As landscapes come under increasing scrutiny from water authorities, the Green Industry ramps up its efforts to develop sprinkler technology and new turfgrasses that make every drop of water count.

PART 3

Counting on TECHNOLOGY to save irrigation

WORD FROM OUR PARTNER

Rain Bird: Smart Technology for a Better Future

AS THE WORLD'S WATER supply continues to be challenged by population growth, drought and contamination, there's little doubt that the future of the irrigation industry rests upon a very important goal. We must consistently develop and implement new, more efficient systems that maintain healthy landscapes while using as little fresh water as possible. At Rain Bird, we're dedicated to achieving this goal each and every day.

Every new product or service developed at Rain Bird is assessed for its contribution to The Intelligent Use of Water™. At one of the largest indoor irrigation testing facilities in the world, we continually test new and current products for quality and accuracy. As a result, we're developing new products that incorporate the latest "smart" or weather-based technology, helping us provide the most efficient irrigation solutions available on the market today.

In June, Rain Bird introduced its ESP-SMT Smart Control System, a simple-to-use tool that provides weather-based control while saving time, money and water. This control system combines a sophisticated controller with an on-site weather sensor that calculates evapotranspiration rates and deducts actual effective precipitation to determine how much water it should apply to maintain an optimum moisture level in the soil. Until the launch of this product, weather-based controllers were often too expensive and complicated for residential use. The ESP-SMT has changed all that by providing an affordable and accurate level of irrigation control that was formerly out of reach.

October 2009 marked the launch of the newest member of Rain Bird's smart irrigation family—the SMRT-Y Soil Moisture Sensor Kit. After the SMRT-Y (pronounced "smart why") is installed, its digital sensor measures absolute soil moisture levels every ten minutes and relays that information back to the SMRT-Y controller interface. When soil moisture levels are above a pre-determined level, the controller interface interrupts the irrigation schedule that's been programmed into the system's timer. If the sensor recognizes dry soil conditions, the system's next watering cycle will proceed as originally scheduled. This closed-loop feedback process means that actual plant and turf conditions at the roots are being communicated back to the controller for a truly accurate snapshot of a landscape's moisture needs.

In addition to these groundbreaking new products, Rain Bird continues to produce many other water-efficient system components that can make a tremendous impact on the amount of water used for irrigation. From rotary nozzles with matched precipitation rates to rotors with pressure-regulating stems and our patented Rain Curtain Technology, Rain Bird continues to make it easier than ever before to incorporate smart, water-saving practices into any irrigation system.

Turfgrass in critics' bull's eye

Responding to growing criticism that lawns "waste" water, the Green Industry ramps up technology and focuses on turfgrass breeding to maintain the popularity and benefits of lawns in American landscapes.

BY **RON HALL** EDITOR-AT-LARGE

THE AMERICAN lawn is under attack. It's being criticized on several fronts, but most vehemently for "wasting" potable water. This criticism is misdirected, say many people in the Green Industry.

Water isn't wasted *by* turfgrass, which almost every scientific study has shown uses water efficiently; rather, it's wasted *on* turfgrass. There's a difference. A big difference, they claim.

"We've established the basic principles of the drought tolerance in turfgrass," says turfgrass expert Dr. James Beard, professor emeritus Texas A&M University. "Now it's a matter of documenting the specific details. There's a lot of pressure to do more research on this

ILLUSTRATION/PHOTO BY: ISTOCK INTERNATIONAL INC.

Developing turfgrass with better drought and heat tolerance has become a top priority in the industry.

PHOTO BY RON HALL

HYBRID GRASS COULD HELP CONSERVE WATER

When Dr. James H. Baird joined the Department of Botany and Plant Sciences at the University of California-Riverside as turfgrass extension specialist on Jan. 1, 2008, he found a full plate of projects waiting for him. One of them was reviving a program to develop a drought-tolerant, cool-season grass for California lawns. That project, stalled because of the retirement of turf expert Dr. Vick Gibeault several years earlier, had been kept alive through the efforts of geneticist Adam Lukaszewski.

Lukaszewski had been working on crosses of ryegrass with a variety of meadow fescue. He is attempting to find the right combination of stress-resistant genes to produce a turfgrass that remains attractive with extremely little water. The investigations of selections have moved to test plots at Riverside's 15-acre turfgrass center.

"We're going to push this grass to being a ryegrass because that's essentially what it is," Baird says. "Even though its parent is a forage-type fescue, it walks, talks and quacks like a ryegrass."

But even if the program is successful, Baird sees the "super" ryegrass as a short-term solution.

"Ultimately, especially in Southern California, we should be using warm-season grasses," he says. "We want to apply the same type of technology we're using on this ryegrass to develop a warm-season grass that stays green year-round. That would be a home run."

because of issues with water use."

This sheds a different light on "water-hogging turfgrass," which has become a journalistic catch phrase when describing lawns in relation to water issues. Industry's response to this description is direct: *Grass doesn't waste water; people waste water.* The people are property owners and usually homeowners.

Yes, a lot of our water is used outdoors. As much as 30% to 70% of homeowners' water use occurs outdoors, mostly for landscapes and lawns, says the U.S. Environmental Protection Agency (EPA). And as much as 50% of that water is wasted by inefficient irrigation.

Where the grasslands occur

There's a lot of drought resistance in grasses, says Dr. Leah Brilman, veteran turfgrass breeder at Seed Research of Oregon in Corvallis, OR.

"Consider where grasses are native

in the world," she says. "These are in the world's arid or semi-arid regions."

Consider that before settlement in the 19th century, deep-rooted native grasses covered the U.S. Great Plains. Tall grasslands in the eastern regions received an average of 20 to 25 in. of rain annually, and the short grasslands beyond the 100th Meridian received less than16 in. of rain. These were native grasses, of course.

While practically none of America's popular turfgrasses are native, nevertheless, many are efficient users of water, too, says Brilman. Most cool-season turfgrasses originated in northern or central Europe. Almost all warm-season species came from Africa and other warmer climates. Even so, many of these "introduced" species (especially the improved cultivars) survive droughts and recover. To do this they typically go off color and and (to many people's eyes) become unattractive.

And that's at the heart of the issue, she says. Homeowners expect their lawns to be green and lush year-round regardless of conditions. As a result, they use too much water on their lawns, she says.

"Unless they have even coverage with their sprinklers, they'll develop dry spots and be tempted to up the amount of water they're using. They end up using way too much water," Brilman says.

IRRIGATORS SEEK MORE SAY WITH EPA WATERSENSE

The big-lawns-waste-water sentiment is hardly confined to the arid Southwest or to Florida, which faces severe groundwater issues in light of its continued population growth and development. The sentiment has become national, and has found a partner in the U.S. EPA WaterSense program, a voluntary government/industry partnership to encourage water conservation.

One of the options in the most recent draft of its Water-Efficient Single-Family New Home Specification suggests turfgrass shouldn't exceed 40% of the landscapable area. This and several other guidelines in the draft, which was released in May 2009, aren't being viewed kindly by the Green and Irrigation Industries.

Early in 2009, the Irrigation Association (IA) formed a WaterSense Task Force consisting of contractors, irrigation product manufacturers and distributors to respond to the draft of the WaterSense specification. The group made a formal request to the EPA to delay the release of the outdoor portion of its program.

"We requested an alternative outdoor portion of the future New Home specification be based on performance results, which are also outcome-based, rather than the prescriptive measures," says John Farner, IA Federal Affairs Director.

"Next, we requested the EPA work with industry experts to develop a science-based alternative," says Farner. "Finally, we stated to the EPA the outdoor criteria, as currently written, are flawed and aren't something that the IA can support."

As of this writing it wasn't clear whether the EPA would modify its stance on turfgrass and other contested issues in its WaterSense outdoor program. Indeed, agencies throughout the United States are seeking to replace turfgrass-dominated properties with plant material they've identified as requiring less water.

To view the IA's complete response to the WaterSense Specifications for New Homes, visit **Irrigation.org** and click on "Gov't Affairs" at the top of the home page.

John Farner, works with the IA's WaterSense Task Force.

Education is crucial

Educating the public to water intelligently is key for all segments of the Green Industry. It's critical for turfgrass sod growers since grass production is their sole livelihood. "Turf has its place in the landscape like other valuable plants, and all plants use water," says Dave Dymond, general manager of H&H Sod Company in Kenansville, FL. "We know that people who have irrigation usually water too much. If we could just train and educate them better, we could provide the water savings our water districts are seeking."

That's a tall order and, to this point, one that's being driven mostly by local governments and water agencies. As these bodies attempt to educate the public (often at great effort and expense), they also put measures in place to force water conservation. These measures include irrigation restrictions and landscape ordinances to discourage the use of certain plant material. Reducing the amount of turfgrass almost always tops these lists.

In September, commissioners in Orange County, FL, approved a plan to limit the amount of grass homes in new neighborhoods can have. They want yards in new homes to be less than 60% grass. The new law can save half of the water used outdoors, the commissioners claim.

The new law is similiar to efforts in communities throughout the arid Southwest where property owners are being asked to reduce the amount

The ITC Center's state-of-the-art rain-out shelter, above, was used in the ambitious drought study.

A&M ROAD WARRIORS PUSH TURF TO ITS LIMITS

Never let it be said that turfgrass experts don't go the extra mile to discover something new about the grasses used on lawns, sports fields or golf courses. Drs. David Chalmers and Kurt Steinke went the extra 350-plus miles as they drove from Texas A&M University in College Station, TX, to San Antonio each week for two years as part of an ambitious project studying the drought tolerance of turfgrasses. The project was headed by Chalmers and used facilities at the modern Irrigation Technology Center (ITC) in San Antonio.

Chalmers and Steinke discovered that turfgrass can be a remarkable survivor.

"The consumer has to recognize how turfgrass has evolved," says Steinke, who left A&M this past year and is now with the Michigan State University turf team. "When conditions are tough for grasses, they shut down to survive — and they will survive."

Steinke makes those comments as a result of the ITC study that used a portable rainout shelter to stress grasses to their limits. The two-year project investigated the 60-day drought tolerance of 25 cultivars of four different species. The study compared and recorded how replicated plots of the different species and cultivars performed when planted on native soil with unrestricted root depth relative to plots with a 4-in. topsoil depth.

The Turfgrass Producers of Texas and the San Antonio Water System (SAWS) funded the study. SAWS had been considering banning the planting of St. Augustine grass, which it described as a high-water-use grass. It was also looking at requiring 4 in. of topsoil for newly established lawns.

Using digital photography, the researchers recorded the condition of the grasses each week as they were forced to go longer and longer without irrigation. It took St. Augustine between 26 and 50 days before losing 50% of its color, and Bermudagrass between 43 and 60 days, Steinke says.

"Consumers view color as indicating plant health," he says.

The grasses growing in the native soils with unrestricted root depth survived even 60 days of drought, says Steinke, while the grasses growing in just the 4 in. of topsoil perished within a month.

"Turfgrasses are a lot more drought-tolerant than most people think," Steinke says. "If you don't water it, it'll recover eventually."

To review the complete report of the 60-day drought study, visit **http://itc.tamu.edu/documents/2008FinalReportSAWS&TPT_s.pdf**

of turf on their properties, in some cases being offered cash incentives to remove lawns.

"If the lawn isn't being used for anything, why have so much of it?" notes Doug Bennett, conservation manager for the Southern Nevada Water Authority. A horticulturist by training and charged with conserving his region's scare fresh water, he makes no apologies for taking a dim view of big lawns in his water district. Las Vegas, after all, is located in the Mojave desert and receives an average of just 5 in. of rain annually.

Turf is viewed in a similar light by some authorities in Florida in spite of the state's vastly wetter climate.

"It's been an uphill battle for us because turf is such an easy target," says Dymond, who has been in the sod business more than 30 years and is past president of the Florida Sod Growers Cooperative. "When people

PHOTOS COURTESY: DR. DAVID CHALMERS, TEXAS A&M UNIVERSITY

drive down the street and see sprinklers running when they shouldn't be or water sprayed onto the pavement, they tend to blame the turf."

Dymond admits educating the public is a tall order and a job the industry needs to do better.

"People have to realize there's a big difference between keeping their lawns alive and keeping them lush, especially when water is scarce," Dymond says. "We try to teach our customers to teach their customers to irrigate the grass only when it needs water, to wait until the grass begins to wilt. It will tell you when it needs water. Don't water it because it's Tuesday or because the clock is set at a certain time."

It's equally important property owners follow other proven cultural practices, too, Dymond says. These include not fertilizing lawns too much and mowing them at the height most advantageous to each type of turfgrass.

The Green Industry's customer education efforts can't match what the EPA and regional policymakers, with their greater financial resources, can accomplish. For example, regional policymakers are attempting to curb landscape water waste with PSAs, a constant stream of literature and, in many water-scare regions, demonstration gardens to showcase water efficient landscapes.

One of the newest gardens will be installed at the University of California San Bernadino this coming spring.

The Water Resources Institute of Cal State San Bernadino (WRI), San Bernadino Valley Water and several other partners joined this past summer in a successful effort to collect funds for a Water Conservation Demonstration Garden on its campus. The site, which consisted of 1.5 acres of turfgrass surrounded by walkways and parking lots, will become a garden of low-water-use "California-friendly" plants. The site will be open to the public and will also be used educate students, from the grade school to the university level.

"Working together with our partners, this garden will promote a better understanding of water conservation, sustainable practices and energy efficiency," says Randy Van Gelder, general manager of Valley District.

RESEARCH HAS SHOWN OVER AND OVER AGAIN THAT TURFGRASS IS AN EFFICIENT WATER USER.

— **Dr. James Beard**, Professor Emeritus Texas A&M University

PHOTO BY: RON HALL

Betting on technology

The Green Industry, by contrast, is relying heavily on technology to provide water to American landscapes. It's attacking water waste on two broad fronts — smarter irrigation products and also by identifying and, in some cases, developing plants, including turfgrasses, that require less water to remain attractive and healthy.

These efforts are leading to "smarter" products, such as sprinklers that dispense water more evenly and precisely across landscapes, and controllers that use climate- and sensing technologies to supply plants with the water they need — and only what they need.

The industry wants to take the guesswork out of irrigation by taking it out of the hands of homeowners.

On the turfgrass front, experts across the United States are attempting to develop grasses that are even more efficient water users. The efforts are scattered in different regions of the country, looking at different species and cultivars..

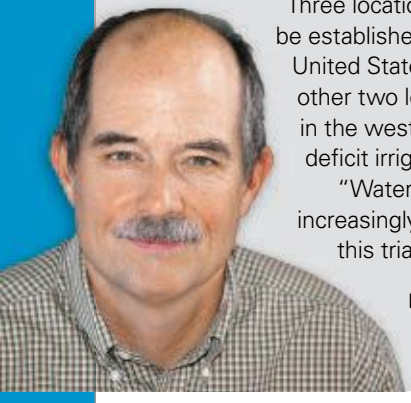
But, developing new, improved turfgrasses takes years even with today's growing knowledge of genetics.

Brilman, one of the relatively small group of turfgrass experts committed to improving the environmental and aesthetic features of turfgrass, says significant progress has been made in

NTEP STARTS SPECIAL TURF DROUGHT TRIALS

The National Turfgrass Evaluation Program (NTEP) is a great information source for landscape and lawn service professionals. The program, headquartered in Beltsville, MD, shares data for 17 turfgrass species gathered from turf trials in 40 U.S. states and six provinces in Canada. It provides information aimed at helping end-users select the turfgrass best suited for their particular regions of the country, specific sites and uses.

In addition to evaluating and sharing data related to turfgrass quality, color, density, resistance to diseases and insects, and tolerance to heat, cold, drought and traffic, NTEP initiated a new trial this year focused on testing the drought tolerance of cool-season grasses at five locations. This will be the first trial in NTEP's new Trait Specific Testing program.



Kevin Morris, executive director of NTEP

Three locations for the drought trial will be established in the eastern half of the United States using rainout shelters. The other two locations will be established in the western half of the country using deficit irrigation testing.

"Water used on turf is becoming increasingly criticized. Therefore, we feel this trial will show improvements in drought tolerance that can help consumers save water in their landscapes," says Kevin Morris, NTEP Executive Director. "Also, since there are municipalities, communities, and even the federal government, that wants to restrict turf use in landscapes, this program is an important step in encouraging development of drought tolerant grasses."

Data about percent green and ground cover throughout time will be collected regularly using digital imaging technology. Highlights of the procedures include:

› Three locations will use rainout shelters, which allow testing of short-term drought situations of 60 to 75 days during two growing seasons. Locations are Fayetteville, AR; St. Paul, MN; and Ithaca, NY.

› Two other locations will measure chronic drought stress by imposing deficit irrigation during two complete growing seasons. Deficit irrigation levels will be determined by the needs at each location, but will range about 50% of evapotranspiration (ET) during spring and fall, and as much as 65% of ET during summer. Locations are Ft. Collins, CO, and Logan, UT.

› Cool-season species will be organized into high-fertility and low-fertility groups. Therefore, low fertility species such as fineleaf fescue will receive only one-half the fertility of species such as perennial ryegrass and Kentucky bluegrass

"In the future, we hope to expand this program to traffic tolerance, salt tolerance and many other important traits," says Morris.

While results from the newly developed drought trials are not yet available, other valuable data related to turfgrass performance can be found online at **NTEP.org**.

developing grasses that remain alive and healthy with low water use.

Unfortunately, property owners (and some contractors, too) seem to be largely unaware of this and lack basic knowledge about turf care. For this reason, they continue to make grass selections on price, she says. Too often the turfgrasses they use to establish lawns represent the cheapest, poorest performing choices.

Brilman says that different species of turfgrass and even cultivars within each species can exhibit widely different degrees of drought tolerance.

Take Kentucky bluegrass, for example. Research has shown some of the improved cultivars of this popular cool-season species, such as the America types, require almost two-thirds less water during the course of a summer to remain green and healthy compared to common types, which are used in a lot of the older bluegrass lawns in the northern parts of the United States, she says.

"If we could convince these people to change and establish lawns with the more expensive bluegrass, they'd need only about a third of the water they're presently using," Brilman says. "The problem is that people still have to know how much water that grass really requires, and only put that amount of water on it."

Basic misconceptions about turfgrass and its water needs color policymakers' perception of its role in landscapes, adds turf expert Beard, who has spend the past half-century researching turfgrass at Michigan State University and Texas A&M.

Turfgrass is an efficient user of water compared to trees and even many desert plants, he adds.

Generally, the water needs of plants are in proportion to the their total leaf areas, he says, a fact born out by the location of forests in wetter climates around the world.

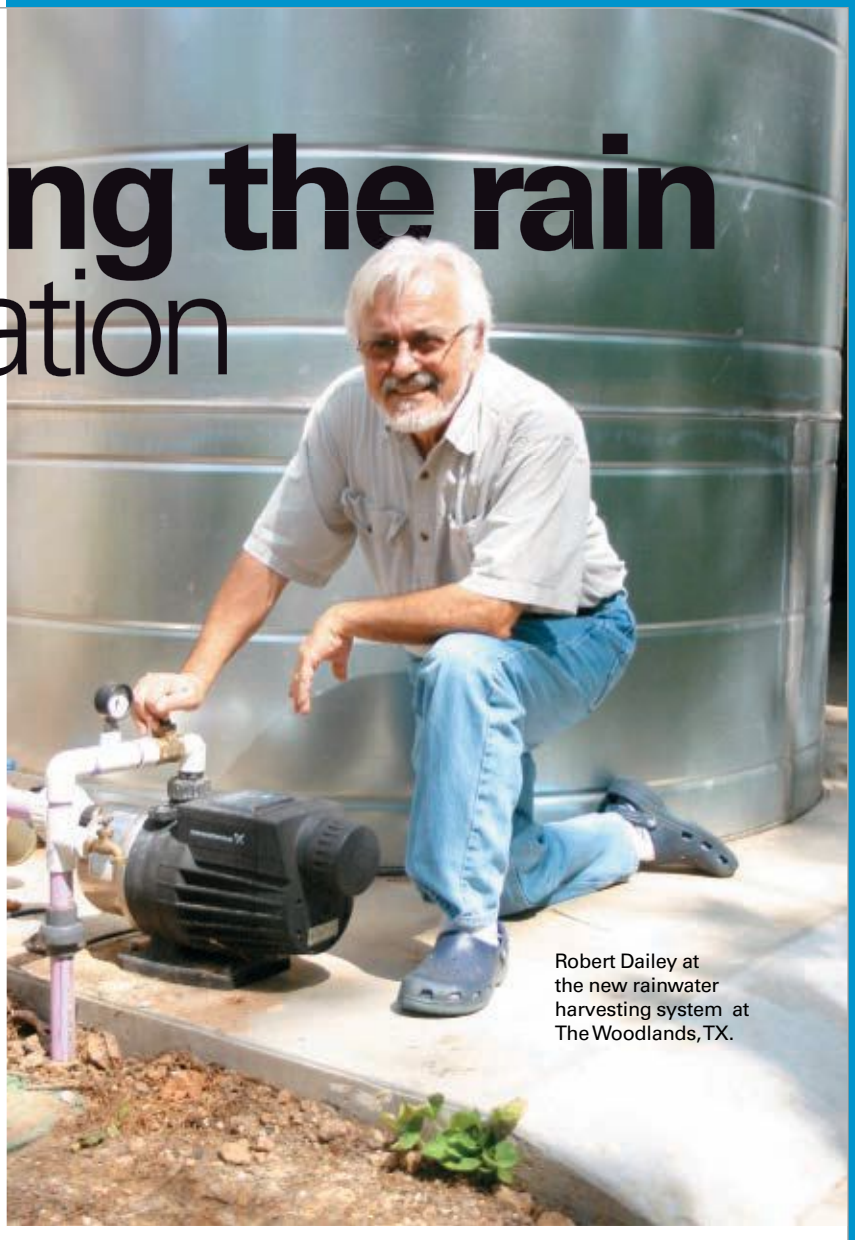
In the end, says Beard, the public will decide the fate of turfgrass on their properties. That decision may rest upon whether they will be willing to pay more for water for irrigation and for improved cultivars that use water more efficiently. Or if they will accept grasses that go dormant or seasonally off color, including when irrigation is not available.

"People may not be willing to accept it, not right away. They'll fight it, at least for a while," says Beard. LM

Catching the rain for irrigation

Interest in rainwater harvesting systems to supplement landscape irrigation is growing, but there's much to learn before jumping into the business.

BY **RON HALL** EDITOR-AT-LARGE



Robert Dailey at the new rainwater harvesting system at The Woodlands, TX.

PHOTO COURTESY: COMMUNITY ASSOCIATIONS OF THE WOODLANDS, TX

Educating your clients about rainwater harvesting systems can provide customers an alternative, free source for irrigation water in the face of increasing water restrictions. And who doesn't like free?

OK, so you've been around long enough to realize that even free usually isn't really free. Yes, there is a cost to using rainwater: the expense of installing a rainwater system, which can be considerable. Add the cost of the system's maintenance, usually minimal. But even these expenses, which vary based on a system's design, size and sophistication, may be a sound investment for many property owners when they consider and tally the expense of replacing dead or dying trees and ornamentals because of watering restrictions.

Landscapes, including expensive specimen trees, get severely stressed and often die because of lack of water whenever a region suffers a severe drought and restrictive watering rules take effect.

As most of us know, local governments and water authorities don't view landscape irrigation as a critical use of potable water, especially on large residential or commercial landscapes where turfgrass is not actively used for sports or recreation.

Look before leaping

Is harvesting rainwater a good business opportunity for a landscape company? Every owner will have to decide that realizing that interest in these systems soars when a region is suffering drought, but demand can dry almost overnight when rains return.

Property owners in regions of the country with persistent water shortages or where potable water is costly are more likely to want them.

The concept of these systems is simple, starting with a design that captures rainwater or snowmelt running off from impervious surfaces such as roofs. The water flows by gravity from a roof, via gutters and downspouts, into a storage tank or underground cistern.

Captured rain supplements traditional sources of water

> DETERMINE THE STORAGE CAPACITY OF A SYSTEM BY THE LENGTH OF DRY SPELLS IN IN A REGION
>
> — **Tim Pope**, President, American Rainwater Catchment Systems Association

The stored water is delivered to irrigation lines by a small pump and is directed to landscape plants. Filters keep debris from flowing into the tank and through the irrigation lines. Keep in mind that because this water has flowed over roofs and other imperious surfaces, it's probably passed over bird waste and other harmful substances. It probably shouldn't be used for anything other than irrigation.

Systems are available in a range of sizes and levels of sophistication — from a simple $50 rain barrel available at most big box stores, to large, above-ground, gravity-fed storage-tank systems or underground cisterns, which deliver stored rainwater to a landscape via 1/2-hp to 1-hp electric pumps.

A supplemental source

The amount of irrigation water a rainwater catchment system can provide depends on the size of the area used to collect the rainwater and the design of the system. A rule of thumb is 1 in. of rain falling on a 1,000-sq.-ft. roof yields 600 gal. of water.

While that may sound like a lot of water, it's not — at least when it comes to watering turfgrass, says Tim Pope, president of the American Rainwater Catchment Systems Association (ARCSA). Installing a system big enough to irrigate turfgrass is rarely, if ever, worth the cost of a system, he says.

Even a professionally designed and installed system is regarded as a supplemental or emergency source of irrigation water, mostly to preserve the health of valuable trees, shrubs and other ornamentals, he says.

Determine the storage capacity of the system largely by the length of dry spells in a region, Pope says. The longer the period between rains, the larger the capacity for storage. In other words, a system installed in Atlanta, which typically receives frequent rains, would require less storage than a system installed for a similarly sized landscaped property in Tucson, where rain is much less frequent.

Pope lives and works out of his home in Friday Harbor, WA, where he has installed about 200 rainwater harvesting systems on the islands in the Puget Sound north of Seattle. Even though capturing rainwater for home use is technically illegal in Washington, Pope says he hasn't been prosecuted.

In spite of the Seattle area's reputation for being wet, it actually receives less total precipitation annually than any U.S. region east of the Mississippi River. In fact, the availability of fresh water in many of the communities on the Puget Sound and around Seattle is scarce, the reason why Seattle has a master water permit that allows residents of most neighborhoods to collect some rainwater.

A similar easing of rain collection by homeowners was approved in

PHOTO COURTESY: COMMUNITY ASSOCIATIONS OF THE WOODLANDS, TX

Colorado as well this past spring. But it remains forbidden in Utah, which continues to honor 19th Century water rights laws that dictate that all flowing water in western states is already dedicated to someone's use.

Even so, interest in rainwater harvesting is exploding, Pope says, citing the growth of ARCSA, which was founded in 1994 in Austin, TX. For example, the association counted 120 members in 2007. This year, there are more than 700 members, including landscape architects, public officials, utilities, regulators and property developers.

Popular in newer communities

Installations are happening at all levels — residential, commercial, community — and since 2008 across entire real-estate developments in New Mexico.

In fact, nowhere in the United States is rainwater catchment systems promoted as vigorously as in Santa Fe County, Bernalillo County and Albuquerque where residents with 2500 sq. ft. or more of property must install an active rainwater catchment system comprised of cisterns. All commercial developments are required to collect all roof drainage into cisterns to be reused for landscape irrigation.

Another striking example of support for capturing and using rainwater for irrigation took place in 2008 in Tucson, AZ, with the passage of a municipal rainwater-harvesting ordinance for commercial projects. Under the law, developers building new corporate or commercial structures must supply half their landscape water needs from harvested rainwater. The law takes effect June 1, 2010.

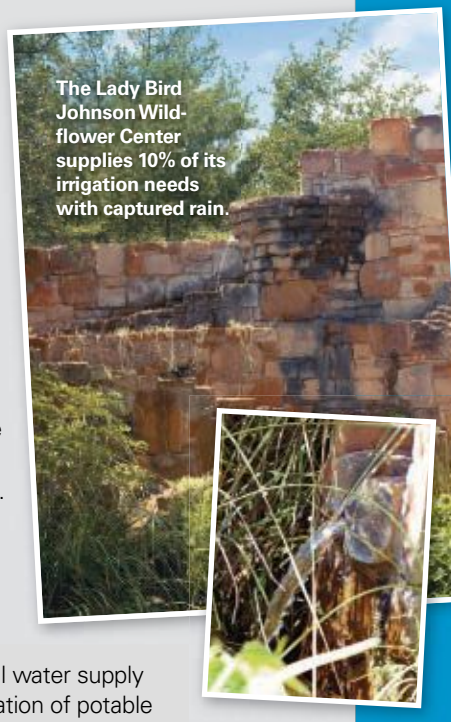
Tucson, of course, is in the Sonoran Desert and receives just 12 in. of rainfall a year on average. With a metropolitan population of just more than 1 million people and growing, the region depends on the Colorado River and groundwater, which it carefully monitors to supply its needs.

Sometimes rainwater harvesting systems serve dual functions — irrigation and also education.

This past summer, the Community Associations of The Woodlands, TX, a master-planned region of about 90,000 people located 28 miles north of Houston, installed a 2,500-gal., rainwater-harvesting tank to collect the rainwater from the office roof at its parks, recreation and environmental services building. The water provides irrigation to more than 1,000 sq. ft. of demonstration gardens on-site. On Sept. 26, the Community Associations invited the public to see the system and learn about rainwater harvesting methods for homes and businesses.

If you're interested to learn more about capturing and using rainwater to irrigate gardens, visit **ARCSA.org** or download the 88-page "The Texas Manual on Rainwater Harvesting" at **www.twdb.state.tx.us/publications/reports/RainwaterHarvestingManual_3rdedition.pdf**. There are several books about the subject, too. LM

NOW THIS IS A RAINWATER CATCHMENT SYSTEM!



The Lady Bird Johnson Wildflower Center supplies 10% of its irrigation needs with captured rain.

AUSTIN, TX — The Lady Bird Johnson Wildflower Center's 14-year-old rainwater harvesting system is an integral part of its architecture, and demonstrates the importance of connecting human culture with the natural world. The collection system conserves water and serves as a public education tool.

The Center collects water from 17,000 sq. ft. of roof, and can store more than 40,000 gal. in five on-site cisterns. The collected rainwater provides about 10% of the center's yearly water needs for irrigation of gardens and landscaping. About 10,600 gal. of water is collected per inch of rain. With an average rainfall of 30 in. per year, this rooftop system can collect about 300,000 gal. of rainwater annually.

The cisterns, one plastic and the others galvanized metal, are linked to the municipal water supply with backflow devices to prevent contamination of potable water. The center has the option to turn to city water, which would bypass the collection system and go right into the irrigation system.

The center was started in 1982 by former First Lady Claudia "Lady Bird" Johnson and actress Helen Hayes, who formed an organization to protect and preserve North America's native plants and landscapes.

First as the National Wildflower Research Center and later as the Lady Bird Johnson Wildflower Center, the facility exists to introduce people to the beauty and diversity of wildflowers and other native plants. Every day, the center brings life to Johnson's vision in its public gardens, woodlands and meadows, as well as in research. In 2006, the center became an organized research unit of the University of Texas at Austin. For more information on the center, visit **Wildflower.org**.

PHOTOS BY JOE MARCUS, LIVING COLLECTIONS MANAGER AT THE UNIVERSITY OF TEXAS AT AUSTIN'S LADY BIRD JOHNSON WILDFLOWER CENTER