

## Reclaimed Water for Homeowner Irrigation<sup>1</sup>

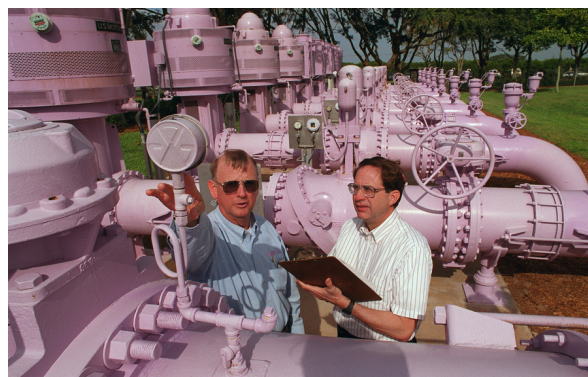
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Reclaimed water is highly treated wastewater that can be used for irrigation and other nonpotable uses. Reclaimed water is disinfected (often by chlorination) and meets strict water quality standards. The term “water reuse” describes the application of reclaimed water for beneficial purposes. Water reuse helps extend water supplies and, thereby, helps meet Florida’s growing demand for water.

The U.S. Environmental Protection Agency (EPA) has established guidelines for water reuse. Rather than establishing national water reuse standards, the EPA determined that comprehensive federal guidelines --along with state regulations -- would increase implementation of water reuse projects. Hence, states have established their own water reuse regulations.

In Florida, the Florida Department of Environmental Protection (FDEP) established these water quality standards and regulates reclaimed water. Florida has been a leader in the production and use of reclaimed water for several decades. In 2007, 430 reuse systems in the state supplied a total of more than 663 million gallons per day (mgd) of reclaimed water. Several large water reclamation systems -- including systems in St. Petersburg, Tallahassee, and Orlando -- have provided reclaimed water to irrigate

landscapes and agricultural crops for more than 20 years.



**Figure 1.** In this photo, taken in 2001 at the reclaimed water distribution center west of Orlando, in Orange County, Fla., Phil Cross, left, of Water Conserv II, is pictured with Lawrence Parsons, a professor based in the University of Florida’s Citrus Research and Education Center in Lake Alfred, Fla. The purple pipes denote transmission of reclaimed water. Credits: Eric Zamora, UF/IFAS

One example of a large and successful water reuse project is Water Conserv II. This cooperative water reuse project involves the City of Orlando, Orange County, and the nearby agricultural community. Water Conserv II combines agricultural

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irrigation with aquifer recharge via rapid infiltration basins (RIBs) and is the largest reuse project of its kind in the world.

Reclaimed water can be used for many purposes, including the following:

- Lawn and landscape irrigation;
- Filling decorative fountains, lakes, or ponds;
- Industrial uses, such as cooling towers;
- Wetlands restoration or enhancement;
- Irrigation of edible crops (citrus and vegetable) that will be peeled or cooked before eating; and
- Indirect irrigation of edible crops that will not be peeled or cooked before eating. (Such crops can be irrigated with reclaimed water by using drip irrigation or other forms of irrigation, in which reclaimed water does not come into direct contact with the edible part of the plant.)

Although reclaimed water meets more than 95 percent of drinking water standards, reclaimed water is not intended to be used for drinking. Hence, in Florida, reclaimed water cannot lawfully be used for the following purposes:

- Drinking;
- Filling swimming pools or hot tubs;
- Interconnecting with a drinking water pipeline; and
- Recreation or water play that involves continuous contact with reclaimed water.

Reclaimed water is sometimes confused with what is called “greywater” or “blackwater.” Greywater (or graywater) is water that has been used in the home, except water from toilets. Greywater comes from showers, bathroom sinks, and laundry washing machines and can be used for irrigation. Greywater is used for landscape irrigation in some parts of the arid western United States where there are persistent water shortages. In some western states, greywater is only permitted for subsurface irrigation or irrigation of non-food crops.

Blackwater is water from a sewage system, including water from the kitchen sink, garbage disposal, toilet, and dishwasher. Blackwater typically contains high concentrations of organic wastes.

Unlike reclaimed water, greywater and blackwater are not disinfected, so they contain bacteria and other pathogens. Therefore, use of blackwater or graywater can potentially create health and safety issues for humans and animals.

Use of greywater for landscape irrigation requires that a second plumbing system be added to the house. Because of costs associated with a second plumbing system, it makes more economic sense in Florida to collect rainwater in a rain barrel or cistern for the purpose of landscape irrigation. For more information on rain barrels, see EDIS Publication SP-191, *A Guide to Florida-Friendly Landscaping: Florida Yards and Neighborhoods Handbook*, <http://edis.ifas.ufl.edu/EP079>. Additional information can be obtained in *Rain Barrels: A Homeowner's Guide* -- [http://www.swfwmd.state.fl.us/publications/files/rain\\_barrels\\_guide.pdf](http://www.swfwmd.state.fl.us/publications/files/rain_barrels_guide.pdf).

## **Aspects and Advantages of Reclaimed Water**

Reclaimed water normally has little or no smell. At times, however, reclaimed water can smell like a swimming pool because of the chlorination. The smell of sulfur indicates water is coming from a shallow well, not a reclaimed water source. Reclaimed water does not stain driveways or walls. Brown or rust-colored stains from water are the result of iron in water, commonly water from shallow wells. During drought conditions that lead to lawn watering restrictions, fewer restrictions apply to the use of reclaimed water for irrigation.

Reclaimed water is commonly carried in purple pipes, whose color identifies their use for reclaimed water and alerts people that the pipes do not contain drinking water. Figure 1 pictures an example of purple pipes and pumping facilities for reclaimed water.

Reclaimed water goes through several stages of treatment before being returned to the environment.

The stages of this treatment are called primary, secondary, and advanced, the last of which is sometimes referred to as tertiary treatment. Screening and settling removes solids during primary treatment. Biological decomposition breaks down organic matter in secondary treatment. Further removal of organic matter, nutrients, and other compounds occurs in advanced treatment. All reclaimed water in Florida must receive at least secondary treatment and disinfection before being discharged into the environment. Figure 2 pictures a secondary clarifier.

## Safety of Reclaimed Water

Reclaimed water has an excellent safety record and has been used in Florida for more than 40 years with no incidence of illness. Reclaimed water is disinfected (usually by chlorination) and can, therefore, be better than some other irrigation sources from a health-and-safety point of view. In fact, reclaimed water undergoes more testing than most irrigation waters, and water quality standards for reclaimed water are more strict than those for recreational water. Because of the strict standards applied to reclaimed water, there is essentially no risk to humans or animals from periodic contact with reclaimed water.

While reclaimed water can meet drinking water standards for many elements, the FDEP does not require that reclaimed water meet all drinking water standards. Reclaimed water is not intended for drinking.



**Figure 2.** The clarifier in this 1999 photo is still used for producing reclaimed water at the McLeod Road Water Pollution Control Facility in Orlando. Reclaimed water from this clarifier is subsequently disinfected and then used for irrigation of residential areas, golf courses, and citrus groves near Orlando. Credits: Lawrence R. Parsons, UF/IFAS

## Irrigation of Edible Crops

According to the FDEP, reclaimed water can be directly applied to the edible parts of any crop that is "peeled, cooked, or thermally processed." Hence, reclaimed water can be used with overhead irrigation for citrus and other crops that are peeled or cooked.

By contrast, for crops that are eaten raw (called the "salad crops"), FDEP regulations prohibit direct contact of reclaimed water with the edible parts of the crop. This requirement means that growers of salad crops who irrigate with reclaimed water should use drip, bubbler, furrow irrigation, or other methods that do not spray water directly onto the crop. This regulation also means that reclaimed water cannot be used in Florida for overhead frost protection sprays onto crops such as blueberries or strawberries.

The FDEP regulation prohibiting direct contact of reclaimed water with salad crops was created in the 1980s to encourage acceptance of reclaimed water. At the time, there were not sufficient studies to determine whether such a precaution was necessary. Since then, however, studies conducted in California have shown that salad crops can be directly sprayed with reclaimed water with no health, safety, or marketing problems. This finding was expected because reclaimed water is disinfected, usually by chlorination. Sunshine is also a good disinfectant. While reclaimed water can lawfully be sprayed onto the edible portion of salad crops in California, FDEP regulations prohibit this practice in Florida.

## Salinity

Salinity refers to the amount of salts in water. Common salts of interest are sodium and chloride, but there are other salts, as well. Sodium and chloride can be measured directly or indirectly by measuring electrical conductivity of the water.

When reclaimed water is created, the process can sometimes slightly increase the salt concentration in the water. This increase in salts is usually not of great importance. However, in coastal areas, the incoming source water used to produce reclaimed water may already be salty. Also, the transmission pipes for the reclaimed water may go through areas of salty water. Additionally, as pipes age, they can develop cracks

and leaks which allow some outside water to penetrate the pipes. This process is called infiltration. If salty water infiltrates into the reclaimed water pipes, the level of salt in the reclaimed water can further increase.

In inland Florida locations, salt in reclaimed water is not usually a problem. However, in coastal regions, whether due to infiltration or the incoming water source, salts in reclaimed water can sometimes be a problem for salt-sensitive plants, such as azaleas or Chinese privet. If you live near the coast, check with the reclaimed water provider (water reclamation facility) to learn whether sodium or chloride levels are high in reclaimed water in that area. If salinity is too high, the reclaimed water may still be acceptable for most lawn irrigation, but not for irrigation of salt-sensitive plants.

Some water reclamation facilities that produce reclaimed water monitor salts. If the salt concentration gets too high, they will divert the salty reclaimed water to another discharge point. However, homeowners who are concerned about salt damage to salt-sensitive plants, such as azaleas, may want to use an alternate water source for irrigating their salt-sensitive plants.

## Plant Nutrients in Reclaimed Water

Reclaimed water contains small amounts of elements that are beneficial for plant growth, such as nitrogen, phosphorus, potassium, calcium, and magnesium. Reclaimed water can also contain low levels of other essential elements, such as manganese, zinc, and boron. Boron is an element that is essential for plant growth in small quantities, but this element can cause plant damage if too much is applied.

Nutrients that plants require in relatively large quantities are called macronutrients; nutrients that plants need in relatively small quantities are called micronutrients. Macronutrients that are particularly important for plants include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg). A plant's nutrient uptake from reclaimed water will depend upon the concentration of nutrients in the reclaimed water, the amount of reclaimed water applied, residence time of the reclaimed water in the root zone, and various environmental factors.

Nutrient concentration in reclaimed water -- particularly in advanced treated reclaimed water -- is typically low. For example, concentration of N, P, and K in reclaimed water sources is usually less than 15, 10, and 30 ppm, respectively. However, with regular irrigation, some turf grasses are relatively efficient in extracting N and P from reclaimed water. In those cases, reclaimed water can supply a significant amount of these nutrients. However, with other crops, such as citrus, typical irrigation with reclaimed water would normally provide less than 16 percent of the recommended nitrogen amount. While reclaimed water can provide some essential elements, the concentrations of N and K in reclaimed water are usually too low to meet plant needs completely. Hence, additional applications of nitrogen, potassium, and other fertilizer elements are necessary to ensure good plant growth. In some cases, however, reclaimed water provided adequate boron, so additional boron applications were not needed.

## Summary

Reclaimed water is not wastewater. Reclaimed water is a safe source of water that can be used for irrigation of golf courses, landscapes, and food crops. Because reclaimed water is disinfected, it can be "safer" than many other sources of irrigation water that are not disinfected. Reclaimed water has been safely used for crop irrigation for more than 40 years in Florida and is regulated by the FDEP. Reclaimed water has proved to be a water source that can help meet Florida's increasing water needs.

For more information on reclaimed water, consult the following Web sites:

Florida Department of Environmental Protection - <http://www.dep.state.fl.us/water/reuse/>

Southwest Florida Water Management District - <http://www.swfwmd.state.fl.us/conservation/reclaimed/>

## References

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