



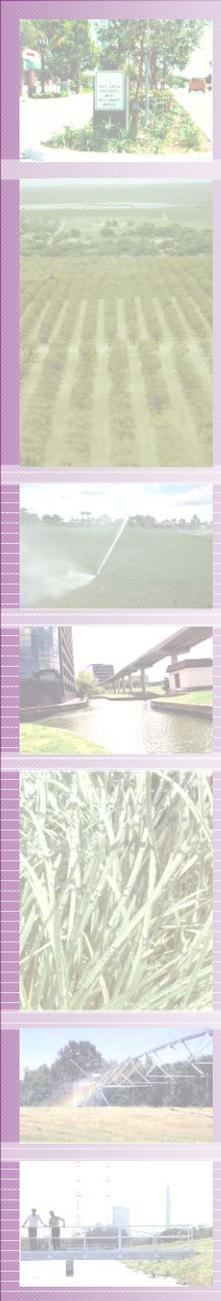
Reclaimed Water Trends Nationally and Internationally

Guy Carpenter
WaterReuse Association

Arizona Governor's Blue Ribbon Panel on Water Sustainability
February 5, 2010

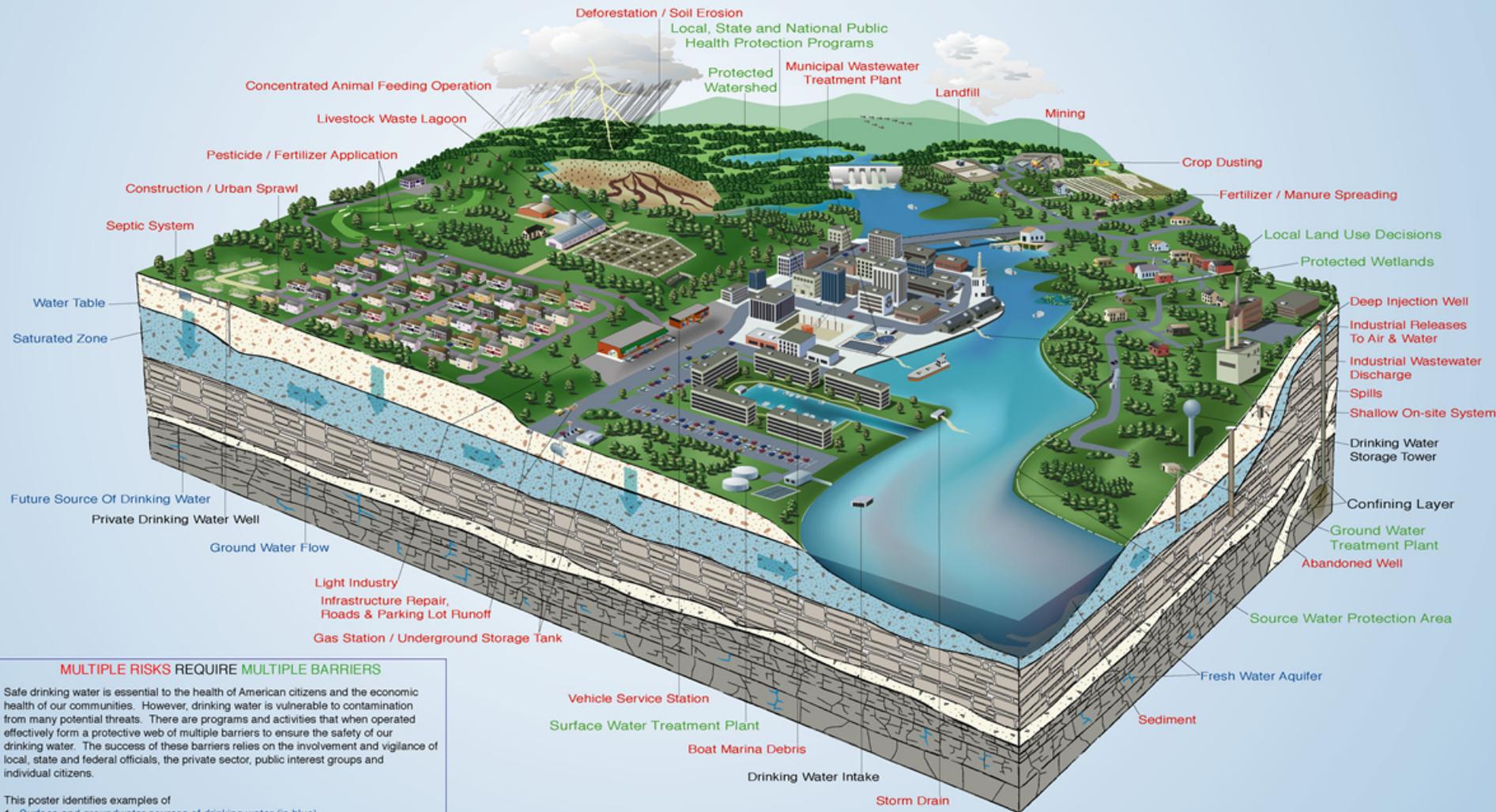
Perspective

- All Water is Reused (we are “in the gap”)
- Water is a Manufactured Product
- “Purity” of Water Should be Matched to its Intended Use
- History of Water is of Little Importance
- In Planned Water Reuse, we Emulate “Mother Nature” – With Technology, can do it better and faster
- Water reuse is (usually) “green” and “eco-friendly”
- The more intentional we are with reuse, the better we can maintain total national water quality



Planning Context: Macro Watershed

Safe Drinking Water Act - Protecting America's Public Health



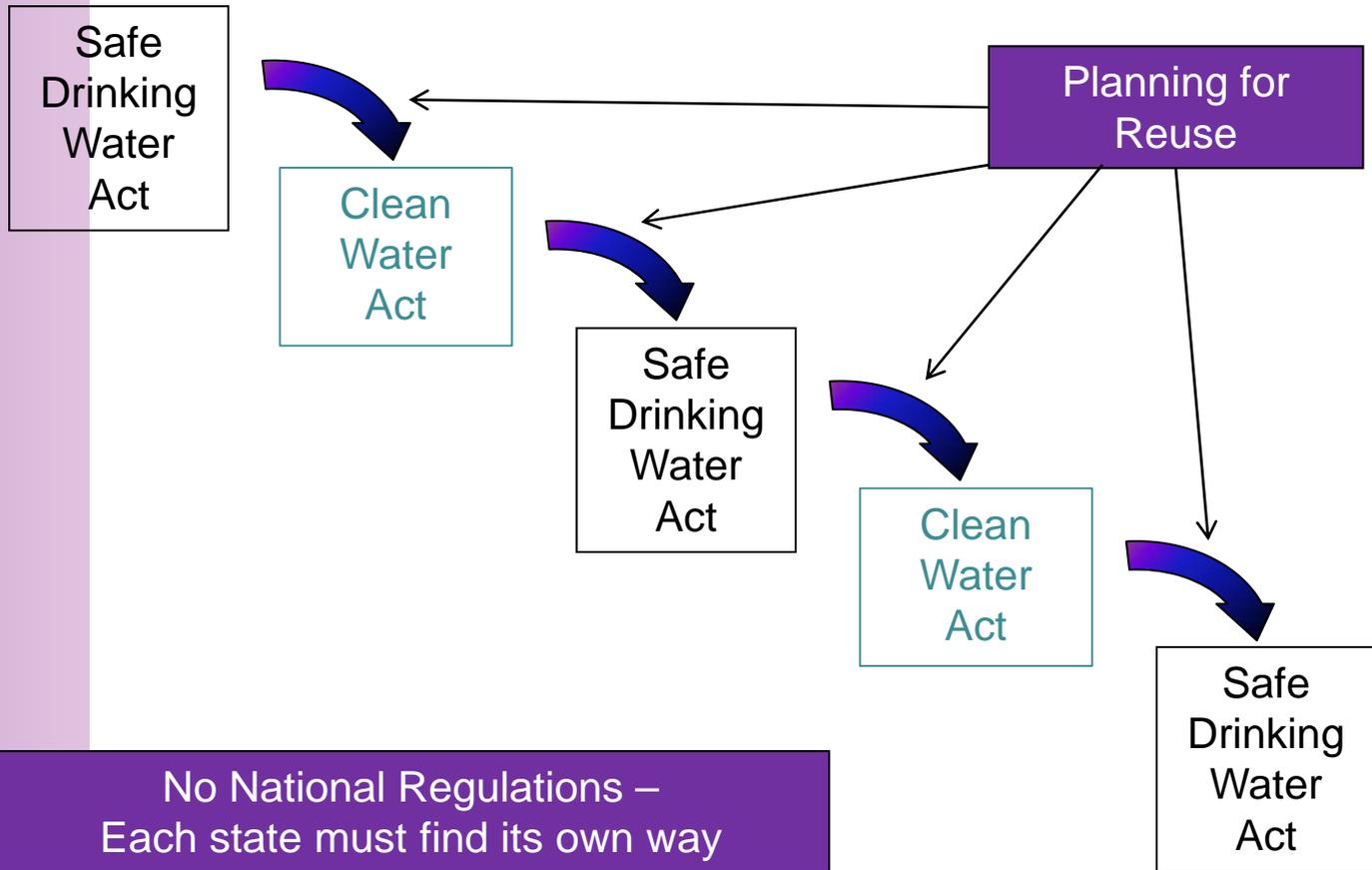
MULTIPLE RISKS REQUIRE MULTIPLE BARRIERS

Safe drinking water is essential to the health of American citizens and the economic health of our communities. However, drinking water is vulnerable to contamination from many potential threats. There are programs and activities that when operated effectively form a protective web of multiple barriers to ensure the safety of our drinking water. The success of these barriers relies on the involvement and vigilance of local, state and federal officials, the private sector, public interest groups and individual citizens.

This poster identifies examples of

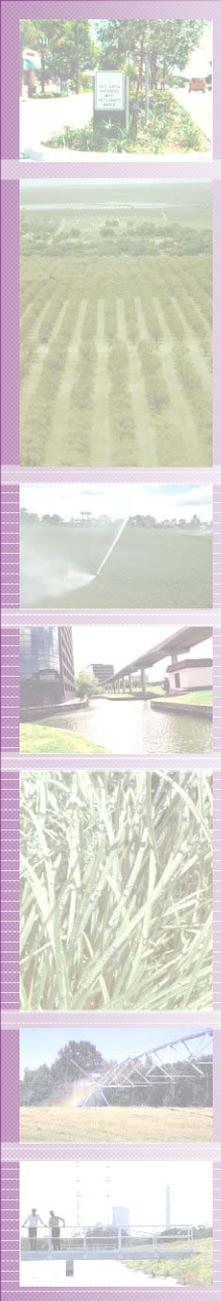
1. Surface and groundwater sources of drinking water (in blue).
2. Potential threats to those drinking water sources (in red), and
3. The multiple barriers that together protect our nation's public health (in green).
 - Risk Prevention Barrier
 - Risk Management Barrier
 - Risk Monitoring and Compliance Barrier
 - Individual Action Barrier

We Operate "In the Gap":



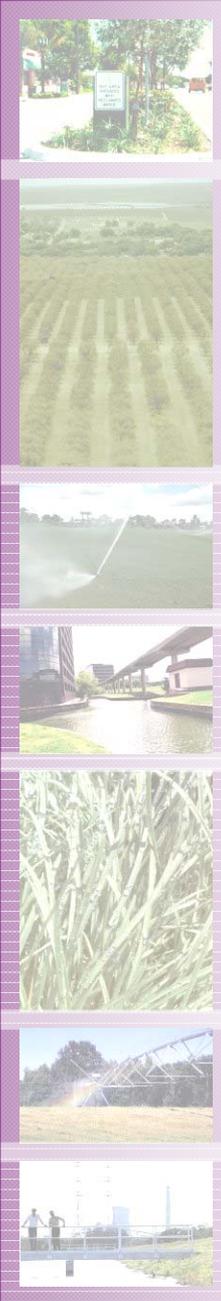
Reuse or Recycle?

- One time reuse
 - Irrigation
 - Cooling systems
 - Car washing
- Recycling
 - Toilet flushing
 - Recharge & recovery
 - Surface water augmentation

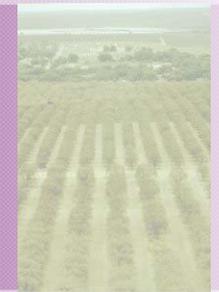
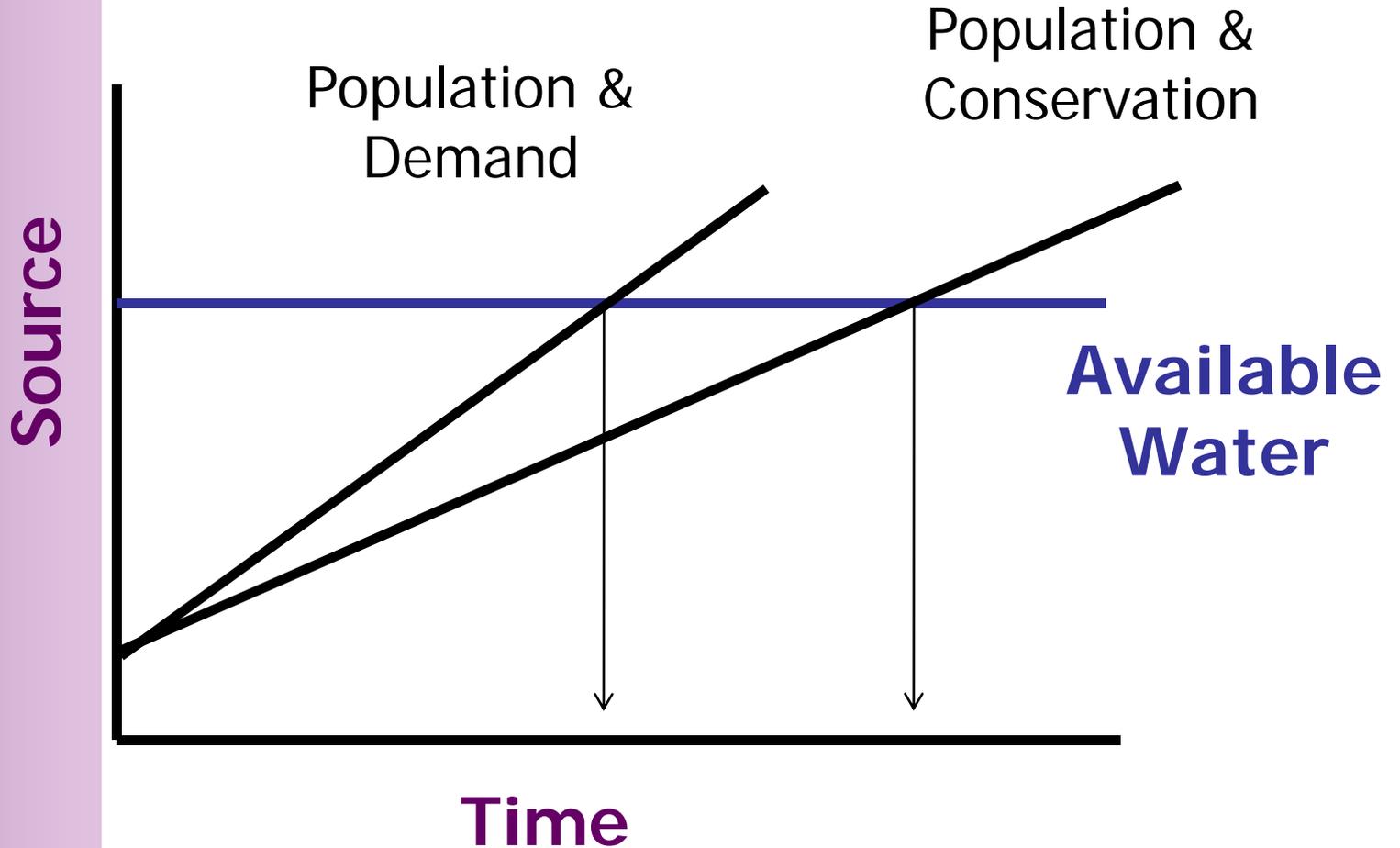


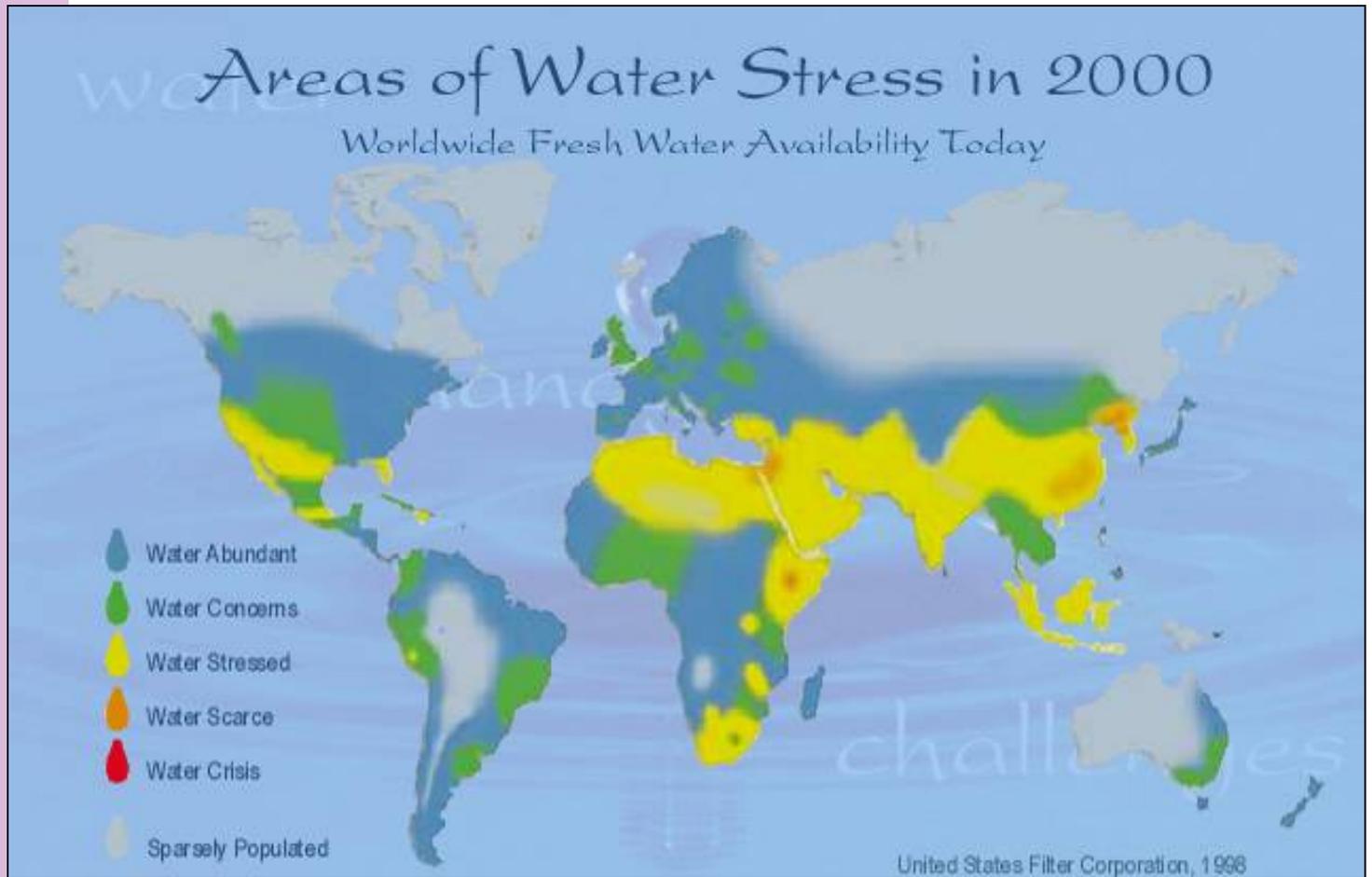
Factors Driving Water Reuse and Desalination

- Population growth
- Water scarcity & costs (TBL)
- Increased municipal, industrial, and agricultural demand
- Water rights mitigation
- Dependence on single source of supply
- TMDLs/nutrient load caps
- Drought / climate variations



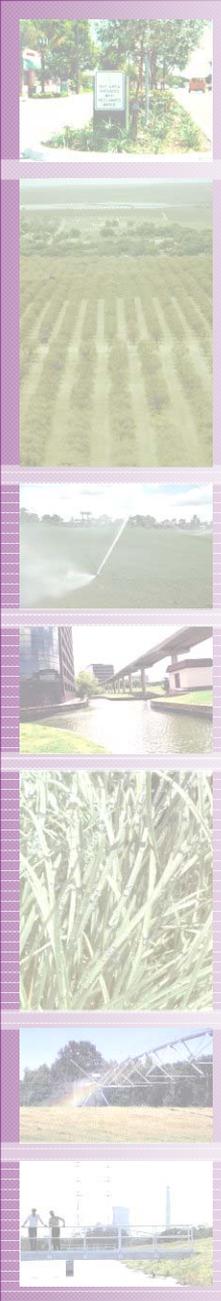
Supply & Demand





Significant Trends in Water Reuse

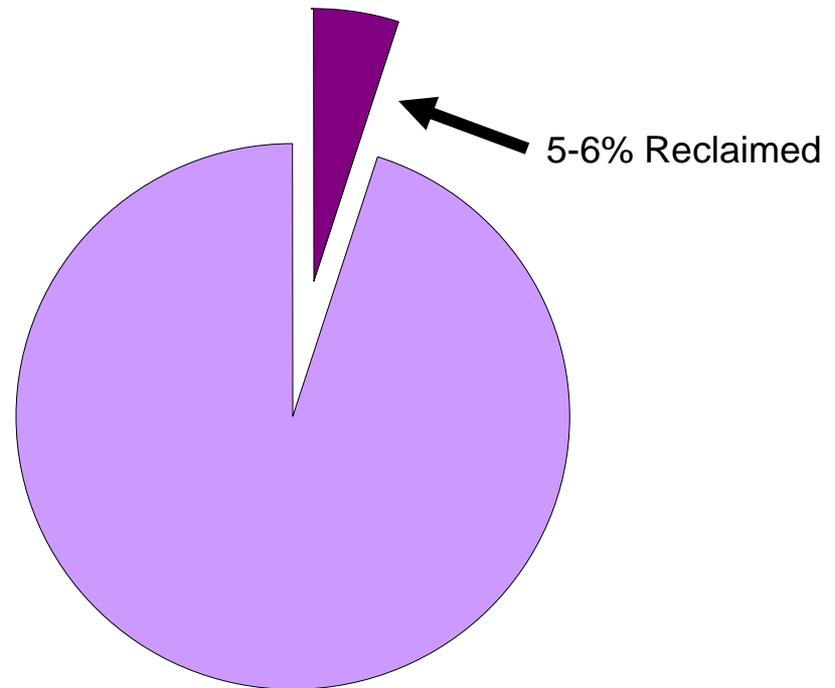
- Reuse is growing in prominence around the globe (e.g., Australia, Singapore, South Africa, Israel, Spain)
- Technology marches forward with MBR, MF/RO, and AOP
- Research focus is now global
- Progress on indirect potable reuse front
- GHG, energy/water, carbon footprint, climate change are growing concerns
- Constant challenge in public acceptance arena



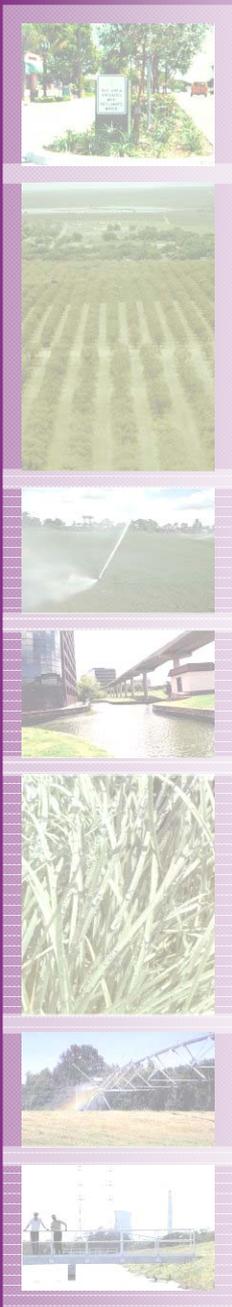
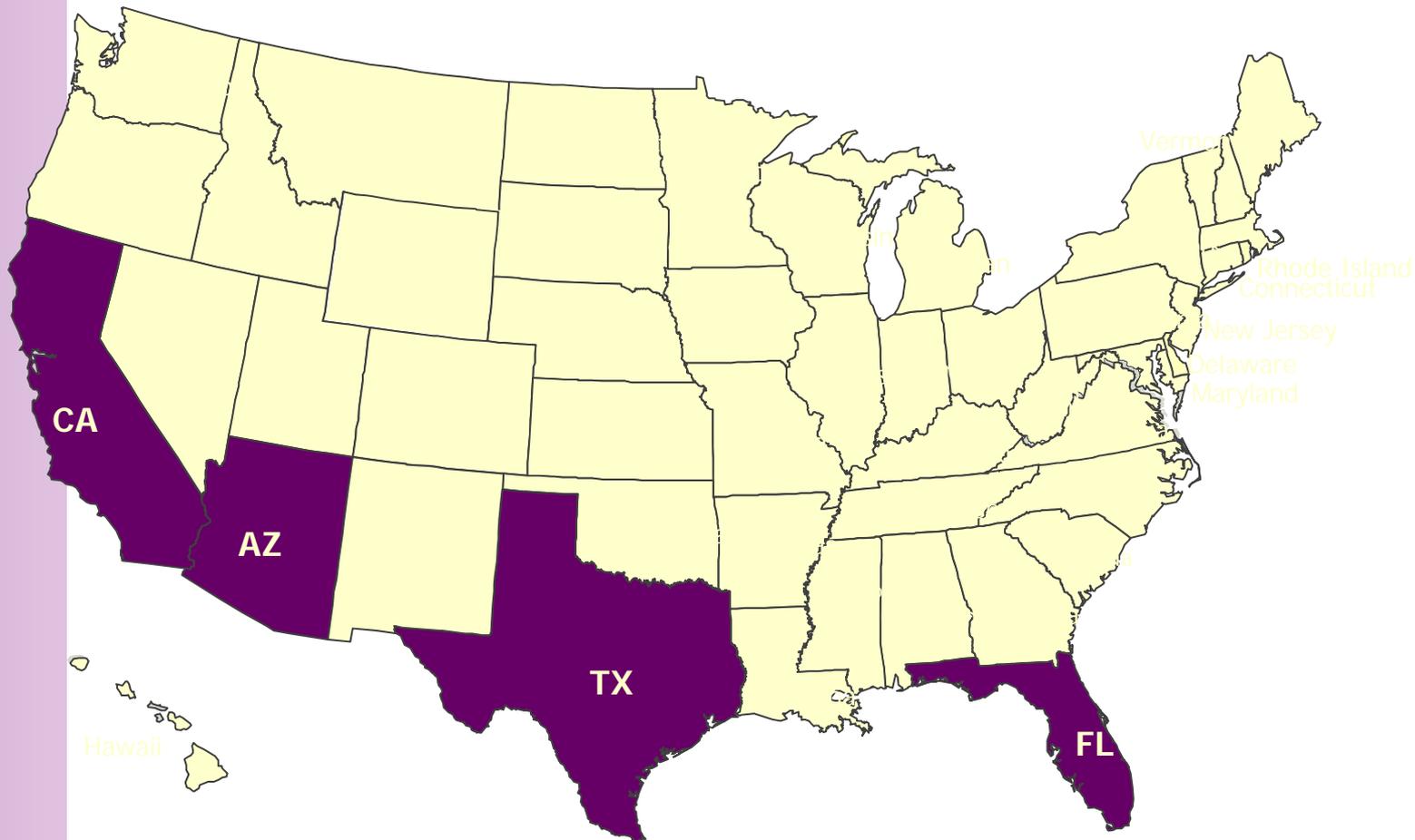
Potential for Water Reuse

- About 5-6% of municipal wastewater effluent in the U.S. is reclaimed and beneficially reused
- Israel reuses more than 70%
- Singapore reuses 15%, but plans to double that rate by this year
- Australia, now at 8%, has a national goal of 30% by 2015

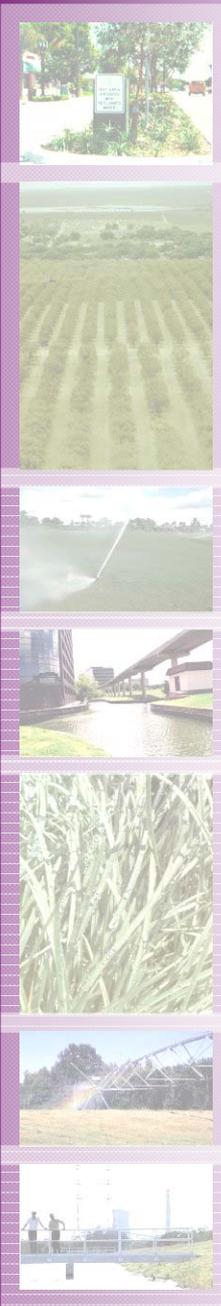
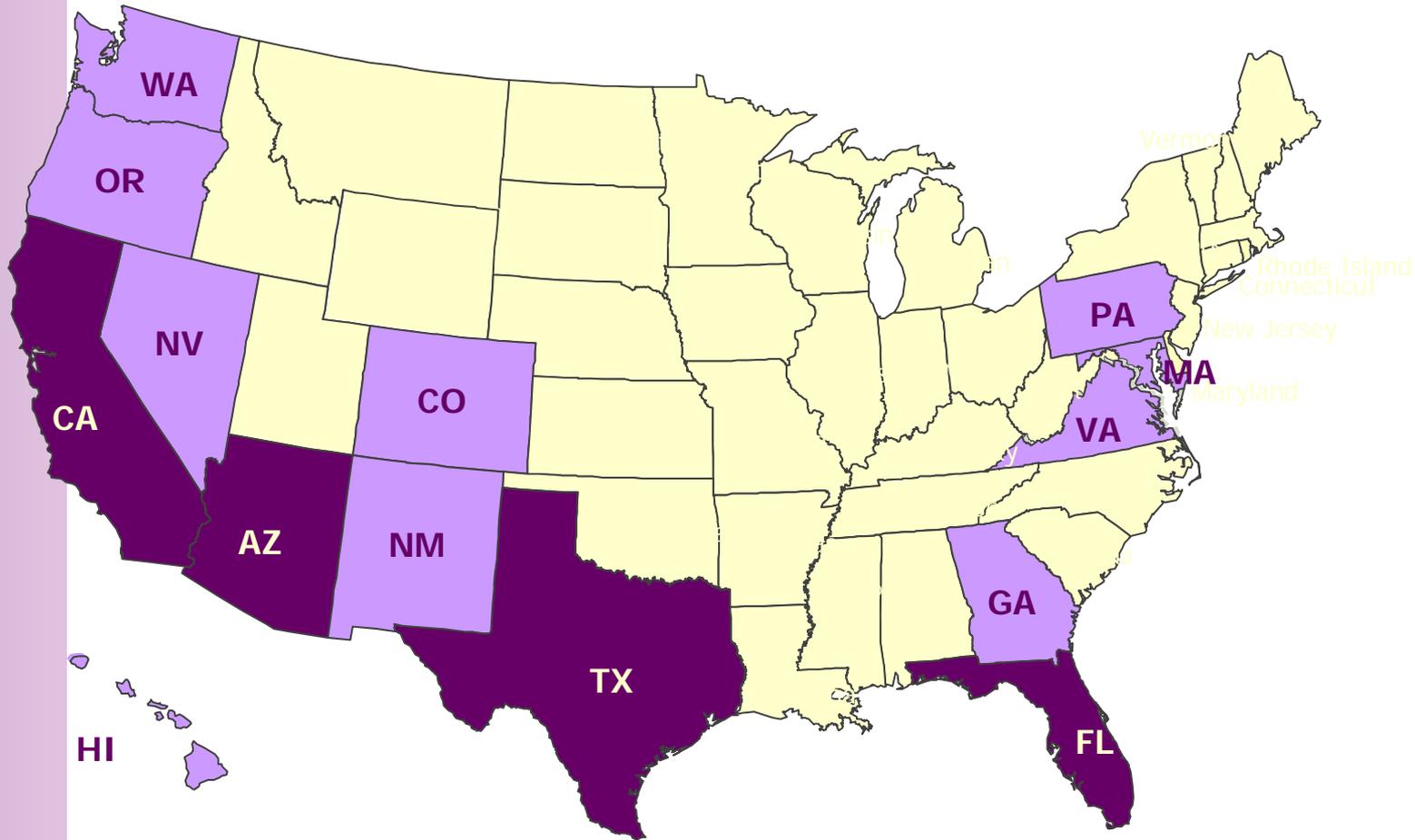
About 34.9 bgd Municipal Effluent in the U.S.



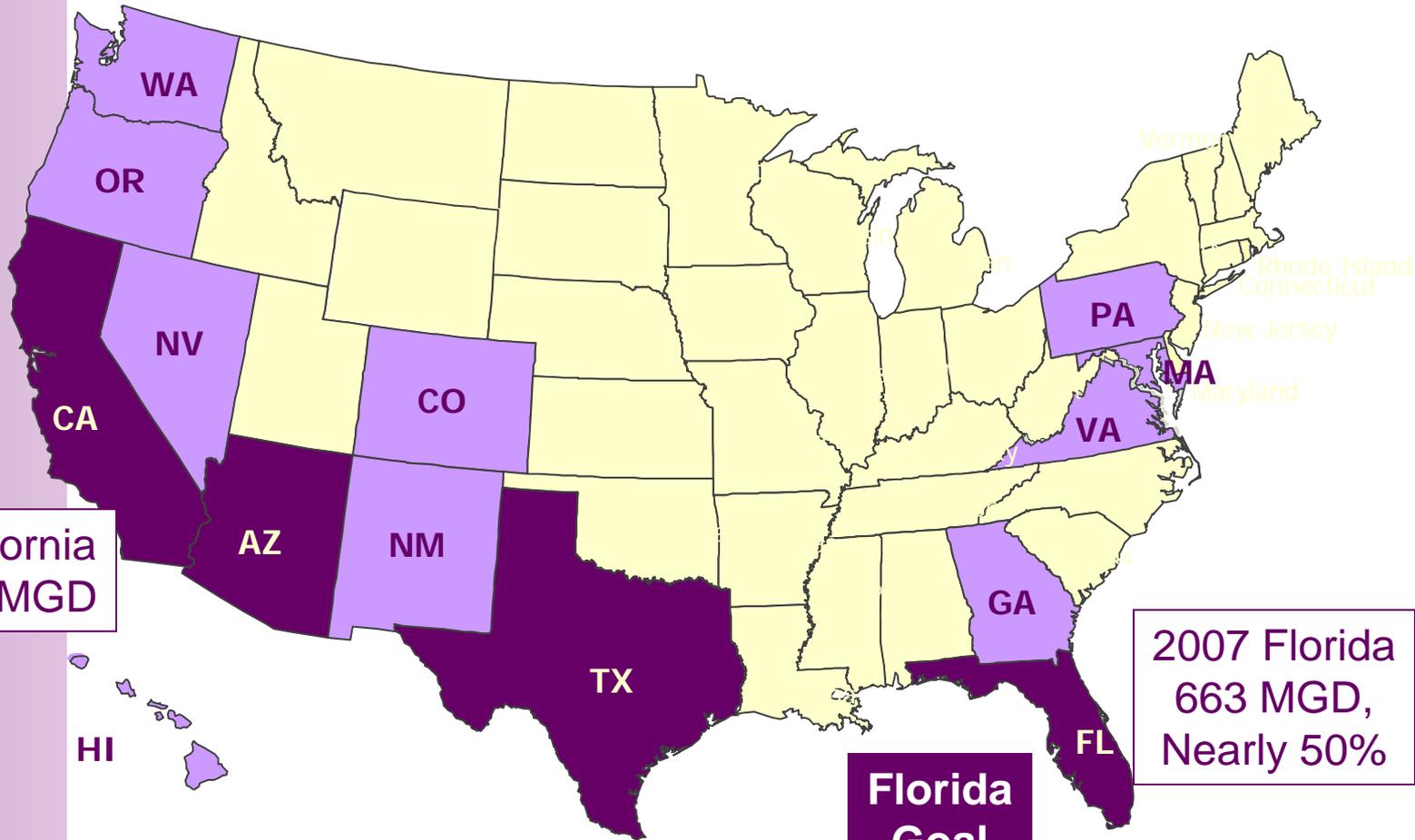
90% of water reuse occurs in four states



...but it is growing in other states



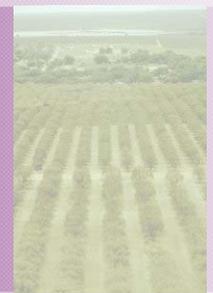
...but it is growing in other states



California
550 MGD

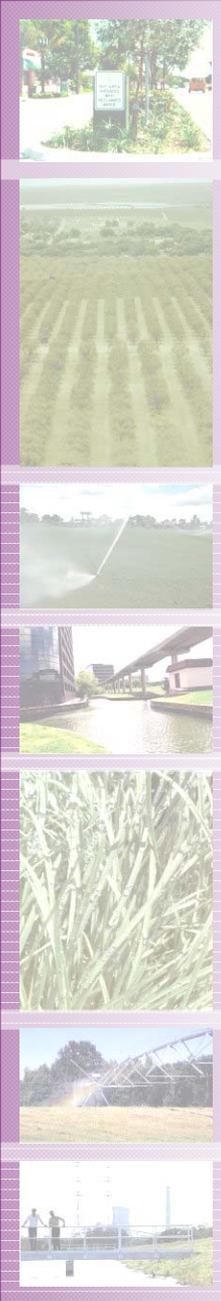
2007 Florida
663 MGD,
Nearly 50%

Florida
Goal
1 BGD



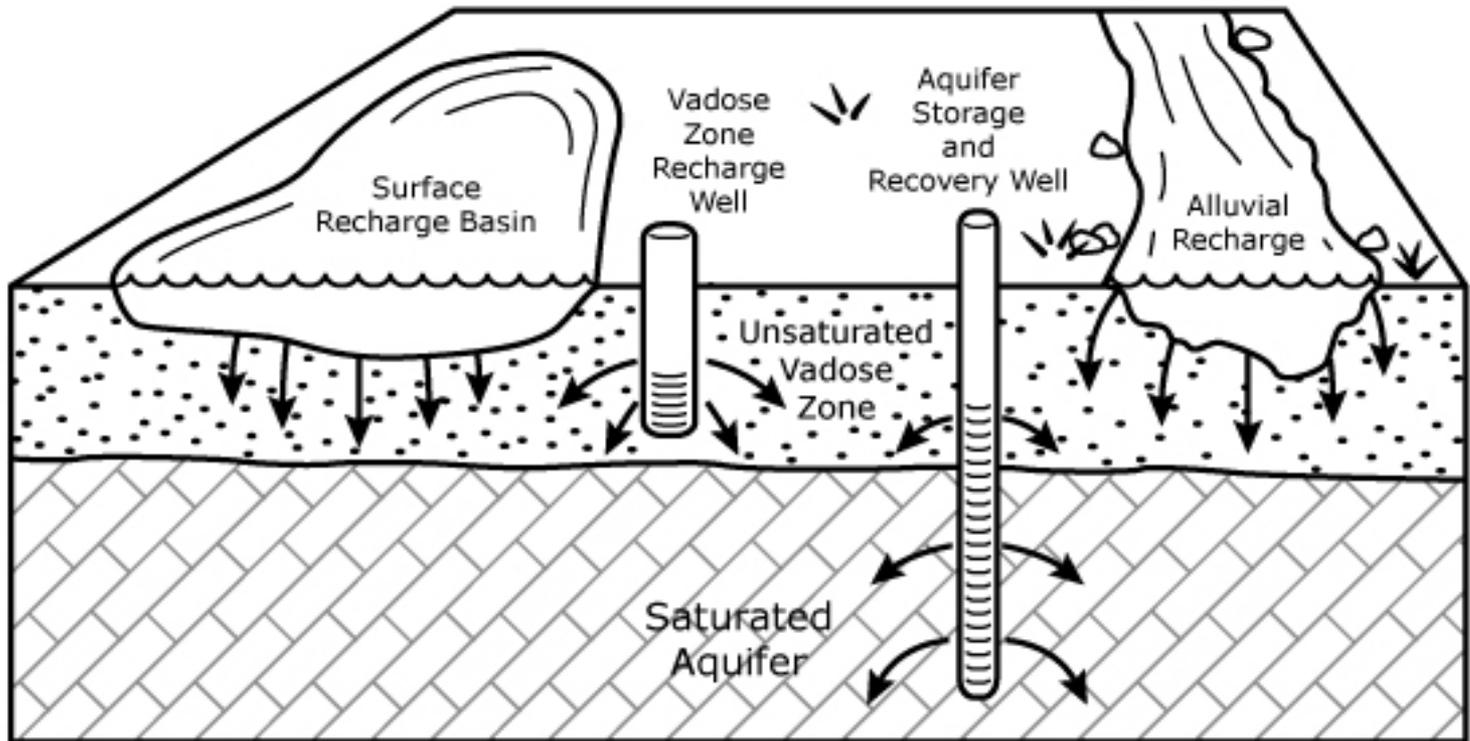
Applications

- Landscape irrigation
- Agricultural irrigation (edible & non-edible crops)
- Power production (steam & cooling)
- Industrial and commercial
- Environmental uses
- Non-potable urban uses (urinal flushing in high rise buildings)
- Groundwater recharge
- Potable water supply augmentation



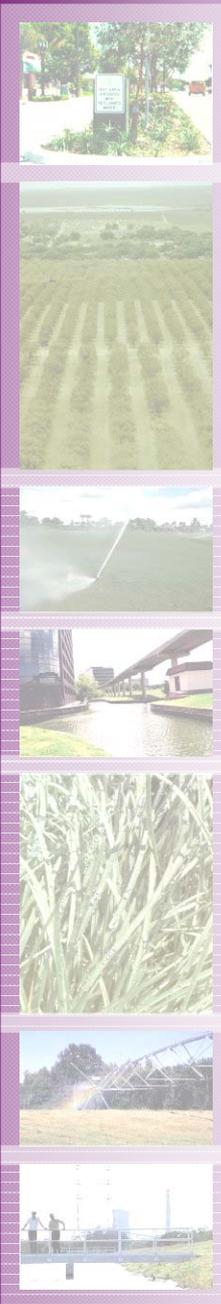
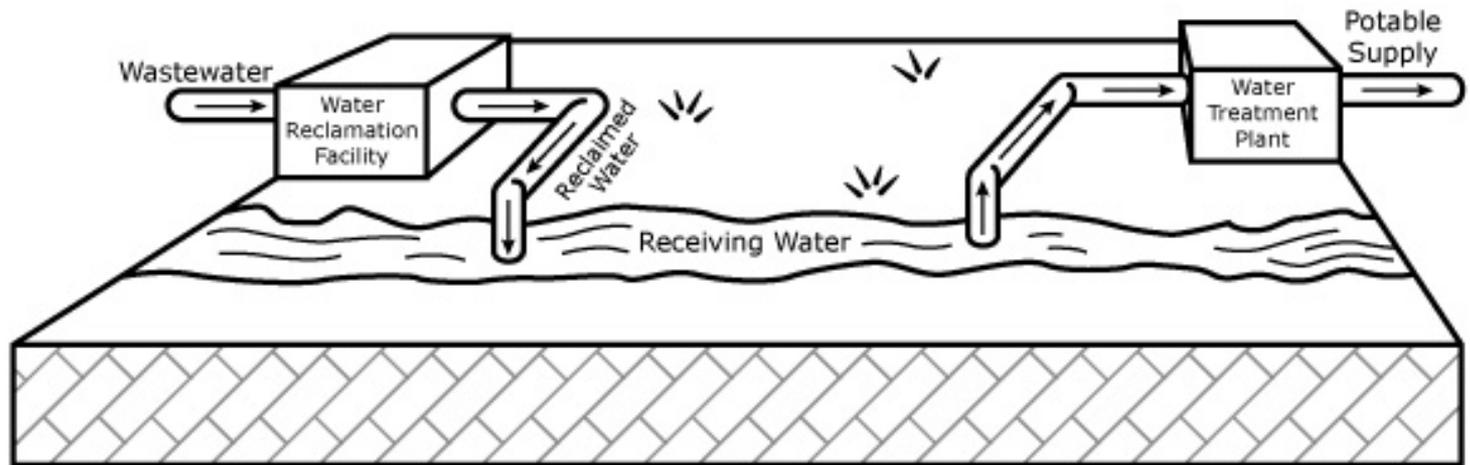
Augmentation

Groundwater Recharge Methods



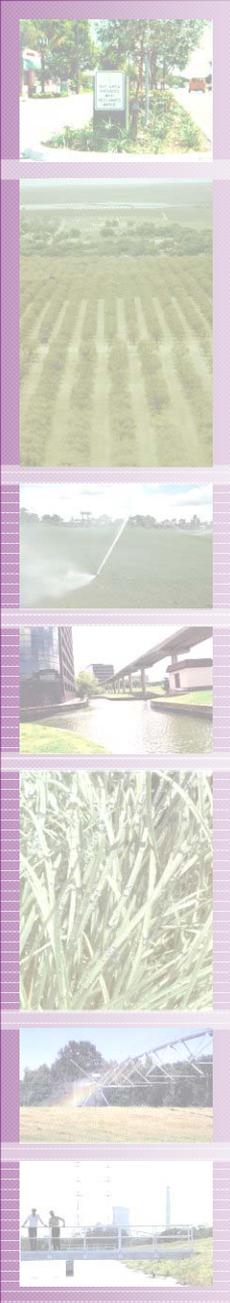
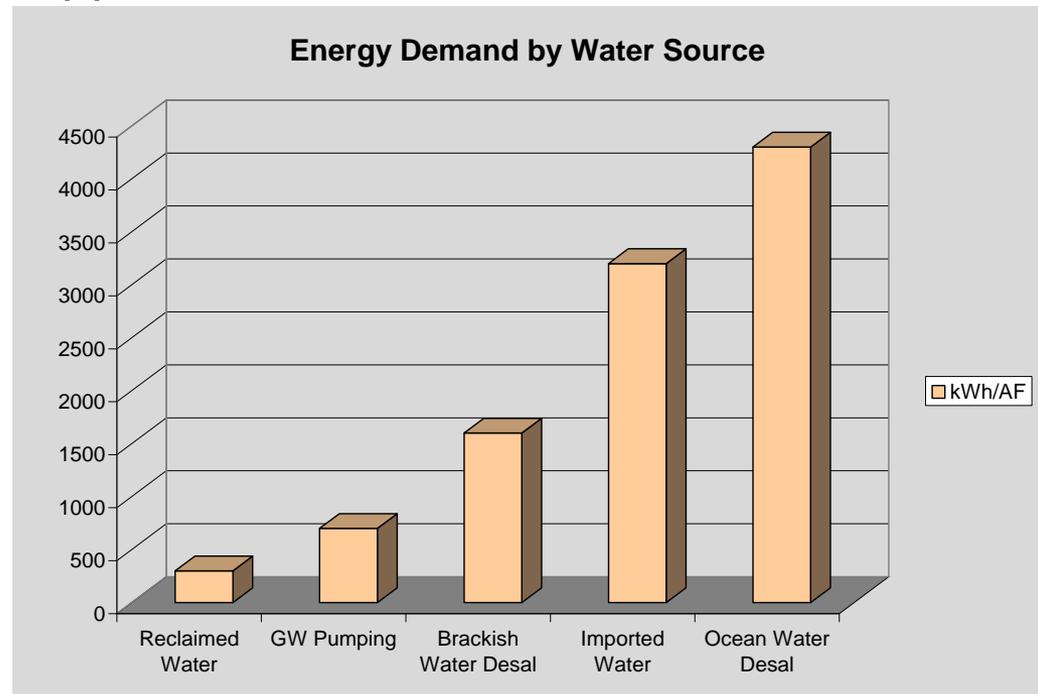
Augmentation

Surface Water Augmentation Schematic



Benefits

- Dependable source of supply
- Reliable, consistent quality
- Locally controlled; right to use
- Environmentally friendly
- Low capital costs (relative to other sources of supply)
- Augments existing supplies



Issues

- Public Perception/Acceptance
- Perceived Chemical Risks
- Poor Differentiation by Public and Policy Makers of Planned vs. Unplanned Reuse
- The Media
- Lack of Political Support
- More Cost-Effective Technologies
- Funding
- Better Understanding of Economics
- Climate Change
- Energy/Water Nexus

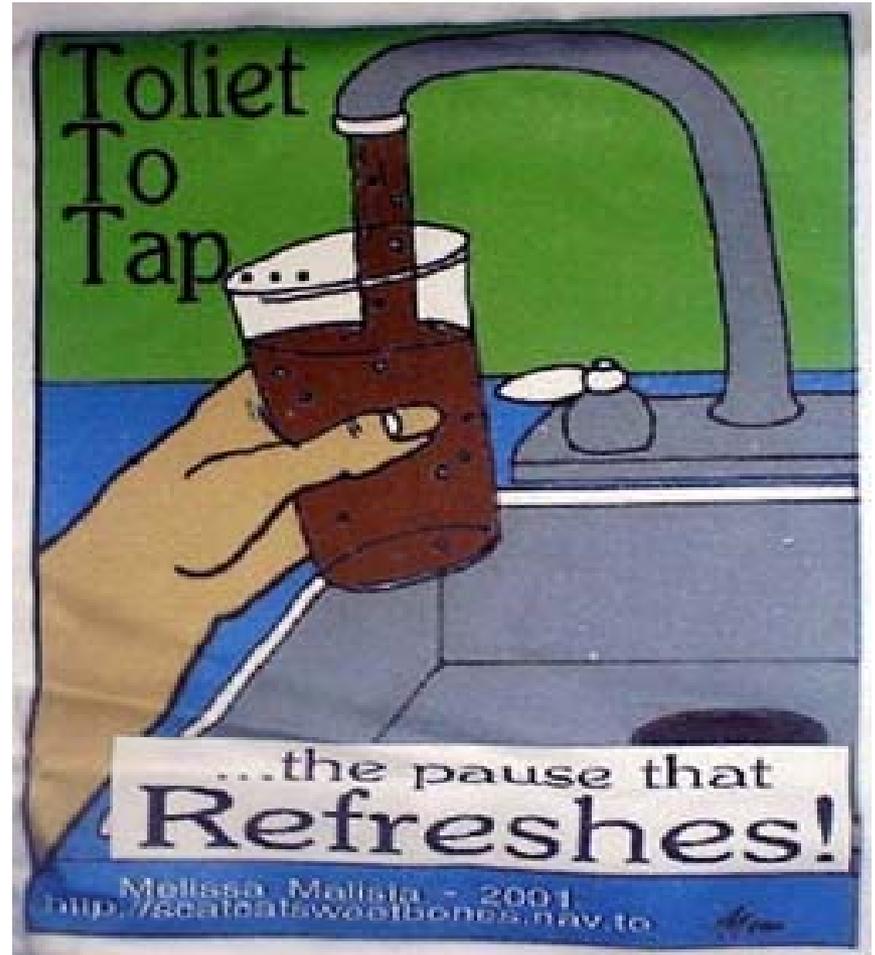


Public Perception: #1 Issue for Water Reuse

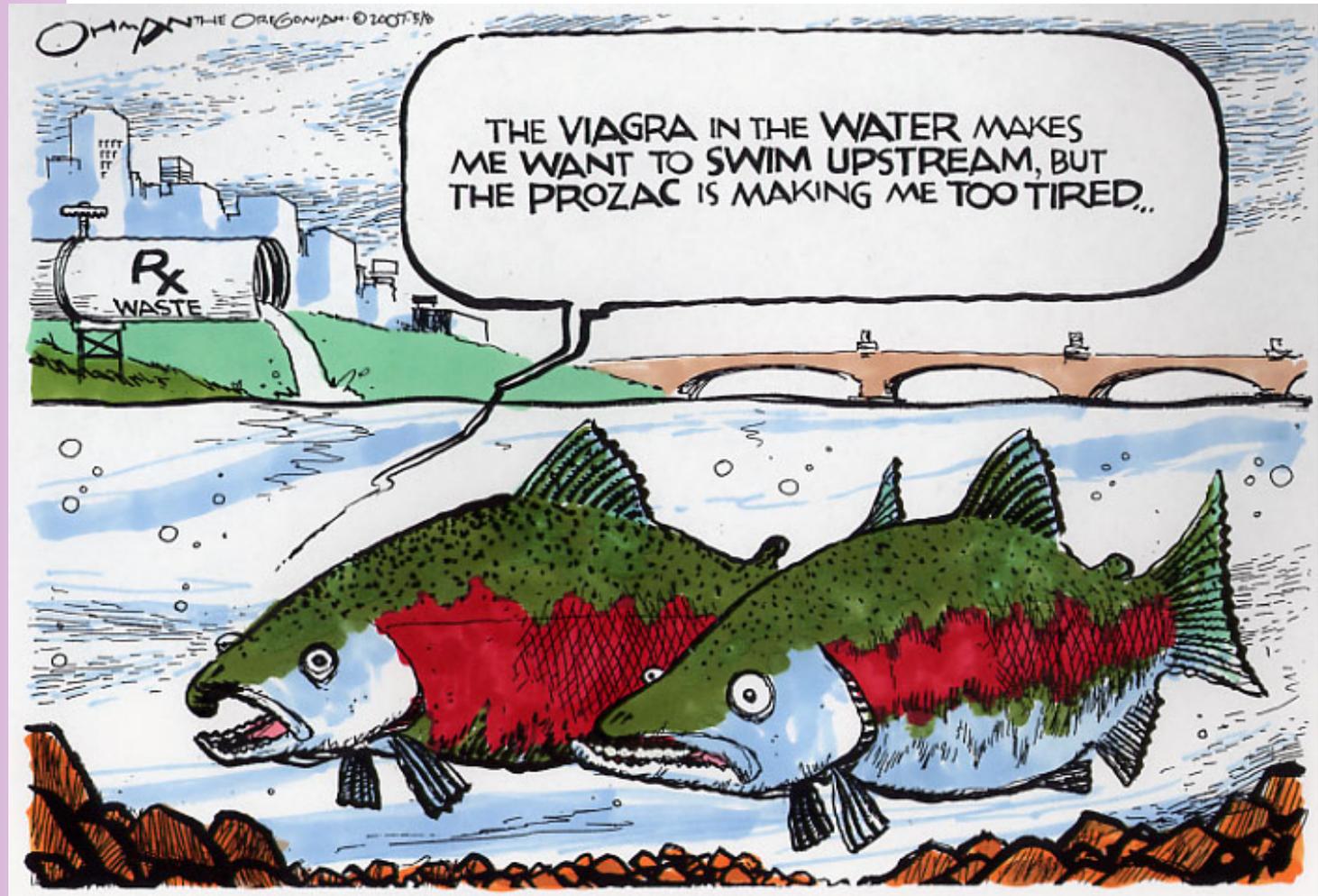
- Negative Branding
 - Sewer water
 - Toilet to Tap
 - Toilet to Turf



No Toilet to Tap!

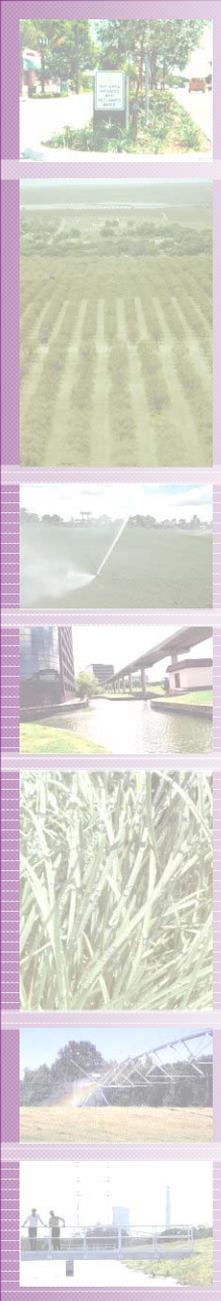


Pharmaceutically Active Compounds

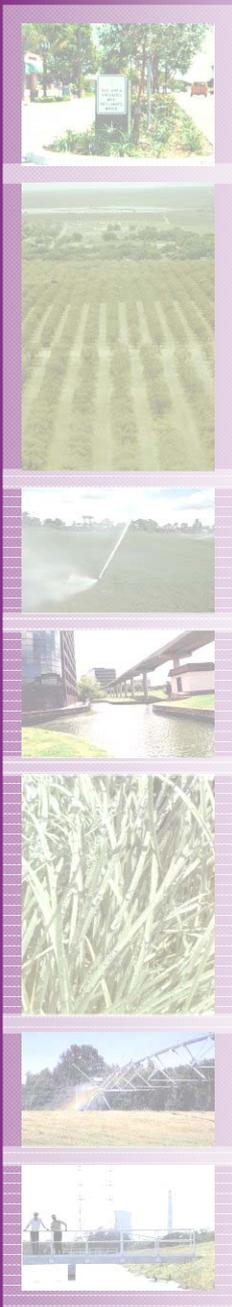
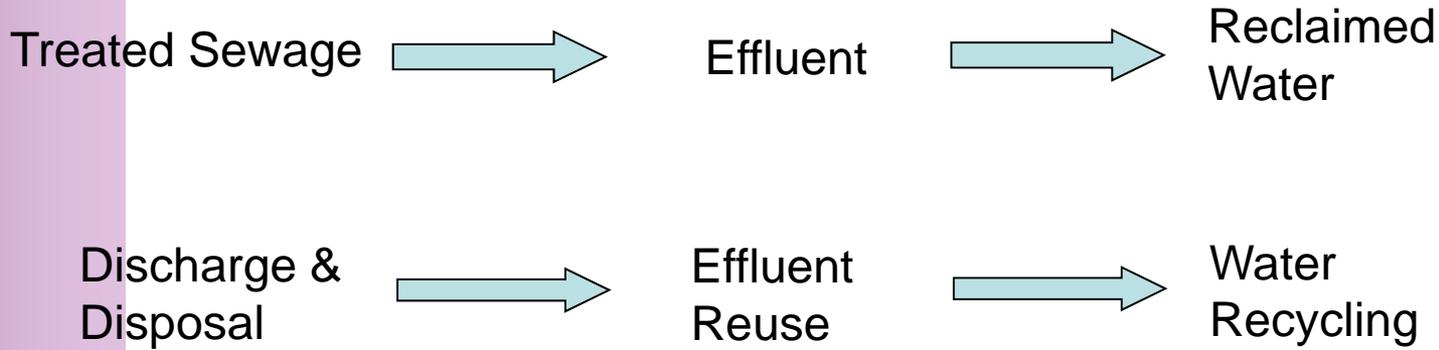


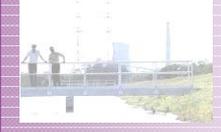
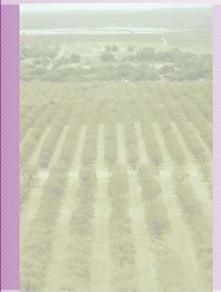
Public Acceptance of Water Reuse

- Strongly supports nonpotable uses
- Favors minimal contact (e.g., irrigation)
- More knowledge = more acceptance
 - (e.g., public education and participation programs)
- Indirect potable reuse has been problematic
 - San Diego
 - East Valley
 - Dublin San Ramon
 - Tampa



Our Words are Changing



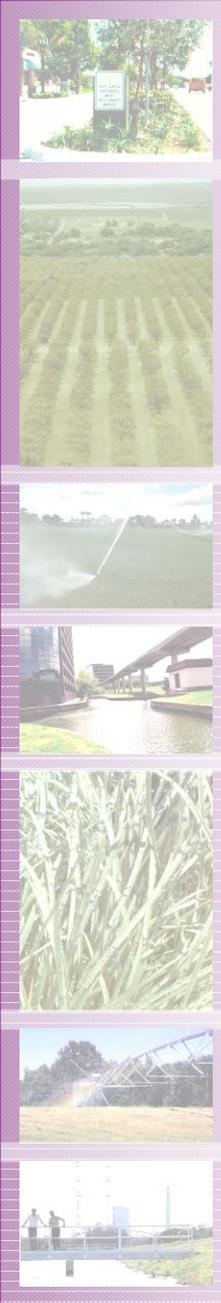


Our Programs are Changing

- 1st Generation: “Effluent Discharge” to Local Golf Course from Wastewater Treatment Plant (POTW)
 - Wastewater treatment plant operator
- 2nd Generation: Networked distribution system to multiple “users” and
 - Reclaimed water distribution system operator
 - Cross connection control programs
 - Public education

Our Programs are Changing

- 3rd Generation: "*Designer Water*" for specific customers; separate distribution systems
 - Advanced recycling (toilet flushing, cooling systems)
 - Groundwater recharge & recovery
 - Surface water augmentation
 - Indirect potable reuse
 - Decentralized treatment & automation
- 4th Generation: Direct Potable Reuse?
 - Singapore (NEWater)
 - Cloudcroft, NM



Our Concerns and Technologies are Changing

Bacteria and appearance



Traditional filtration and chlorination (maybe)

Organics, disinfection by-products, potable supply protection



Membranes, UV, Ozone, Wetlands

Pharmaceutically Active Compounds & Trace Organics

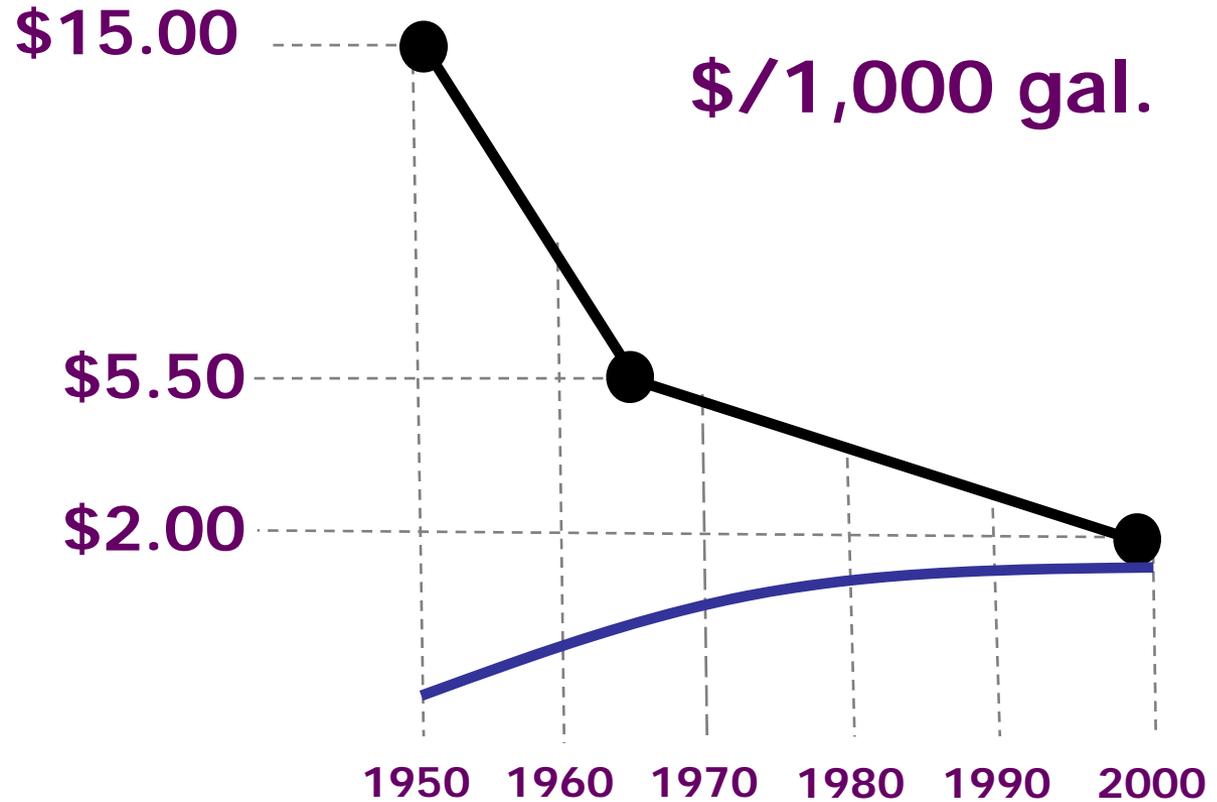


MF/RO, AOP, treat to end use requirement

Membrane Technologies are Best Available Technologies for Reuse



Reverse Osmosis Costs



AWWARF Study, 2001

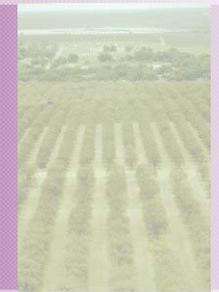
- RO Tech.
- Traditional WTP Tech.



10 Hottest "Projects"

All indirect potable projects

1. Scottsdale Water Campus Expansion, AZ – GW Recharge System; MF/RO and AOP
2. Orange County, CA – GW Recharge System; \$487.6M Cost
3. San Diego's 2nd Attempt at Indirect Potable Reuse-
"repurification"
4. Miami-Dade's Proposed \$1.1 Billion Indirect Potable Reuse Facility
5. Logan Township MUA – IPR Facility
6. Singapore PUB's *"NEWater"* Facility – since 2003; 1% of supply
7. Brisbane's Indirect Potable Reuse Facility (on hold)
8. Monterey Regional WPCA's Proposed IPR Facility (GW Recharge)
9. Windhoek, Namibia – since 1968, 25% of drinking water reservoir supply is reclaimed water
10. Cloudcroft, NM – MBR & gravity fed RO; mixed with well and spring water, followed by UF.



Challenges

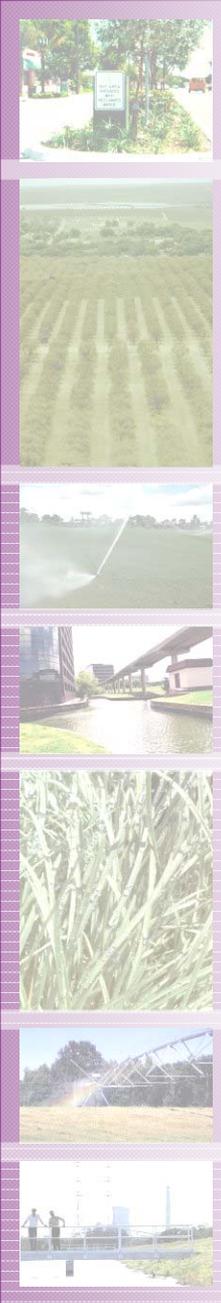
- ✓ Terminology – “sewage,” “drinking recycled sewage,” “wastewater reuse,” “effluent,” “Toilet to Tap” etc.
- ✓ Develop a Positive Brand – NEWater
- ✓ Learn how to Communicate Risk – must be able to answer difficult questions posed by media
- ✓ Educate the Political leaders – political support is crucial to success of a project
- ✓ Embrace all Stakeholders – only a handful of community activists can defeat a project
- ✓ Educate Public on the Value of Water – “We know the value of water when the well is dry.”

The Future

- Indirect potable reuse is inevitable
- Smarter infrastructure for the deployment of the right water for the right use
- Desalination – both brackish groundwater and seawater – also is inevitable
- Public holds reclaimed water to higher standard than drinking water – needs to change
- Concerns about endocrine disruptors, pharmaceuticals, other trace organics must be understood & addressed
- Effectiveness of technology is not an issue
- Education & outreach/stakeholder involvement is key to acceptance

National Database of Water Reuse Facilities

- Completed two years ago – insufficient participation
- Updated in 2010 through WaterReuse State Sections
- Single most important effort for the WaterReuse Association



QUESTIONS?

