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Reclaimed Water: Uses and Definitions

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Introduction

Reclaimed water is commonly defined as treated municipal wastewater that is able to be used again, a practice known as water reuse. Municipal water reuse in the United States occurs mostly in California, Florida, Arizona and Texas; but it is growing in other states, including Nevada.

What is reclaimed water?

In cities, municipal wastewater is typically cleaned through a series of mechanical, biological and chemical processes to ensure it is safe and sanitary prior to being released to a natural body of water. Wastewater treatment systems, initially designed to preserve human and environmental health, have advanced to a level where this wastewater can be reclaimed and safely used for other purposes. Reclaimed water, also known as recycled water, or repurified water, is used for a variety of beneficial purposes, such as landscape irrigation, industrial processes, toilet flushing or drinking.

There are no federal standards that directly govern reclaimed water use in the U.S. The U.S. Environmental Protection Agency established comprehensive *Guidelines for Water Reuse,* but leaves states with the responsibility of developing regulations (U.S. EPA, 2012). Many states, including California, Arizona, Texas and Nevada, have developed regulations to support and encourage greater water reuse.

In Nevada, reclaimed water is defined as “water that has received at least secondary water treatment and is reused after flowing out of a wastewater treatment facility” (Nevada Department of Conservation and Natural Resources, nd). Secondary wastewater treatment defines the minimum standard for legal discharge of treated wastewater into waterways in the U.S. The quality of reclaimed water depends on the level

and type of wastewater treatment. As a result, reclaimed quality can be treated to match predefined water quality standards and disinfected to levels necessary for the chosen method of reuse (NDEP, 2014). In Nevada, reclaimed water use falls into six different categories depending on its quality, ranging from A+ though E. The quality categories and allowable uses for reclaimed water are included in **Table 1**.

In Nevada, potable and nonpotable uses of reclaimed water are allowable, as indicated in **Table 1.** Nonpotable water is water *not* suitable for human consumption but that can be used for other purposes, such as landscape irrigation, dust control or toilet flushing. Nonpotable reclaimed water is delivered in purple pipes, which indicates the lesser-quality reclaimed water. Potable water is water that is suitable for human consumption (e.g., drinking).

Table 1. Categories of reuse and examples of allowable reclaimed water uses in Nevada.

Category of Reuse	**Allowable Uses for Reclaimed Water**
A+	• Indirect potable reuse through groundwater augmentation and other allowed uses
A	• Spray irrigation of food crops, cemetery, commercial lawn, golf course, greenbelts and parks • Impoundment and outdoor decorative water features • Snowmaking (may require additional treatment) • Commercial toilet and urinal flushing • Commercial window washing or pressure cleaning • Any activity approved for reuse category B, C, D or E
B	• Spray irrigation of cemetery, commercial lawn, golf course, greenbelts and parks • Cooling water for industrial processes • Firefighting in urban areas • Commercial chemical mixing • Street sweeping • Any activity approved for reuse category C, D or E
C	• Spray irrigation of cemeteries, nurseries, commercial lawns, golf courses, green belts and parks with 100-foot buffer • Establishment, restoration or maintenance of wetlands – with buffer zone • Firefighting of forest or wildland fires • Any activity approved for reuse category D or E
D	• Spray irrigation for agriculture with 400-foot buffer • Dust control • Flushing sewer lines or impoundment (with conditions) • Any activity approved for reuse category E
E	• Spray irrigation of agriculture with 800-foot buffer

Reclaimed water is not the same as graywater. Graywater is defined as "wastewater from a household or small commercial establishment which specifically excludes water from a toilet, kitchen sink, dishwater or water used for washing diapers" (Nevada Department of Conservation and Natural Resources, nd). Unlike reclaimed water, graywater does not undergo treatment. In graywater systems, the wastewater from bathroom sinks, tubs or washing machines is used to water lawns, landscapes or for other nonpotable purposes (Ormerod, 2016). The various types of water reuse are included in **Table 2.**

One of the most common uses for nonpotable reclaimed water is landscape irrigation (NDEP, 2014), which is often indicated by purple signs, as illustrated in **Figure 1.** Although drinking reclaimed water is a less common use, potable reuse has been adopted in several U.S. cities (U.S. EPA, 2012). Two of the better-known examples of potable reuse in the U.S. are located in Los Angeles County and Orange County, California (U.S. EPA, 2017). Recently, the National Research Council claimed, "[t]he uses of reclaimed water to augment potable water supplies has significant potential for helping to meet the nation's future need" (National Research Council, 2012).

Table 2. Types of water reuse, definitions, water quality criteria and other requirements.

Technique	Definition, Uses and Requirements
Graywater	• Reuse of household wastewater from sinks, tubs or washing machines, not including water from toilet, kitchen sink or dishwasher • Used exclusively for on-site nonpotable applications, such as landscape irrigation • Requires limited, if any, treatment; may contain pollutants found in personal and household hygiene products; regulatory oversight varies
Dual systems	• Reuse of reclaimed water is conveyed via a separate, dual, "purple pipe" distribution system • Used strictly for nonpotable applications, such as municipal irrigation (e.g., yards, schools, parks) and industrial processes (e.g., cooling water) • Requires secondary treatment to remove residual organics and suspended solids; additional treatment levels may vary
Indirect potable reuse	• Reuse of reclaimed water that is blended with drinking water supply resources using an environmental buffer (e.g., groundwater recharge) prior to delivery • Used for potable and nonpotable applications (e.g., tap water supply) • Requires advanced treatment to remove micropollutants and chemicals of concern
Direct potable reuse	• Reuse of reclaimed water that is treated to required drinking water standards, then deliberately added to municipal supply without an environmental buffer • Used for potable and nonpotable applications (e.g., tap water supply) • Requires advanced water treatment to remove micropollutants and chemicals of concern

Figure 1. Typical purple compliance sign for reclaimed water used for landscape irrigation. The language and color signals nonpotable water quality.

Options for supplying reclaimed water are divided into direct or indirect. (See **Table 2**) Indirect reuse involves blending treated reclaimed water within an environmental buffer before normal drinking water treatment and delivery. Direct reuse involves adding reclaimed water directly to water supply without use of an environmental buffer, for example, by sending reclaimed water to the raw water feed for a drinking water facility.

An update to Nevada's regulations in 2016 allows for potable reuse based on new reuse category of "A+" water, which is the highest quality of reclaimed water (NDEP, 2016). These regulations expanded reclaimed water uses to allow for indirect potable reuse through groundwater augmentation. Groundwater augmentation involves placing highly treated reclaimed water into an aquifer (groundwater table) to be extracted and treated later by a water treatment facility. The Nevada Water Innovation Institute at the University of Nevada, Reno, is currently collaborating with local agencies to explore the feasibility and long-term benefits of implementing indirect potable reuse in northern Nevada.

In Nevada, reclaimed water use is administered by the Bureau of Water Pollution Control within the Nevada Division of Environmental Protection, who provides oversight and issues discharge permits according to NAC 445A.275 and NAC 445A.276. Per the permitting requirements, all reclaimed water application must be prepared by a registered professional engineer (Nevada Division of Environmental Protection, 2017). Related information about the existing regulations and permitting processes specific to Nevada is available in the Extension fact sheet FS-20-11, Reclaiming Water for Urban Foodsheds: State of Nevada Regulations and Permitting (Sterle, et al., 2020).

To learn more about reclaimed water use in Nevada, visit the Nevada Division of Environmental Protection website here.

References

National Research Council (U.S.). (2012). *Water Reuse: Potential for Expanding the Nations Water Supply Through Reuse of Municipal Wastewater.* Washington DC: National Academies Press.

Nevada Adminstrative Code NAC 445A.275 General requirements and restrictions. Retrieved October 22, 2020 from here.

Nevada Adminstrative Code NAC 445A.276 Reuse categories: Requirements for bacteriological quaity of reclaimed water. Retrieved October 22, 2020 from here.

Nevada Department of Conservation and Natural Resources, Division of Water Planning, Water Words. Retrieved March 17, 2020 from here.

Nevada Division of Environmental Protection (NDEP). (2014). *Water Technical Sheet 1a: General Design Criteria for Reclaimed Water Irrigation Use.* Retrieved August 12, 2019, from here.

Nevada Division of Environmental Protection, (NDEP). (2016). Adoped Regulations of the State Environmental Commission. Retrieved October 16, 2020, from here.

Nevada Division of Environmental Protection, (NDEP). (2017). Overview of Permitting Programs and Requirements. Retrieved October 16, 2020, from here.

Nevada Revised Statute NRS 533.440 Permits: Primary and Secondary; applications: issues of certificate. Visit the link here.

Ormerod K.J. (2016). Illuminating Elimination: Public Perception and the Production of Potable Water Reuse. *Wiley Interdisciplinary Reviews: Water*. *3*(4):537-47. Visit link to the above publication here.

Sedlak D. (2014). Water 4.0: *The Past, Present, and Future of the World's Most Vital Resource.*Yale University Press.

Sterle, K., Ormerod, K.J., Singletary, L., Pagilla, K., Hanigan, D., Verburg, P. and Yang, Y. (2020). Reclaiming Water for Urban Foodsheds: State of Nevada Regulations and Permitting, Extension FS-20-11, University of Nevada, Reno. Retrieved October 16, 2020, from here.

United States Environmental Protection Agency (U.S. EPA). (2017). 2017 Potable Reuse Compendium. Retrieved March 17, 2020, from here.

United States Environmental Protection Agency. (U.S. EPA) (2012) 2012 Guidelines for Water Reuse. Office of Wastewater Management. Office of Water. National Risk Management Research Laboratory. Office of Research and Development. Washington, DC; Cincinnati, OH: U.S. Retrieved March 17, 2020, from here.

