Water Reuse in the U.S.A.

Presented at:
The 1st International Conference
of the
Spanish Association for Sustainable Water Reuse
Madrid, Spain
October 19-20, 2010

Presented by:
Wade Miller
Executive Director
WateReuse Association and Foundation
Alexandria, VA, USA

2010 WateReuse Person of the Year

Omni Shoreham Hotel
Washington, DC
September 13, 2010

International Panel: Water Reuse & Desalination in 2030

Topics

- Main Objectives of the WateReuse Association
- Water Scarcity: The New Paradigm
- Activities to Address and Promote Water Reuse
- Overview of Water Reuse in the U.S.
- Progress Made and Challenges Facing Water Reuse in U.S.
- Conclusions
- Potential Areas of Collaboration with ASERSA

WateReuse Association

A Trade Association

Four Strategic Initiatives

- Advocacy (Lobbying) -- National & State
  - Obtain Funding for Local Projects
  - Obtain Funding for Research
  - Influence National Water Policy
- Research (through WateReuse Research Foundation)
- Education & Outreach (Publications, Conferences)
- Membership (400 Organizational Members)
  - U.S.
  - Australia
  - Canada
  - Europe (Belgium)

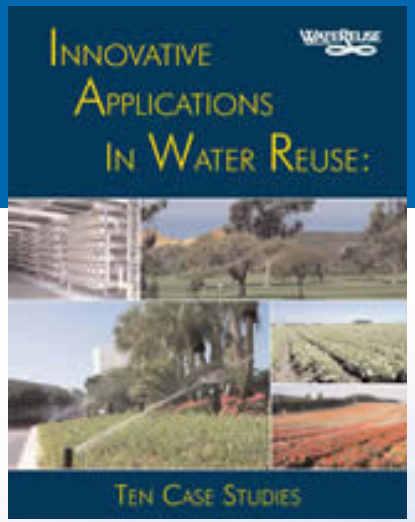
Membership

- Evolution from State to National to International Association
- Organizational Membership Totals More than 400
- ~180 Water Agency Members
- Virtually all Major Consulting Engineering Firms (e.g., CH2M Hill, Black & Veatch)
- Many Major Equipment Suppliers (e.g., GE Water, Siemens, Acciona Agua, Veolia)
- Membership Growing at Approximately 10%/Year

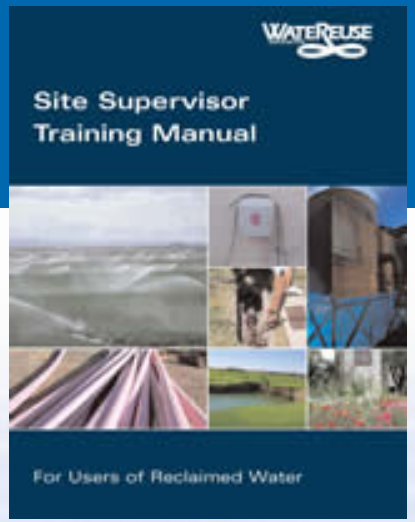
26th Annual WateReuse Symposium

Sheraton Wild Horse Pass Resort
Phoenix, AZ
September 11–14, 2011

WateReuse Association Products

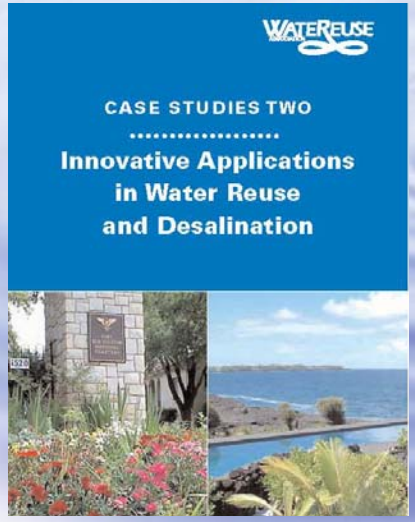


2004

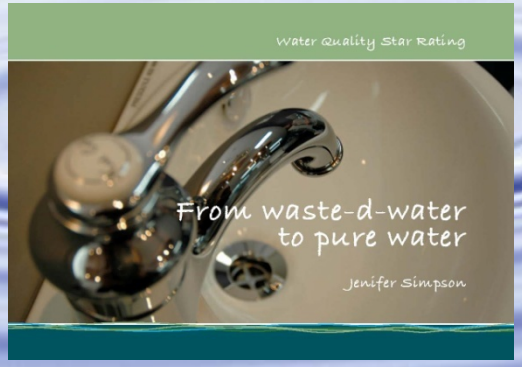


2006

2006



2007



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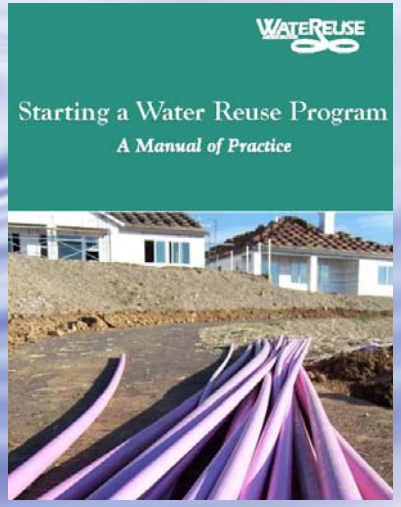


2008


Sustainable Solutions
...for a Thirsty Planet.
www.athirstyplanet.com


Disinfection
Removal of pathogens, emerging contaminants
Environmental impacts
RO reduces energy costs, nutrient discharges
Public acceptance
Education and technology transparency
Water recycling
GE reclaims coal mine water
worldwater
water reuse & desalination™
Volume 1 / Issue 1
Autumn 2010
Breaking down the barriers
to water reuse & desalination
Water Environment Federation
WATEREUSE
WATEREUSE

WateReuse Research Foundation's Mission

"The mission of the WateReuse Research Foundation is to conduct and promote applied research on reuse, reclamation, recycling,and desalination of water."

Snapshot of Current Status

- Strong & Steady Growth Since 2000
- Have Attracted >$35MM in Federal & Non-Federal Funding Since 2000
- Currently 85 Subscribers
- More than 80 Active Projects
- 50+ Publications in Circulation
- Established Credibility Within Scientific Community
- Have Established Strategic Alliances in U.S. and Around the World

Key Achievements in 2009/2010

- Obtained $2.5MM “earmarks” through Congressional appropriations process in FY-2009, FY-2010
- Signed MOU with Singapore PUB to jointly fund research of mutual interest
- Received funding contributions from the Pentair Foundation, Aqua-Aerobic Systems, and ACWA
- 15 new reports published

Future Emphasis

- Public Acceptance
- Potable Reuse
- Ensuring Chemical/Microbiological Safety
- Desalination (goal is to allocate 33% of research dollars to desal by 2013)
- Energy/Water Nexus
- Criteria/Standards

WateReuse Australia

- First International Division of WateReuse
- Formed through an MOU with WSAA
- Focus is on Shared Experiences, Technology Transfer
- WateReuse will Convene Specialty Conference in Australia Every Three Years
- Currently, 8 Utilities/2 Engineering Firms are Members
  - Sydney Water
  - Melbourne Water
  - Barwon Water
  - ACTEW Corporation
  - South East Water
  - Water Corporation of Western Australia
  - WaterSecure
  - MidCoast Water

Water Reuse & Desalination

Conference Registration

WATER SCARCITY SOLUTIONS FOR THE 21ST CENTURY

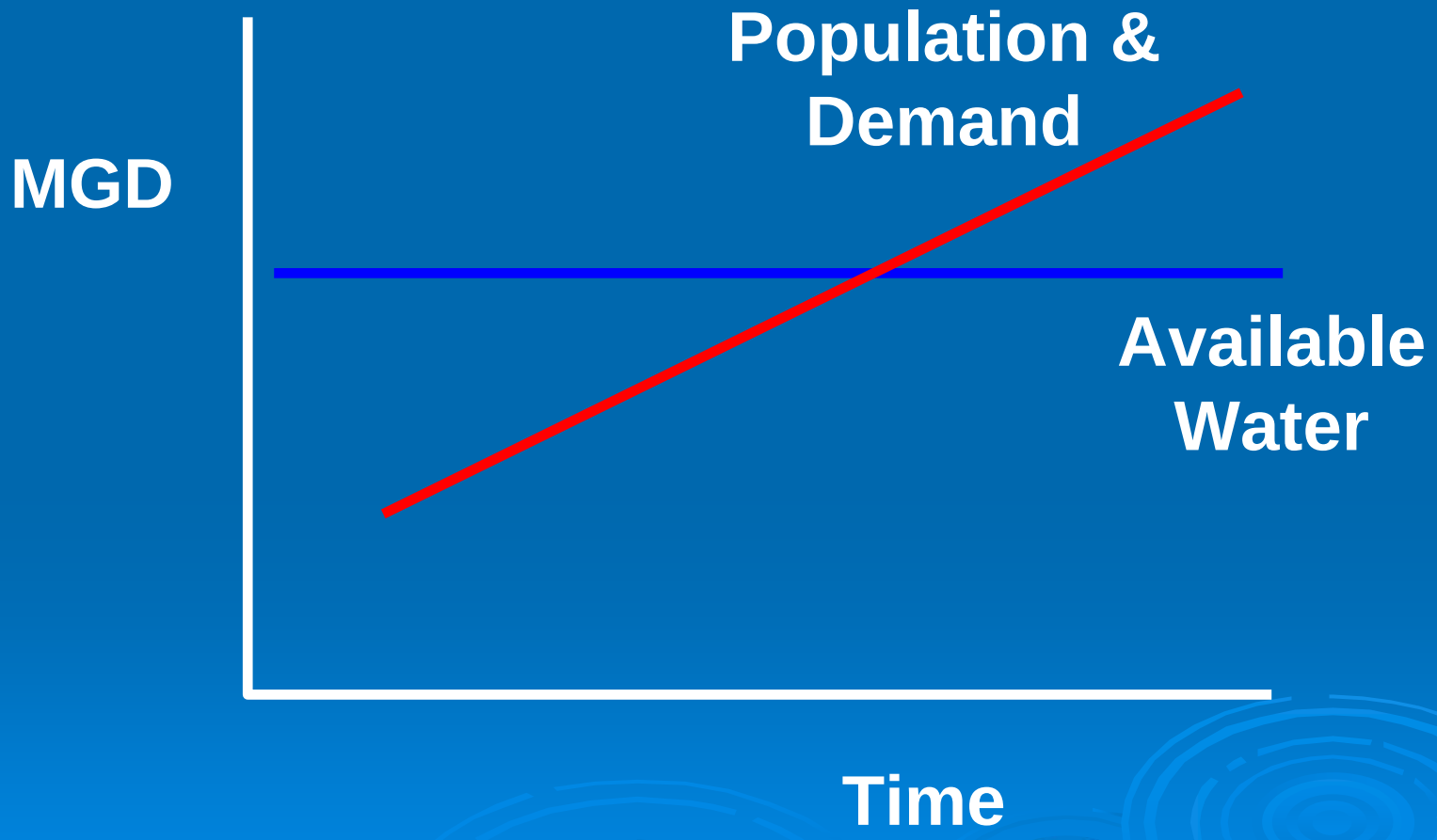
WateReuse Association

Water Services Association of Australia

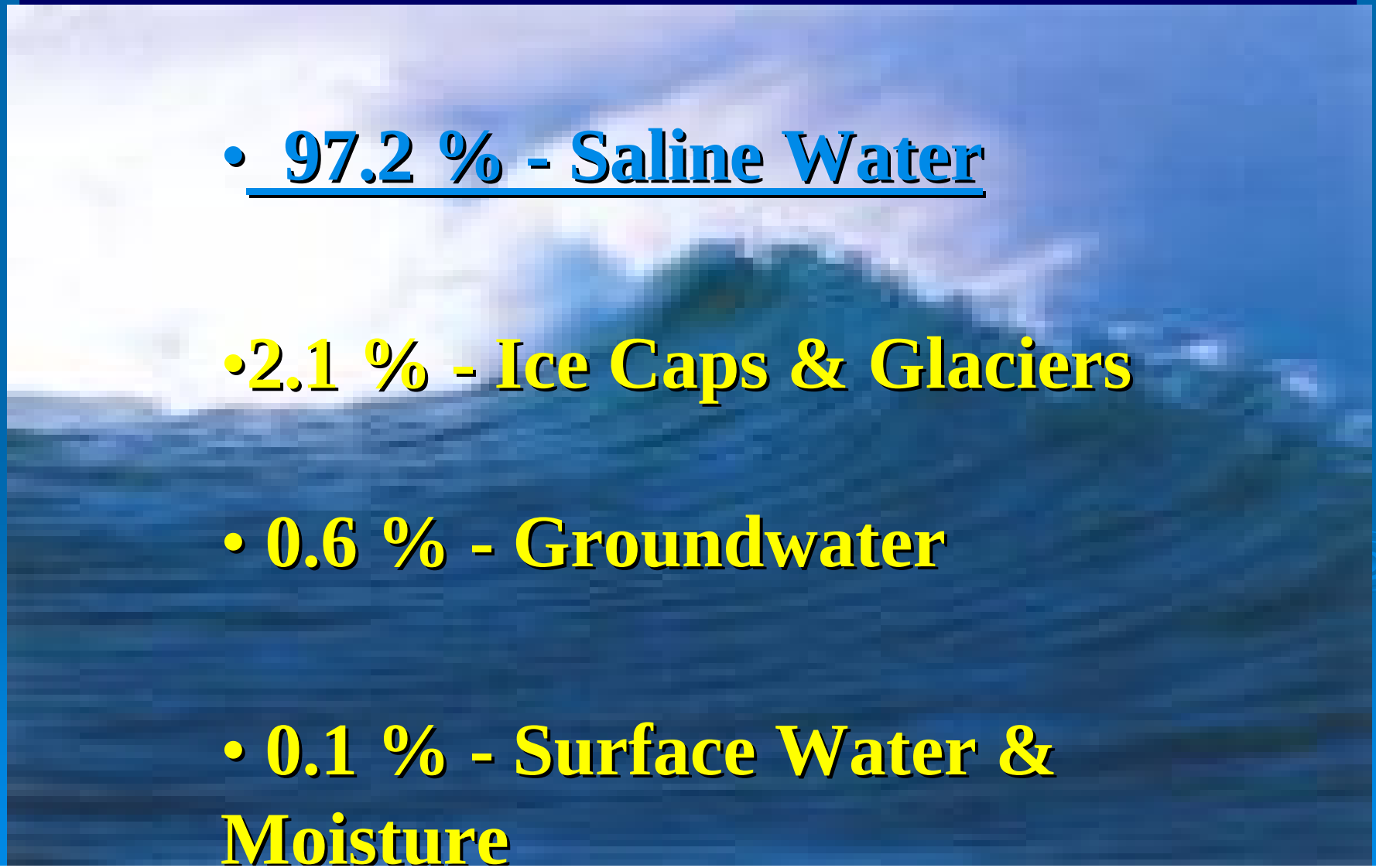
WateReuse Australia

Water Scarcity – A New Global Paradigm

Supply & Demand



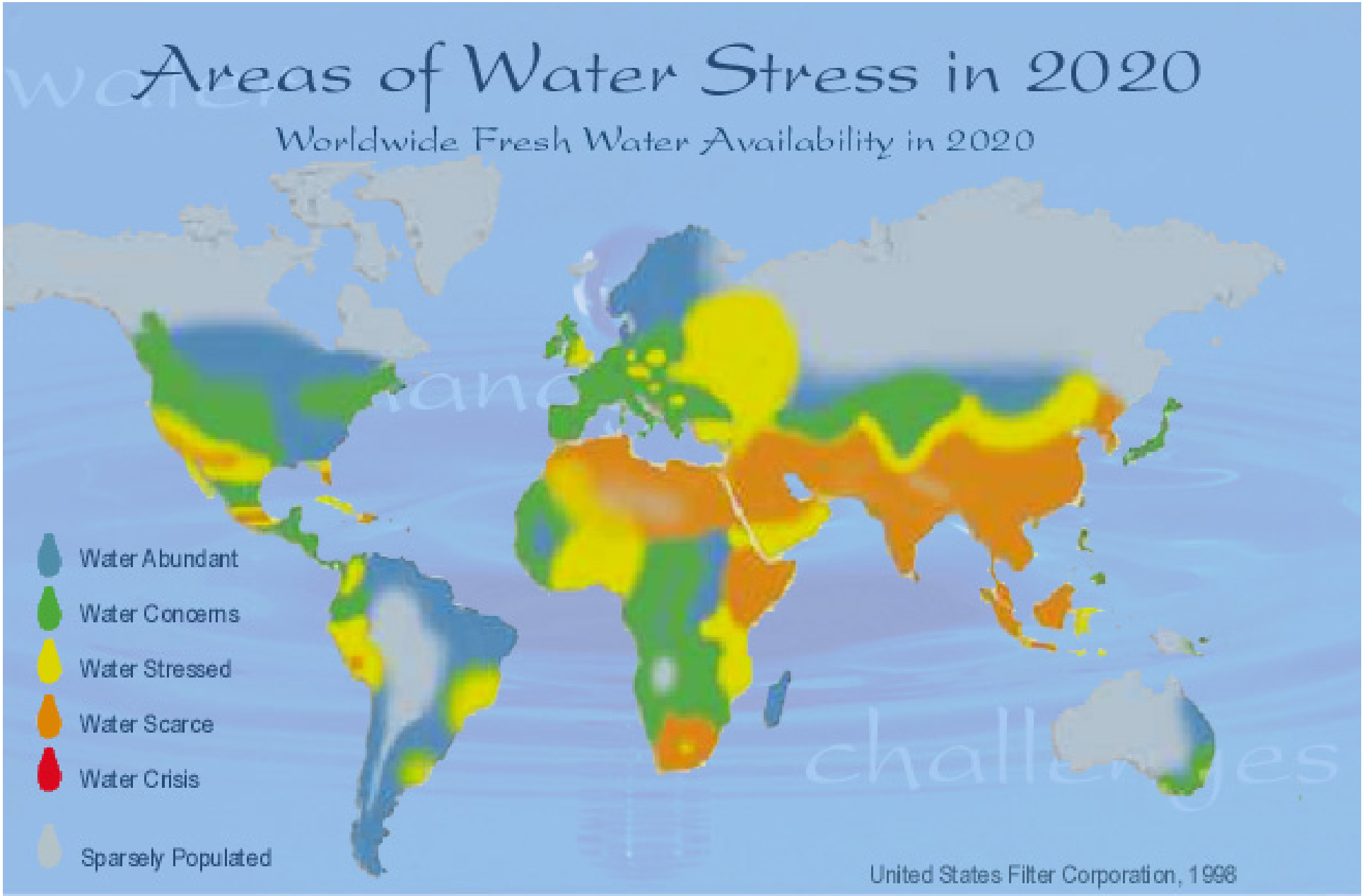
Most of World's Water is in the Ocean!



- **97.2 % - Saline Water**
- **2.1 % - Ice Caps & Glaciers**
- **0.6 % - Groundwater**
- **0.1 % - Surface Water & Moisture**

Areas of Water Stress in 2020

Worldwide Fresh Water Availability in 2020



artment of the Interior
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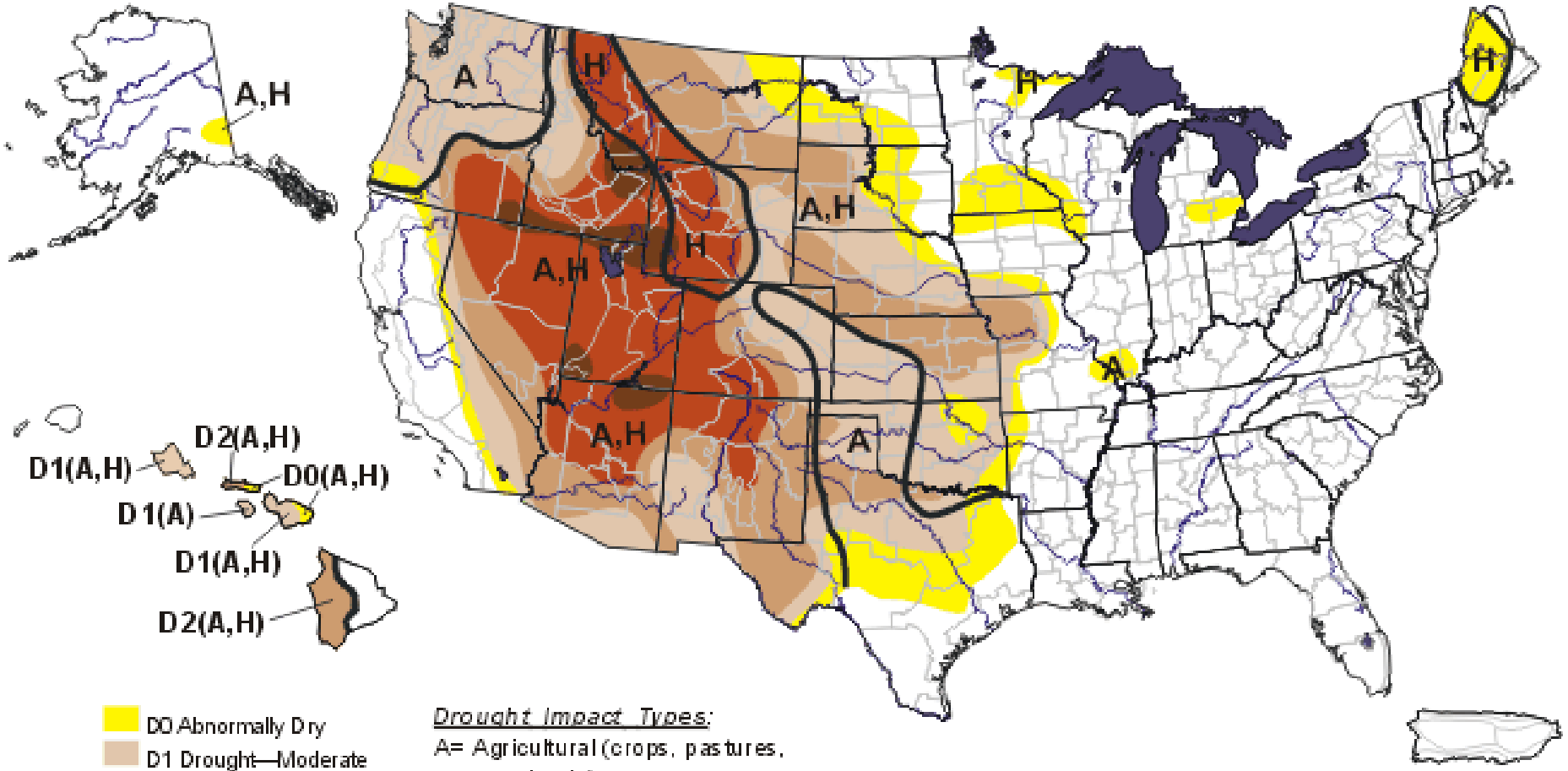
U.S. Drought Monitor

August 5, 2003
Valid 8 a.m. EDT



D0 Abnormally Dry
D1 Drought—Moderate
D2 Drought—Severe
D3 Drought—Extreme
D4 Drought—Exceptional

Drought Impact Types:
A= Agricultural (crops, pastures, grasslands)
H= Hydrological (water)
No type = both impacts
Delineates dominant impacts

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

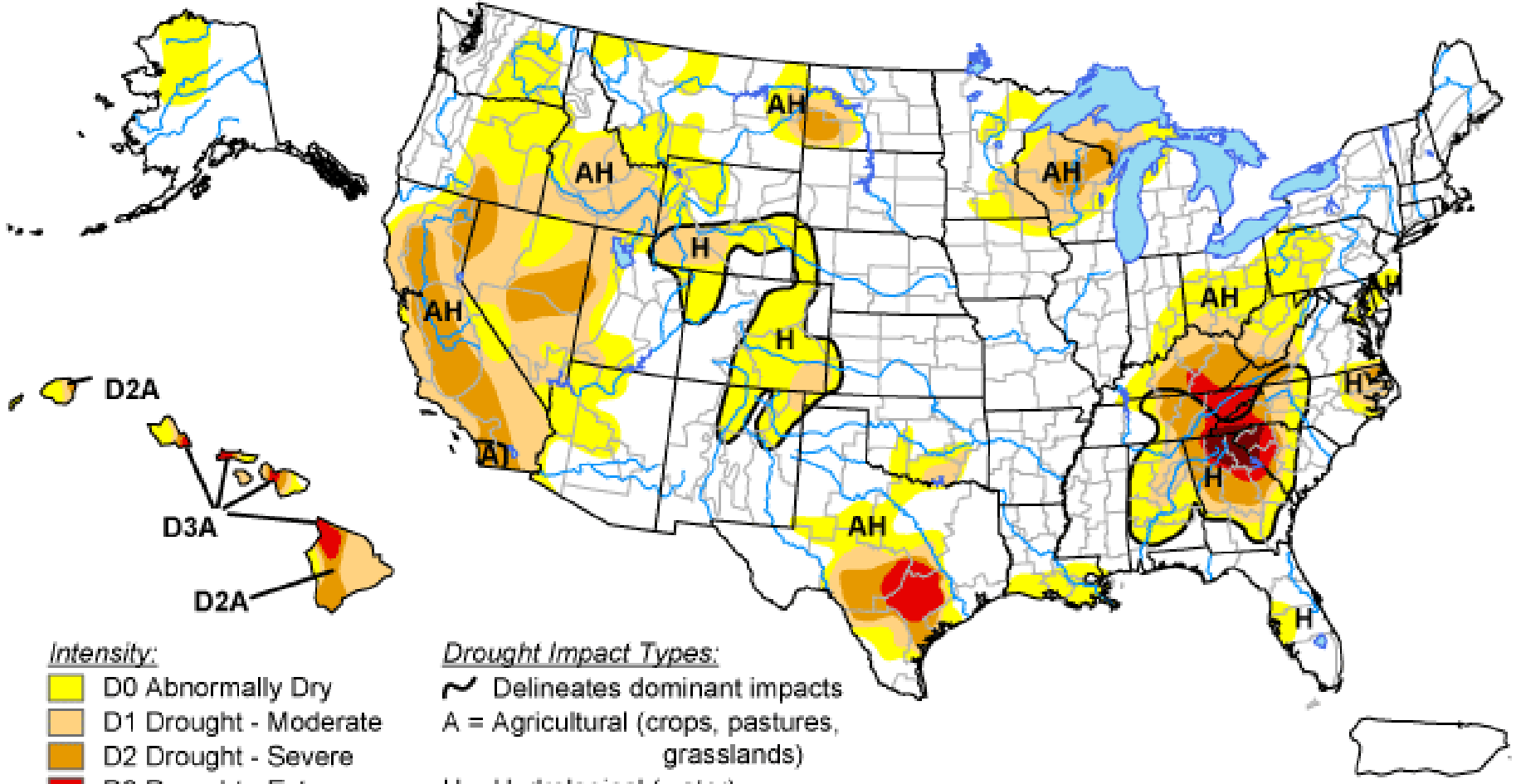
http://drought.unl.edu/dm

Released Thursday, August 7, 2003

Author: *Douglas LeComte, NOAA/CPC*

U.S. Drought Monitor

November 11, 2008
Valid 8 a.m. EST



Intensity:
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:
- ~ Delineates dominant impacts
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The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

USDA National Drought Mitigation Center

Released Thursday, November 13, 2008

Author: Mark Svoboda, National Drought Mitigation Center

Water Reuse – An Overview

All Water is Reused

Some Basic Facts

- All Water is Reused
- There is Substantial Unplanned Reuse (e.g., the Mississippi River, Thames, Rhine, Seine, etc.)
- 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 “green” and “eco-friendly”

Factors Driving Water Reuse (and Desalination)

- Drought
- Population growth
- Increased municipal, industrial, and agricultural demand
- Dependence on single source of supply
- TMDLs/Nutrient load caps

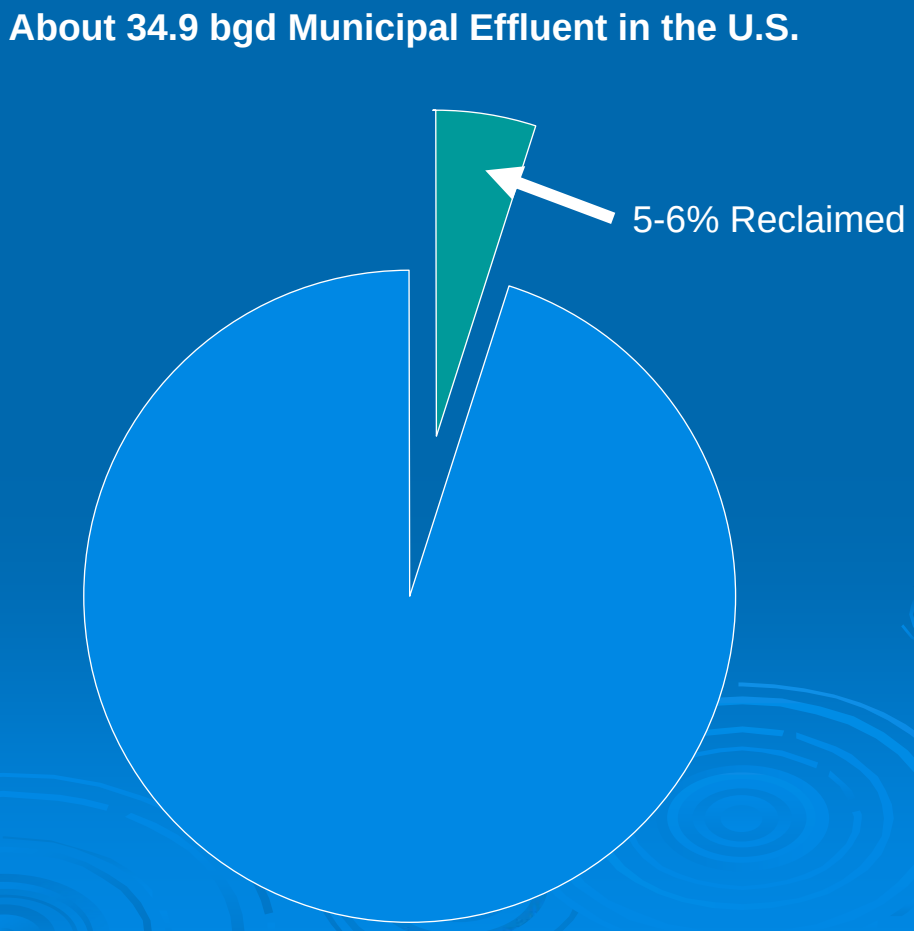
"Water scarcity"

What is Possible with Water Reuse?

- Answer: Virtually Anything Given Current Technology
- With MF/RO/AOP, Can Produce Water that is Virtually Pure Dihydrogen Monoxide
- Problem is that the Technology has Surpassed our Ability to Communicate to Public

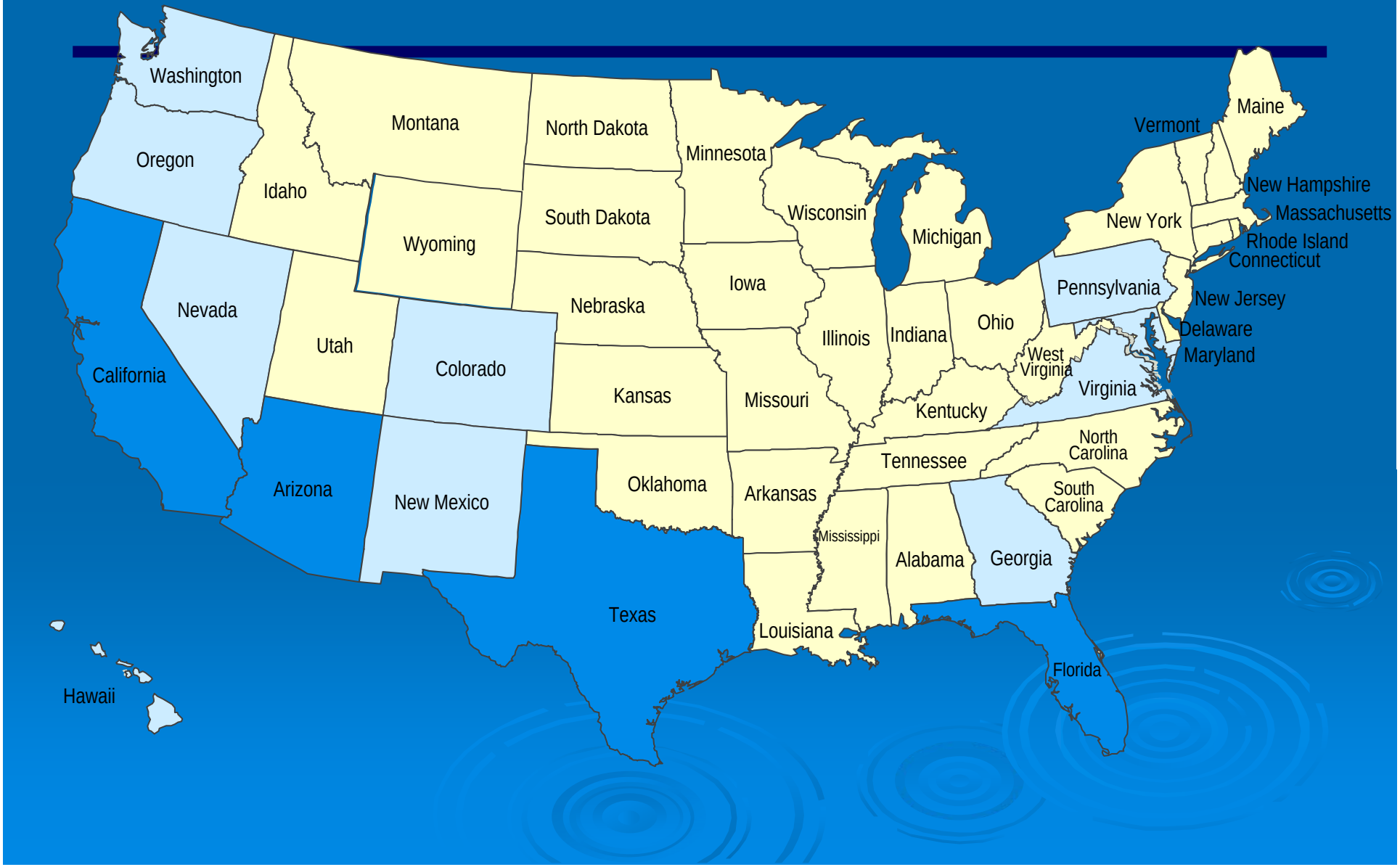
Potential for Water Reuse

- 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 2010
- Australia, now at 8%, has a national goal of 30% by 2015

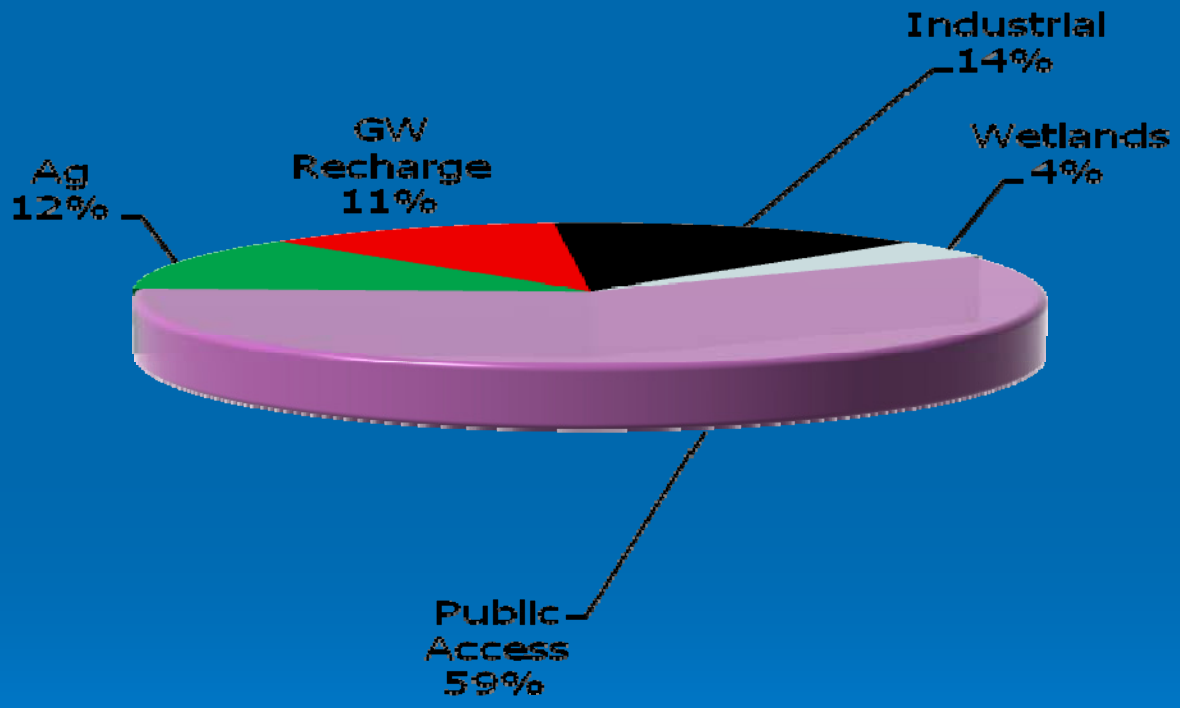


~90% of Water Reuse Occurs in Four States

…but it is growing in other states

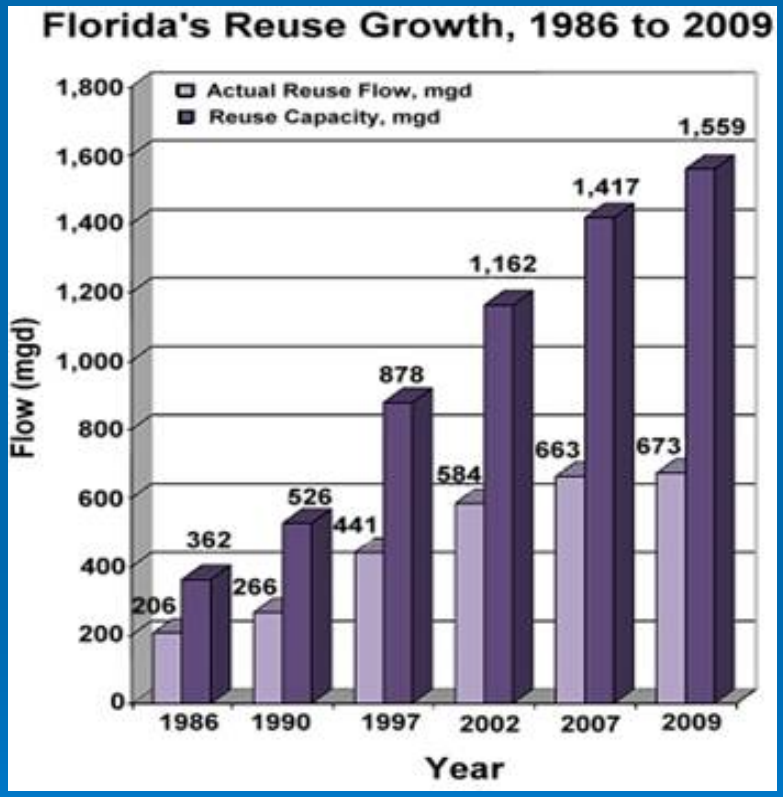


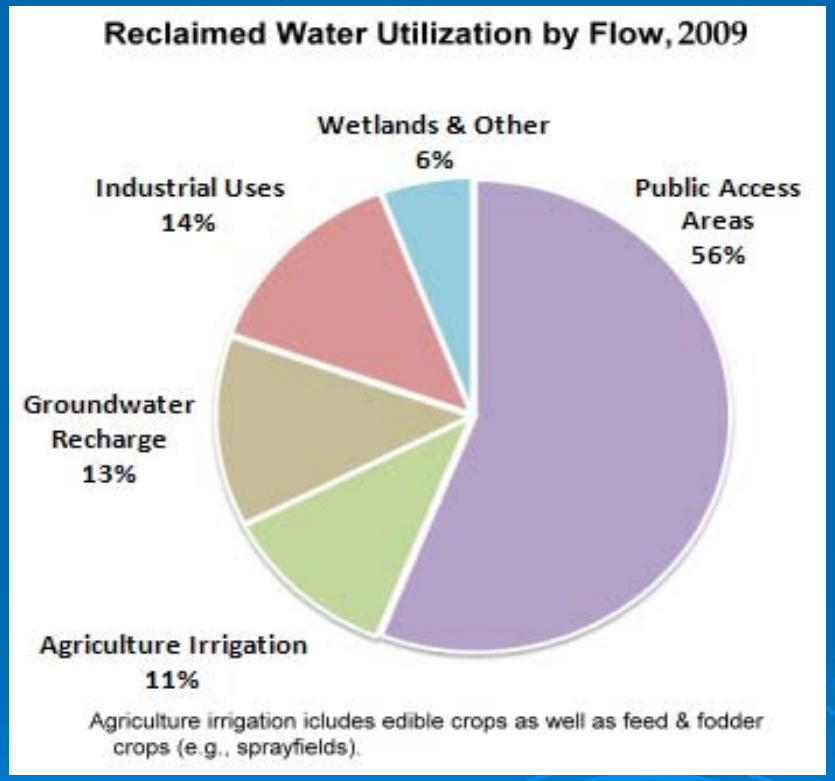
Water Reuse in Florida -- 2008



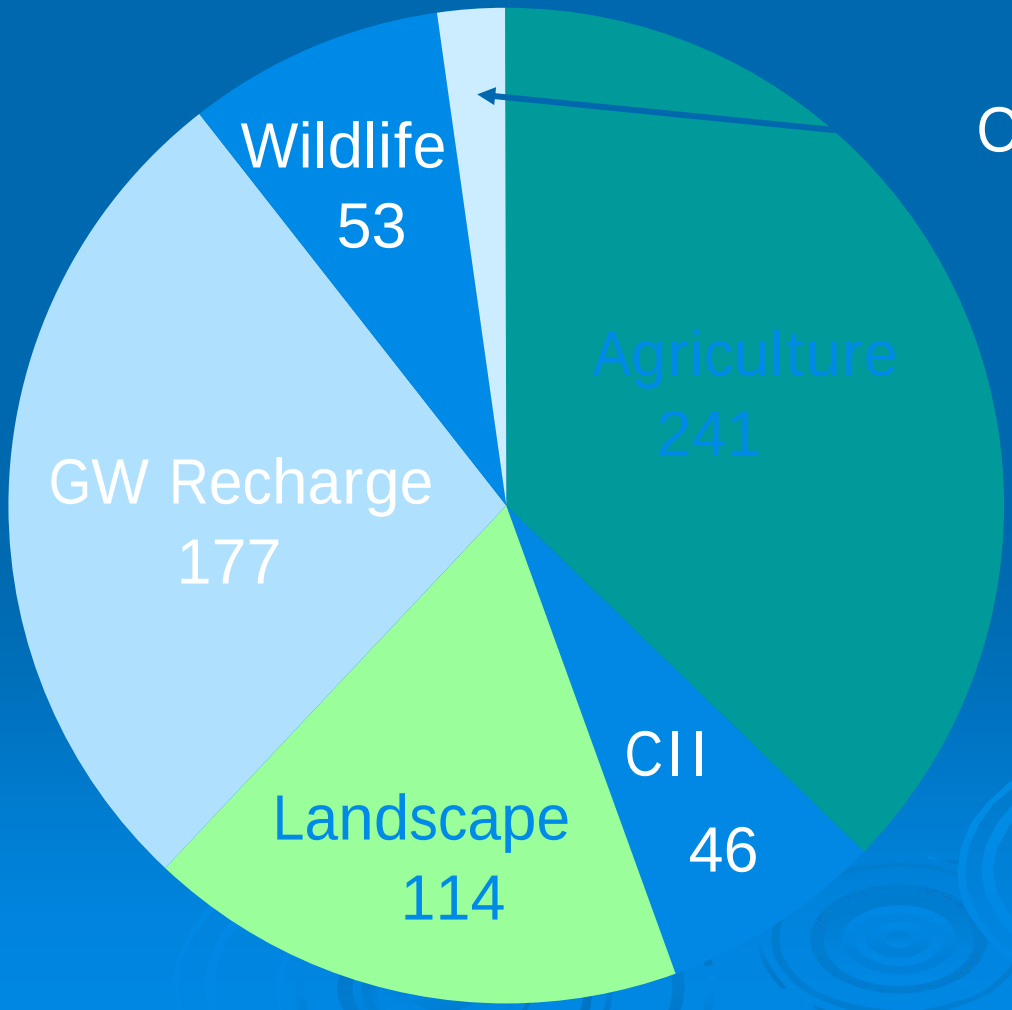
667 MGD

Current Florida Reuse





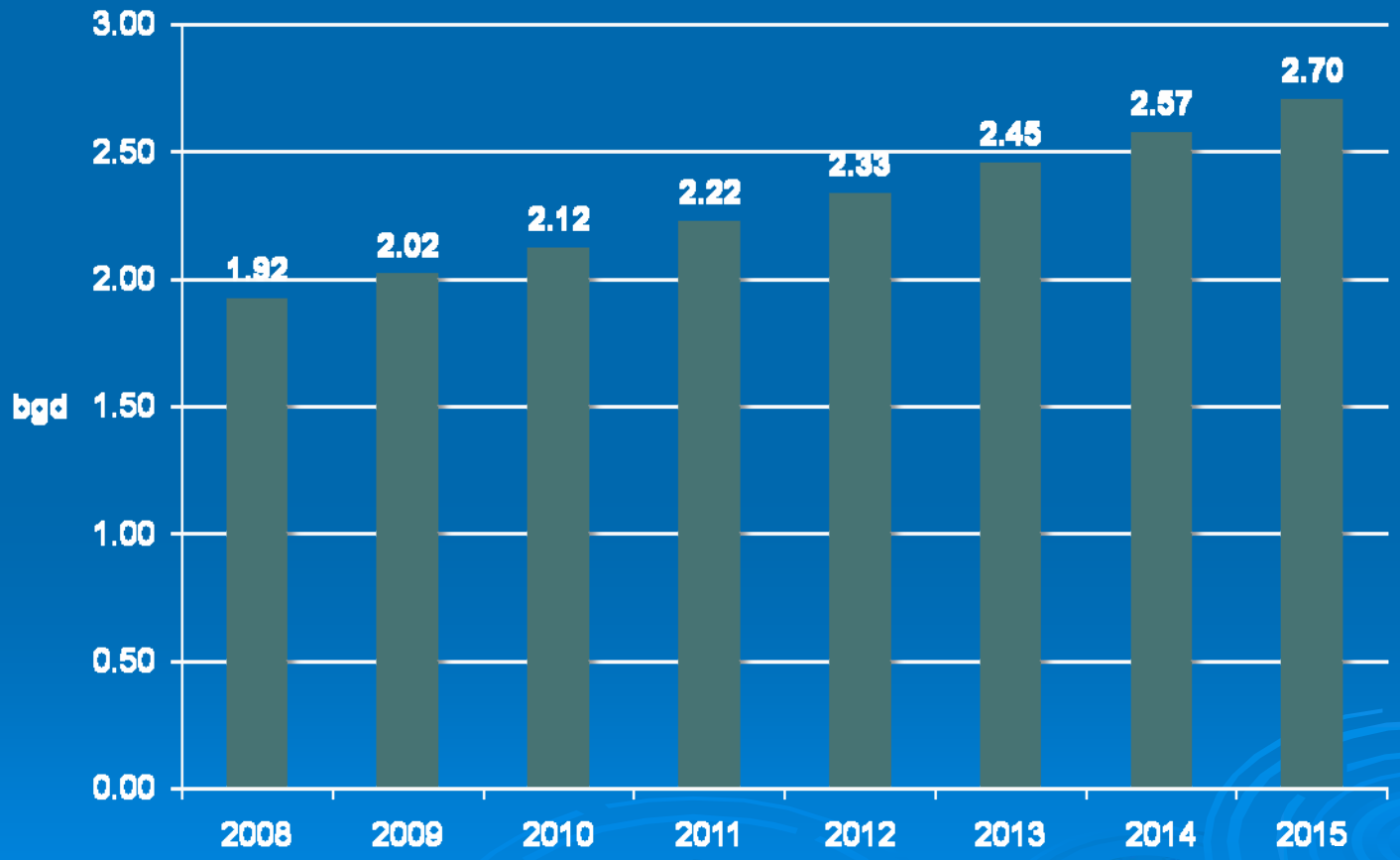
Recycling in California (2008 data in TAF)



Total=
650 TAF

(580 mgd)

Projection of Water Reuse levels through 2015



Great Success Stories

- OCWD's Groundwater Replenishment System
- West Basin's Reuse Facility – Producing "Designer Water"
- MRWPCA – Recycled Water for Edible Crops
- Pinellas County's Dual Distribution Systems
- Conserv II – Irrigating Citrus Crops in Florida for Three Decades
- LACSD — Producing Recycled Water at 11 Facilities
- Santa Rosa — Recycling 100% of its Effluent
- UOSA — Surface Water Augmentation since '78
- Scottsdale Water Ranch — IPR since 2001

GWR System (OCWD and OCSD)
Advanced Water Treatment Flow Diagram

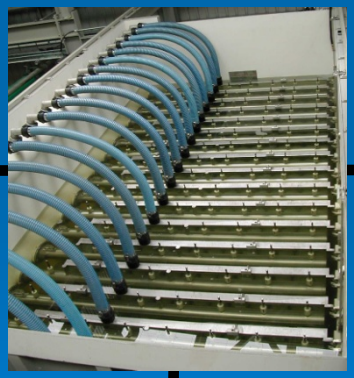
Enhanced Source Control

Secondary Treatment

OCSD Secondary Effluent

86 mgd

Microfiltration (MF)



Backwash OCSD Plant 1

70 mgd

Reverse Osmosis (RO)

Brine OCSD Outfall

70 mgd

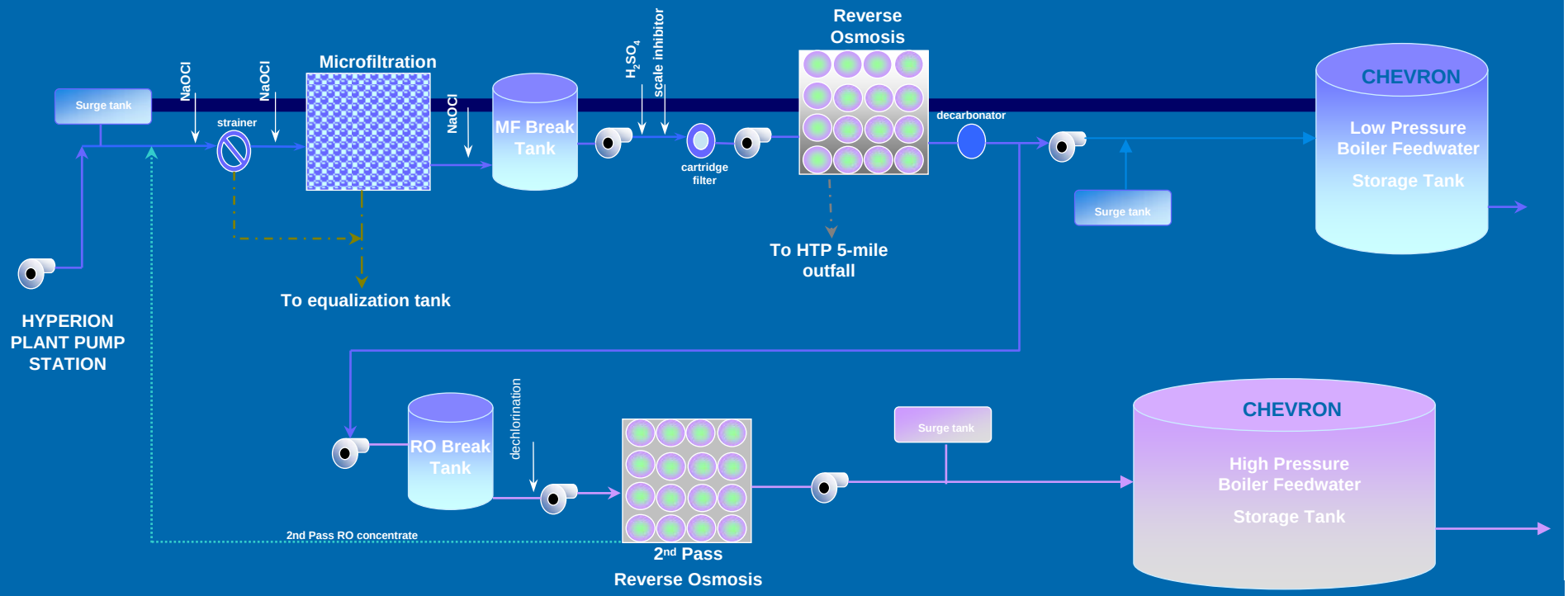
Ultraviolet Light (AOP)

with hydrogen peroxide

Purified Water

Natural soil filtration

West Basin Water Recycling Plant



West Basin Water Recycling Plant
Phase III Expansion - Flow Schematic

$FeCl_3$ - ferric chloride
NaOCl - sodium hypochlorite
H_2SO_4 - sulfuric acid
CO_2 - carbon dioxide

West Basin Municipal Water District

Examples of Potable Reuse Projects

- 1962: CSDLAC (California) – groundwater recharge
- 1968: Windhoek (Namibia) – direct potable reuse
- 1976: OCWD WF-21 (California) – seawater barrier
- 1978: UOSA (Virginia) – surface water augmentation
- 1985: El Paso (Texas) – groundwater recharge
- 1995: WBMWD (California) – seawater barrier
- 2000: Scottsdale (Arizona) – groundwater recharge
- 2003: Singapore – surface water augmentation
- 2005: Alamitos Barrier (California) – seawater barrier
- 2005: IEUA (California) – groundwater recharge
- 2008: OCWD GWR System (California) – seawater barrier and groundwater recharge

Setbacks & Hiccups

- San Diego's Repurification Facility (1998)
- Tampa Bay's Proposed IPR Facility (1999)
- East Valley Project of LA Department of Water & Power (2002)
- Dublin San Ramon Services District (2002)
- Redwood City (2004)

Regulations and Criteria

- No Federal Regulations
- 28 States Have Water Reuse Regulations
- 2004 U.S. EPA Guidelines for Water Reuse:
  - Recommended treatment processes
  - Water quality limits
  - Monitoring frequencies
  - Setback distances
  - Other controls
- www.epa.gov/ORD/NRMRL/pubs/625r04108/625r04108.htm

Regulations and Guidelines Vary Depending on Type of Reuse

Indirect potable reuse

Agricultural Reuse on Food Crops

Unrestricted Recreational Reuse

Unrestricted Urban Irrigation Reuse

Restricted Urban Irrigation Reuse

Restricted Recreational Reuse

Industrial Reuse

Environmental Reuse

Agricultural Reuse on Non-food Crops

So What are the Problems and Challenges

Issues in Water Reuse

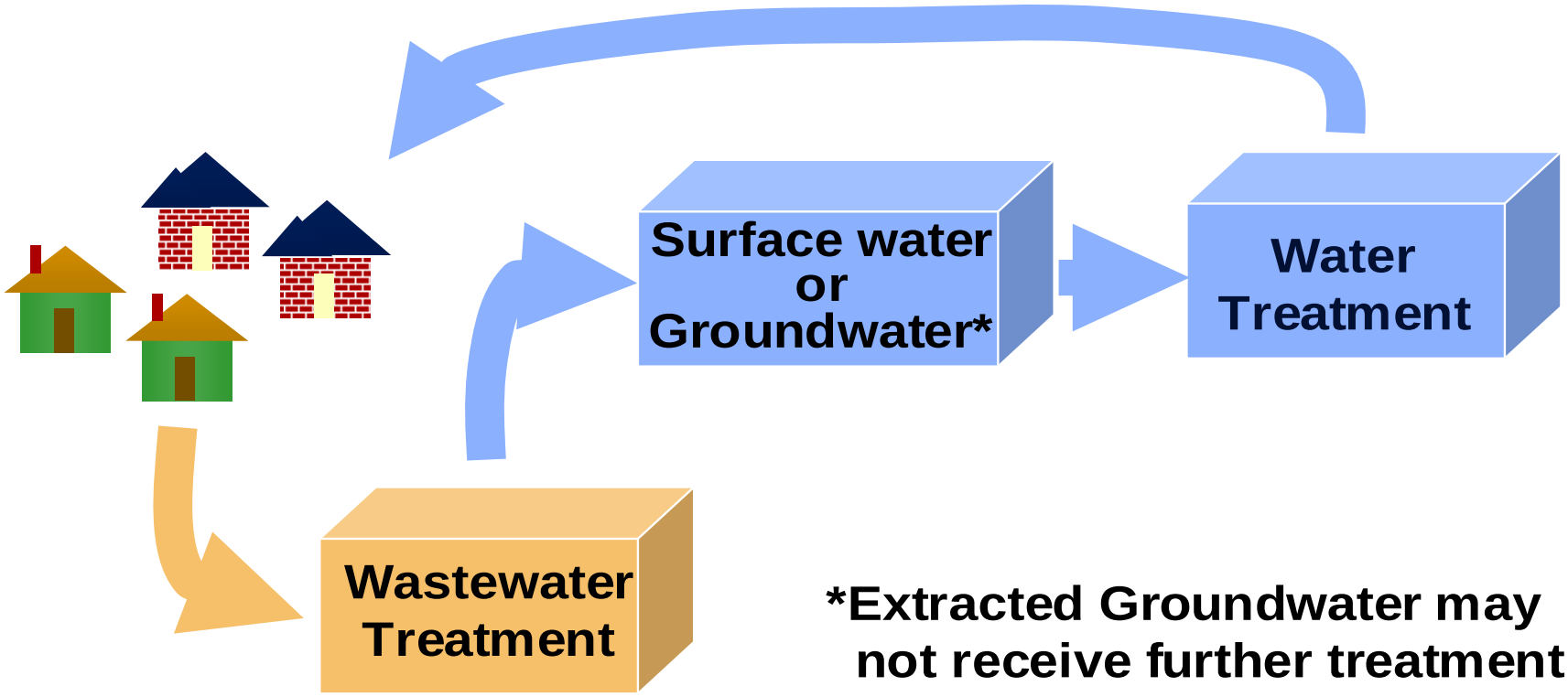
- Public Perception/Acceptance
- Chemical Risks
- Poor Differentiation by Public and Politicians of Planned vs. Unplanned Reuse
- The Media
- Lack of Political Support
- More Cost-Effective Technologies
- Funding
- Better Understanding of Economics
- Energy/Water Nexus
- Climate Change

Components of a Public Acceptance Strategy

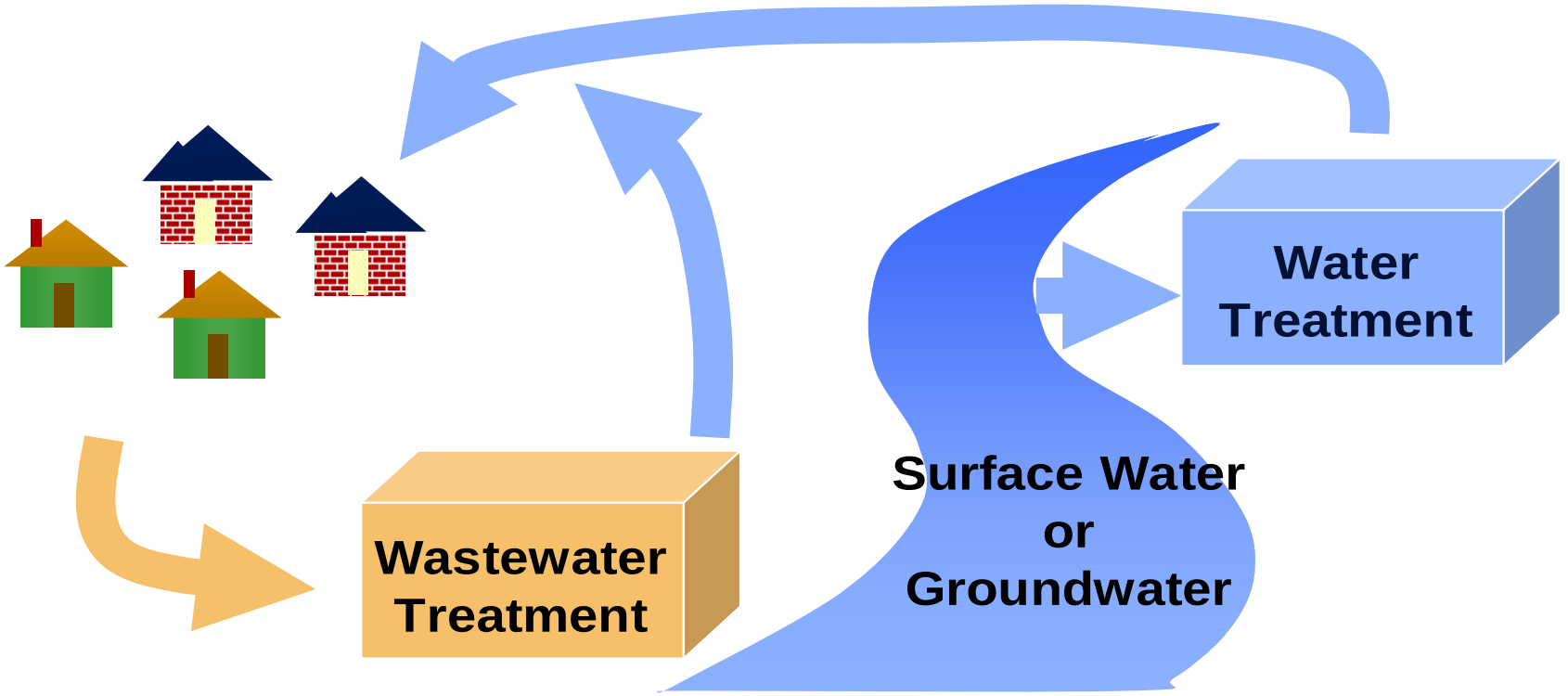
- ✓ Agree on Terminology (WRF-07-03)
- ✓ Develop a Positive Brand
- ✓ Learn how to Communicate Risk
- ✓ Conduct Necessary Research on Trace Organic Chemicals (e.g., EDCs/PhACs/PPCPs)
- ✓ Educate the Politicians
- ✓ Embrace all Stakeholders
- ✓ Educate Public on the Value of Water

New Initiatives in Potable Reuse

Indirect Potable Reuse



Direct Potable Reuse

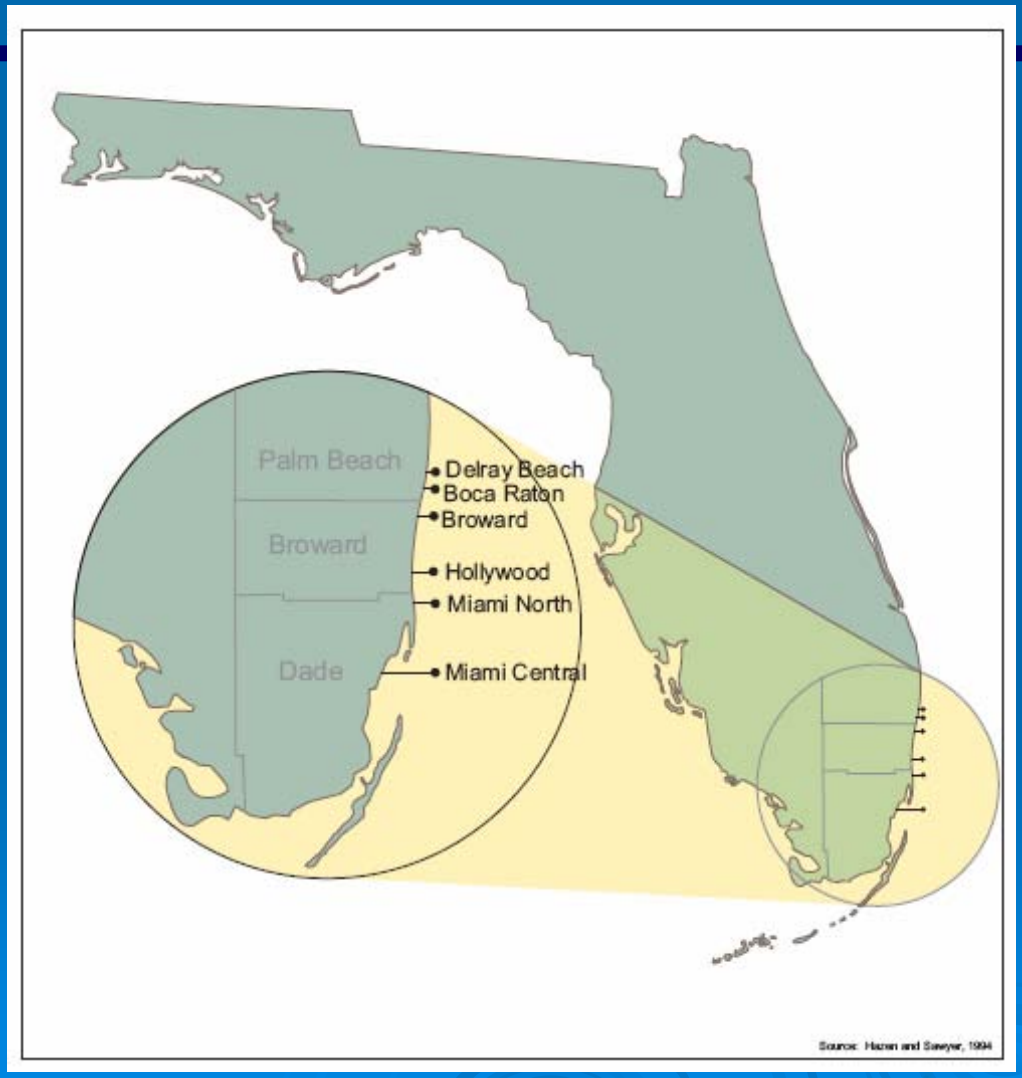


Potable Reuse is on the Rise

- Progress Being Made Globally on Potable Reuse Front
  - WateReuse California's Potable Reuse Initiative
  - Florida's Ocean Outfall Legislation
    - Prohibits construction of new domestic wastewater ocean outfall pipes or expansion of six existing outfalls on Southeast FL coast
    - Law requires a) significant decrease in nutrients discharged through outfalls by 2018 and b) elimination of outfalls as primary disposal method for wastewater by 2025.
    - 60% of water previously discharged via outfalls would be required to be beneficially reused.
  - Australian Water Recycling Centre of Excellence is Launching Comprehensive Potable Reuse Study ($3MM AUD)
  - WateReuse Association will hold its second Potable Reuse Conference in south Florida in November, 2011
  - Bottom Line: All of these efforts will result in more research, more widespread public acceptance

Ocean Outfalls

SB 1302



- Plan by 2013
- Full AWT by 2018, unless 100% reuse
- Reuse system operational by 2025
- 300 MGD

WateReuse California's Potable Reuse Initiative

- WateReuse California formed a*d hoc* committee to explore how it can develop potable reuse in CA; decision based on following:
  - Legislative (California) activity related to potable reuse;
  - Willingness of key environmental organizations and regulators to consider potable reuse;
  - Construction of purple pipe systems is too costly for utilities to implement on large scale;
  - Compliance with IPR regulations is infeasible for many agencies;
  - Drought; and
  - Availability of proven treatment technology.
- NWRI Commissioned "White Paper" on identification of measures and information needed to ensure public health protection if direct potable reuse is to be successfully implemented
- Workshop with state regulators in Sacramento on April 26-27
- Foundation to fund "White Paper" on Research gaps

California Water Facts
(all values MAF/Yr)

- Urban water use 9
- Agricultural water use 34
- Total water use (current) 43
- Recycled water use 0.65
- WW Discharge to ocean 3.5
- 2050 incremental demand: -2 to +8*

*3 growth scenarios in 2009 California Water Plan, including estimated effect of climate change

Why Direct Potable Reuse?

- IPR compliance not feasible for all
  - Wrong geology
  - Insufficient surface storage capacity
  - Poor quality diluent
- Purple pipe systems
  - Expensive
  - Won’t alone achieve 20-year goal of 4-fold increase in water recycling (0.6 to 1.5 MAF/Yr)

Conclusions

- Water Reuse and Desalination are “the last rivers to tap”
- Their Ultimate Acceptance is Essential to Achieving Long-Term Sustainability
- Water Reuse Industry Needs to Develop and Implement a Strategy to Achieve Public Acceptance because…
- Public Acceptance is Key to Widespread Water Reuse

The Future

- Potable Reuse is Inevitable
- Increased Desalination – both Brackish Groundwater and Seawater – Also is Inevitable
- Education & Outreach/Stakeholder Involvement is Key to Acceptance of Water Reuse
- Public Needs to “get over” Holding Water Reuse to Higher Standard than Drinking Water
- Efficacy of Technology is Not an Issue
- Concerns About EDCs/PhACs Must be Addressed
- Research is Key Component

Opportunities for Collaboration between ASERSA and WateReuse

- Historical Precedents
  - Partnered with AWWA/WEF on WateReuse Annual Symposium since 2005
  - Partnership has Spawned other Opportunities, Including:
    - Collaboration on White Paper on Graywater
    - Co-Funding of Research Project – “Talking About Water”
    - Developed Journal with WEF
  - Partnered with IWA on Potable Reuse Conference in 2008; Will repeat in 2011

Opportunities

- Joint Sponsorship of:
  - Conferences/Workshops/Seminars/Webinars
  - White Papers/Other Publications
  - Research Projects w/WateReuse Research Foundation
- ASERSA Could become Division of WateReuse (similar to Australia)
- ASERSA Could be the foundation for Establishment of WateReuse Europe

Thank you

WATEREUSE ASSOCIATION

WATEREUSE RESEARCH

www.WateReuse.org

Wade Miller, Executive Director (703) 548-0880 ext. 102