



## Irrigation for a Growing World

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April 3, 2009

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Water is one of Earth's most precious resources. However, in most cases it is being consumed as if a limitless supply existed.

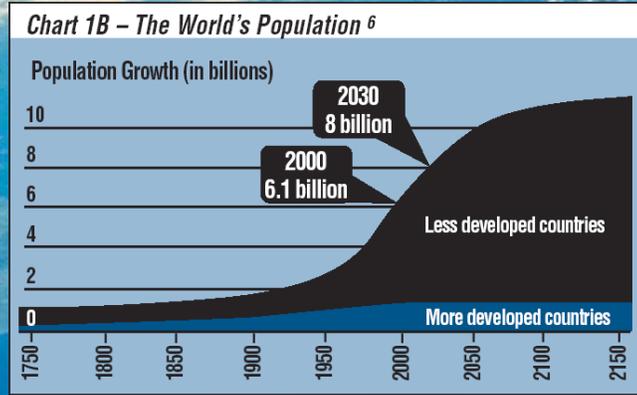
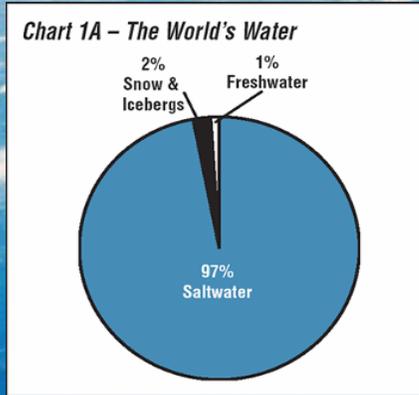
As the world's leading irrigation manufacturer, we feel it is our responsibility to increase awareness of the growing threats posed by global water scarcity. We've published a series of white papers, the first entitled *Irrigation for a Growing World*. That is the foundation of our effort to educate people on the importance of using water efficiently and ways to incorporate these practices into their daily lives.

Since 1933, our research, marketing and manufacturing resources have been committed to developing products and technologies that use water efficiently – we call it *The Intelligent Use of Water*™. It is a commitment that extends to education, training and services for our industry and our communities.

## What We'll Cover Today

- **The World's Water Crisis**
- **Options to Address Water Scarcity**
- **Conservation through Efficient Irrigation**
- **Encouraging Water Conservation**

# The World's Water Crisis

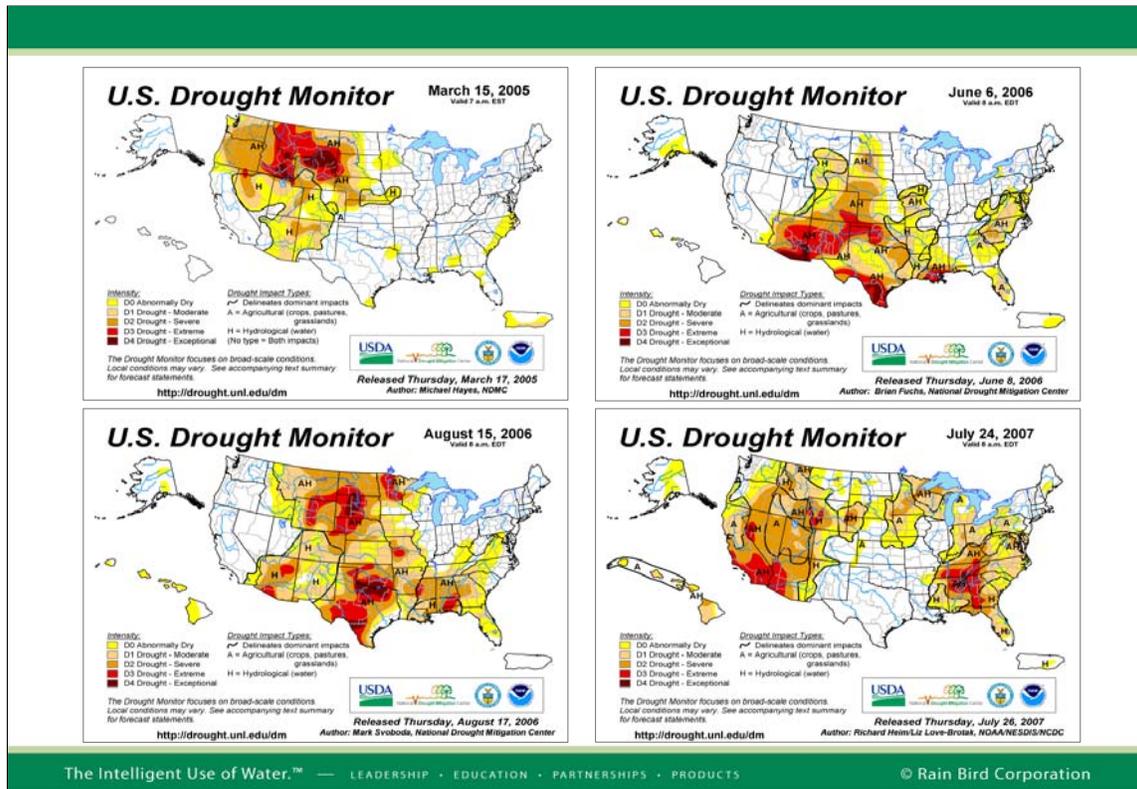


**There is no new water.**

Water seems to be the most abundant resource around. But even though we live on a planet that is covered in water, only a very small percentage of it is fresh water that people can use. Most is tied up in our oceans, or trapped in snow and icebergs. This leaves only about 1% available for use by us – humanity.

By 2030, the world's population is expected to reach 8 billion people - all relying on a finite water supply.

The world's water problems arise from a basic conflict: the global fresh water supply is fixed, but world population and water consumption continue to go up every year. In a nutshell, there is no new water.

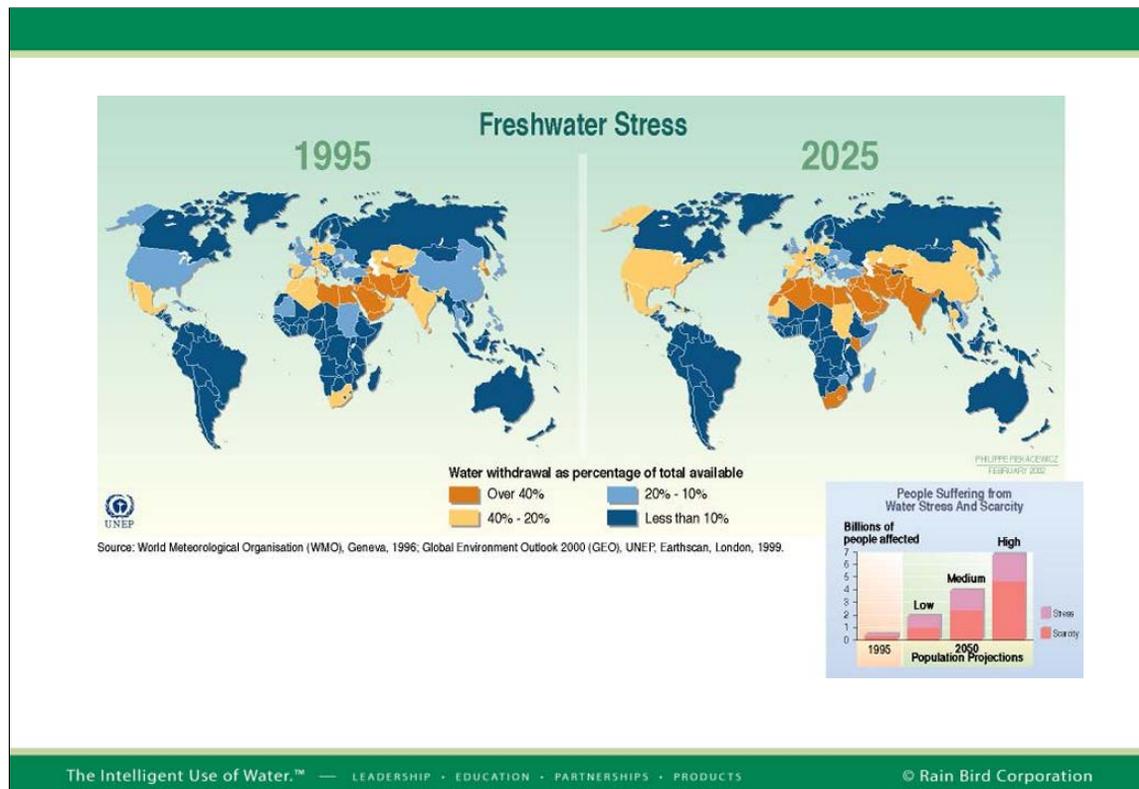


Today, half a billion people (8% of the world's population) are experiencing moderate to severe water shortages. Drought is becoming a very painful reality in many parts of the world. This map shows a large portion of the United States is suffering from drought. You can also see that drought conditions vary from year to year, affecting different regions.

Water usage is also on the rise. During the past century, water usage has outpaced the growth in population. Since 1900, population in the United States has doubled, but per capita water use has increased eightfold.

Many people use much more water than they truly need. In the US, residents on average use 101 gallons of water per day, far more than the estimated 20.5 gallons needed.

Water agencies are responding by imposing bans and restrictions on watering. In many cases, water consumption goes even higher once bans are lifted.



More and more demands are being placed on the 1% of the world's water that is available for human use. The world's population is growing at such a rate that by 2025, the UN predicts that more than 2.7 billion people will face severe shortages of fresh water.

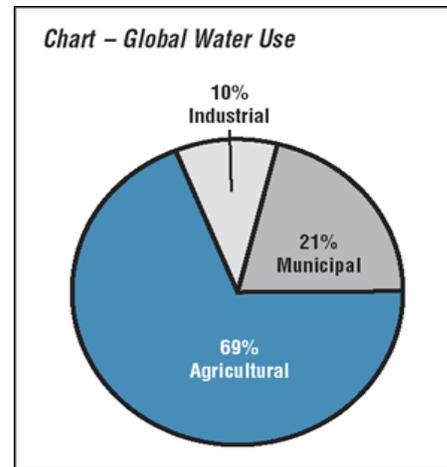
An estimated one-third of the world's population already lives in areas with water shortages. In developing countries, this translates into 1.1 billion people lacking access to safe drinking water. While they manifest themselves differently, the effects of both actual and forecasted water shortages are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

Many people use much more water than they truly need. In the US, residents on average use 101 gallons of water per day, far more than the estimated 20.5 gallons needed.

Water agencies are responding by imposing bans and restrictions on watering. In many cases, water consumption goes even higher once bans are lifted.

## Outlook for the Future

- **69% of water used in Agriculture**
- **More efficient use can have significant impact on available supply**
- **Increasing number of international and regional summits**
- **Working together to find a solution**

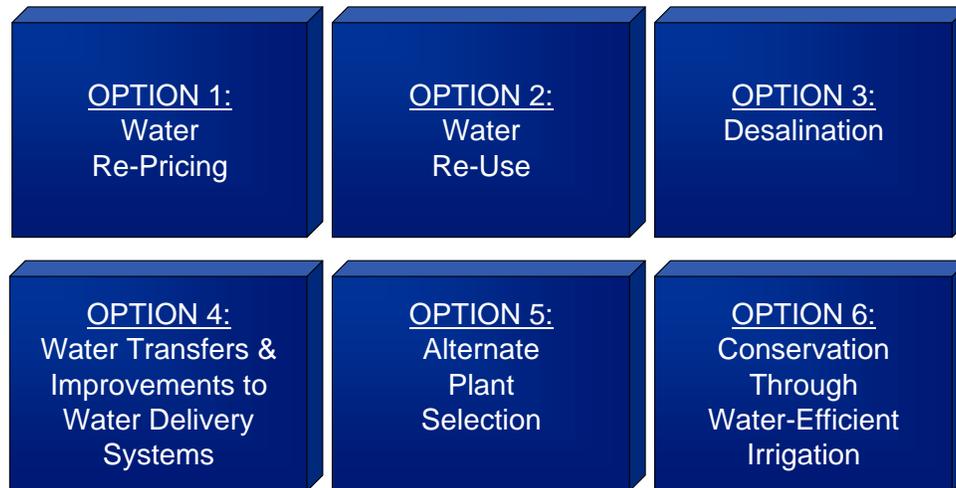


It is estimated that 69% of all water withdrawn is used for agriculture, 10% for industry and 21% for municipal use. If we could use water more efficiently, particularly in agriculture, it would have a major and positive impact on the water supply.

Throughout the world, people are coming together to discuss the problems we all face and try to come up with workable solutions before a massive global crisis erupts. Water distribution agencies, non-profit groups and industry are all working together to research water scarcity issues. The problem can only be solved by a united effort.

# Options to Address Water Scarcity

## The Options



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Our options include:

1. Water repricing
2. Water re-use, or reclaimed water systems
3. Desalination -- producing fresh water from ocean sources
4. Water transfers and delivery system improvements
5. Alternate plant selection or Xeriscaping.

And finally...

6. Conservation through water efficient irrigation, which we at Rain Bird feel is one of the most promising options.

# 1. Water Re-Pricing

- **Government subsidized**
- **Set artificially low to promote development**
- **Low water prices encourage wastefulness**
- **Re-pricing impact can be immediate**
- **Lengthy process to get buy-in from all groups**



In many cases water prices are set artificially low by the government to promote development. Many farmers in the United States pay a flat fee for water per acre with unlimited consumption. Manufacturers and commercial developments often receive volume discounts.

Even at the household level, water prices have been so low for so long that many people do not think about it. For example, in Central Arizona the price of water is around \$2 per acre foot, but the actual cost is over 100 times that, \$209 per acre foot. With water being so cheap, there is little incentive to conserve.

By simply allowing market forces of supply and demand to work, and raising water prices to be more in line with actual costs, we can have an immediate impact on conservation behavior. But unfortunately, it can take a long time to get the government and policy groups to come to agreement.

## 2. Water Re-Use

- Water recycling can reduce fresh water consumption by up to 80%
- Power-plant cooling, construction, manufacturing, golf course irrigation
- **Expensive, high capital costs, not available in all areas**



The second option is water re-use or recycling. This can have a huge impact on fresh water consumption. Treated water can be used for a wide variety of industrial and commercial applications. For example, many golf courses and commercial landscapes are irrigated with reclaimed water. But the high capital costs involved with establishing recycled water systems often prevent communities from taking advantage of this option.

### 3. Desalination

- Tap into the 97% supply of ocean water
- Technology improving
- Costs coming down
- **Negative impact on environment, high capital start up costs, high water cost**



The third option is desalination. This seems like a logical solution since most of the Earth's water is contained in our oceans. Today, there are about 13,600 plants in operation producing about 6.8 billion gallons of fresh water per day. That may sound like a lot, but in reality, it is less than 1% of the world's water needs.

The costs of desalinated water used to be the biggest obstacle preventing its adoption, but technology improvements are helping to bring costs down. Still, it takes a lot of money to build a desalination plant. Start up costs typically run in the tens if not hundreds of millions of dollars.

Another argument against desalination is the environmental impact. A by-product of the desalination process is a highly concentrated salty brine discharge that can harm marine life in the area.

## 4. Transfers & Delivery Systems

- Transfers from agricultural to urban use
- Satisfies immediate need
- Improved delivery systems prevent water lost in transit
- **Transfers only reallocate, infrastructure improvements can be expensive**



Option four has to do with moving water around to where it is needed most. When faced with decreasing water supplies, water districts typically shift water away from farmers to meet urban and ecological needs. Farmers often agree to these transfers for financial reasons, particularly if they get paid more for the water than they would make from selling their crops. But transfers can spark angry debate when they threaten farmers' ability to continue farming.

The second part of this option has to do with water delivery systems. Old, poorly maintained canals and wells can lose anywhere from 24% of available water in the US, up to about 60% of available water in countries like Jordan.

Improving infrastructure and plugging leaks can have a significant impact on water supplies, but these projects come with a high price tag. California spent \$200 million on two canal lining projects which helped to preserve nearly 100,000 acre feet of the Colorado River annually. And in the end, water is only transferred -- no new water is created.

## 5. Alternative Plant Selection

- Use native plants that can thrive on natural levels of rainfall
- Can reduce irrigation and watering needs
- **Restricted plant selection; some people mix native and non-native plants**
- **Irrigation design and scheduling are very important**



The fifth option is part of Xeriscaping -- the practice of replacing non-native plants and turf grass with plants and grasses that are native to the area. In some areas, this practice has led to a decrease in outdoor water usage of up to 60%.

Better matching plants or crops to climates and regions has also been successful in agriculture. In Cape Verde, Western Africa, farmers who switched from high water use sugar cane to more suitable crops like low water consuming potatoes, onions and peppers have saved water and increased yields.

But Xeriscaping has some downsides. It can cost a lot to overhaul an existing landscape to put in a Xeriscape. Proper education is also crucial. Often times, people put native plants right next to non-native plants and are forced to continue watering at high levels.

## 6. Water-Efficient Irrigation

- Can be implemented immediately and in stages
- Significant savings opportunity in Agriculture
- Benefits can be reaped immediately
- **Requires 4 important components:**
  - Proper system design, products, installation and usage/maintenance



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Conservation through water-efficient irrigation is one option that can be implemented today or phased in over time for significant water savings. Cost may be a concern to some, but installation costs are often quickly covered by reduced operating costs. On large farms, converting a flood system over to more efficient drip irrigation can significantly lower costs in water, labor and fertilizer while increasing plant health and crop yields.

Water efficient irrigation does require four important components:

proper system design, using the right products, proper installation and proper usage and maintenance. We'll go over each of these points in just a minute.

# Water Conservation through Efficient Irrigation

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## History of Irrigation

- **Earliest irrigation followed river flooding**
- **Channels dug to move river water to crops**
- **Still the most common method of agricultural irrigation used today**
- **Only about 15% of crops worldwide grown with more efficient irrigation**



*Illustration by Mark Peppe, © 2002 World Book, Inc*

Water conservation through efficient irrigation is one of the most promising and viable options we have available. It's somewhat shocking, but many irrigation methods haven't changed much over the centuries.

Back in ancient Egypt, the very first forms of agricultural irrigation involved digging channels and directing river water into the fields. Surprisingly, the flood/furrow method of irrigation is still the most common one in use today. Even though we have made great improvements in irrigation technology, only a small fraction of crops grown worldwide use more efficient irrigation methods. This is largely due to the lack of understanding of advanced systems and the initial cost to convert to new methods.

## History of Irrigation

- **December 1933, Orton Englehart filed patent for “spring-activated horizontal arm driven sprinkler”**
- **Durable, distributed water farther and more evenly and efficiently**
- **Foundation that evolved into modern sprinkler irrigation**



One of the inventions that led to modern water-efficient irrigation was the original impact sprinkler. Invented in a barn back in 1933 by a citrus grower named Orton Englehart, this new sprinkler was more durable and efficient than other sprinklers of his day. His neighbors, Clem and Mary La Fetra, saw the potential of this invention and began marketing it. Their initial manufacturing operations in the family barn grew into today’s Rain Bird Corporation.

# Irrigation Applications



Agriculture



Golf Courses



Landscapes

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Irrigation today can be split into three major areas:

**Agriculture.** As we already mentioned, agriculture uses a large percentage of the world's water to grow our food and other important crops. Even though many farmers still use old methods, many are beginning to realize the potential benefits of more efficient irrigation, including healthier crops, higher yields and ultimately financial gain.

**Golf Courses.** Golf courses are another group of large water users, consuming approximately 2.7 billion gallons of water per day in the United States. They are often the target of criticism, particularly in drought-prone areas. What you may not realize is that the golf industry has been on the forefront of water-efficient irrigation. They have helped pioneer the use of reclaimed water and advanced central control systems. Many of the technologies developed for the golf industry have made their way across to other industries like Landscaping.

Commercial, homeowner and recreational landscapes are the third major user of water. There are many opportunities for homeowners and property managers to significantly reduce their water bills and increase the health of their landscapes through efficient irrigation.

## The Value of Landscaping

- **Increases real estate market values**
- **Beauty and relaxation for family, employees and visitors**
- **Provides safe, high-quality play and exercise areas**



## The Value of Landscaping

- **Turf, shrubs and trees reduce noise pollution by up to 50%**
- **One tree removes 26 pounds of carbon dioxide and produces 13 pounds of oxygen annually - enough to support a family of four**
- **Eight average front lawns have the cooling effect of 70 tons of air conditioning**



## Key Steps to Implement Water-Efficient Irrigation

- Proper irrigation system design
- Use the most water-conserving products
- Proper system installation
- Proper maintenance and usage

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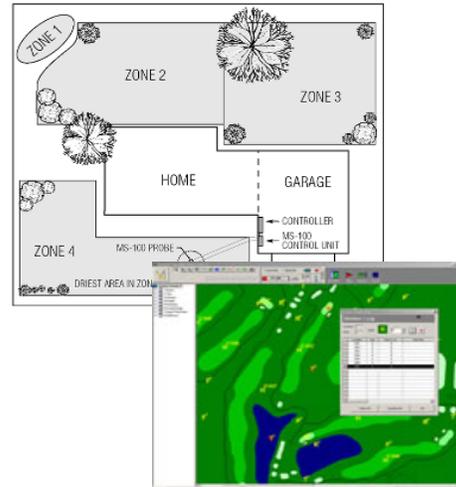
In order to achieve maximum savings, four key steps must be followed.

1. Proper irrigation system design
2. Use the most water-conserving products available
3. Proper system installation
4. Proper maintenance and usage.

Let's take a look at each one of these.

## Proper Irrigation Design

- Different plants require different amounts of water
- Understand exactly what will be irrigated
- Divide by zones
- Use the right products for the right applications
- Consult a licensed professional



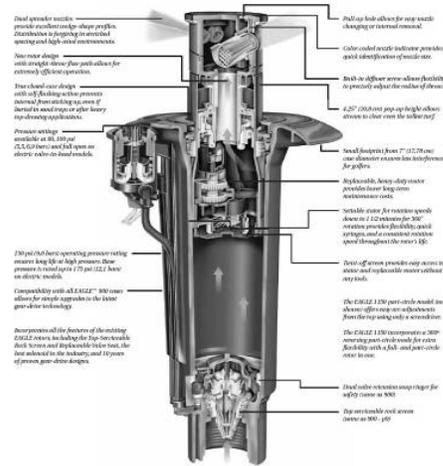
The first step is a properly designed plan. Whether you are designing for a small home, a golf course, a farm or a commercial property, it is important to understand that different types of plants require different amounts of water.

Certified Irrigation Designers are trained in irrigation design and know all about the watering needs of various plants, water-efficient irrigation products and local environmental conditions. They can divide a system into zones based on the watering needs of the plants in that area.

A properly designed plan is a critical first step toward water-efficient irrigation.

# Use Water Conserving Products

- Significant recent advances in irrigation technology
- Automated systems can be more efficient than hand watering
- Can be set to deliver exactly the amount of water needed



Irrigation technology has come a long way in the past century. And even though you might think that automated systems use more water, in reality they can be even more efficient.

If you've started with a good irrigation system plan like we just discussed, then an automatic system can deliver precisely the amount of water needed to keep plants healthy without waste.

So let's take a look at some of the products that make this possible:

## Automatic Controllers with Water Conserving Features

- Multiple start times and multiple independent programs
- Cycle+Soak™
- Water Budget
- ET Programming
- Rain Delay



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The brains of any good automatic irrigation system is the controller or timer. These range from small units for home use to wireless systems for use in agricultural fields, all the way up to computer-based central control systems for golf courses and large commercial sites.

Water conserving controllers use multiple start times and multiple programs which allow shorter and more precise run times based on plant needs. This also helps reduce runoff, since water can soak in between cycles.

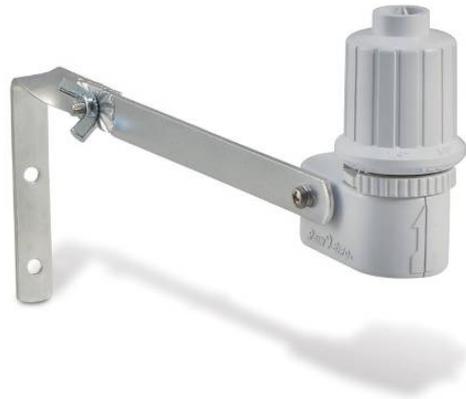
A water budget feature allows users to easily adjust their system up or down based on the season. For example, a user can reduce water usage by 85% by simply adjusting the water budget down to 15% during the rainy season.

ET Programming takes this a step further by adjusting each zone's run times based on the actual water used by plants. This is usually used in larger commercial sites, golf courses and farms due to the cost and complexity of the system.

Rain Delay allows a user to postpone watering when it isn't needed, typically when it is raining, then automatically resume watering when appropriate.

## Add an Automatic Shut-Off Device

- Rain and moisture sensors automatically suspend watering
- 15-20% or more in water savings
- Some cities considering or passing legislation



A rain or moisture sensor allows an irrigation system to postpone watering automatically when it is not needed, then resume normal watering once conditions dry out. This can save 15-20% or more water on average.

Not only are rain and moisture sensors a smart addition to an irrigation system, in some cities and states they are becoming mandatory.

## Use Low Volume Irrigation

- **Very efficient for non-turf applications**
- **Apply precise amounts of water slowly and evenly at the root**
- **Helps reduce weeds and plant disease**
- **Helps eliminate runoff**
- **Helps plants thrive**



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Low volume or “drip” irrigation is generally the most efficient method of watering non-turf areas because it delivers precise amounts of water slowly and evenly at the plant roots. This helps combat the problems of runoff, overspray and weed growth.

The slow, consistent application of water also helps plants to be healthier. In landscaping, drip is often best for trees, shrubs and flowers. In agriculture, drip and micro irrigation is typically used for higher value row crops like almonds, apples, oranges, plums and peaches.

## Provide Optimum Water Pressure

- Use pressure regulating devices in high pressure situations
- Every 5 psi reduction results in 6-8% lower water usage
- Prevent misting & fogging
- Use booster pumps in low pressure environment



In landscaping and agricultural sites, water is often wasted through evaporation when water pressure is too high and misting or fogging occurs. Fortunately, there are a wide array of pressure regulating valves, nozzles, sprayheads and regulators that can bring excess pressure back down to optimum levels.

For example, an irrigation system running too high at 70 psi that is reduced down to a recommended 30 psi can provide over 50% in water savings.

For situations where water pressure is too low, a high efficiency irrigation pump can bring pressure up to optimum levels to ensure efficient and even coverage.

## Use High Efficiency Nozzles

- Provides uniform coverage
- Can reduce water usage by up to 30%
- Provides even watering at close-in, medium and far distances
- Without uniform coverage, some areas get overwatered to compensate for dry spots



It doesn't matter whether you are watering a golf course, a vineyard or your own backyard -- uniform and even coverage is vital. When coverage is uneven, programs need to be run for longer periods of time to compensate. This results in overwatering and runoff. High efficiency nozzles can reduce water usage by up to 30% while making sure everything is watered evenly.

## Proper Installation

- **Systems must be properly installed and configured to achieve the most efficient use of water**
- **Use Certified Irrigation Contractors (WaterSense program)**



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A good design plan and the right products are important, but they can't deliver water savings by themselves. Proper installation and maintenance are essential to achieve the most efficient use of water.

Using a certified contractor is one way you can be sure to get the highest level of water efficiency. The EPA's WaterSense program has identified certification programs that accurately assess professional competency in designing, installing, maintaining and auditing water-efficient irrigation systems.

Several states and counties such as New Jersey, Connecticut and parts of Florida are now requiring irrigation contractors to be certified by the Irrigation Association, Rain Bird Services Corp or another certifying organization in order to install irrigation systems.

## Proper Maintenance and Operation

- **Set systems to operate in early morning**
- **Periodic monitoring is important**
- **Routine inspections to discover problems**
- **Adjust schedules when the seasons change**
- **Adjust schedules when plants change**



The last and ongoing step in conserving water through efficient irrigation is proper maintenance and operation. This is just as important as proper design, using the right products and proper installation.

Here are a few tips to help you get the most out of your system.

1. Set systems to run in the early morning hours, generally between 5 and 10 am. You'll lose less water to evaporation.
2. Do routine inspections. Since watering should be done in the early morning hours, problems can often go undetected for weeks resulting in water waste. Regular inspections of all system components is very important.
3. Adjust watering schedules to match the season. Overwatering often occurs because end users rarely adjust their watering schedules. As we mentioned before, today's controllers make it very easy to scale back watering when the seasons change.
4. Similar to seasonal changes, make sure to adjust watering schedules when plants change. New plants bring new water requirements, so make sure you are delivering the right amount of water to keep the new arrivals healthy without overwatering.

# Encouraging Water Conservation

## Encouraging Water Conservation

- **Essential to ensure adequate water for future generations**
- **First reactions tend to be “shut off the taps”**
- **Creates confusion**
- **Leads to increased water consumption when bans are lifted**
- **Doesn't change long term behavior**

As we mentioned in the very beginning, the global supply of water is fixed, but world population continues to grow. We have to act now to ensure that enough water is available for future generations.

But the first reaction to drought and water shortage tends to be drastic water restrictions. Communities are forced to “shut off the taps” during drought times, only to return to their wasteful ways when the rains come again. These restrictions cause confusion and often encourage people to overcompensate and use more water than they need on the days they are allowed to water.

One of the most feasible options to address this growing crisis is the proper management of existing water resources. We need to encourage water conservation behaviors and motivate people to change the way they think about water.

## Government Incentives

- **Loans, grants, rebates and incentives**
- **Conservation incentives and disincentives can change behavior**

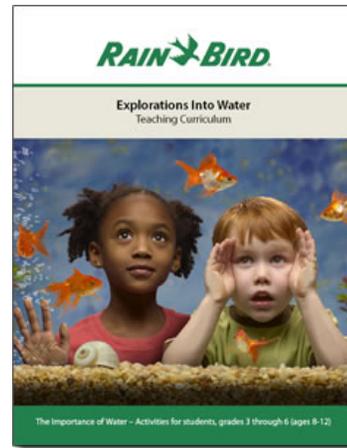
At the Third World Water Forum, held in Japan in March 2003, they stated that “Many countries face a governance crisis, rather than a water crisis. Primary responsibility rests with governments to make water a priority...”

Governments know they need to change water consumption behavior and they are exploring a number of incentives and disincentives, including:

- Israel: low interest loans are available to farmers to install more efficient irrigation systems.
- Pakistan: loans and working capital offered to farmers to install canals, small dams and drip and sprinkler irrigation systems.
- U.S. Farm Bill: a ten year measure that contains 11 different programs with more than 180 conservation initiatives.
- In Washington, the Seattle Public Utilities have operated a water-efficient Irrigation Program for over four years. Through capital improvements alone, the program achieved water savings of more than 117,817 gallons per day.
- Many states offer conservation subsidies such as loans, grants, rebates and tax incentives. In one case, the Texas Water Development Board provided more than \$44 million in low-interest loans to hundreds of farmers to encourage the installation of water efficient irrigation equipment which saved from 13-26 million gallons of water annually per individual farmer.

## Education and Awareness

- **Change perception of water as an “unlimited commodity”**
- **Professional education programs**
- **Public education and awareness**



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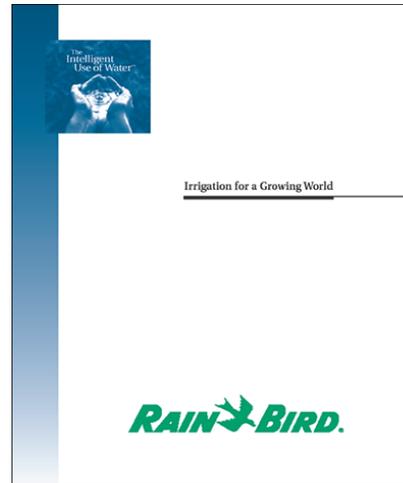
Many water users still treat water as an unlimited commodity and are unaware of waste. The public needs to understand that conservation efforts we take today will significantly impact future generations.

Organizations like the Irrigation Association and irrigation manufacturers like Rain Bird are actively working to help educate and train professionals in the landscape, golf and agricultural irrigation business. Courses and information include water auditing, water-efficient landscaping and water conservation technologies.

Water districts, especially those in drought-impacted regions of the U.S. like the Southwest, the Rockies and Florida, have created programs for residential, commercial and institutional users that focus on interior water savings. Recently, they have expanded their efforts to include programs about irrigation and exterior water use.

## Looking Ahead

- **Solving the crisis will take collaboration**
- **All methods have promise**
- **Water-efficient irrigation can make a significant impact**
- **Encourage policymakers to act now**
- **Let's all work together to be a part of the solution**



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So what can you do to help solve this crisis? It is going to take a fundamental shift in the way we all look at water and how we use it. Governments, farmers, water agencies, landscapers and equipment manufacturers are all committed to finding a solution.

There are a number of options available to help us address this issue and all of them have potential to help. We strongly believe that water-efficient irrigation is one of the most promising options that can be implemented today.

Rain Bird offers many resources – including this white paper as well as one targeting homeowners – for free download on our website: [www.rainbird.com](http://www.rainbird.com). We also encourage you to take a long, hard look at the way you and those around you think about water. Contact your government officials and encourage them to take actions now. Together, we can find a solution to this problem before it becomes a crisis and ensure there will be enough water for future generations.

# Thank You



**“The need to conserve water  
has never been greater.  
We want to do even more,  
and with your help, we can.”**

I’d like to close with a comment from Tony LaFetra, the President of Rain Bird. You can find this on the first page of our white paper.

**“The need to conserve water has never been greater.  
We (at Rain Bird) want to do even more, and with your  
help, we can”**

Thank you.