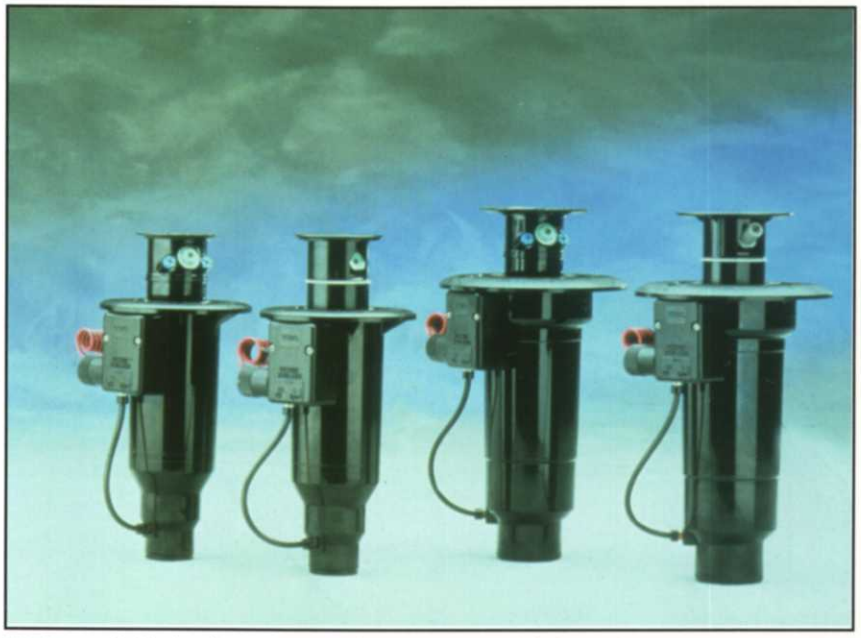
Irrigation equipment and sound water management practices

BY SCOTT MORGAN
Marketing Manager, Golf, TORO

The golf course superintendent's responsibility is to use the least amount of water necessary to fulfill customer's minimum playability and aesthetic expectations, staying within budget and regulatory guidelines.

Golf course irrigation equipment manufacturers are tasked with supplying tools to help the superintendent satisfy this challenging responsibility. Irrigation equipment manufacturers strive to fulfill this commitment every day. Their focus may not be aimed directly at water conservation. Instead, manufacturers promote responsible water application indirectly through product development that is sensitive to the golf course superintendent's role.



Modern sprinkler heads can conserve from 25 to 50% of their previous usage.

Manufacturers perceive that golf course superintendents employ sound water management practices and superintendents have always wanted irrigation equipment manufacturers to support these intentions with appropriate products and services.

Simply stated, sound irrigation management is the application of the correct amount of water when and where it is needed.

What is the correct amount of water? The current standard in the industry is evapotranspiration (ET). ET is an agronomic measure of a plant's need for water due to evaporation and the plant's own transpiration. Irrigation equipment manufacturers have developed central control systems based entirely on ET.

These systems calculate the projected water need of plant materials on a golf course based on ET, rainfall, plant type, soil types, soil compaction, terrain slope, geographic location and pH factor.

When do you apply the correct amount of water? We all know golf courses have very specific times when water can be applied. Generally, manual watering and syringing are the only daytime irrigation activities on a golf course.

The summer irrigation window for a typical golf course is eight to ten hours, which seems ample. However, if there are 1,200 sprinkler heads on a golf course with average sprinkler precipitation rates of approximately .7 inches per hour, average water demands of 40 gallons per minute per sprinkler, an ET replacement target of .21 inches per day, and a targeted water usage from the pump station of 1500 gallons per minute, the absolute best you can do is a 10-hour watering window.

Because of these limitations, irrigation equipment manufacturers have loaded features into their control systems to support complex irrigation schedules.

Where do you apply the correct amount of water? Thirty years ago, certain manufacturers perceived that their customers wished to individually control each sprinkler head on their golf course. The valve-in-head sprinkler was created to allow the superintendent to manage every point of irrigation application.

Combined with control innovations such as solid-state field controllers and personal computer-driven central controllers,

With continued focus on water distribution, dramatic percentage decreases will continue to occur

valve-in-head sprinklers offer the most precise water applicator feasible at this time.

We may conclude that valve-in-head sprinklers, sophisticated scheduling features and ET-based central controllers are adequate tools to support sound water management. However, irrigation manufacturers feel there is ample room for technological innovation and improvement.

First and foremost, irrigation manufacturers understand that their products need to be easy to install. Sound water management cannot be supported by the latest technologies if those technologies are problematic to install. Irrigation manufacturers will continue to invest in radio technology, which eases installation problems and hastens system upgrades.

In fact, some manufacturers will search out or intensify strategic alliances with companies that already supply state-of-the-art radio solutions to other industries.

Second, even with a sophisticated central control system, sprinkler heads need to apply water evenly, causing manufacturers to continually improve water distribution. Assuming that a control system supplies adequate tools for sound irrigation practices, the most important component of an irrigation system is the sprinkler head.

For example, some manufacturers can now produce sprinklers with scheduling coefficients (the application rate multiplier used to insure that the area of a sprinkler's pattern that gets the least amount of water is sufficient to replace water consumed by ET) of 1.2. Scheduling coefficients of sprinklers have improved from an industry norm of 2.0 - 2.5 to a current industry norm of 1.3 - 1.5.

That means that golf courses that employ the latest sprinkler technology automatically conserve at least 25% (and up to 50%) of their previous water usage and reduce waste by 50%.

With continued focus on water distribution, dramatic percentage decreases will continue to occur.

Finally, central irrigation system software needs must be intuitive to the system user or the system will not fulfill its potential. Irrigation equipment manufacturers do not have intrinsic expertise in software development.

However, they do understand that superintendents have very specific control needs. The challenge before irrigation manufacturers today is to translate control needs into more understandable central software systems. New developments in central software will continue the progression toward a more consistent and intuitive user interface.

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Recycled Water

Treated Effluent as an Irrigation Source

BY RON ANDREWS
Grand Harbor

Whether you are gearing up an irrigation system for a new golf course, trying to find another water source, or simply up for renewal on your consumptive use permits, it is likely that the subject of effluent irrigation will arise.

Treated sewage effluent, or reuse water as it is commonly known, is becoming available on a much wider scale than it has been in the past. Sewage plant operators are coming under much greater pressure to dispose of effluent water in the most environmentally appropriate manner.

Direct discharge to state bodies of water, long a common practice, is no longer a preferred choice. Plant operators are also finding mounting pressure on deep well injection disposal systems. Both of these methods have had the sling and arrows of pollution watch guards launched at them.

The two modern alternative disposal methods that are receiving the most attention are reuse as an irrigation source and the recharging of systems of artificially created wetlands linked to state water bodies.

Each of these methods has its advantages and both are likely to impact golf courses. For new golf course developments with home sites, this pressure to find better disposal methods will cause plant operators to force these communities to take back the treated effluent that is generated from the sewer tie-ins. This is one of the reasons Grand Harbor uses effluent water.

As more pressure comes on plant operators to dispose of treated effluent through irrigation re-use, they are naturally going to look to all properties with large consumptive uses. To many this means golf courses. Never mind that golf courses don't use the quantity of water that many people think they do.

Also, do not expect plant operators to market their water as something that they need to dispose of. No, more likely it is now a valuable resource for which you should be willing to pay. Perhaps it is, but there are a lot of complicated issues when it comes to irrigating with effluent.

The intent of this article is to discuss these issues from the point of view of a golf course operation that has used effluent for several years.

The first thing you need to consider is what your water sources are now. Your are a much better candidate for effluent irrigation if you are using a non-renewable or a potable water source as part of your irrigation programs. At Grand Harbor, the bulk of our irrigation water comes from a system of storm water treatment lakes and wetlands.

Such a system is already a highly efficient re-use strategy that

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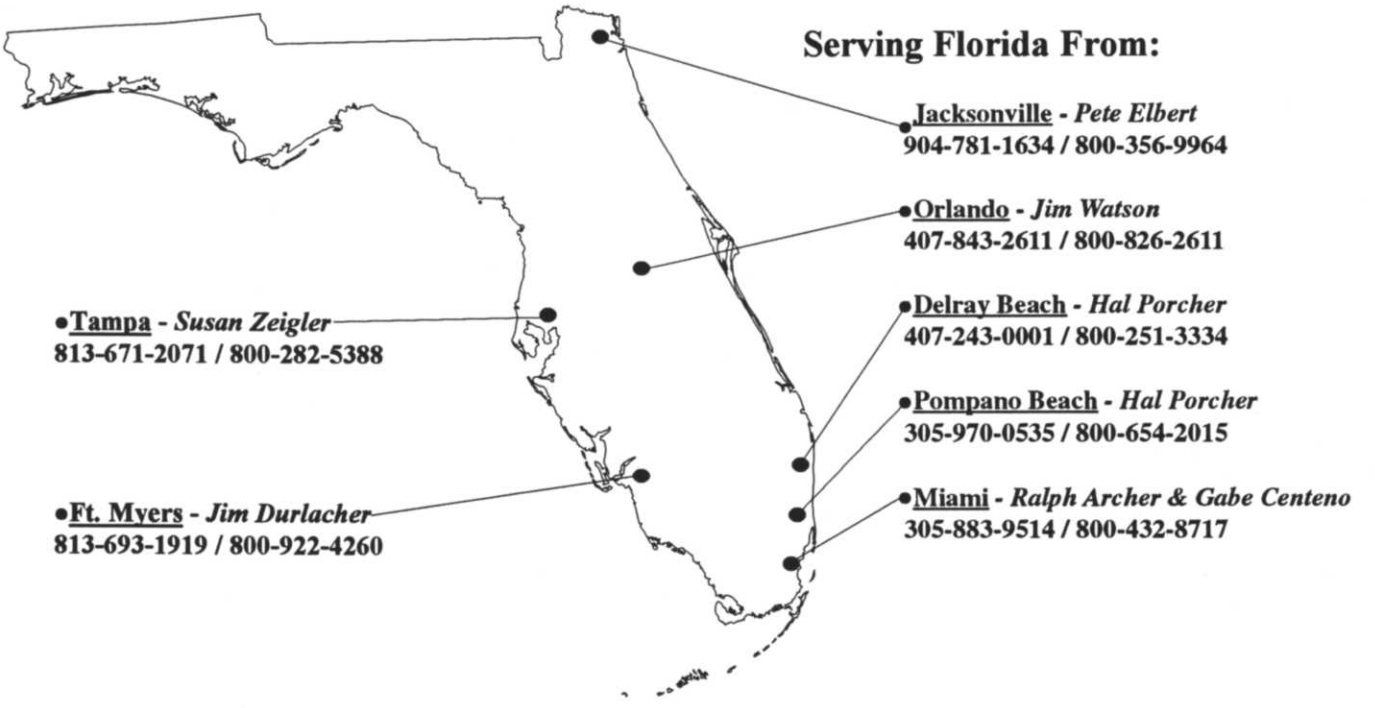

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carries the side benefit of providing a diverse habitat for many different species. However occasionally, we will enter a drought that is significant enough to lower our lake levels and impact our ability to irrigate from this source.

This is where effluent irrigation is most important. Without this resource, we would be forced to turn to our Floridan aquifer wells much sooner and more often. This is a second reason why during the permitting of Grand Harbor we were required to accept treated effluent.

However, most of the time, the storm water lake system has plenty of water and meets our needs nicely. Clearly, effluent would be a more valuable resource to a golf course that did not have such a strong first line source.

The quality of the effluent source available to you is also going to be important.

Talk to the plant manager. He or she will have a good idea who is contributing to their input stream and what level of treatment the plant is providing. Most plant managers can provide a good lab report on the irrigation suitability of the effluent leaving their plant. Failing that, obtain a sample and pay for an irrigation suitability analysis.

Test your other water sources while you are at it. For us, this process did a lot to dispel many of the myths of poor quality effluent water. The effluent we receive has a more desirable pH (6.4 - 6.9), lower total salts, lower sodium and bicarbonate than either of our other water sources.

The total nitrogen level is usually very near 10 ppm, which is 2.5 times higher than our storm water lakes. Phosphorus (p not P O) levels are 4 - 6 ppm, or 30 times the level of our storm water lakes. These differences are contributory to a fertilizer program. However, it takes 16 inches of irrigation (0.04 inches/day) to provide 1/2 lb. N/1000 sq. ft. The same quantity of irrigation with effluent would provide 1/3 of a lb. per 1000 sq. ft. more than what irrigation with our storm water would provide.

These are not exactly fertigation levels, but they are significant, especially for the phosphorus. Minor elements are in a suitable range, but zinc (0.5 ppm) and boron (0.3 - 0.4 ppm) levels are somewhat elevated. We have removed zinc and boron as much as possible from our fertilizer sources and have not seen any build-up to date.

People are concerned about where you are putting this water. We do not use it for clubhouse irrigation.

From behind Grand Harbor #7. Lined and walled effluent receiving lake to the right. Percolation pond in use of the left.

In short, we have not found quality to be a problem. It would be remiss of me to not at least mention the perception issues. People are concerned about where you are putting this water. We do not use it for clubhouse irrigation. Minimize over-spray to adjacent properties.

The treatment levels provided by most plants will kill the majority of potentially harmful bacteria or viruses that may be present. However, when this water leaves the plant, it looks potable, so you will need to provide warning signs.

If you are still considering effluent for irrigation purposes on your property, you now have to work out the storage problem. Most of us will not be lucky enough to have effluent delivered to us in a pressurized main that we can tap on demand.

In Florida, it may be possible to obtain a DER permit to store this water in on-site unlined lakes, as long as these lakes are used for irrigation. We elected not to pursue this route for a couple of reasons.

First, our concern was that a certain amount of water would leach away through the lake bottoms, especially during drought periods. Second, we were concerned that the nutrient levels of the effluent, when added to our lakes, would give us greater difficulty with water quality and appearance issues in our freshwater lakes. Instead, we built a 2-acre lined lake that can fluctuate 6 ft. in level.

Adjacent to this lake, we constructed 1.5 acres of cleverly disguised percolation ponds to add to our storage and to increase our ability to dispose of excess effluent during rainy periods.

It was necessary to add aeration equipment to the storage lake to eliminate algae problems in the water. When we do not receive enough treated effluent, we have a high volume transfer pump that moves water from the storm water lakes to the lined lake. This adds about 8% to our cost of pumping this portion of our irrigation.

It the treated effluent is not available in sufficient quantity and the storm water lakes are getting too low, then we can free flow artesian water from the Floridan aquifer into this same lined lake. We have gained the significant advantage that we will not be leaching this well water away through the bottom of an unlined lake.????

This storage strategy has worked well for us and has helped deal with the reality that we have to receive effluent every day, whether we need it or not.

In fact, in Florida at least, I would say

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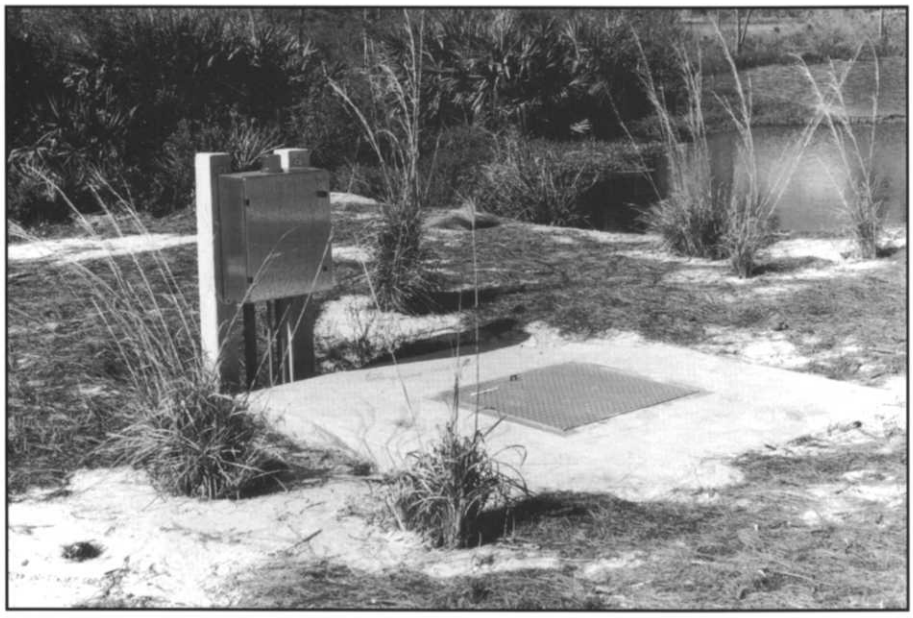
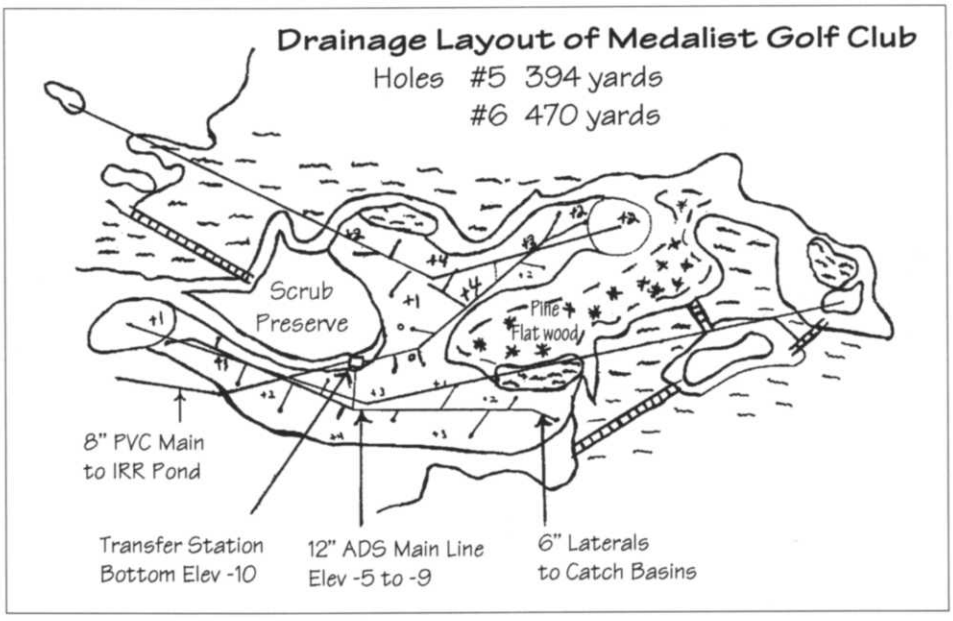
Water Recapture and Re-use



#18 Medalist Golf Cub. One of 11 lift stations.

Below, a diagram of drainage plan for holes 5 and 6 at the Medalist Club.



It has been estimated that we've been recycling somewhere in the neighborhood of 200,000 to 300,000 gallons per watering cycle during grow-in.

BY JASON MCCOY
AND DANNY FORE

Jason McCoy is Project Manager and Danny Fore is Golf Course Superintendent at the Medalist Golf Club in Hobe Sound

The drainage system at the Medalist Golf Club in Hobe Sound, Florida, is one of the most elaborate efforts yet by Architect, Pete Dye. The system has evolved since its inception at Old Marsh Golf Club in Palm Beach County.

The system at the Medalist Club is a complete recycling of excess water in all grassed areas. The system contains 11 transfer stations strategically placed through the golf course. Each system consists of a 10-foot deep concrete vault with a 10 HP ABS submersible pump on a slide rail which is capable of 1500 GPM.

There are electronic float switches which operate the system on and off. Each system has a double check valve which in turn lets us connect each together with an 8" PVC main discharge line which flows to the 30 mil VLDPE lined irrigation holding pond.

It has been estimated that we've been recycling somewhere in the neighborhood of 200,000 to 300,000 gallons per watering cycle during grow-in.

Each system is fed by a 12" N-12 ADS pipe-line with laterals to each basin in the turf. The irrigation system is also a vital entity to our drainage system. We have installed a Maxi V system with the new Eagle heads.

We have installed all part circle heads on fairways to keep any drift from getting into wetlands or upland buffers. With this type of irrigation heads, we feel we'll be able to retrieve as much as possible through our system.

Effluent —

from Page 44

this is the most significant problem with using treated effluent for irrigation. We are relatively lucky in that we receive only slightly more treated effluent in the winter than we do the rest of the year.

Despite this, we still receive more water than we need for irrigation in the winter and less than we need in the hot dry months. We also receive too much during the rainy season.

Our ability to store a lot of water helps us match supply and demand and the percolation areas we built help even more. We linked the two golf course irrigation mainlines and this gives us more demand, and therefore better balance during these difficult periods.

Lately, we have added spray disposal areas that we can irrigate without impacting playability. Still, it is sometimes a challenge to use all they send. Our initial costs were quite high.

We paid for the construction of the lined lake, the transfer lines from the plant, and the pump to pump the water to the property.

In exchange, we were to receive the water free for a period of time, with a negotiation process to determine a fair price set at a future date.

The reality is; everybody's deal is different. That's the way life works.

Educate yourself about the issues and negotiate as strongly as your position will allow.

Your course will probably have to sign an agreement that will dictate that you must take a certain quantity daily. Keep that number small and your storage large. Despite the difficulties of using treated effluent as an irrigation source, we are happy to have it during drought years.

This year has been challenging though, as we have received 66 million gallons of effluent in the first 10 months, and it has been a very rainy year.

During September, October and November, we were blessed with over 30 inches of rainfall. Still, the difficulties have been manageable and are offset by the relatively high quality of the water and the less restrictive covenants about how and when you can use it.

Maybe it will be drier next year.

Stop wasting water by pouring it down the drain

BY SHELLY FOY

Have you ever thought about how much water you use daily just on flushing toilets, washing your hands, and taking a shower? Each time your toilet is flushed, you use 5 to 7 gallons of water, and the normal faucet flow is 3 to 5 gallons of water per minute (gpm).

The average flow rate for showerheads is 6.5 gpm, meaning a 10 minute shower would use 65 gallons of water. Did you know that a leaking toilet can use 50 - 100 gallons of water per day?

If your faucet is dripping at the rate of one drop per second, you can waste 2,700 gallons of water per year.

The National Energy Policy Act, signed by the President in 1992, addresses water conservation through fixture requirements. As of January 1, 1994, all manufacturers are required to meet the criteria listed below (*See table*).

What can you do to save water if you have old fixtures, manufactured before January 1, 1994?

- **Place a plastic bottle** in your toilet tank (dishwashing soap, juice bottles, soda bottle, etc..) Take the label off, fill with water, put the cap on and place in the tank. You can put a few stones in the bottle to weight it down. You may need to experiment with bottle size. SAVINGS: 1-2 gallons per flush.
- **Put a displacement bag** in your tank. They're available free from some utilities or relatively inexpensive to buy at a hardware or plumbing store. Fill the bag with water and place it in the tank. SAVINGS: 1-2 gallons per flush.
- **Toilet Dams are plastic barriers** that isolate part of your tank so that the water in that section doesn't run out when you flush. Each dam can hold one gallon of water, and you can use 2 in a tank. They are also available at hardware and plumbing stores. SAVINGS: 1 gallon per flush.

By using any of these conservation methods, you can save 8-16 gallons of water per day, based on the average 8 flushes a day. Those numbers may not sound that impressive, but if you think about 56-112 gallons a week, or 2,900 -5,800 gallons a year, that's a pretty significant water savings.

And on a golf course, you can believe that your toilets are flushed more than 8 times a day. If 10,000 people were to try one of these water conservation tips, we could save 29 to 58 million gallons of water a year! Now, that's impressive.

For your older faucets which use 3-5 gallons of water per minute, you can reduce this by 50% if you attach a low-flow faucet aerator.

The aerator mixes air into the water that leaves the tap, so it may look like you're using more water, not less. Ask the hardware or plumbing stores about these aerators or other water saving devices they may have for faucets. ➥

Fixture	National Energy Act	Prior Florida Law *1	Most Existing Fixtures *2
Tank-type toilets	1.6 G/Flush	3.5 G/Flush	6.0 G/Flush
Urinals	1.0 G/Flush	N/A	2.o G/Flush
Showerheads	2.5 GPM	3.0 GPM	6.5 GPM
Lavatory Faucets	2.0 GPM	3.0 GPM	5.0 GPM

*1 Chapter 553 Florida Statutes

*2 Maddaus, Water Conservation, AWWA, 1987

Dear Friends of Turf Management:

On December 10th, 1993, the EPA published its final rule to regulate methyl bromide as an ozone depleting chemical under the Clean Air Act. This rule schedules a complete phase-out of methyl bromide production and consumption on January 1, 2001.

The methyl bromide industry is challenging the EPA's rule on the basis that the science of ozone chemistry, as it applies to methyl bromide, is not well established and that suitable substitutes for many of its uses do not exist.

The immediate effect of the final rule during 1994-1995 will be felt on the pricing of methyl bromide products for the following reasons:

- Producers will need to increase their prices to cover the cost of methyl bromide's defense.
- Demand for methyl bromide products will continue to increase as production becomes restricted to 1991 levels beginning in 1994.
- Methyl bromide products may be levied an *excise tax* because of formal listing as an ozone depletion substance.

What this means:

Although the bulk of methyl bromide usage is confined to agriculture, methyl bromide's role in turf establishment remains substantial as the best product available for the control of nematodes, soil pathogens and weed seeds.

If your long range plans include methyl bromide fumigation to rectify contaminated fairways, as an example, it may be time to accelerate your plans while the product is *still* available.

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Below are several water saving tips from the Water Management Districts:

- **Never put water down** the drain when there may be another use for it.
- **Verify that your faucets** are leak free by reading your water meter before and after a 2 hour period when no water is being used.
- **Check for toilet leaks** by adding food coloring to the tank. If you have a leak, color will appear within 30 minutes. Don't leave the food coloring in to stain your tank however.
- **Want to get rid of a dead bug** or a used tissue? Throw them in the trash, not the toilet.
- **Take shorter showers.** Replace your showerheads with the ultra low volume version.
- **Be sure your irrigation system** isn't watering cart paths, roads, etc.
- **Make sure you have a rain sensor** device which cuts the irrigation cycle in case of rain.
- **Mulch to retain** moisture in the soil.
- **Plant native and/or drought** tolerant grasses, ground covers, shrubs and trees.

Since water demands are different in each district, check with your local utilities, municipalities and local Water Management District to see if they offer incentive programs for upgrading or retro-fitting your current fixtures.

Don't Waste water! Put it on the right target