

RECLAIMING
WATER

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HAT IS
RECLAIMED
WATER?

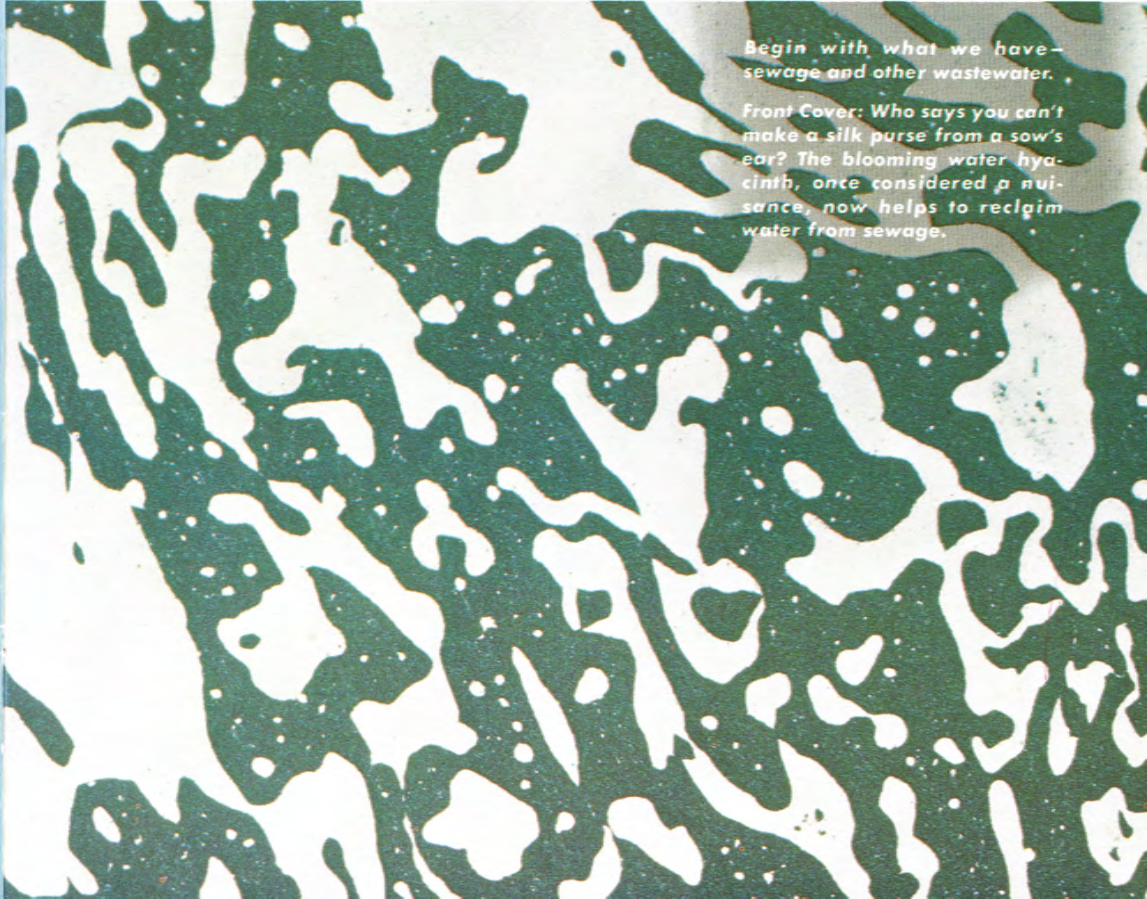


Reclaimed water is treated wastewater—water that has gone down the sink, down the shower drain, down the toilet or down the gutter and has flowed into the sanitary sewer system. Sewer pipes and pumps transport the wastewater from homes, businesses and industry to water pollution control plants—also called water reclamation plants—for processing.

Treatment removes about 98 percent of the solids from wastewater and disinfects it. Now it's ready for recycling, reuse or disposal.

Begin with what we have—sewage and other wastewater.

Front Cover: Who says you can't make a silk purse from a sow's ear? The blooming water hyacinth, once considered a nuisance, now helps to reclaim water from sewage.



ONE GOOD USE DESERVES ANOTHER

No one thinks much about water. But we all depend on it being available whenever we open a tap...and we expect it to be clean and inexpensive.

Southern California's economy depends on water for the nearly 13 million people in the 5200 square miles served by Metropolitan Water District—an area reaching into six counties from the coast to Riverside, and from Ventura to the Mexican border. One-third to one-half as many more people are expected to live here by the year 2015. Metropolitan's service area, if viewed as a nation, would rank twelfth in gross national product among all nations. This is possible because we have water.

But the 1976-77 drought reminded us that water is not abundant here, with an annual rainfall of less than 15 inches.

Southern Californians haven't had to worry much about water, thanks to the foresight of planners who made sure aqueducts and reservoirs were in place before they were needed. But new water projects are more expensive and politically difficult to develop. New water sources are scarce. And water shortages loom in the Southland's uncertain future.

One way to deal with this uncertainty is to become more efficient with what we already have. We can do that through water reclamation, reuse and recycling. Why should we use water only once and discard it?



Water hyacinths naturally filter out pollutants from sewage at a San Diego reclamation project.

WHAT IS THE DIFFERENCE BETWEEN WATER RECLAMATION, RECYCLING AND REUSE?

It's easy to be confused by these terms—they sound alike and are often used in the same discussion. But there are differences between the "3Rs."

Reclamation is collecting and treating wastewater to make it a usable product again. Sewer pipes collect wastewater and reclamation plants treat it.

Recycling means running fresh or treated water through a closed system again and again—through many cycles. Think of car radiators. They are "closed systems" that recycle water to cool engines.

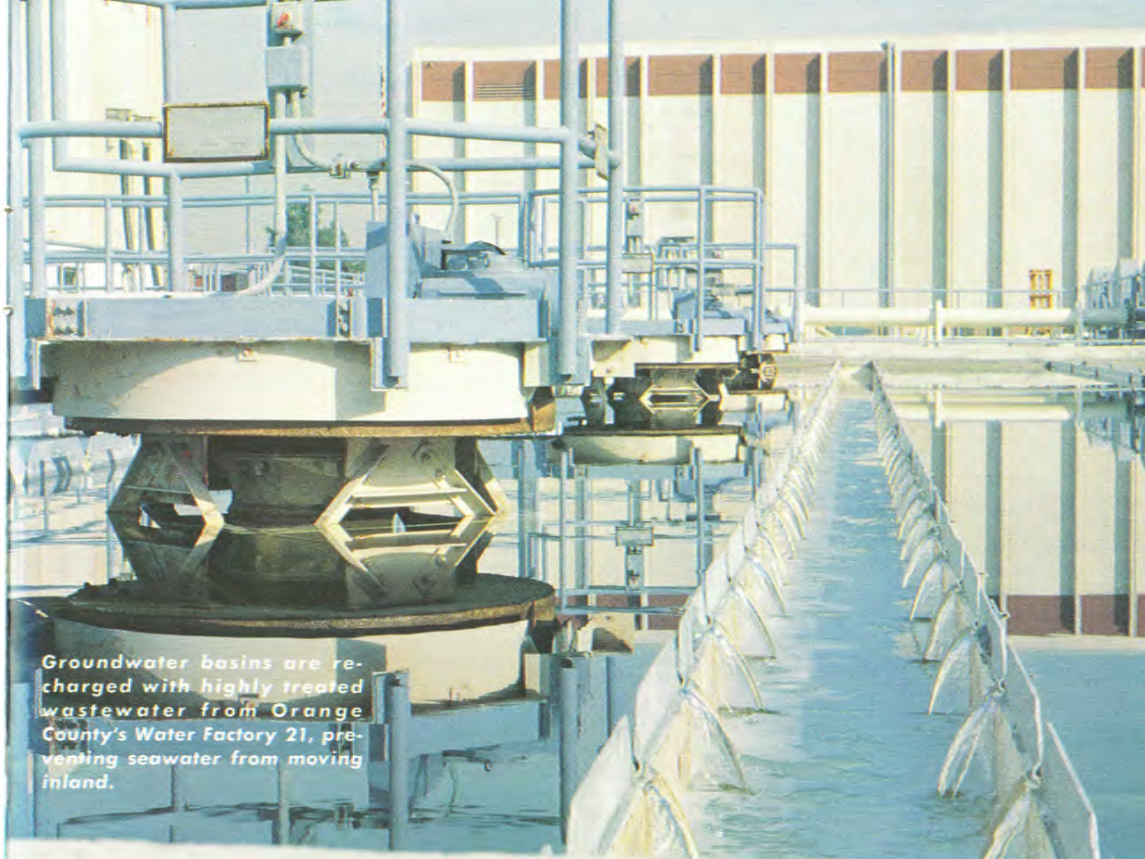
On a much larger scale, at one of Southern California's most famous landmarks—Disneyland—treated water is recycled throughout the park. Lakes, rides and waterways are connected by pipes and pumps. Four filtration plants clean more than 18 million gallons of water a day so it can be recycled through the system. In this way the water is used again and again. The water is clean enough to allow submarine riders to see through it, jungle boat riders to ride on it, and Matterhorn tobogganists to splash through it. More than half of Disneyland's major rides involve water use.

Reuse is a term that covers the many special ways reclaimed water can be used. These include irrigation, industrial use, groundwater replenishment and even recycling.

Irvine Ranch Water District in Orange County reuses *all* eight million gallons a day

of its reclaimed water for agriculture and landscape irrigation. Woodbridge Village Homeowners' Association and other Irvine homeowners associations purchase reclaimed water to sprinkle front lawns, parkways and median strips.

For public health protection, all reclaimed water is delivered through specially constructed and separate pipe systems to comply with permit requirements and regulations. Irvine community schools, golf courses and parks use water from the Michelson Water Reclamation Plant. The University of California's Irvine campus uses reclaimed water on its 180-acre site. A nine-acre lake in Mason Regional Park is filled with reclaimed water. Irvine Ranch Water District has an unrestricted use permit for its reclaimed water—it can be used for all purposes except drinking.



Groundwater basins are recharged with highly treated wastewater from Orange County's Water Factory 21, preventing seawater from moving inland.

HOW IS WASTEWATER TREATED?

Most Southern California wastewater reclamation plants put the incoming water through three levels of treatment.

Primary treatment begins the minute wastewater reaches the plant. Chlorine is often added immediately to disinfect and control odor. The water is slowed considerably from its forceful entry into the plant to allow dirt and heavy material to settle to the bottom of large rectangular holding tanks where they are removed. Floating solids, oils and grease rise to the surface and form scum which is also removed.

Secondary treatment goes after tiny waste particles too light to settle and dissolved organic matter. Bacterial cultures, already present in wastewater, begin to feed

on tiny organic particles and dissolved organics. As bacteria eat and grow, they convert the organics into cell material, sometimes called biomass. As biomass grows heavier, it settles out, leaving a clear product, water that is 95 percent free of the original organics.

Tertiary treatment is a polishing step. The most common method passes clear secondary-treated wastewater through coal and sand or activated carbon. This leaves a highly clarified, high-quality water. Chlorine is added to kill any remaining bacteria and viruses. The final step is dechlorination—removing residual chlorine—to protect fish and other aquatic life in streams receiving the treated wastewater.



ARE THERE MANY RECLAMATION PLANTS IN SOUTHERN CALIFORNIA?

Reclamation is not new to the Southland. Pomona Water Reclamation Plant, serving Pomona, Claremont and La Verne for almost 60 years, has a long list of customers. The plant, which is now operated by Los Angeles County Sanitation Districts, provides irrigation water to the Pomona Parks Department, Pacific State Hospital, Bonelli Regional Park, CALTRANS Route 57 Freeway landscaping, Northside Water Company and California State Polytechnic University, Pomona.

Much of the Cal Poly campus is irrigated with reclaimed water to grow vegetables and livestock fodder. Flowers are also a big crop and the products may be

purchased at campus flower marts. Reclaimed water is also provided to Garden State Paper Company in manufacturing newsprint and to the Simpson Paper Company.

Then there's the Tapia Water Reclamation Facility, a joint venture of Las Virgenes Municipal Water District and Triunfo County Sanitation District. It has been delivering reclaimed water to golf courses, greenbelts and agricultural users since 1972.

Some reclamation ideas have been around a long time and are now looking and smelling better than ever. Take San Diego, for example, and their own experimental aquaculture and

reverse osmosis project—literally a swamp.

As some may say, "What's sewage to one may be a meal for others." In the unique reclamation project in San Diego, water hyacinths, other plants and small marine animals all contribute their organic talents, consuming most particles and heavy metals. The aquaculture's low-tech output then gets a high-tech pass through reverse osmosis membranes and some standard treatment processes.

One promising aspect of San Diego's aquaculture program is that in time, conventional reclamation may be substantially more expensive than a comparable aquaculture system.

There are now about 20 reclamation plants within Metropolitan's service area. They produce about 200,000 acre-feet of highly treated wastewater each year. Of this amount, only 60,000 acre-feet are put to beneficial use.

One reason is economics. Although federal and state grants were available to sanitation districts for the construction of the wastewater treatment plants, none was available for construction of reuse projects. Most of the feasible reuse projects were already built and financed by local sanitation or retail water agencies. There are many more worthwhile projects, but their expense requires re-

gional financing. Metropolitan supports an extensive program to help with regional financing because once built, most reuse projects are economical.

Another reason more water isn't reused has been the problem of matching customers with the supply. However, the comprehensive Orange and Los Angeles Counties Water Reuse Study concluded in 1982 that markets do exist for a large portion of the reclaimed water which is now discharged to the sea.

Livestock in Pomona graze in fields irrigated with reclaimed water.

WHAT IS DESALTING?

Desalting—or desalination—is another water treatment process. It is used to make brackish groundwater drinkable or to prepare secondary- or tertiary-treated wastewater to meet the special requirements of a potential user. A factory owner may want to remove all salts in water that might corrode sensitive machinery. A paper and fiberboard manufacturer may require salt-free processing water to produce paper products of the necessary quality.

Orange County has a special problem. Its groundwater supply is so near the coastline that it's constantly threatened by saltwater contamination. During the 1950s, ocean water penetrated several miles inland into Orange County groundwater basins. To prevent this from happening again, an advanced treatment plant, Water Factory 21, was built in 1971. WF 21 clarifies, filters and then desalts up to 15 million gallons a day of secondary-treated wastewater it gets from the Orange County Sanitation Districts. Treated, desalted water is then pumped into the ground under very high pressure to create an underground water wall—or barrier—that keeps the seawater out and the drinking water free from salt.

WF 21 is the first full-scale reverse osmosis plant in California. Reverse osmosis is a process that uses a very fine membrane through which water is forced. The water may pass through the membrane, but not the salts. Until

the recent development of low-pressure membranes, large-scale desalting projects were much too expensive because so much energy was needed to run the process. The picture is changing because of new, improved equipment—and more desalting projects are likely to be built in the future.

Seawater contains much more salt than brackish groundwater—10 to 20 times as much. This makes seawater desalting a future enterprise. For now, it is far too expensive to consider.



Disneyland's rides glide through water processed at the amusement park's own reclamation plants.

IS TREATED WASTEWATER SAFE TO USE?

Yes! Although the image most people have of reclaimed water is that it's cloudy and unpleasant smelling, this is only true before treatment. After treatment, the processed water is crystal clear and odorless as it flows out of reclamation plants.

Reclaimed water is high quality water and it is expensive. The cost of cleaning the water through the tertiary level is about \$500 per million gallons, or \$165 an acre-foot. To give you an idea what that means, the largest inland reclamation plant in Southern California is Los Angeles County Sanitation Districts' San Jose Creek Plant producing up to 62.5 million gallons a day. Even when the plant is not operating at full capacity, the cost remains about \$25,000 per day, 7 days a week, 52 weeks a year.

Tertiary-reclaimed wastewater can safely flow out to sea. But to make practical use of the \$165 water, perhaps another \$500 an acre-foot must be spent for distribution piping, pumps and storage reservoirs.

After tertiary treatment, the water is clean enough to irrigate food and fodder crops, playgrounds, recreation areas, cemeteries, freeway embankments and median strips and more. Since 1962, up to 32,000 acre-feet a year of this water has been bought by the Central and West Basin Water Replenishment Districts. They take a portion of the output from two water reclamation plants in Los Angeles

County, mix it with fresh water and let it percolate underground in Whittier Narrows. Tertiary-treated water is also bought by the California Country Club to keep their greens, in fact, green. And some industrial uses, in addition to paper manufacturing in Pomona, include power plant cooling by the city of Burbank from their own reclamation plant.

In fact, all inland water reclamation plants are required to produce water of sufficiently high quality to allow people to swim in it.

IS TREATED WASTEWATER SUITABLE FOR DRINKING?

Federal, state and local health regulations prohibit drinking even highly treated wastewater until long-term health effects are clearly understood. The culprits are trace organics. Some of them are industrial cleaning solvents. But it's not yet clear where they all come from. Complete removal of trace organics is difficult and very expensive. Further study is necessary.

Meanwhile, great precautions are taken to ensure that reclaimed water never mixes with drinking water, except in groundwater recharging. To use reclaimed water directly, a separate distribution system carries non-potable water from the reclamation plant to the point of use.

All reuse facilities must meet standards by the state health department, regional water quality control boards or the Department of Fish and Game.

Some specific hardware requirements include back-flow preventers and brightly colored adhesive tapes to distinguish distribution pipes for reclaimed water from drinking water. Specifications also call for rigorous inspections to prevent leaks. These are some of the methods to protect drinking water and to prevent a homeowner from accidentally cross-connecting a reclaimed water line to his household plumbing.



Wastewater reclamation is in step with the lifestyle of Irvine and of Southern California.

WHAT IS BEING DONE TO ENCOURAGE MORE WATER REUSE?

For one thing, Metropolitan created its local projects program to encourage more efficient use of local water.

This is a cooperative effort between Metropolitan and local water and wastewater agencies proposing reuse or desalting projects. The object is to develop new local water supplies. For instance, a proposing local agency finds a project worthy of construction but finds the cost of construction is too great for it alone to pay. Metropolitan can offer to finance part of the cost in exchange for an entitlement to the water produced by the project for a specific time. The final contract terms must be approved by Metropolitan's board of directors.

Under this demonstration program, as many as 70 projects were originally considered by the board. Fifty million dollars were targeted to be spent on selected projects at about \$10 million a year until 1987. The goal for the 1980s is to develop projects that will yield another 50,000 acre-feet each year.

The approximate cost to each household for a region-wide water reuse program is less than \$7 per year, or 58 cents per month.

The local agency benefits because it will be able to build the project, to eventually produce lower cost water, to retain local control and to regain ownership of the project yield after their contract with Metropolitan is completed.

One project that has been

given the go-ahead is expansion of the Las Virgenes Water Reuse Project. It will provide an additional 3600-acre-feet of tertiary-treated water annually for a variety of irrigation uses in the Agoura/Westlake Village areas of Los Angeles County.

Other approved local projects include the Arlington Basin Desalter Project and the South Laguna Greenbelt Project. The Arlington Basin project will be a facility capable of desalting 5600 acre-feet a year of brackish groundwater. The desalted groundwater contains no wastewater and can be added directly to the drinking water supply for the area west of the city of Riverside. The South Laguna project will make 860 acre-feet of reclaimed water available annually to irrigate parks and lawns in south and coastal areas of Orange County.

New projects that seem reasonably sound will be added to the list of those being considered by Metropolitan and its member agencies.

Water reuse—it's one way to help stretch our water supply. Every gallon of reclaimed water that is used means one more gallon of freshwater is available for better use.

When we can, shouldn't we use water again?

The answer, we feel, is a definite yes.