



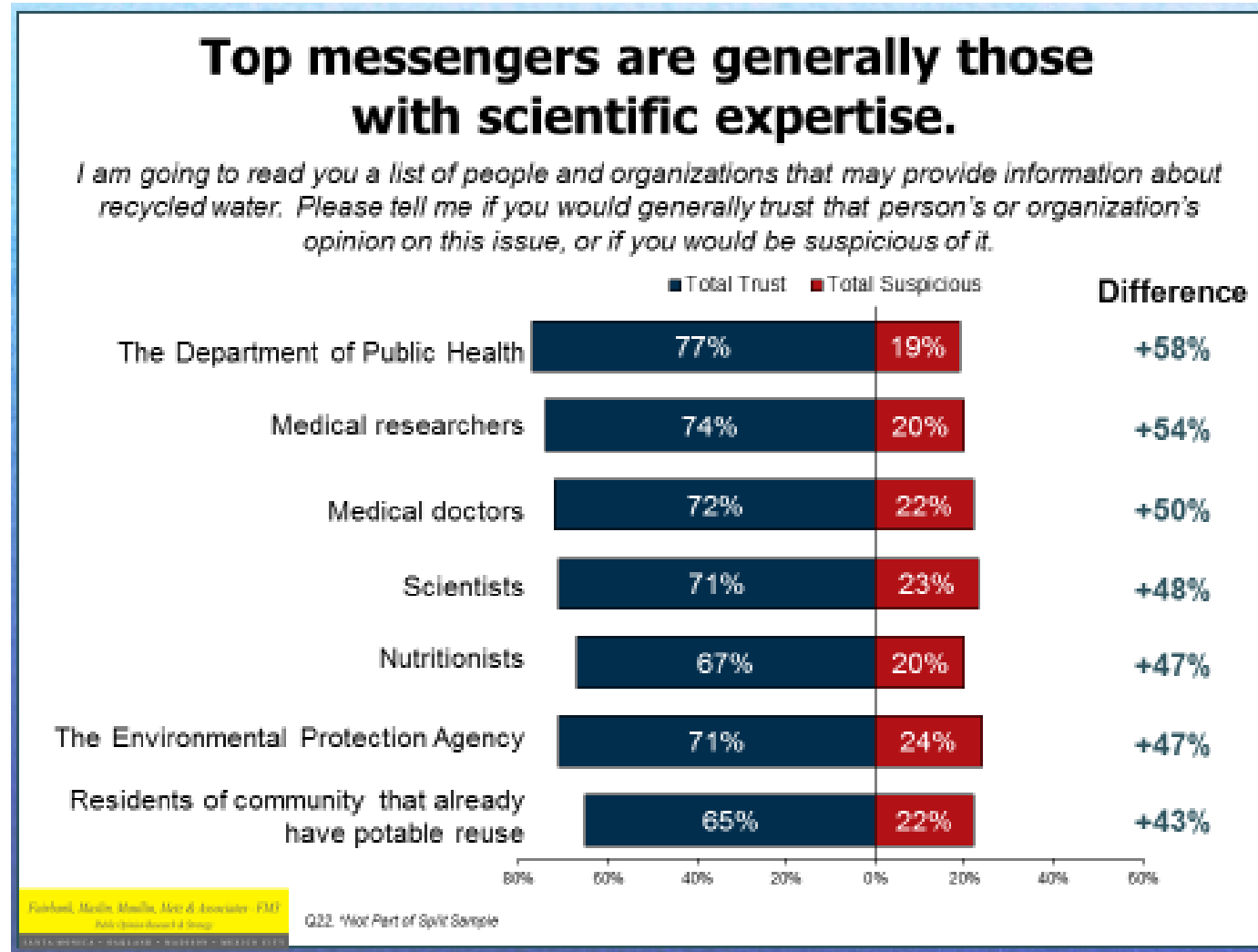
Prescription for Public Acceptance

Guy Carpenter
Past-President
WaterReuse Association

September 11, 2018



We've learned from survey data that opinions from Medical and Public Health Professionals matter most.



WateReuse Members have asked for support in this regard.

The City of
SAN DIEGO



Santa Clara Valley
Water District

May 17, 2016

Guy Carpenter
President
WateReuse Association
1199 North Fairfax Street, Suite 410
Alexandria, VA 22314

Dear Mr. Carpenter:

Research consistently shows that the public wants to hear from medical professionals and scientists regarding the safety and quality of purified water. In fact, providing information about safety, quality and the treatment process to respondents was the single most important factor in increasing support for potable reuse in the research conducted for WRRF 13-02. We are writing you to request that the WateReuse Association commit its resources and influence to obtain support for potable reuse from leading national medical associations, health researchers and scientists. We believe this is one of the most important actions you can take for all of your members. You have the stature and reach to accomplish what most of your members cannot: access to these associations, researchers and scientists for purposes of obtaining letters or resolutions of support for this important drinking water source.

Orange County Water District's Groundwater Replenishment System is widely recognized as the model for purified water projects, especially with regard to its public outreach program. Their early medical and science support included an environmental epidemiologist from the Centers for Disease Control and Prevention, a researcher from the Center for Water and Health at Johns Hopkins University and a former director of the Center for Risk Sciences & Public Health, to name a few. It would be very helpful for WateReuse to seek support from individuals prominent in the medical or science field and such groups as the American Medical Association, the National Medical Association – the oldest African American medical association, the National Hispanic Medical Association, leading medical schools such as Johns Hopkins University, Columbia University, Stanford University and others, and associations representing pediatricians and nurses.

Your members pursuing potable reuse projects are "doing the work" of informing community members about the importance of this new, local water supply. But they need your help in breaking through to state or local medical schools, public health associations, nurses, doctors, hospitals and others in the health community who are busy with the daily demands of this important profession. For example, physicians at a recent presentation to a medical association in San Diego wanted to know what scientists and medical associations thought about purified water before they would take a position on the local potable reuse project. Your assistance can help provide these answers and increase local support.

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Securing written support for the science, health and safety of potable reuse at a national-level demonstrates the value that membership in the WateReuse Association provides. Thank you in advance for your leadership on this issue and consideration of our request.

Sincerely,

Halla Razak
Director of Public Utilities
City of San Diego

Mike Markus
General Manager
Orange County Water District

John Balliew
President/Chief Executive Officer
El Paso Water Utilities

Rich Nagel
General Manager
West Basin Municipal Water District

Norma Camacho
Interim Chief Executive Officer
Santa Clara Valley Water District



Talking about Water to a Skeptical Public



Topics

- Water Availability & Scarcity
- The Safety of Drinking Water
- Resilience & Reliability
- Risk & Perception
- Potable Reuse
 - Treatment Technologies
 - Other Risk Mitigating Practices
- Q/A





Water Availability and Scarcity



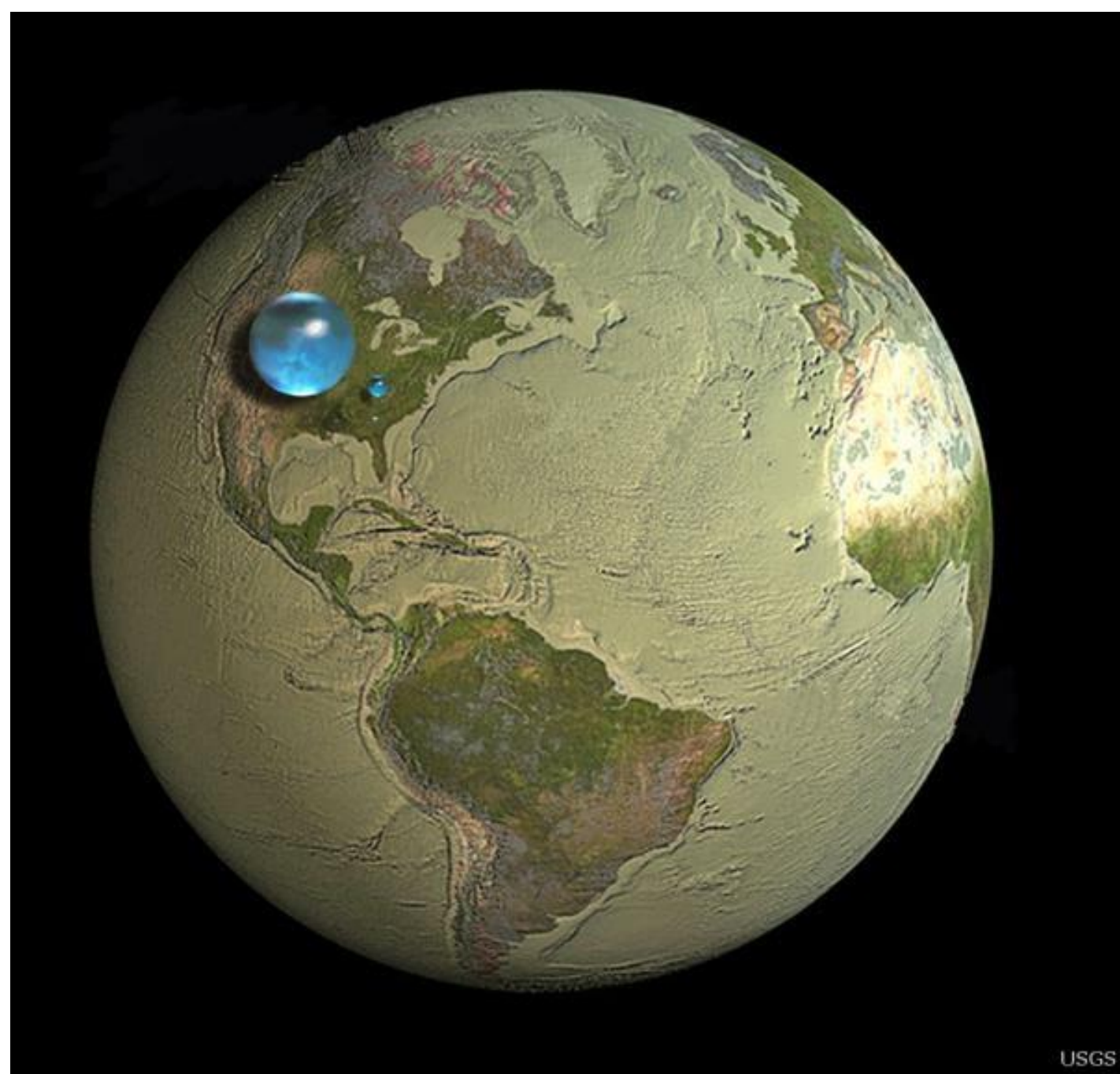


We forget that the water cycle and
the life cycle are one.

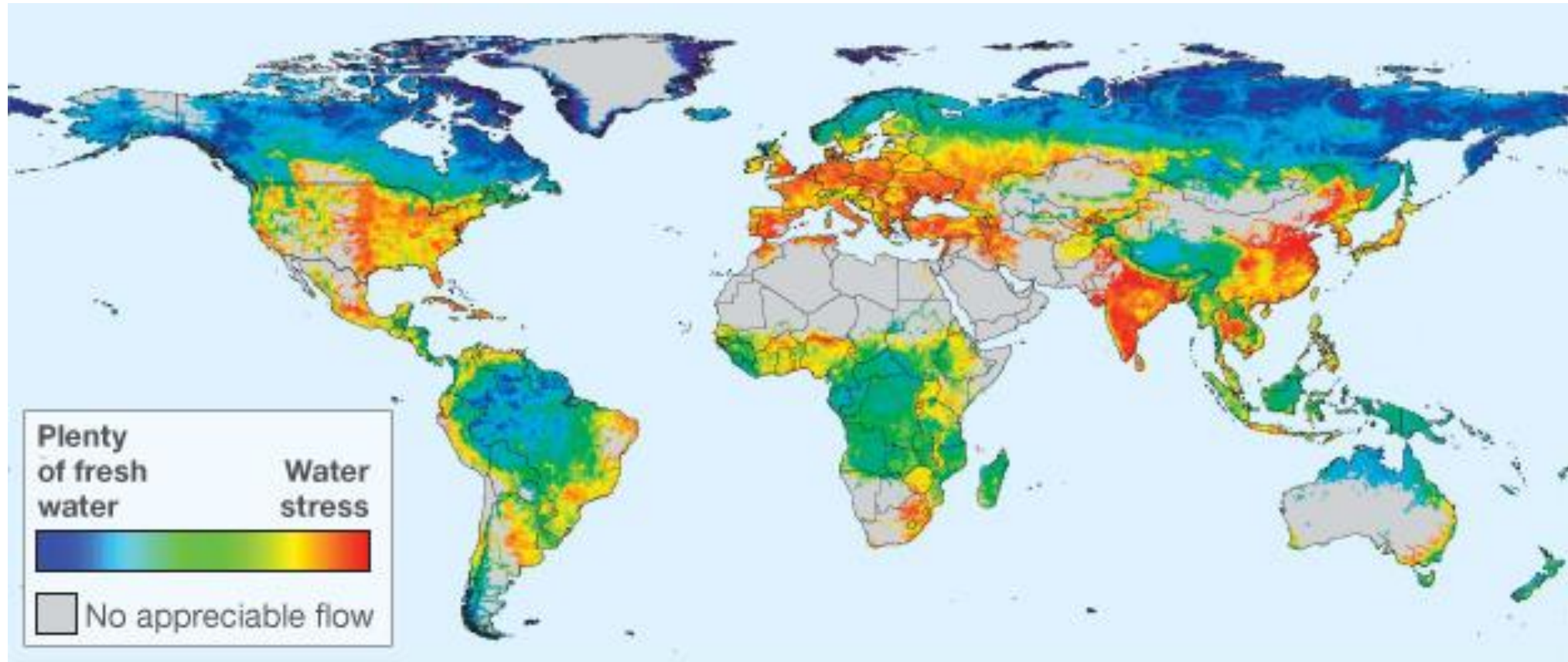
— *Jacques Yves Cousteau* —

AZ QUOTES

Water covers
70% of the
earth's surface,
but...



Water stress is increasing, particularly where populations are high

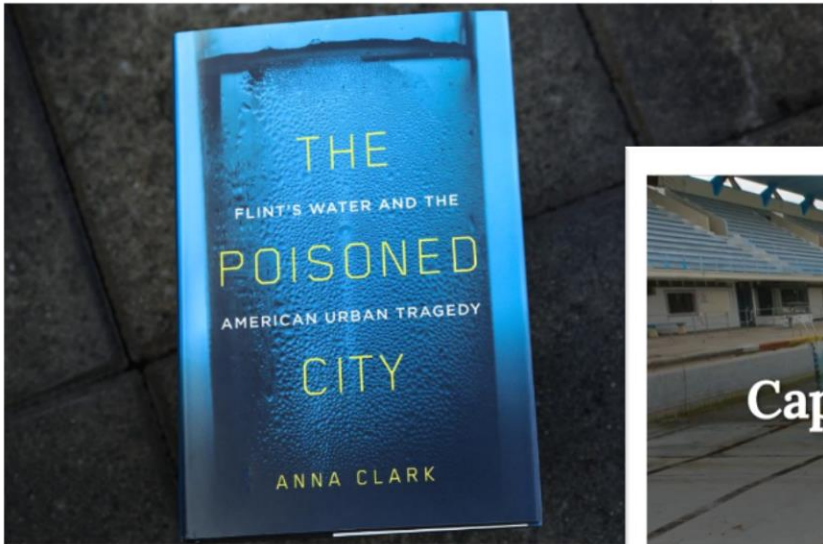


Nature: International Journal of Science, 9/29/2010

The Public Doesn't Pay Much Attention to Water Until Something Bad Happens

How Flint's Water Crisis Happened, And Why It Isn't Over

July 10, 2018 Updated Jul 10, 2018 2:27 PM



VIDEO: Geyser erupts when water main breaks in San Antonio

By: Calily Bien

Posted: Aug 27, 2018 02:57 PM CDT

Updated: Aug 27, 2018 02:57 PM CDT





The Safety of Drinking Water



Water Supplies

- Surface Water
 - “Fresh”
 - Stormwater
 - Brackish
 - Ocean
 - Contaminated
- Groundwater
 - “Fresh”
 - Under the Influence of Surface Water
 - Brackish
 - Contaminated
- Reclaimed or Recycled Water



Potential Contaminants

Acute

- Nitrate
- Pathogens
 - Parasites
 - Bacteria
 - Viruses

Chronic

- Volatile organic chemicals (VOCs)
- Inorganic chemicals (IOCs)
- Synthetic organic chemicals (SOCs)
- Radionuclides

Aesthetic

- Taste
- Odor
- Color
- Total dissolved solids



Water Quality Standards are based upon acceptable risk of exposure

- EPA uses default exposure assumptions that are based on national data in its recommended Human Health Criteria:
 - A drinking water intake of 2 liters per day
 - An average body weight of 70 kg
 - Over 70 years
- Pathogens: 1 / 10,000 risk of infection
- Chemicals: 1 / 10,000 to 1 / 1,000,000 risk of effect
 - Cancer
 - Nervous disorders
 - Organ damage
 - Teratogen



So, depending upon the source and potential contaminants, we treat the water to reduce the risk of infection or effect

- Safe Drinking Water Act is supported by updates and rules
- Operators of treatment plants have to be certified based upon size of treatment plant, complexity of treatment technologies, and population served
- A disinfectant residual is typically maintained within the piping system
- Safety is demonstrated through regular laboratory testing
- Industry involves engineers, chemists, microbiologists, and public health officials

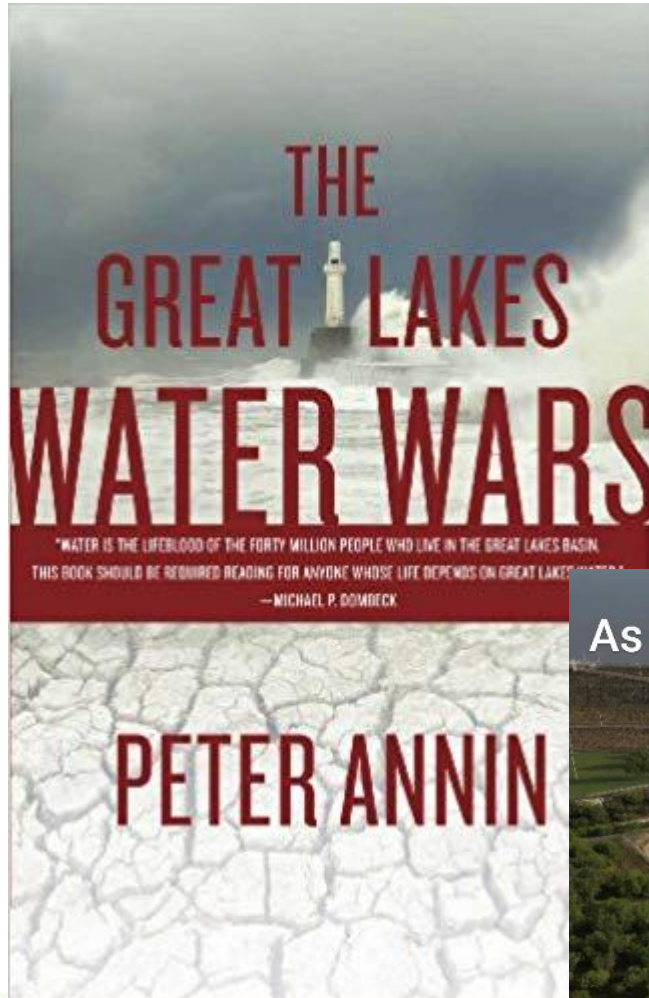




Resilience and Reliability



Sole & Limited Source Communities are Scrambling to Increase Reliability – Creates conflict



As World Eyes Cape Town Water Crisis, Texas Study Explores New Options

The Lone Star State considers a new approach to water management.



How Atlanta Is Preparing For The Next Water Crisis

By CELESTE HEADLEE & SEAN POWERS • MAY 5, 2016

PROGRAM
On Second Thought



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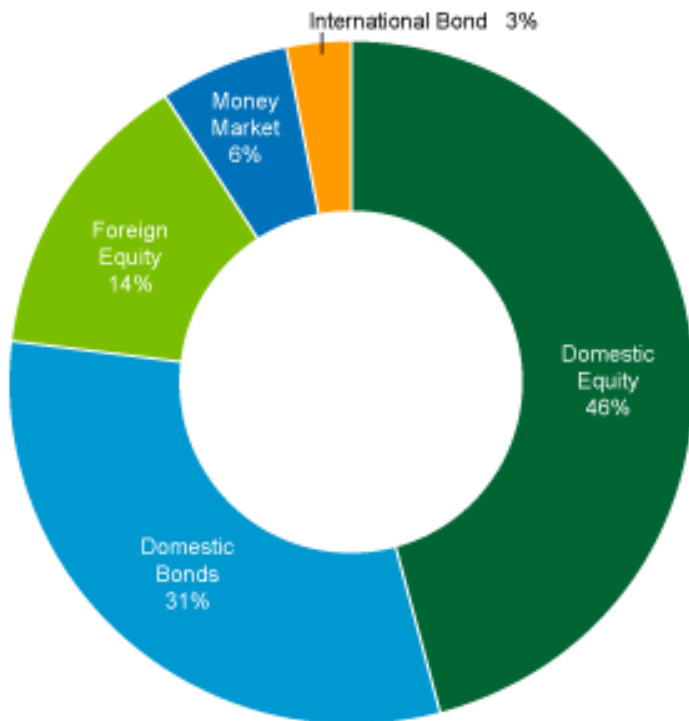


Email



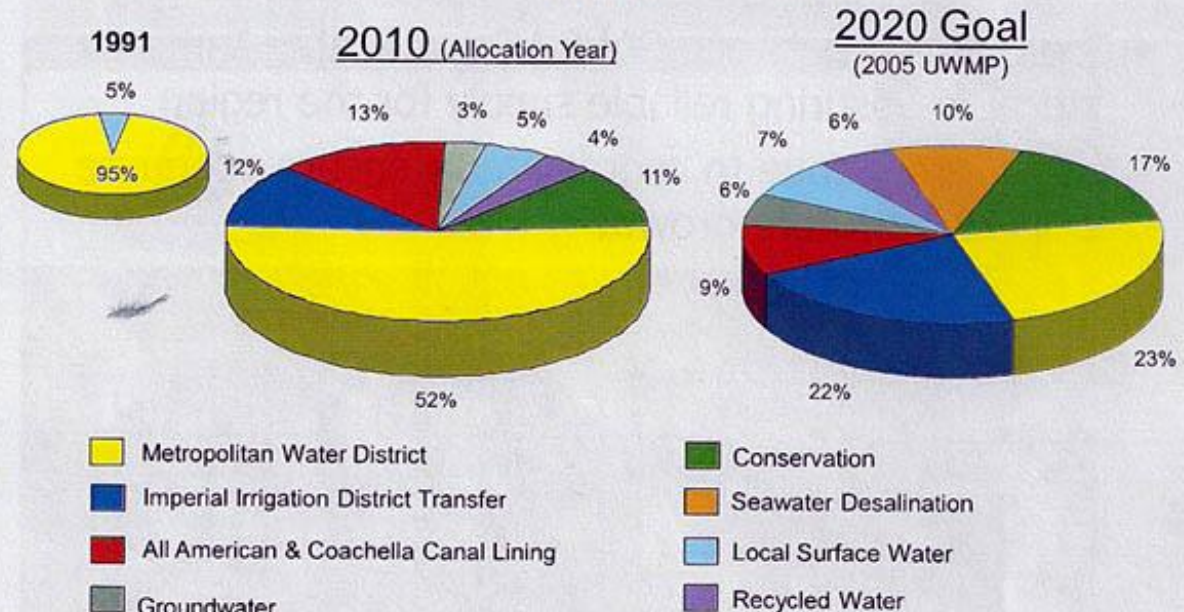
Most large community water systems have moved to a portfolio approach to water resources

Hypothetical “Balanced” Portfolio



Source: American Century Investments

Diversifying San Diego County's Water Supply Portfolio



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Risk & Perception

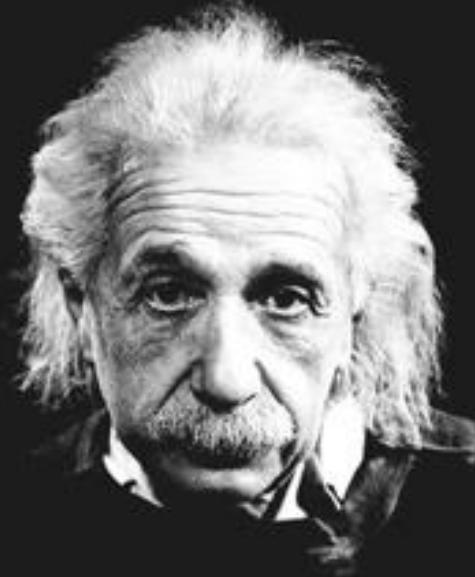


The general public has difficulty with the concept of relative concentrations and risk

- There is a concern that “presence” in any amount is a problem
- Adverse health effects are presumed if anything can be detected.
- There is no “zero” of anything... including risk.

“Not everything that counts can be counted, and not everything that can be counted counts.”

-Albert Einstein



As scientists, we have to remind ourselves that feelings AND facts matter



... there can also be strong, spiritual references and connectedness to water, particularly among native people groups.



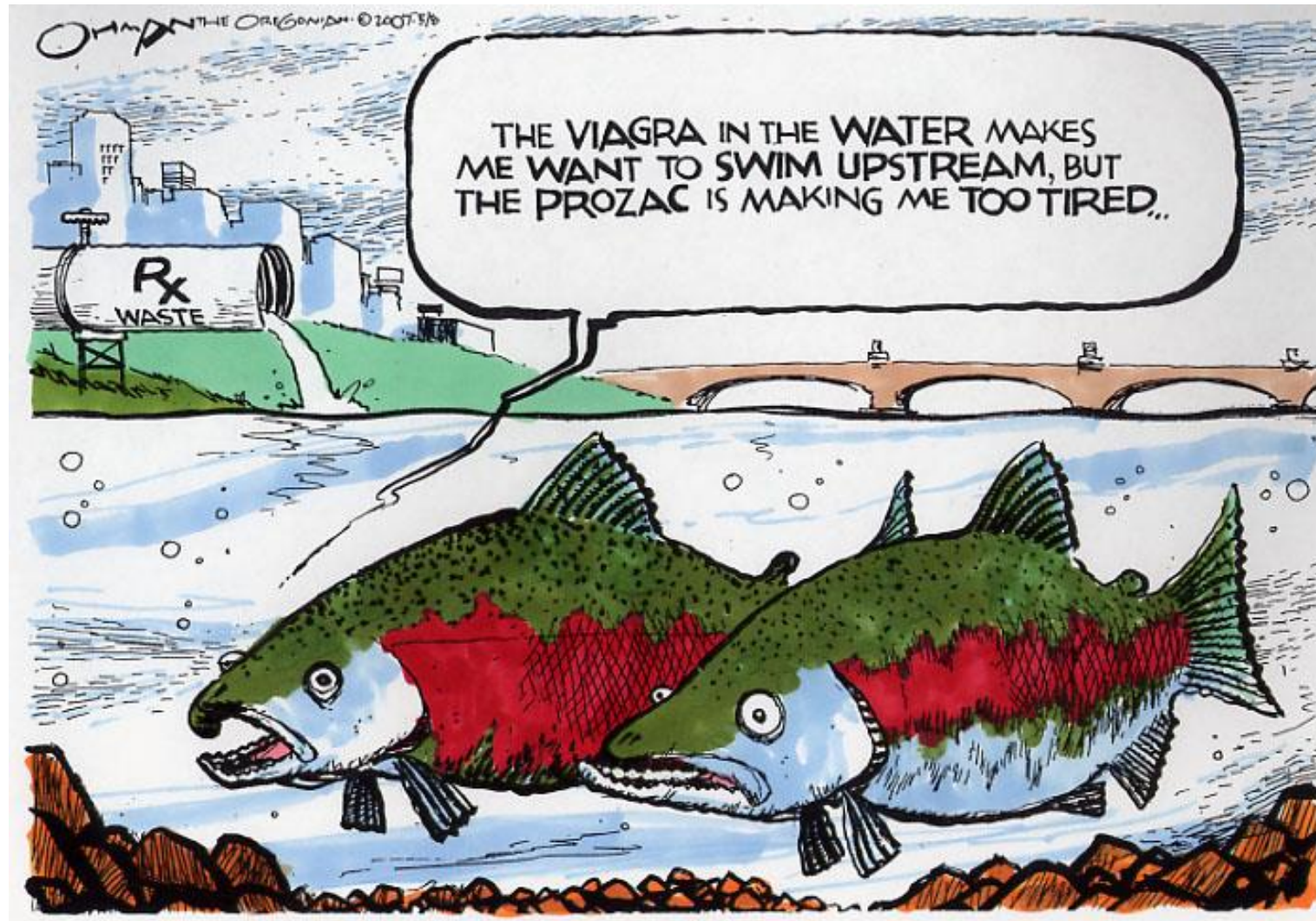
Risk Perception Summary



- We are sometimes irrational and react to our perception of risk rather than to the risk itself
- **We are generally more accepting of risks that:**
 - **We voluntarily expose ourselves to** - as opposed to those over which we have no control
 - **Are natural** - as opposed to human made
 - **Are familiar** – as opposed to unfamiliar
 - **Are well-defined** - as opposed to uncertain
 - **We have good understanding of** - as opposed to our fear of the unknown



Pharmaceutically Active Compounds



Amount of Water to Meet Acceptable Daily Intake (for Humans) - Pharmaceuticals

	ADI-DWEL	Maximum Water Conc. Finished	Amount of water to meet ADI		
			8 oz Glasses/d	Gallons/d	55-Gallon drums/d
	µg/L	µg/L			
Atenolol	70	0.026	22,800	1,400	25
Carbamazepine	12	0.018	5,500	340	6.2
Diazepam	35	0.00033	890,000	55,000	1,000
Prozac Fluoxetine	35	0.00082	360,000	22,000	400
Gemfibrozil	45	0.0021	180,000	11,000	200
Meprobamate	260	0.043	51,000	3,200	58
Phenytoin	6.8	0.032	1,800	110	2.0
Risperidone	0.49	0.00034	12,000	770	14
Sulfamethoxazole	18,000	0.0030	51,000,000	3,200,000	58,000
Triclosan	2,600	0.0012	19,000,000	1,200,000	22,000

Credit: Shane Snyder, University of Arizona

Contagion mentality: Once contaminated, always contaminated



Stigmatization

- Our capacity to absorb factual information is blocked by negative associations of “dirty” water
- The negative associations (based on FEAR rather than FACT!) scare us!



What's the Solution?

Engineering technology and science can remove the chemicals and micro-organisms in water...

... and negative associations and fears can be reframed by creating a better understanding of water.

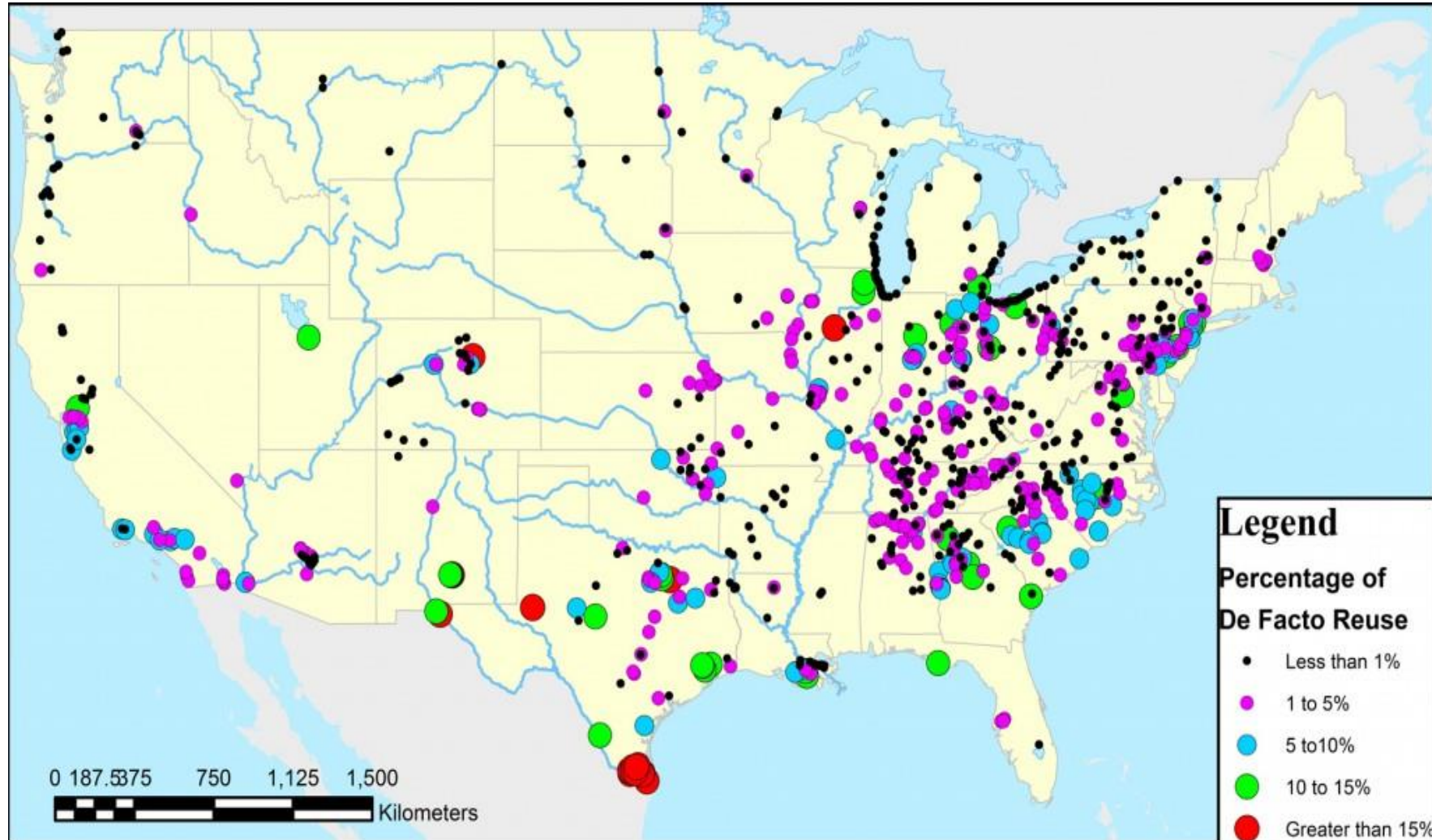


The Hydrologic (Water) Cycle with Human Influence



Graphic credit:
www.healthywaterways.org

De Facto Water Reuse in the US



5 Steps to Clean Water



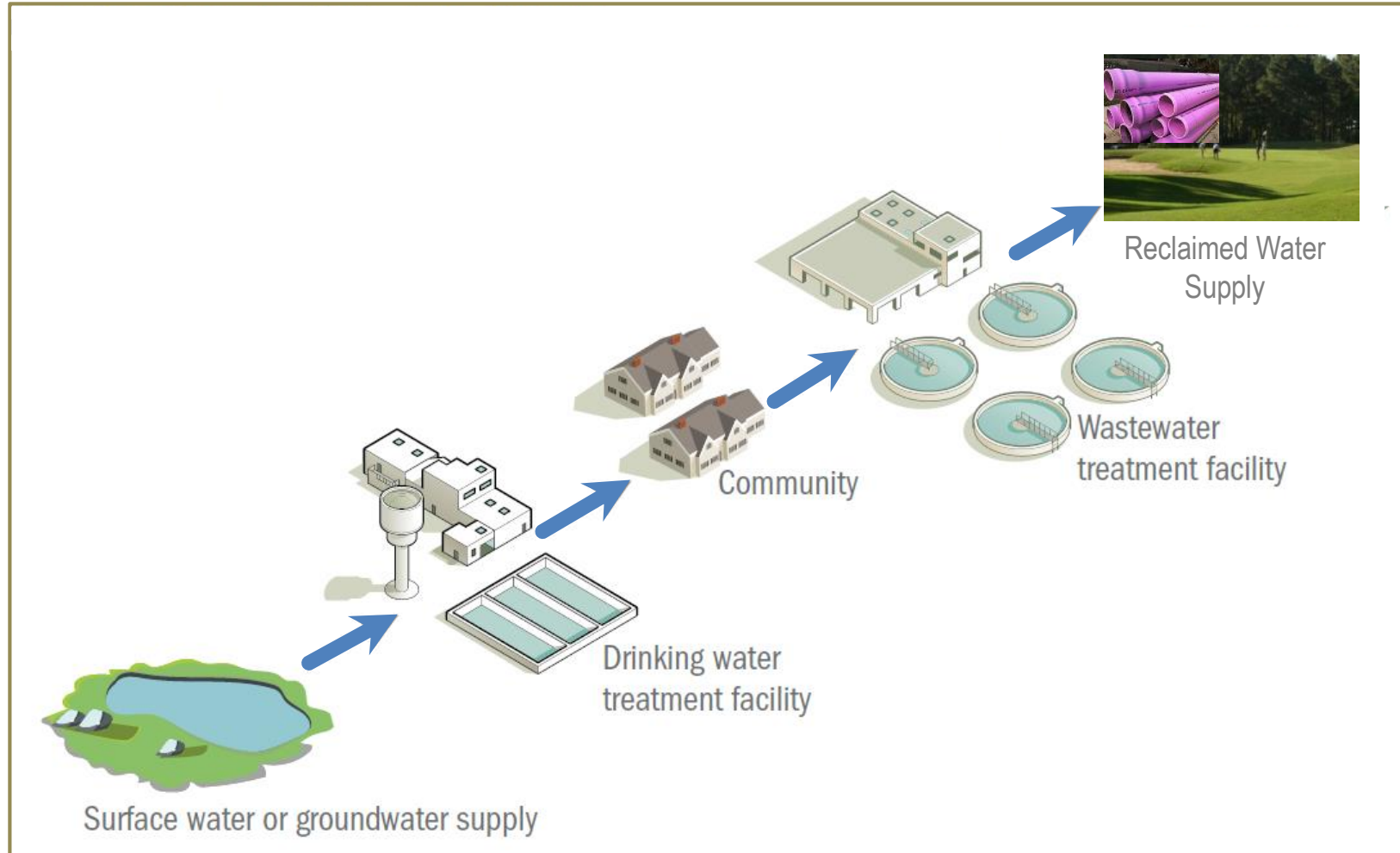


Potable Reuse

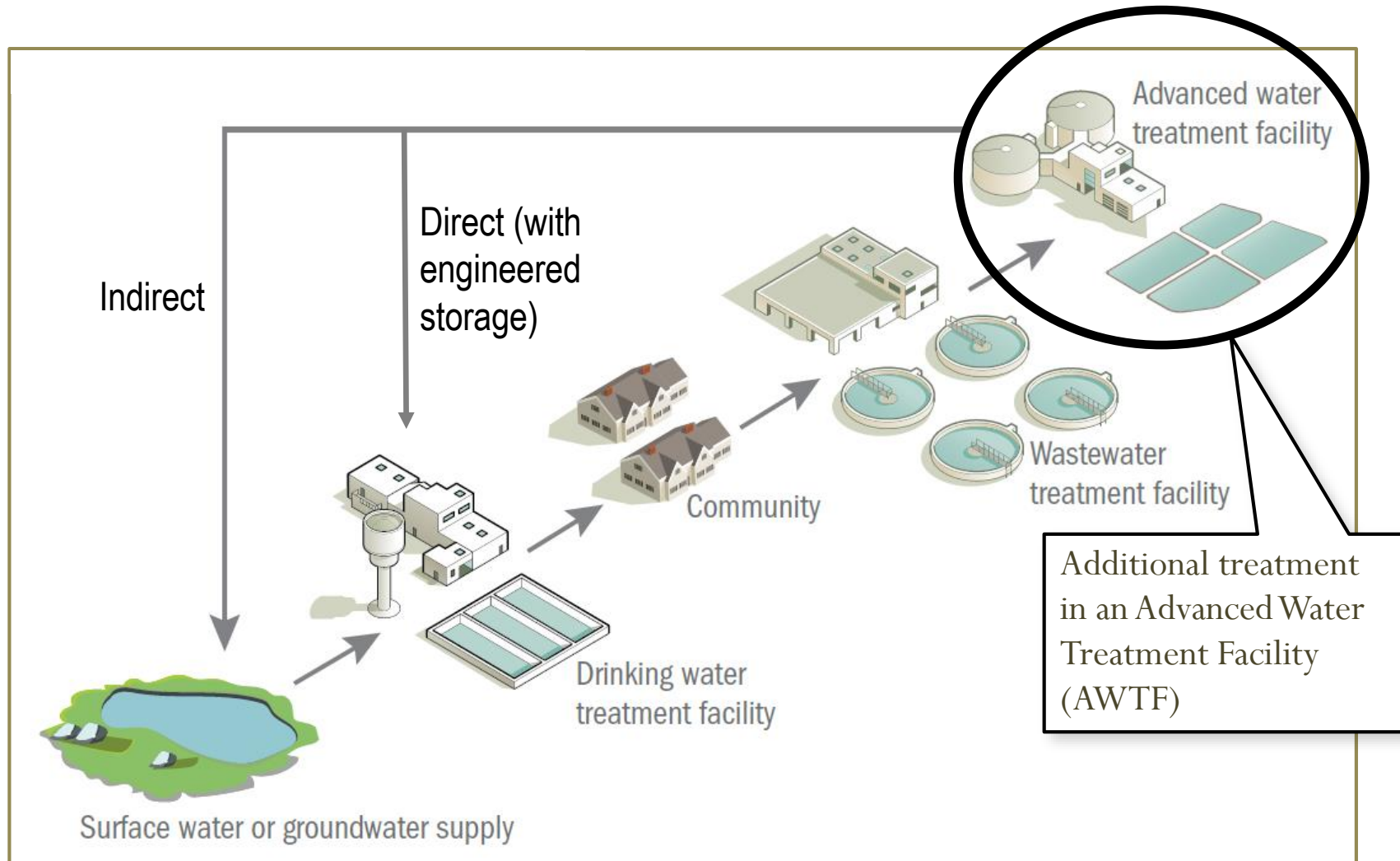
Significantly increases resiliency and reliability



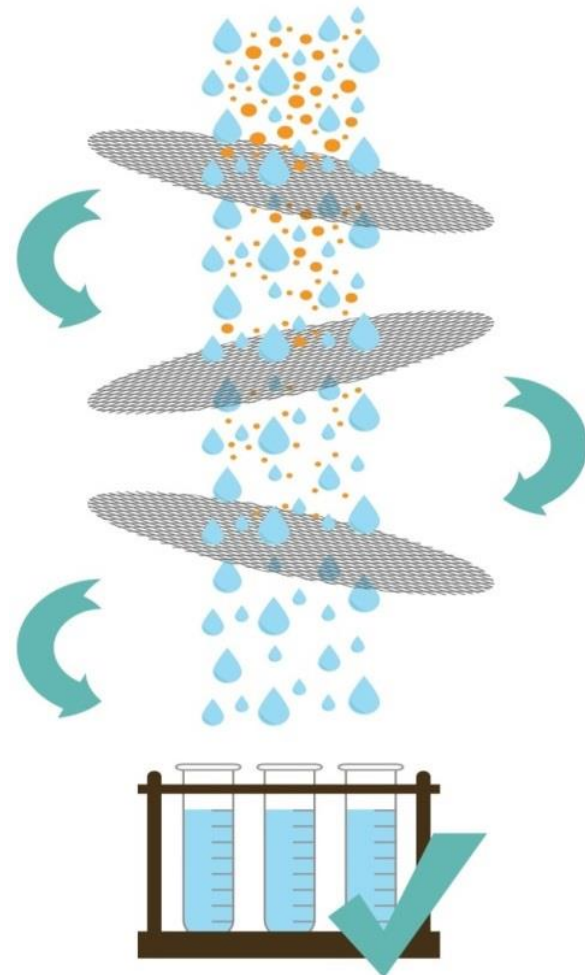
Non-Potable Reuse



A Key Element of Potable Reuse is the ATWF



Advanced Water Treatment Facility removes pathogens and chemicals to make drinking water



- ① **Ultrafiltration**
Membranes remove bacteria, protozoan and some trace pathogen.
- ② **Reverse Osmosis**
Membranes remove salt, organics, trace pollutants and remaining pathogens.
- ③ **Disinfection/Advanced Oxidation**
Removes trace pollutants and pathogens.
- ④ **Meets all drinking water standards**

In addition to effective treatment technologies, other Risk Mitigating Practices are used

- Supported by pilot and full scale testing
- Multiple barrier approach, with lots of built in conservatism
 - Based upon hazard analysis and critical control points (HACCP)
- Trained operators
- Checklists
- Real-time water quality monitoring
- Source control





Questions?

Guy Carpenter
Past-President
WateReuse Association
gcarpenter@carollo.com

