal utilities in the state have already undergone expansions and updates in recent years, the DNR does not anticipate many, if any, municipal utilities coming close to triggering the two million gallon per day threshold in the foreseeable future.[38] The only applicants that have ever been required to obtain a water loss permit are those constructing large gas fired thermoelectric power plants using cooling towers instead of once-through cooling systems.[39]

Thus, while perhaps providing an administrative convenience by curtailing the number of water loss permits being processed and issued over the years, section 281.35 supports a regulatory course that will be self-defeating for the state in the long run. As demonstrated by the small number of water loss permits granted over the statute's twenty-year history, the statute's high threshold and water loss provisions fail to deter inefficient water waste on the part of most of the state's water users. The state's failure in this respect harms its ability to prevent local water shortages, like those presently arising in critical portions of the state, which, in turn, have the potential to strain state resources and require more governmental regulations.[40]

The recent request by Manitowoc Public Utilities to increase the utility's current rate of withdrawal of Lake Michigan water by up to thirty million gallons per day illustrates these points plainly.[41] The utility sought the increase in order to supply water to the Central Brown County Water Authority, which needed Lake Michigan water to replace its own contaminated groundwater.[42]

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37. *See infra* Part I.B.3.

38. Interview with Lee Boushon, Chief, Drinking Water Sys. Section, Wis. DNR (Sept. 8, 2005).

39. *Id.*

40. Although a solution would be to amend Wisconsin Statute section 281.35 to eliminate the current threshold and water loss provisions and instead implement conservation measures for all water users seeking new or increased withdrawals in excess of 100,000 gallons per day, the 100,000 gallons per day threshold will be effected regardless upon legislative enactment of the Compact. *See* 2005 Great Lakes Compact, *supra* note 1, § 4.10.

41. MANITOWOC EVALUATION, *supra* note 30.

42. *See* Central Brown County Water Authority, *Commonly Asked Questions*, http://www.cbcwaterauthority.com/common.htm (last visited Apr. 1, 2007).

Even with a project of this magnitude, the DNR concluded that the two million water loss threshold was not exceeded.[43] The DNR thus informed the utility that it could proceed with the increased withdrawal without the need to obtain a water loss permit provided other necessary permits and approvals were obtained. As a result, with no water loss permit under consideration, neither the utility nor the water authority was required to comply with any of the conservation provisions. Although questions remain as to whether the DNR properly calculated water loss for purposes of determining if a water loss permit was in fact required, the case surely demonstrates the ineffectiveness of the statute as a conservation tool.

Policy Recommendation: Great Lake States should be careful to devise conservation programs and operative thresholds that impact the majority of new and increased water withdrawals occurring within the state.

4. *Wellhead Protection Program Lacks Implementation*

Although Wisconsin's Wellhead Protection Program identifies water conservation as an objective, it has failed to accomplish its conservation goals. Designed to protect public water supply wells, the Wellhead Protection Program's primary goal is to prevent contaminants from entering public water supply wells by managing the land that contributes water to the wells.[44]

All communities installing a new municipal water supply well after May 1, 1992, must complete a Wellhead Protection Plan containing nine elements, including the development of a "water conservation program."[45]

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43. As set forth within the Manitowoc Water Withdrawal Evaluation:

> Therefore, the proposed withdrawal will be evaluated as an increase above base level of water loss. The withdrawal increase does not include an interbasin transfer of water resulting in an evaluation of consumptive use. The base level of water loss is established as the estimated 2006 level of water loss. Water loss for water utilities in Wisconsin has been assigned a factor of 10%. Data from water utilities is reported on a monthly basis. The daily average from the maximum month will be used to determine the daily average maximum water loss during any 30-day period. A 2006 maximum month average of 9.17 MGD results in a base water loss of 0.917 MGD. The maximum month average of 13.69 MGD results in a water loss of 1.369 MGD. The difference is an increase of 0.452 MGD. This is less than the water loss approval threshold of 2 MGD. No water loss approval is required.

MANITOWOC EVALUATION, *supra* note 30, at 1-2.

44. Wis. DNR, Wisconsin's Wellhead Protection Program, http://www.dnr.state.wi.us/org/water/dwg/gw/wellhead.htm (last visited Apr. 1, 2007).

45. WIS. ADMIN. CODE § NR 811(16)(5)(g) (2000). The DNR maintains a list of communities that have a wellhead protection plan for at least one well. That list identifies 265 communities that actually have a plan out of a total of 564 potential municipal water supply systems that use groundwater. *See* List of Communities in Wisconsin with Wellhead Protection Plans, http://www.dnr.wi.gov/org/water/dwg/gw/whp/communities.pdf. To assist communities in designing Wellhead Protection Plans (WHPs), the DNR provides conserva-

While the DNR identifies an array of water conservation measures, the DNR does not require the community seeking a new well to implement any of these measures.[46] Rather, the state's role is limited to reviewing the "reasonableness" of the water conservation program included within the Wellhead Protection Plan of the municipal well.[47] Other than this requirement, the DNR concedes that Wisconsin has no other specific program to promote or require water conservation.[48]

Moreover, there appear to be no financial incentives, like those offered under the Smart Growth law, provided to communities interested in launching a conservation program. In fact, no financial assistance of any kind appears to be available for community water conservation programs under Wisconsin's Wellhead Protection Program.[49] This void lies in contrast to the state's lake planning and lake protection grant programs, both of which are administered by the DNR and funded by water resources account funds arising from the motorboat gas tax.[50] Under these state programs, the financial incentive provided to local organizations involves grants to "assist lake planning projects," which provide seventy-five percent of the costs associated with their lake monitoring, education, and planning work.[51]

Further demonstrating the low priority given to this aspect of the program, Wisconsin neither maintains a database keeping track of the communities that have water conservation programs nor tracks implementation of

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tion information on its website. *See* WIS. DNR, BUREAU OF DRINKING WATER AND GROUNDWATER, A TEMPLATE FOR PREPARING WELLHEAD PROTECTION PLANS FOR MUNICIPAL WELLS (2000), http://www.dnr.wi.gov/org/water/dwg/gw/whp/whptplat.pdf [hereinafter PREPARING WELLHEAD PROTECTION PLANS].

46. *See infra* notes 57-58 and accompanying text.

47. *Id.*

48. E-mail from Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. DNR, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (May 3, 2005) (on file with Midwest Envtl. Advocates). The DNR does provide materials on its Wellhead Protection website to offer assistance to communities in designing a water conservation program. *See* PREPARING WELLHEAD PROTECTION PLANS, *supra* note 45; Wis. DNR, Wellhead Protection Slideshow, http://dnr.wi.gov/org/water/dwg/gw/whp/whp-ss.htm (last visited Apr. 1, 2007).

49. E-mail from Jill Jonas, Bureau Director, Drinking Water and Groundwater, Wis. DNR, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (Apr. 20, 2005) (on file with Midwest Envtl. Advocates).

50. "Grants made under this program will assist lake planning projects. They will assist local organizations by helping to provide information and education on the uses of lakes, the quality of water in lakes, and . . . will be used to improve lake management assessment and planning . . . ." WIS. ADMIN. CODE § NR 190.001 (2000); *see also* WIS. STAT. §§ 281.68-.69 (2006).

51. *See* E-mail from Ezra Meyer, Wis. Ass'n of Lakes, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (Oct. 31, 2005) (on file with Midwest Envtl. Advocates); Wis. DNR, Lake Planning Grants, http://www.dnr.state.wi.us/org/water/fhp/lakes/lakeplan.htm (last visited Apr. 1, 2007); Wis. DNR, Lake Protection and Classification Grants, http://dnr.wi.gov/org/caer/cfa/grants/Lakes/lakeprotection.html (last visited Apr. 1, 2007).

those programs.[52] As such, while there may be best management practices in place and municipalities who can teach others how to conserve, no such data has been gathered on a statewide level. Finally, like the state water conservation plan, the Wellhead Protection Program does not require implementation or enforcement, thus relegating the conservation component to nothing more than a paperwork requirement.

The lack of financial incentives combined with no legal requirements to implement the conservation program has resulted in another missed opportunity at the state and local level to increase the number of Wisconsin communities developing sustainable water uses.

Policy Recommendation: Existing or new statutory programs should be directed to set measurable water conservation goals, require actual implementation of conservation programs, and provide financial incentives comparable to that of Wisconsin's lake planning grant program.

C. Gaps and Opportunities for Reusing Water

Conserving water with reclaimed or reused water presents both a gap and an opportunity for Wisconsin. Many communities in Wisconsin currently operate at a water deficit; that is, they are using more water than is being replenished to their water supply.[53]

Water deficits are a product, in many respects, of customary consumption and water treatment practices. Most water systems throughout the United States, including Wisconsin, use "wasting" or "once through" water systems—water is withdrawn, used once, and then discarded.[54] In the city of Waukesha, for example, water is drawn from underground aquifers, used, and then discharged into the Fox River where it is transferred out of Waukesha's water system.[55] In contrast, "recycling" systems reclaim used water, treat it, and re-use it for a number of beneficial purposes, including groundwater recharge, irrigation, commercial uses, and wetlands restoration.[56]

When developing and implementing a water recycling system, it is important to understand federal and state laws regulating water reuse, water quality, and water quantity. In 2004, the U.S. Environmental Protection

52. *See id.*
53. *See supra* note 11.
54. *Id.*
55. *Id.*
56. It has been estimated that "recycling" or "recharge" water systems can support eight to twenty people per acre in contrast to the two to five people supported by wasting systems. *See generally* Douglas S. Cherkauer & Sajjad A. Ansari, *Estimating Ground Water Recharge from Topography, Hydrogeology and Land Cover*, GROUND WATER, Jan.-Feb. 2005, at 102.

Agency published federal guidelines pertaining to water reuse.[57] The document, however, is solely informational and does not impose legally binding requirements on the states or other entities.[58] As such, no federal regulations directly govern water reuse practices in Wisconsin or in any other state.[59]

Nonetheless, as of 2002, twenty-five states have adopted regulations regarding the use of reclaimed water.[60] A number of states, including Florida and California, have developed extensive water reclamation guidelines.[61] In contrast, Wisconsin has not promulgated any state regulations or guidelines specifically addressing water reuse for purposes other than the irrigation of non-food crops.[62] Further inquiry is needed to determine whether and to what extent existing water quality and water storage regulations restrict the use of large-scale water recycling systems in the state.

While a clear prohibition exists against underground injection systems that fail to meet drinking water standards, it has long been permissible under Wisconsin law to use treated wastewater for land applications, including groundwater recharge, once a WPDES permit has been obtained and state surface water quality standards have been met.[63] Although primarily intended as a means to treat rather than to reuse water, more than 100 municipalities across Wisconsin as well as numerous industrial facilities already use treated wastewater in land use applications, including seepage cells, infiltration basins, and spray irrigation.[64] For example, the City of Lake

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57. U.S. EPA, MUNICIPAL SUPPORT DIV., EPA/625/R-04/108, GUIDELINES FOR WATER REUSE (2004) [hereinafter GUIDELINES FOR WATER REUSE].

58. "This document is intended to be solely informational and does not impose legally binding requirements on EPA, states, local or tribal governments, or members of the public." *Id*. at 1.

59. *Id*. at 149; *see also* E-mail from Robert Bastion, Senior Envtl. Scientist, U.S. EPA Office of Wastewater Mgmt., to Donna McGee, Midwest Envtl. Advocates (July 27, 2005) (on file with Midwest Envtl. Advocates) ("Individual states under state authority, rather than EPA, directly regulate water reuse. . . . While EPA certainly could develop water reuse/recycling criteria or regulations under the Clean Water Act, I know of no ongoing effort in this area or plans to do so in the near future.").

60. GUIDELINES FOR WATER REUSE, *supra* note 57, at 149.

61. FLA. STAT. §§ 373.250, 373.1961, 367.0817(3), 403.135, 403.086(7) (2005).

62. The EPA's federal guidelines include a summary of state reuse regulations and guidelines; Wisconsin's sole entry regards regulations addressing "Agricultural Reuse Non-Food Crops." *See* GUIDLINES FOR WATER REUSE, *supra* note 57, at 152, 388.

63. Telephone Interview with Chuck Hammer, Attorney, Bureau of Legal Servs., Wis. DNR (May 9, 2005); *see also* E-mail from Tom Gilbert, Wastewater Facility Planning Coordinator, Bureau of Watershed Mgmt., Wis. DNR, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (May 18, 2005) (on file with Midwest Envtl. Advocates); WIS. STAT. § 160 (2006); WIS. ADMIN. CODE §§ NR 140, 206, 214 (2000).

64. Telephone Interview with Tom Gilbert, Eng'r, Wastewater Facility Planning Coordinator, Bureau of Watershed Mgmt., Wis. DNR (May 18, 2005) (on file with Midwest Envtl. Advocates); *see also* Telephone Interview with Scott Tesmer, Plant Supervisor, Lake

Geneva maintains one of the largest municipal land applications in the state.[65]

Impediments may nonetheless arise with regard to limits on total Nitrogen and Coliform emissions. In order to meet these standards, treatment facilities need to modify current wastewater treatment methods if water reclamation is to have any chance of proceeding. While in theory wastewater plants can treat to any level, depending upon how much money their community is willing to spend, Wisconsin's locale and soil composition requirements are likely to prove cost-prohibitive for large municipalities needing to acquire large tracts of land for seepage cell installation.[66] This is especially true given the legal imperative that municipal systems pursue "cost effective" design solutions, which, as a practical matter, encourages communities to prioritize their bottom line over water quantity concerns.[67]

Given the state's failure to actively promote water reuse on any large-scale basis, the next important step for Wisconsin in moving towards a sustainable water supply is the development of strategies for the implementation of an institutional and regulatory framework for the use of reclaimed water. Wisconsin communities then would be in a better position to use reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.

Policy Recommendation: The Great Lakes States should commit to the development of an institutional and regulatory framework pertaining to the use of reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.

D. Gaps and Opportunities in Land Use Planning

Wisconsin's Comprehensive Planning Legislation,[68] more commonly referred to as Smart Growth, reflects the culmination of a national movement led by public officials, developers, environmentalists, and other community members seeking intelligent growth and land uses. Smart Growth endeavors to protect farmland, historic and cultural resources, and areas of natural scenic beauty and to guide development.

Enacted in October of 1999, Wisconsin's Smart Growth law requires that by 2010, every city, village, county, and town in the state that undertakes certain land use related actions will be guided by a comprehensive

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Geneva Wastewater Treatment Facility (May 20, 2005) (on file with Midwest Envtl. Advocates).

65. *See id.*

66. Telephone Interview with Tom Gilbert, *supra* note 64.

67. *Id.*; *see also* WIS. ADMIN. CODE § NR 110 (2000).

68. WIS. STAT. § 66.1001 (2006).

land use plan that addresses specific elements and goals.[69] Unlike the conservation program component of the state's Wellhead Protection Program discussed above, Smart Growth provides financial incentives through state grants and dividends to local governments that promise to meet certain criteria and successfully implement the comprehensive plans.[70]

Many land use activities have the potential to impact both the quality and quantity of a community's groundwater.[71] As to groundwater quality, an improperly sited landfill could leak contaminants into the groundwater supply. In terms of groundwater quantity, expanding development and paved over roads, shopping centers, and parking lots contribute to increased run-off of precipitation into lakes and streams rather than its infiltration into the ground where it would recharge the underlying aquifers. As a result, less water is available for groundwater recharge at the same time that the growing community's demand for groundwater is increasing.

The Smart Growth law sets forth nine elements that each community must develop in its comprehensive land-use plan.[72] Under the agricultural, natural, and cultural resources element of the law, groundwater and surface water is addressed as a resource that should be included in a local community's "compilation of objectives, policies, goals, maps and programs."[73] However, because the law was not intended to prescribe specific plans and policies for local communities, the communities themselves must determine, through their planning process, what their groundwater issues are and how to address them.[74]

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69. *Id.*

70. Communities in Wisconsin are eligible to receive state planning grants provided by the Wisconsin Department of Administration to pay approximately half of the costs associated with the preparation of a comprehensive plan required under the law. WIS. STAT. § 66.1001 (2006). As of March 2004, over 600 governmental bodies have received over $11.3 million in funding from the Comprehensive Planning Grant Program. *See* 1000 Friends of Wisconsin, Perfecting the Places We Live and Protecting the Places We Don't, Funding for Comprehensive Planning, http://www.1kfriends.org/Community_Planning/WI_Comprehensive_Planning/Funding.htm (last visited Apr. 1, 2007).

71. *See* Wis. Groundwater Coordinating Council, *Groundwater and Its Role in Comprehensive Planning: Comprehensive Planning and Groundwater Fact Sheet 1* (July 2002), *available at* http://dnr.wi.gov/org/water/dwg/gw/pubs/SmartGrowth1.pdf [hereinafter *Groundwater Fact Sheet*].

72. The nine Smart Growth Local Plan Elements include: Issues and opportunities; Housing; Transportation; Utilities and community facilities; Agricultural, natural and cultural resources; Economic development; Intergovernmental cooperation; Land-use; and Implementation. *See id*.

73. Nonetheless, communities interested in protecting their community groundwater supplies must be sure to prioritize groundwater issues within this process, as Smart Growth's sole reference to groundwater appears in its fifth element entitled "Agricultural, natural and cultural resources," where it is lumped together for consideration with sixteen other natural, historical, and cultural resources. *Id*. at tbl. 2.

74. WIS. STAT. § 66.1001(2)(e) (2006).

Although Smart Growth does not specifically require communities to prepare and submit groundwater management plans, Smart Growth planning funds can be used for groundwater planning. Groundwater management plans, if properly conducted, are premised on groundwater studies and, optimally, principles of groundwater budgeting.[75] The hydrogeologic assessment of a community's groundwater provides answers to a number of critical questions including: the availability of water in the community's underlying aquifers; the recharge rate of the aquifers; the aquifer's recharge areas; and the effect that new development could have on the community's water supply. Especially in those areas experiencing declining aquifer levels and problems with water quality, these considerations are imperative to sound future development and land use decisions.

While the costs of the necessary groundwater studies and modeling are not insignificant, the benefits in terms of long-term, sustainable economic development make it a worthwhile investment.[76] One way to prioritize where to spend scarce resources would be to require this degree of in-depth planning in communities that are currently experiencing, or at risk of experiencing, water quality or quantity problems.

Moreover, a number of neighboring communities can pool their resources together to finance a groundwater management plan for their area, in the manner recommended under Smart Growth with regard to multi-jurisdictional comprehensive plans.[77] With improved information and resource support, local governments would be in a better position to protect vital areas like groundwater recharge zones, wetlands, and floodplains through zoning laws, conservation plans, and development guidelines.[78]

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75. *See Groundwater Fact Sheet*, *supra* note 71.

76. E-mail from Greg Kessler, Dir. Dep't Cmty. Dev., City of New Berlin, to Jodi Habush Sinykin, Of Counsel, Midwest Envtl. Advocates (May 4, 2005) (on file with Midwest Envtl. Advocates) (identifying the $235,000 in costs associated with Groundwater studies conducted in New Berlin over the past seventeen years, which ultimately led to the identification of New Berlin's groundwater recharge zone and the subsequent enactment of a model land-use ordinance to protect this area). This zoning ordinance, based upon the principles of noted conservation planner, Randall Arendt, and recently approved by New Berlin's Common Council, establishes a seventy-five percent Open Space requirement for new subdivision developments. *See* NEW BERLIN, WIS. CODE ch. 275 (2005), http://www.newberlin.org; Reid J. Epstein, *New Berlin OKs Conservation Rule*, MILWAUKEE J. SENTINEL, Apr. 13, 2005, http://www.jsonline.com/news/wauk/apr05/317956.asp (last visited Apr. 1, 2007).

77. Wisconsin Department of Administration, Comprehensive Planning Grant Program, http://www.doa.state.wi.us/pagesubtext_detail.asp?linksubcatid=368&linkcatid=224&linkid=7 (last visited Apr. 1, 2007).

78. *See Groundwater Fact Sheet*, *supra* note 71, at tbl. 2 (noting that the infiltration requirements provided under WIS. ADMIN. CODE § NR 151, subchapter III, which requires to the maximum extent possible, the infiltration of stormwater or "run-off volume," is another opportunity for the statue's progress in this area).

Thus, while Smart Growth represents an important step towards curtailing unplanned and haphazard development, it is up to communities to utilize the law effectively to prepare an integrated water resources management plan and land use plan that are in harmony with the local water supply. By taking the initiative and acknowledging the key relationship between land use decisions and water issues, Wisconsin communities can move toward an environmentally sustainable future.

Policy Recommendation: Great Lakes state land use laws and annexation policies need to be amended or enacted to proactively protect water supplies, including groundwater recharge zones, and to facilitate water supply planning at both the local and state level.

E. Gaps and Opportunities for Conservation in Water Utility Rates

1. *Overview of Utility Rate Structures*

In the U.S. there are five ways that utilities structure the rates they charge their customers, with each structure providing different incentives or disincentives for water conservation: Flat Rate, Uniform Rate, Declining Block Rate, Increasing Block Rate, and Seasonal Rates.[79] Flat rates charge users a fixed price regardless of the amount of water used. This is the least effective method of encouraging water usage reduction as it fails to internalize the costs of increased usage. Uniform rates charge the user the same unit rate for all water usage. They are minimally effective in encouraging water conservation. Declining block rates charge users less as usage increases. This rate structure discourages efficient water use for large water uses. Increasing block rates charge users more as their usage increases; this rewards efficient water usage and therefore reduces usage. There are two kinds of seasonal rates: differentiated seasonal and summer seasonal. Summer seasonal rates charge users a higher rate for water used during the summer. Differentiated seasonal rates have surcharges directed only at users whose peak season use exceeds average use during off-peak season. Both varieties encourage water users to be efficient by reducing uses during peak season.

The Wisconsin Public Service Commission (PSC) has the authority to set the rate structures for water utilities.[80] Water utilities are municipal water systems that provide fresh water to residential and industrial customers in its service area. The Wisconsin PSC has selected the declining block rate

79. In a 1996 survey conducted by the American Water Works Association (AWWA), 827 water facilities throughout the United States were asked to identify their rate structures and distilled five different rate structures. *See* Lameka, *supra* note 14, at 30.

80. WIS. STAT. § 66.0815(2)(a) (2003).

as its state-wide pricing structure.[81] As the name suggests, a declining or decreasing block rate provides a volume discount to water users; thus, the more you use, the less you pay per unit used.[82] The initial usage is charged at the highest rate.[83] Thus, under the declining block rate pricing structure, there is a financial disincentive to conserve water because the price of water decreases as consumption increases.[84]

The rationale commonly provided for the utilization of a declining block rate is that "unit costs decrease with increased usage."[85] In theory, a utility's efficiency increases when greater demand is placed upon its systems.[86] Where increased uses cost less for the utilities to operate, these savings are passed on to the consumers. From the perspective of the utilities, it follows that reduced usage, a goal of water conservation, translates into reduced revenue streams and potential fiscal problems. While a declining block rate is therefore beneficial to commercial and industrial users who use large amounts of water, the clear problem with this structure, at least from a conservation perspective, is that it promotes maximal amounts of water usage.[87]

Municipalities throughout Wisconsin are given the authority to own and operate public utilities. Any town, village, or city can own and operate a public utility pursuant to the limitations created by the Wisconsin Statutes in Chapter 196.[88] Municipal public utilities are utilities owned and operated by a city, village, or town that conduct their public service functions, not in a governmental capacity, but in a proprietary capacity.[89] As such, municipalities operate their water utilities as business entities and thus have the power to determine their own prices for water utility services.[90] The revenue that a utility generates is designed to support the costs associated with the operation of the utility. Thus, so long as the prices established are consistent with the rate structure established by the PSC, each municipal public utility may set its own water prices.[91]

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81. *See* Pub. Serv. Comm'n of Wis., FAQ's-Water and Sewer, Questions related to the Process of Conventional and Simplified Rate Cases, http://psc.wi.gov/consumerinfo/faq%27s/water/waterFAQ-index.htm (last visited Apr. 1, 2007) [hereinafter Pub. Serv. Comm'n, Rate Case Process].

82. *See* United Water Delaware, Customer Info, Customer Bill of Rights, http://www.unitedwater.com/uwde/customer.htm (last visited Apr. 1, 2007).

83. Lameka, *supra* note 14, at 30.

84. *Id.* at 31.

85. Patrick C. Mann, *Water-Utility Regulations: Rates and Cost Recovery* 13 (Policy Study No. 155, 1993), http://www.reason.org/ps155.html (last visited Apr. 1, 2007).

86. *Id.*

87. Lameka, *supra* note 14, at 31, tbl. 17; *see also* VICKERS, *supra* note 17.

88. *See* WIS. STAT. § 66.0803(1)(a) (2006).

89. *Id.* § 66.0801(1)(a); Pub. Serv. Comm'n, Rate Case Process, *supra* note 81.

90. Pub. Serv. Comm'n, Rate Case Process, *supra* note 81.

91. WIS. ADMIN. CODE. § PSC 185.21 (2001).

A recent survey conducted by the American Water Works Association found that, as a region, Midwestern states tend to price their water lower than the prices set by other areas of the country.[92] The survey results also indicate that the average monthly price of water in the state ($16.56 monthly based upon 7,750 gallons of use) is significantly lower than the national average ($19.85 monthly based up 7,750 gallons of use).[93] There is also a large variation in water rates charged within the State of Wisconsin. A selected Comparison of Net Quarterly Water Bills in Wisconsin is found below.[94]

Wisconsin PSC's reliance on a declining block rate structure to set water rates throughout the state, together with the PSC's silence on conservation, are impediments to conservation.[95] Economic studies indicate that water prices influence water conservation behavior.[96] Rate structures that charge for the amount of water used or charge a higher rate for consumption above a certain level encourage people to use water on a more efficient basis notwithstanding the effect of price elasticities for utilities.[97] Given this

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92. AMERICAN WATER WORKS ASS'N & RAFTELIS FIN. CONSULTANTS, INC., WATER AND WASTEWATER RATE SURVEY 2004 94 (2004) [hereinafter AWWA SURVEY]. Note that median calculations were based upon rate surveys of 266 facilities: 41 in the Northeast, 51 in the Midwest, 101 in the South, and 73 in the West. *Id.* at 94, 103. Rate data is current as of the later part of 2003. Based on 7,750 gallons of use per month, the rates were: $25.41 for the Northeast, $17.18 for the Midwest, $18.17 for the South, and $19.41 for the West. *Id.*

93. *Id.* at 24-33. The survey bases average water use on responses received from 263 U.S. water systems. These authors calculated the Wisconsin average based upon water charges (7,480 gallons of use) provided for the six Wisconsin utilities (7,480 gallons) as found in Exhibit 2 of the AWWA SURVEY. Note that the study does not prove a breakdown of regional averages, only medians as discussed in the previous footnote.

94. *See* Pub. Serv. Comm'n of Wis., Comparison of Net Quarterly Bills of Wisconsin Water Utilities Using Rates in Effect as of February 26, 2007 (Division of Water, Compliance and Consumer Affairs Bulletin 25, 2007).

95. Yet another impediment to conservation arises in the context of municipal finance systems. Over past years, the trend has been for municipal utilities across the state to shift from property taxes to user charges to finance the utilities' capital improvement costs. The impact of this from a conservation perspective is that if a utility's customers start conserving water, the utility's revenue stream will be insufficient to cover its capital costs. Under this kind of finance system, where capital repayment is based on user charges rather than property taxes, conservation may be viewed as a threat. Telephone Interview with Chuck Ledin, Bureau Dir., Office of the Great Lakes (July 25, 2005) (on file with Midwest Envtl. Advocates).

96. Lameka, *supra* note 14, at 29 (citing Ben Dziegielewski, *Management of Water Demand: Unresolved Issues* (2003), http://www.ucowr.siu.edu/updates/pdf/V114_A1.pdf.

97. Utility services that are basic necessities, like water, have been found to be relatively price-inelastic; that is, price changes do not necessarily induce significant usage reductions. David Sheard, Assistant Adm'r of the Div. of Water, Compliance and Consumer Affairs, Wis. PSC, Presentation to the Groundwater Advisory Committee (Oct. 19, 2005), http://dnr.wi.gov/org/water/dwg/gac/presentations/sheard101905.pdf. Nonetheless, a variety of arguments exist in support of increased water pricing, with some advocating for pricing based upon relative water scarcity and others arguing in favor of price adjustments made

reality and Wisconsin's increasing water concerns in highly populated parts of the state, the PSC would be wise to take a closer look at the state's present rate structure and adopt alternatives that favor water conservation.

The PSC should proceed mindful of the lessons learned in other states that water rate structures work best as a conservation tool when coupled with a sustained customer education program.[98] Indeed, due to the common perception that water is "free," before people will be willing to consider higher water rates, they will need to understand that water charges pay for all the costs of water service, including finding and building new water sources.[99]

2. *The Delaware Lead*

Indeed, Wisconsin and the other Great Lakes States and provinces should follow Delaware's lead when reviewing their rate structures. In January of 2005, the State of Delaware implemented, under a state-wide contract with United Water, a new rate structure with the express aim of rewarding residential customers who conserve water.[100] The pricing structure adopted is an inclining block rate. While there remain flat rates for items such as fire protection and service charges, the rate system is designed to be revenue neutral with the unit price of water increasing as consumption increases.[101] For example, after a resident consumes over 5,000 gallons, the price per 1,000 gallons increases from $2.48 to $2.64.[102] If a resident consumes over 20,000 gallons, the price rate per 1,000 gallons increases again to $3.07.[103]

This new conservation pricing was adopted in conjunction with the conservation outreach efforts of the Delaware River Basin Commission, which includes Delaware, New York, New Jersey, and Pennsylvania. These states have faced water quantity problems comparable to those faced currently by Southeastern Wisconsin.[104]

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along a continuum of essential water uses, critical water uses, and discretionary water uses. *Id.* at 29; *see also* Robert Glennon, *The Price of Water*, 24 J. LAND RESOURCES & ENVTL. L. 337, 340 (2004).

98. *Id.*

99. *Id.*

100. *See supra* note 82.

101. *See id.*

102. *See id.*

103. *See id.*

104. *Id.*; *see also* United Water Delaware, Conservation, Conservation Inspiration, http://www.unitedwater.com/uwde/consrvtn.htm (last visited Apr. 1, 2007); *see also* Welcome to the Delaware River Basin Commission's Web Site, http://www.state.nj.us/drbc/ (last visited Apr. 1, 2007).

Policy Recommendation: The Great Lakes States should facilitate application of an increasing block rate structure to areas or communities in the state experiencing worrisome water quantity or quality concerns. Water use then could be accurately priced to motivate water conservation measures that limit consumption and promote water reuse.

3. *Opt Out Alternative for Large-Scale Users*

Yet another potential impediment to conservation is Wisconsin's failure to provide a state-wide prohibition on large-scale users "opting out" of the available municipal water supply. Indeed, if a large industrial water user were to determine that the municipal utility's water pricing or proposed conservation measures were undesirable from a corporate perspective, Wisconsin law allows the facility to opt out of the municipal system and drill a high capacity well of its own provided that it meets existing statutory requirements.[105] This scenario would result in a smaller pool of utility customers for the same fixed operating costs, thereby creating fiscal difficulties for the municipal water utility. While it remains unclear to what extent large-scale users are opting out of municipal systems, large-scale users' ability to opt out may discourage municipal utilities from initiating conservation pricing and undermine implementation of system-wide water conservation initiatives.[106] In recent correspondence between the PSC and the Waukesha Water Utility, the PSC relied on the "opt out-death spiral" rationale to discourage the utility's request for approval of a conservation rate structure in Waukesha: "Often in a water rich state like [Wisconsin] true conservation rate structures result in . . . water utilities losing industrial customers who may have other options, which then simply fuels the rated death spiral for the customers who remain."[107]

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105. 2003 Wisconsin Act 310 (2004).

106. PSC Cost Engineer, Bruce Schmidt, echoed similar concerns at the prospect of a conservation rate structure. In his view, large industry, like Kohler and General Motors, when faced with a flat or inclining rate structure, would simply switch over to a private well, to the detriment of residential customers forced to pay more for their water. *See* Telephone Interview with Bruce Schmidt, Cost Eng'r, Wis. PSC (July 29, 2005) (on file with Midwest Envtl. Advocates). In addition, while the PSC's rate structure applies to municipal customers, according to the DNR roughly two-thirds of Wisconsin's population drinks water drawn from over 750,000 private, non-municipal wells that are not impacted by the PSC rates. *See* Wis. DNR, Information for Homeowners with Private Wells, http://www.dnr.state.wi.us/org/water/dwg/prih2o.htm (last visited Apr. 1, 2007); B.R. Ellefson et al., U.S. Dep't of the Interior, Water Use in Wisconsin (Open-File Report 02-356, 2000) [hereinafter Water Use in Wisconsin].

107. E-mail from Dave Sheard, Assistant Adm'r of the Div. of Water, Compliance and Consumer Affairs, Wis. PSC, to Waukesha Water Util. (Aug. 31, 2005) (on file with Midwest Envtl. Advocates).

Policy Recommendation: Great Lake States should consider statutory or regulatory measures to preclude large scale water users—not already implementing a conservation program on par with that of the available municipal utility—from opting out of available public water utility systems.

F. Summary

As the analysis of Wisconsin's incentives and disincentives to conservation demonstrates, current state laws and economic structures can impede water conservation objectives on both a local and a state-wide basis. Part II explores water conservation opportunities for Great Lakes States like Wisconsin under the Great Lakes Compact and prospective state implementing legislation. By examining best management practices utilized by other municipalities and states around the country, the authors have identified a Water Conservation Toolkit useful to policymakers across the region.

II. DEVELOPING A SUCCESSFUL CONSERVATION PROGRAM CONSISTENT WITH THE GREAT LAKES COMPACT

Compared to other states in the Southern and Western United States, the eight Great Lakes States are water rich. Some areas of the Great Lakes region, however, are already facing challenges to their water supplies, including drawdown of groundwater aquifers and problems with water quality.[108] In other communities, water demands are quickly exceeding available supplies.[109]

The Great Lakes Compact provides a valuable opportunity to bring water conservation to the forefront in the Great Lakes States. The Compact provides:

> Within two years of the effective date of this Compact, each Party shall develop its own Water conservation and efficiency goals and objectives consistent with the Basin-wide goals and objectives, and shall develop and implement a Water conservation and efficiency program, either voluntary or mandatory, within its jurisdiction based on the Party's goals and objectives.[110]
>
> Within two years of the effective date of this Compact, the Parties commit to promote Environmentally Sound and Economically Feasible Water Conservation Measures such as:
>
> a. Measures that promote efficient use of Water;
>
> b. Identification and sharing of best management practices and state of the art conservation and efficiency technologies;
>
> c. Application of sound planning principles;

108. *See supra* note 11.
109. *Id.*
110. 2005 Great Lakes Compact, *supra* note 1, § 4.2.2.

d. Demand-side and supply-side Measures or incentives; and,

e. Development, transfer and application of science and research.[111]

The Compact further provides that communities seeking diversions of Great Lakes water must meet the Exception Standard, which in addition to other criteria, requires the applicant to demonstrate that the proposed diversion will incorporate "Environmentally Sound and Economically Feasible Water Conservation Measures [in order] to minimize Water Withdrawals or Consumptive Use."[112] Likewise, the Compact's Decision Making Standard includes as one of its mandatory criteria that "The Withdrawal or Consumptive Use will be implemented so as to incorporate Environmentally Sound and Economically Feasible Water Conservation Measures."[113] As another important impetus for conservation under the Exception Standard, the Compact requires applicants for diversions to demonstrate "that there is no feasible, cost effective, and environmentally sound water supply alternative within the Great Lake watershed to which the Water will be transferred**,** including conservation of existing water supplies . . . ."[114]

Thus, as the Compact works its way through the state legislative process on its path toward Congressional ratification,[115] Great Lakes States' policymakers have much to accomplish at the state and local level in order to meet the Compact's strong conservation ethic. The states' endeavors in this respect can be optimally accomplished through (A) the enactment of Compact implementing legislation which clarifies and strengthens the Compact's conservation provisions, and (B) the development and implementation of comprehensive, measurably successful, state conservation plans.

A. The Great Lakes States Should Enact Implementing Legislation to Clarify and Strengthen the Compact's Conservation Provisions

On December 13, 2005, the eight Great Lakes States signed the historic Great Lakes–St. Lawrence River Basin Water Resources Compact.[116] However, the Compact will not become enforceable until each of the Great

111. *Id.* § 4.2.4.
112. *Id.* § 4.9.4.
113. *Id.* § 4.11.
114. *Id.* § 4.9.4.
115. As discussed below, although the Great Lakes Compact was signed by the eight Great Lakes Governors on December 13, 2005, the Compact will not become enforceable until each state has enacted the Compact through state legislation and it has been ratified by the United States Congress. *See infra* Part II.A.
116. Also signed that day by the eight Great Lakes Governors and the Premiers from Ontario and Quebec was the Great Lakes–St. Lawrence River Basin Sustainable Waters Resources Agreement, an agreement that will be implemented in Ontario and Quebec through Provincial laws. 2005 Great Lakes Agreement, *supra* note 27.

Lakes States enacts the Compact through its own state legislation and it is ratified by the United States Congress.[117] Currently, state legislation seeking to ratify and implement the Compact is being drafted and considered by the eight states, with varying degrees of progress. Because the Compact provides a floor, or minimum, standard, the Compact affords the party states flexibility in how it can be implemented at the state level in a number of important respects.[118] Accordingly, legislative study committees[119] and legislatures have been considering implementing legislation that, in addition to other matters, may include clarifying language or improvements to the Compact's water conservation provisions.[120]

1. *State Implementing Legislation Should Require Measurably Successful Implementation of Water Conservation Measures and Programs Prior to a Community's Application for a Diversion*

Common sense and experience dictate that, while it is easy to set lofty goals, it is far more difficult to achieve them. As such, only by requiring communities to implement conservation measures and programs, demonstrating *measurable* savings *before* their application for a diversion of Great Lakes Basin water, can society be assured that the conservation goals of the Compact will be realized. It is on this basis that state implementing legislation should include the following provision:

> Consistent with party state discretion under the Compact, the Exception Standard as set forth at Compact Section 4.9.4 shall be interpreted to require that the need for all or part of the proposed Exception cannot be reasonably avoided through the demonstrated conservation and efficient use of existing water supplies.

This provision will require parties applying for diversions to prove they have first reasonably reduced their need through conservation and efficient use of their current water supplies.

2. *State Implementing Legislation Should Clarify the Compact's "Economically Feasible" Caveat*

The Compact's core conservation ethic risks being compromised by the caveat that conservation measures and incentives be "economically fea-

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117. 2005 Great Lakes Compact, *supra* note 1, § 9.4.

118. *Id.* § 4.12.1; *see also* Memorandum from John Stolzenberg, Chief of Research Servs. & Rachel Letzing, Senior Staff Attorney, to Members of the Special Committee on Great Lakes Water Resources Compact (Sept. 26, 2006), http://www.legis.state.wi.us/lc/committees/study/2006/GLAKE/files/memono4_glake.pdf.

119. Wisconsin, for example, has commenced a Legislative Council Special Committee on the Great Lakes Water Resources Compact. *See* Stolzenberg, *supra* note 118.

120. *Id.*

sible." As demonstrated time and again in other legal contexts, the application of a cost-benefit analysis to "free" natural resources like water leads to the undervaluation of the resource. Accordingly, if left unaddressed, this caveat will undermine the implementation of conservation programs both inside and outside the Basin, as communities will undoubtedly rely upon it to limit any water conservation measures deemed "too costly." Given political reality, when environmental benefits are pitted against budgetary constraints and costs to the populace, the environment will lose every time, unless there is some mechanism in place to require verification by the applicant of any claimed "economic infeasibility."

It is on this basis that Wisconsin's implementing legislation should include the following provisions:

> (i) Application of the Exception Standard:
>
> Consistent with state discretion under the Compact, it will be incumbent upon the applicant for a diversion to assess and to justify the economic feasibility or infeasibility of available water conservation measures pursuant to the Compact's Exception Standard.
>
> (ii) Application of the Decision-Making Standard:
>
> Consistent with state discretion under the Compact, it will be incumbent upon the applicant for a new or increased withdrawal to assess and to justify the economic feasibility or infeasibility of available water conservation measures pursuant to the Compact's Decision-making Standard.

B. The Great Lakes States Should Strive Toward the Development of a Measurable, Mandatory, and Comprehensive State Conservation Plan

1. *State Plans Should Require Measurable Conservation Goals that Can Be Monitored and Evaluated*

As stated above, while each party state's water conservation and efficiency goals are to be consistent with the Basin-wide Water Conservation and efficiency goals articulated by the regional Council, the Compact provides states with the flexibility to develop a water conservation program that reflects its own goals and objectives. The Great Lakes States should take this opportunity to explore an array of conservation strategies for the state, rather than limit its scope to demand-side or voluntary measures. State policymakers should be sure to require measurable water conservation goals and objectives that can be monitored and evaluated annually. In places where this has occurred, the water savings are also fiscal savings, and in places where this has been ignored, conservation has made little progress.

2. *State Plans Should Require Conservation for Large Water Users and Eliminate Opt Out*

As described in Part II.1 above, some states like Wisconsin are silent on the subject of requiring all water users within a municipal water system's boundaries to hook up to the system.[121] This opens the door for large water users to opt out of a municipal water system and seek their own water supply to avoid water conservation requirements. This would result in a smaller pool of utility customers for the same fixed operating costs, thereby creating fiscal difficulties for the municipal water utility. To counter this and promote conservation, the state's conservation program should consider prohibiting large water users not already implementing a conservation program on par with the available municipal utility's from opting out of the municipal water supply.

3. *State Plans Should Identify a Comprehensive Array of Conservation Practices and Best Available Technologies*

Conservation plans are typically comprised of a variety of best management practices that entail conservation measures or incentives that have proven to be cost-effective and water efficient. Choosing the best management practices to form the backbone of a successful conservation plan is a task that may seem daunting for policy-makers given the wide variety of conservation measures and incentives from which to choose. With the goal to assist Great Lakes regional policymakers and stakeholders to develop successful conservation programs with measurable results, this Article provides a sample Great Lakes States Conservation Toolkit containing the twelve best management practices.

As the following discussion illustrates, there is no such thing as a one-size-fits-all conservation plan. Communities need to tailor their conservation plans to their own population's needs, norms, and values. Outlined below is the three-step process used to develop our toolkit. Step one discusses the need to create water-use profiles. It examines water use in Wisconsin, using Waukesha County as an example, to gain a better understanding of how this information can help inform the selection of best management practices. Step two explores various best management practices and water conservation programs currently implemented in other states—programs that can be used as models for water conservation in Wisconsin. Step three involves selection among these programs and best management practices.

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121. *See supra* note 105.

C. Example of an Effective Conservation Plan: The Great Lakes Conservation Toolkit

1. *Step One: Developing a Water-Use Profile*

An important first step in developing a successful conservation program at the local and state level is to develop a water-use profile. A water-use profile serves two functions: first, it should provide a realistic sense of a community's water supply and future water needs; and, second, it should detail where, when, and how water is being used. Understanding both the historic and projected water supplies and demands can help communities develop water budgets and set realistic conservation goals to help balance these budgets. Likewise, understanding how water is being used, and in what quantities, can help decision makers select conservation measures and incentives that will prove most effective.

An examination of Wisconsin's water usage statistics, for example, would help policymakers target areas where they can achieve the greatest benefit. In 2000, Wisconsin residents withdrew approximately 7,594 million gallons of water a day from surface and groundwater sources.[122] Of this amount, seventy-nine percent (6,094 million gallons) was withdrawn almost exclusively from surface waters for use in thermoelectric power production.[123] According to the U.S. Geological Survey, withdrawals for thermoelectric use in Wisconsin in 2000 constituted over four times the amount of water withdrawn for all other uses combined.[124]

The majority of water used for thermoelectric power generation is for cooling purposes. In Wisconsin, approximately ninety-nine percent of this water is returned to the natural system, ultimately becoming available for other uses.[125] However, even consumptive use as low as one percent of total withdrawals can lead to staggering water use numbers when large volumes of water are involved.[126] As such, conservation measures targeting thermoelectric uses will be discussed later in this Article.

It is noteworthy that over sixty-five percent of Wisconsin's seventy-two counties, including Waukesha County, did not withdraw any surface or

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122. Water Use in Wisconsin, *supra* note 106.

123. *Id.*

124. *Id.*

125. *Id.*

126. According to the authors of a National Renewable Energy Laboratory report on consumptive water use for U.S. power production, "The total amount of water evaporated seems insignificant compared [to] the total amount of water passing through the power plant, but when compared to the amount of energy and water consumed in a typical commercial building or residential home, these values are significant." P. TORCELLINI ET AL., NATIONAL RENEWABLE ENERGY LABORATORY, CONSUMPTIVE WATER USE FOR U.S. POWER PRODUCTION 1 (2003).

groundwater in 2000 for thermoelectric purposes.[127] Further, thermoelectric water withdrawals in two counties, Milwaukee and Manitowoc, comprised over fifty percent of the state's total water withdrawals for use in thermoelectric power production in 2000.[128] As such, and for ease in comparing water use figures statewide to those in Waukesha County, the ensuing discussion excludes thermoelectric water withdrawals.

According to the most recent national water use data released by the U.S. Geological Survey, water use in Wisconsin, excluding thermoelectric power use,[129] broke down as follows: industrial (41%), domestic (19%), irrigation (13%), public use and loss (10%), commercial (9%), and agricultural (8%).[130] To put things into perspective, estimates indicate that residents of Southeastern Wisconsin withdrew approximately 100 gallons of water per person per day from groundwater sources in 2000.[131]

This suggests that considerable statewide water savings may be realized by targeting industrial and domestic users and by focusing on irrigation practices. It is important to recognize, however, that the largest categories of water consumption at the state level may vary from the largest water users at the local level. For example, as the use figures for Waukesha County in 2000 indicate, domestic water use comprised the largest water use group in the county, followed by industry, public use, and losses.[132]

National figures indicate that sixty-nine percent of residential water use occurs indoors, with the remaining thirty-one percent being used outdoors.[133] However, given Wisconsin's shorter and cooler summers, it is likely that indoor use in the state comprises an even higher percentage of total domestic water use than the national average. Water use in the home

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127. Water Use in Wisconsin, *supra* note 106.

128. *Id.*

129. *Id.*

130. *Id.*

131. This figure is based on an analysis of 2000 pumpage figures reported by various utilities in Southeastern Wisconsin for each well that it operates. Daily per capita water use was obtained by dividing pumpage figures by the population of each community as reported in the 2000 Census. Pumpage figures include water extracted from the aquifer for all purposes including residential, commercial, and industrial uses. In cases where the utility does not supply water to an entire community, as is the case, for example, in New Berlin, the per capita consumption calculated (93.0 gallons per capita per day) is artificially low. A more accurate estimate of per capita groundwater use can be made by examining pumpage figures from utilities that supply virtually an entire community, for example, Brookfield/Elm Grove, Cedarburg, and Grafton among others. Daily per capita water consumption in these communities in 2000 was 95.7 gpd, 134.9 gpd, and 123.3 gpd, respectively. *See* E-mail from Dr. Douglas Cherkauer, Professor, Univ. of Wisconsin, Milwaukee (Sept. 11, 2005) (on file with Midwest Envtl. Advocates).

132. More precisely, they broke down as follows: domestic (37%), industrial (24%), public use and loss (18%), commercial (13%), irrigation (7%), and agricultural (1%). Water Use in Wisconsin, *supra* note 106.

133. VICKERS, *supra* note 17, at 12.

typically breaks down as follows: toilet (26.7%), washing machine (21.7%), faucets (16.7%), showers (15.9%), leaks (13.7%), other (2.2%), bath (1.7%), dishwasher (1.4%).[134] This suggests that conservation measures aimed at reducing residential water use, particularly in the bathroom where more than half of all indoor water use occurs, have the potential to lead to considerable savings. Domestic water savings can also be realized through water conservation programs targeting residential outdoor use. Most outdoor water use occurs in the summer months and the increases in water use during this concentrated period of time can place a seasonal strain on utility supplies.

Further, industrial water use accounted for a large portion of water use in Wisconsin and Waukesha County, forty-one and twenty-four percent, respectively. Industrial use was the single largest use category in Wisconsin, and the second largest use category in Waukesha County. Commercial use constituted eight percent and thirteen percent, respectively, of all water use in Wisconsin and Waukesha County in 2000—comprising the fourth largest use category in Waukesha County and the lowest (sixth) use category in Wisconsin.[135]

When examining water use by user category, it is noteworthy that industrial and commercial customers account for significantly greater water usage per site, compared to residential customers. As a result, greater water savings are often realized on a per customer basis when targeting these customers as opposed to residential customers.[136] Additionally, while residential use is fairly consistent, commercial and industrial use typically varies widely among customers. This suggests that when implementing conservation measures targeting industrial and commercial users, significant initial results can be achieved by focusing on the highest water users in each of these use categories.[137]

Water use for irrigation purposes comprised thirteen percent and seven percent of total water use in Wisconsin and Waukesha County, respectively.[138] While these figures are relatively low, it is important to note that Portage, Adams, and Waushara Counties reported the highest water uses for irrigation purposes in the state for 2000 and collectively comprised over half

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134. *See* P. W. MAYER & WILLIAM B. DEOREO, AMERICAN WATER WORKS ASS'N, RESIDENTIAL END USES OF WATER (1999); Every Drop Counts, http://www.everydrop.org (last visited Apr. 1, 2007).

135. Water Use in Wisconsin, *supra* note 106.

136. These figures were obtained by taking gallons of water sold by the City of Waukesha Water Utility, as reported in its 2004 Annual Report, to residential, commercial, and industrial customers and dividng these figures by the average number of residential, commercial and industrial customers, respectively, provided in this same report. Waukesha Water Utility, Annual Report for the Year Ended December 31, 2004, at W-16 (2005).

137. VICKERS, *supra* note 17, at 230-31.

138. Water Use in Wisconsin, *supra* note 106.

of the daily water use for irrigation purposes statewide.[139] Irrigation-based conservation initiatives targeting these three counties will likely yield considerable results.

Finally, water consumption for public uses and losses is worth noting. The public use and loss category refers to uses not specifically categorized, such as water use in some public parks, schools, buildings, water used for fire control, main flushing, water lost from broken water mains, and from transfer and distribution systems.[140] In examining ways in which to reduce water consumption in this category, it is important to examine the percentage of unaccounted for losses in water systems. Unaccounted-for losses can vary from a small percentage to over seventy percent of a system's total water pumpage.[141] Water utilities reporting high unaccounted for losses can save considerable amounts of water by instituting leak detection and repair programs. The City of Waukesha Water Utility currently has a low unaccounted for loss figure, reporting unaccounted for losses of six percent in 2004.[142]

2. *Step Two: Identifying, Evaluating, and Assessing Conservation Measures and Incentives*

Once decision makers understand their community's water use profile and develop conservation goals that set out the numeric water use reduction for which they are aiming, the next step in developing a conservation program is to identify, evaluate, and assess the existing myriad of conservation measures and incentives. Conservation measures come in many different forms and vary considerably in cost and ease of implementation. A compilation of national examples of water conservation measures and incentives can found in the Appendix of this Article.

Water demand is inconsistent—it can, and often does, vary dramatically throughout any given day and from one season to the next. As a result, water distribution systems are designed to accommodate peak demand. Water treatment plants and storage facilities are often built as much as four times larger than the average daily demand on the system in order to accommodate these peak periods.[143] During peak periods, which often occur in the summer months, water systems may not be able to maintain adequate

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139. *Id.*

140. *Id.*

141. OFFICE OF WATER, U.S. EPA, CASES IN WATER CONSERVATION: HOW EFFICIENCY PROGRAMS HELP WATER UTILITIES SAVE WATER AND AVOID COSTS 15 (2002), http://www.epa.gov/watersense/docs/utilityconservation_508.pdf.

142. Waukesha Water Utility, *supra* note 136, at W-16.

143. MINN. DEP'T OF ENVTL. PROT., REDUCING PEAK DAY DEMANDS CAUSED BY LAWN WATERING (2001), http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/reducing_peak_demands.pdf.

water pressure for basic drinking and residential functions, provide water to tall buildings, or provide water to fight fires.[144] Reducing peak water demands can help reduce pressure on water systems and defer capital expenditures for expensive plant expansions. Thus, in addition to reducing overall water demand, comprehensive conservation plans should also aim to reduce peak usage, for example, through selection of best-management practices that seek the reduction of outdoor water use in the summer months.

a. Traditional Best Management Practices for Water Conservation

Traditional and commonly accepted methods of water conservation focus on best management practices to reduce human consumption and water demand. A list of various best management practices implemented in other communities can be found in the Appendix. These best management practices typically take two forms: conservation measures and conservation incentives. Conservation measures are discussed in detail below and can be further characterized as hardware/technical measures or behavioral measures. Incentives address how to motivate people to implement a particular conservation measure and are typically educational, financial, or regulatory.[145] Conservation incentives fall under three broad categories: educational incentives (including school curricula, bill inserts, advertisements, demonstrations, training programs, and conservation checklists), financial incentives (including rebates, conservation rate structures, incentives and surcharges, bill credits, and metering), and regulatory incentives (including water efficiency ordinances, laws and plumbing codes requiring water-efficient fixtures, landscape standards, irrigation scheduling, and penalties for outdoor water waste).[146]

i. *Public Education*

Public education is an essential element to any conservation program. Public education is often not part of discussions of water conservation measures for two reasons: first, it is virtually impossible to quantify resulting water savings; and second, there are hundreds of different educational tools available. One of the main obstacles to implementing water conservation programs, however, is public perception that water is plentiful.

A recent survey conducted by the Great Lakes Commission on current water conservation practices of the Great Lakes–St. Lawrence Region found that the majority of municipal water supply facilities that do not have formal conservation plans in place cited perception of adequate water supply as the

144. VICKERS, *supra* note 17, at 140.
145. *Id.* at 5-6.
146. *Id.* at 7.

reason.[147] Public education can begin to alter behavioral patterns and can help residents understand the extent and limits of the area's water resources. Armed with this knowledge, the public can and may press policymakers to enact and to implement more stringent regulations to protect one of Wisconsin's most valuable resources.

ii. *Reducing Residential Water Use*

Significant water savings can be realized by targeting residential water use. Some of the most common conservation measures used in the home include replacing water-guzzling toilets, faucets, and showerheads with low-volume counterparts or through the installation of retrofit devices. Unlike behavioral measures that require continual reinforcement, technical measures produce water savings long after they are initiated and only require a one-time commitment on the part of consumers. Other technical measures include faucet, toilet, and shower leak detection and repair, and replacing dishwashers and washing machines with more water efficient models. A list of the above-mentioned residential and domestic water efficiency hardware measures and the potential water savings they can achieve are located in the Appendix. Behavioral water efficiency measures are also important, and can include turning off faucets when they are not in use or when brushing teeth and shaving, washing only full loads of laundry and dishes, taking shorter showers, and refraining from using the toilet as a trash can.[148]

Water savings can also be realized through water conservation programs targeting residential outdoor use. As discussed earlier, due to the seasonal nature of outdoor water use, reductions in this area can significantly impact peak water usage. Frequent sources of outdoor water waste include poor irrigation practices: watering too much and for too long, watering pavement areas, and the use of inefficient equipment.

iii. *Reducing Industrial Water Use*

As discussed above, conservation practices targeting Industrial, Commercial, and Institutional ("ICI") water use can net considerable water savings per targeted ICI customer. While residential customers typically use water in similar ways, ICI customers use water for vastly different purposes—manufacturing, running a hospital or health care facility, schools, and restaurants. Conservation measures that produce results in one facility may have a minimal impact in others. On-site water audits can provide the

147. Lameka, *supra* note 14, at 21.

148. *See* VICKERS, *supra* note 17, at 12-133 (detailing information on residential and domestic water use and efficiency measures can be found in Chapter 2).

most accurate assessment of water efficiency in any given facility and can produce custom tailored water conservation strategies.[149] In addition to these water audits, or where individualized water audits are not practical, conservation rate structures can also help reduce water consumption among ICI customers, including peak water usage.

A 2000 study of ICI water use and conservation indicates that potential water savings from ICI conservation measures range from fifteen to fifty percent, with fifteen to thirty-five percent being typical.[150] Amounts spent on ICI conservation plans are typically recouped by ICI customers through reductions in water and energy costs within one to four years, with most paybacks occurring in less than 2.5 years.[151]

iv. *Reducing Agricultural Water Use*

In the agricultural realm, inefficient irrigation technology and practices are major sources of water waste. There are three basic types of irrigation systems in use throughout the country: surface (gravity) irrigation, sprinkler irrigation, and micro-irrigation.[152] According to the U.S. Geological Survey, all irrigation reported in Wisconsin in 2000 was of the "spray" type.[153] The efficiency of spray irrigation systems varies considerably and falls in the range of sixty to ninety-eight percent.[154] Inefficient uses of water also result from evaporation and wind drift caused by water being applied at great heights, non-uniform application of water, and malfunctioning systems.[155]

Examples of agricultural-related water efficiency measures include the use of low energy precision application or drip irrigation systems, the recovery and reuse of tailwater, the lining of canals, and behavioral measures such as altering irrigation patterns based on weather conditions and monitoring soil moisture.[156] As was true with ICI customers, irrigation and agricultural water use practices differ among customers. Water audits conducted on-site can help agricultural customers understand how their water is being used and help customers develop site-specific water conservation practices.

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149. *Id.* at 152-53 (discussing landscape water use and efficiency measures, see Chapter 3).

150. *Id.* at 235.

151. *Id.*

152. *Id.* at 332.

153. Water Use in Wisconsin, *supra* note 106.

154. The highest water efficiencies (90-98%) result from a low energy precision application combined with the use of furrow dikes. *See* VICKERS, *supra* note 17, at 333, 339.

155. *Id.* at 332-34.

156. *Id.* at 6.

v. *Reducing Thermoelectric Water Use*

Typically in thermoelectric power plants, heat is removed from the power production cycle with a condenser that relies on cooling water.[157] The two major types of cooling systems for thermoelectric power plants are once-through and closed-loop cooling systems.[158] The U.S. Geological Survey categorizes thermoelectric power use in each state by cooling system, as it is a primary determinant of the amount of consumptive use relative to withdrawals.[159]

According to the U.S. Geological Survey, almost all thermoelectric water withdrawals in Wisconsin in 2000 were used in "once through" cooling systems.[160] These systems pass water withdrawn from nearby sources through heat exchanges to condense steam. Because the water does not directly contact the air, consumption through evaporation at the power plant is minimal.[161] The water, however, is returned to the natural system at a much higher temperature than when it was withdrawn. In addition to the impacts this thermal pollution can have on fragile ecosystems, the elevated temperature of the water increases evaporation, indirectly leading to increased water consumption.[162]

Recently, several power plants using closed-loop cooling systems have been constructed in Wisconsin.[163] These systems are designed to reduce the amount of water that is withdrawn from water sources. Through the use of cooling towers, cooling water is recycled between a cooling tower and a heat exchanger. During the process, water is evaporated in order to cool the cooling water. As a result, water must be withdrawn to make up for the evaporated water. Due to evaporation, closed-loop cooling systems consume much more water than once-through systems. However, these systems withdraw significantly less water from water sources, thereby reducing environmental impacts associated with the intake of large quantities of water and thermal pollution resulting from the discharge of this water at high temperatures.[164]

New technologies for reducing water withdrawals and consumption through the use of once-through cooling systems are being developed. The U.S. Department of Energy's National Energy Laboratory initiated a re-

157. TORCELLINI ET AL., *supra* note 126, at 1.

158. *Id.* at 9.

159. Susan S. Hutson et al., U.S. Dep't of the Interior, *Estimated Use of Water in the United States in 2000*, 1268 U.S. GEOLOGICAL SURV. CIRCULAR 35 (2004), *available at* http://pubs.usgs.gov/circ/2004/circ1268/pdf/circular1268.pdf.

160. *Id.* at 39.

161. TORCELLINI ET AL., *supra* note 126, at 9.

162. *Id.*

163. *See* Telephone Interview with Duane Schuettpelz, *supra* note 29.

164. TORCELLINI ET AL., *supra* note 126, at 10.

search and development program to develop technologies and approaches to reduce the amount of freshwater used by power plants and to minimize potential impacts of these power plants on water quality.[165] Thermoelectric power plants in Wisconsin should be regularly updated to ensure that the most water efficient equipment is in place.

Furthermore, reductions in both water withdrawals and water consumption for purposes of thermoelectric power production are also achievable through the use of dry cooling systems.[166] In these systems, water does not come in contact with air. According to the National Renewable Energy Laboratory, "[t]he advantage to dry cooling is the water withdrawals and consumptions are zero."[167] Unfortunately, dry cooling systems are less efficient than once-through cooling systems and have higher capital costs. However, future improvements in dry cooling technology may make these cooling systems an attractive alternative to once-through and closed-loop systems.[168]

b. Water Reuse and Reclamation

Water conservation is commonly associated with water demand management strategies, which aim to reduce human consumption of and demand for water. Another less common approach to water conservation focuses on the reuse and reclamation of treated wastewater. The utilization of reclaimed water for groundwater recharge occurs through the infiltration and percolation of treated wastewater into the underlying shallow aquifer.[169] Recharge can be accomplished through various methods: surface spreading (which can include the use of infiltration basins), the use of vadose zone injection wells, and direct injection techniques.[170] Returning used water to the same water system may reduce groundwater losses to other systems by over eighty percent.[171]

In addition to its recharge potential, the use of reclaimed water also has tremendous water conservation potential. Reclaimed water can be used

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165. NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, PROGRAM FACTS: INNOVATIVE APPROACHES AND TECHNOLOGIES FOR IMPROVED POWER PLANT WATER MANAGEMENT 1, 1-2 (2005), http://www.netl.doe.gov/publications/factsheets/program/Prog078_4P.pdf.

166. TORCELLINI ET AL., *supra* note 126, at 10.

167. *Id.* at 11.

168. *Id.* at 1-4. In addition to the use of improved technology, investment in wind, solar, and other renewable energy systems can provide further reductions in water consumption within power production systems. Ed Brown, *Renewable Energy Brings Water to the World*, RENEWABLE ENERGY ACCESS, Aug. 23, 2005, http://www.renewableenergyaccess.com/rea/news/story?id=35664 (last visited Apr. 1, 2007).

169. GUIDELINES FOR WATER REUSE, *supra* note 57, at 32.

170. *Id.*

171. Cherkauer & Ansari, *supra* note 56, at 102-12.

for a number of purposes for which potable water is typically used, including urban, industrial, agricultural, environmental, and recreational uses, thereby decreasing potable water supply demands. In its *Guidelines for Water Reuse*, published in September 2004, the EPA estimated that 1.7 billion gallons of wastewater were reused nationally and that this number will continue to grow.[172] California, Florida, Texas, and Arizona have large reuse programs in place, and many other states have programs that are rapidly expanding.[173] Examples of several of these reuse programs are listed in the Appendix.

The largest and most developed water reuse programs have been implemented in arid states or in states which experience seasonal droughts.[174] However, due to the significant water savings attributable to water reuse, its use as a water conservation tool is worth examining in Wisconsin. Converting existing infrastructure to allow for the reuse of reclaimed water for non-potable purposes such as irrigation and commercial use may prove prohibitively expensive to many communities, as it requires the creation of a dual distribution system to ensure that potable and reclaimed water are not mixed.[175] However, many of the communities operating with water deficits are doing so because of rapid growth and expansion. In these situations, it may prove financially advantageous for communities to require that any new developments install dual water systems. [176] In contrast, water reuse for the purpose of recharging groundwater could be accomplished on-site at wastewater facilities and would likely require less extensive infrastructure modifications than the dual system required for non-potable reuse.

3. *Step Three: Selecting Conservation Measures and Incentives*

Based on the above analysis of water use patterns and a review of various conservation programs in effect in other communities, a Conservation Toolkit has been amassed, comprised of eleven conservation programs and practices for Great Lakes States' policymakers to consider when developing comprehensive water conservation plans of their own:

(1) School and public information programs;

(2) Residential low-flow toilet and appliance replacement and retrofitting programs and incentives;

(3) Landscape conservation programs and incentives for residential and ICI customers;

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172. GUIDELINES FOR WATER REUSE, *supra* note 57, at 2.
173. *Id.* at 2.
174. *Id.*
175. *Id.* at 2-3, 7-8.
176. GUIDELINES FOR WATER REUSE, *supra* note 57, at 8.

(4) ICI customer on-site audit programs and informational programs and incentives;

(5) Implementation of a conservation rate structure where appropriate;

(6) Promotion of efficient irrigation practices and technologies among residential, ICI, and agricultural customers;

(7) Water facility leak detection and repair to achieve reductions in unaccounted-for-flows;

(8) Land use planning protective of groundwater resources;

(9) Developing groundwater recharge and infiltration systems;

(10) Increased use of reclaimed water in lieu of other water sources—especially for irrigation; and,

(11) Leading by example: water efficient technologies and practices in public parks and buildings.

Developing a successful conservation program is a complex but necessary task, both in keeping with the Compact's conservation provisions and in consideration of the needs of the Great Lakes Region's growing economy and population. The preceding analysis of Wisconsin water use patterns and best management practices adopted in other areas of the country indicates that certain conservation practices and incentives readily lend themselves to local and state-wide initiatives in the Great Lakes region. These measures comprise the Conservation Toolkit, a toolkit that will hopefully be used by state and local policymakers to develop and implement comprehensive water conservation programs for their respective states.

CONCLUSION AND POLICY RECOMMENDATIONS

The eight states of the Great Lakes Region, as elsewhere in the United States, need to take steps to safeguard their water resources, prevent future water conflicts, and respond to Great Lakes Basin communities already experiencing water supply problems. State officials and policymakers would be wise to rectify the existing gaps in state laws and regulatory systems that effectively forestall the implementation of water conservation measures on a local and state-wide basis.

Part I identified and evaluated the shortcomings and opportunities present under Wisconsin state law. To fill these gaps, Wisconsin and other Great Lakes States—who will soon be obligated to meet the Compact's water conservation requirements—should incorporate these principles into their water conservation plans:

(1) Great Lakes States' water conservation programs and planning requirements, specifically those contemplated under the Compact, must include implementation and enforcement provisions to be effective.

> (2) Great Lakes States should devise conservation programs and operative thresholds that impact the majority of new and increased water withdrawals occurring within each state.
>
> (3) Existing or new statutory programs should be directed to set measurable water conservation goals, require actual implementation of conservation programs, and provide financial incentives comparable to that of Wisconsin's lake planning grant program.
>
> (4) The Great Lakes States should commit to the development of an institutional and regulatory framework pertaining to the use of reclaimed water as an additional means of aquifer recharge and as an alternative non-potable water supply to decrease groundwater withdrawals.
>
> (5) State land use laws and annexation policies need to be amended or enacted to proactively protect water supplies, including groundwater recharge zones, and to facilitate water supply planning at both the local and state level.
>
> (6) Local communities within the region should utilize Smart Growth planning efforts and funding to develop comprehensive groundwater management and land use plans.
>
> (7) Great Lakes States should facilitate application of an increasing block rate structure to areas or communities experiencing worrisome water quantity or quality concerns. Water use then could be accurately priced to motivate water conservation measures that limit consumption and promote water reuse.
>
> (8) State legislation or regulations should be enacted to prohibit large water users, not already implementing a water conservation program on par with that of the available municipal utility, from opting out of the municipal water supply.

With the goal of assisting policymakers, stakeholders, and citizens with the development of measurably successful conservation plans in their respective state communities, Part II provided recommendations for Compact-implementing legislation and created a Water Conservation Toolkit for the Great Lakes States based upon programs and practices already in effect in other parts of the country. To most effectively apply the lessons learned from these other communities, the Great Lakes States will need to undergo a realistic assessment of their own water supply and demand trends and work towards a balanced water budget. They will need to identify, evaluate, and assess which conservation measures and initiatives make sense for their state's communities. With the benefit of this knowledge and a vision for the future, planners can think long-term, invest in public education, and take the time and forethought necessary to implement a comprehensive conservation plan in keeping with the Compact's strong conservation ethic.

APPENDIX A

EXAMPLES OF WATER CONSERVATION MEASURES AND INCENTIVES[177]

Conservation Measure or Incentive	**Examples of Communities Implementing Measure or Incentive**
I. SCHOOL & PUBLIC INFORMATIONAL PROGRAMS	
Public Informational (including bill inserts, ads, demonstrations, and publications)	The **Town of Cary, NC** has extensive informational programs in place, including its "Beat the Peak" program which encourages summer water conservation through the use of bill inserts, mailings, newspaper, radio and television advertisements and its "Block Leader" program focusing on indoor and outdoor residential water use. **Phoenix, AZ,** in cooperation with Mesa, Scottsdale and the Arizona Department of Water Conservation, launched the "Water Use It Wisely" water conservation campaign in 2000. It has since expanded into a multi-million dollar campaign with over 250 public and private water companies participating nation-

177. The chart is not intended to provide a comprehensive description of each highlighted city's conservation plans, but rather to illustrate the wide variety of conservation measure in place throughout the United States. Many of the below mentioned programs are extensive and multi-faceted and contain measures and incentives not discussed. For more in-depth descriptions of conservation programs in 17 different communities, see OFFICE OF WATER, *supra* note 141. For a brief summary of water conservation incentives (mostly technical/mechanical) in place in 27 cities, see OFFICE OF POLICY DEV. AND RESEARCH, U.S. DEPT. OF HOUSING AND URBAN DEV., OVERVIEW OF RETROFIT STRATEGIES: A GUIDE FOR APARTMENT OWNERS AND MANAGERS, APPENDIX B (2002). For case studies of Albuquerque, NM, Southwest Florida Management District, the State of California, the City of Calgary, Alberta, Canada, Fukuoka City, Japan, Western Australia and Israel, see LAURA E. KAMINSKI, GREAT LAKES COMMISSION, PUBLIC SECTOR WATER CONSERVATION: TECHNOLOGY AND PRACTICES OUTSIDE THE GREAT LAKES – ST. LAWRENCE REGION (2004).

	wide. The city's conservation programs emphasize public education and awareness and include workshops, public events, literature distributions, and information on efficient appliances. **Houston, TX** conducts a number of outreach activities including providing speakers to local businesses and homeowner's associations, attending trade shows, sponsoring an annual water festival, publishing a quarterly newsletter and preparing and distributing water bill inserts. **Tampa, FL** provides a number of downloadable brochures on its website on topics such as "How to Read Your Water Meter," "Conservation Education Program," "Saving Water Indoors," "Save Water; Fix Leaks" and "Saving Water Outdoors."
School Education Programs	**The Town of Cary, NC** has staff members available to teach elementary and middle school lessons on water conservation and related topics and to arrange tours of water and wastewater treatment plants. **Phoenix, AZ** has several school education programs in place, including water conservation education for grades K-12 and Project WET (Water Education for Teachers). **Houston, TX** has initiated several student and teacher education initiatives, including providing speakers for elementary schools, its "WET in the City" water education program for teachers and a "Team WET Schools" program whereby students, educators and administrators make a commitment to increasing environmental education and stewardship in their communities. **Tampa, FL** has several in-school education efforts in place, including an elementary school program (K-5), a middle

	school program (6-8), a high school program (9-12) and a teacher's program, to teach students, teachers and parents about the importance of water resources and conservation.
II. RESIDENTIAL LOW-FLOW TOILET & APPLIANCE REPLACEMENT & RETROFITTING PROGRAMS AND INCENTIVES	
Water Audits	**The City of Ashland, OR** conducts home or business audits to determine the efficiency of plumbing fixtures, and provides replacement showerheads, faucet aerators and toilet retrofits if needed. Information is also provided on appliance rebates and state tax credits. **The City of Albuquerque, NM** offers free residential indoor/outdoor water audits which include the installation of low-flow shower-heads, aerators and shut off hose nozzles. The city also offers ICI Audits for both large and small account holders.
Consumer Rebates and Other Financial Incentives	**The City of Albuquerque, NM** offers a number of water conservation incentive programs, many taking the form of water bill credits. Residential incentives include the following: Toilet rebates: Residential customers can receive a $125 credit for the first toilet replaced, $75 for the second and $50 for the third. Commercial customers are eligible for credits of $90 per toilet. Dishwasher rebates: $50 rebates. Washing machine rebates: $100 water bill credit. **The City of Ashland, OR** offers toilet rebates to customers who replace existing toilets (3.5 gallons or greater) with ultra-low flush toilets; $45 for the first toilet, $35 for the second and $25 for the third. **El Paso, TX** offers a number of water

	conservation incentive programs to customers of El Paso Water Utilities. Residential incentives include the following: Ultra low-flow toilet rebates: 75% of purchase price up to $100. Washing machine rebates: $200 residential / $300 commercial. **The Metropolitan Water District of Southern California,** through its Residential Rebate Program, provides rebates for low-flush and dual-flush toilets and clothes washers.
Use of Low-Flow Plumbing Fixtures	**Houston, TX** distributes more than 20,000 "water saver" kits to citizens each year to help them reduce water consumption. The kits contain a displacement bag for the toilet tank, dye tablets for testing leaks, a tankee clipper, a flow restrictor and an instruction manual. Kits are also provided to apartment complex owners and managers. **Tampa, FL** provides free plumbing retrofit kits which include showerheads, bathroom and kitchen aerators and dye tablets for leak detection.
III. LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES FOR RESIDENTIAL AND ICI CUSTOMERS	
Promotion of the use of Native and Drought-Tolerant Turf and Plants	**The City of Albuquerque, NM** offers free xeriscape design templates. **The Town of Cary, NC** offers free workshops on landscape planning, drought tolerant plants, and soil improvement and preparation and has a large volume of information on its website. **Tampa, FL** provides free Xeriscape packets.
Consumer Rebates and Other Financial Incentives	**The City of Albuquerque, NM** offers a number of water conservation incentive programs, many taking the form of water bill credits. Landscape incentives include the following:

	Landscape rebates: Credits are given for the removal of high water use landscapes if 50% of the project area is covered by low water use plants as they will appear at maturity. Spray irrigation is not permitted in rebate areas. Single family residential and multi-family and non-residential customers can earn a credit of $0.40 for every square foot of qualifying landscape if a minimum of 500 square feet are converted, up to a maximum of $800 residential and $5,000 non-residential. Multi-setting sprinkler timer rebates - $10 rebates are offered for the purchase of these devices. Rainwater harvesting barrel rebates: $25 water bill credit. **El Paso, TX** offers a number of water conservation incentive programs to customers of El Paso Water Utilities including landscape rebates of up to $1.00 per square foot of established grass area that is converted into environmental sensitive and water conserving landscapes. **The Metropolitan Water District of Southern California** has established the City Makeover Program -- a competitive grant program providing funding for new Southern California Heritage landscape in prominent public locations within the utility's service areas.
Landscape Standards	**The City of Albuquerque, NM** requires that at least 80% of plants on newly developed properties be low or medium water use. All city- owned new developments other than parks, golf courses, and housing (which are subject to other restrictions) must use medium and low water use plants on 100% of landscaped areas. Violators may be found guilty of a misdemeanor and punished by a fine not to exceed $500 and/or imprisonment for a period not to exceed 90 days.

IV. PROMOTION OF EFFICIENT IRRIGATION PRACTICES AND TECHNOLOGIES AMONG RESIDENTIAL, ICI AND AGRICULTURAL CUSTOMERS	
Informational	**Seattle, WA** offers conservation tips for commercial buildings on its website, including information on efficient irrigation practices. **Tampa, FL** provides sensible sprinkling irrigation evaluations, free rain sensors and rain sensor instructions and a free rain barrel kit. **The Metropolitan Water District of Southern California** offers tips on how to use sprinklers more efficiently. Tools include a "Watering Calculator" that creates a customized water schedule and a weekly watering index to help modify watering schedules in response to weather changes.
Irrigation Scheduling / Water Efficiency Ordinances	**The City of Albuquerque, NM** prohibits sprinkler usage from 10 am to 6 pm from April 1 through September 30. A fee of $20 is assessed on the account holder's water bills for first violations and can be as high as $1000 if previous violations have already occurred. **The City of Cary, NC** has a year round alternate day watering ordinance in place and requires rain sensors set at ¼" on all automatic irrigation systems to override irrigation controllers during times of adequate rainfall. Oral or written notices are given for first time violations. Repeat offenders are charged $100 for the first day, $200 for the second, $300 for the third and $400 for every day thereafter. **El Paso, TX** – customers using water from El Paso Water Utilities must comply with mandatory restrictions on certain water use activities including landscape watering day and time restrictions.

	Violations can result in a class C misdemeanor with fines ranging from $50 to $500 per citation. **Tampa, FL** restricts irrigation to a maximum of two times a week with no lawn watering to occur between the hours of 8 am and 6 pm. Other restrictions apply to personal vehicle washing, pressure washing and outdoor aesthetic uses of water. Restrictions apply to all Tampa Water Department customers and to users of all water sources, including well and surface water located inside Tampa city limits. Violations may result in a fine of up to $500 and a mandatory court appearance.
Penalties for Outdoor Water Waste	**The City of Albuquerque, NM** prohibits water waste as a condition of receiving service from the municipal water utility. Enforcement occurs mostly thought complaints which are then observed and documented. Fines are assessed on water bills and increase from $20 for the first offence to $1000 and the addition of a flow restriction device or $2000 for the ninth violation. **The City of Cary, NC** prohibits over watering landscapes by (1) directly watering impervious surfaces and (2) over watering beyond the soil's saturation point. Oral or written notices are given for first time violations. Repeat offenders are charged $100 for the first day, $200 for the second, $300 for the third and $400 for every day thereafter. **El Paso, TX** – customers using water from El Paso Water Utilities are prohibited from wasting water which is defined as (1) landscape watering on the wrong day, (2) allowing water to flow into public rights of way or storm drains and (3) failure to repair a leak within five working days of detecting it. Violations can result in a class C misdemeanor with

	fines ranging from $50 to $500 per citation. **Tampa, FL** prohibits all wasteful and unnecessary water use. Violations may result in a fine of up to $500 and a mandatory court appearance.
V. ICI CUSTOMER ON- SITE AUDIT PROGRAMS, INFORMATIONAL PROGRAMS AND INCENTIVES	
Water Audits	**Houston, TX** conducts water audits for customers with large irrigation landscapes and/or cooling towers. Customers are trained how to use their systems more efficiently in order to decrease water use and reduce their water bills.
Training Programs and Direct Technical Assistance	**Seattle, WA** as part of its "Water Smart Technical Program" offers its regional and ICI Customers information on end use metering, life-cycle cost analysis, speaking engagements on water conservation, technical information on water efficient technologies, bill analysis, water efficient irrigation information an on-site water audits. **Phoenix, AZ** provides technical assistance to industry, business and government by helping create and monitor water budgets, conducting on site water audits, and assisting in developing water conservation plans. The city also provides technical assistance to city departments.
Consumer Rebates and Other Financial Incentives to Encourage Reduction in Water Use (including surcharges and bill credits)	**Seattle, WA,** as part of its "Water Smart Technology Program," offers financial assistance for qualified water conservation projects completed by large and small businesses. Assistance has included up to 50% of the project cost for commercial and multi-family irrigation systems, water efficient changes relating to process water, commercial laundry, vehicle washing and other unique water use technologies. These incentives often

	reduce paybacks from over three years or more to 1-2 years or less. **El Paso, TX** offers a number of water conservation incentive programs to ICI customers of El Paso Water Utilities. These incentives include the following: Refrigerated Air Conditioning: El Paso Water Utilities and El Paso Electric offer a joint rebate of $300 (plus any additional incentives offered by dealers) to customers or builders who replace existing evaporative water cooling systems with central refrigeration units in their existing home or install a unit in their new home. Hot Water on Demand (HWD) Pilot Program: $100 rebate for the installation of an approved Hot Water on Demand or Hot Circulation Pump System. **The Metropolitan Water District of Southern California** has a number of financial incentives in place targeting ICI Customers: The Innovative Conservation Program is designed to provide grants to explore the water savings potential and practicality of new water conserving technologies. Special consideration is given to projects promoting water-landscape saving products or technologies. Save A Buck is an aggressive rebate program tailored for the commercial sector. It includes rebates for the installation of ultra-low flush toilets and urinals ($60), clothes washers ($100+), pressurized waterbrooms ($100+), pre-rinse kitchen sprayers ($50+), cooling tower conductivity controllers ($500+), and X-Ray Film Processor Recirculation Systems ($2000+). The Industrial Process Improvement Program offers financial assistance to local industries to encourage investment in water-saving process improvements.

	Incentives include: the lesser of (1) $2.26 per 1,000 gallons of actual water saved for a one year monitoring period, (2) fifty percent of the project's water-related process improvements, and (3) a buy down of project costs to reduce the simple pay back period to two years.
VI. IMPLEMENTATION OF CONSERVATION RATE STRUCTURES	
	The City of Cary, NC has implemented multi-tiered increasing block water rates. Residential and single family rates range from $3.28 k/gals to $10.83 k/gals. Non-residential and multi-family residential users are given a water budget based on historical water use and are charged $3.75 k/gals for water used up to the budgeted amount and are charged $11.88 k/gals for water use in excess of this amount. Reduced water rates are available for reclaimed water use. **Seattle, WA** has implemented a three-tier seasonal residential rate structure. During off-peak seasons, residents inside the city limits pay $2.35 per 100 cubic feet of water (748 gallons). Rates rise to $2.88 per 100 cubic feet for the first 1,000 cubic feet used in 60 days from May 16th through September 15th, $3.35 per 100 cubic feet for the next 2,600 cubic feet and $8.55 per 100 cubic feet for over 3,600 cubic feet used in 60 days. Commercial users pay $2.00 per 100 cubic feet used off peak and $3.35 per 100 cubic feet from May 16 through September 15 in addition to a set per month base service charge that can range from $6.90 to $1,668 depending on meter size. **Houston, TX** revised its model contract for industrial and municipal users in 1994. Customers whose consumption exceeds their normal average 30-day

	billing period by more than 10% are charged a 5% penalty. Contract customers are required to prepare conservation plans. **Tampa, FL** has implemented an increasing block rate structure. Residential rates are based on a five-tier system with prices per 100 cubic feet ranging from $1.04 to $3.12 inside the city limits. Commercial rates are based on a four-tier system with prices per 100 cubic feet ranging from $1.20 to $3.12 inside the city limits.
VII. WATER FACILITY LEAK DETECTION AND REPAIR	
	Illinois – all Lake Michigan water users, as a condition to receiving an allocation permit from the Illinois DNR, must reduce unaccounted-for flows to 8% or less based on annual pumpage and implement leak monitoring programs To comply with the Illinois requirement, Chicago has implemented a five-year, $620 million capital improvement program to reduce unaccounted-for flow and water pumpage by replacing 50 miles of leaking water mains each year.
VIII. LEAD BY EXAMPLE – WATER EFFICIENT PRACTICES IN PUBLIC PARKS AND BUILDINGS	
	Seattle, WA has been actively pursuing water conservation measures internally. Seattle currently has 16 city-owned projects participating in the LEED Program (Leadership in Energy & Environmental Design), including the Carkeek Park Environmental Learning Center. Biofiltration swales and infiltration trenches at the center will reduce impact on city water supplies and recharge the aquifer. No storm water will drain off site. Rainwater captured from the roof and

	stored in a cistern and rain barrels will help water plants and flush toilets. These features, along with faucet aerators, low volume and pressure assist toilets will reduce net water use at the center by more than 30%.[178]
IX. REDUCTION OF THERMOELECTRIC WATER USE	
	U.S. Department of Energy – in order to reduce the amount of freshwater used by power plants and to minimize impacts on water quality, the U.S. Department of Energy's National Energy Technology Laboratory has initiated a power plant water research and development program through its Innovations for Existing Plants (IEP) program. The program aims to develop technologies to better manage how power plants use and impact fresh water sources. The project is built around partnerships with industry, academia and other government and non-government organizations. Five research projects are currently being conducted including, "Use of Produced Water in Recirculated Cooling Systems at Power Generation Facilities," "Water Extraction from Coal-Fired Power Plant Flue Gas," and "Environmentally Safe Control of Zebra Mussel Fouling."

178. Information on the City of Seattle's internal conservation programs is on file with Midwest Environmental Advocates.

APPENDIX B

EXAMPLES OF WATER RECYCLING PROGRAMS[179]

Location of Program	**Description**
Orange County, CA Orange County Water District ("OCWD")	Orange County's Groundwater Replenishment System ("GWR"), scheduled for completion in 2007, will take waste water and purify it to levels similar or better than bottled water. This purified water will be used to replenish the groundwater basin underlying north and central Orange County. Purified water will be pumped to spreading basins and will follow the same natural filtering path as rainwater and will also be used to expand the seawater intrusion barrier that currently keeps the Pacific Ocean out of the groundwater basin. Once in the groundwater basin, the purified water will blend with groundwater from the Santa Ana River and imported sources. Upon completion, the GWR will generate enough pure drinking water to meet the needs of 114,000 families, exceed all state and federal drinking water standards and be the largest water purification project of its kind in the world. OCWD currently operates Water Factory 21 which treats reclaimed water. This water is then blended with deep well water and pumped into the groundwater basin via a series of 23 multi-point injection wells. The injected water forms a water-mound between the ocean and groundwater basin preventing seawater intrusion. The majority of water injected ultimately augments Orange County's domestic groundwater supply. OCWD also currently owns and operates 1,000 acres of recharge spreading facilities including 17 major facilities.

179. Information on the programs described is on file with Midwest Environmental Advocates.

El Paso, TX El Paso Water Utilities ("EPWU")	The Fred Hervey Water Reclamation Plant, located in Northeast El Paso, Texas, purifies reclaimed water to drinking water quality levels for reinjection into the Hueco Bolson through a series of injection wells. In 2004, a total of 577 million gallons of reclaimed water was returned to the Hueco Bolson. The plant also supplies approximately 889 million gallons of water to the El Paso Electric Company each year for use in their cooling towers and approximately 187 million gallons of water to a local golf course for irrigation purposes. Beginning in 2005, the plant will supply 20 million gallons of water annually to the City of El Paso Regional Park with this number expected to increase to 72 million gallons annually after full implementation of the program. In addition to the Fred Hervey Plant, El Paso Water Utilities has several other water reclamation facilities.
Denver, CO Denver Water	Denver's new recycling plant on the South Platte River in Commerce City came on line April 1, 2004 and is the largest in the state. From start up through the end of the irrigation season in the fall of 2004, approximately 1,344 million gallons of recycled water were delivered to customers via twelve miles of pipeline. Customers included schools, parks and golf courses. Phase two of the distribution system, which will add a storage reservoir, pump station and six additional miles of pipe is scheduled to be completed by 2007. Future phases will provide recycled water to additional parks and schools, as well as the Denver Zoo, Airport and University. At full capacity, the recycling plant will receive 45 million gallons of water a day from Metro Wastewater's treatment plant.
Gilbert, AZ	Since 1986, the town of Gilbert, Arizona has been using 100% of its reclaimed water. A portion of the reclaimed water is being used to charge the shallow water table through 18 recharge ponds located on over 175 acres at two urban locations and a third site measuring 70 acres. An added benefit of these recharge areas is the creation of a desert riparian habitat that attracts a variety of wildlife – these riparian areas occur naturally on less than 1% of the land in Arizona but support 60% of the state's wildlife. Reclaimed water is also used by a wide variety of customers for irrigation, aesthetic purposes (such as fountains and decorative ponds), and various industrial uses. While there are no current plans to serve individual homeowners, developers of new communities and businesses are responsible for building the infrastructure needed to connect to the town's reclaimed water system.

APPENDIX C

EXAMPLES OF INDOOR RESIDENTIAL AND DOMESTIC WATER EFFICIENCY HARDWARE MEASURES AND POTENTIAL WATER SAVINGS[180]

Low-Volume Toilets and Urinals	• Replacing a 4.5 gallon per flush (*gp*f) toilet with a 1.6 *gp*f toilet saves 14,252 gallon per household per year. • Replacing the same toilet in an office building saves 2,262 gallons per female and 754 gallons per male per work-year (260 days). • Some toilets use as much as 7.0 *gp*f. • Replacing a 4.5 *gpf* urinal with a 1.0 *gpf* urinal saves an estimated 1,820 gallons of water per male per work-year.
Low-Volume Showerheads and Showerhead Retrofit Devices	• Replacing a showerhead with a rated flow of 3.0 gallons per minute (*gpm*) with a showerhead with a rated flow of 2.5 *gpm* saves an estimated 1,702 gallons of water per household per year.
Low-Volume Faucets and Faucet Retrofit Devices	• Replacing a faucet with a rated flow of 3.0 *gpm* with a faucet or aerator with a rated flow of 1.5 *gpm* saves an estimated 7,850 gallons per household and an estimated 445 kilowatt-hours of energy per year. • Retrofitting a high volume faucet is often much less expensive than replacing it and usually leads to comparable water savings.
Toilet and Urinal Retrofit Devices	• Water savings from toilet retrofit devices vary depending on device installed and range from 0.5 to 1.5

180. Adapted from VICKERS, *supra* note 17, ch. 1.

	gpf with average household savings of 2 to 4 gallons per capita per day (*gpcd*). • Adjustments to urinal flush valves save an estimated 0.5 *gpf* to 2.0 *gpf.*
Toilet and Urinal Leak Repair	• The average amount of water lost through leakage (mostly from toilets) is 9.5 *gpcd* • A toilet that leaks 5 *gpd* wastes 1,825 gallons of water a year. • It is estimated that 5.5% of homes have leaks averaging more than 100 *gpd.* • Jammed or malfunctioning flush-valve toilets in non-residential facilities can lose 2,100 gallons of water per hour.
Faucet Leak Repair	• Water loss from a leaky faucet can range from several gallons to several hundred gallons a day.
Water-Efficient Dishwashers	• Replacing a dishwasher that uses 9.5-12.0 gallons a load with one that uses 7.0 gpl can save an estimated 361 gallons of water per household per year and save 940 kilowatt hours of energy.
High-Efficiency Clothes Washers	• Replacing a clothes washer that uses 43 gallons per load with a 27 gpl washer saves an estimated 5,705 gallons per household per year and 615 kilowatts of energy. • Some clothes washers use as much as 56 gallons per load.