Embracing One Water
For Supply Sustainability

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About Water Environment & Reuse Foundation

WERF and WRRF merged in May 2016

**WE&RF:** Dedicated to research on renewable resources from wastewater, recycled water, and stormwater while maintaining the quality and reliability of water for the environment and communities.

**New Focus: One Water.**

WateReuse brings recycled water, desalination and related topics.

WERF brings wastewater, resource recovery, stormwater, receiving waters, climate change, and integrated water.
**Bottom Line: Major Paradigm Shift**

**PAST**
Collect wastewater, move it quickly downstream, treat it to acceptable standards, and dispose of waste without harming the environment

**FUTURE**
- Manage resources to generate value for the utility and its customers
- Improve environmental quality, at least cost to the community
- Use a holistic “one water” approach to water management
Strategic Collaborations

- Federal and State Agencies
- Water sector partners and NGOs
- Global Partners
WE&RF Research Focus Areas (Water)

2001 - 2004

2005 - 2008

2009 - 2012

2013 - Present

- Non-Potable Reuse
- Potable Reuse
- Industrial Reuse
- Desal/Salinity Mgmt
- Social Science
De Facto Water Reuse in the US

Assessment of De Facto Wastewater Reuse across the U.S.: Trends between 1980 and 2008
Jacelyn Rice†*, Amber Wutich‡, and Paul Westerhoff†
Oregon’s Lott Clean Water Alliance

Oregon’s Largest Reuse Program

100 million gallons a year of Class A water to meet seasonal demands. Uses include:

- Municipal parks, schools and athletic fields
  - Community amenity
- Golf courses
- Wetland recharge and restoration
Fit for Purpose (Nonpotable Reuse)

The Water (re)Cycle

LEGEND:

- Monitoring
- Regulatory compliance
- Different treatment barriers
Eastern Municipal Water District

- EMWD has four facilities that create a total of 45MGD of tertiary treated recycled water
- Additional water quality treatment is conducted through created wetland habitat
- The largest use of this water is agricultural irrigation, including fruits, vegetables and fodder for cattle and dairy.
- Other uses include non-crop irrigation and industrial.
**Monterey County Water Recycling Project**

**Monterey, CA**

- 20 MGD
- Irrigation for 222 Farm Parcels
- 46 miles of transmission/distribution pipelines
- 11-year Wastewater Reclamation Study - assess safety/feasibility of recycled water to irrigate raw vegetable crops
- 5-year demonstration project
- Never experienced human health incidence
- Crops include lettuce, celery, broccoli, cauliflower, artichokes, strawberries
### Fit for Purpose

**The right water for the right use**

<table>
<thead>
<tr>
<th>Agricultural Reuse</th>
<th>Great potential for enhanced utilization of recycled water</th>
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</table>

**Ongoing research: WRRF-15-08 - State of Irrigated Agricultural Water Reuse - Impediments and Incentives**

**Upcoming research to identify existing uses, characterize potential, and develop strategies for overcoming barriers and incentivizing greater use of recycled water**

**Will evaluate existing governance frameworks and develop recommendations**

<table>
<thead>
<tr>
<th>New research: Evaluating Economic and Environmental Benefits of Water Reuse for Agriculture</th>
<th></th>
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</table>
Fit for Purpose (Nonpotable Reuse)

The Water (re)Cycle

Legend:
- Monitoring
- Regulatory compliance
- Different treatment barriers

Water for drinking
Water Treatment Plant
Stormwater
Water for landscape
Water for recreation
Water for crops we eat
Water for industry

Upstream towns and cities
Rivers of the World
Downstream towns and cities

Water for high tech industry
Santa Clara Valley Water District Constructed a New Recycled Water Purification Facility

- 8 million gallons per day of purified water
- Uses Microfiltration, Reverse Osmosis & Ultraviolet Light Disinfection
- Water is currently used for manufacturing and irrigation
- The agency is planning a Potable Reuse Facility.
# Fit for Purpose

The right water for the right use

<table>
<thead>
<tr>
<th><strong>Industrial Reuse</strong></th>
<th>Private businesses and government have different mandates and priorities</th>
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<tbody>
<tr>
<td></td>
<td>Different industrial sectors have different needs for water quality and quantity</td>
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<td></td>
<td>Completed research seeks to bridge the gap between business and government as well as identify the similarities and differences between sector and end-use</td>
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<tr>
<td></td>
<td>Ongoing research to develop a framework for onsite reuse and a decision support tool for evaluating the economics of potential projects</td>
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<tr>
<th>WRRF-13-04: Drivers, Successes, Challenges, and Opportunities of Onsite Industrial Water Reuse: a Path Forward for Collaboration and Growth</th>
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<td>WRRF-14-04: A Framework for the Successful Implementation of Onsite Industrial Water Reuse</td>
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</table>
Squeezing the most out of each drop of recycled water

1. Filter and add chlorine
   Most water purification plants stop here

2. Take ammonia out of irrigation water

3. Filter through plastic sheet (i.e., reverse osmosis)

4. Filter through plastic sheet 2x (double reverse osmosis)

5. Multiple high tech processes

- Augmentation of drinking water wells and seawater barrier
- Cooling tower water
- Office buildings and manufacturing
- Low pressure boiler feed water
- High pressure boiler feed water

The right water for the right use

West Basin’s Five Designer Waters
Potable Reuse

Drivers
- Drought
- Increased Demand
- Lack of/contaminated local supply

Potable Reuse is
- Safe
- Reliable
- Locally-Controlled
- Environmentally-Friendly/Protective

Tools to deliver
- Research
- Technology
- Sound Science
- Innovation
Orange County Water District

- Manage local groundwater basin
- Groundwater = 70% local supply for 2.4 million residents
Gwinnett County Department of Water Resources

- Indirect Potable Reuse system
- Ozone-BAC based treatment at the F. Wayne Hill Water Resources Center
- Surface water discharge into Lake Lanier
Big Spring Water Supply Augmentation

- Blends advanced treated reuse with lakes to produce a high-quality drinking water.
- 16 MGD with microfiltration, reverse osmosis, and ultraviolet disinfection.
- Blends advanced treated water with 21 MGD with traditional sources.
Level of Treatment is dependent on End Use

Adapted from EPA Guidelines, 2012

Water Quality

Raw Water

Drinking Water

Wastewater

Secondary Treatment

Tertiary Treatment

Advanced Treatment

Landscape irrigation

Industrial Reuse

Potable Reuse

* Level of treatment depends on the reuse application
The “State” of Reuse: Developing Consensus on Public Health Protection

No Reuse Regulations
Non-Potable Reuse
Indirect Potable Reuse
Direct Potable Reuse
Hashed Lines Indicate Pending Regs or Projects
# Status of Potable Reuse Regulations

<table>
<thead>
<tr>
<th>Region</th>
<th>Details</th>
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</table>
| **California** | • Regulations in place for GW recharge; Draft regulations for surface water augmentation expected in January 2017.  
• Through *Expert Panel process*, State Water Board determined it is feasible to develop DPR regulations.  
• More research needed, DPR sites can be permitted on case by case basis until regulations in place (2020+?). |
| **Arizona** | • IPR can be permitted.  
• ADEQ in the process of updating the state’s Reclaimed Water Rules – considering DPR regulations. |
| **Nevada** | • In November 2016, NV State Environmental Commission approved reclaimed water regulations that include provisions for IPR groundwater augmentation.  
• Regional IPR demonstration project underway in Reno. |
| **Colorado** | • WateReuse CO formed **DPR Regulatory Workgroup** to develop recommendations for DPR regulations; DPR Outreach Workgroup also formed. |
| **Oklahoma** | • IPR regulations are in development with help from *ad hoc technical advisory group* to help review. |
| **New Mexico** | • *DPR Guidance Document* was developed by an *Expert Panel* to inform NMED’s permitting process.  
• DPR project in Cloudcroft, NM – expected in 2017. |
### Status of Potable Reuse Regulations (continued)

<table>
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| **Texas**   | • Texas Water Development Board *sponsored a DPR Resource Document* to inform implementation of DPR projects.  
• Big Spring, TX is only operational DPR site in US. |
| **Florida** | • Potable reuse interest is growing – multiple DPR and IPR pilots are on-going and/or planned.                                                                                                                  |
| **Virginia**| • IPR regulations in place:  
  • Longest operational IPR (surface water augmentation) site in country – Upper Occoquan Service Authority (1978).  
  • Hampton Roads Sanitation District (HRSD) is building a 1 MGD IPR (GW replenishment) demo to eliminate nutrient discharges to the Chesapeake Bay and overdrafting and subsidence. *Expert Panel* in place. |
| **North Carolina** | • IPR and DPR is possible. NC Department of Environment Quality’s Public Water Supply division is determining how to regulate DPR beyond conventional technologies used in the state-wide *de facto* reuse practices. |
| **Georgia** | • IPR regs in development, DPR guidelines do not yet exist.  
• Two notable planned IPR systems include those at Gwinnett County and Clayton County, both in suburban Atlanta. |
| **Maryland** | • Maryland currently does not permit IPR or DPR projects.  
• Limited groundwater supplies are pushing state regulators to consider IPR for groundwater replenishment. |
One Water LA Plan

FYE 2010 - 2014 Average
Total: 553,876 AFY

LA Aqueduct 189,700
34%

MWD 293,010
53%

Local GW 64,809
12%

Recycled Water 7,803
1%

Fiscal Year 2034 - 35
Total: 711,000 AFY

LA Aqueduct 244,000
33%

MWD 168,227
24%

Local GW 110,405
16%

Recycled Water 59,000
8%

Water Transfers 40,000
6%

Stormwater Capture 25,000
4%

Conservation 64,368
9%
Capturing Water for Non-potable Use

Precipitation collected from roofs and above-grade surfaces

Precipitation collected at or below grade

Nuisance groundwater from dewatering operations

Wastewater from toilets, dishwashers, kitchen sinks, and utility sinks

Wastewater from clothes washers, bathtubs, showers, and bathroom sinks

Source: SFPCA

National Blue Ribbon Commission for Onsite Non-potable Water Systems
Its not the history of the water that is important, it is the quality.

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