LAND USE TOOLS TO PROTECT GROUNDWATER:
WATER EFFICIENCY STANDARDS

ENVIRONMENTAL LAW & POLICY CENTER

Part 4 *of* 4 in a Series

Supported by the Gaylord & Dorothy Donnelley Foundation

Land Use Tools to Protect Groundwater: Water Efficiency Standards

AUTHOR **JESSICA DEXTER**, ELPC STAFF ATTORNEY

EDITOR **KATIE COLEMAN**, ELPC COMMUNICATIONS ASSOCIATE

Front Cover Images from stock.xchng

Back Cover Image from Veer Stock Photography

Introduction

Photo: Jessica Dexter, ELPC

Water efficiency means water supply.

Communities facing water shortages may dream of stumbling upon a new source of affordable, clean and safe water supply to support families and businesses in the future. Luckily, communities can turn to water efficiency to unlock its potential as a "new" source of drinking water to support current and future development.

Efficiency differs from conservation, which asks people to do less. Conservation asks for sacrifice in order to get through a drought or emergency, relying on individuals to change their behavior to achieve results.

Efficiency means doing more with less. It means using the best available technology and innovative ideas to achieve long-term water sustainability without sacrificing quality of life.

Where individual sacrifices to save water may begin to slide once the emergency has passed, efficiency builds water savings into the infrastructure, and the savings are sustained even when individual stamina begins to deteriorate.

Efficiency is a smart investment in the future of any community. It is the least-cost water management strategy and truly the best source of additional water supply. Installing water-efficient fixtures can reduce water use up to 35%[i]. If all U.S. households installed water-efficient fixtures, that would save more than 8.2 billion gallons of clean water *daily*[ii] — that's equivalent to more than 12,000 Olympic-size swimming pools worth of water every single day. What's more, those efficiency measures would add up to cost savings of more than $18 billion per year[iii].

Communities across the country have successfully employed efficiency measures to improve reliability of water supply, save money and protect the environment.

For example, Boston, Mass., used efficiency measures to provide clean, safe water to 2 million more people while reducing its water consumption by a third! These measures saved the city $500 million because it eliminated the need to build a new dam to develop additional water supply[iv].

Seattle used efficiency to extend its water supply by 50 years.

In an extreme draught that had left the town of Orme, Tenn., with water supply for only 3 hours per day, installation of efficiency measures that reduced consumption by 45%

Photo: Jessica Dexter, ELPC

helped to rapidly restore the town's water service[vi].

Communities can attain greater water security by insuring that water efficiency technology is built into development projects. By reducing the volume of water demand, pressure on infrastructure — pipes, sewers, drinking water treatment facilities and wastewater treatment facilities — is reduced. Equipment wear and tear is also reduced where individual wells are used. Lowering water demand helps a community be better prepared for a draught or emergency. Finally, efficiency helps to allow growth and extend water supply over many more years. In areas that are groundwater-dependent, slowing the pace of consumption helps buy time to allow water to recharge the aquifers, making the water supply more sustainable overall[vii].

Communities across the country have successfully employed efficiency measures to improve reliability of water supply, save money and protect the environment.

Efficiency also makes good financial sense for both individuals and the community as a whole. Most water-efficient home fixtures save enough water (and therefore money) to pay for themselves in less than 5 years. Because efficiency reduces overall demand, variable operating costs are lower for community water utilities, and those utilities might be able to defer (or avoid altogether) infrastructure costs. These savings can help free up public funds for necessary upgrades to water infrastructure, including fixing leaks, improving drinking water quality and improving wastewater treatment.

Perhaps most importantly, developing efficiency always costs less than developing a new water supply. Efficiency upgrades cost about $0.46 - $1.40 per 1,000 gallons of water saved[vii]. Developing a new water supply source (for instance, by building a dam on a river) can cost 8,500 times more per 1,000 gallons than efficiency costs. In areas like McHenry County, Ill., where there is no viable non-groundwater source to develop, efficiency is the clear — and perhaps only — choice to sustain water supply.

Efficiency is also the right choice for the environment. Unsustainable consumption of water, whether surface water or groundwater, takes water away from rivers, streams and wetlands. Healthy aquatic ecosystems need sufficient water supply too, and efficiency can help to preserve and protect precious water resources.

Saving water also saves energy, which in turn saves money and reduces greenhouse gas emissions. Nationwide, water supply and treatment facilities use 56 billion kWh of electricity per year, which is enough to power 5 million homes during that year[ix]. Electricity consumption could be reduced by 5 billion kWh if just half of American homes replaced older inefficient toilets, faucets and showerheads with more efficient models[x].

The Case for Water Efficiency Standards

Photo: Corbis Images

Communities should consider adopting performance standards that require that certain fixtures in new, remodeled — and possibly existing — development to meet a minimum level of water efficiency. This standard could easily apply to all development (including commercial, institutional and industrial development), but should at least apply to residential development.

If McHenry County, Ill., adopted water efficiency standards for toilets, faucets, showerheads and clothes washers, the water savings could be over a billion gallons of water per year. At current rates of groundwater withdrawal, this savings could support more than 42,000 additional households in the county[xii].

More than half of water supplied is used by residences. The average American uses 101 gallons of water per day — nearly three times the 36 gallons per day used by residents of Brisbane, Australia, who share a similar standard of living[xiii].

The good news is that nearly every residence (as well as most commercial, institutional and industrial facilities) tends to consume water using the same kinds of water-using fixtures: toilets, urinals, faucets, showerheads, clothes washers and dishwashers. This means that adopting a simple performance standard for those fixtures can achieve huge water savings.

Half of the homes that will exist in the U.S. in 2030 have not been built yet[xiv], so establishing these standards as soon as possible is important to the future sustainability of our communities.

Indoor water uses comprise around 70% of total residential water use, but during the hot summer months, outdoor water uses for landscaping can be 80% of the total water used. Because both indoor and outdoor uses of water are significant, it is important that water efficiency standards include standards for both indoor and outdoor fixtures.

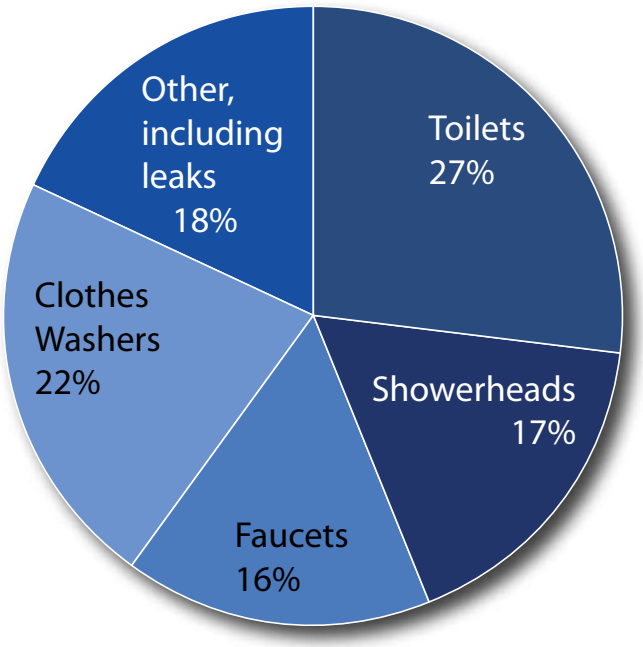
Efficiency Standards for Indoor Fixtures

Many different organizations have adopted recommendations or requirements for water efficient fixtures and appliances: U.S. EPA through its WaterSense program; organizations that develop model plumbing and building codes and standards, including the ICC, IAPMO and ASHRAE; the National Home Builders' Association; and the Alliance for Water Efficiency. Fortunately, these organizations have more or less come to a consensus about high-efficiency standards that several common fixtures and appliances are able to attain.

For each of the standards discussed in this section, there are many affordable options readily available on the market for consumers to choose. Many such fixtures carry the U.S. EPA WaterSense label, which is a relatively new certification program similar to U.S. EPA's successful EnergyStar labeling program for home appliances. In most cases, the standard is expressed as a "maximum flow rate" that the fixture must not exceed.

Where available, each fixture on the chart to the right includes a "payback period." Saving water means saving money on water. The payback period is the amount of time it takes for those savings (e.g. in the form of lower water bills) to add up to the cost premium of the efficient fixture above a less-efficient fixture. In the parlance of water and energy efficiency, the payback period is often referred to the amount of time it takes for the fixture or appliance to "pay for itself."

Residential Indoor Water Use



Residential Indoor Water Fixture Facts

Indoor Water Fixture	% Indoor Water Use	Efficiency Standard	Payback on Efficient Model	Notes
Toilet	27% [xvi]	1.28 gallons/flush maximum [xv]	1-3 years [xvii]	Efficient toilets vary widely in price.
Urinal		0.5 gallons/flush maximum	Immediate	There is no cost difference between efficient and inefficient models, and efficient models save 4,600 gallons of water annually.
Showerhead	17%	2.0 gallons/minute	14 months - 2 years	Where multiple showerheads are desired, the total flow of the showerheads must not exceed the 2.0 gallon/minute standard.
Faucet	16%	1.5 gallons/minute (bathrooms) 2.2 gallons/minute (kitchen)	10 months - 1 year	
Clothes Washer	22%	U.S. EPA's EnergyStar certification (50% less water use than traditional models)	3.5 years [xviii]	The efficiency standard for clothes washers is the U.S. EPA's EnergyStar certification, which also requires 37% less energy use than traditional models.
Dishwasher		U.S. EPA's EnergyStar certification (5.8 gallons/cycle maximum)	1.1 years	The efficiency standard for dishwashers is the U.S. EPA's EnergyStar certification. Compared to hand-washing, an EnergyStar dishwasher saves 5,000 gallons of water, $40 in utility costs, and 230 hours of time annually.

See the Endnotes of this publication for source information.
The green column represents the information often used by county or municipal governments in building or plumbing codes. See page 7 of this document for more information.

Efficiency Standards for Landscape Irrigation

Photo: Jessica Dexter, ELPC

Up to 50% of water used outdoors for landscaping is wasted[xix]. This waste can be minimized by adopting several basic efficiency standards for landscape development:

- A limitation on the percentage of the developed landscape area that can be turf. The CMAP Model Water Efficiency Ordinance recommends a limit of 25-35%; U.S. EPA WaterSense for homes sets a limit of 40%.
- A requirement that the remander of the developed landscape area be planted with native plants or plants that need little water. A list of locally-appropriate plants that meet these standards can be found in Appendix E of the CMAP Model Water Efficiency Ordinance.
- A requirement that irrigation systems include moisture sensors and freeze gauges that shut water off when the soil is saturated or when conditions are freezing.
- A prohibition on irrigation systems that waste water by overspraying onto impervious surfaces (e.g., sidewalks, driveways and roads).
- A requirement that outdoor landscape irrigation be metered separately from indoor water uses to give consumers more useful information about water use and efficiency opportunities.
- A requirement that developments establish a water use budget using a formula keyed to landscape design. If water use exceeds the water budget by a certain factor, this can trigger an outdoor water efficiency audit to help find ways to improve the functioning of the irrigation system.

These efficiency standards ("change technology to do more with less") can be used as a complement to the conservation standards ("change behavior to do less") common throughout the area that limit landscape irrigation to certain days of the week when water supply is at a critical level. However, as a greater and greater percentage of households meet high water efficiency standards, the conservation measures may be necessary less often.

How Water Efficiency Standards Can Be Adopted

There are two major ways to adopt water efficiency standards into a local code, and a county or municipality might well choose both approaches.

The first approach is to adopt a stand-alone water efficiency code. To help cities, towns and counties implement the recommendations of the Water 2050: Northeast Illinois Regional Water Supply Plan, the Chicago Metropolitan Agency for Planning (CMAP) has developed a Model Water Use Conservation Ordinance. The model ordinance includes many of the efficiency standards discussed in this report, as well as several other provisions that complement the efficiency standards. Municipalities and counties are invited to review the model ordinance and adopt the ordinance as a whole or adopt and adapt the sections to best suit local needs.

Because toilets last a long time, old toilets can waste 4,799 gallons of water per person per year for years on end if retrofits are not required.

The second option is to amend the local (county or municipal) building or plumbing code to include a section on maximum flow standards for plumbing fixtures. This is often as simple as adding a table like the green column seen on page 5 of this report. All major code development agencies (IAPMO, ICC and ASCME) have some form of "green" code language available that can simply be "plugged into" the general plumbing or building code without creating conflicts or confusion in the code language. These amendments may be desirable in tandem with a stand-alone ordinance option to help streamline ordinance compliance. The disadvantage of the building/plumbing code amendment approach is that a separate ordinance would be needed to establish outdoor water use efficiency standards.

One ordinance provision to consider is whether the county or municipality will require existing development to retrofit to efficiency standards. In communities where a significant portion of the housing stock was built prior to 1993 (when the first minimum efficiency standards established by the federal Energy Policy Act became effective), requiring updates to old water-wasting fixtures is "low-hanging fruit," offering big water savings at minimal cost.

For example, older models of toilets used upwards of 3.5 gallons of water per flush. Because toilets last a long time, old toilets can waste 4,799 gallons of water per person per year for years on end if retrofits are not required. A locality can choose to adopt one of three triggers for retrofits: on resale of the property, on purchase of the property or on reconnection to a water utility. The CMAP Model Water Conservation Ordinance includes model language and an explanation and examples of how each of these triggers can be used.

A number of cities have adopted the fixture efficiency standards discussed in this report. For example:

- New York City amended its plumbing code in 2010 to update maximum flow rate efficiency standards for faucets, showerheads, urinals and toilets[xx]. The New York City ordinance requires the U.S. EPA's WaterSense label for these fixtures and bans the sale of plumbing fixtures that don't achieve ordinance standards.
- Washington, D.C., has amended its plumbing code to include maximum flow rates for faucets, showerheads, urinals and toilets[xxi].
- Rockville, Md., also amended its code to adopt efficiency standards for faucets, showerheads and toilets[xxii].

The efficiency standards adopted by all of these cities are the same standards recommended in this report.

Complementary Ideas to Curb Water Demand

Photo: stock.xchng

This report provides a simple, common sense approach to achieve significant water and cost savings, but there are countless ways to save water that complement these core standards. For example, a community could:

- Adopt efficiency standards for a wider range of water uses — for example, maximum flow rates for commercial dishwashers and sprayers, requirements that pools have covers to minimize evaporation and that landscape water features recirculate water.
- Require or encourage new homes to be certified as WaterSense homes. The U.S. EPA WaterSense standards for whole-house certification go above and beyond the standards identified in this report, saving 10,000 gallons per year.
- Explore incentives to help achieve a high percentage of old-fixture retrofits. When compared to the cost of finding and developing new water supply, programs that offer incentives such as $150 rebates for 1.28 gallon/flush toilets, giveaways of low-flow faucet aerators and low-flow showerheads and/or direct installation programs might seem like sensible public investments to ensure a safe and clean water supply in the future.
- Encourage use of alternative water sources like greywater (from bathroom sinks, tubs and washing machines) or collected rainwater for landscape irrigation and other uses that don't require drinking-quality water. The first step in encouraging use of these alternate sources is to review existing state and local codes to remove any roadblocks that disallow the use of greywater or rainwater.
- Finally, a well-designed water use education campaign can help the public understand and embrace the water efficiency standards recommended in this report. An education campaign may take the traditional form of presentations, tabling and brochures, but can also include a transition to "smart" water bills that show individual water use in a meaningful way[xxiii] and/or offering free water efficiency audits to help identify more opportunities for residents to save water and save money.

Resources

Alliance for Water Efficiency *www.allianceforwaterefficiency.org.*

American Rivers, Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast *(2008): www.americanrivers.org/library/reports-publications/hidden-reservoir.html.*

Handbook of Water Use and Conservation *(Amy Vickers) www.waterplowpress.com.*

Chicago Metropolitan Agency for Planning, Model Water Use Conservation Ordinance *(March 2010): www.cmap.illinois.gov/regional-water-supply-planning.*

International Code Council, Inc., International Green Construction Code Public Version 2.0, *Water Efficiency Provisions (Nov. 2010): http://98.129.193.74/IGCC-PV2_Water_Efficiency_Provisions.pdf.*

International Association of Plumbing and Mechanical Officials, Green Plumbing and Mechanical Code Supplement *(2010): www.iapmo.org/Pages/IAPMO_Green.aspx.*

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., *Standard 189.1 ("Standard for the Design of High-Performance Green Buildings") (2009): www.ashrae.org/publications/page/927.*

Endnotes

[i] American Rivers, Hidden Reservoir: Why Water Efficiency is the Best Solution for the Southeast, 7 (2008): www.americanrivers.org/library/reports-publications/hidden-reservoir.html.
[ii] Hidden Reservoir, Id. at 7.
[iii] Hidden Reservoir at 17.
[iv] Hidden Reservoir at 11.
[v] Presentation by Al Dietemann, Seattle Public Utilities, October 18, 2007.
[vi] Hidden Reservoir at 12.
[vii] See ELPC's previous reports in this series, available at www.elpc.org/publications.
[viii] Water 2050: Northeast Illinois Regional Water Supply Plan, 90 (Jan. 2010): www.cmap.illinois.gov/regional-water-supply-planning.
[ix] Hidden Reservoir at 12.
[x] Id.
[xi] Calculated based on savings identified in the CMAP Model Water Efficiency Ordinance and assuming a 40% saturation rate of the 2009 U.S. Census estimates of the number of households in McHenry County.
[xii] Calculated by dividing calculated water savings by 23,962 gallons (65% of the U.S. household average consumption (reflecting a 35% reduction in water consumption)).
[xiii] Hidden Reservoir at 11.
[xiv] Professor Arthur C. Nelson Report for Brookings Institute, (2004): www.citymayors.com/development/built_environment_usa.html.
[xv] Multiple organizations have recommended each efficiency standard discussed here. The EPA WaterSense certification requirements for homes includes all of these standards and more. For more information, including relation to various plumbing and building codes, the Alliance for Water Efficiency has developed a helpful table comparing the various recommendations/requirements to one another, available at www.a4we.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=5208.
[xvi] Appliance and fixture water use estimates are taken from CMAP Model Water Conservation Ordinance: www.cmap.illinois.gov/regional-water-supply-planning.
[xvii] Payback periods for toilets, urinals, showerheads and faucets are found on the EPA WaterSense website, www.epa.gov/WaterSense/.
[xviii] Payback periods for clothes washers and dishwashers are found on the EPA Energy Star website, www.energystar.gov.
[xix] Hidden Reservoir at 18.
[xx] New York City Plumbing Code Table § 604.4.
[xxi] DC - DCMR 12F Plumbing Code Table 604.4.
[xxii] Rockville, Maryland City Code Table P2903.2.
[xxiii] A good example of a "smart water bill" is included as Appendix F to the CMAP Model Water Conservation Ordinance.

Environmental Law & Policy Center

The Environmental Law & Policy Center is the Midwest's leading public interest environmental legal advocacy and eco-business innovation organization. We develop and lead successful strategic advocacy campaigns to improve environmental quality and protect our natural resources. We are public interest environmental entrepreneurs who engage in creative business dealmaking with diverse interests to put into practice our belief that environmental progress and economic development can be achieved together. ELPC's multidisciplinary staff of talented and experienced public interest attorneys, environmental business specialists, public policy advocates and communications specialists brings a strong and effective combination of skills to solve environmental problems.

ELPC's vision embraces both smart, persuasive advocacy and sustainable development principles to win the most important environmental cases and create positive solutions to protect the environment. ELPC's teamwork approach uses legal, economic and public policy analysis, and communications advocacy tools to produce successes. ELPC's strategic advocacy and business dealmaking involves proposing solutions when we oppose threats to the Midwest environment. We say "yes" to better solutions; we don't just say "no."

ELPC was founded in 1993 and has achieved a strong track record of successes on national and regional clean energy development and pollution reduction, transportation and land use reform, and natural resources protection issues. ELPC's creative public advocacy effectively links environmental progress and economic development together and improves the quality of life in our Midwestern communities.

ENVIRONMENTAL LAW & POLICY CENTER

35 East Wacker Drive, Suite 1600 Chicago, Illinois 60601
ELPC.org | (312) 673-6500 | elpcinfo@elpc.org
facebook.com/ELPCenter | twitter.com/ELPCenter

With Regional Offices in Iowa, Minnesota, North Dakota, Ohio, South Dakota, Washington, D.C., and Wisconsin

Printed on recycled paper