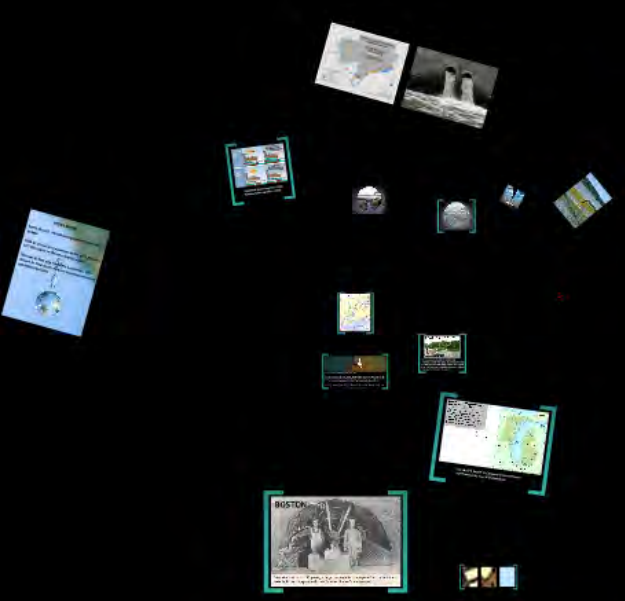
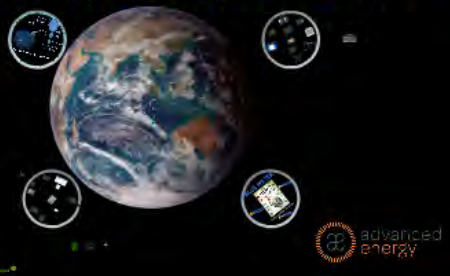


2000 Years ??

The Money is in the Pipes

The Whole Story About Saving Water in Homes



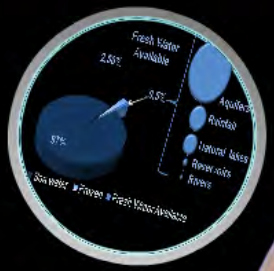
Case Study

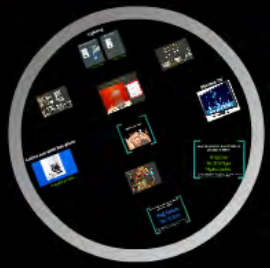
1. Land Subsidence*
2. Water Rights*
3. Salination of Crop Land*
4. State Tension Over Water
5. Waste Water Treatment
6. Pumping Power
7. Free Flowing Rivers
8. Global Water Distribution
9. Population Shift To the Coast
10. Historic Water levels in Lakes
11. Damage from Dams and Reservoirs
12. Industrial Waste

Population growth by 2030, the earth's projected eight billion inhabitants will need 25 percent more freshwater and 2 times more food.

The Money is in the Pipes

The Whole Story About Saving Water in Homes





Learning Objectives

1. Learn the "WHY" of saving water

2. Receive the supporting data for future action in your home and those you serve.

3. Learn what we can do

Why?

1. Land Subsidence*
2. Water Rights*
3. Salination of Crop Land*
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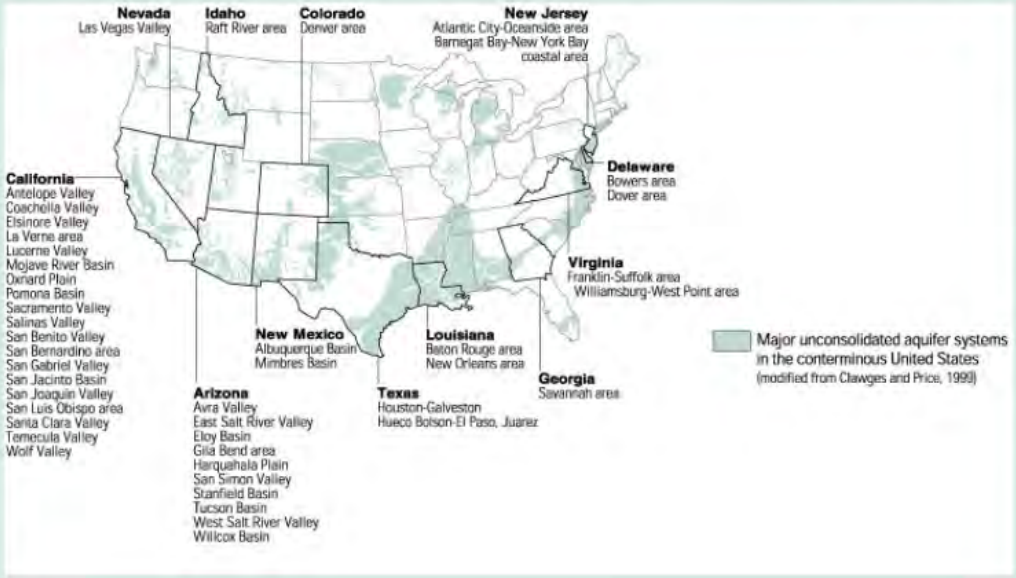
1925
1955
SAN JOAQUIN VALLEY
CALIFORNIA
BM 5681
SUBSIDENCE 9M
1925-1977
1977


Subsidence
around a
well

Areas where subsidence has been attributed to groundwater pumping

Areas where subsidence has been attributed to groundwater pumpage (Land Subsidence in the United States, USGS Circular 1182)



http://water.usgs.gov/ogw/pubs/fs00165/

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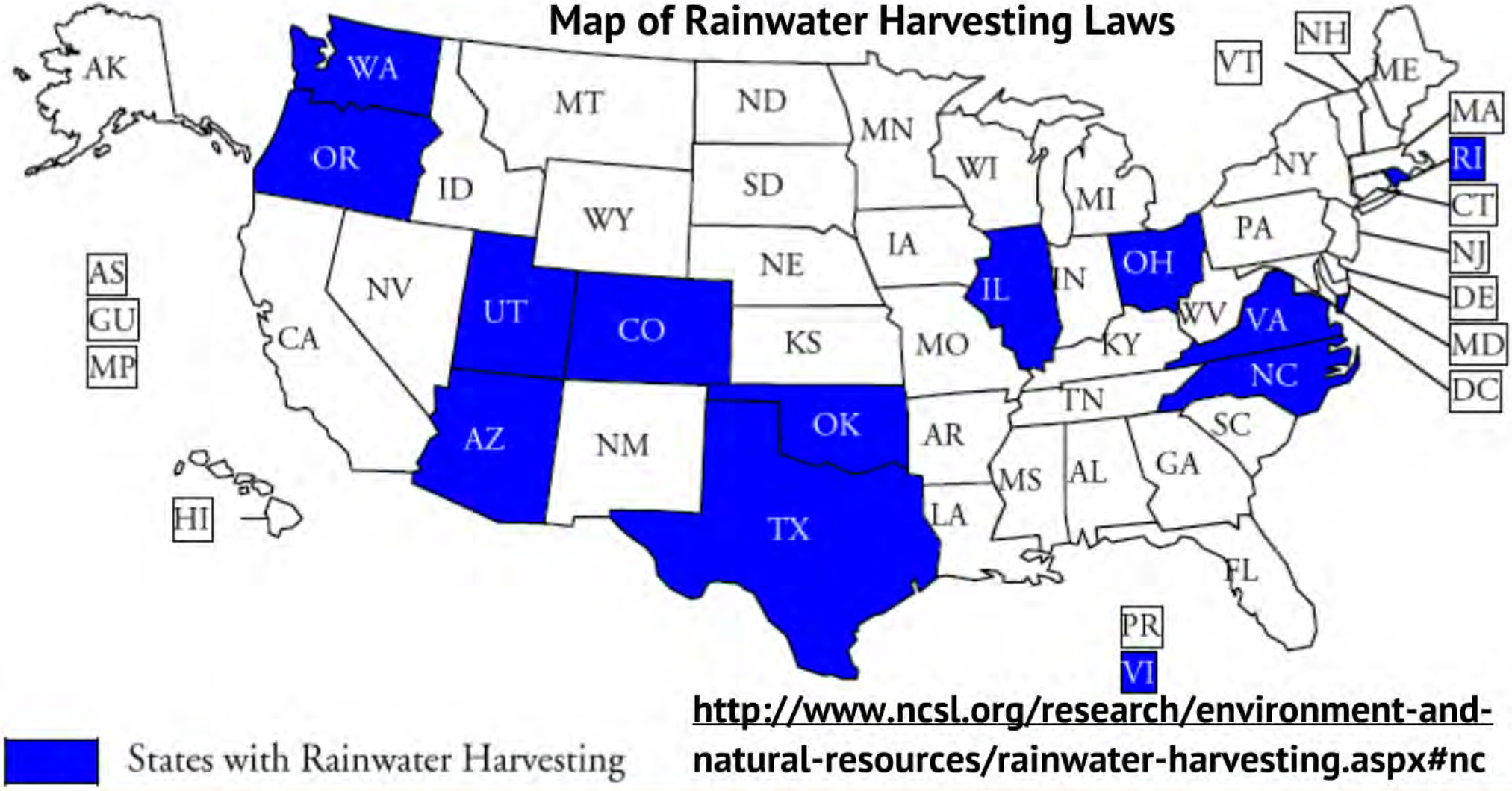
Map of Rainwater Harvesting Laws



States with Rainwater Harvesting

http://www.ncsl.org/research/environment-and-natural-resources/rainwater-harvesting.aspx#nc

1. Land Subsidence*
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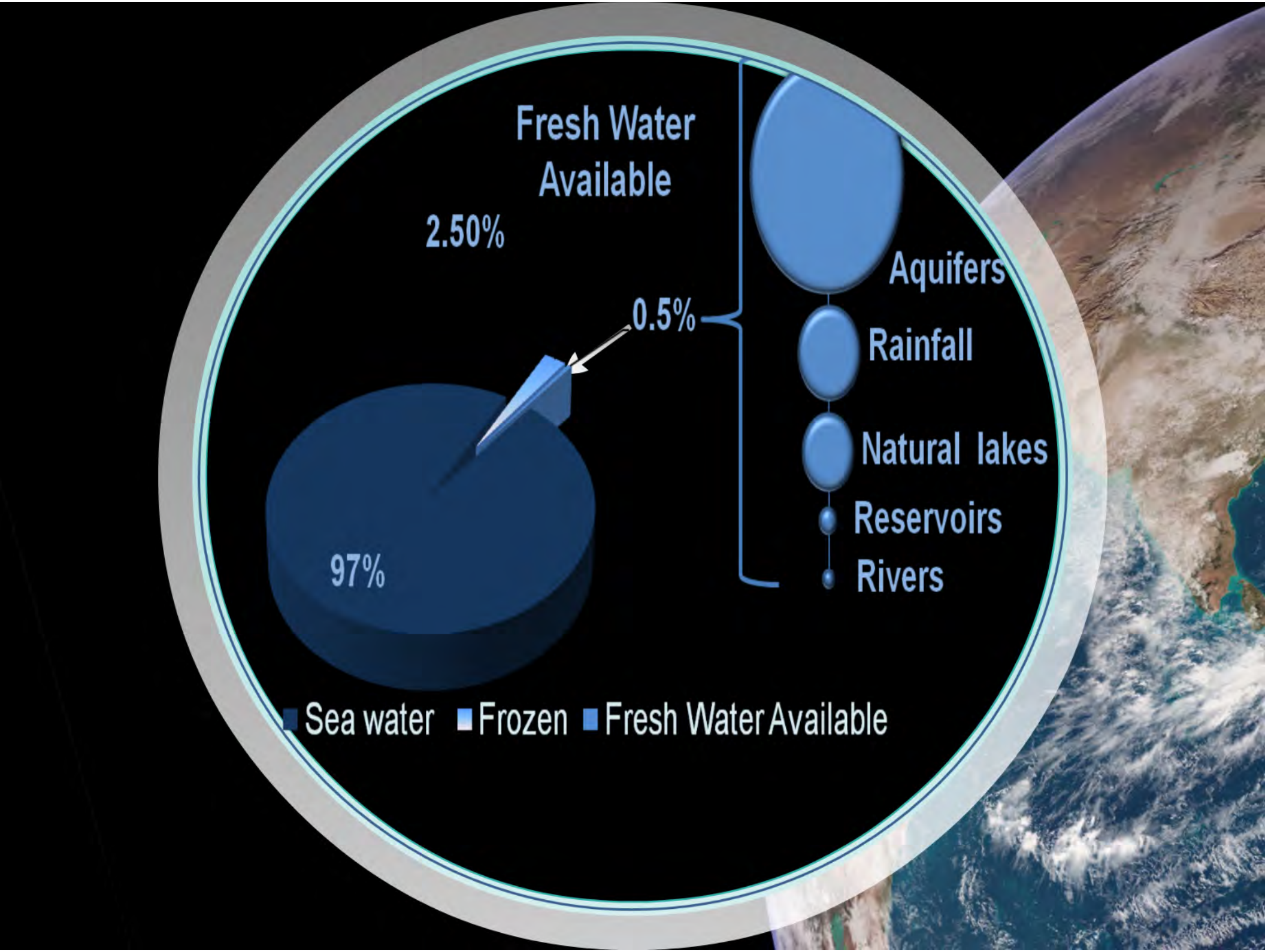
MONEY

&

Flow in the same direction

WATER


FACT
The world is not “running out of water,” but it's not always available when and where people need it.


Fresh Water Available
2.50%
0.5%
97%
Aquifers
Rainfall
Natural lakes
Reservoirs
Rivers
Sea water
Frozen
Fresh Water Available

Human blood 82% Water

Human bones 22% Water

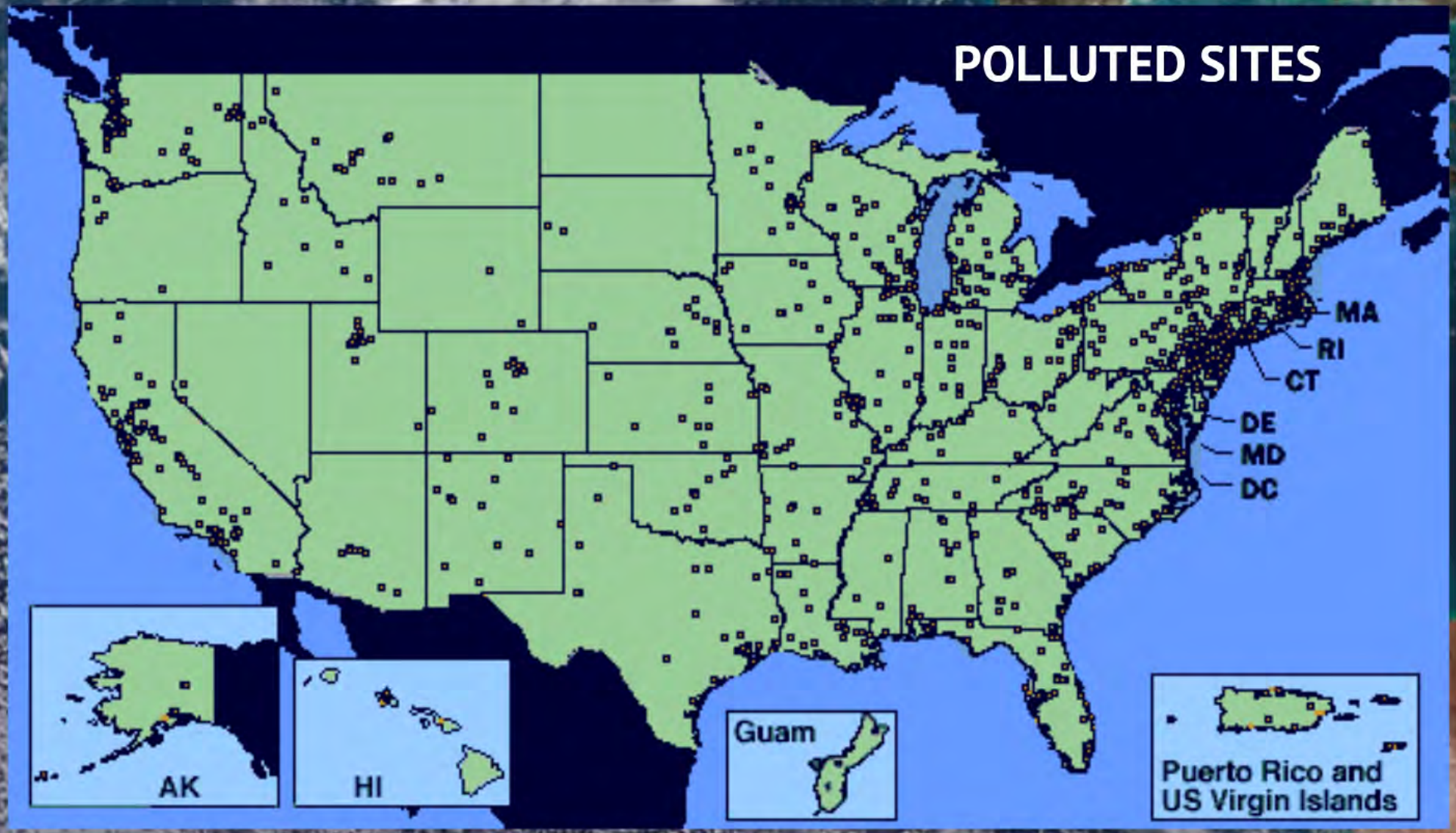
Human brain 75% Water

Human lungs 90% Water

We are 70% Water/ 45 Quarts


People can live without food for for a month, but most can survive only a few days without a drink of water

Ground water can be extremely susceptible to contamination from a variety of common sources, including septic tanks, feed lots, fertilizer, highway de-icing salt, industrial processes, landfills, and underground storage tanks



Super Fund Sites

Population growth by 2030, the earth's projected eight billion inhabitants will need 25 percent more freshwater and 2 times more food.

4 Types of water

Blue - Water extracted from nature and ground water

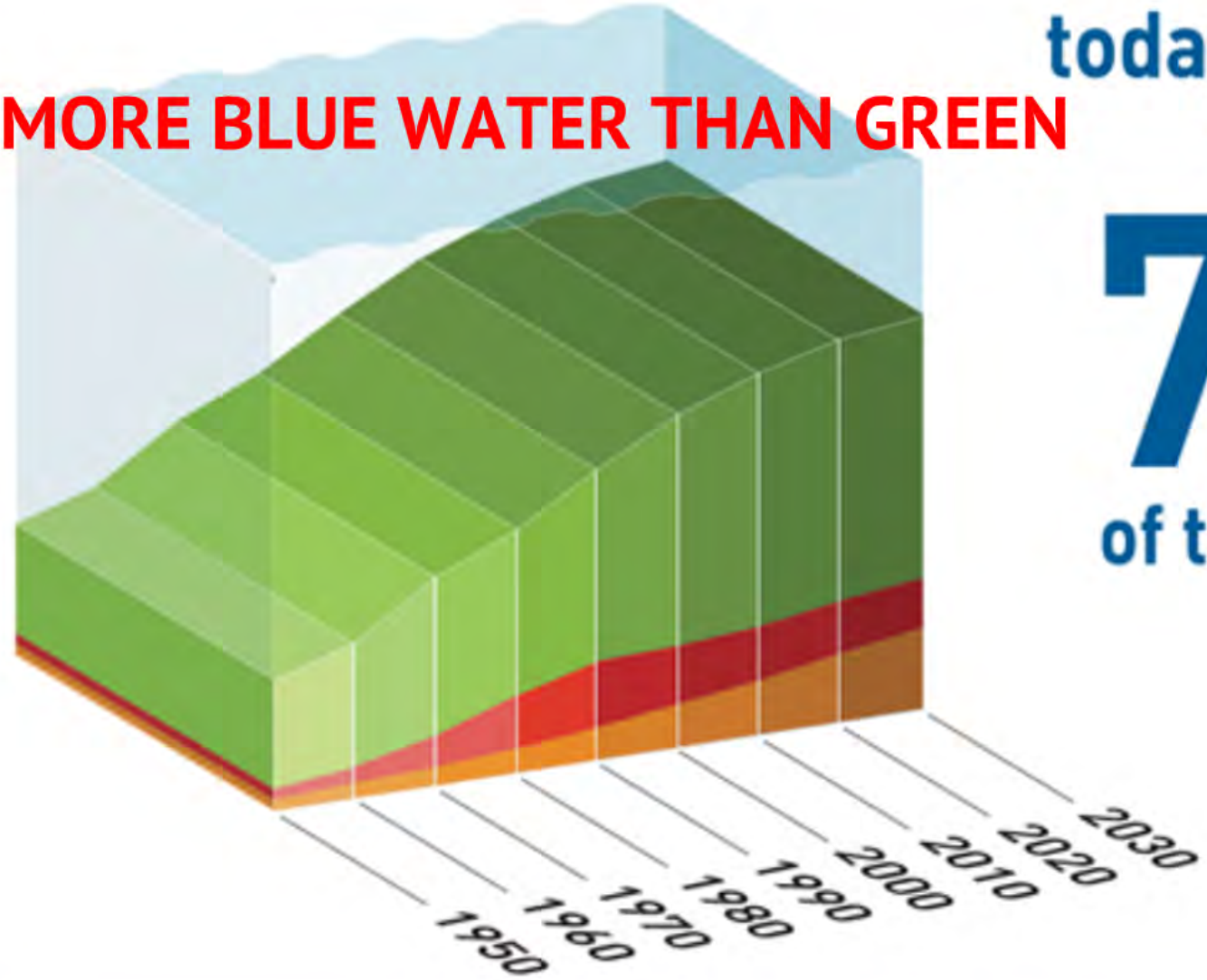
Green - Water that falls directly on crops

Gray - Water that goes back into nature but could be polluted

Black - Water that cannot be cleaned due to industrial waste

BLUE WATER

MORE BLUE WATER THAN GREEN



today agriculture accounts for

70%

of total water use

Agricultural use

Industrial use

Domestic use

www.fao.org/nr/water

Blue Water

- Arizona has been removing underground water at twice the rate that rains can replace it
- California people pump out 15 percent more than the rains replenish. An overdraft of 1.3 million acre-feet a year
- In a good year, the High Plains aquaphor produced three quarters of the wheat traded on the world market

Aquifer Honeycomb Rocks

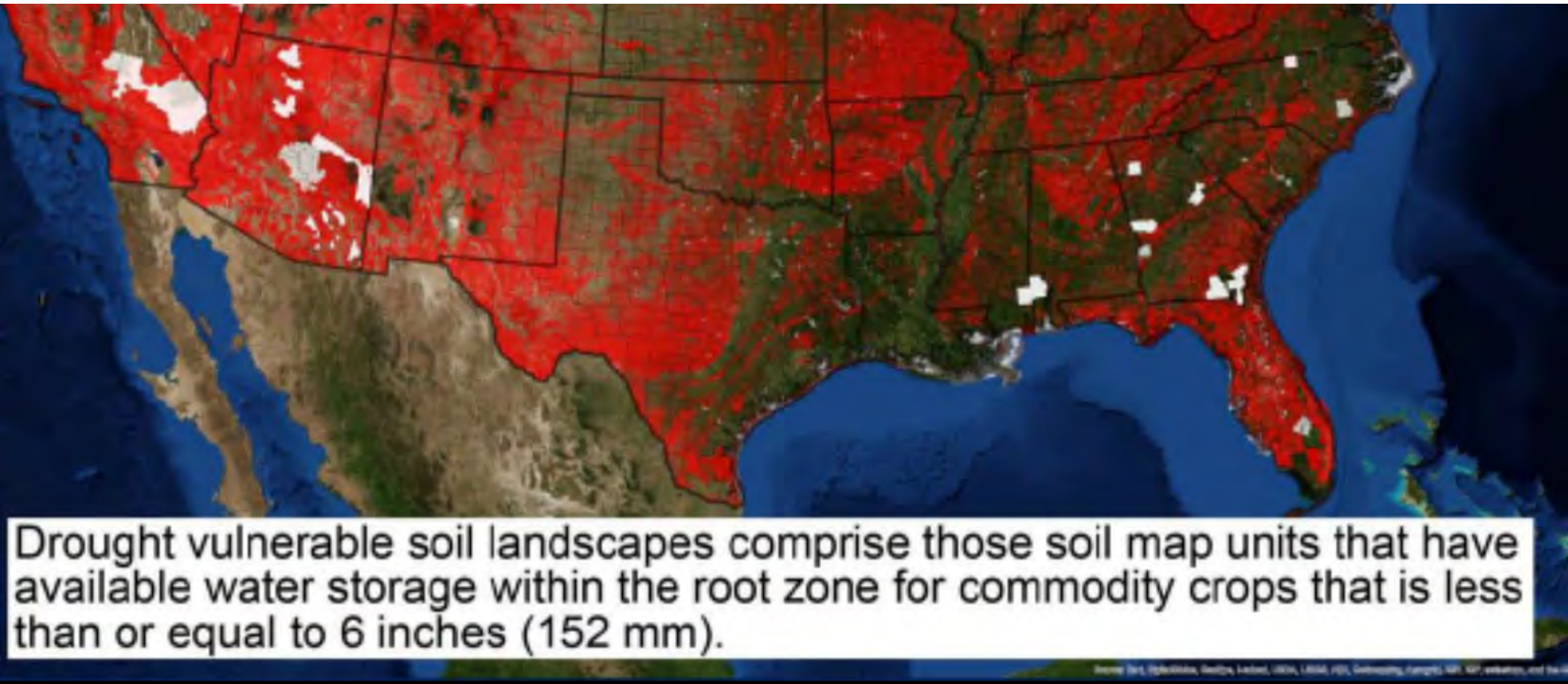

BLUE Water
Saudi Arabia wheat fields


Green Water

Wilting corn causing spike in food prices

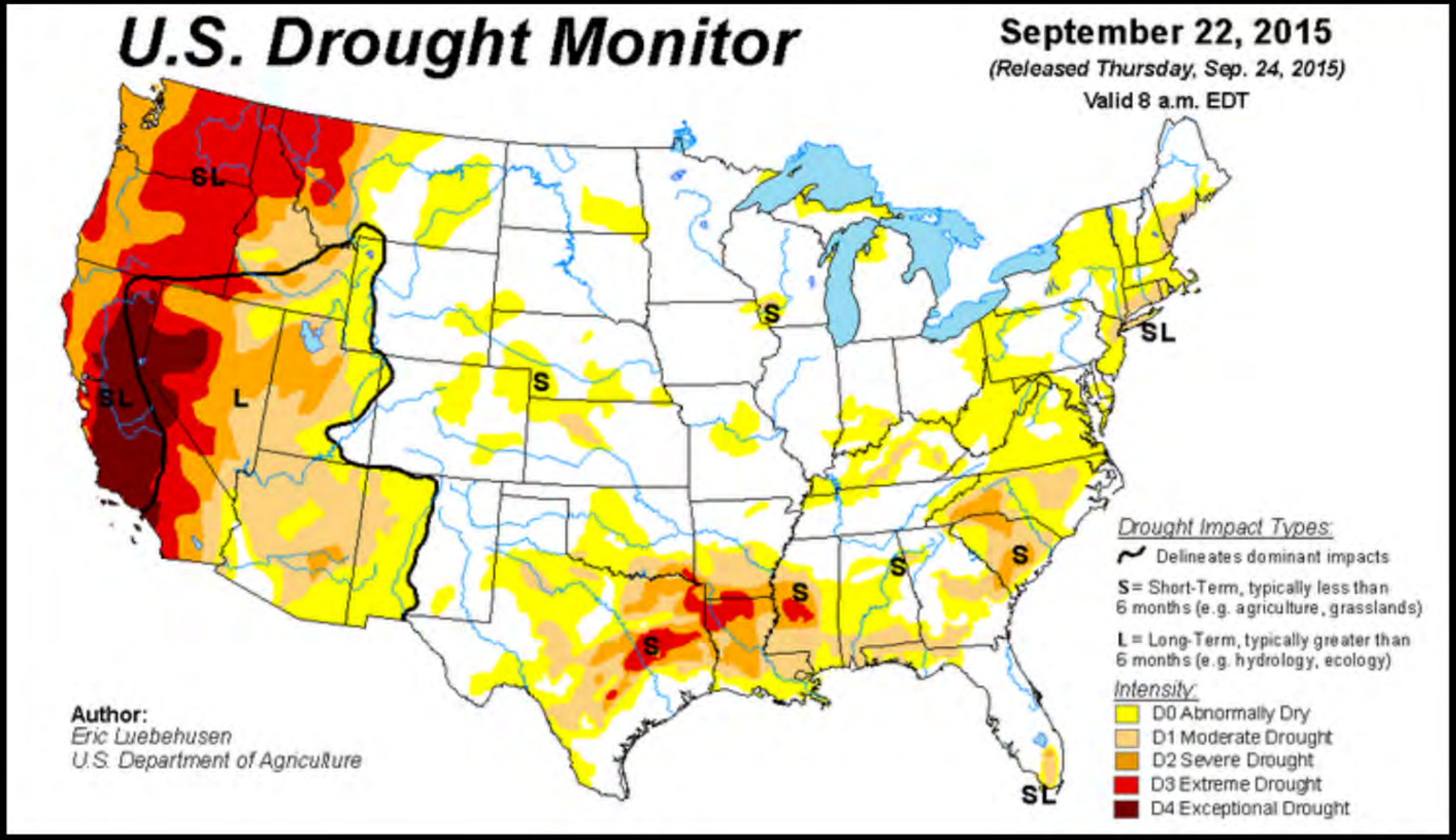
The World Needs Our Wheat

Drought Vulnerable Soil Landscapes (less than or equal to 6 inches)


Drought vulnerable soil landscapes comprise those soil map units that have available water storage within the root zone for commodity crops that is less than or equal to 6 inches (152 mm).

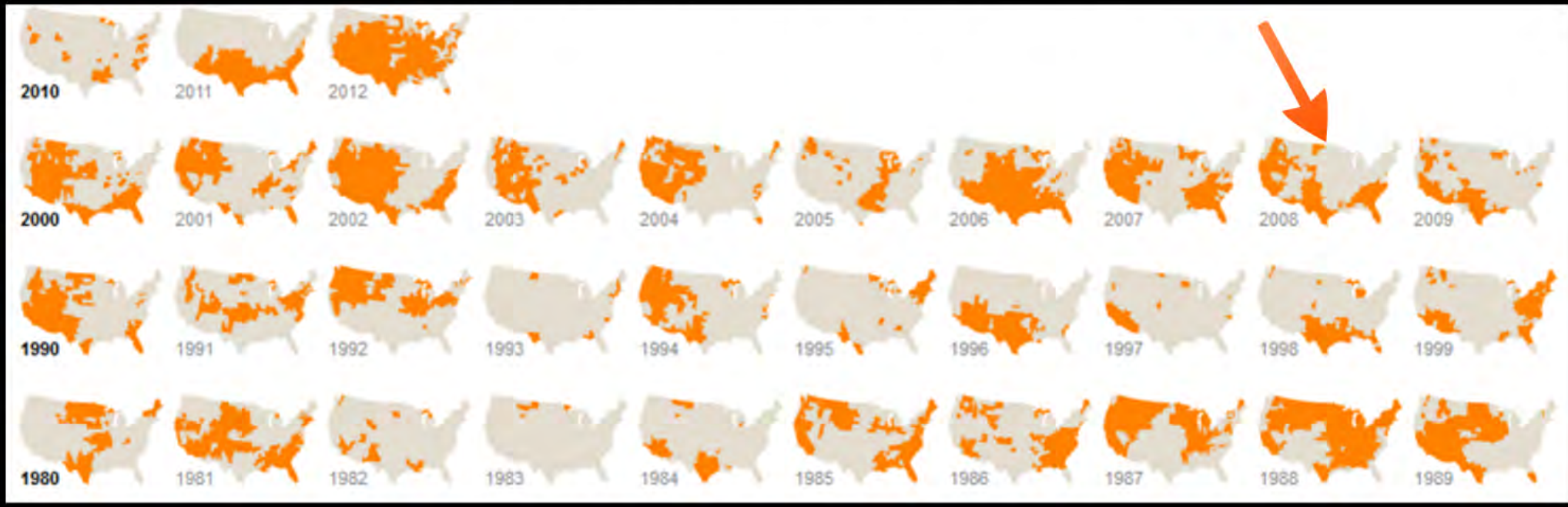

Drought Vulnerable Soil Landscapes for States and Counties in the Conterminous US
Drought vulnerable soil landscapes comprise those soil map units that have available water storage within the root zone for commodity crops that is less than or equal to 6 inches (152 mm).

L = Long Term >6 months



Exceptional | Extreme | Severe | Moderate | Abnormally Dry

Drought Foot Print 1982-2012



Hoover Dam

THE HOOVER DAM SUPPLIES ELECTRICITY TO
29 MILLION PEOPLE

designed capacity **2,080** MEGAWATTS
current capacity **1,617** MEGAWATTS
1931 — 2010

20% chance Lake Mead will go below **1,050 feet** BY **2025**, which could halt generation

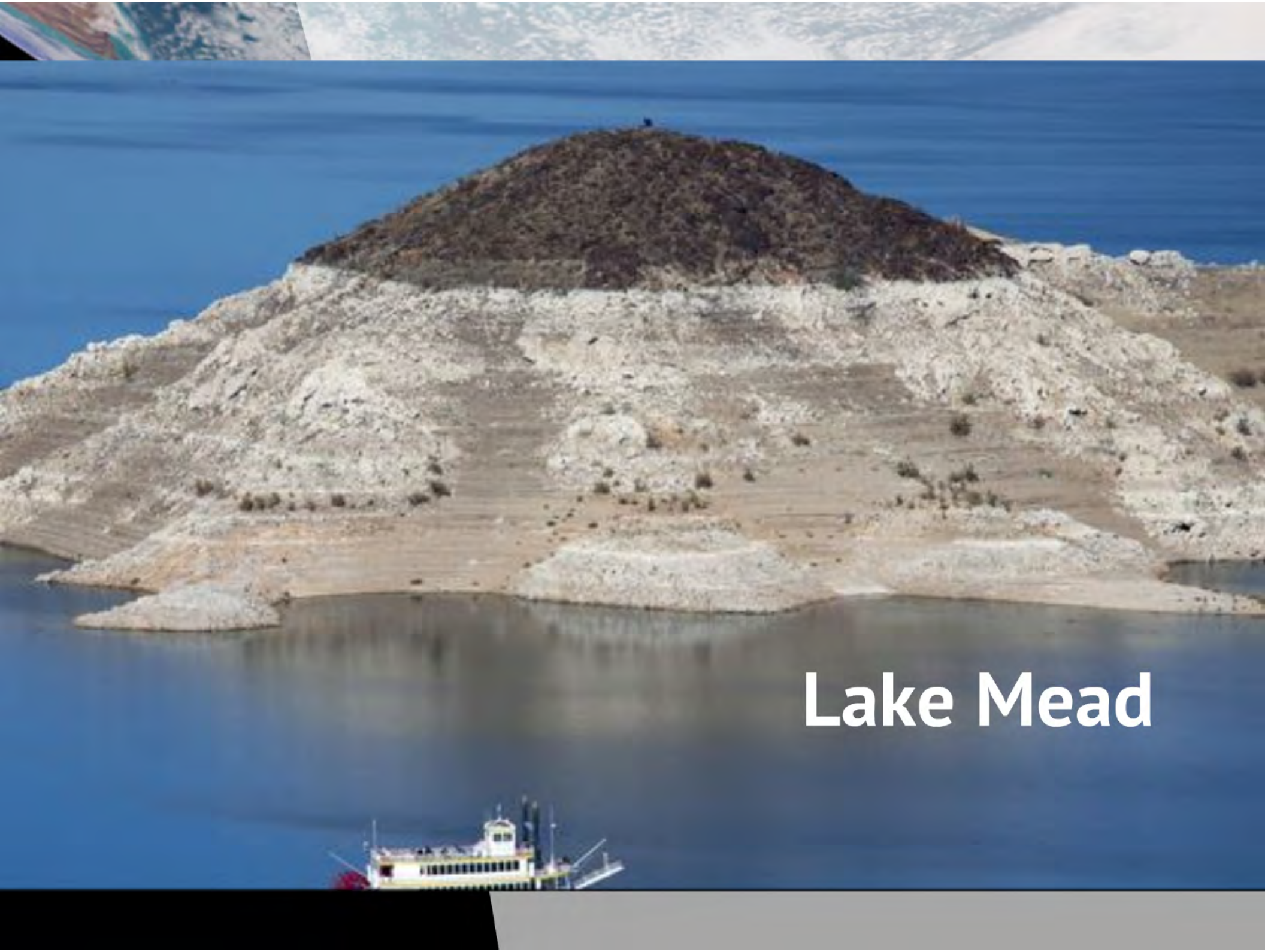
10 YEAR Dry Spell

33% REDUCTION in generating CAPACITY since the late 1990s

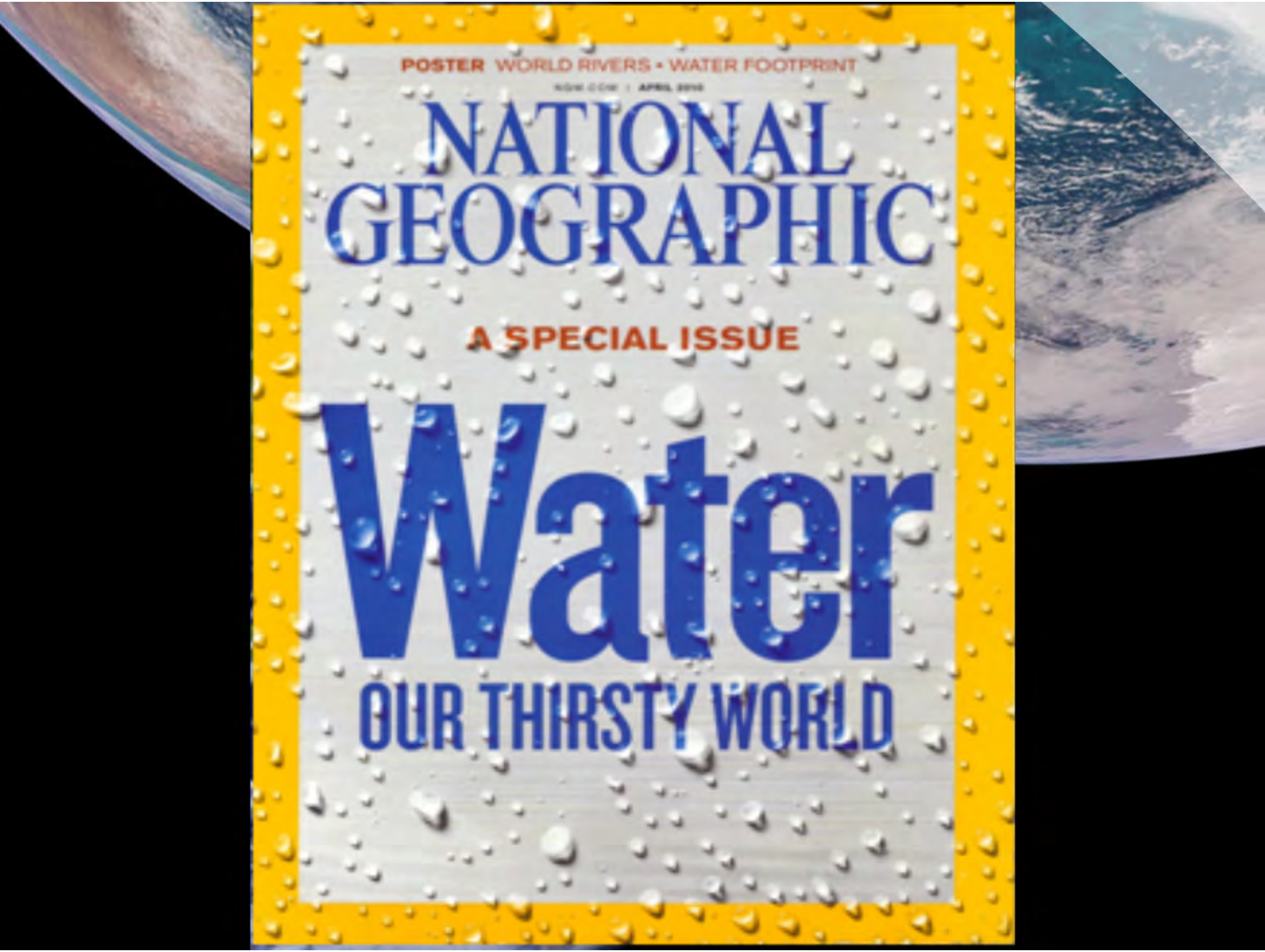
Every FOOT of elevation loss **REDUCES** the power potential by **5.7** mega watts

LAKE MEAD IS ONLY **41%** FULL

The lake has **DROPPED 130 ft.** since 1999


Lake Mead


Lake Michigan drops another 2.5 inches in 2012


POSTER WORLD RIVERS • WATER FOOTPRINT
NATIONAL GEOGRAPHIC
A SPECIAL ISSUE
Water
OUR THIRSTY WORLD

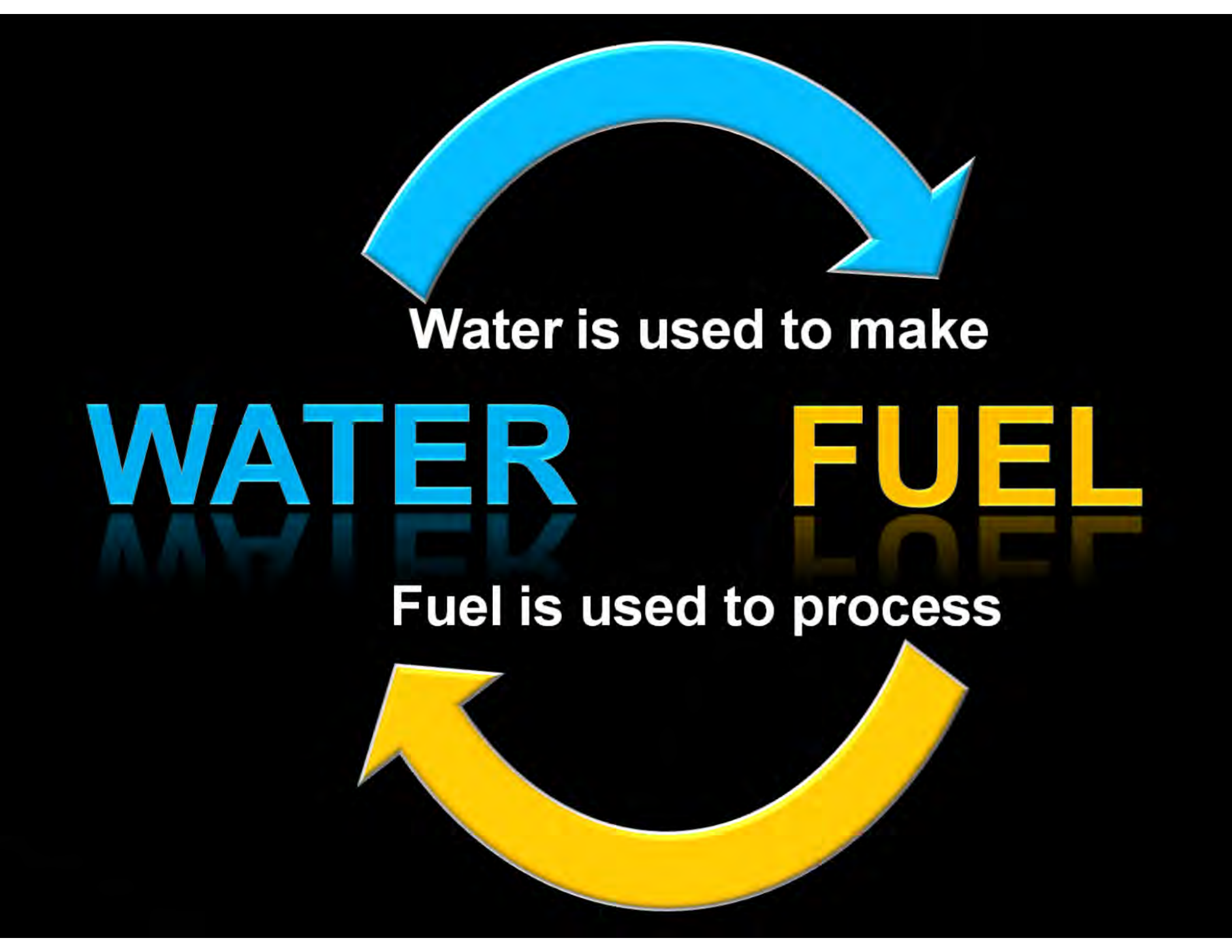
BLUE WATER

E=H2O

E=H2O

Energy and Water Connection

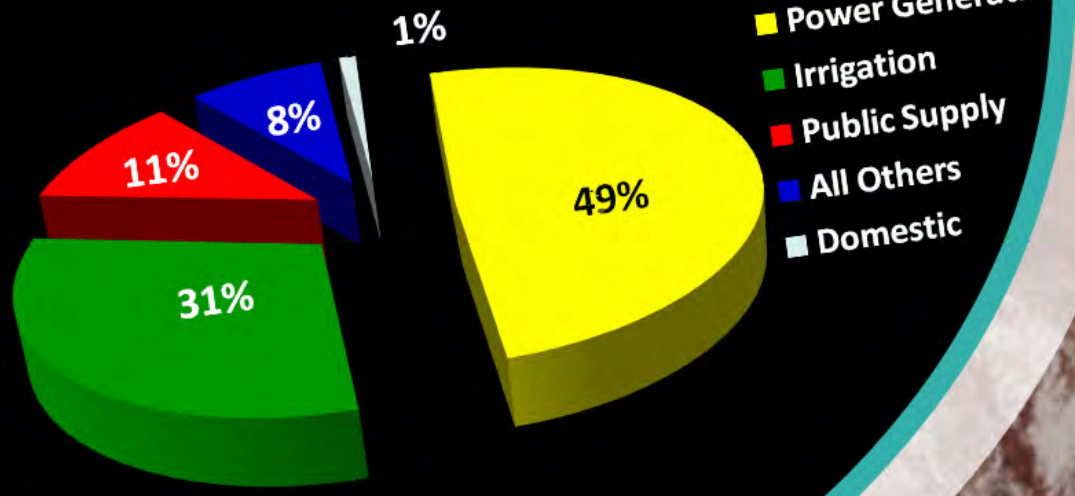
E=H2O


Water is used to make
WATER
FUEL
Fuel is used to process

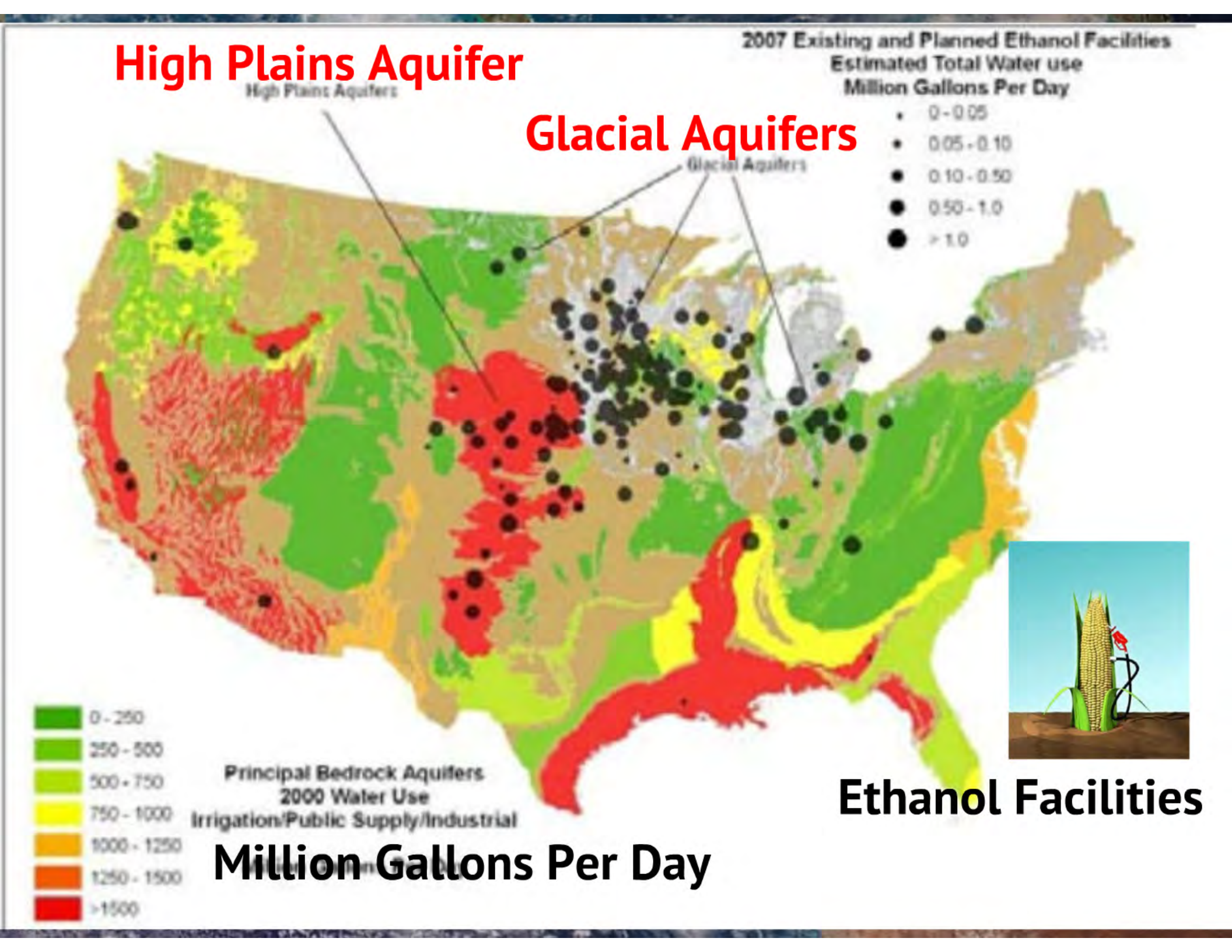
BLUE WATER

Water Stress

US Water Withdrawals by Category




Fracking
Barrnet Shale
9 Bgal/d
Public use
43 Bgal/d
Industrial
20 Bgal/d
Thermalelectric
195 Bgal/d
BLUE WATER
USGS
Irrigation
137 Bgal/d
Ethanol
22 States
349 Mgal/d


High Plains Aquifer
High Plains Aquifers
Glacial Aquifers
Glacial Aquifers
2007 Existing and Planned Ethanol Facilities
Estimated Total Water use
Million Gallons Per Day
0 - 0.05
0.05 - 0.10
0.10 - 0.50
0.50 - 1.0
> 1.0
0 - 250
250 - 500
500 - 750
750 - 1000
1000 - 1250
1250 - 1500
>1500
Principal Bedrock Aquifers
2000 Water Use
Irrigation/Public Supply/Industrial
Million Gallons Per Day
Ethanol Facilities

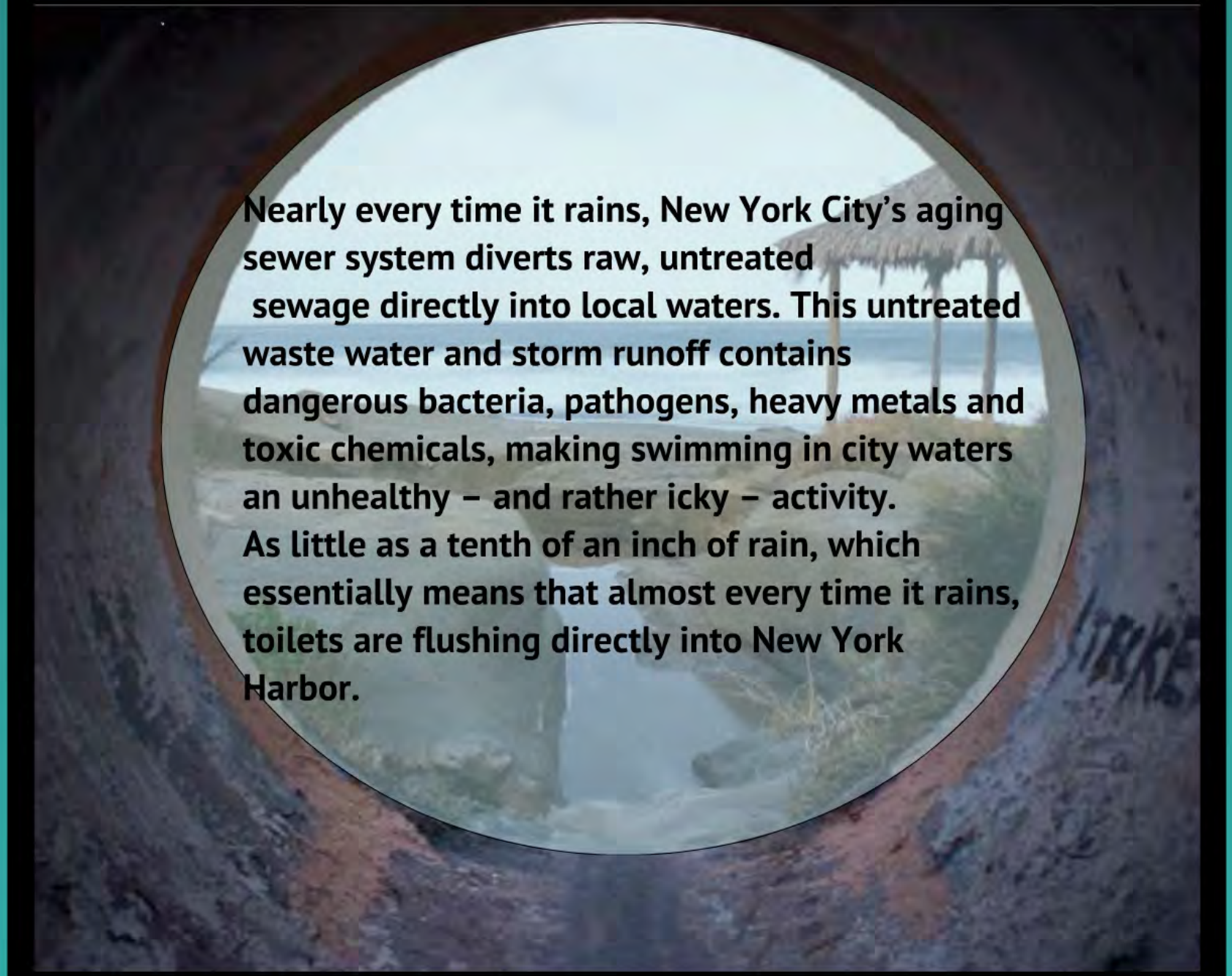
According to a 2009 study in Environmental Science & Technology, the 2007 U.S. Congressional mandate to produce 15 billion gallons of corn ethanol a year by 2015 would annually require an estimated 6 trillion liters of additional irrigation water (and even more direct rainfall) – a volume exceeding the annual water withdrawals of the entire state of Iowa.

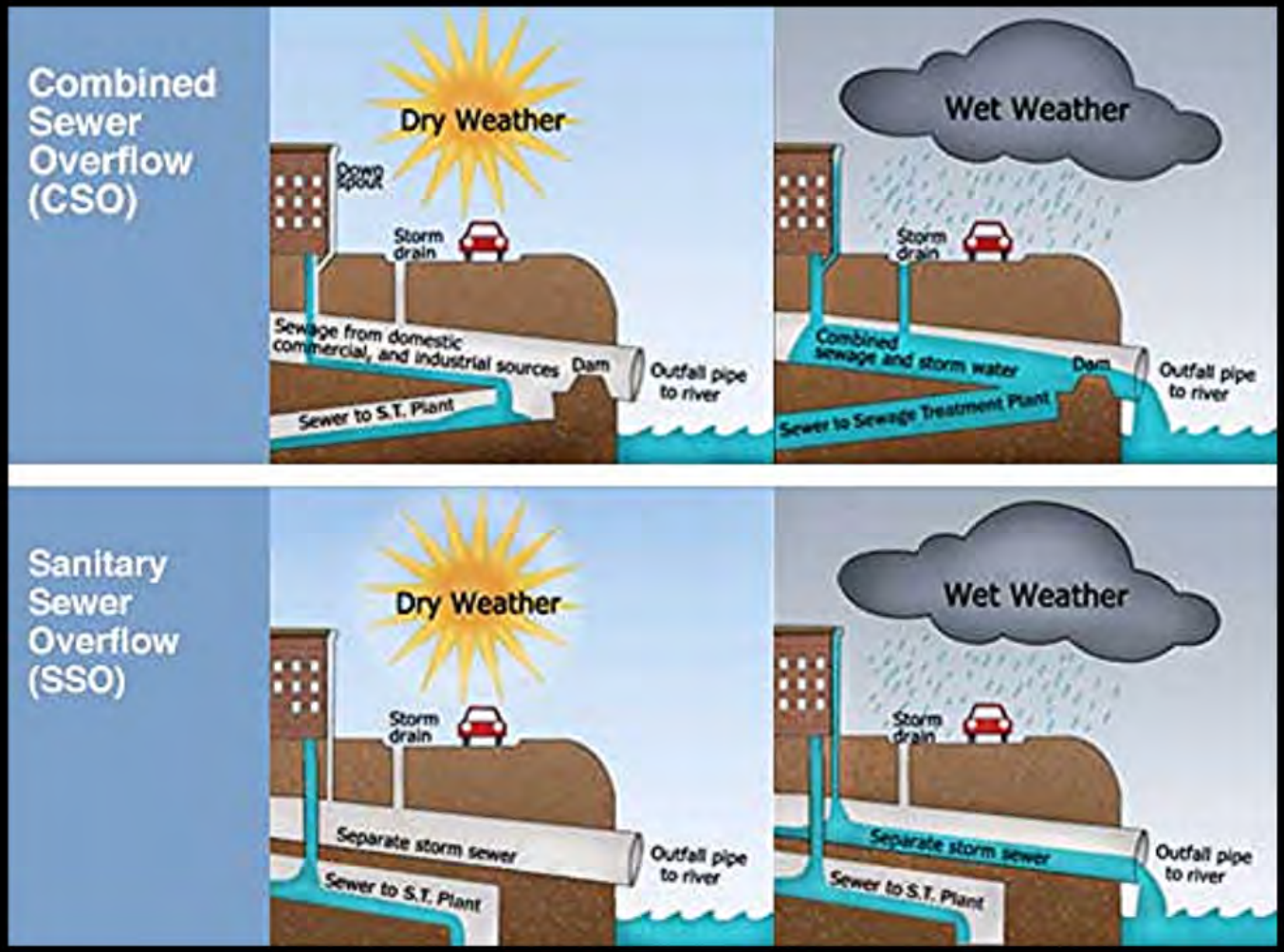
URBAN WATER

Every second, the urban population grows by 2 people

95% of the urban expansion in the next decades will take place in the developing world

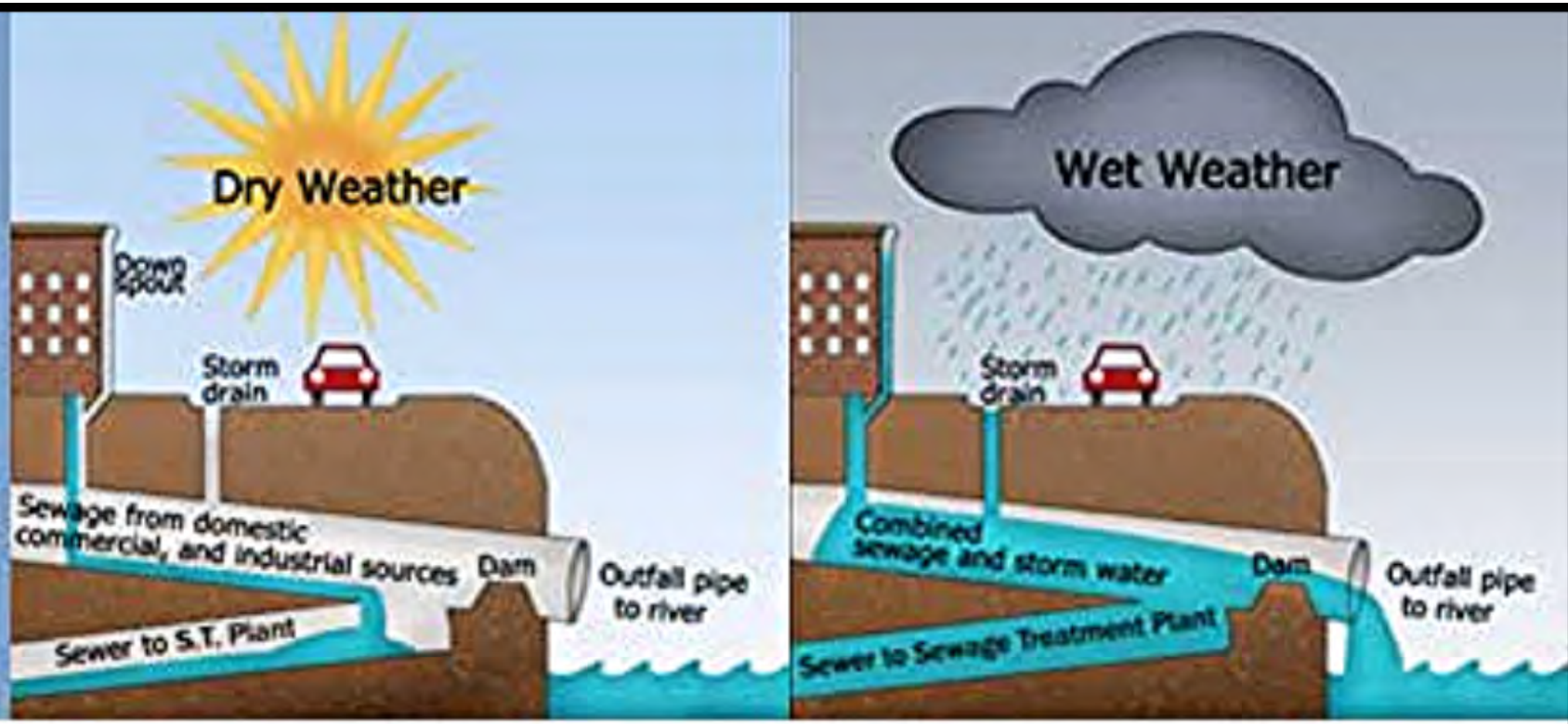
One out of four city residents worldwide, 789 million in total, lives without access to improved sanitation facilities


Nearly every time it rains, New York City's aging sewer system diverts raw, untreated sewage directly into local waters. This untreated waste water and storm runoff contains dangerous bacteria, pathogens, heavy metals and toxic chemicals, making swimming in city waters an unhealthy – and rather icky – activity.
As little as a tenth of an inch of rain, which essentially means that almost every time it rains, toilets are flushing directly into New York Harbor.

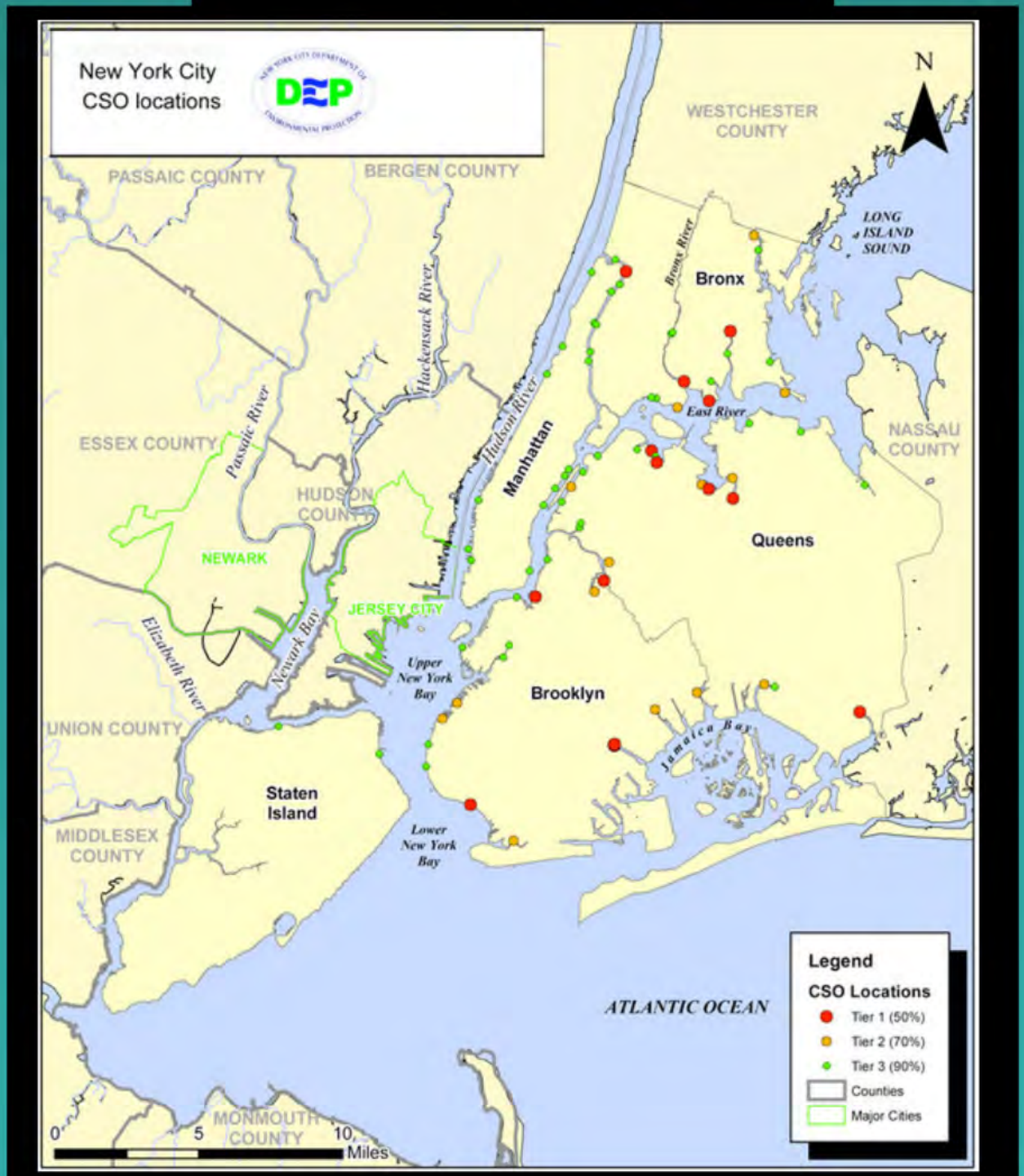


Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO)

Combined Sewer Overflow (CSO)



Sanitary Sewer Overflow (SSO)


New York City
CSO locations
DEP
N
WESTCHESTER COUNTY
PASSAIC COUNTY
BERGEN COUNTY
LONG ISLAND SOUND
Bronx River
Bronx
Hackensack River
Hudson River
Manhattan
East River
NASSAU COUNTY
ESSEX COUNTY
Passaic River
HUDSON COUNTY
Queens
NEWARK
JERSEY CITY
Elizabeth River
Newark Bay
Upper New York Bay
Brooklyn
Jamaica Bay
UNION COUNTY
Staten Island
MIDDLESEX COUNTY
Lower New York Bay
ATLANTIC OCEAN
MONMOUTH COUNTY
0
5
10
Miles
Legend
CSO Locations
Tier 1 (50%)
Tier 2 (70%)
Tier 3 (90%)
Counties
Major Cities

Neighborhood Without a Swimming Pool Gets an Alternative to the Bronx River

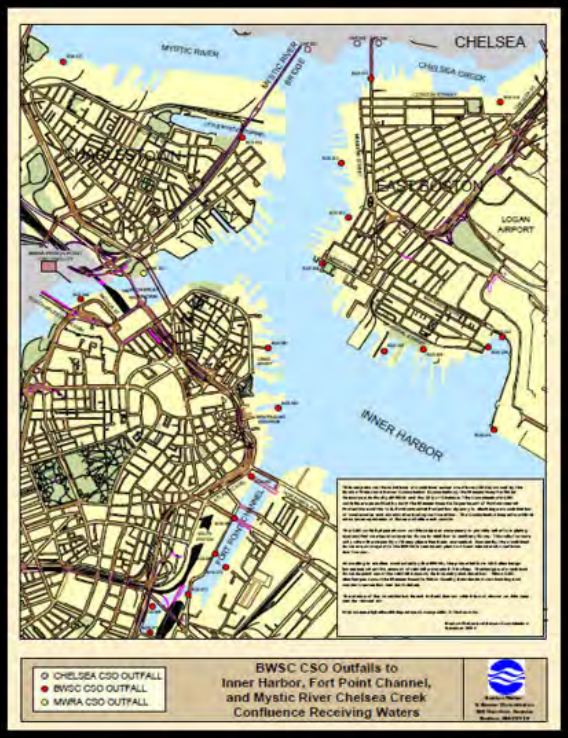
David Gonzalez/The New York Times

On Tuesday, as temperatures neared 100, more than a dozen teenagers were diving off a pier and dock into the murky Bronx River at Hunts Point Riverside Park, despite warnings from police officers about health hazards in the water.

BOSTON

Over the course of 150 years, a large and complex sewage infrastructure has been built to transport and treat Greater Boston's wastewater.


EVERETT
SOMERVILLE
CAMBRIDGE
BROOKLINE
BWSC CSO OUTFALL
MWRA CSO OUTFALL
CAMBRIDGE CSO OUTFALL
Combined Sewer Overflows (CSOs)
Discharging to the Lower Charles River Basin


CHELSEA
MYSTIC RIVER
CHELSEA CREEK
EAST BOSTON
LOGAN AIRPORT
INNER HARBOR
CHELSEA CSO OUTFALL
BWSC CSO OUTFALL
MWRA CSO OUTFALL
BWSC CSO Outfalls to
Inner Harbor, Fort Point Channel,
and Mystic River Chelsea Creek
Confluence Receiving Waters


NORTH DORCHESTER BAY
SOUTH DORCHESTER BAY
THOMPSON ISLAND
QUINCY
BWSC CSO OUTFALL
CSO Outfalls to
Dorchester Bay

Untreated Sewage Discharges to the Great Lakes

More than 24 billion gallons of combined untreated sewage and storm water is dumped into the Great Lakes each year. Bacteria and viruses in untreated sewage pose a significant health risk, and are a major cause of Great Lakes beach closings and swimming advisories.

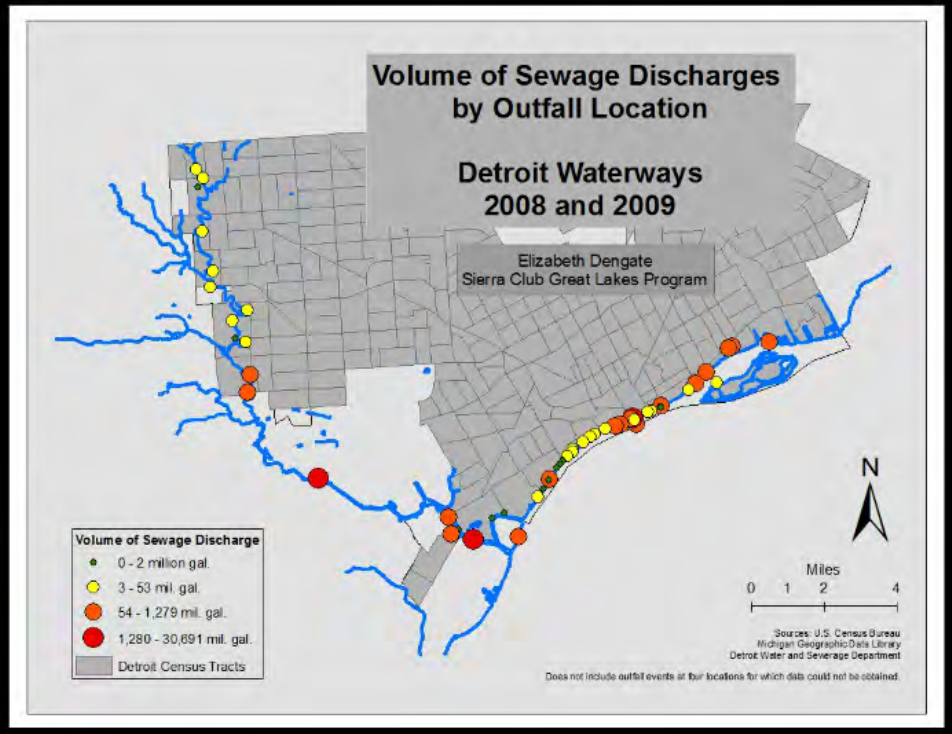
The largest source of combined sewer overflow: Detroit, Cleveland, Milwaukee and Chicago

Source: Alliance for the Great Lakes

Location of CSO Communities in the Lake Michigan Basin

The shaded area defines the Lake Michigan basin, which includes portions of Indiana, Michigan, Wisconsin, and Illinois. The white circles (○) indicate Lake Michigan CSO communities. The black circle (●) indicates Chicago.

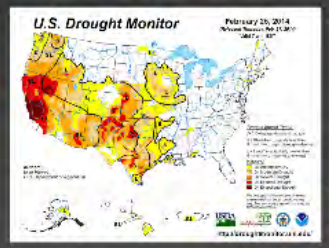
Source: EPA Report to Congress Combined Sewer Overflows to the Lake Michigan Basin


Volume of Sewage Discharges
by Outfall Location
Detroit Waterways
2008 and 2009
Elizabeth Dengate
Sierra Club Great Lakes Program
N
Miles
0 1 2 4
Volume of Sewage Discharge
0 - 2 million gal.
3 - 53 mil. gal.
54 - 1,279 mil. gal.
1,280 - 30,691 mil. gal.
Detroit Census Tracts
Sources: U.S. Census Bureau
Michigan Geographic Data Library
Detroit Water and Sewerage Department
Does not include outfall events at four locations for which data could not be obtained.


772 Cities

2000 Years ??

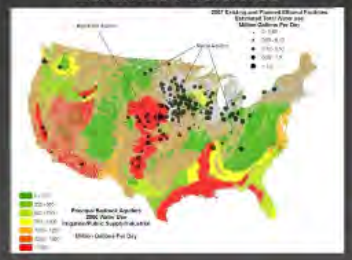
US Drought Monitor



Water Sustainability Index (2050)

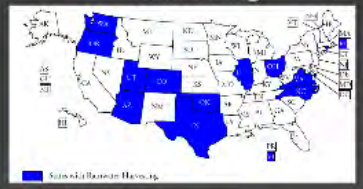
COS Citys

Ethanol Facilities



Super Fund Sites

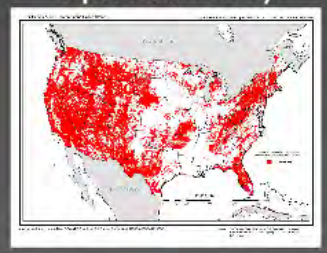
States With Rainwater Harvesting



Land Subsidence

Drought 1989 -2012

Drought Vulnerable Soil Landscapes (less than or equal to 6 inches)



e Pipes

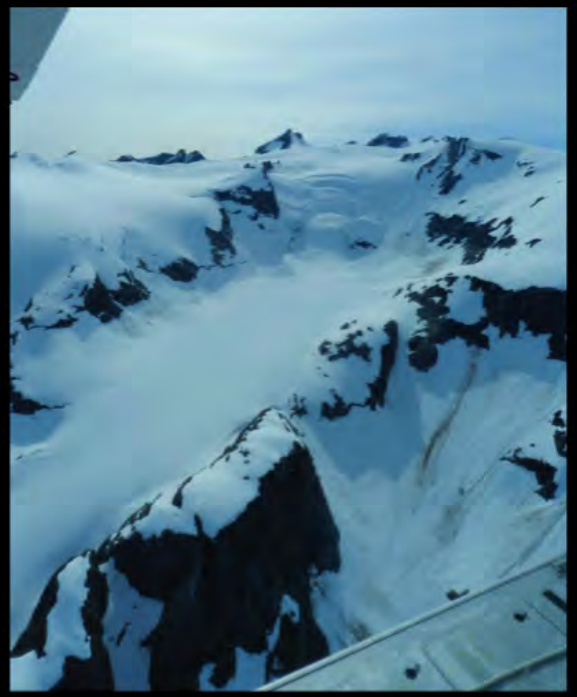
Water in Homes

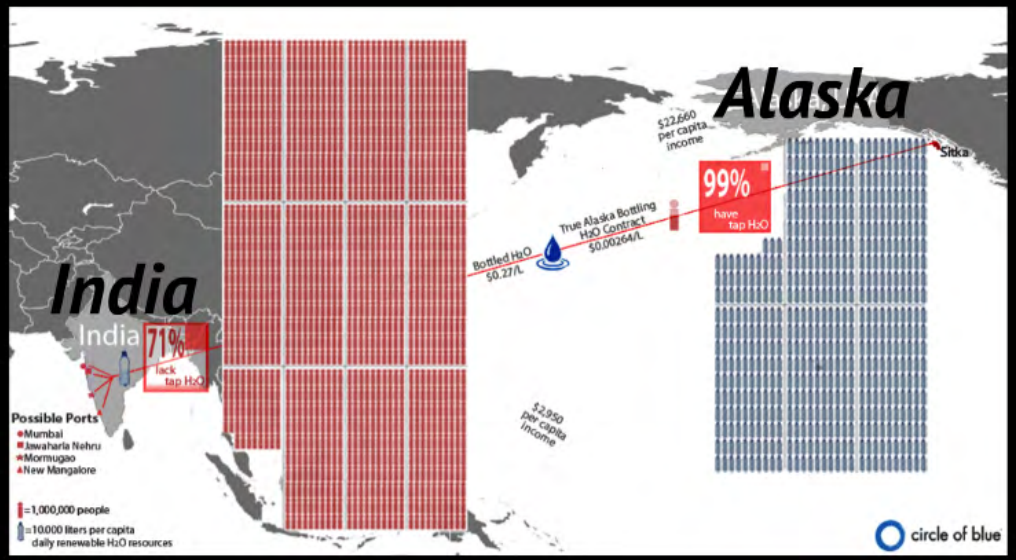
Drought Vulnerable Soil Landscapes (less than or equal to 6 inches)

2000 Years ??

Water has been public

Case Study




India
India
71%
lack
tap H₂O
Possible Ports
Mumbai
Jawaharla Nehru
Mormugao
New Mangalore
=1,000,000 people
=10,000 liters per capita
daily renewable H₂O resources
Alaska
$22,660
Per capita
income
Sitka
99%
have
tap H₂O
True Alaska Bottling
H₂O Contract
$0.00264/L
Bottled H₂O
$0.27/L
$2,950
Per capita
income
circle of blue

The New "Water Barons": Wall Street Mega-Banks are Buying up the World's Water

http://www.globalresearch.ca/

Familiar mega-banks and investing powerhouses such as Goldman Sachs, JP Morgan Chase, Citigroup, UBS, Deutsche Bank, Credit Suisse, Macquarie Bank, Barclays Bank, the Blackstone Group, Allianz, and HSBC Bank, among others, are consolidating their control over water. Wealthy tycoons such as T. Boone Pickens, former President George H.W. Bush and his family, Hong Kong's Li Ka-shing, Philippines' Manuel V. Pangilinan and other Filipino billionaires, and others are also buying thousands of acres of land with aquifers, lakes, water rights, water utilities, and shares in water engineering and technology companies all over the world.

Billionaire T. Boone Pickens owned more water rights than any other individuals in America, with rights over enough of the Ogallala Aquifer to drain approximately 200,000 acre-feet (or 65 billion gallons of water) a year.

What can I do?

How much water does it take to produce a KWH?

Half Gallon Per KWH

Source: Consumptive Water Use for U.S. Power Production
P. Torcellini, N. Long, and R. Judkoff, NREL

How much water does it take to produce a KWH?

18 Gallons Per KWH for Hydro-Electric

Source: Consumptive Water Use for U.S. Power Production
P. Torcellini, N. Long, and R. Judkoff, NREL

Plasma TV

Lighting

20 Incandescent bulbs

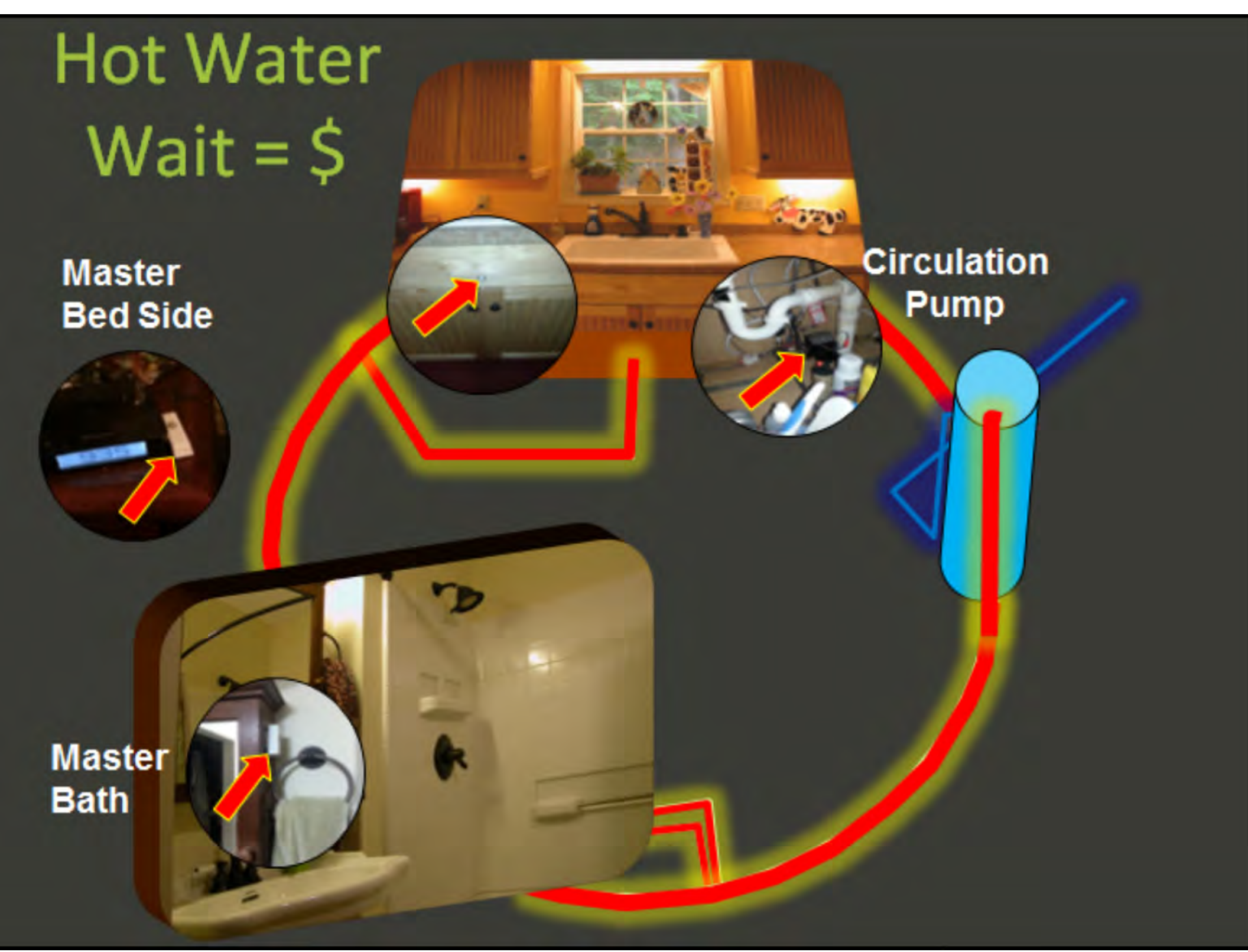
1 Gallon per Hour

20 CFL Bulbs

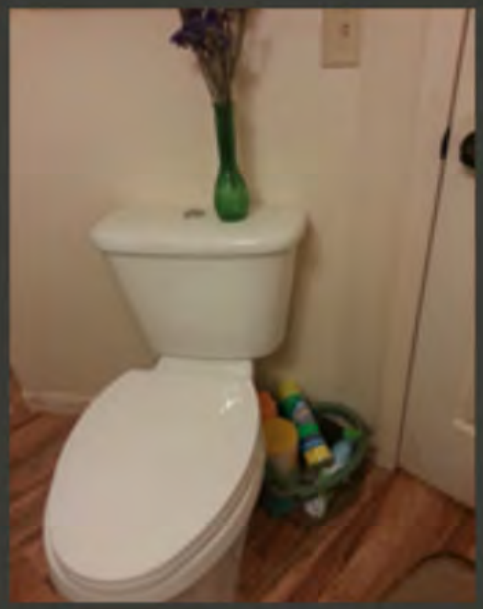
1 Quart per Hour

Coffee pot with hot plate

3 quarts per hour


Hot Water
Wait = $
Master
Bed Side
Circulation
Pump
Master
Bath

1



2

3

4

5

6

7

Large Exterior Water Reduction Strategies

- **Smart Irrigation Controllers**
- **Rain Water Catchment Systems**

Absolute numbers of people don't influence water demand as much as changing diet and lifestyle

Is water resilient?

Resilient:
1. springing back; rebounding.
2. returning to the original form or position after being bent, compressed, or stretched
3. recovering readily from illness, depression, adversity, or the like; buoyant


HOPE?
YES!!
P&G

Sustainable Quality of life = Sustainable Water

We can't wait!


THANK YOU