

**Water Conservation
and the Green Industry**



RAIN  ***BIRD***®



Since Rain Bird's beginnings in 1933, we have focused on developing products and technologies that use water in the most efficient manner possible. At Rain Bird, we feel it is our responsibility to take the lead on water conservation by promoting it not only through efficient outdoor water management, but also through education, training and services for our industry and communities. We call this The Intelligent Use of Water™.

A series of white papers on the topic of water conservation has been the cornerstone of our educational initiatives. The first paper, *Irrigation for a Growing World*, discusses both causes and potential solutions to the growing global water crisis. The second paper, *A Homeowner's Guide to Water-Efficient Landscapes* focuses on the role homeowners can play in conserving earth's most precious resource through efficient irrigation.

With this third paper, *Water Conservation and the Green Industry*, we revisit many of the solutions presented in the original paper to gauge progress that has been made while simultaneously examining the threats and opportunities water conservation presents for various groups within the green industry – landscape architects, irrigation consultants, landscape contractors, builders, irrigation manufacturers, sportsfield managers, municipalities and local governments and growers.

It is Rain Bird's belief that through education and communication, we can all contribute to finding a solution to global water shortages. The need to conserve water has never been greater. We want to do more, and with your help, we can.



Table of Contents

<i>Introduction</i>	1
<i>Chapter One: Trends and influencing factors in conservation</i>	3
<i>Chapter Two: Efficient irrigation and green industry technological advances</i>	9
<i>Chapter Three: The conservation movement</i>	14
<i>Chapter Four: Conclusions</i>	18
<i>Endnotes</i>	20

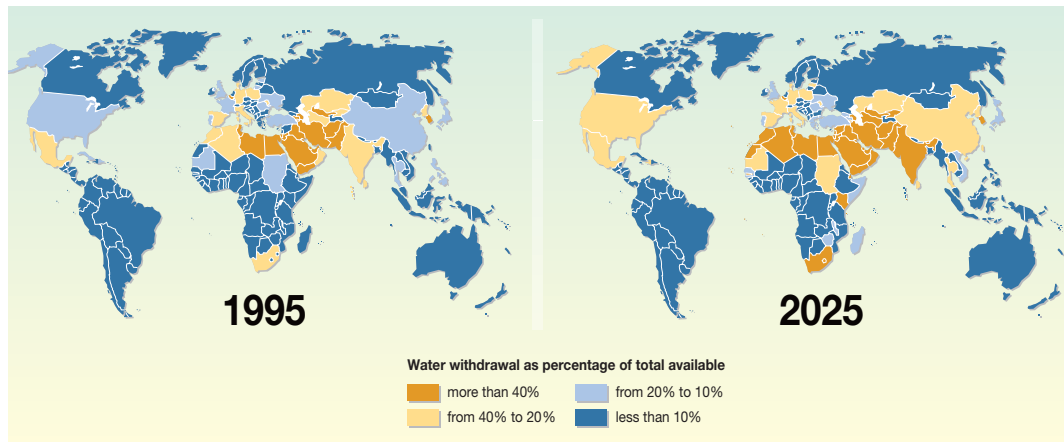
INTRODUCTION

GLOBAL SHORTAGES

Water may seem to be the most abundant resource available on Earth. But the reality is that 97 percent of all water is saltwater, 2 percent is held in snow and icebergs and only 1 percent is fresh water (the only portion currently usable for human consumption).¹

More and more demands are being placed on the 1 percent of the world's water that is available for human use. The world's population is growing by about 80 million people a year, implying an increased fresh water demand of about 64 billion cubic meters a year. In 2030, 47 percent of the world's population will be living in areas of "high water stress."²

The most severe water shortages will be faced by countries along the equator and in the Southern Hemisphere. But the depletion of the world's fresh water resources will be a global phenomenon. Charts showing depletion of available fresh water resources in 1995 and the predicted level of depletion by 2025 reveal that virtually every region of the world will have further diminished its reserves of this irreplaceable resource.



Map by Philippe Rekacewicz, UNEP and Le Monde diplomatique, March 2008.

An estimated one-third of the world's population already lives in areas with water shortages. In developing countries, this translates into 1.1 billion people lacking access to safe drinking water.³ While they manifest themselves differently, the effects of both actual and forecasted water shortages are not limited to developing countries. In developed countries shortages are being felt through restrictions on water's use.

Outdoor water use

Not surprisingly, one reaction to the looming water crisis has been increased scrutiny of how, and for what purposes, water is being used. Currently, agriculture accounts for 69 percent of global water consumption; industry accounts for 23 percent; and domestic use accounts for about 8 percent.⁴

For the purposes of this paper, we are concerned with that portion of industrial and domestic water use that irrigation represents. Numbers quantifying irrigation's share of industrial water use are hard to come by. While estimates vary greatly by country and

region, in the United States landscape irrigation accounts for approximately one-third of all domestic/residential water use.⁵ In warmer regions, that share can more than double.⁶

The growing need to reduce water waste is causing many to review landscape irrigation practices. Landscape watering restrictions have become a common reaction to actual or forecasted water shortages, both in the United States and around the world. Water managers in 36 U.S. states anticipate water shortages by 2013.⁷ Australia, suffering from a sustained drought, only recently lifted “stage 3” restrictions in Sydney that had severely limited the times homeowners could water their lawns and gardens with a hose or drip system and banned altogether other types of automatic irrigation. Melbourne’s stage 3 restrictions are in their fourth consecutive year, prohibiting any irrigation of lawns and allowing for drip irrigation or hand watering of gardens only two days a week.⁸ Even “rainy” London, England, has not escaped restrictions: a “hosepipe” ban enacted during the summer of 2006 prevented residents from watering their gardens and lawns.⁹

In addition to enacting watering restrictions, some communities are discouraging the planting of high-water-use turfgrass. Albuquerque, Las Vegas, Chandler (AZ) and Aurora (CO) are just a few cities offering their residents financial incentives to remove turfgrass from their landscapes and replace it with native plants. Las Vegas, where homeowners have been paid between \$1 and \$1.50 per square foot of lawn they remove, has converted the equivalent of about 24,000 football fields of grass to low-water-use landscape.¹⁰

The green industry and water conservation

This paper reflects attitudes that various factions of the green industry have on water conservation. It also investigates the social and economic factors behind water conservation and gauges their impact on the green industry. An examination of the energy efficiency movement offers additional context to the past, present and future of water conservation.

Is water conservation a threat or an opportunity for business? What are the best practices for reducing outdoor water waste? A turfgrass grower and one of the pioneers in Xeriscape™, for example, might respond differently to these questions.¹¹ By presenting a variety of viewpoints – those of sports field managers, turfgrass growers, builders, municipalities and local government representatives, landscape architects, irrigation consultants, landscape contractors, and non-governmental environmental groups – this paper identifies both areas in which there is common ground and opportunities for further collaboration by different green industry groups.

Rain Bird’s first white paper in this series, *Irrigation for a Growing World*, investigated several options to address global water scarcity:

- 1) Water Re-pricing
- 2) Water Re-use
- 3) Desalination
- 4) Water Transfers and Improvements to Water Delivery Systems
- 5) Alternative Plant Selection
- 6) Conservation through Efficient Irrigation

Seven years later, this paper revisits these solutions to see what progress has been made in each area. While water conservation through efficient irrigation remains the focus of this series of papers, averting a global water crisis will likely entail pursuing all of the above.

CHAPTER ONE: Trends and influencing factors in conservation

KEEPING THE TAP ON

The Professional Landcare Network (PLANET) is an international association serving lawn care professionals, landscape management contractors and design/build/installation professionals. Safeguarding the ability to use water on landscapes is understandably critical for the organization. As PLANET’s director of government affairs, Tom Delaney, puts it, “If you don’t have water, you’re out of business. Then we’re in the AstroTurf® business.”¹²

Indeed, synthetic turf is enjoying a renaissance as the growing need to conserve water has prompted some cities to ban turf or to ban watering on landscapes altogether. While advances in synthetic turf have made it a viable alternative to natural grass in some applications – especially on sports fields, it has not been a panacea. Studies have shown that synthetic turf is more likely to have higher surface temperatures, accumulate more biological contaminants and contribute to more frequent injuries of its users than natural grass. It also requires some irrigation, albeit less than natural grass, to maintain hygienic conditions and to keep it cool.¹³

In reaction to the proliferation of watering restrictions across the United States, PLANET joined forces with the Irrigation Association (IA), the American Nursery and Landscape Association (ANLA) and Turfgrass Producers International (TPI) to create the Green Associations Water Conservation Council. Through the Council’s Water Action Guide (www.wateractionguide.com), the coalition helps industry professionals educate their local governments and other decision makers in their communities on the benefits of maintaining healthy landscapes and ways in which this can be accomplished through the efficient use of water.

End-user education initiatives are also very important in changing water-use behaviors. The success of a landscape professional’s business depends on homeowners both valuing their landscapes and knowing how to properly maintain them, including how much to water, when and how. Project Evergreen, a partnership of green industry suppliers, end-user companies and other associations interested in promoting green spaces throughout the country, has a section of its website entitled “Why Green Matters,” which features statistics on the environmental, lifestyle and economic benefits of green spaces.¹⁴

While efforts from groups like The Green Associations Water Conservation Council and Project Evergreen to promote the maintenance of healthy landscapes were born largely out of commercial interest, thriving green spaces do offer many societal and environmental benefits:¹⁵

- Release oxygen
- Absorb carbon dioxide
- Reduce soil erosion

- Purify and replenish our water supply
- Serve as natural barrier to wildfire
- Naturally insulate homes and buildings, keeping them cooler in the summer or warmer in the winter
- Provide natural, comfortable and safe setting for recreational activities

Furthermore, a well maintained lawn and landscape can enhance a home's curb appeal and add as much as 14 percent to its overall value.¹⁶

Representatives from some of the major green industry associations have shared their views on the role their members can play in encouraging outdoor water conservation. The first of several excerpts from interviews with these green industry professionals appears below.

PERSPECTIVE: LANDSCAPE CONTRACTORS

*Tom Delaney
Director of Government Affairs, Professional Landcare Network (PLANET)
Lilburn, GA*

“Over the last few decades, attitudes have changed on water conservation because of the droughts. I think they've been more widespread and have hit areas that weren't hit before – places in the Midwest and Northeast like Iowa, Pennsylvania and Illinois. The West had always dealt with those issues, but once other places had to start embracing watering bans, it got the industry more involved.

Research into turfgrass has been one result. Turf researchers have been trying to find varieties that either use less water or salt water.

All of this has changed the way [landscape professionals] do business. Consumers are looking for more low-maintenance and low-water [landscapes]. People need to understand how existing and new irrigation systems should properly operate and how they should be fixed, because the biggest problem is over-watering. We're probably doing a better job with newer installations but a poorer job with the older installations. So we've seen growth in the maintenance business. People choose different ways to expand their business, but because of the do-not-call list and the cost of getting new customers, companies are trying to expand services to existing customers.”

EPA takes action

A very significant development in the effort to educate consumers on how to conserve water came in the summer of 2006 with the US Environmental Protection Agency's creation of the WaterSense program. Patterned after its own Energy Star program, which certifies home appliances as energy efficient, the EPA's WaterSense is a voluntary labeling program that identifies and promotes high-performance products and programs that are certified as water efficient. With input from a range of stakeholders—water utilities, environmental groups and manufacturers of water-using products—WaterSense's first action was to specify technical requirements for programs certifying landscape irrigation professionals. Certification programs that meet the EPA's requirements will earn the WaterSense label.



According to the EPA, certified programs will test for the ability to design, install, maintain and audit water-efficient landscape irrigation systems, including:

- Tailoring systems to the surrounding landscape and local climate conditions
- Selecting equipment, designing irrigation systems, and setting up proper scheduling
- Auditing systems that deliver water unevenly or inefficiently and recognizing how to improve performance

The EPA was encouraged to develop similar metrics to the Energy Star program with the idea that a label will allow the public to have a recognizable signal of a product that is of premium performance and water efficiency. The WaterSense program has adopted an even more stringent procedure for the certification of products that meet the criteria – unlike Energy Star, where products are certified by the manufacturers, WaterSense will have third-party certification.¹⁷

In addition to landscape irrigation services, WaterSense has already certified high-efficiency toilets, bathroom sink faucets and showerheads. It is currently working on establishing criteria for weather- or sensor-based irrigation controller technologies.

In December 2009, WaterSense unveiled its water-efficiency specifications for new homes, which included landscape water use guidelines for single-family homes and townhomes three stories or less. These WaterSense labeled new homes will use an estimated 10,000 fewer gallons of water per year than the average home. To earn the WaterSense label, a new home must demonstrate efficient outdoor water use by either working within a pre-determined irrigation or watering budget for the landscape or by ensuring that any landscaped area contains primarily low-water-use plants with no more than 40 percent of the area covered by grass.¹⁹

WaterSense's final specifications met with some mixed reviews from the green industry. The Irrigation Association, for example, publicly opposed the 40 percent turf limitation, describing it as "prescriptive" and "lacking sound scientific support" for its ability to guarantee water efficiency. But the trade association representing irrigation manufacturers applauded several components, including the requirement that irrigation systems be designed or installed and audited by WaterSense-certified professionals.²⁰

Benefits of a healthy landscape... at what cost?

With outright bans perceived as a drastic approach to conserving water but with many cities' infrastructures not capable of meeting the spiked demand during hot summer months, many cities have resorted instead to restrictions, such as assigned-day watering. Giving homeowners the OK to apply limitless water to their lawns just because it's a Tuesday, though, only serves to exacerbate the problem of over-watering.

A FACTOID FROM WATERSENSE:

"By using irrigation professionals who have partnered with WaterSense to perform regular maintenance and audits, homeowners with landscape irrigation systems can have the same beautiful yard while reducing their water use by 15 percent or about 9,000 gallons annually. That's equal to the amount of water that would flow from a garden hose non-stop for nearly a whole day."¹⁸

UK WATERING BAN

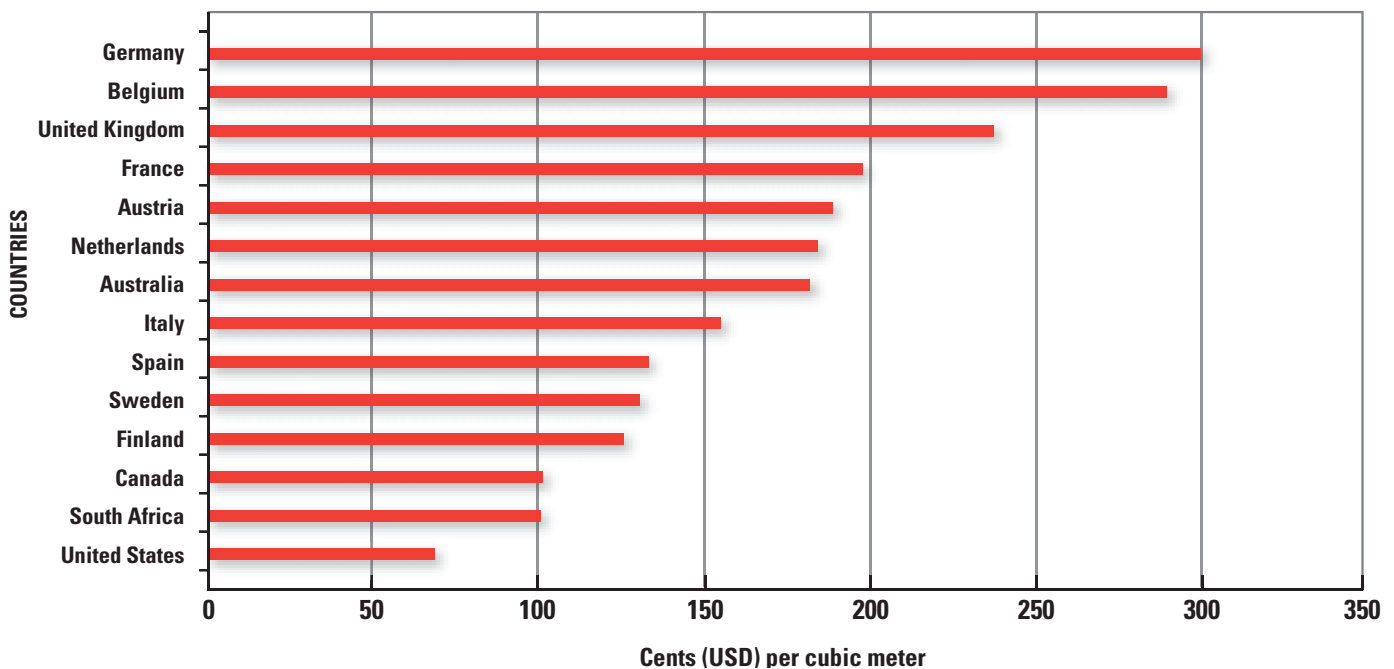
A report on the effectiveness of hosepipe bans in the UK recommended allowances for “efficient” irrigation: “Due to the legislation governing the hosepipe ban being drafted in the 1940s there are no allowances for improvements in modern technology. The restriction therefore applies equally to all irrigation systems. Some irrigation systems are more water efficient than others but currently all fall under the classification of hosepipes and are therefore banned.”²¹

It would appear that technology enabling homes and businesses to use water more efficiently is needed. But convincing people to update their irrigation systems to include water-efficient technologies – rain gauges, soil moisture sensors, weather-based controllers, efficient spray heads and nozzles, etc. – can be a challenge unless those people are convinced that they need to save water. While environmental stewardship motivates some, many are motivated by dollars and cents. At least in the United States, saving water does not always translate into saving money.

Despite a 30 percent price increase over the last five years, the cost of water in the United States is significantly lower than that in nearly every other developed country, according to a report by NUS Consulting Group. US residences and businesses paid \$0.74 per cubic meter (264.2 gallons) of water in 2008.²² By comparison, water cost \$3.01 in Germany, \$1.82 in Australia and \$1.02 in Canada.²³

Robert Glennon, author of the book *Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters*, argues that higher prices would create incentives for all users to conserve water.

INTERNATIONAL WATER COST COMPARISON 2008²⁴



There is evidence that water pricing affects consumption. Compare Phoenix and Tucson, for example. These two Arizona cities are only about 100 miles apart and have similar arid climates. Tucson has priced water to encourage people to conserve; Phoenix has not. The result: Tucson's water consumption is 143 gallons per capita per day (GPCD); Phoenix's is 196.^{25,26}

The American Water Works Association (AWWA), a trade association for water industry professionals, has echoed Glennon's concern. Past President Andrew Richardson was quoted in a 2005 Water World article saying that the water industry needs to communicate the "true value of water" to end users.²⁷ He stressed the importance "that local decision makers – mayors, city councils, etc. – be part of the educational process, since they will have to implement the rate increases needed to fund maintenance and improvements."

...Act locally

While water industry groups like AWWA serve as a forum for communication for both industry professionals and local decision makers from across the country and around the world, water-related issues remain very localized. This is illustrated by the Tucson-vs.-Phoenix example. Even within the same state, views on water management can vary widely as can approaches to conservation.

With water distribution, infrastructure and pricing so localized, knowledge gained by one city in handling water-related issues stands to be lost to other cities that might face similar issues. The Mayors Water Council (MWC) was created in 1995 with a mission to close this information gap. A 40-member taskforce of The US Conference of Mayors, the MWC provides a forum for local governments to share information on water technology, management methods, operational experience and financing of infrastructure development. The MWC also monitors and responds to federal legislative and regulatory policy proposals affecting the delivery of municipal water services.

In 2005, the MWC conducted a survey of mayors of the largest US cities (those with a population of at least 30,000) to examine water resource priorities and trends. The survey indicated that US cities overall rank water supply availability as the third most pressing issue, behind aging infrastructure and water infrastructure security. Five additional priorities relating directly to water supply availability were among the top 15: drought management, regional conflict over water use, water rights, groundwater depletion and inter-basin transfers.²⁸

A high proportion (82.8 percent) of survey cities that indicated water supply availability was a priority issue had formal water conservation plans in place. Only half of these cities (50.5 percent) alter their water rate structures to encourage homeowners and businesses to conserve water.²⁹

“Quite simply, we are not paying the true cost of water. When homeowners or businesses receive a monthly water bill from the utility, that bill normally includes only the extraction costs of drilling the wells, the energy costs of pumping the water, the infrastructure costs of a distribution and storage systems and the administrative costs of the water department or company. Water rates, with rare exceptions, do not include a commodity charge for the water itself. The water is free.”

–Robert Glennon
Water Follies: Groundwater Pumping and the Fate of America's Fresh Waters, Island Press, Washington, DC, 2002.

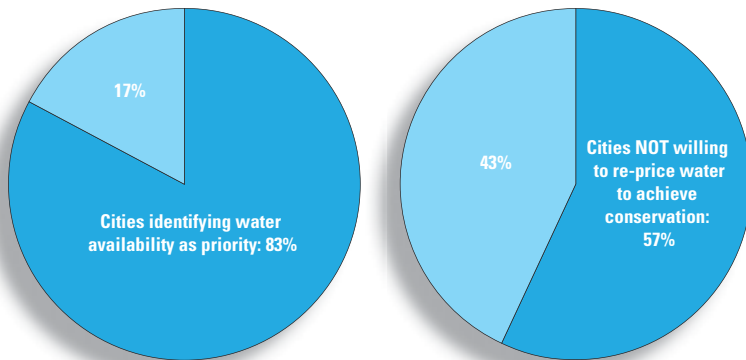
Irrigation for a Growing World concluded that water re-pricing could produce an immediate impact on curbing water use. The fact remains that hiking water rates is unpopular. Given that 57.2 percent of all cities surveyed would NOT consider altering the water rate structure to achieve water conservation, it may be a while before we start to pay the “true cost of water,” as Glennon puts it.

As was the case seven years ago, water re-pricing continues to face challenges in the United States and elsewhere because of its unpopularity with the general public and, consequently, their elected officials. This trend puts us on a potentially dangerous path with regard to improving water delivery systems – another option identified in *Irrigation for a Growing World* for addressing water shortages. Charging only what it costs to

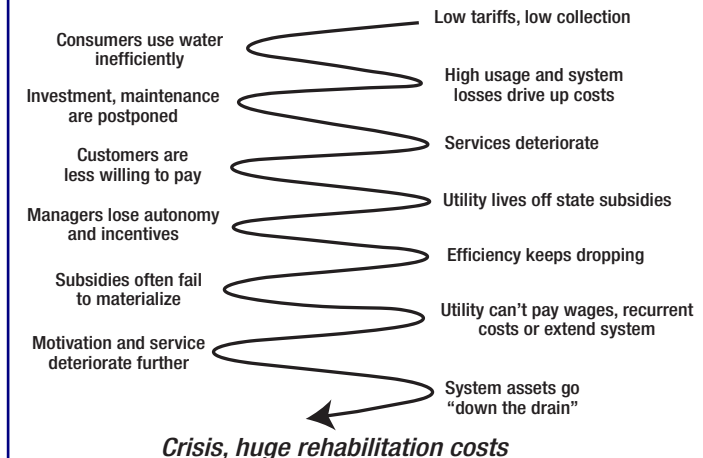
deliver water or, worse yet, under-charging for delivery and making up the difference with government subsidies can perpetuate the perception of water as a limitless resource, thereby discouraging conservation. Under pricing also opens up the possibility for the deterioration of water infrastructure.³⁰ If and when the actual costs of acquiring and

delivering water rise above what end-users are accustomed to paying, will elected officials make the very public and very unpopular choice to raise prices? Or will they simply opt to forego expensive infrastructure maintenance, repair or expansion?

A system of checks and balances protect most developed countries from the worst effects of infrastructure neglect resulting from artificially low water prices. In developing countries, however, such a “downward spiral” can culminate in a public health crisis – lacking availability of clean water. The illustration to the right captures this deterioration.



Service quality spirals downward when service is provided below cost³¹



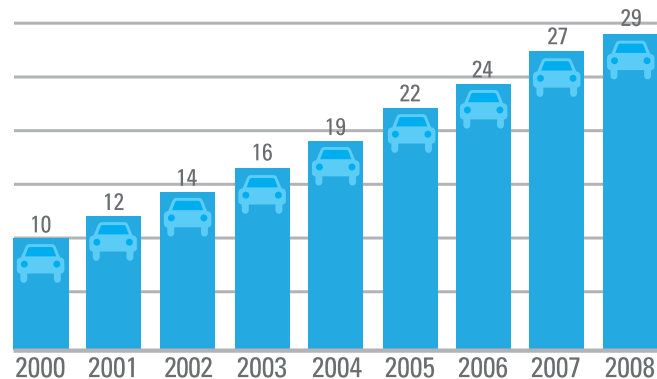
CHAPTER TWO: Efficient irrigation and green industry technological advances

MAKING WATER CONSERVATION AN EASY CHOICE

If increasing the price of water remains an unpopular option in the United States, people who do conserve will do so either for environmental reasons or because it's easy. The EPA's WaterSense program has this in mind – if it's easy to choose a water-efficient product over one that's not, people will.

The Energy Star program's success supports the idea that people, if given a choice, will opt for efficiency. More than 2.5 billion Energy Star qualified products have been purchased since 1992. These energy-efficient purchases translated into a reduction of 43 million metric tons of greenhouse gas emissions in 2008 alone – the equivalent to removing 29 million vehicles from the roads for the entire year.³²

Making technology accessible to homeowners and businesses that enables them to reduce outdoor water waste involves not only product manufacturers but all green-industry professionals – those who specify water-efficient products in their designs, those who install water-efficient products and those who help end-users manage the products to optimize their water efficiency.



EMISSIONS SAVED IN VEHICLE EQUIVALENTS (in millions)³³

Applying less water

Irrigation for a Growing World and the follow up paper *A Homeowner's Guide to Water-Efficient Landscapes* presented a case for efficient irrigation being an easy-to-implement and effective option to address water scarcity. Both papers presented tips and best practices to realize significant water savings immediately through a combination of four critical components: design, water-efficient products, proper installation and maintenance.

Emission devices like sprays, rotors and drip devices have become increasingly water efficient, helping homeowners and commercial end-users to apply water more precisely. The following devices can provide additional water efficiency when incorporated with an automatic irrigation system:³⁵

- Rain Sensors – Rain sensors detect a set level of rainfall to shut off a system during a rainstorm and resume when the sensor dries out, indicating deficient soil moisture.

A FACTOID FROM WaterSense

Letting the faucet run needlessly wastes not only water but electricity. According to WaterSense, leaving the faucet on for 5 minutes is equivalent to running a 60 watt light bulb for 14 hours.³⁴

- Moisture sensors – These devices are placed in the landscape to measure soil moisture and suspend watering until the ground moisture level is dry enough to require more water.
- Wind and freeze sensors – Freeze sensors are used to shut off irrigation systems in climates where irrigation is still required during a time when it may also freeze. Freeze sensors prevent irrigation during freezing weather, preventing dangerous conditions on streets and walkways as well as potential damage to plants due to ice formation. Wind sensors stop watering during high-velocity winds and resume when the wind speed lowers. They are used in windy climates where spray from a sprinkler would be blown away.
- Rain Gauges – Because the amount of rain a landscape receives may vary from that reported by county weather stations, a simple rain gauge in the landscape can provide a more accurate local reading and help in water management.
- Weather-based (ET, or “smart”) controllers – Evapotranspiration, the measurement of the combined water loss from plants through evaporation and transpiration, is used to estimate the water needs of plants. ET is calculated through the use of various equations which use temperature, humidity, solar radiation and wind data. Rain gauges are used to determine how much effective rainfall has occurred to offset the ET during the same period of time. These measurements, taken from various weather sites, are often posted online (such as local water purveyors’ or municipal government websites) for a given time period so that homeowners and businesses can set their controllers. “Smart” controllers can be programmed to receive this data and automatically interrupt watering schedules as necessary.
- Drip Irrigation – Drip irrigation, also called micro-irrigation or Xerigation®, uses tubing and emitters to apply a slow, steady trickle of water directly to the soil above the plant’s root structure. Through gravity and capillary action, water spreads slowly down to plant roots, reducing water loss to surface evaporation. Drip can often be a more efficient way to water trees, shrubs, flower beds, ground cover or borders. A drip system can be 30% to 50% more efficient than traditional sprinkler irrigation on landscapes for which drip is appropriate. Drip can also reduce runoff and plant disease, which can result from over-watering.

**PERSPECTIVE: IRRIGATION
EQUIPMENT MANUFACTURERS AND
SERVICE PROVIDERS**

*Deborah Hamlin
Executive Director
Irrigation Association (IA)
Falls Church, VA*

The IA believes in water conservation through efficient irrigation – products that save money and competent people to install them. I do believe the entire industry is behind this – if someone has a product that is not efficient, they realize that they’re going to be out of business if they don’t improve efficiency. We don’t want people to stop using water; we want them to use more efficient means.

The EPA’s WaterSense program recognizes that irrigation is an area where we could improve water savings through the certification of professionals. You have to have [irrigation products] properly installed and maintained, unlike a dishwasher or a washing machine. WaterSense decided to have a secondary labeling (to product labeling) – one for the individual, to certify that person is water conscious and has the ability to install that product and save you water. The IA certification for contractors and designers was approved by WaterSense [in early 2007].

We have a hard time going out to the consumer – whether that’s residential or commercial – as a small association with a staff of 15. So the EPA has a larger reach. They’ll reach out to end users to encourage them to save water by choosing [a certified professional].

Turfgrass: friend and foe

Turfgrass is the largest irrigated crop in the United States, with residential and commercial lawns (including golf courses) covering an estimated 32 million acres – three times the acreage planted in irrigated corn.³⁶ As we have seen, its relatively high water needs combined with its ubiquity have made it a controversial plant.

On the flip side to all the negative attention turfgrass has received as of late are its specific environmental benefits: soil erosion control and dust stabilization; improved recharge and quality protection of groundwater; flood control; entrapment and biodegradation of synthetic organic compounds; soil improvement; accelerated restoration of disturbed soils; substantial urban temperature moderation; decreased noxious pests and allergy-related pollens.³⁷

Turfgrass Producers International seeks to safeguard the future of turfgrass by educating the public about these benefits and on how to maintain it in a water-efficient way. The organization published a guide entitled “Water Right: Conserving our Water, Preserving our Environment” (available at <http://www.turfgrassod.org> under the “Resources” tab).



Photo: Turfgrass Producers International

PERSPECTIVE: TURFGRASS GROWERS

*T. Kirk Hunter
Executive Director
Turfgrass Producers International
East Dundee, IL*

Approaches like the even-odd-day watering have nothing to do with actual need. It's a band-aid approach for cities to supposedly cut water use when it comes to outdoor use. It has nothing to do with what the plant actually needs. It makes sense from the standpoint of the water companies, because to them it's about peak use. Their systems are not up to date, so when they experience this, they can't handle the demand.

The biggest problem is over-watering. It's the people who are wasting the water; it's not the turfgrass plant. It's OK to let it go into dormancy over the summer. It's going to come back. Equipment that measures how much water they're putting on can help stop this. Too often, the sprinklers are watering sidewalks or over watering to the point that water is just running off.

New turf species

Research into new species of drought- and saltwater-tolerant grasses is helping improve turfgrass's image. New turfgrass species, like seashore paspalum, have saltwater tolerance and can survive in poor soil.

Seashore paspalum has done quite well in Florida and in the Middle East and parts of Asia, where water quality and soil quality are issues. The salt still has to be leached from the soil through rainfall or secondary irrigation, which can be with reclaimed water. Either way, though, there is still a relatively decreased demand on the potable water source.

Seashore paspalum is also gaining popularity as a drought-tolerant species, although it is more likely to be used on golf courses because of its tolerance to low-quality (reclaimed) water. A more commonly used turfgrass species with good drought tolerance is Bermuda grass, as it is widely grown for many applications, including: home lawns; golf course putting greens, tees, fairways, and roughs; and sports fields. Both Bermuda grass and seashore paspalum are warm-season turfgrass species.³⁸

Xeriscaping and plant selection

The practice of replacing thirsty turfgrasses and exotic, nonnative plants with low-water-use grasses, wildflowers and plants native to the local environment is gaining popularity with many water districts in the United States. In some areas, this practice of Xeriscaping has resulted in a decrease in outdoor water usage of up to 60 percent.³⁹

As is the case with any landscape, the water efficiency of a Xeriscaped area has much to do with its design and maintenance. In order for Xeriscaping to truly succeed in decreasing a landscape's water needs, the design must incorporate only native plants or plants with low water needs and must group plants with similar watering needs together so that different zones can be created to apply different amounts of water. Compared to simply planting turfgrass, Xeriscape requires more planning and often a greater investment.

Irrigation for a Growing World identified many successful large-scale applications of alternative plant selection to bring about increased water savings – from farmers in arid areas switching from water-intensive crops (like sugar cane) to lower water-use plants (like onions, peppers and tomatoes) to golf courses turning to native grasses and plants for areas around the fairways, tees and greens.

At the residential level, community Xeriscape demonstration gardens have played a key role in educating homeowners on the benefits of and best practices for low-water-use gardens. In 2007, Rain Bird recognized Southern California's Water Conservation Garden as the winner of the first Intelligent Use of Water Award. The El Cajon-based demonstration garden's numerous exhibits, classes and programs on water-wise gardening attracted more than 35,000 people to the five-acre facility last year – and attendance has been growing by as much as 35 percent each year over the past four years.⁴⁰

**PERSPECTIVE:
LANDSCAPE ARCHITECTS**

*Donald H. Godi
Fellow, American Society of Landscape
Architects (ASLA)
President and Design Principal,
Donald H. Godi & Associates, Inc.
Denver, CO*

Most landscape architects pretty well feel that they have to be aware of what they're designing and what it's going to require in the way of water. That's much more evident in the last 10-15 years. The coordination of the landscape with the irrigation has been much more critical. We've been required to get into irrigation design so that our designs can better incorporate it. The big buzzword is sustainable – make everything stand on its own. That gets impossible – not everything can be Xeriscaped and native plants. The landscape architect's part is to be able to know good irrigation design. Unfortunately, not enough of the schools are teaching irrigation. They try to teach the big picture; this is the detail. You can only accomplish sustainability by taking care of the details.

I think the [green industry] is changing for the better – becoming more sophisticated. There can still be a lack of coordination between the designers and water managers. A lot of maintenance people use water as aspirin – just put another half-inch on it and call me in the morning. I think this is where the landscape and maintenance firms can really make some money. There should be a way to build some management into it. You can design it and install it, but it's the long-term maintenance where the long-term water savings takes effect.



Photo: Ted Salois for The Water Conservation Garden, El Cajon, Calif.

With many parts of the United States facing sustained drought conditions that have led to more frequent and often more prolonged restrictions on outdoor water use, the embrace of low-water-use plants is no longer limited to the arid Southwest. In fact, the National Xeriscape Council, an advocacy and resource group supporting the principles of Xeriscaping, is based in Atlanta, GA, and operates programs in 40 states.

CHAPTER THREE: The conservation movement

THE ECONOMICS OF BEING GREEN

Just as the opportunity to save money can be a very powerful incentive to embrace water efficiency, so too can the opportunity for profit.

Behind the sales of those 2.5 billion Energy Star qualified products since 1992 are 2,400 manufacturers who produce them, 1000 retailers who sell them, 6,500 homebuilders and hundreds more service providers, architects and building engineers who specify, install and service them.⁴² Growing demand for energy-efficient products has translated into a boon for business. In 2006, for example, an estimated \$10 billion was spent on green buildings in the United States. By 2013, industry analysts predict a five-fold to eight-fold increase in this number.^{43, 44}

Just how popular green building has become was evident at the 2009 Greenbuild International Conference and Expo in Phoenix – it had a record 28,000 attendees and 1,800 exhibitors. The annual event is put on by the US Green Building Council (USGBC), the organization behind the LEED Program (Leadership in Energy and Environmental Design), a voluntary rating system that benchmarks design, construction and operation of green buildings. Promoting a “whole-building approach to sustainability,” LEED recognizes performance in: sustainable sites; water efficiency; energy and atmosphere; materials and resources; indoor environmental quality; locations and linkages; awareness and education; innovation in design; and regional priority. LEED currently offers certification programs for existing buildings, new construction, commercial interiors, core and shell, retail, healthcare, neighborhood developments, homes and schools.



Water efficiency is a component of every LEED certification program. While its contribution to the total certification score is relatively low (compared to carbon emissions, for example), its overall importance is significant. There are currently only 10 points out of a total of 110 that are directly related to water efficiency in the New Construction rating system, for example. But water is a bigger contributor to overall score than its points suggest in that it is tied to other criteria for the total environmental impact of the building, such as management of storm water.

LEED CASE STUDY

Dan Benner, a Marietta, Georgia-based irrigation consultant, has seen more and more of his corporate clients asking for help earning the water efficiency points to qualify for LEED (Leadership in Energy and Environmental Design) certification on their buildings. Recently, he and his company Hydro Environmental, Inc. have worked on earning LEED points through efficient irrigation for such companies as Lowe’s Home Improvement, Wachovia Corporation and The Weather Channel as well as Emory University.

At the corporate headquarters for The Weather Channel in Atlanta, GA, pursuit of LEED certification prompted the decision to install a water-capture system for use with drip irrigation. An underground retention pool was built under the 170,000 square-foot, 8-story building to capture stormwater from the roof and the surrounding parking lot. This graywater will be used to drip irrigate approximately half of the campus’s six acres.⁴¹

New water sources

LEED certification programs' water efficiency component awards points toward certification when buildings and homes have non-potable water incorporated into their landscape irrigation. Depending on the geographical location and the type of building, non-potable water can be provided by the city or from on-site water capture and recycling systems.

The global water industry's sales – estimated at \$400 billion – are growing about 7 percent annually, but the industry's technology segment is growing more than twice as fast and already accounts for one-quarter of all revenues.⁴⁵ This technology segment's primary activities center around supply issues like water purification, treatment and desalination. Water technology is deemed a good investment with growth opportunities: Large conglomerates including Siemens, ITT and Dow have made major investments in water technology in the last few years, and many of these investments have helped increase revenues in an otherwise sluggish economy. ITT Water Technologies' revenues, for example, represented about 40 percent of the more than \$10 billion of total revenues for ITT in 2007.⁴⁶

There are approximately 60,000 municipal water utilities in the country and more than 155,000 water supply systems.^{47, 48} According to WateReuse, a non-profit organization advocating water efficiency through such technologies as reclamation, recycling, re-use and desalination, 1,250 U.S. municipal water utilities in 18 states have water re-use programs. While the organization has not received reliable data from the remaining 32 states, their research indicates that the total number is much larger and that it is only growing.⁴⁹

WateReuse monitors water re-use and desalination projects in the country and around the world. Since January 2006, more than 60 US water re-use or desalination projects have been given the green light.⁵⁰ A sampling of those projects appear on the map on pages 16-17.

Having identified desalination and water re-use as two options for addressing water shortages, *Irrigation for a Growing World* discussed the pros and cons to each. On the positive side, each creates "new" sources of water. In the case of desalination, the oceans provide a virtually unlimited source of new water. High start-up costs for desalination plants as well as some laws against capturing and recycling water still present hurdles in some areas. Perhaps the biggest negative to desalination – potential harm to the environment, however, has been mitigated in the last few years by technological advances and a more holistic approach to plant construction and operation.

A plant opened in 2006 in the Australian city of Perth has become a model for environmentally sound desalination. It currently provides one-fifth of the potable water for a population of 1.3 million people without polluting the air or the sea. The reverse osmosis desalination process requires significant energy to force saltwater through tight membranes to yield salt-free water. Usually this energy is generated by burning fossil fuels, but the Perth plant is powered by renewable energy from a nearby wind farm.⁵¹ Furthermore, the Perth plant has taken extra precautions to ensure that the brine byproduct (water with high salt concentrations) is discharged into the ocean in the least harmful way possible and has ongoing monitoring programs near the outlets where the brine is discharged to ensure minimal impact on the marine ecosystem.⁵²

The success of the Perth plant, which cost \$360 million to build, has spawned others across Australia – a second, Perth plant is currently under construction with an estimated price tag of \$875 million and a Melbourne facility, the biggest in the pipeline, will likely cost \$2.5 billion. Similar projects are also under way in Europe (England and Spain) and in India.⁵³

Watsonville, CA
Recycling project

Impact:
Plant to deliver irrigation water to over 2,000 acres of crops in the central valley

Olympia, WA
Recycling facility

Impact:
3 million gallons of reclaimed water a day for irrigation as well as wetlands and groundwater recharge basins

Ketchum, ID
Wastewater treatment plant

Impact:
Recycle up to one million gallons of water each day to irrigate parks and other green spaces

Cheyenne, WY
Recycled water system

Impact:
1 million gallons a day recycled water irrigating 230 acres of parks, cemeteries and golf courses

Flagstaff, AZ
Reclaimed water sale to ski area

Impact:
1.5 million gallons a day to be used by ski resort to extend the ski season with artificial snow

Gloucester County, NJ
Potable reuse system

Impact:
740,000 gallons a day purified water to replenish aquifers and prevent saltwater intrusion

Santa Monica, CA
Recycling facility

Impact:
Dry weather runoff recycling facility intercepts 500,000 gallons of runoff per day headed to the Pacific Ocean and reuses the water for irrigation and toilet flushing

Water Re-Use in the U.S.

A sampling of existing and planned projects

Huntington Beach, CA
Desalination plant

Impact:
To be completed in 2011, will provide 50 million gallons of clean drinking water per day, enough to supply approximately 100,000 homes

Carlsbad, CA
Desalination plant

Impact:
Proposed 50-million-gallon-a-day plant will be the largest and most technologically advanced in the Western Hemisphere

Orange County, CA
Groundwater replenishment system

Impact :
Produces about 70 million gallons of drinking water per day, providing pure water for 500,000 people

El Paso, TX
Desalination plant

Impact:
World's largest inland desalination plant converts brackish groundwater into 27.5 million gallons of fresh water daily

Tampa Bay, FL
Desalination plant
potable water product

Impact:
The largest desalination plant in the United States is located in Tampa Bay, Florida, which began desalinating 34.7 million cubic meters (28,740 acre feet) of water per year in December 2007

Manatee County, FL
Water reuse system

Impact:
Three treatment plants provide up to 14 million gallons of reclaimed water per day day for agricultural and residential irrigation

CHAPTER FOUR: Conclusions

During the 1920s, Prohibition in the United States prevented the free flow of alcohol. For those who still wanted a drink, there were the bootleggers. Today's landscape watering restrictions, by contrast, are not morality-based and are likely here to stay. For less than \$6 on eBay, you can buy a guide to "drill your own well" and avoid watering restrictions.⁵⁴ But with depleted aquifers part of the same water-shortage problem the restrictions are seeking to remedy, "bootlegging" water isn't a viable option.

Like Prohibition, outright bans on landscape watering are likely to prove ineffective and short-lived. The benefits of green spaces – environmental, economic and social – are numerous enough that people will find a way to maintain them. We've seen that the green industry is taking proactive measures to ensure that it is part of the solution, not the problem.

Nearly every industry association has either best management practices or a code of conduct that acknowledges the need to conserve (available at their websites). In some cases, these publications are the result of a joint effort of several green industry groups:

- The Irrigation Association: Turf and Landscape Irrigation Best Management Practices (<http://www.irrigation.org>)
- American Society of Landscape Architects (ASLA): Code of Environmental Ethics (<http://www.asla.org>)
- American Society of Irrigation Consultants (ASIC): Smart Water Solutions (<http://www.asic.org>)
- Turfgrass Producers International (TPI): Water Right: Conserving our Water, Preserving our Environment (<http://www.turfgrassod.org>)
- Green Associations Water Conservation Council (Professional Landcare Network (PLANET), Irrigation Association (IA), the American Nursery and Landscape Association (ANLA) and Turfgrass Producers International (TPI)): Water Action Guide. (<http://www.wateractionguide.com>)

As the EPA's WaterSense program illustrates, water conservation initiatives can be informed by other conservation movements. In the same regard, the green industry can benefit from looking at approaches to conservation taken by other water-related industries.

The Alliance for Water Efficiency, created in 2006, established the first national non-profit organization dedicated to water efficiency. The Alliance will serve as a clearinghouse for information and an advocate for water efficiency research, evaluation and education. On its board of directors are representatives of plumbing fixture manufacturers, home appliance manufacturers and irrigation equipment manufacturers as well as environmental groups, utility companies and local and national government.

Such collaboration will be key to achieving practical, sustainable conservation initiatives that help protect Earth's most precious resource. Having revisited the options to address global water shortages that were presented in *Irrigation for a Growing World*, this paper concludes that each one – water re-pricing, re-use, desalination, transfers and delivery improvements and alternative plant selection – has a vital role to play in averting a global water crisis. Conservation, however, remains the easiest, most immediate and most affordable option.

The extent to which conservation through efficient irrigation will be a long-term solution to water shortages depends on the extent to which the green industry and the general public is educated on outdoor water conservation. Any educational initiative must perform two functions: 1) increase awareness of the need to conserve; 2) provide best practices for conservation. One without the other will only have short-term results and will not change perceptions or behaviors.

“Smart” controllers, for example, can be a great tool for reducing outdoor water waste. Rebate incentives offered by municipalities across the United States are encouraging homeowners to purchase and integrate smart controllers into their irrigation systems. These products' full contribution to water conservation, however, can only be realized if both irrigation professionals and their customers understand their benefits and features – and the limits to both. Yes, they can save water by incorporating weather data to automatically interrupt and adjust watering schedules, but they are not a set-it-and-forget-it panacea. They must be monitored to ensure that their programs are optimizing water savings *and* keeping plants healthy.

The most water-efficient products alone cannot solve our water shortages. These same products in the hands of people who recognize water as a precious resource and who know how to use them properly, however, can certainly provide a meaningful solution.

In the end, we will only conserve what we love.
We will only love what we understand.
We will only understand what we are taught.
—*Baba Dioum, Senegalese ecologist*

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