

# WATER REUSE



**IS RECYCLED WATER A KENTUCKY  
OR TENNESSEE POSSIBILITY?**



**KENTUCKY-TENNESSEE**  
WATER ENVIRONMENT ASSOCIATION



# About Us

## KY-TN WATER REUSE COMMITTEE

- Co-Chairs
  - Robert Bates, KY - [rbates@grw.com](mailto:rbates@grw.com)
  - Brent Fowler, TN - [bfowler@ssr-inc.com](mailto:bfowler@ssr-inc.com)
- Members – 8, including co-chairs

# Webinar Outline



## Reuse Introduction

What is Reuse?  
Terminology  
Reclaimed Water Uses  
Drivers



## Implementation

Benefits  
Challenges  
Considerations



## TN Reuse

Water Availability and Use  
Regulations and Guidance  
Current Reuse Providers  
Future of Reuse



## KY Reuse

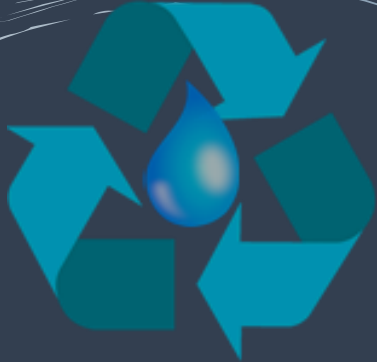
Rules and Regulations  
Current Reuse Providers



## Reuse Beer Project

2019 WPC





# INTRODUCTION TO WATER REUSE

- WHAT IS REUSE?
- TERMINOLOGY
- RECLAIMED WATER USES
- DRIVERS

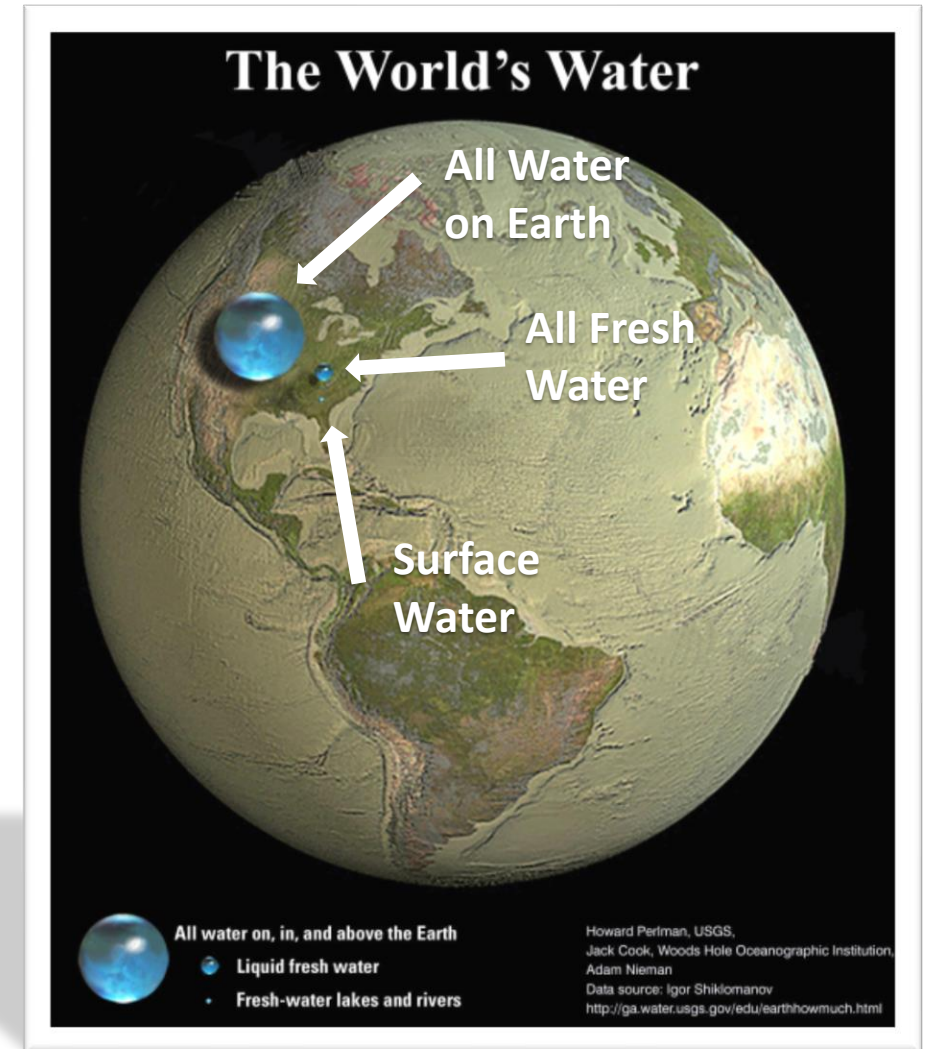
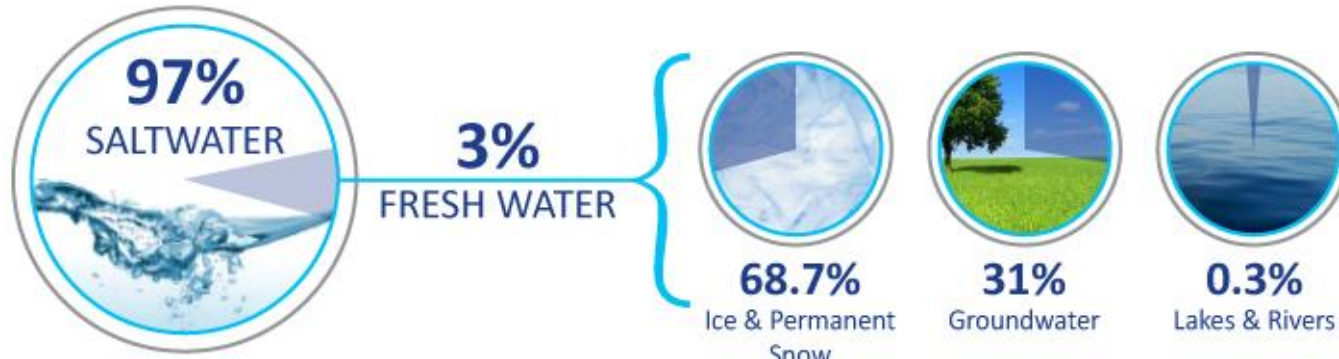


# What is Water Reuse?



- Reclamation and repurposing of water to best manage the challenges of water supply, use, treatment, and disposal
- Matching alternative water sources to potential end uses with a need for water – “Fit for Purpose”
- Reuse of wastewater, stormwater, graywater, rainwater, process water, saltwater

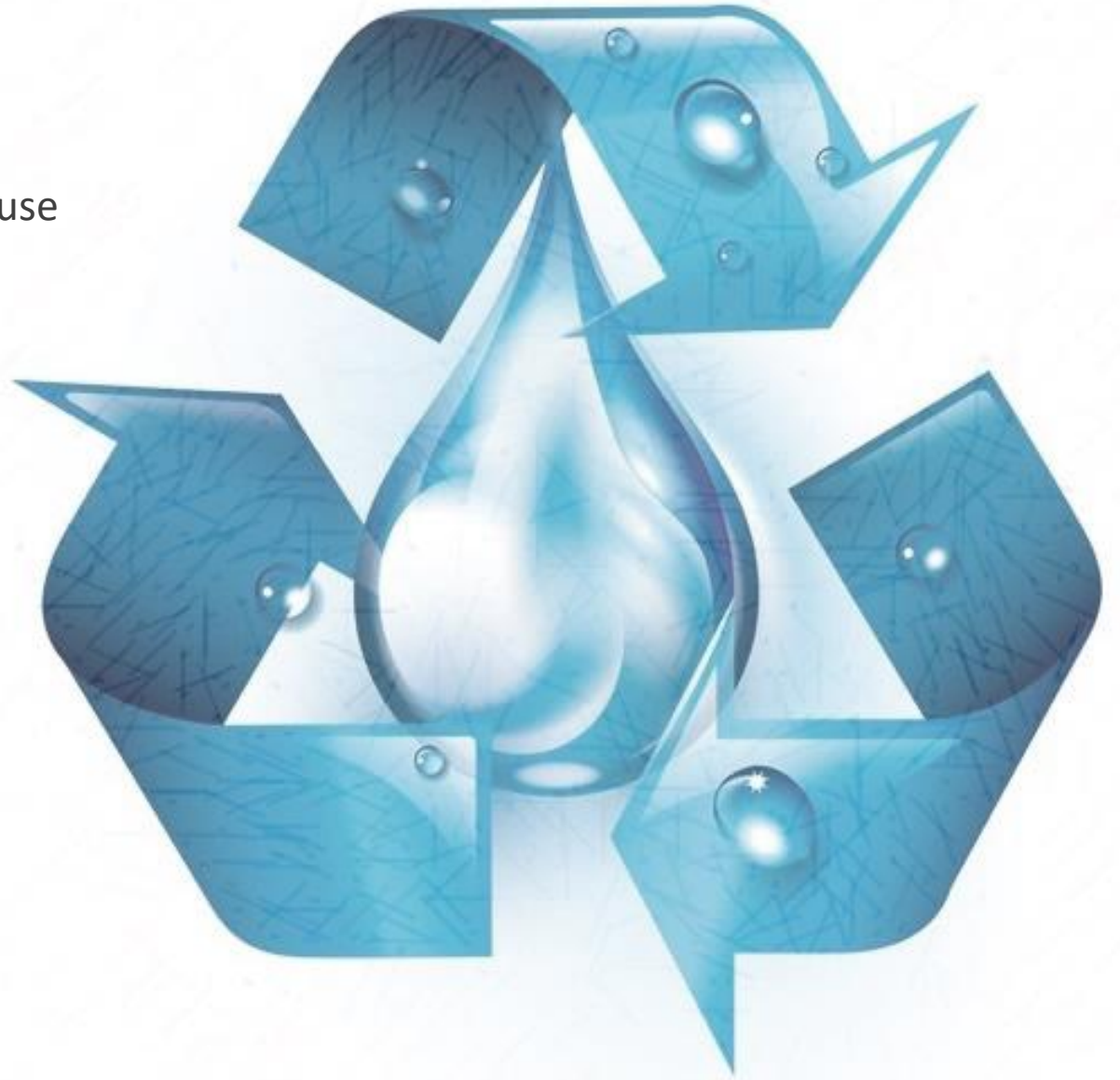
# Why Water Reuse?





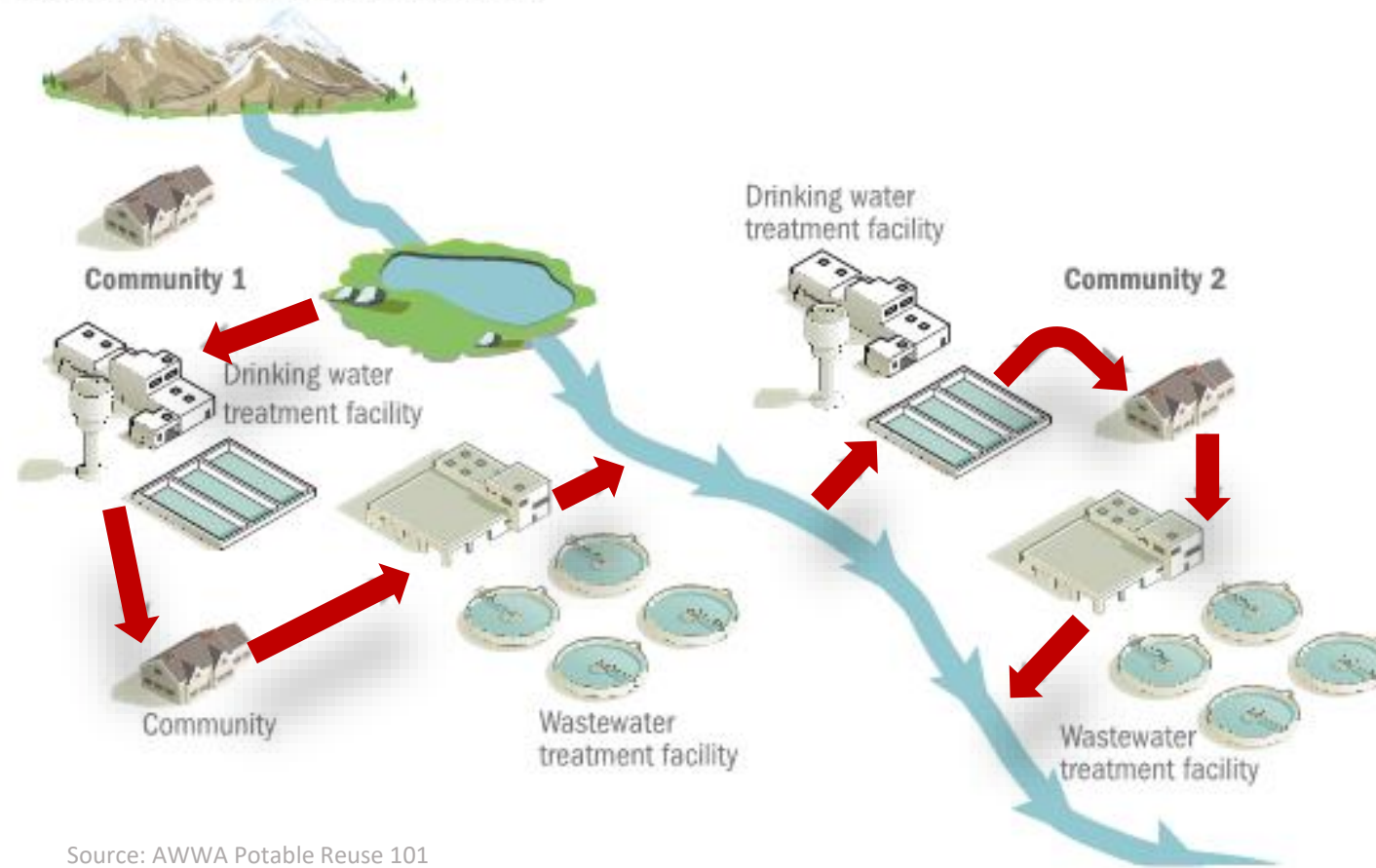
# Water Reuse Terminology

- Unplanned, Unacknowledged or “De Facto” Potable Reuse
- Planned Potable Reuse
  - Indirect Potable
  - Direct Potable
- Non-Potable Reuse
- Reclaimed Water
- Reused/Recycled (used interchangeably)
- Beneficial Reuse
- Restricted/Unrestricted Reuse
- In-Plant/Facility Reuse
- On-Site Reuse
- Augmentation
- Groundwater Recharge



# Water Reuse Terminology

Figure 1: Flow schematic of de facto reuse



Source: AWWA Potable Reuse 101

**Unplanned, Unacknowledged, or De Facto Reuse**

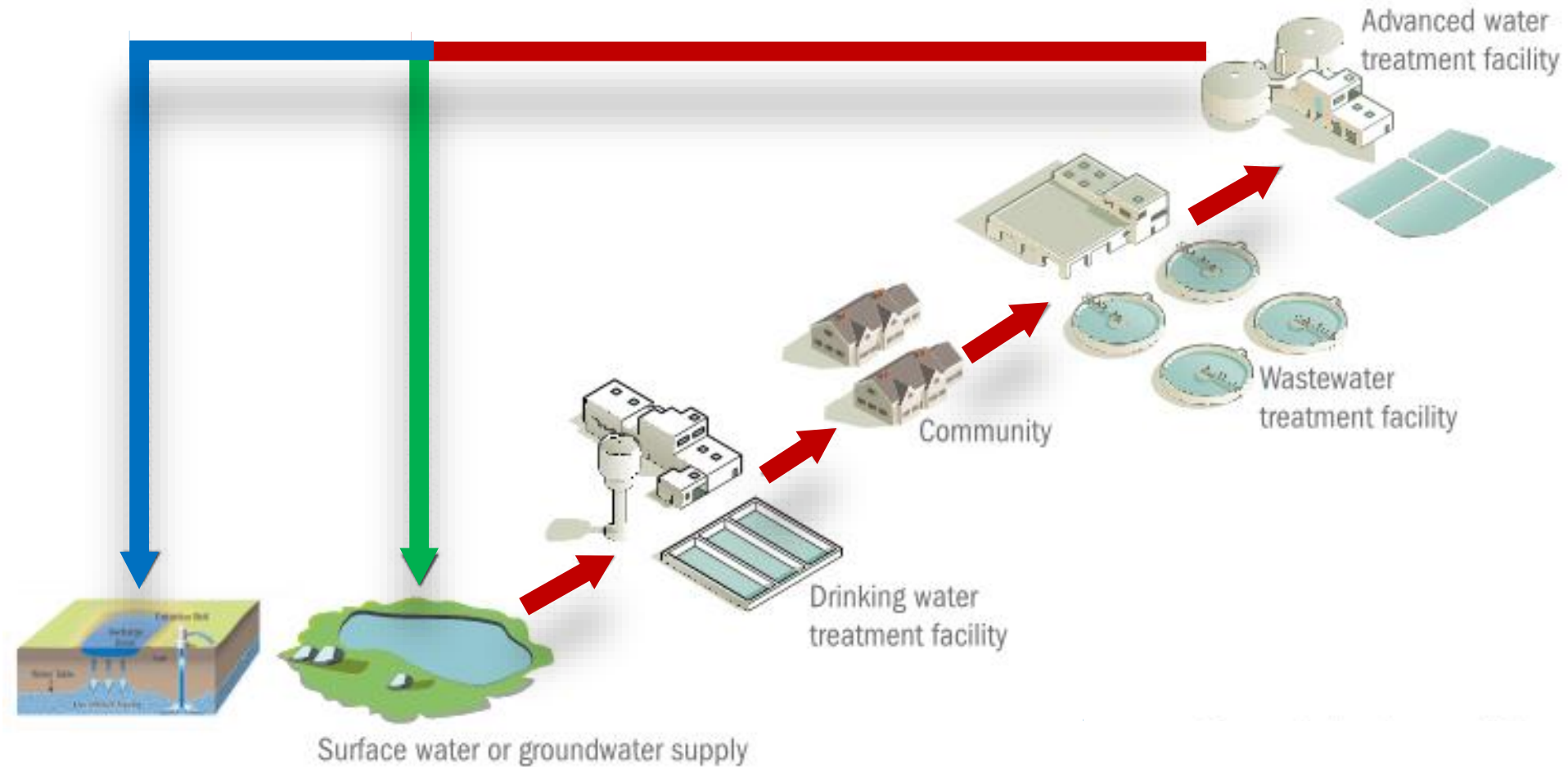


# Water Reuse Terminology

## IPR Uses

**Groundwater Augmentation**  
**Surface Water Augmentation**

- Seawater intrusion barrier
- Groundwater replenishment
- Aquifer Storage Recovery
- Reservoir supplementation



## Indirect Potable Reuse

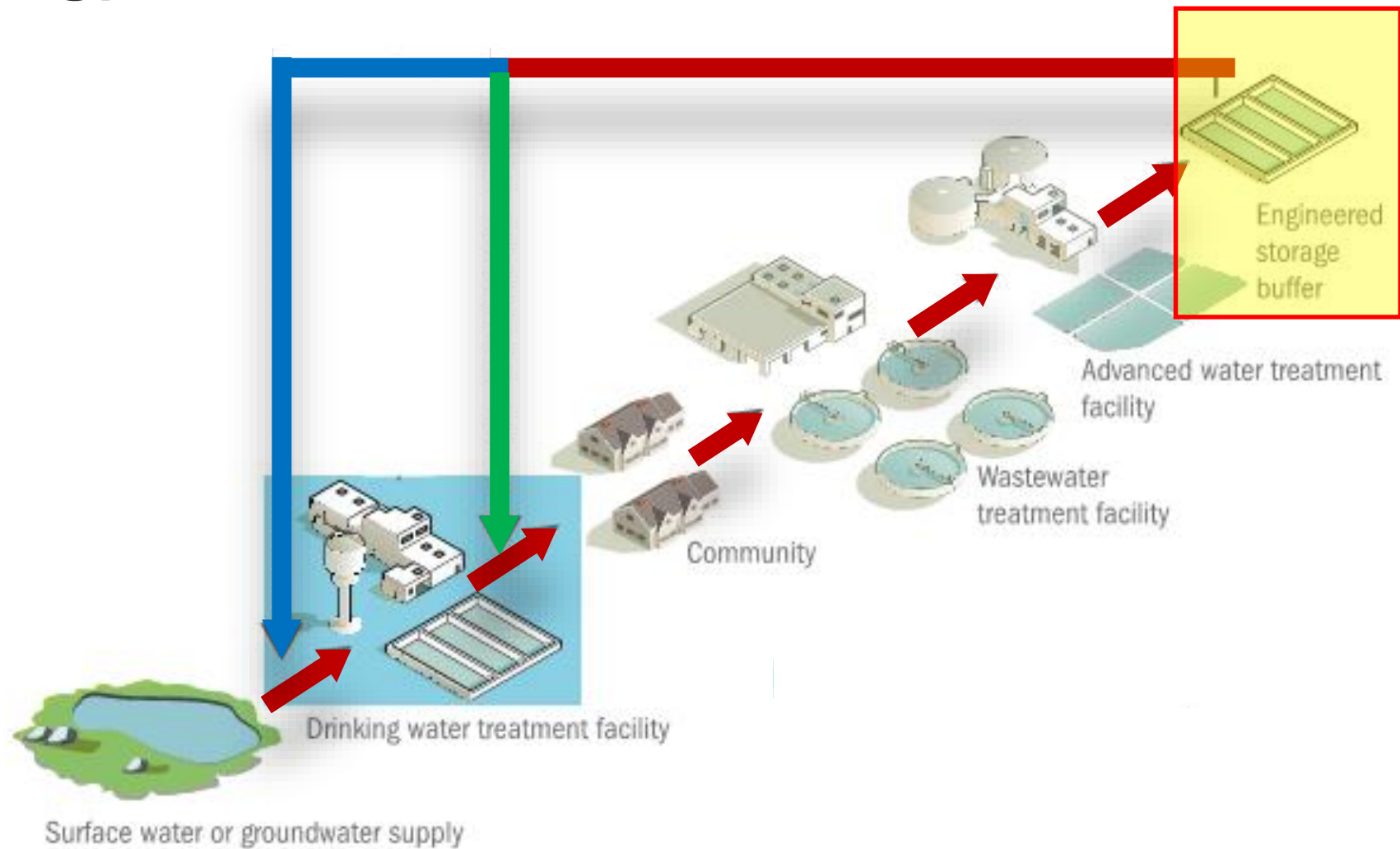
Modified from: AWWA Potable Reuse 101 and  
Department of Water Resources, CA Water Plan 2009

# Water Reuse Terminology

## DPR Uses

**Raw Water Augmentation**  
**Finished Water Augmentation**

- WWTP pipe-to-WTP intake
- WWTP pipe-to-distribution system



Modified from: AWWA Potable Reuse 101

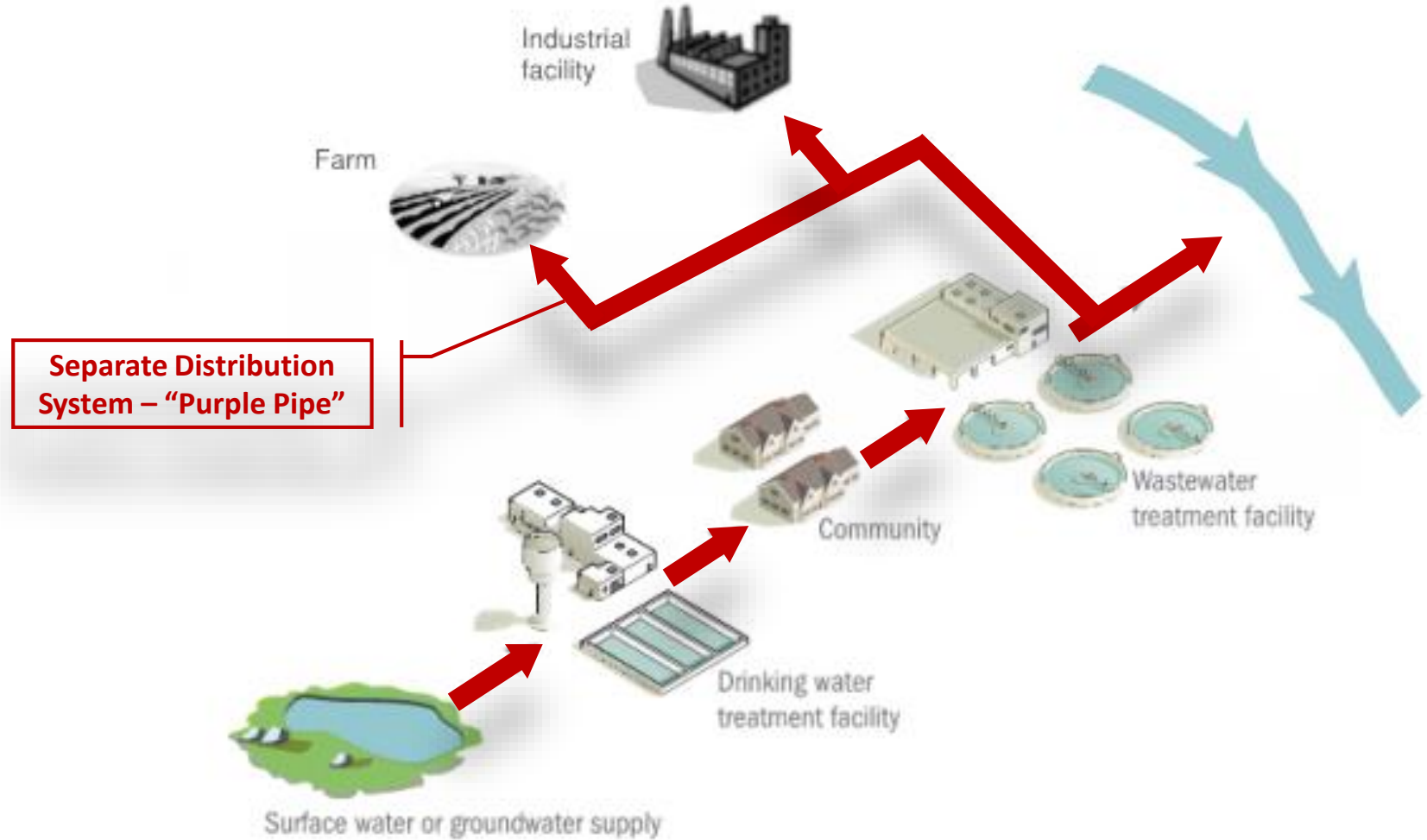
## Direct Potable Reuse

# Water Reuse Terminology

## Non-Potable Uses

### Non-Potable Reuse

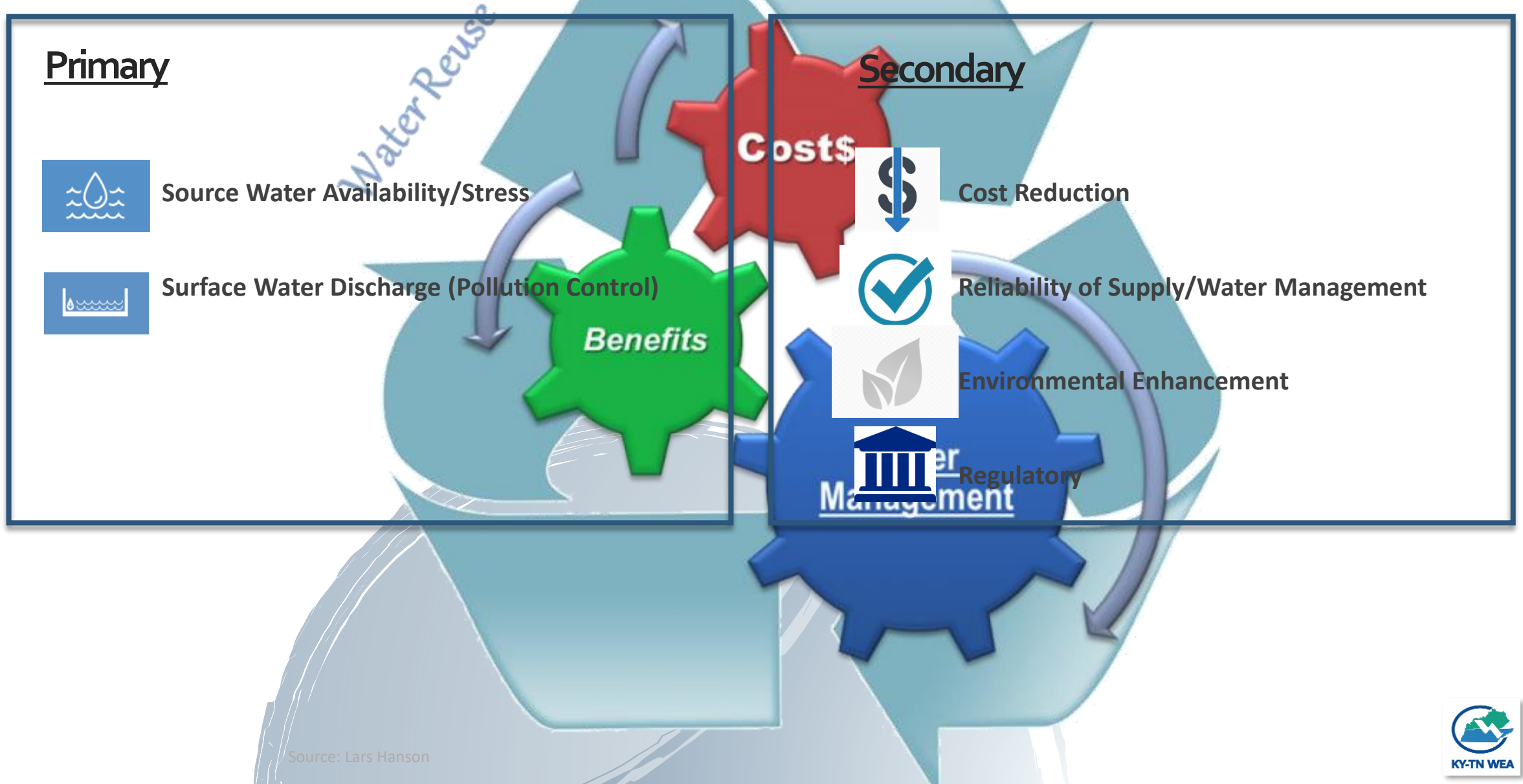
- Urban and Ag Irrigation
- Cooling
- Boiler feed
- Refineries
- Wetland restoration
- Toilet flushing
- Washdown



## Non-Potable Reuse



# Water Reuse Drivers





# WATER REUSE IMPLEMENTATION

- BENEFITS
- CHALLENGES
- CONSIDERATIONS

# Water Reuse Benefits



## Cost Effective

Reusing water **can be** more cost effective than developing other alternative supplies.



## Environment

Reusing water improves natural systems.



## Safe

Water is purified to meet stringent state and federal water quality standards.



## Reliable

Because wastewater is renewable, water reuse is the only sustainable source of freshwater.



## Locally Controlled

Communities are not beholden to nature or neighbors for their water supply.



# Water Reuse Challenges



## Cost

Typically more costly than alternate water sources



## Environment

- Effects on downstream flows
- Excess salinity



## Health Concerns

- Pathogens
- Metals, Chemicals, Pharmaceuticals



## Operations

Managing peaks of non-potable reuse



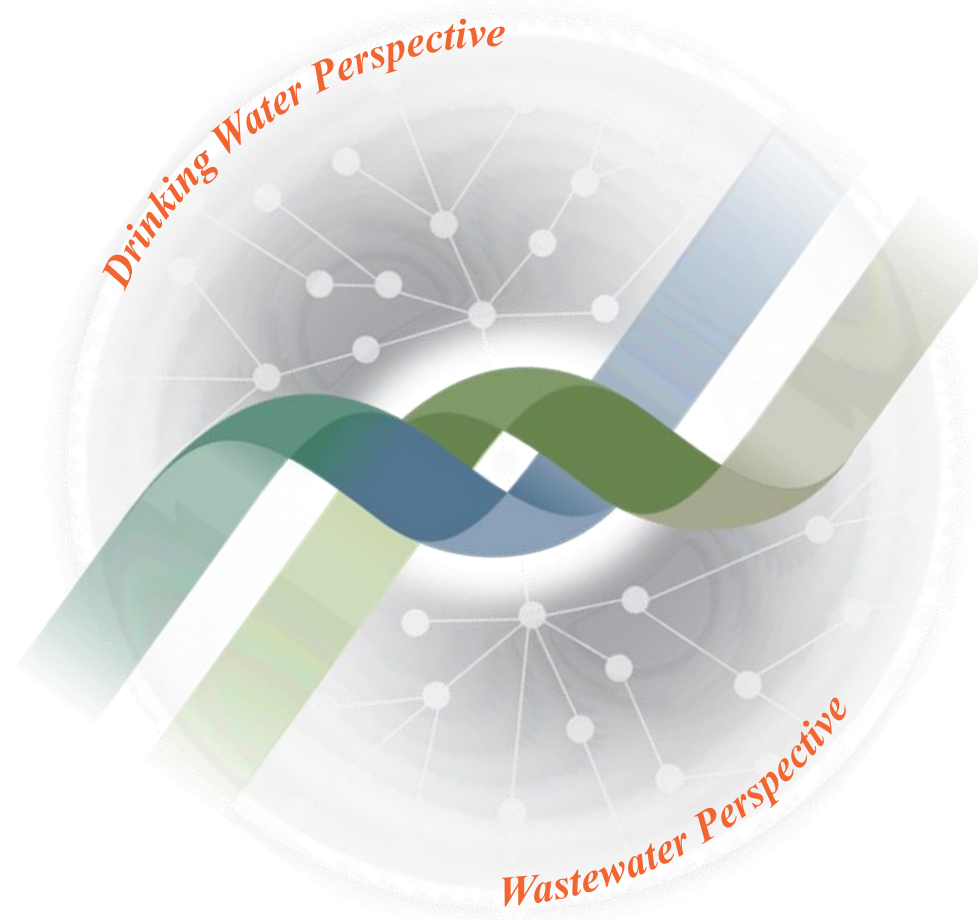
## Public Perception

Perceived lower quality

# Water Reuse Considerations

**Planning Goals – Consider all drivers for water reuse from water and wastewater perspectives**

- Limited quantities and/or challenging qualities of conventional source water supplies
- Limited drinking water treatment capacity
- Limited drinking water distribution capacity



- Environmental discharge limitations
- Evaluate potential demand for reclaimed water
- Treatment levels required for potential customers
- Limited collection system capacity (onsite or decentralized reuse)

Risk Management

Financing

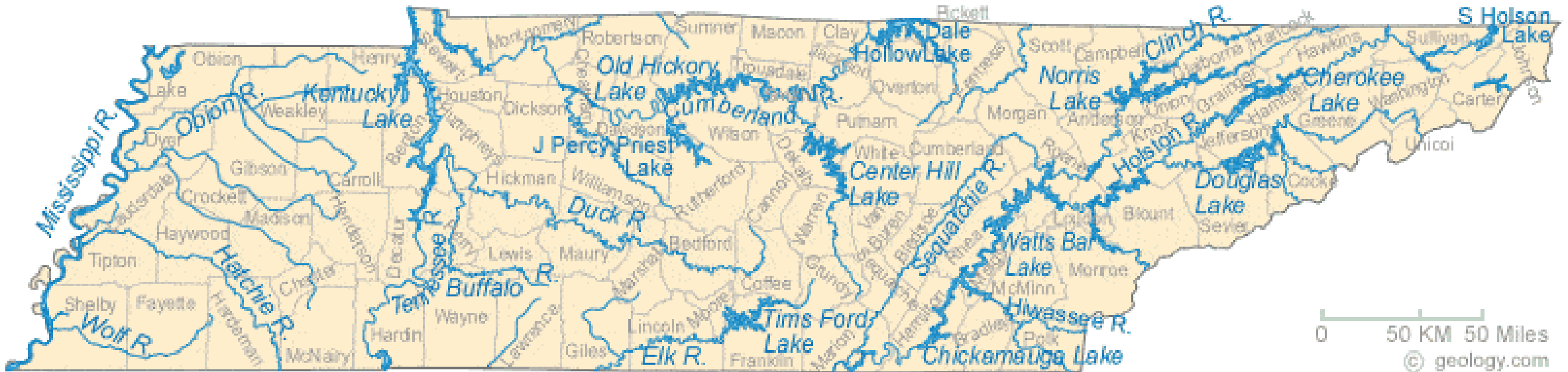


# **WATER REUSE IN TENNESSEE**

**AVAILABLE FRESH WATER  
REGULATIONS AND GUIDANCE  
CURRENT REUSE PROVIDERS**



# Fresh Water in Tennessee



- 60,000 miles of rivers and streams
- 570,000 acres of lakes and reservoirs
- 787,000 acres of wetlands

# Tennessee Water Use (2018 USGS Report)

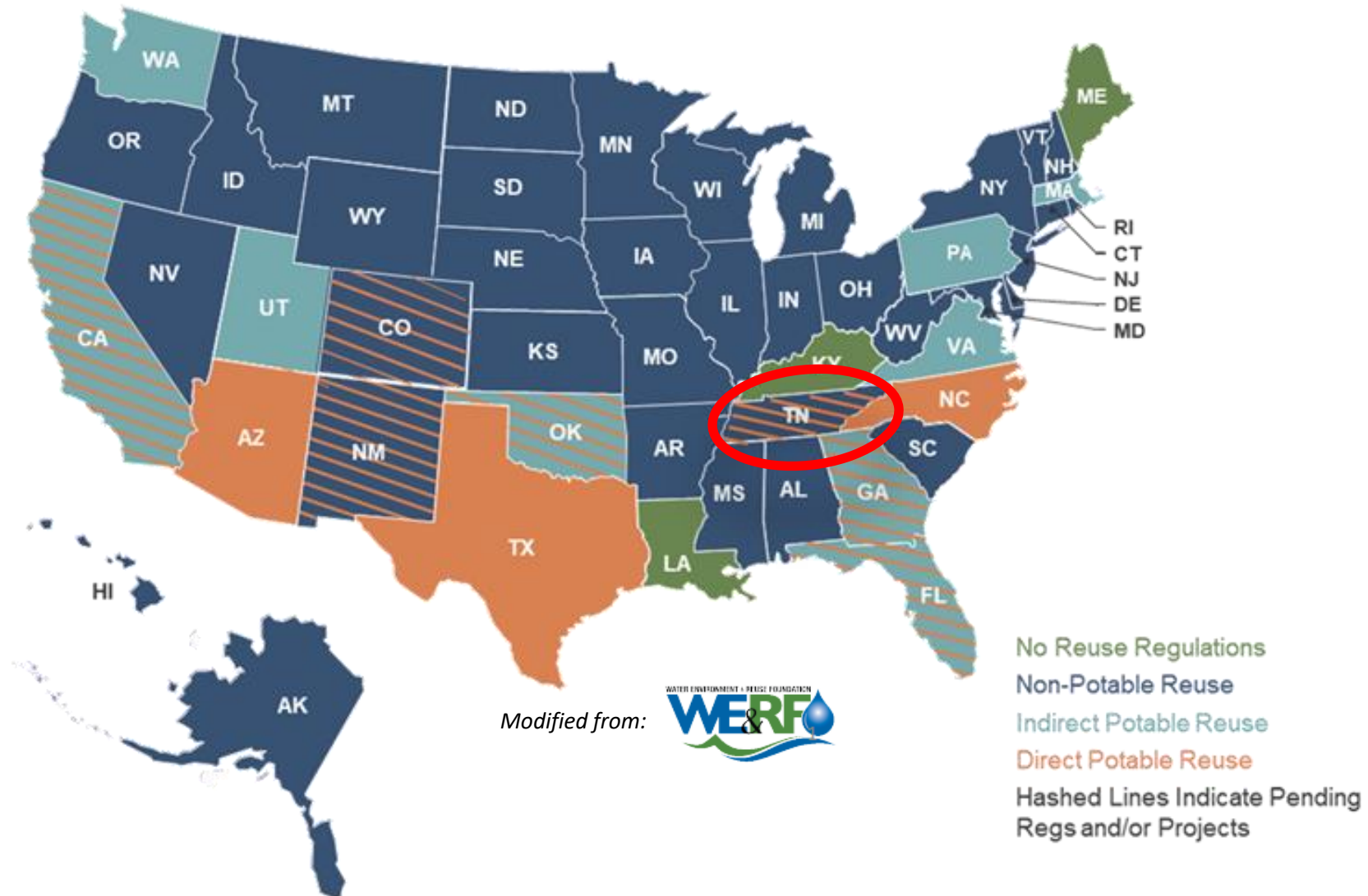
- TN water users withdrew approximately 6,420 mgd from groundwater and surface water
  - Only 6.7% groundwater
- Overall trend in TN is just like US - declining water withdrawals
- Net water demand is about 4% of total withdrawal and is slightly increasing
- TN is OK for now, but opportunities for reuse exist!!

*Population in thousands; all withdrawals in million gallons per day*

	1990	1995	2000	2005	2010	2015	Percent Change
Population	4,877	5,256	5,689	5,963	6,346	6,600	35%
Total withdrawals	9,190	10,100	10,900	10,800	7,700	6,420	-30%
Public supply	695	777	890	914	918	850	-22%
Self-supplied domestic	59	54	33	37	39	43	-27%
Livestock	21	8	31	30	28	23	10%
Irrigation	38	25	22	55	72	64	68%
Thermoelectric power	7,320	8,300	9,040	8,940	5,800	4,620	-37%
Self-supplied industrial	882	863	842	783	776	734	-17%
Mining	90	6	14	22	15	31	-66%
Aquaculture	28	28	44	60	53	57	104%
Groundwater Total	503	435	456	489	470	430	-15%
Surface Water Total	8,690	9,640	10,500	10,300	7,230	5,990	-31%

Source: US Geological Survey, Robinson 2018.

## Regulating Water Reuse: State Regulations and Guidance





# Reuse Regulations in TN?

- Amended Chapter 0400-40-05: Permits, Effluent Limitations and Standards
- New Draft Chapter 0400-40-06: State Operating Permits
- *Amended Chapter 0400-40-10: National Pollutant Discharge Elimination System General Permits*



# Reuse Regulations in TN?

## Highlights of Amended Chapter 0400-40-05: Permits, Effluent Limitations and Standards

- Chapter only applies to NPDES effluent discharge permits
- State Operating Permits (SOPs) for non-discharging systems
- Reuse and low flow in receiving stream
- Permit shall impose conditions of new non-potable reuse Rule 0400-40-06.10



# Reuse Regulations in TN?

## Highlights of DRAFT New Chapter 0400-40-06: State Operating Permits

- Applies to non-discharging systems.
- New non-potable guidance document?
- Reuse and low flow in receiving stream
- Requirements for land application
- Prohibited types of reuse (not exhaustive list)
  - Potable reuse, Reuse impoundments, Environmental reuse, Groundwater recharge, Food prep
- Availability of alternatives to reuse



# TN State Design Criteria

## State Design Guidance: Design Criteria for Review of Sewage Works Construction Plans and Documents, November 2017

- Chapter 16-Spray Irrigation
  - Spray requires sufficient emergency storage to accommodate periods of no application
- Chapter 17-Drip Irrigation
- *Chapter 19-Beneficial Reuse*

**COMING  
SOON**

CHAPTER 16	Design Guidelines for Wastewater Treatment Systems Using Spray Irrigation (012710)	16-1
CHAPTER 17	Design Guidelines for Wastewater Dispersal Using Drip Irrigation (012710) App 17-A: Hydraulic Values & Conversion Factors App 17-B: Example Hydraulic & Nutrient Loading Calculations App 17-C: Derivation of Conversion Factor for Eqn.17-2	17-1



## Design Criteria for Review of Sewage Works Construction Plans and Documents



Effective Date: November 1, 2017

Document No.

DWR-NPDES/SOP-G-01-WW Design Criteria Chapter 1-110117

Department of Environment and Conservation  
Division of Water Resources

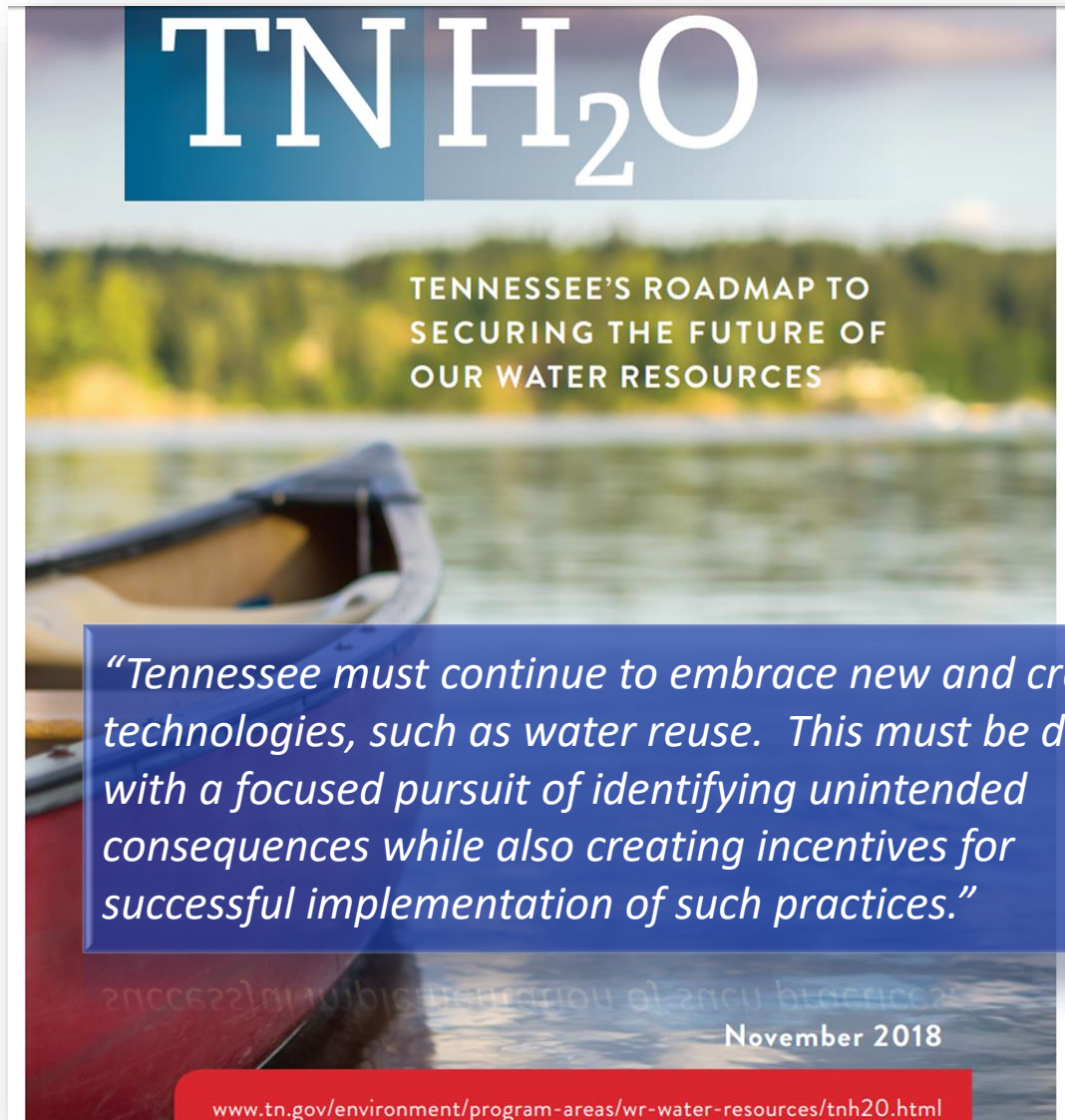
<https://www.tn.gov/environment/program-areas/wr-water-resources-home.html>



# Non-Potable Reuse Providers in Tennessee



# Future of Reuse in TN?



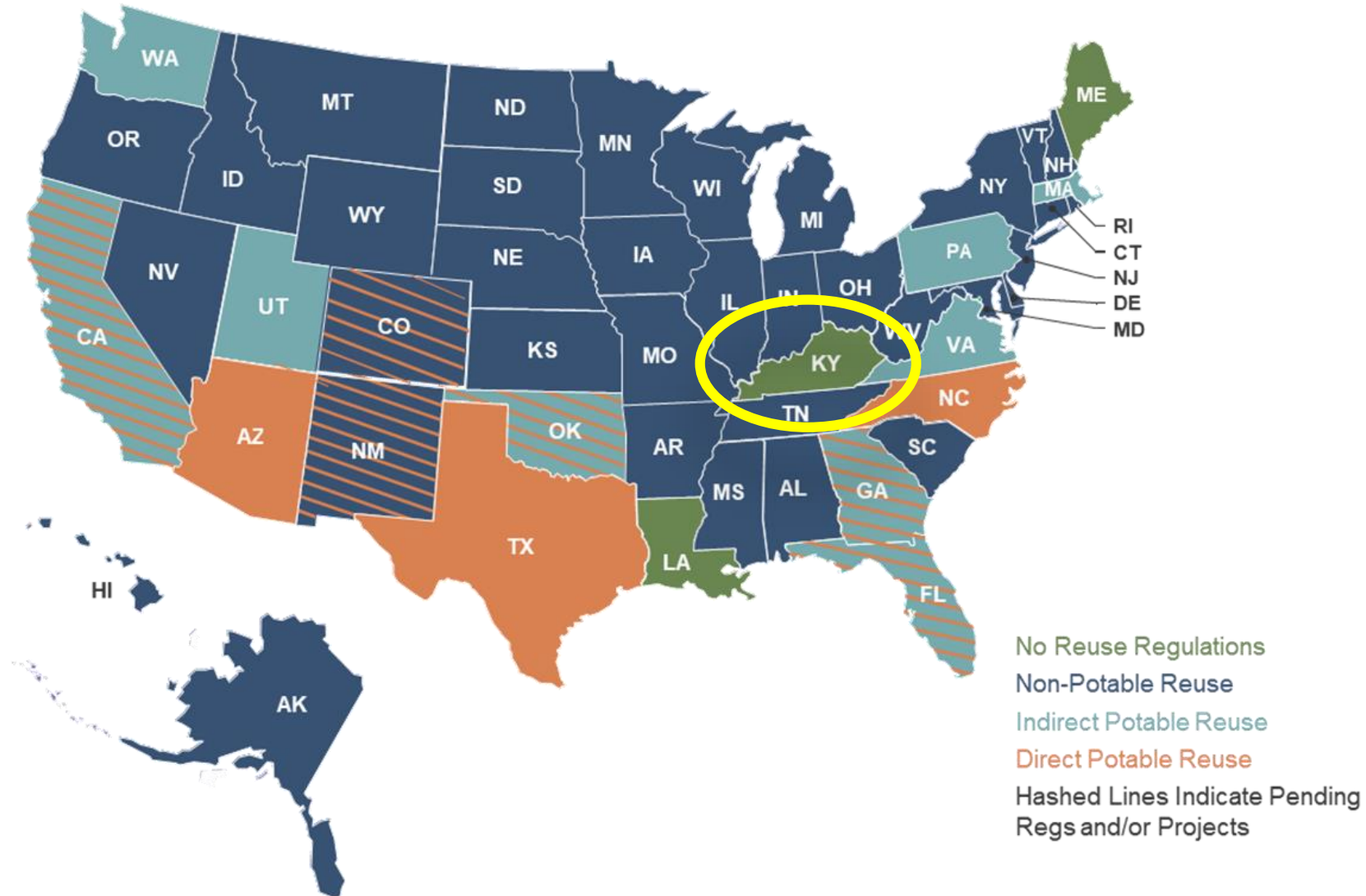
## Tennessee Panel Developing Statewide Water Plan

*Expected population growth, "along with recent concerns over the utilization of the Memphis Sands Aquifer, droughts that have impacted numerous Tennessee communities, failures of aging drinking water and wastewater infrastructure, and interstate battles over water rights, all stress the need to develop a statewide plan for addressing water availability," according to the governor's office.*

Jan 25, 2018

# WATER REUSE IN KENTUCKY

# Regulating Water Reuse: State Regulations and Guidance





# What does Kentucky say about reuse?

After an exhaustive search of the Kentucky regulations:



# What does Kentucky say about reuse?



1990	1995	2000	2005	2010	2015	Percent Change
Population						
3,685	3,860	4,042	4,173	4,339	4,425	20%
Public Supply						
427	496	525	557	572	553	29%

Why is water reuse not addressed?

# Freshwater in Kentucky

## Lakes

Barkley - Barren River – Beaver  
Boltz – Buckhorn – Bullock Pen  
Beshear – Cannon Creek – Carnico  
Cave Run – Cedar Creek – Cranks Creek  
Cumberland – Dale Hollow – Dewey  
Doe Run – Elk – Elmer Davis  
Fishtrap – Grayson – Green River  
Greenbo – Guist Greek – Herrington  
Kentucky – Kincaid – Laurel River  
Linville – Malone – Martins Fork  
Nolin River – Paintsville – Pan bowl  
Rough River – Shanty Hollow – Shelby  
Swan – Taylorsville – Wilgreen  
Williamstown – Willisburg – Wood Creek  
Yatesville



Kentucky has more miles of running water than any other state except Alaska. The numerous rivers and water impoundments provide 1,100 commercially navigable miles (1,770 kilometers).

# It can happen!

## 27 Counties on Drought Watch

Soil Testing Under Dry Fall Conditions - August 8, 2012  
Coping With High Cattle Feed Prices - August 3, 2012  
Valuing Drought Stressed Corn Silage - July 27, 2012  
2012 Could Be A Tough Year For Kentucky Ag - July 20, 2012  
Improving Your Pastures - July 20, 2012  
Preparing Livestock Facilities For Extreme Heat - July 20, 2012  
Watch For Blossom End Rot - July 20, 2012  
Downy Mildew On Cucurbit Crops - July 5, 2012  
Create Watering Zones - July 5, 2012  
Heat Stress In Dairy Cows Affects Reproduction - July 5, 2012  
Insects In Alfalfa - July 5, 2012  
Rethinking Landscapes During Drought - July 5, 2012

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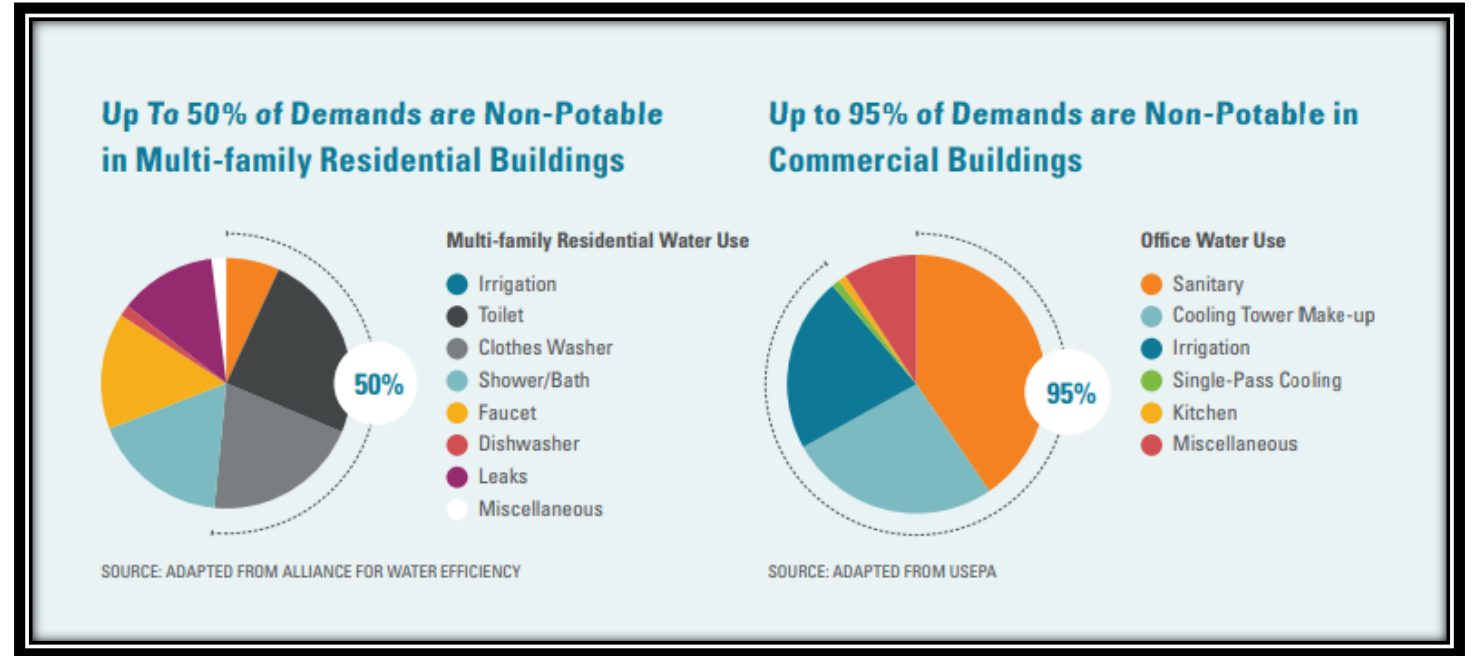
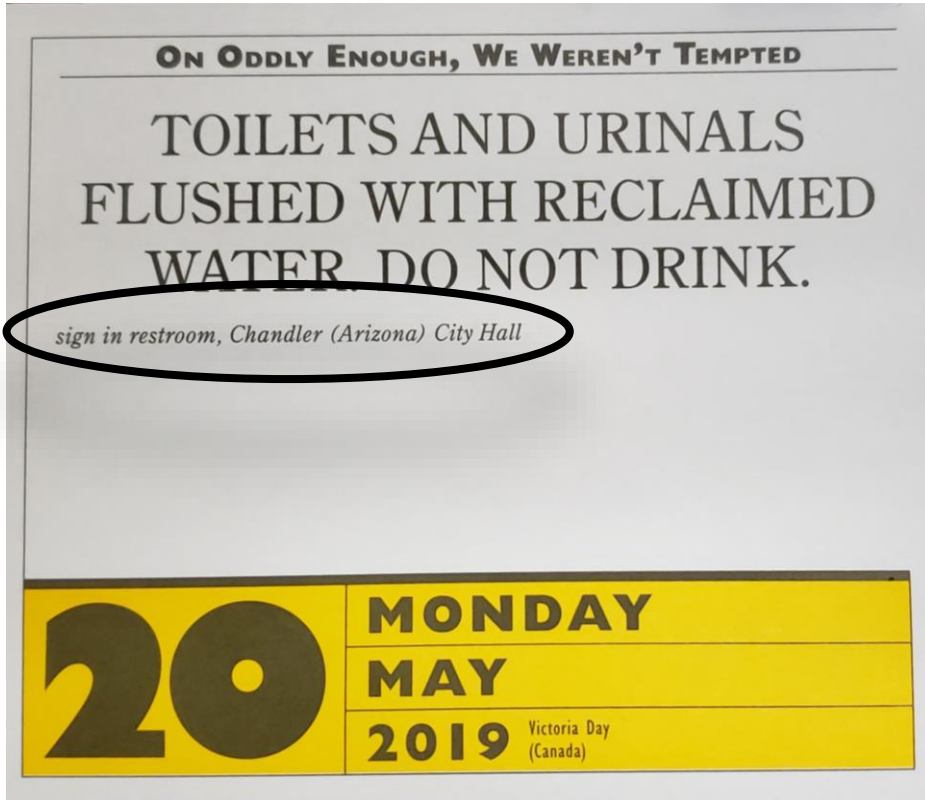
<http://drought.ca.uky.edu/>

In Kentucky, permits give no guarantee of a water right during droughts.

<https://geochange.er.usgs.gov/sw/responses/management/>

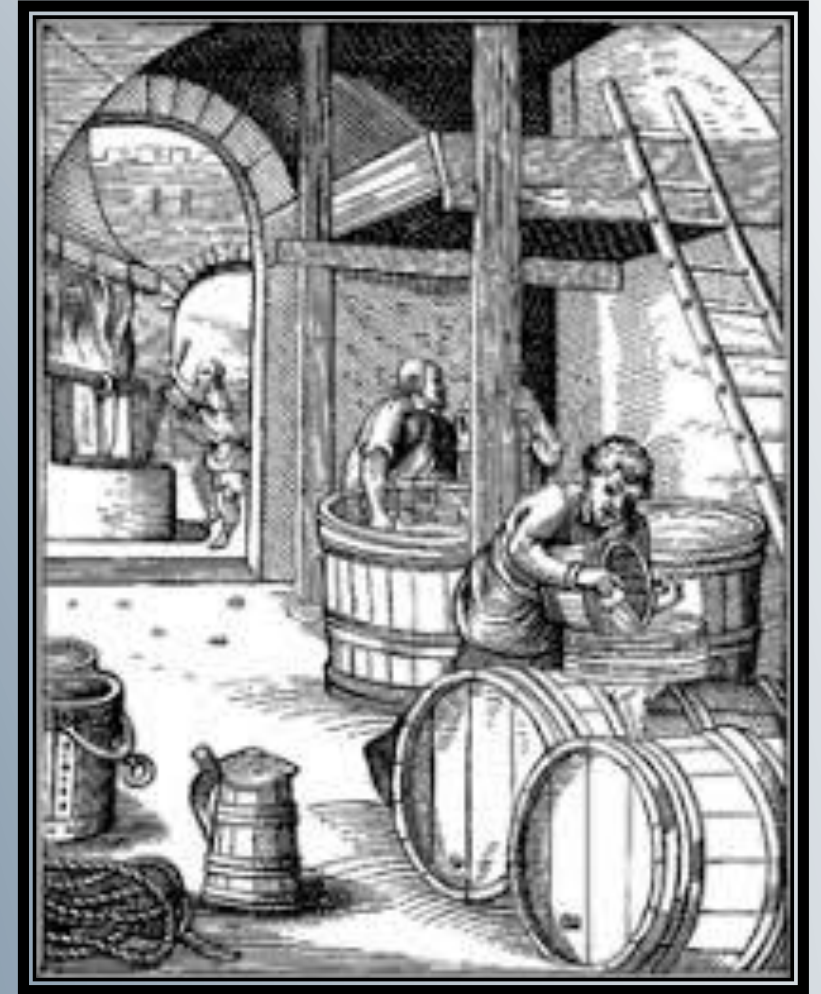


# Good first step?



[https://www.pankowfoundation.org/wp-content/uploads/WaterReuseGuide\\_FINAL.pdf](https://www.pankowfoundation.org/wp-content/uploads/WaterReuseGuide_FINAL.pdf)

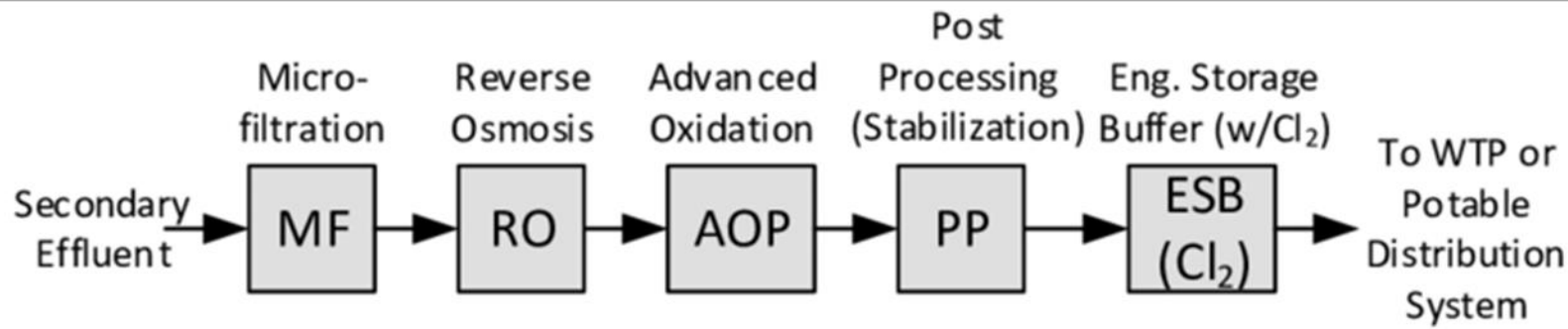
# KY/TN WEA REUSE PROJECT



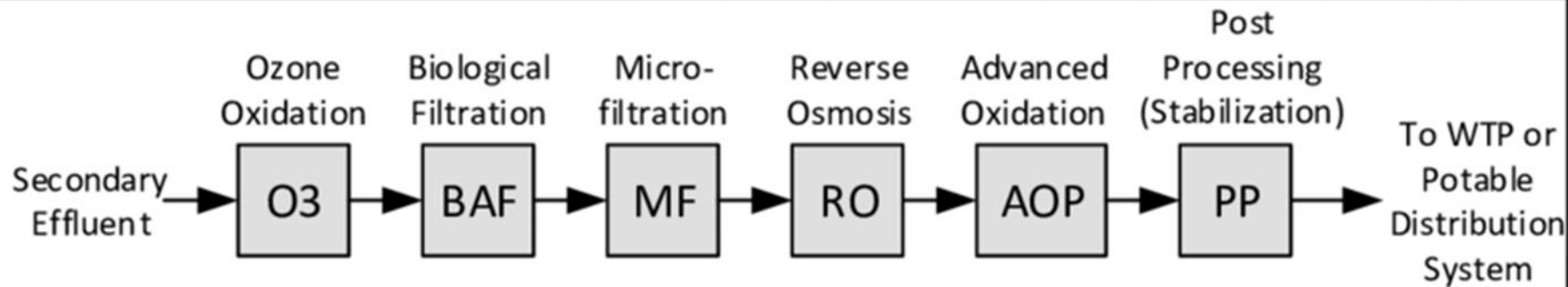


## Direct Potable Reuse??

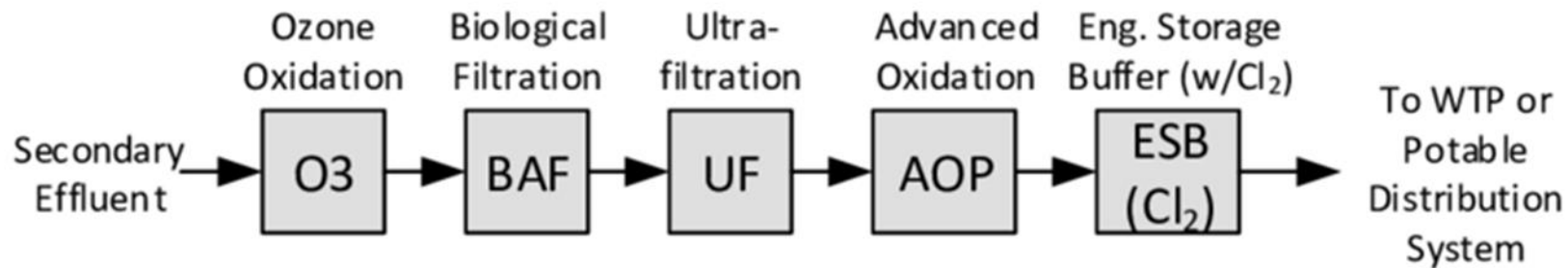
The City of Los Angeles announced a bold plan to recycle 100 percent of wastewater currently being discharged to the ocean through the Hyperion Wastewater Treatment Plant by 2035. (450 mgd)



### Treatment Train #1



### Treatment Train #2



### Treatment Train #3

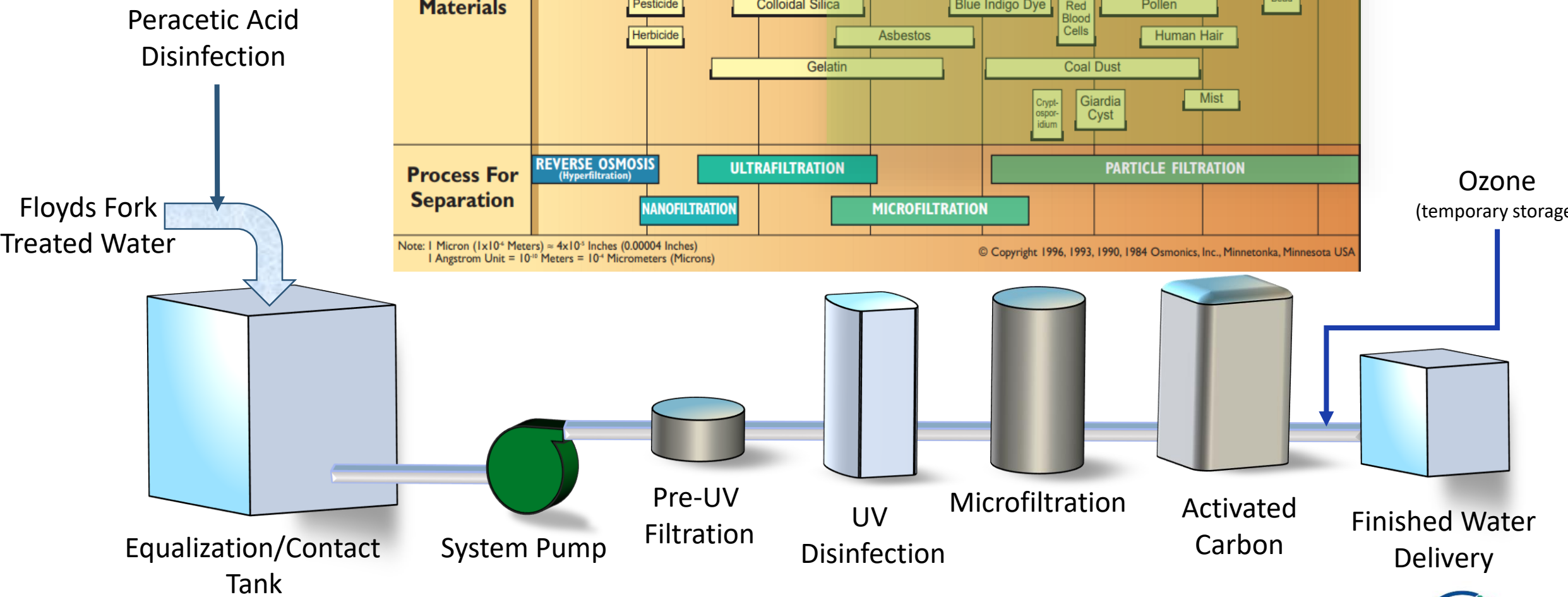
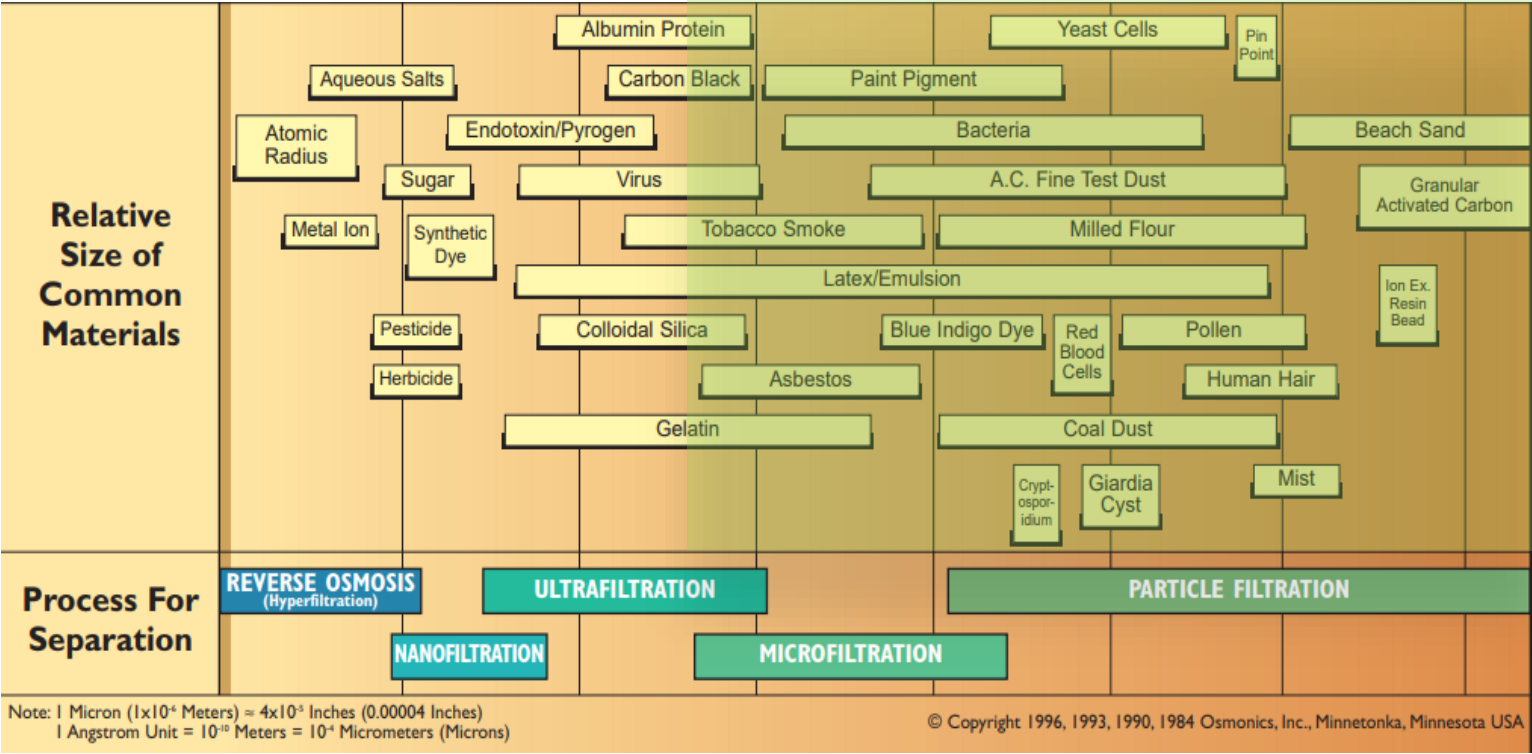


# Floyds Fork Water Quality Treatment Center – Louisville MSD









# Not some flash in the pan (or kettle actually)



- Barbarian Brewery
- Brown and Caldwell
- Cambrian Innovation
- Cascade Brewing
- CDM Smith
- CH2M
- City of Boise
- Clean Water Services (OR)
- Corollo
- Declaration Brewing
- Denver Water
- Garver
- Half Moon Bay Brewing
- HDR
- Hillsborough County (Florida)
- LongDrop Cider
- Lost Grove Brewery
- Mad Swede Brewery
- Marana Water
- MICROrganic Technologies
- Oregon Brew Crew
- Pima County RWRD (Arizona)
- Seismic Brewing Company
- Stone Brewing Company
- Water Environment Federation
- Water Research Foundation
- WaterReuse Association
- Xylem Inc.



## Why Partner With Brewers?

Brewers understand water and recognize the need to use it sustainably. And brewers are very picky about their water. Clean, high-quality water is a vital ingredient in beer, making up 90 percent of its content.







# Key Takeaways

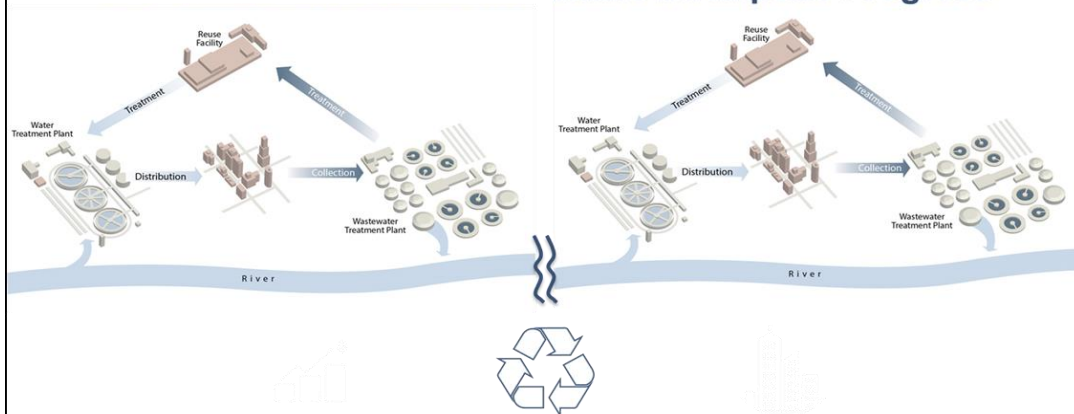
- Many uses for reclaimed water
- Benefits:
  - Conserve fresh water resources
  - Provide potential water source for stressed areas
  - Reduce pollutant load to sensitive streams
- Challenges:
  - Cost
  - Health risk mitigation
  - Careful planning required
  - Public perception



## Summary

Is Recycled Water a  
Kentucky or Tennessee  
Possibility?

### We Cannot Let Fear of the Unknown Impede Progress



# THANK YOU

Robert Bates; Brent Fowler 

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www.kytnwea.org 