

The Money Is In the Pipes

The Whole Story About Saving Water in Homes



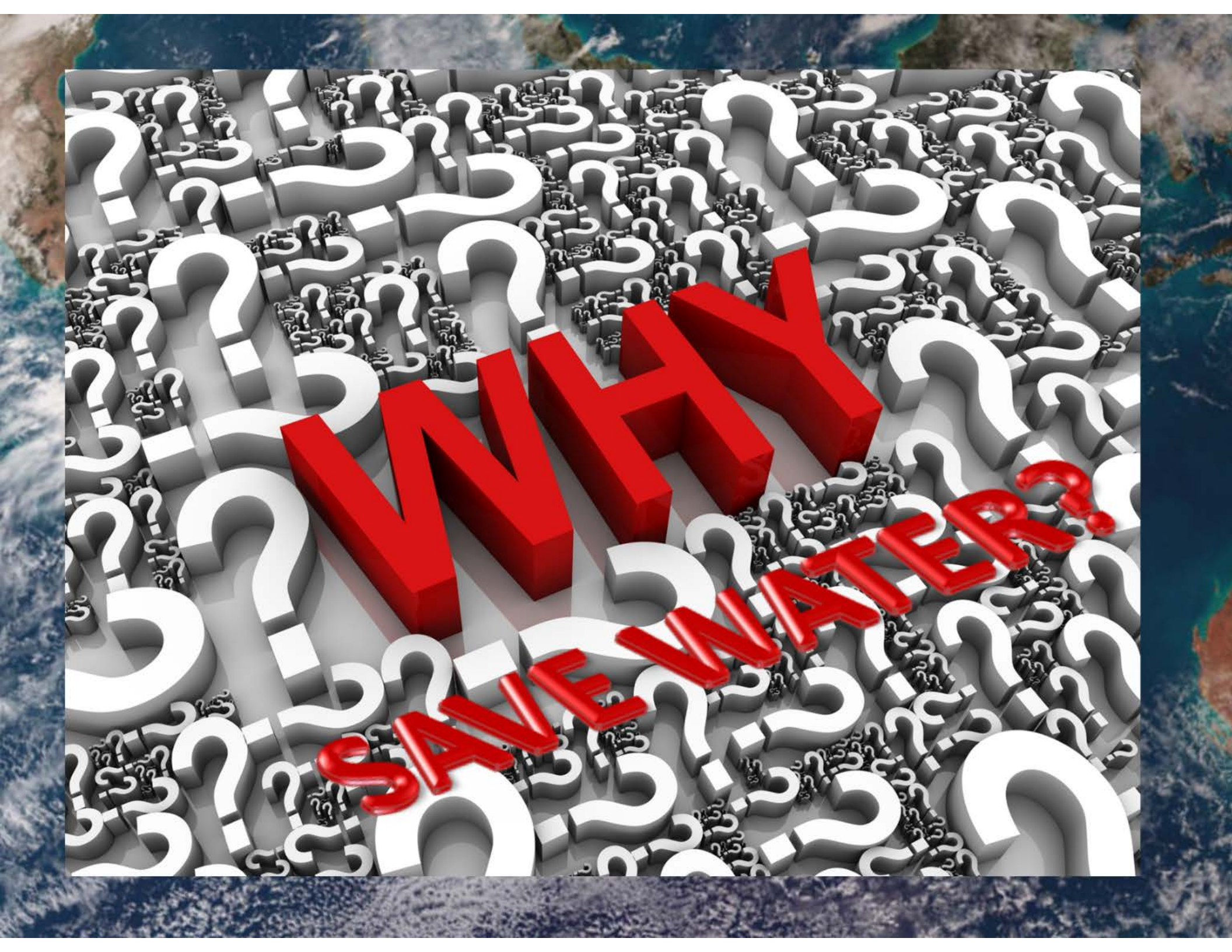
2015

**“We never know the worth of water till the well is dry.”
Thomas Fuller, 1732**



Learning Objectives

- 1. Learn the connection between energy, water and food and how to affect change.**
- 2. Receive the supporting data for future action in your home and those you serve.**
- 3. Learn what we can do**



Circle of Blue's 2012 Water Pricing Survey

City	Service Area Population (in thousands)	Average Monthly Bill for Family of Four Using 50 gallons/person/day % change from 2011 bill (50 gpd)	Average Monthly Bill for Family of Four Using 100 gallons/person/day % change from 2011 bill (100 gpd)	Average Monthly Bill for Family of Four Using 150 gallons/person/day % change from 2011 bill (150 gpd)
Increasing Block		50 gpd	100 gpd	150 gpd
Denver	1300	21.57	39.36	69.90
Tucson	775	21.29	39.50	88.86
Dallas	1306	17.62	40.28	95.82
Jacksonville	614	23.11	41.12	59.14
Las Vegas	2000	24.79	41.13	61.53
Charlotte	774	16.41	43.69	86.25
Fort Worth	625	23.26	45.66	70.78
San Jose ¹	107	27.23	47.73	70.61
Columbus	1115	27.80	50.00	72.20
Houston	2060	27.78	53.46	95.82
Austin	796	26.16	59.16	115.77
Boston	609	34.72	71.39	108.74
San Francisco	2400	40.50	77.30	114.10
San Diego	1300	48.53	80.83	116.02
Atlanta	1200	42.64	91.92	141.20

\$67.57
Savings

\$67.49
Savings

\$98.56
Savings

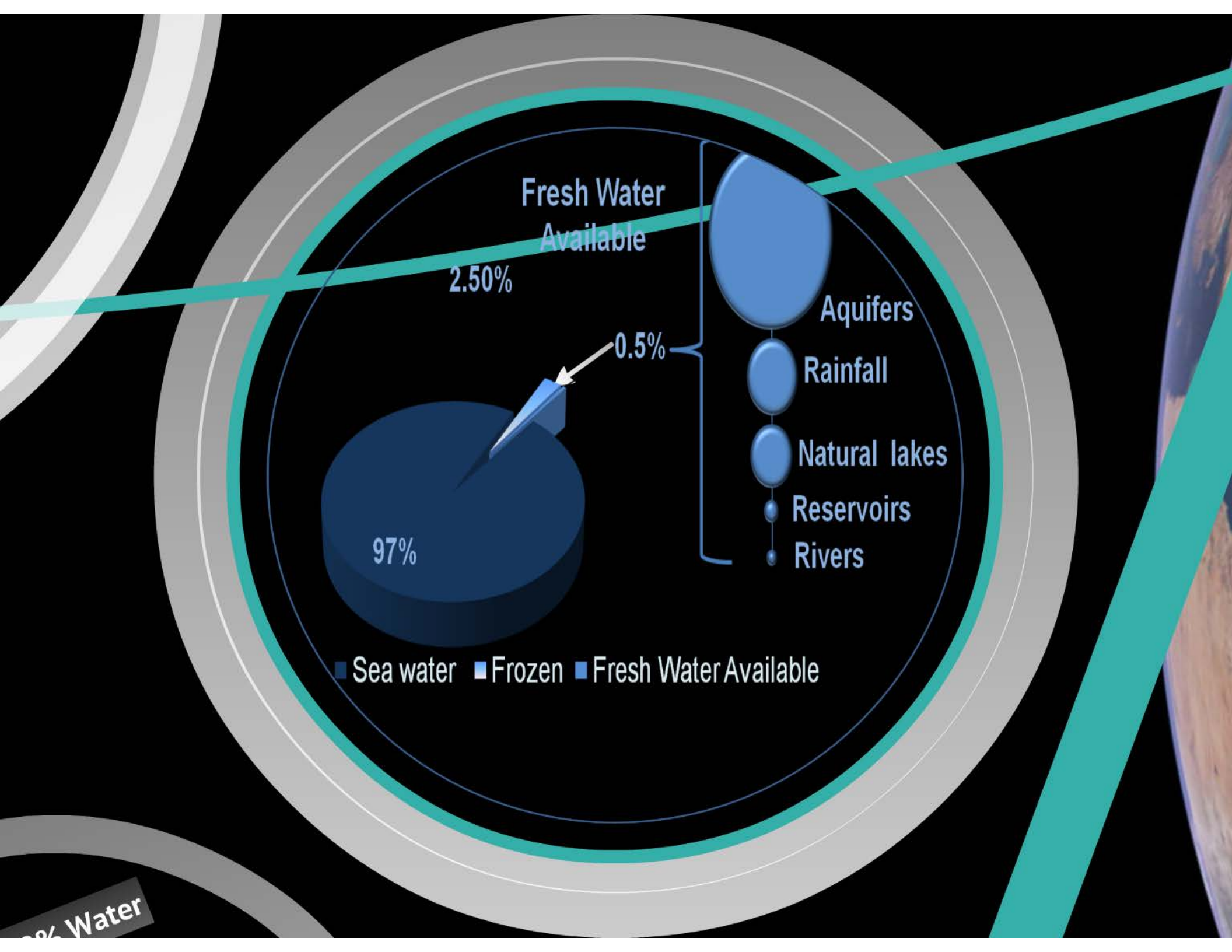
<http://www.circleofblue.org/waternews/wp-content/uploads/2014/05/WaterPricing2014TableInteractive.pdf>

Water Facts



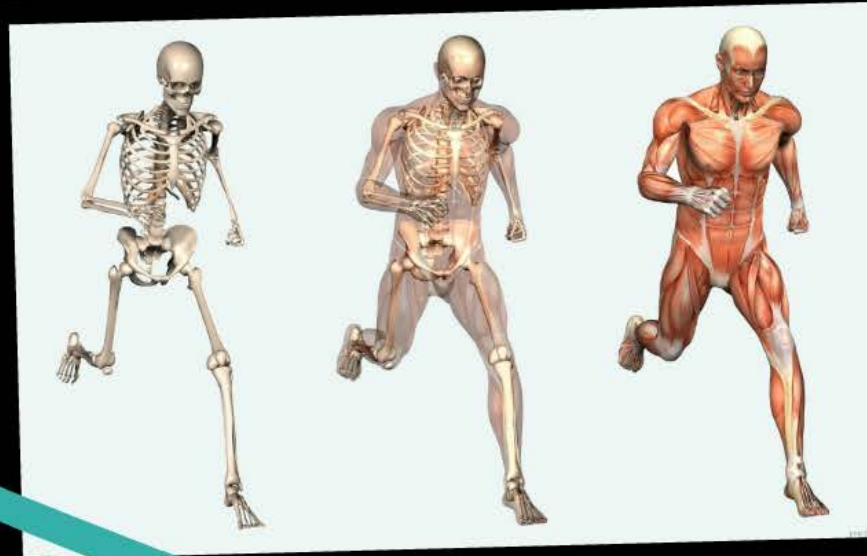
FACT

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



Human bones 22% Water

Human blood 82% Water

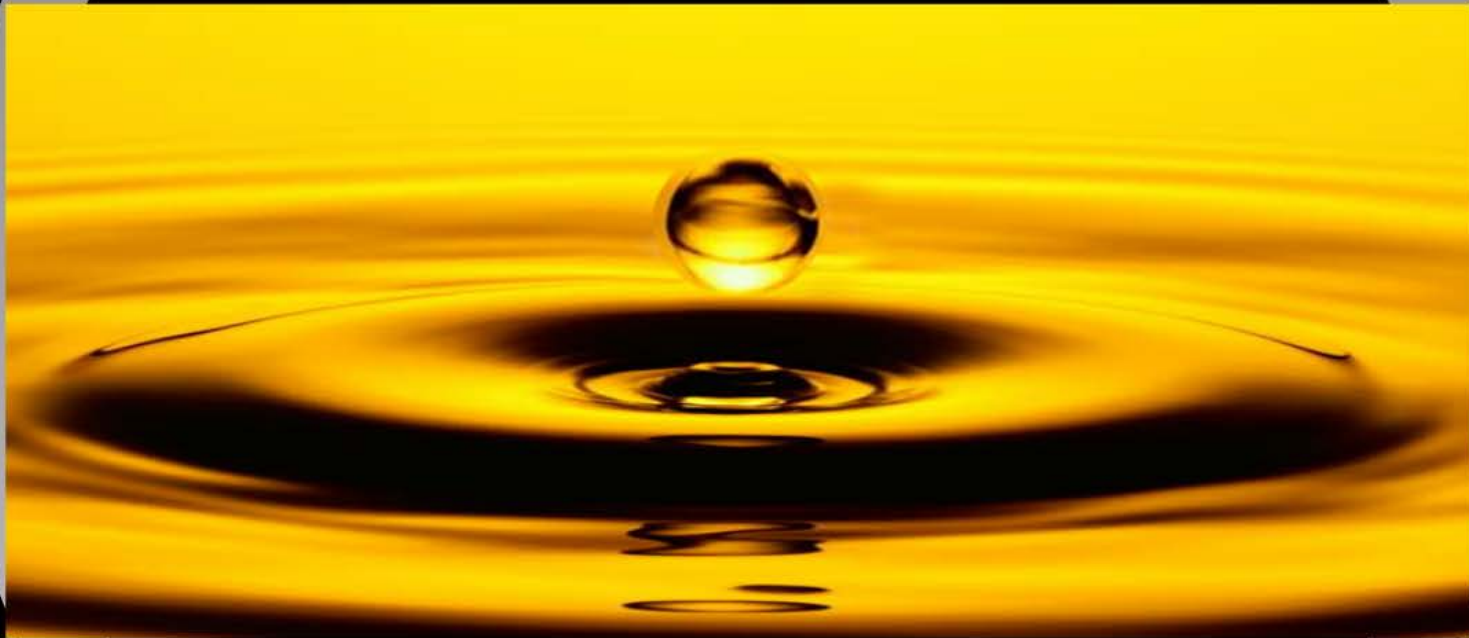


We are 70% Water/ 45 Quarts

Human brain 75% Water

Human lungs 90% Water

1 Drop of oil



**Pollutes 9.9
gallons of water**

FACT

1. The average American household uses approximately 146,000 gallons of fresh water annually.
2. Americans drink 1 billion glasses of tap water per day.
3. 77 billion gallons of ground water are used in America each day, compared to 34 billion in 1950.
4. 40% of the nation's drinking water and 92% of our total fresh water supply comes from ground water (BLUE).
5. 75% of our cities derive all or part of their water from underground sources (BLUE).
6. 99% of the rural populations supply their own water from their own wells, using ground water (BLUE).



&



MONEY

Flow in the same direction

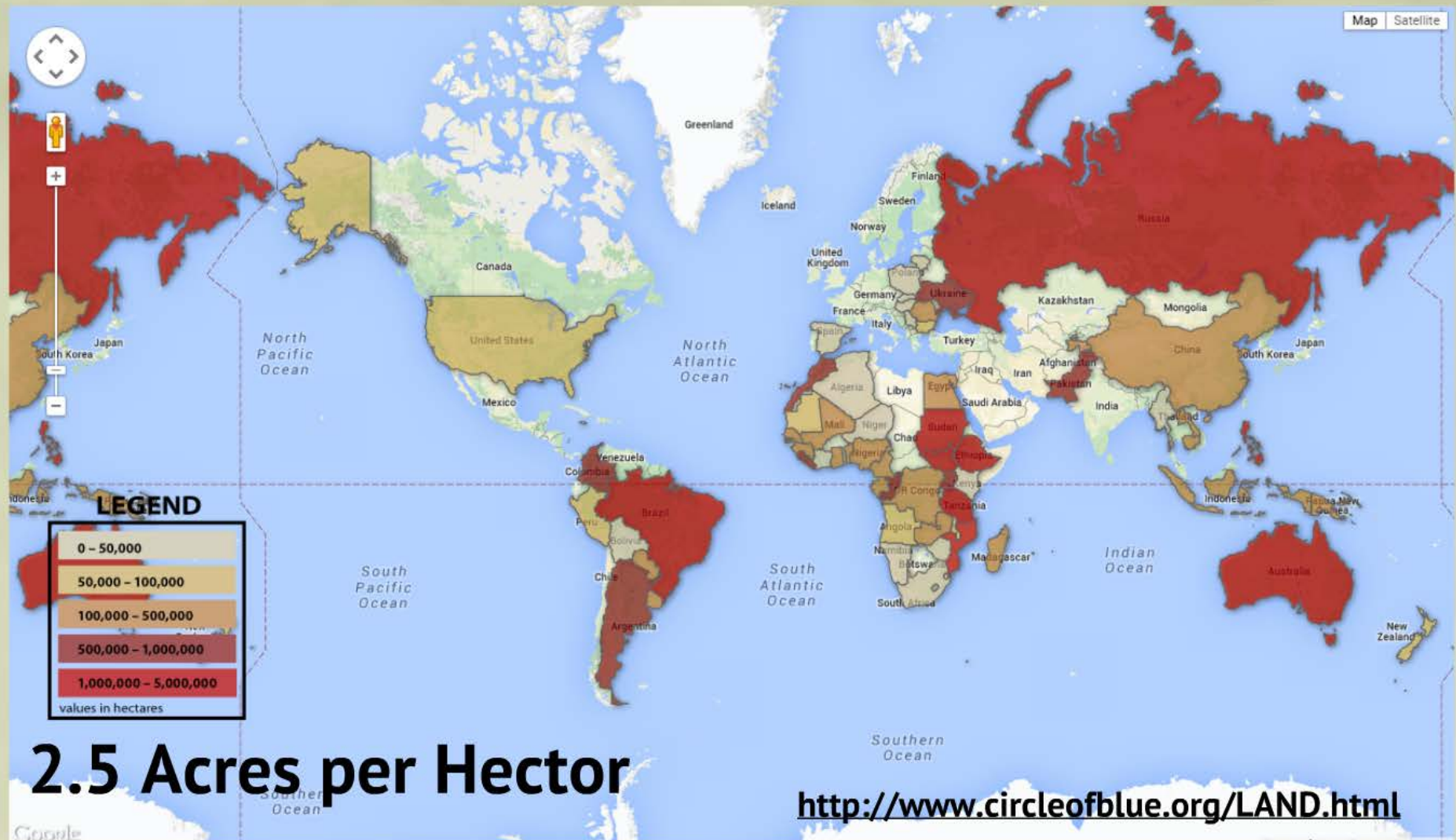
WATER

The New “Water Barons”: Wall Street Mega-Banks are Buying up the World’s Water

A disturbing trend in the water sector is accelerating worldwide. The new “water barons” – the Wall Street banks and elitist multibillionaires – are buying up water all over the world at unprecedented pace.

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.

Global Map of "Land Grabs" By Country and By Sector





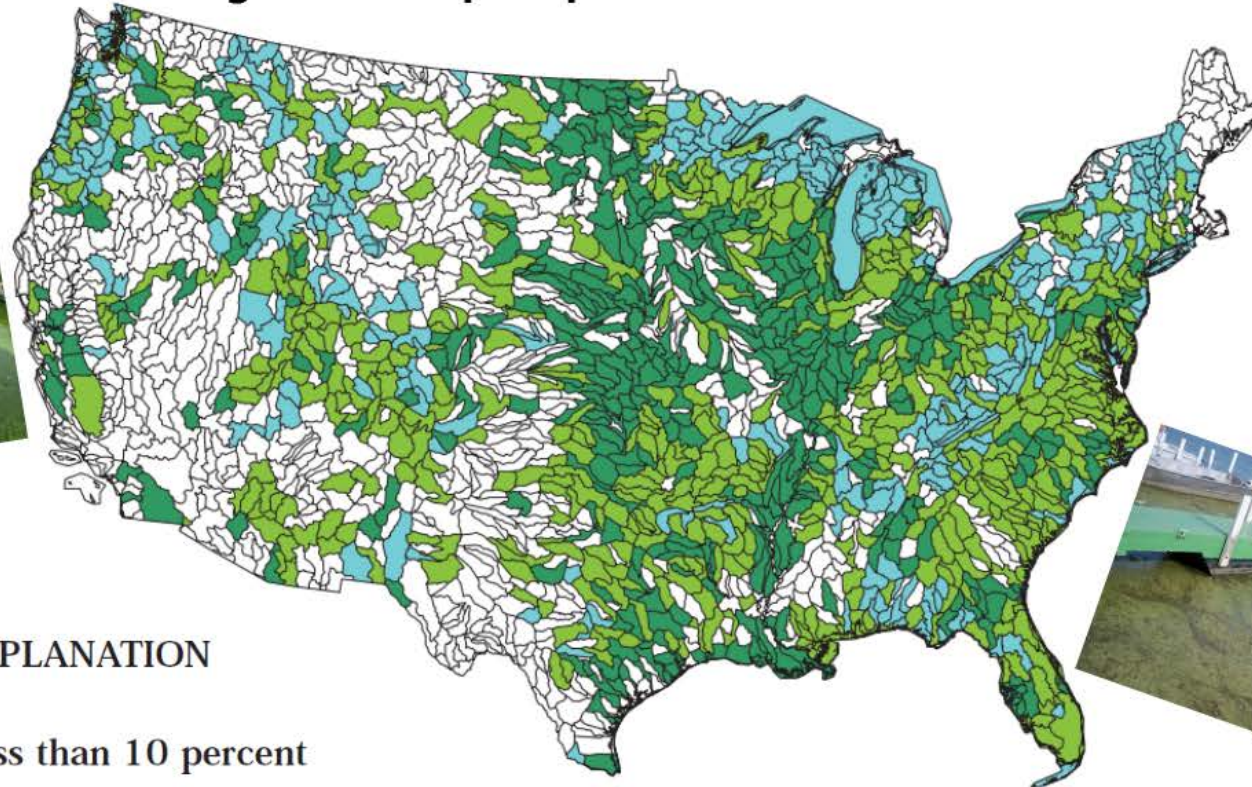


Ground water can be extremely susceptible to contamination from a variety of common sources, including oil, septic tanks, feed lots, fertilizer, highway de-icing salt, industrial processes, landfills, and underground storage tanks





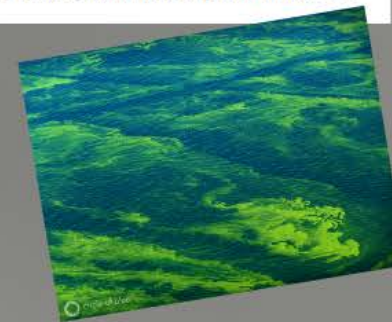
Percentage of total phosphorus that exceeds EPA limits

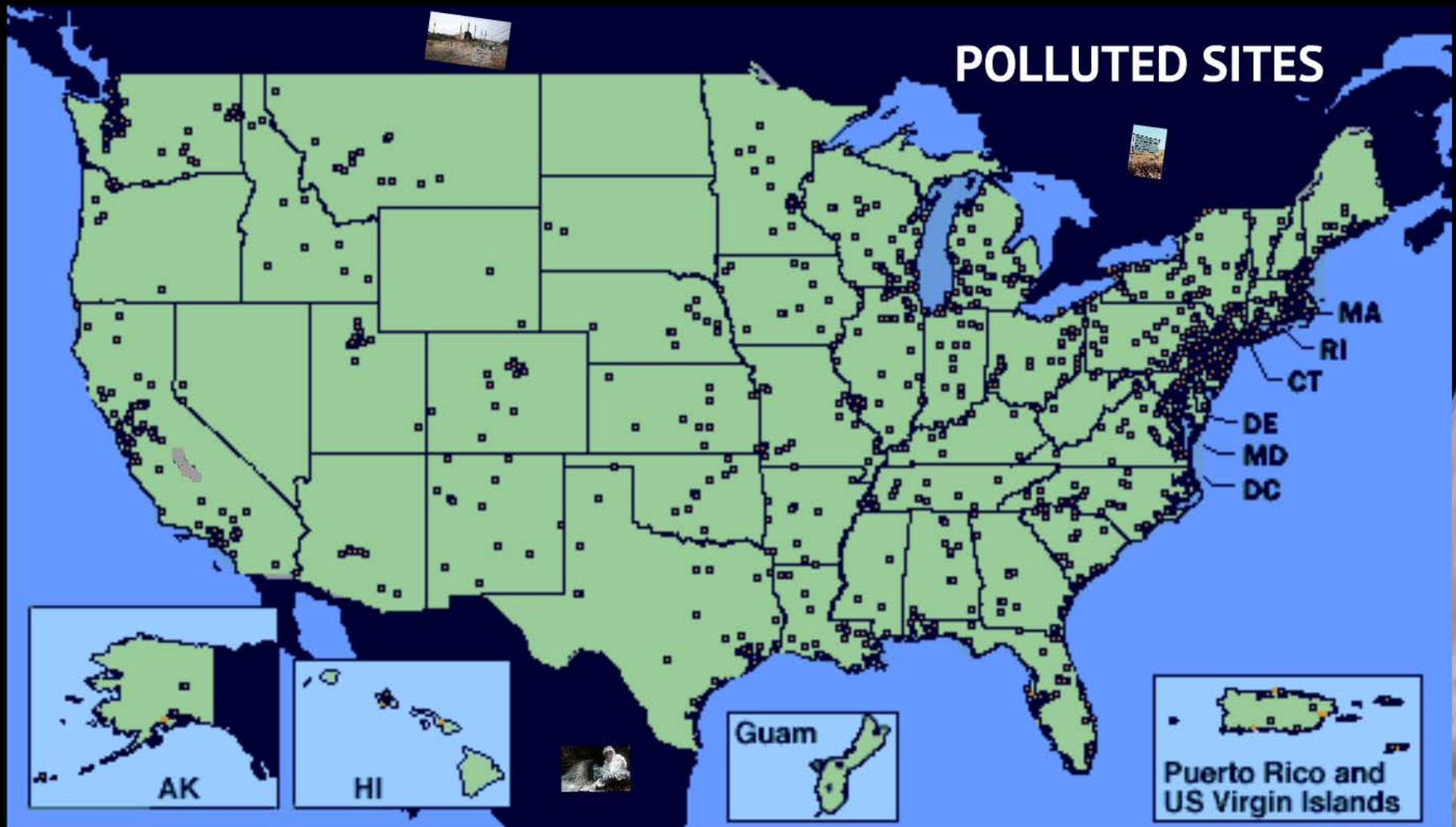


EXPLANATION

-  Less than 10 percent
-  From 10 to 50 percent
-  More than 50 percent
-  Insufficient data

Concentrations that exceeded recommended limit of 0.1 milligram per liter, by hydrologic unit, 1990-95 [source of data: U.S. base].






1322 Super Fund Sites

http://en.wikipedia.org/wiki/List_of_Superfund_sites_in_the_United_States
http://en.wikipedia.org/wiki/List_of_Superfund_sites_in_the_United_States#Lists_of_Superfund_sites



GREENPEACE

A photograph of a white rectangular sign with black text, mounted on two metal poles. The sign is positioned in front of a chain-link fence. The background consists of a field of dry, brownish-yellow vegetation under a clear blue sky. The text on the sign is as follows:

HAZARDOUS WASTE AREA
UNAUTHORIZED PERSONS KEEP OUT
FOR INFORMATION CALL
800-231-3075
U.S. EPA SUPERFUND SITE



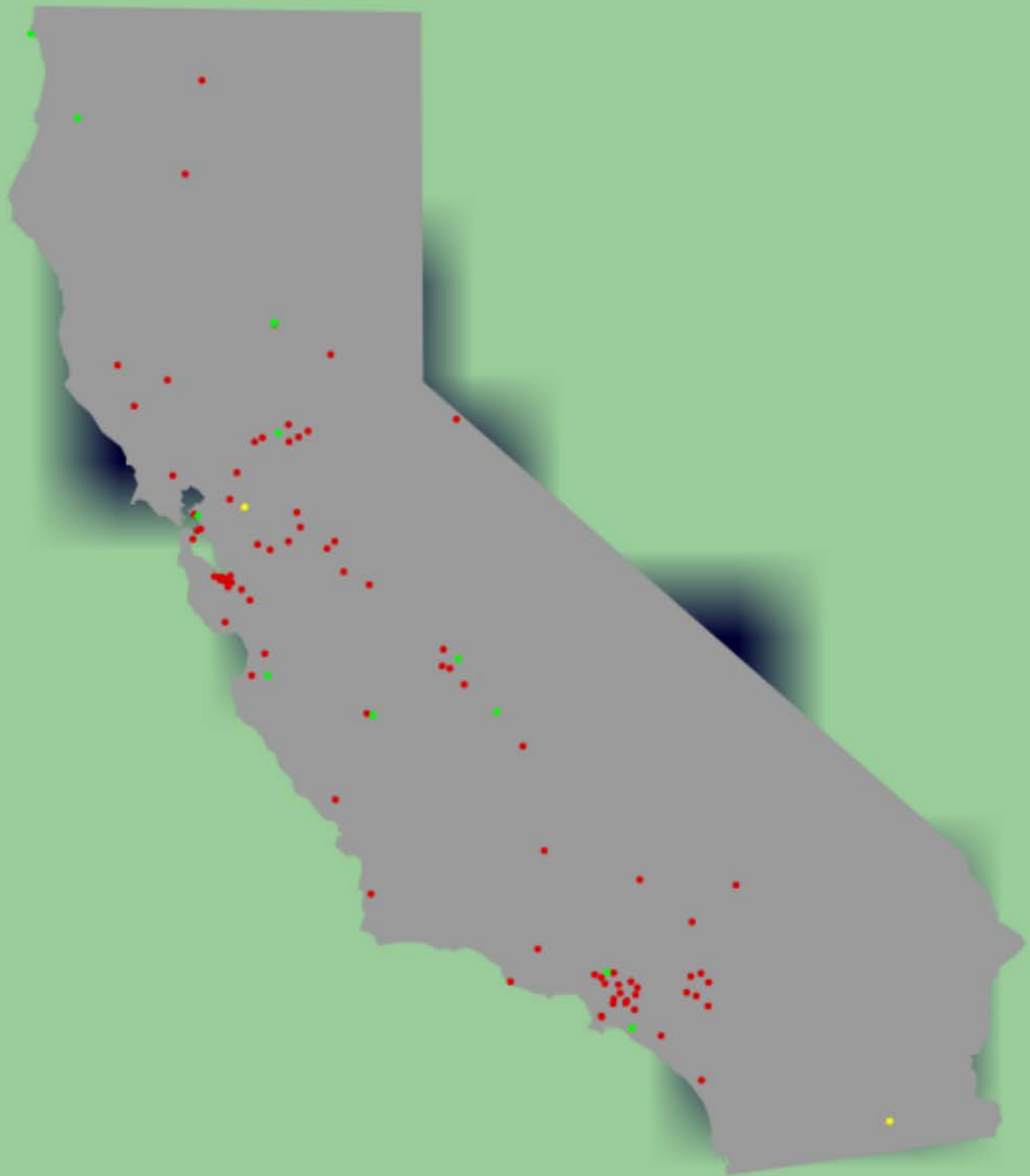
DANGER
HAZARDOUS
AREA



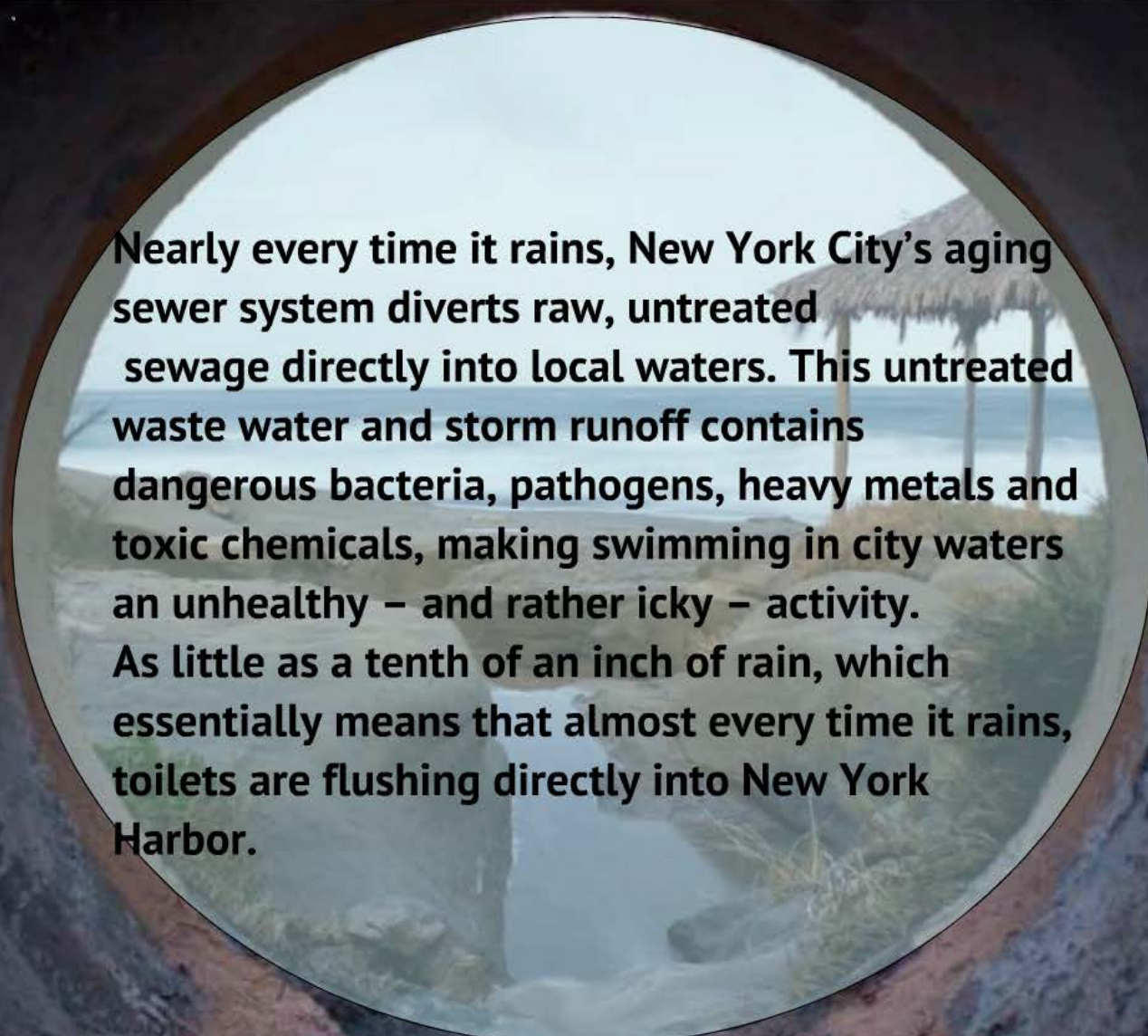
**CURTIS SPECIALTY PAPERS
SUPERFUND SITE**

WARNING:
Hazardous materials present at this site.
No trespassing

For further information call the
• U.S. Environmental Protection Agency at •
(800) 346-5009





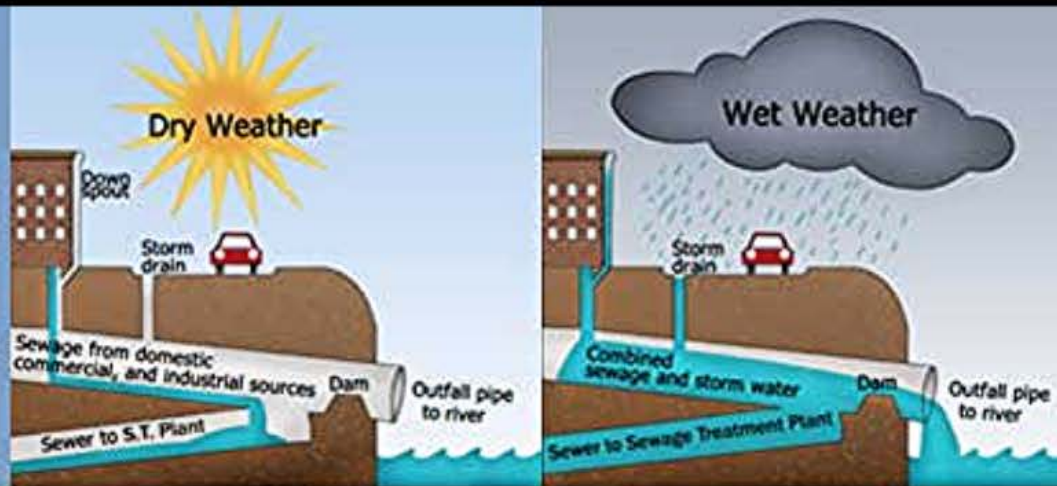
A circular view through a sewer manhole looking out onto a beach with a thatched hut. The manhole is made of dark, rough concrete. The view outside shows a sandy beach, a body of water, and a thatched hut in the background. The text is overlaid on the circular view.

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)

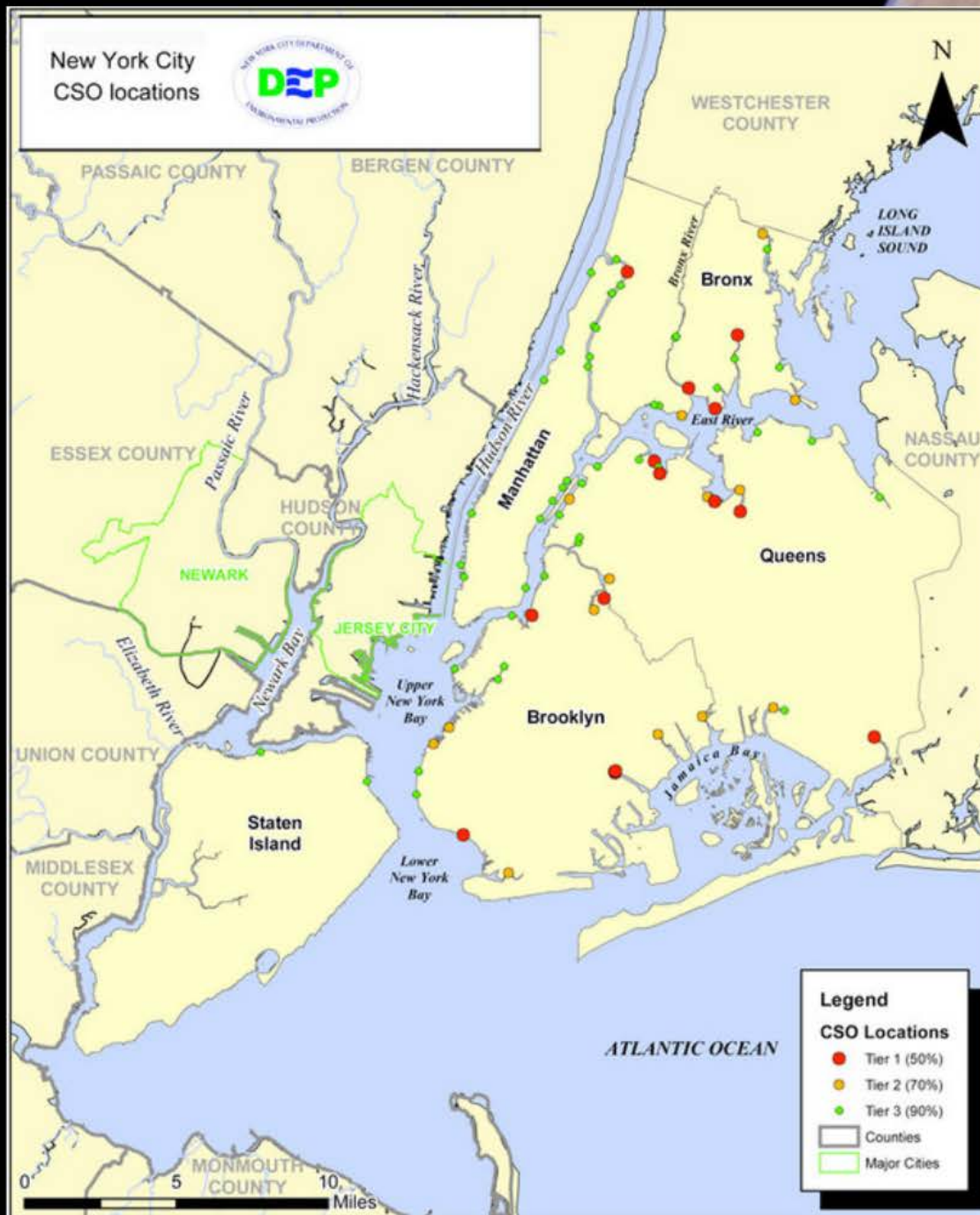


**Combined Sewer Overflow (CSO),
Sanitary Sewer Overflow (SSO)**

CSO: A combined sewer overflow is a type of sewer system that collects sanitary sewage and storm water runoff in a single pipe system. Combined sewers can cause serious water pollution problems due to combined sewer overflows, which are caused by large variations in flow between dry and wet weather. This type of sewer design is no longer used in building new communities, but many older cities continue to operate combined sewers

SSO: Sanitary Sewer Overflow is a condition in which untreated sewage is discharged into the environment prior to reaching the sewage treatment facility





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



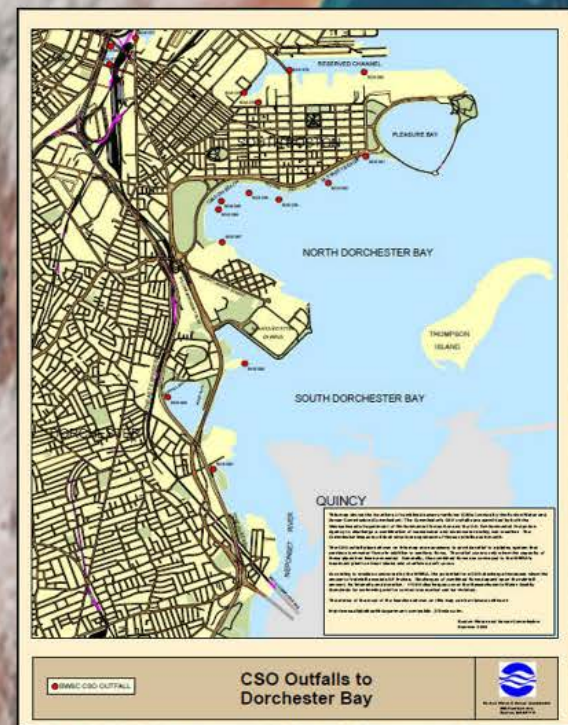
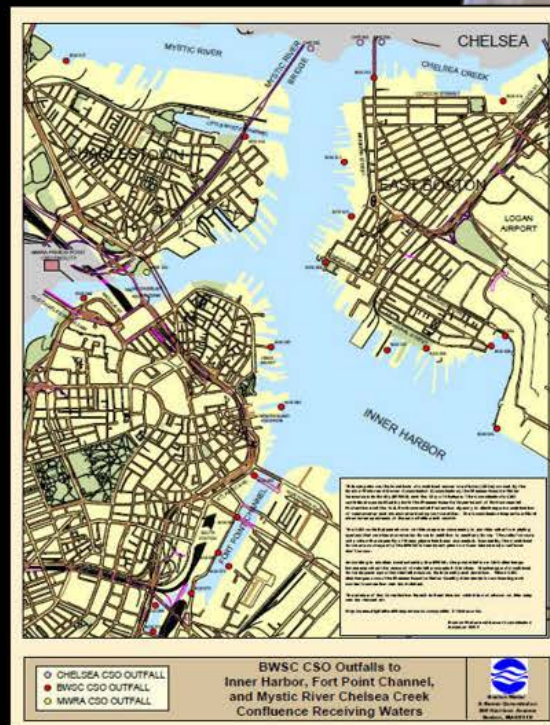
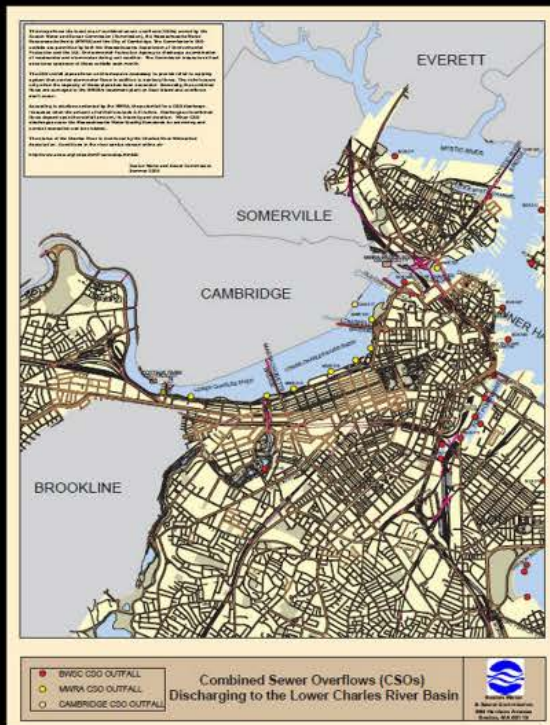
David Gonzalez/The New York Times

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.



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

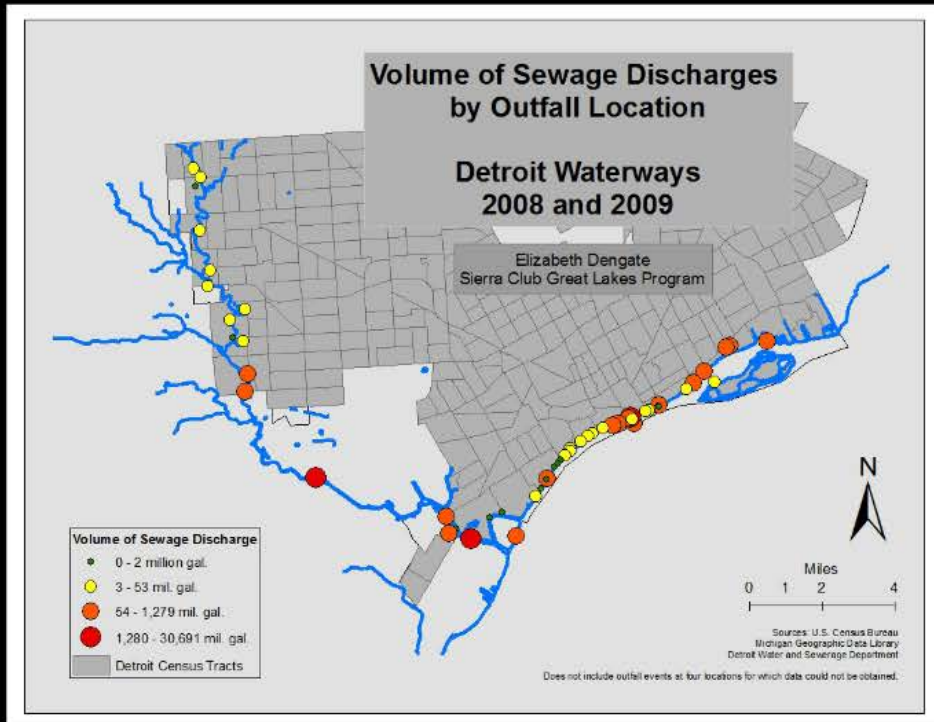


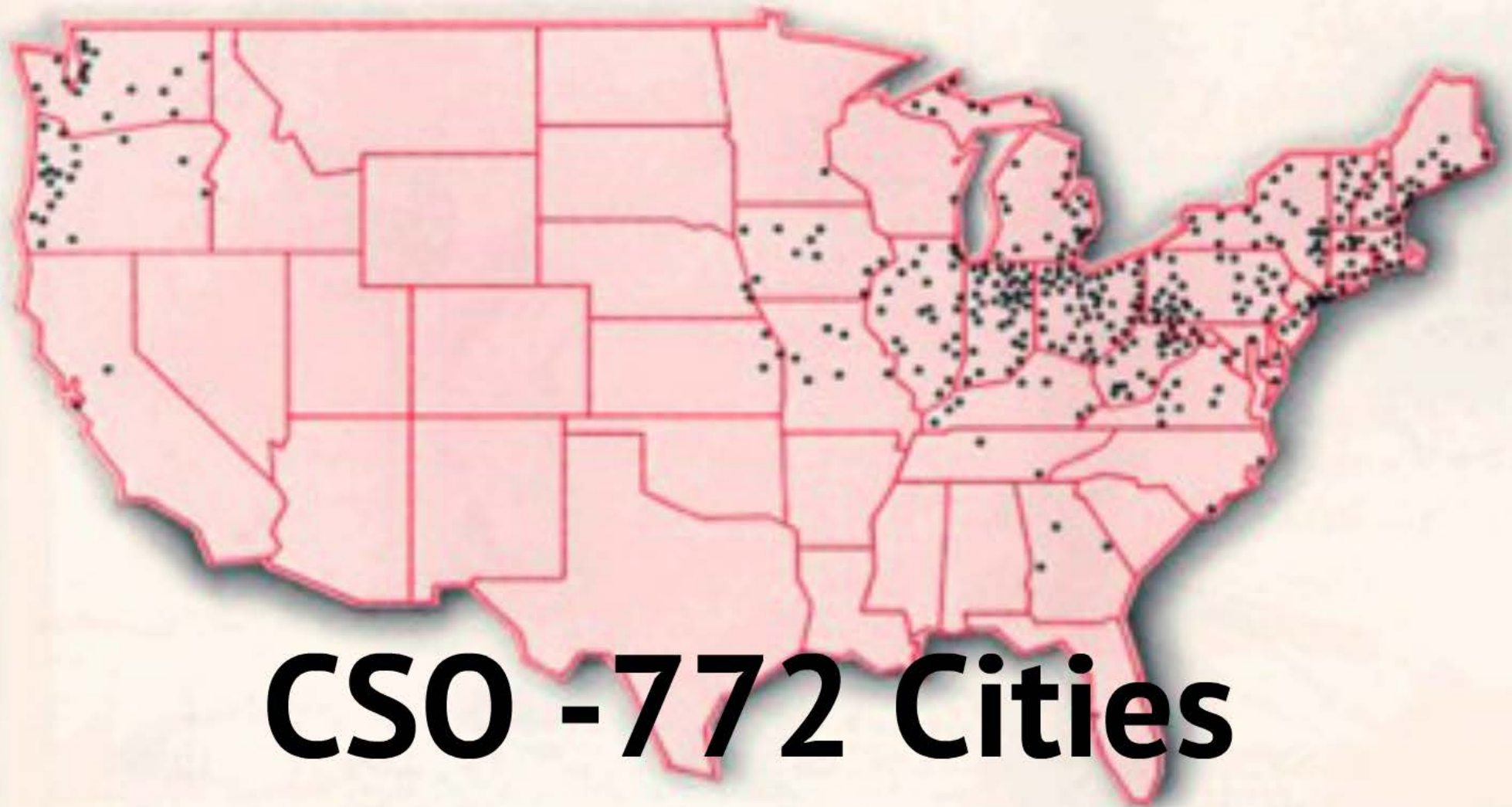
Untreated Sewage Discharges to the Great Lakes

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





CSO - 772 Cities



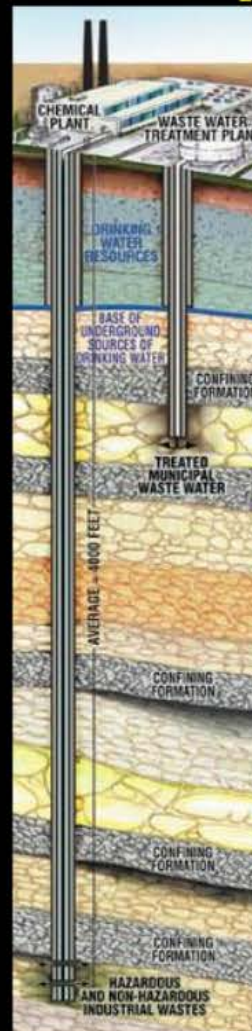
http://www.waterboards.ca.gov/water_issues/programs/sso/sso_map/sso_pub.shtml

2.5 trillion gallons of water may be required to hydrofracture a single well in a deep shale formation.



Industrial Waste Wells

30 trillion gallons of toxic liquid



402, 020 Wells



SSQ - Sites

**5-9 million gallons of BLUE water
may be required to hydrofracture
a single well in a deep shale
formation.**





Frac Sand Mining in Wisconsin:

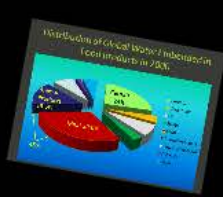
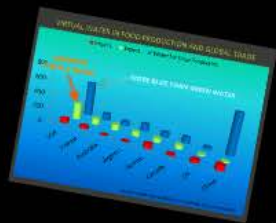
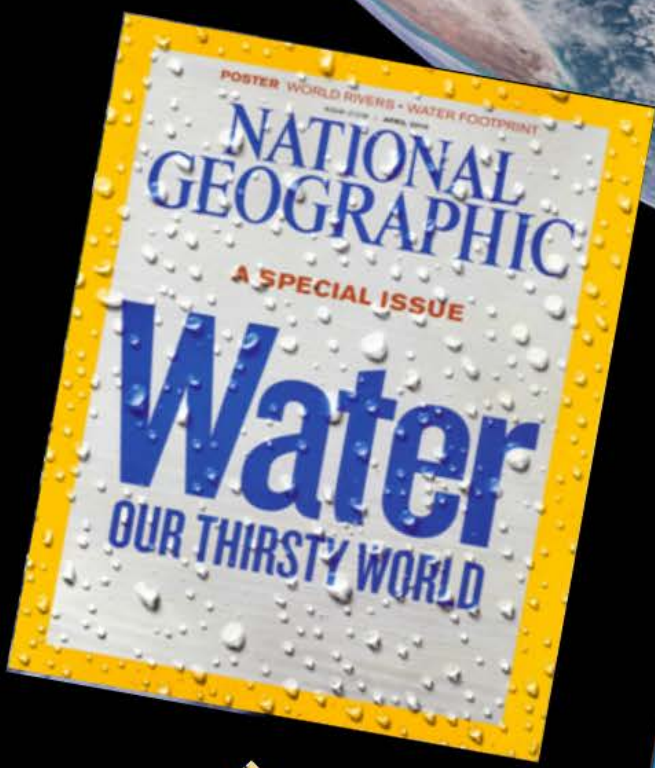
Northwestern Wisconsin is experiencing a large expansion of frac sand mining and processing operations. Frac Sand is used to help extract oil and gas from previously hard to reach shale deposits. It is exported from Wisconsin to places with gas and oil bearing shale where it is used in a combined process called **hydraulic fracturing and horizontal drilling**. Frac sand is mixed with high volumes of water and toxic chemicals and forced into the shale, where it holds open fissures allowing the oil or gas to be extracted.

Blue Water

According to a 2009 study in Environmental Science & Technology, the 2007 U.S. Congressional mandate by 2013 would actually require an estimated 1 trillion more additional freshwater water (and even more direct runoff) - a volume exceeding the annual water withdrawals of the entire state of Iowa.



Green Water



Almonds have been receiving underground water at twice the rate that they can replace it.

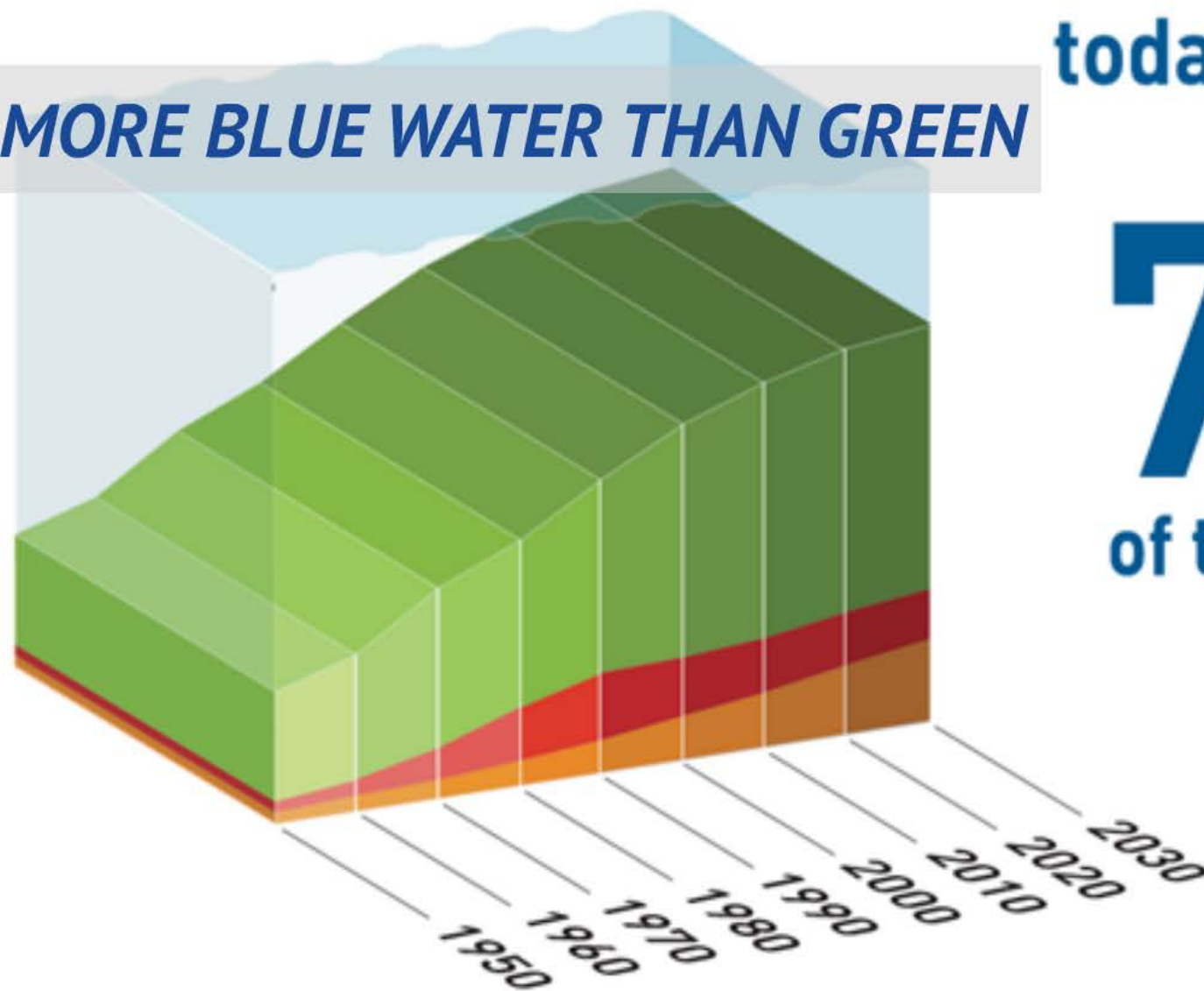
California pumps out 2.5 percent more than the water footprint. An amount of 1.5 million acre feet a year.

In a good year, the right plants together produced more quantity of the water footprint on the soil.



Look: Water footprint of wheat 1.5 tonnes in 2012

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



An aerial photograph showing a vast desert landscape in Saudi Arabia. The foreground and middle ground are dominated by large, circular green fields, which are irrigated using a center pivot system. The fields are separated by sandy, light-colored soil. In the background, the horizon line is visible, and a small portion of the Earth's blue and white atmosphere is seen at the very top of the frame.

BLUE Water

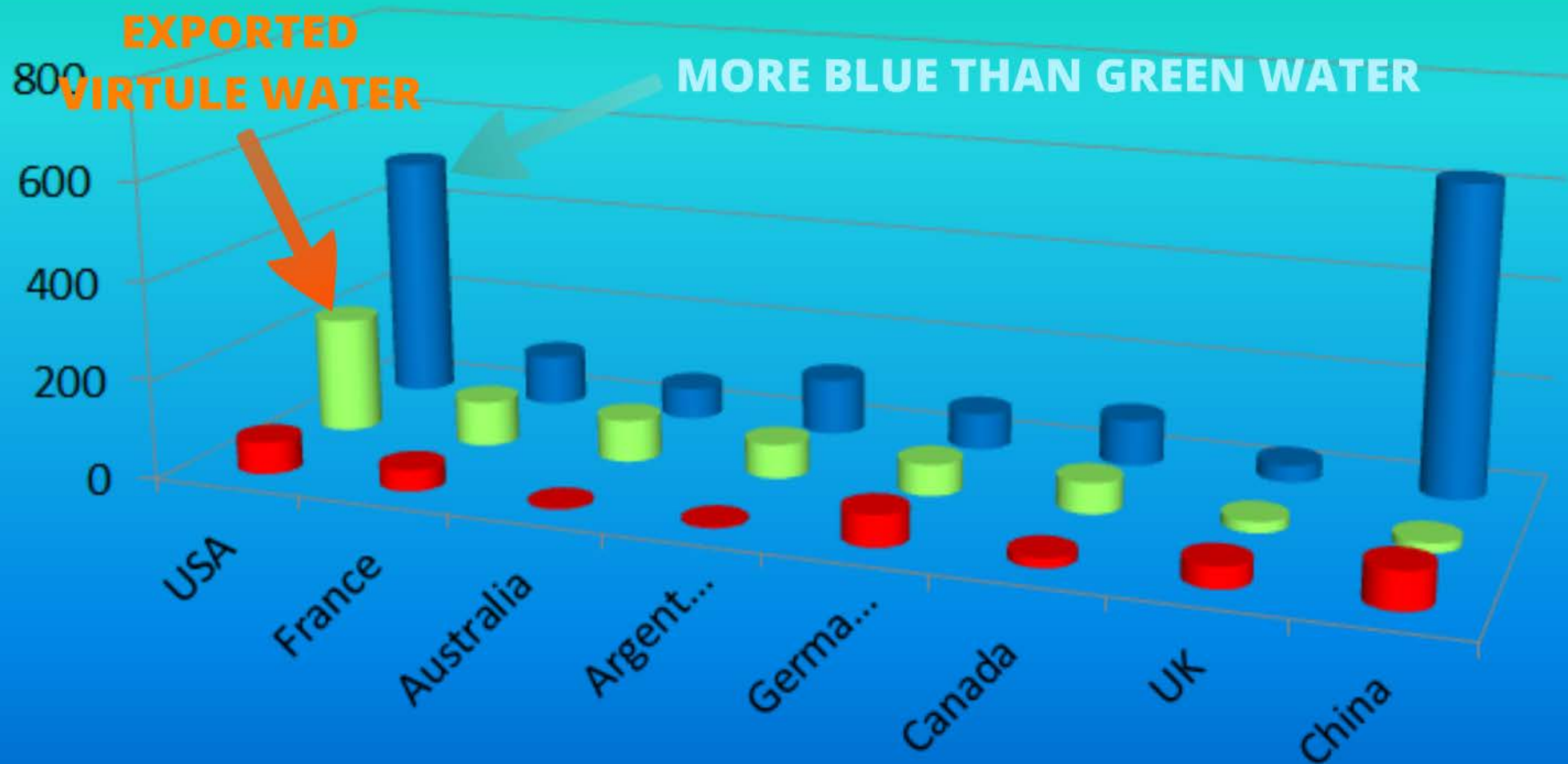
Saudi Arabia wheat fields

A close-up photograph of a window covered in numerous raindrops of various sizes. The background is a blurred view of a green landscape, possibly a field or park, with some structures visible in the distance. The overall mood is rainy and serene.

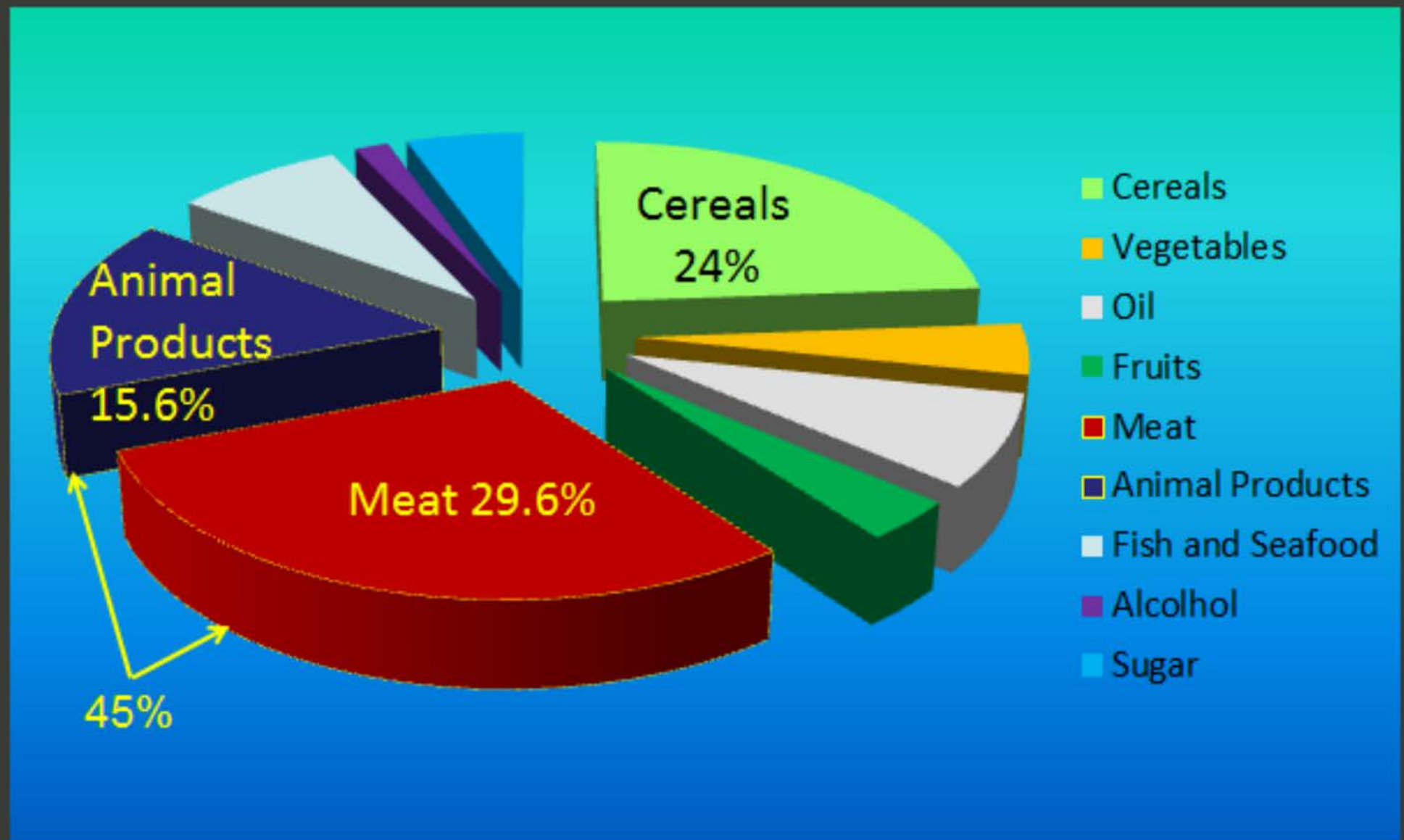
GREEN WATER

VIRTUAL WATER IN FOOD PRODUCTION AND GLOBAL TRADE

■ Import ■ Export ■ Water for Crop Production



Distribution of Global Water Embedded in Food products in 2000



Water for food

Volume of water required to produce one kilogram of...

■ 100 litres

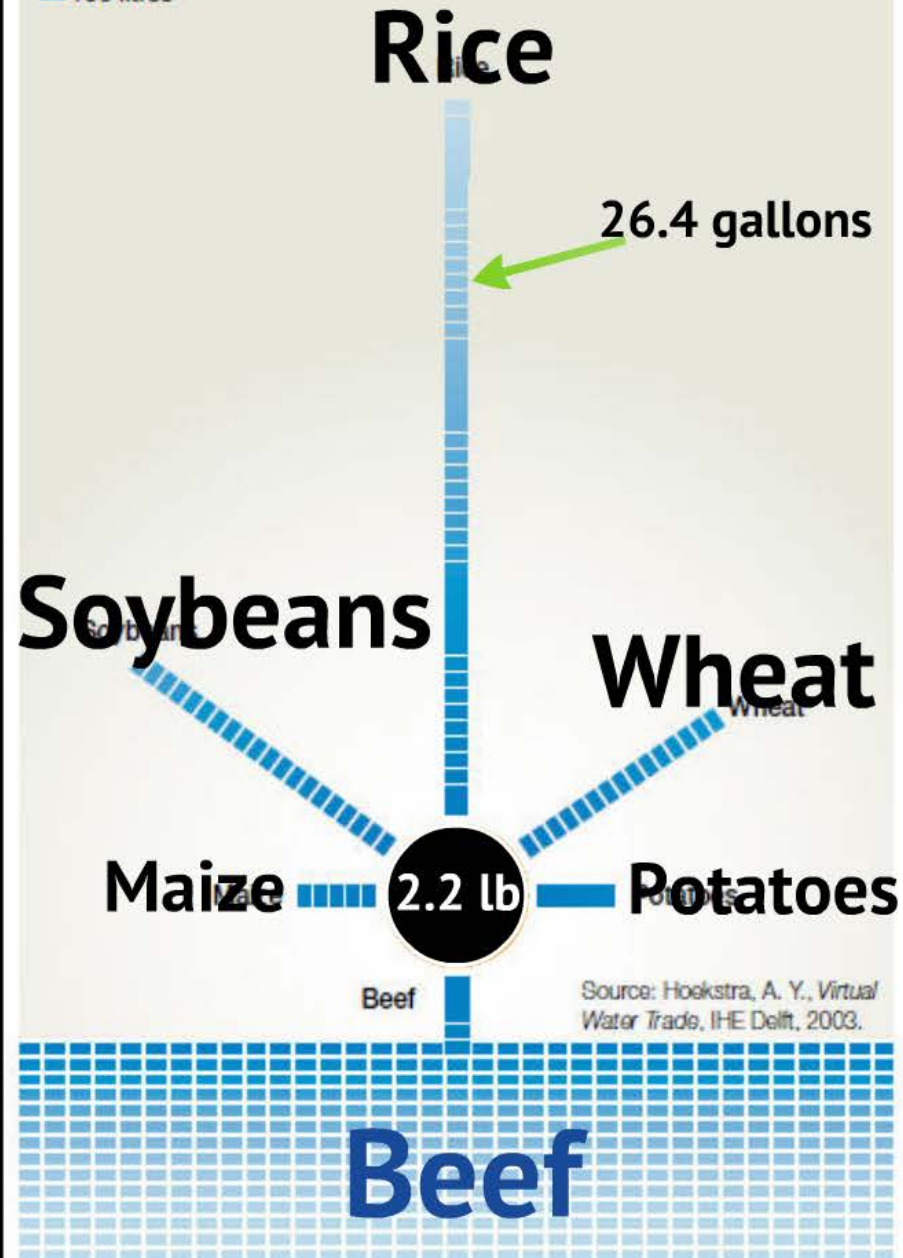


Figure 10: The volume of water required to produce different food products varies enormously, as do the waste products.

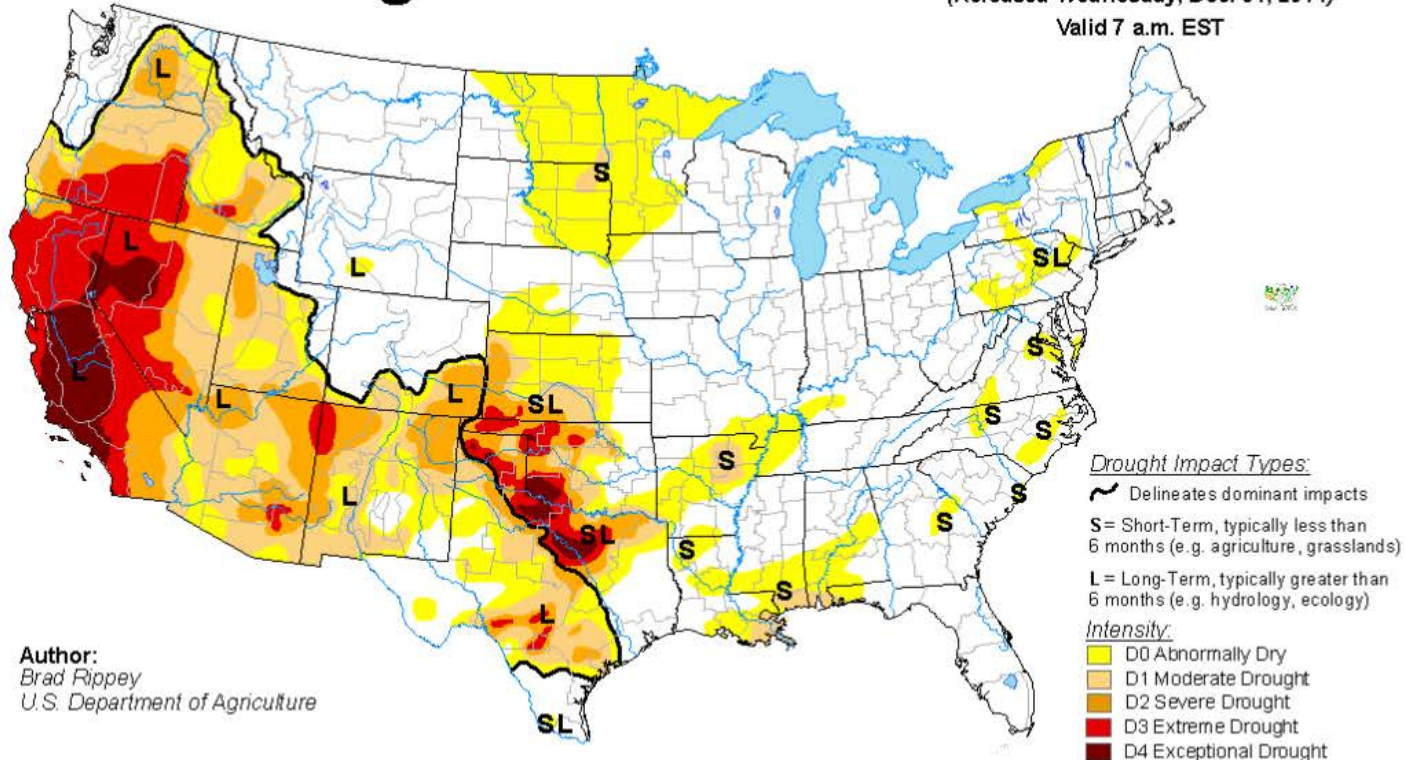
L = Long Term >6 months

U.S. Drought Monitor

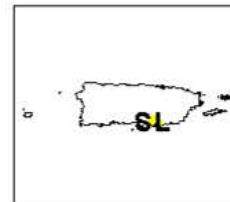
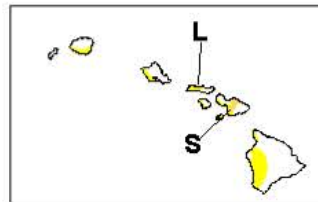
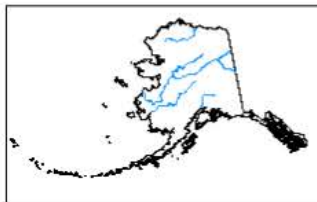
December 30, 2014

(Released Wednesday, Dec. 31, 2014)

Valid 7 a.m. EST



Author:
Brad Rippey
U.S. Department of Agriculture



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



<http://droughtmonitor.unl.edu/>

Exceptional

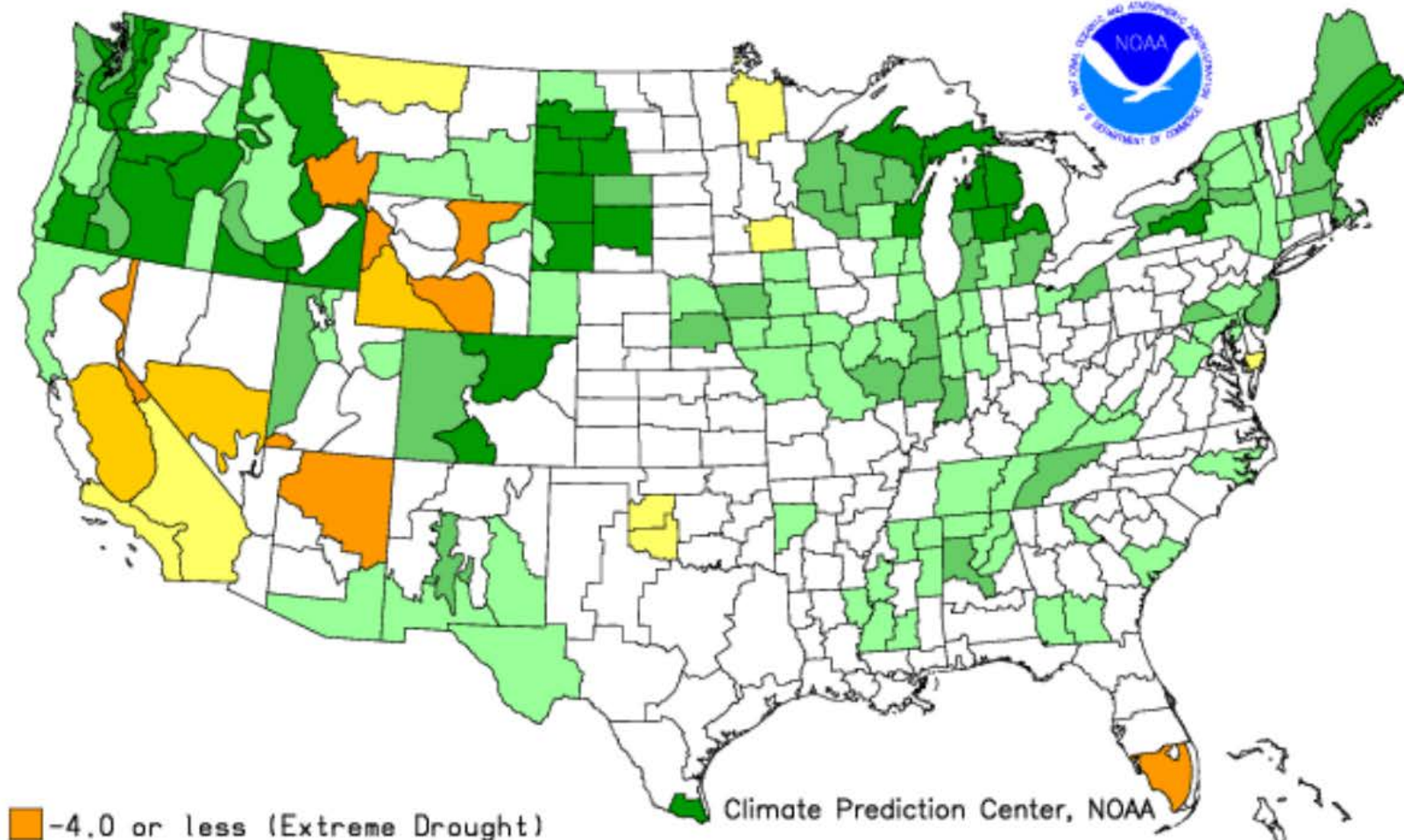
Extreme

Severe

Moderate

Abnormally Dry

Drought Severity Index by Division
Weekly Value for Period Ending JAN 3, 2015
Long Term Palmer



- -4.0 or less (Extreme Drought)
- -3.0 to -3.9 (Severe Drought)
- -2.0 to -2.9 (Moderate Drought)
- -1.9 to +1.9 (Near Normal)

- +2.0 to +2.9 (Unusual Moist Spell)
- +3.0 to +3.9 (Very Moist Spell)
- +4.0 and above (Extremely Moist)

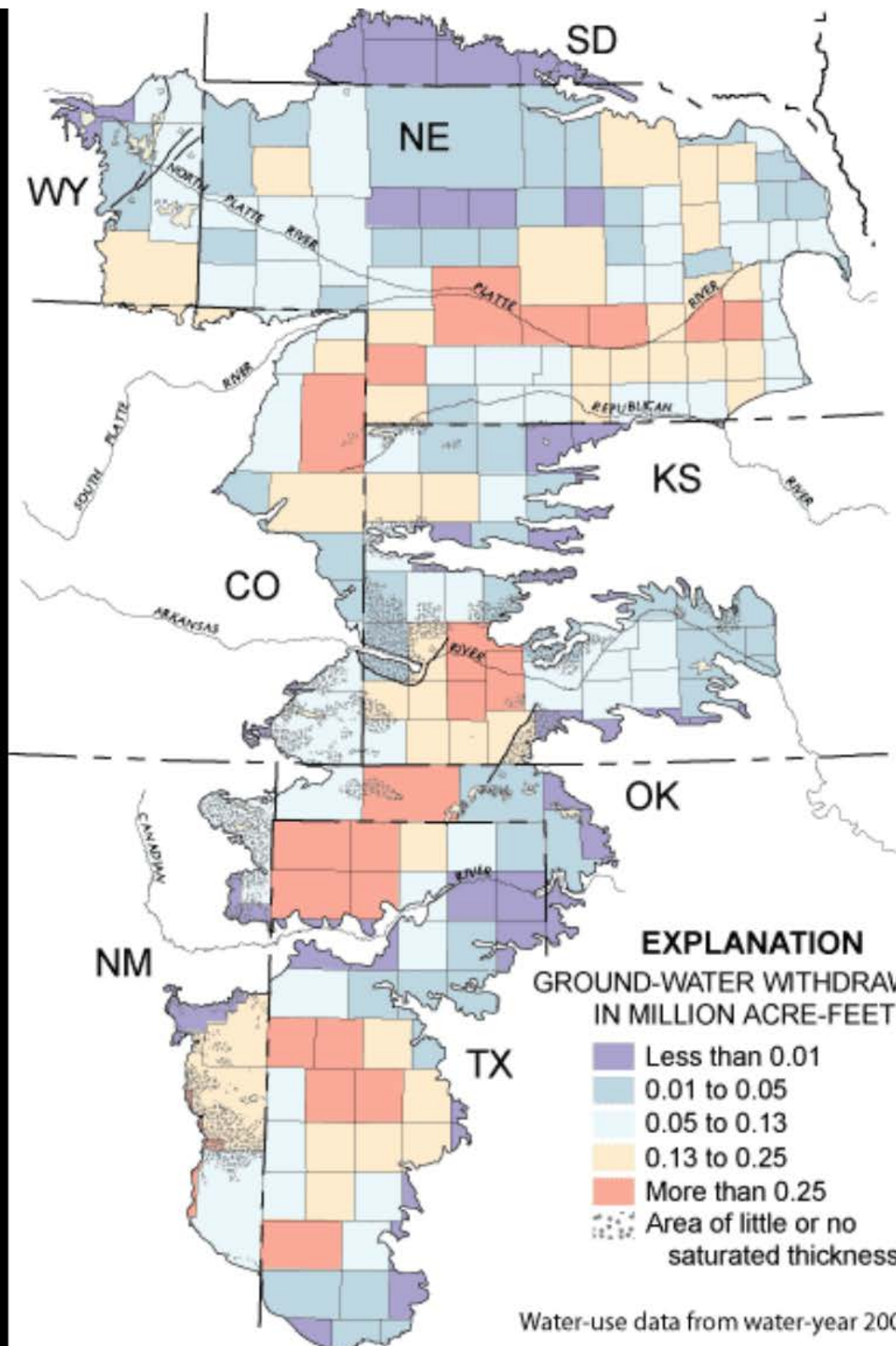


Wilting corn causing spike in food prices



- **Arizona has been removing underground water at twice the rate that rains can replace it**
- **California pumps 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**





Water-use data from water-year 2000, USGS



**2007 Existing and Planned Ethanol Facilities
Estimated Total Water use
Million Gallons Per Day**

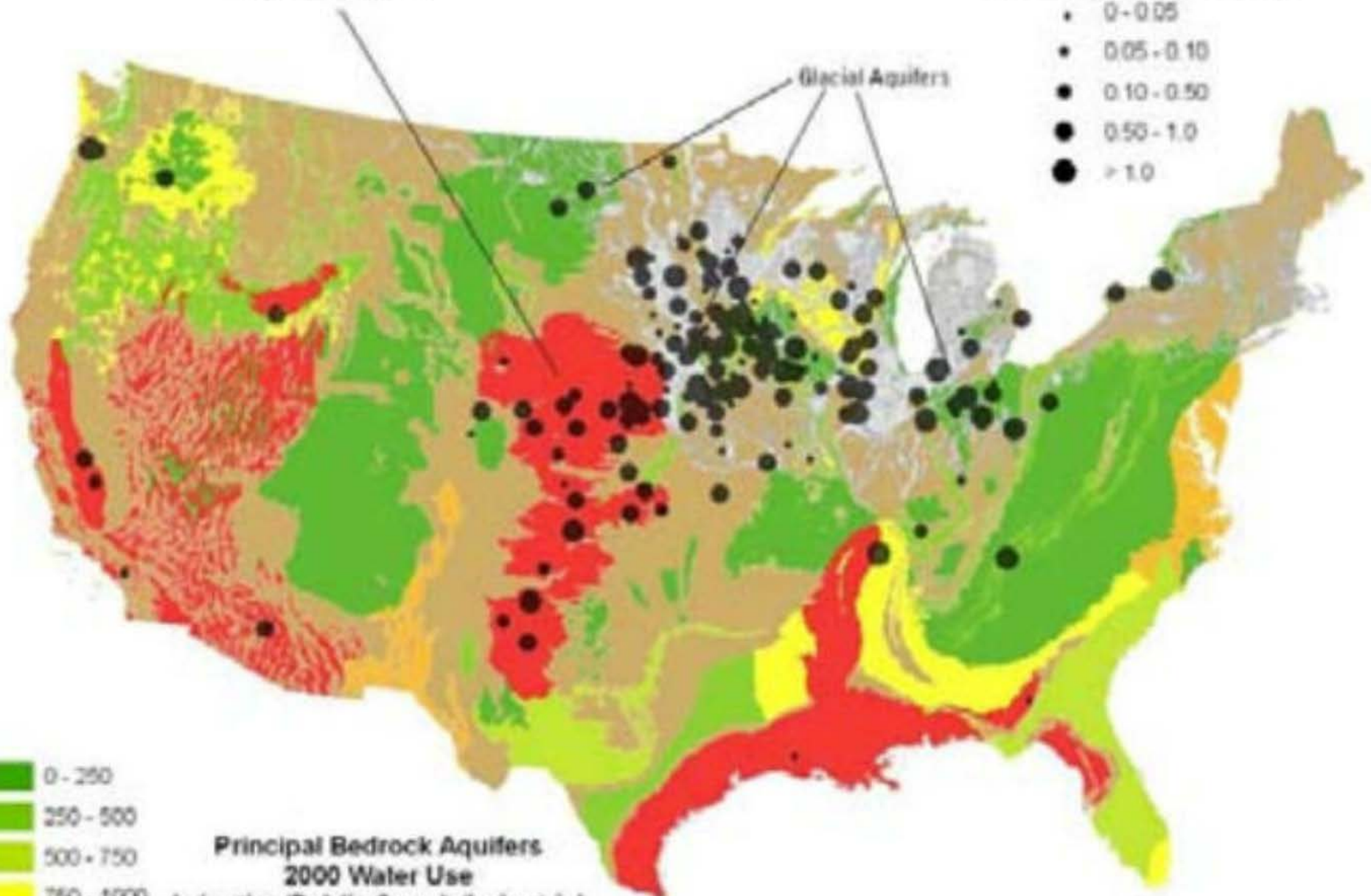
- 0 - 0.05
- 0.05 - 0.10
- 0.10 - 0.50
- 0.50 - 1.0
- > 1.0

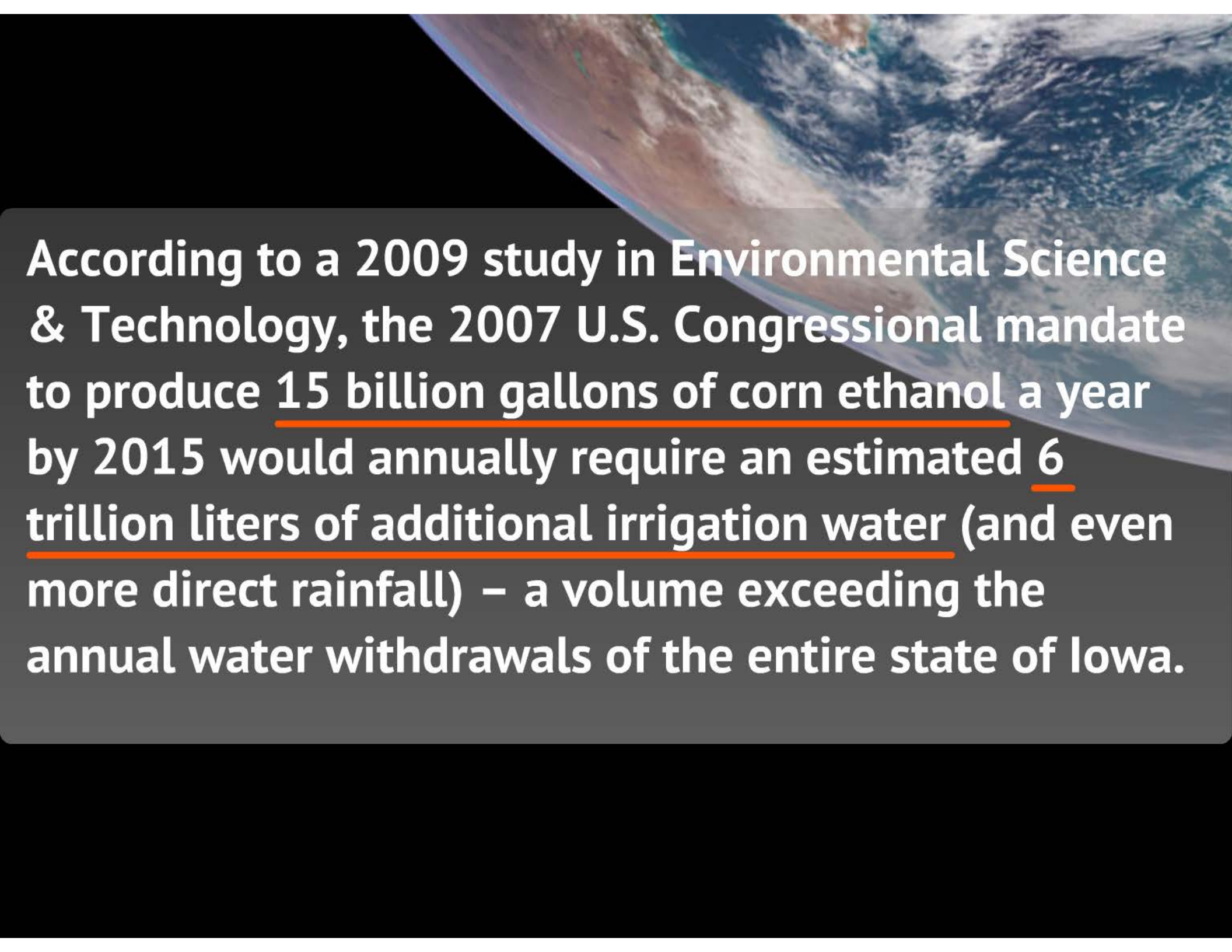
High Plains Aquifers

Glacial Aquifers



**Principal Bedrock Aquifers
2000 Water Use
Irrigation/Public Supply/Industrial
Million Gallons Per Day**





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.





BLUE WATER

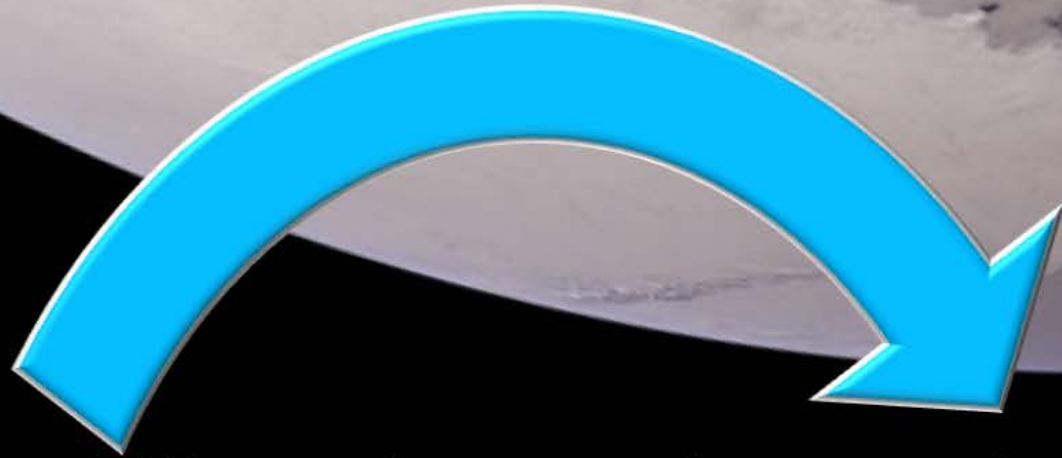
E=H2O



E=H2O



Energy and Water Connection
E=H2O



Water is used to make

WATER

FUEL

Fuel is used to process

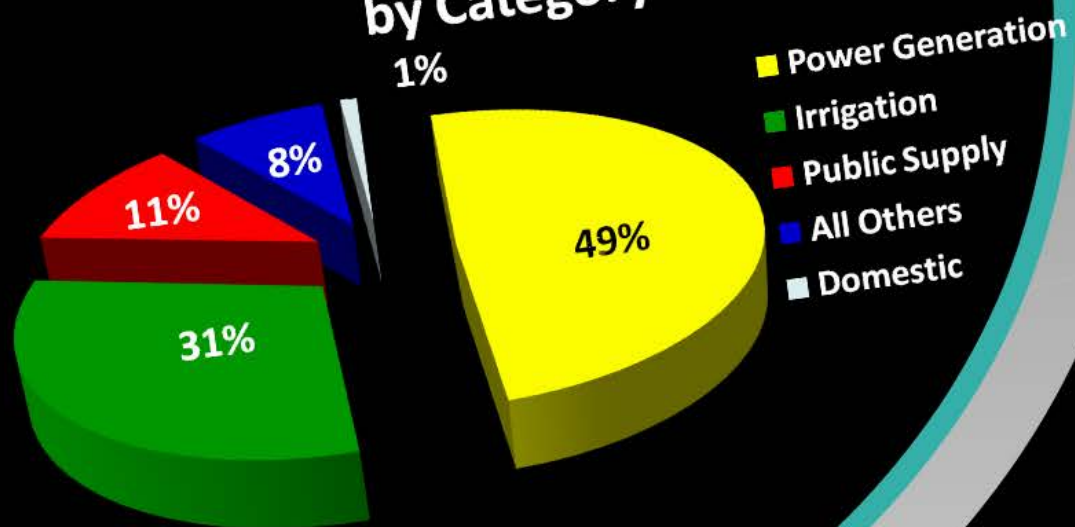


BLUE WATER



Water Stress

US Water Withdrawals
by Category



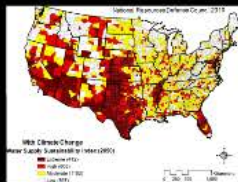


Blue Water



Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use.

1. Rivers (6 free flowing, levels dropping)
2. Historic Water Levels in Lakes and Reservoirs
3. Land Subsidence
4. Water Rights
5. Salination of Crop Land
6. State Tension Over Water
7. Urban Waste Water Treatment
8. Pumping Power
9. Industrial Waste



Colorado River



Its end

A FEW CONSEQUENCES



Aquifer Honeycomb Rocks





Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use.

- 1. Rivers (6 free flowing, levels dropping)**
- 2. Historic Water Levels in Lakes and Reservoirs**
- 3. Land Subsidence**
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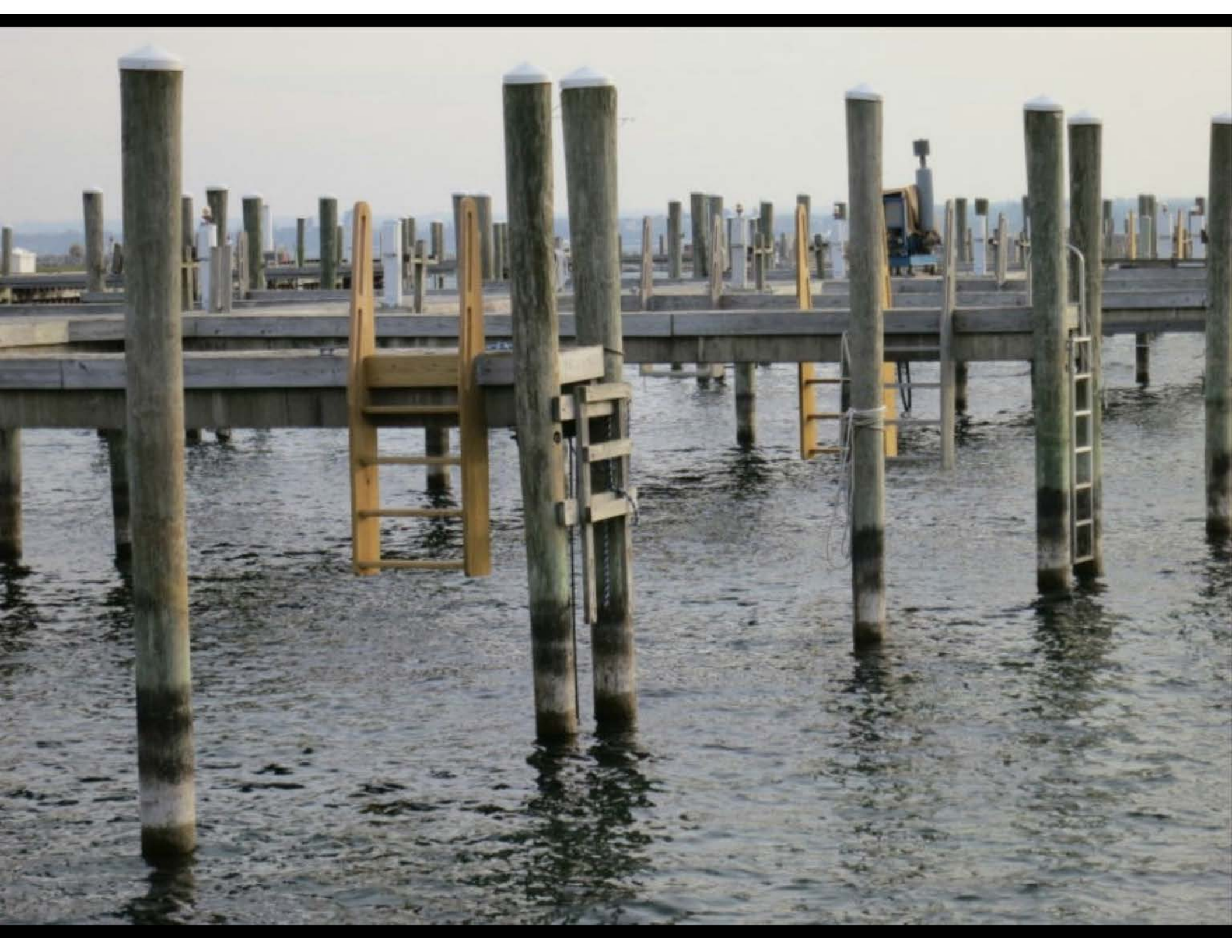


Colorado River



Its end







Hoover Dam

THE HOOVER DAM
SUPPLIES ELECTRICITY TO
29 MILLION
PEOPLE

designed capacity
2,080
MEGAWATTS

1931

current capacity
1,617
MEGAWATTS

2010

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

10 Dry Spell
YEAR

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, AZ/NV



Lake Powell, UT

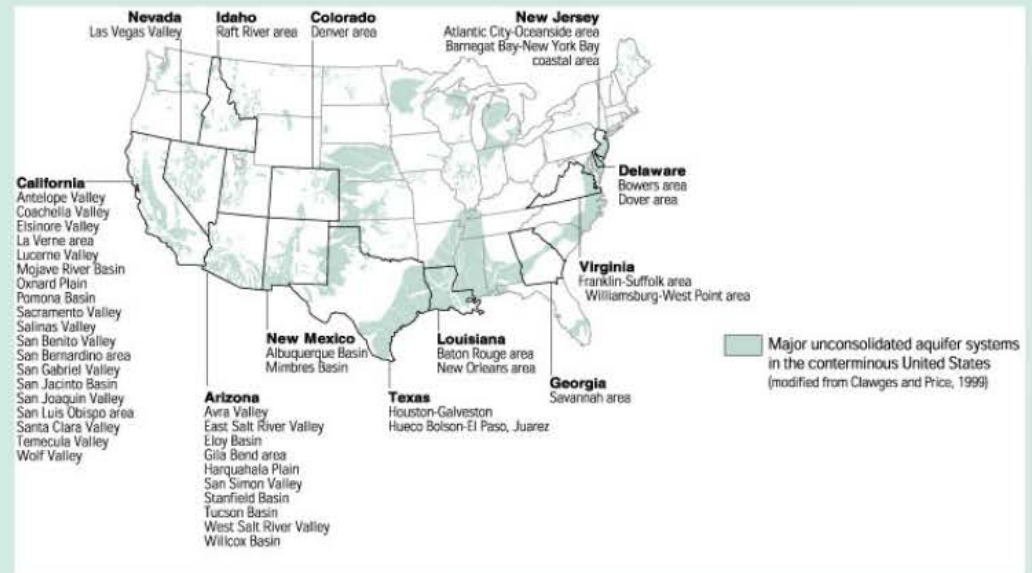




Areas where subsidence has been attributed to groundwater pumping



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



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

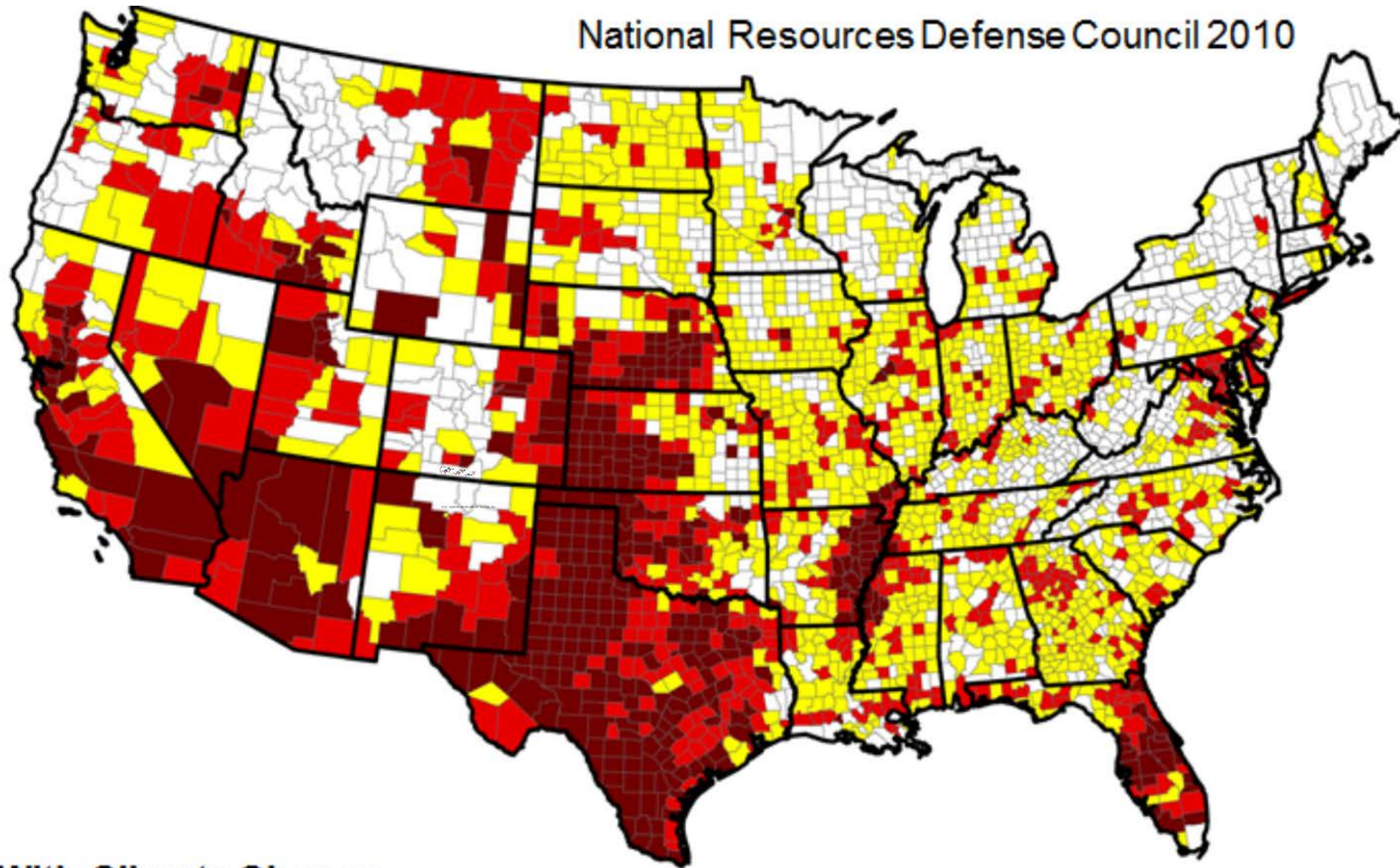




Aquifer Honeycomb Rocks







With Climate Change

Water Supply Sustainability Index (2050)

- Extreme (412)
- High (608)
- Moderate (1192)
- Low (897)



0 250 500 1,000 Kilometers

U.S. Supreme Court

In addition to Montana v. Wyoming, three other disputes between states over shared rivers are moving through the nation's highest court. The justices have appointed special masters to hear arguments and offer legal guidance in two cases: **Florida against Georgia**, and **Texas versus New Mexico**. A third case, between **Kansas and Nebraska**, was argued before the court last October. A ruling will likely come in 2015.



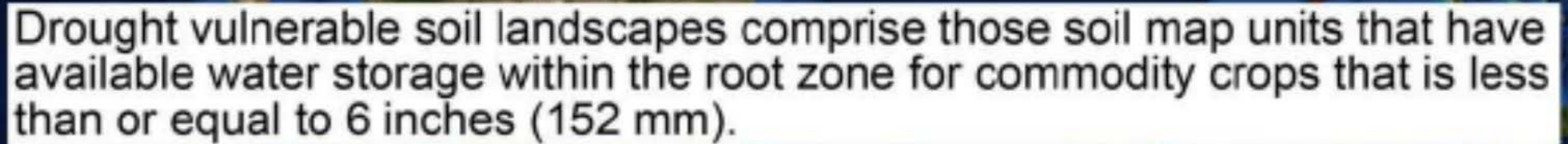
“We never know the worth of water till the well is dry.” – Thomas Fuller, 1732



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

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





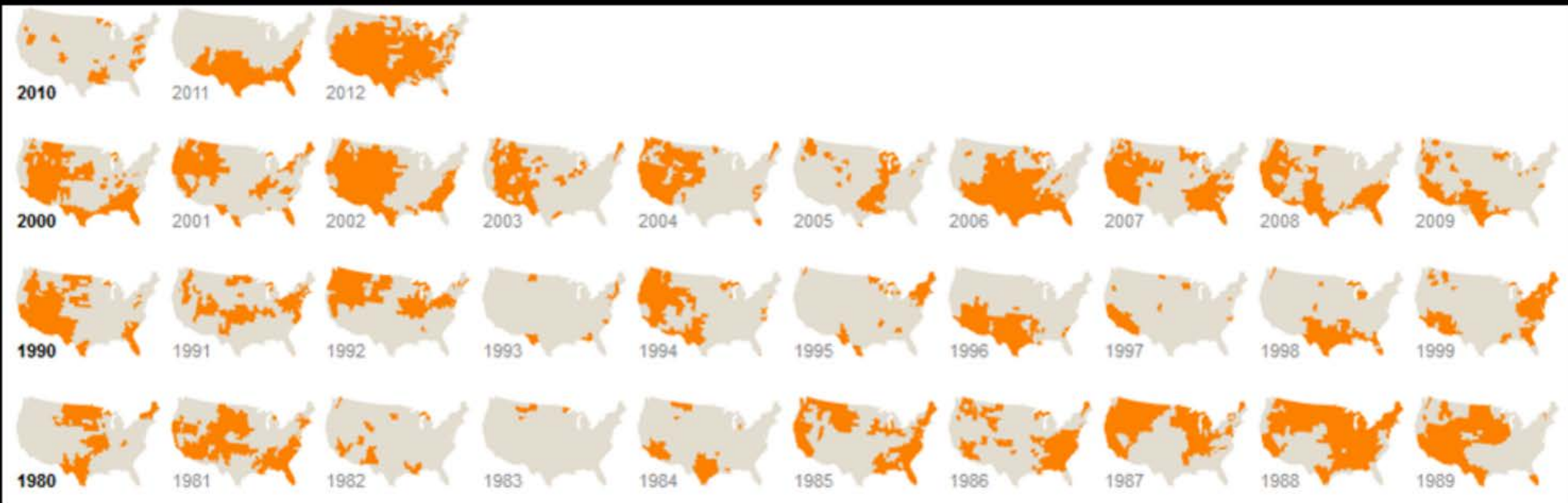
Drought vulnerable soil landscapes comprise those soil map units that have available water storage within the root zone for commodity crops that is less than or equal to 6 inches (152 mm).

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).

Drought Foot Print 1982-2012



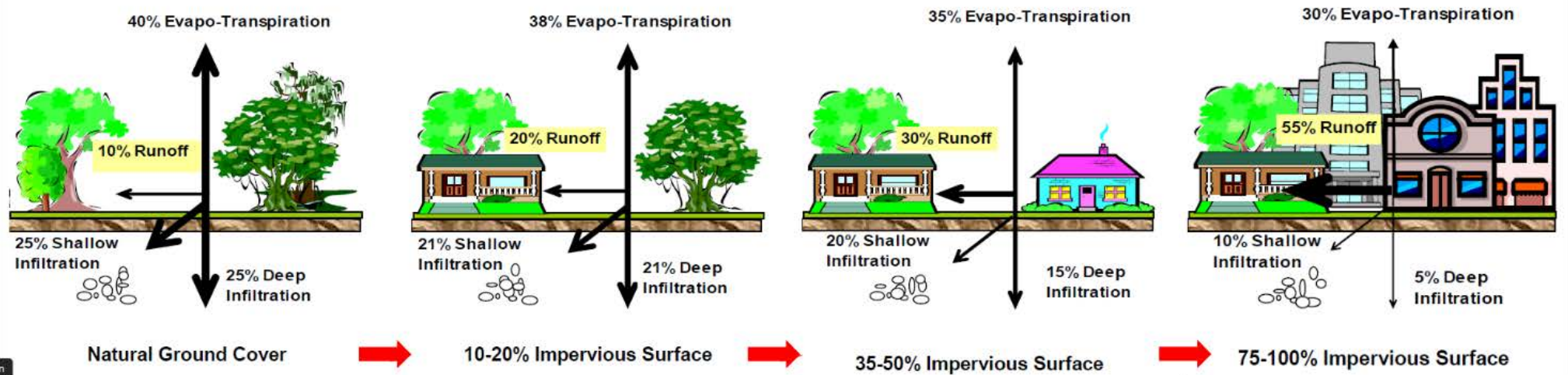
URBAN WATER

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





What can I do?





Water and How We Think About It

Amy Dryden
Senior Program Manager
Build It Green
February 2015



Build It GREEN
Smart Solutions from the Ground Up

Build It Green

- A non-profit with mission to achieve healthy & resource efficient homes
 - Establish and promote an attainable and credible green building program
 - Train professionals in green building
 - Work with local governments to create green building policy





What Is Your Perspective on Water?



What is Your Perspective on Water?



What is Your Perspective on Water?



A high-speed photograph of a water splash. The water is captured in mid-air, forming a large, circular, shell-like shape. The water is a vibrant blue, and the edges are sharp and detailed, showing individual droplets and ripples. The background is a clean, bright white.

GHGs

What Is Your Perspective on Water?

The background of the slide features a dynamic image of water splashing, with numerous droplets and ripples. This image is overlaid with geometric shapes: a grey triangle in the top right corner and a grey trapezoid in the bottom right corner. A yellow curved line runs along the bottom left edge. The text is presented in a bold, black, sans-serif font.

GHGs Energy Use

What Is Your Perspective on Water?

GHGs

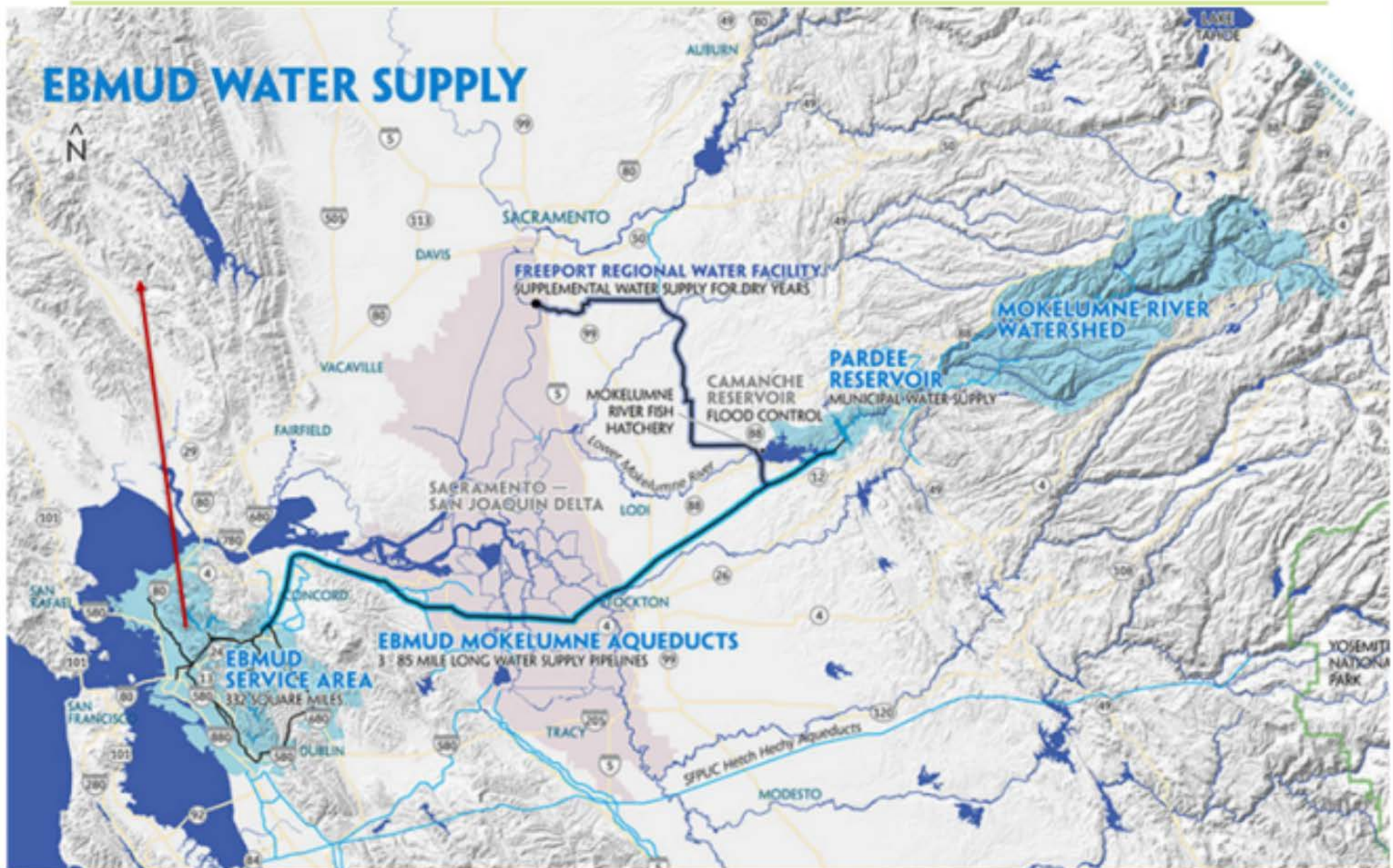
Energy Use

Volume

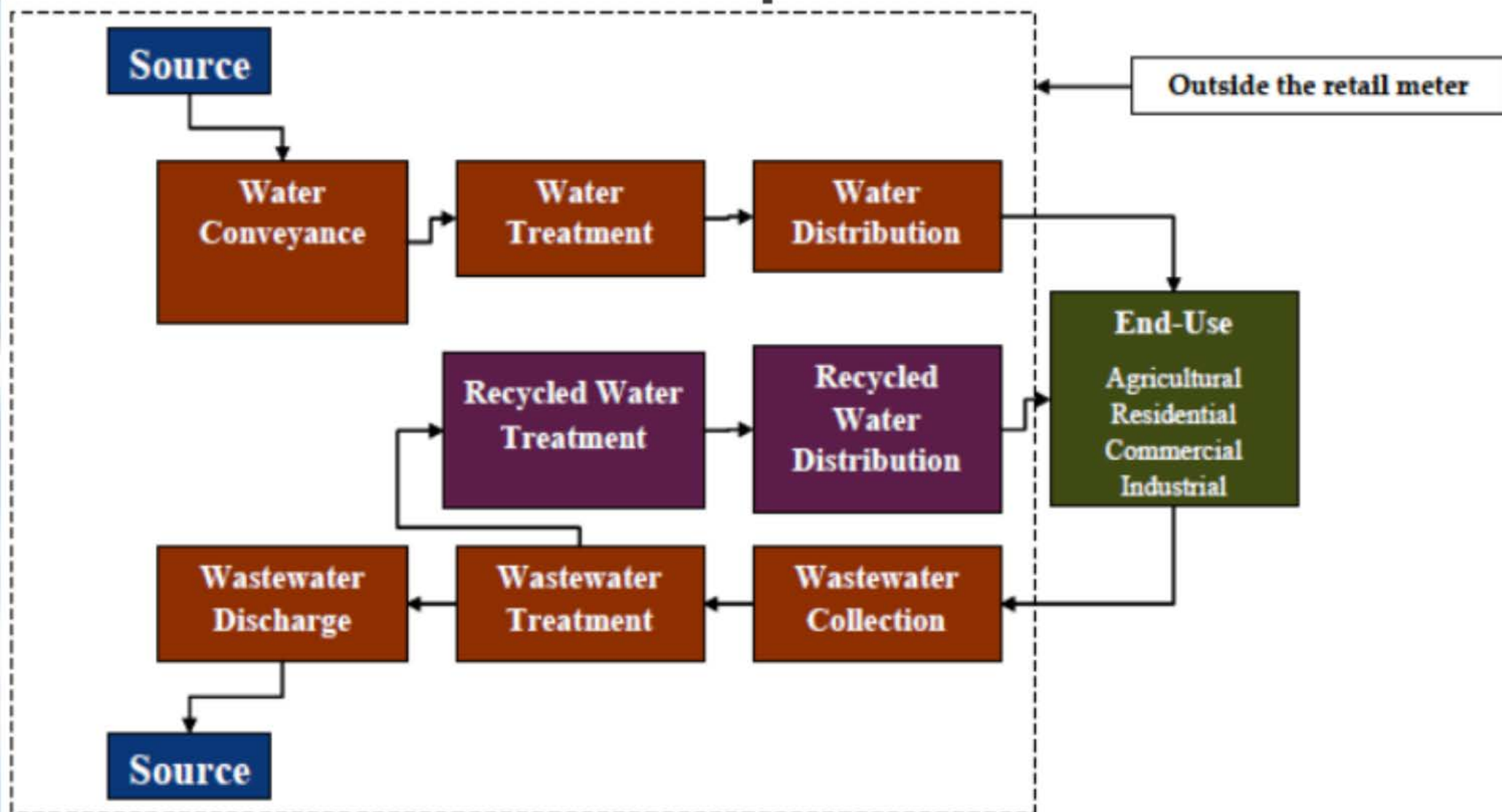
What Is Your Perspective on Water?

A high-speed photograph of a blue liquid splash. The water is captured mid-air, creating a series of overlapping, translucent blue waves and a dense cloud of small, spherical bubbles that rise from the point of impact. The background is a stark, bright white, which makes the vibrant blue of the water stand out. The overall effect is one of motion and energy.

Sphere of Influence for GHGs

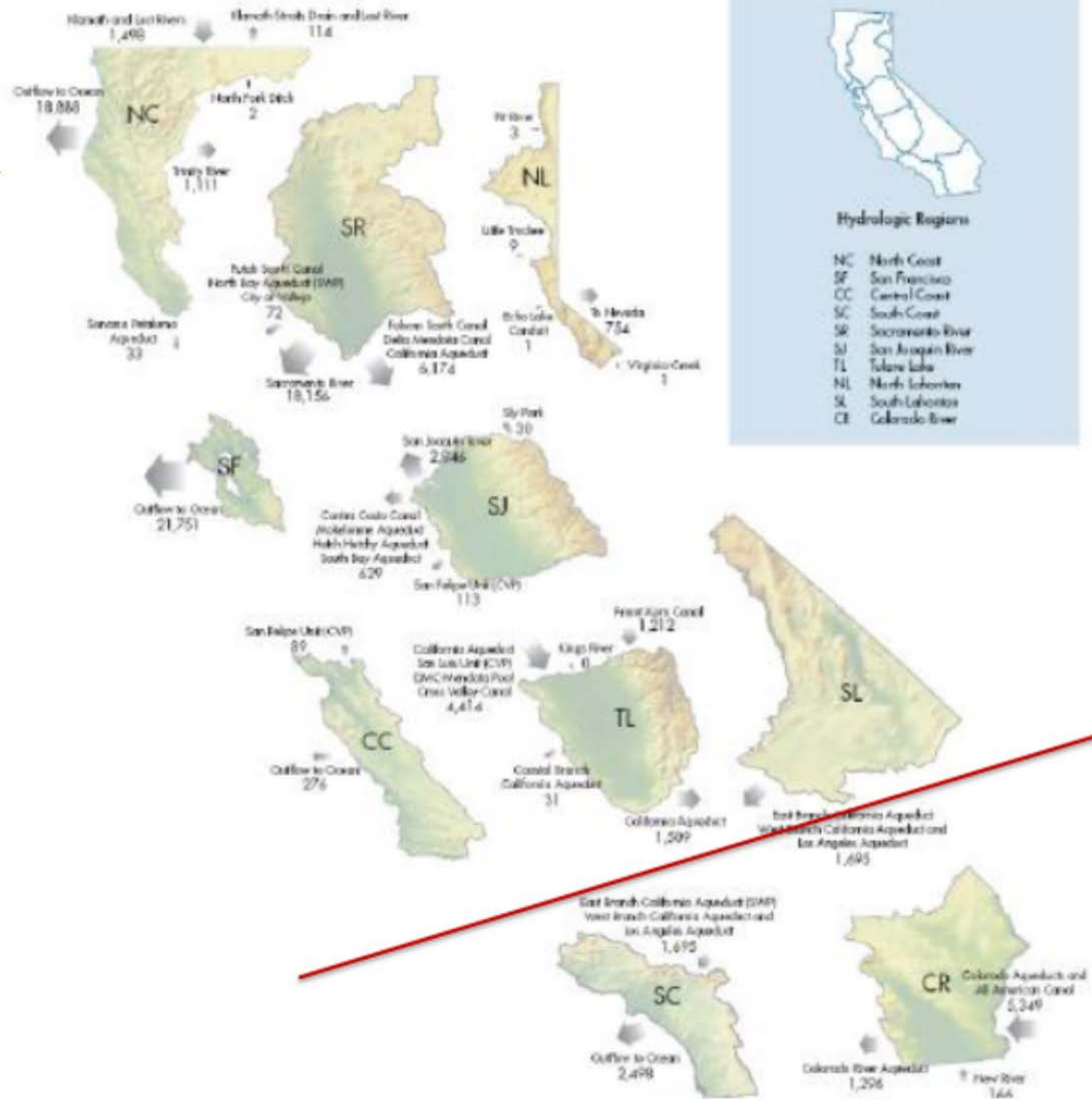


What is included in Sphere?



Hydrologic Zones in CA

10
Regions
vs.
previously
2 regions



The Accounting

Location	Gallons of Water	Metric Tons of CO2e
Oakland	166,647	.0463
Los Angeles	166,647	.1856

- ✦ 1 4- bedroom 2,000 sq.ft. home
- ✦ Variables in pumping due to distribution, conveyance, and treatment 4 times the difference in CO2e



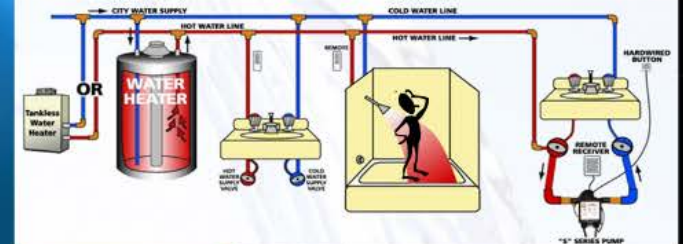
The Accounting on Energy Use

- ✦ Water heater
- ✦ Distribution system – structural waste
- ✦ Behavioral waste
- ✦ Type of fixture
- ✦ Use based on occupancy

Configuration	Gallons of Hot Water	kBTU
No Optimization	70,656	12,969
Optimization	59,140	9,285

Sphere of influence on Energy Use for Hot Water

- ✦ Water heater
- ✦ Distribution system – structural waste
- ✦ Behavioral waste





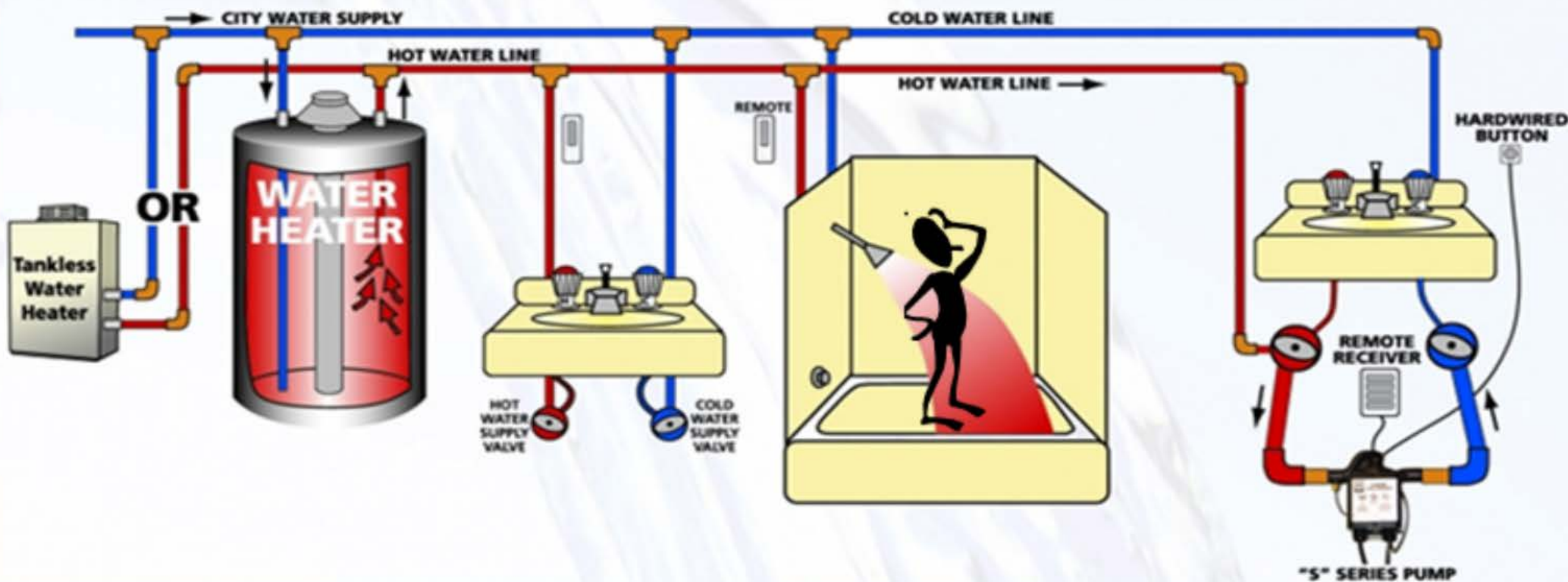
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Sphere of influence on Energy Use for Hot Water

- ✦ **Water heater**
- ✦ **Distribution system – structural waste**
- ✦ **Behavioral waste**



The Accounting on Energy Use

- ✦ *Water heater*
- ✦ *Distribution system – structural waste*
- ✦ *Behavioral waste*
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The Sphere of Influence on Volume

- ✦ Distribution system – structural waste
- ✦ Behavioral waste
- ✦ Type of fixture
- ✦ Use based on Occupancy



The Accounting of Volume

- ✦ Water volume for single user and use non linear equation for additional persons in residence
- ✦ Different equations for different building types

Configuration	1 Bedroom		4 Bedroom	
	Gallons of Water	Assumed Occupancy	Gallons of Water	Assumed Occupancy
Single Family	69,256	2.18	166,647	3.4
Multifamily	55,723	1.94	151,734	2.85
Multifamily- 100% below poverty level	74,135	2.26	214,897	3.4



Thank you!

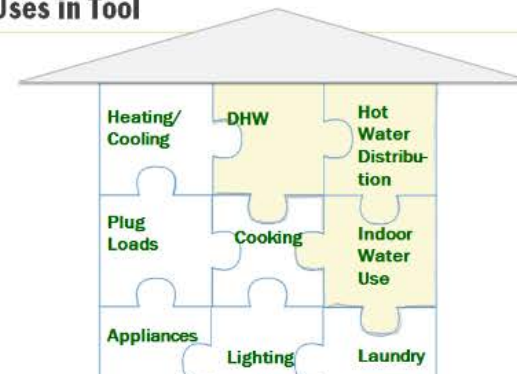
Amy Dryden
Senior Program Manager

510.590.3360 x.123
amy@builditgreen.org



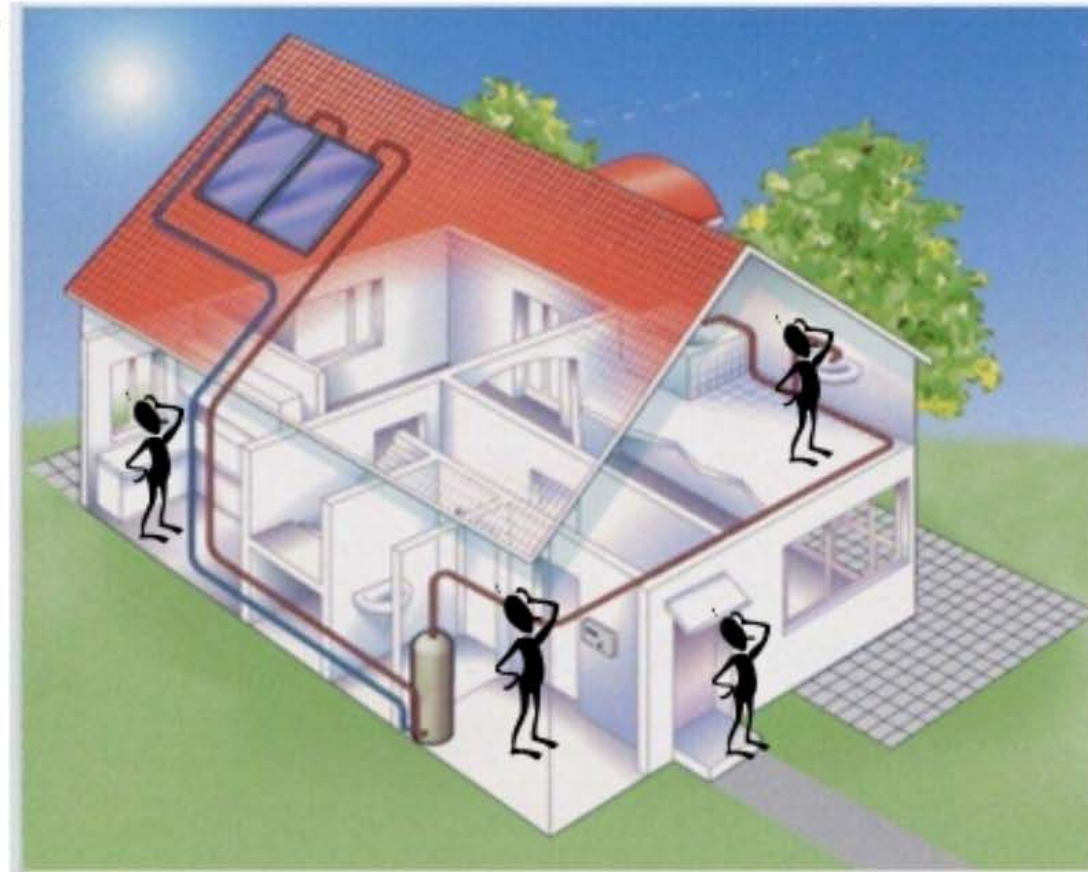
19

End Uses in Tool



The Sphere of Influence on Volume

- ✦ ***Distribution system – structural waste***
- ✦ ***Behavioral waste***
- ✦ ***Type of fixture***
- ✦ ***Use based on Occupancy***





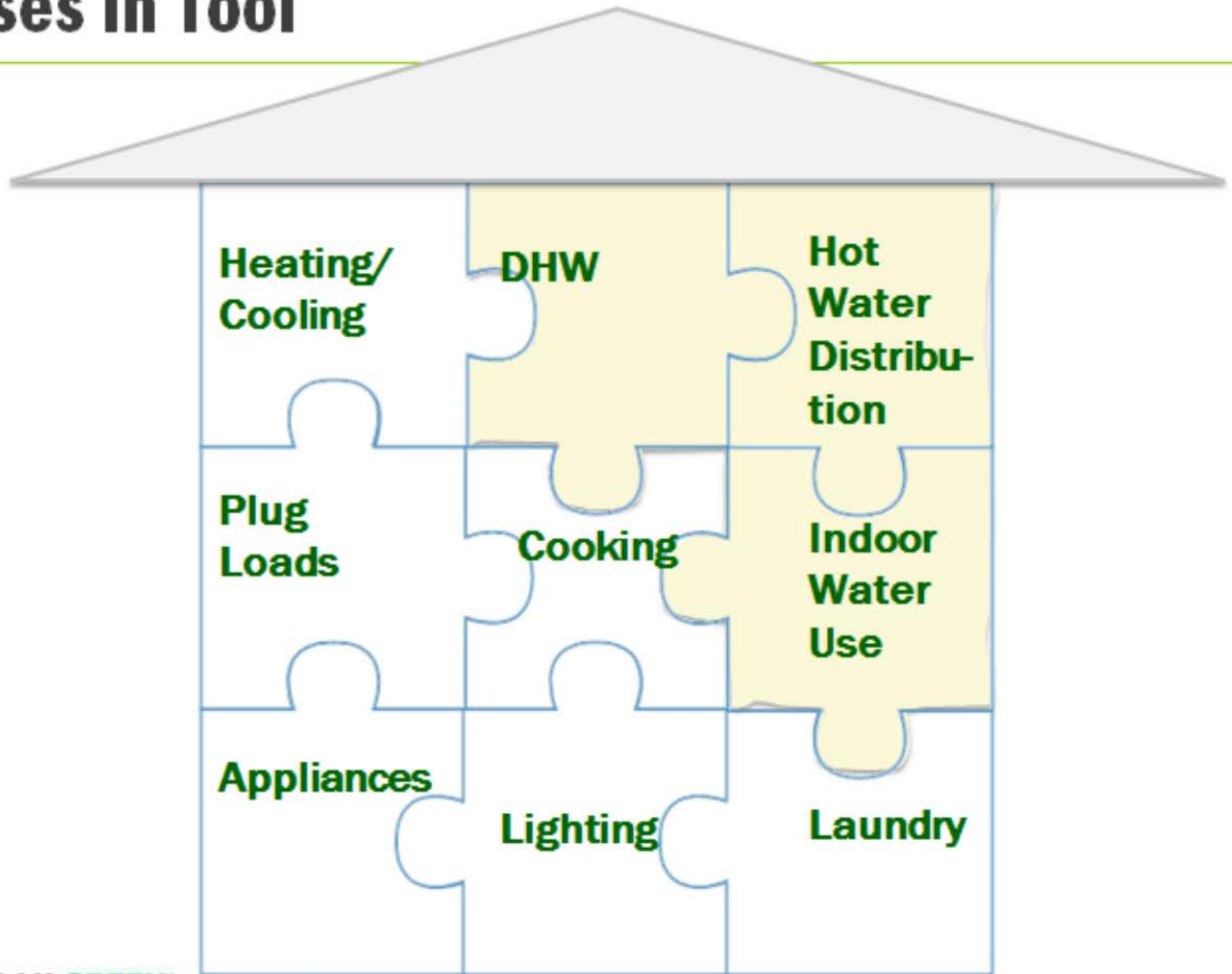
The Accounting of Volume

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- ✦ ***Different equations for different building types***

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End Uses in Tool





Thank you!

Amy Dryden
Senior Program Manager

510.590.3360 x.123
amy@builditgreen.org

**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

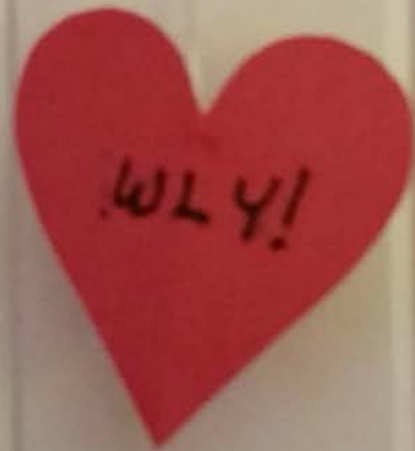


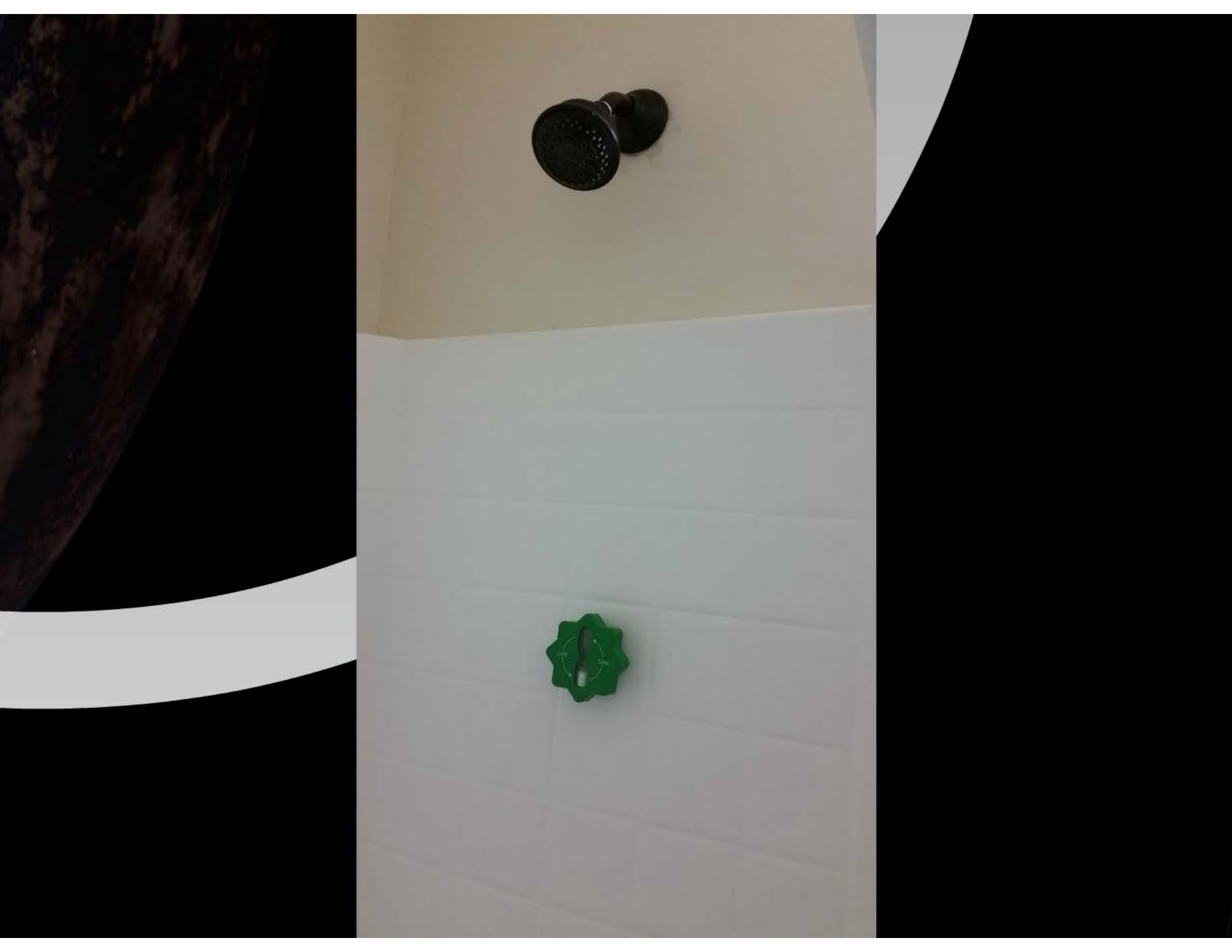
8. Teenage Showers

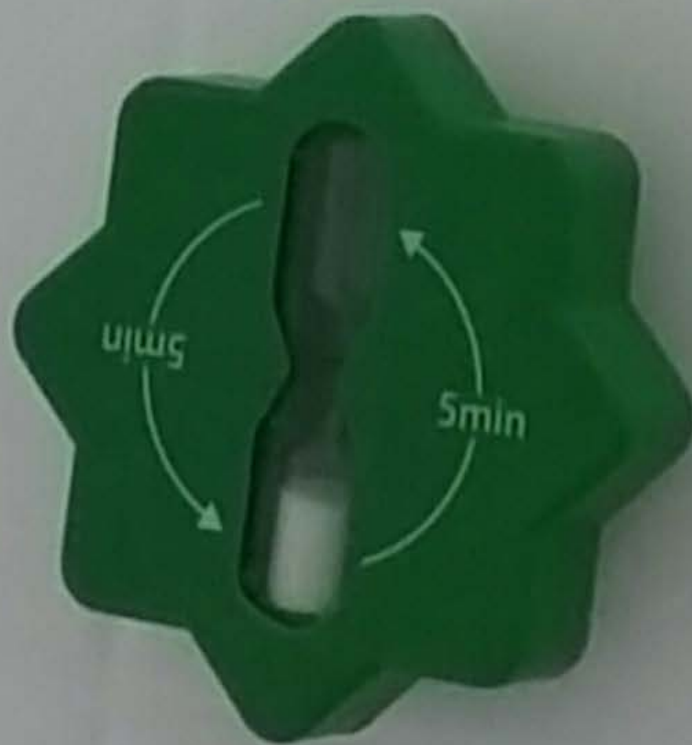




8
S

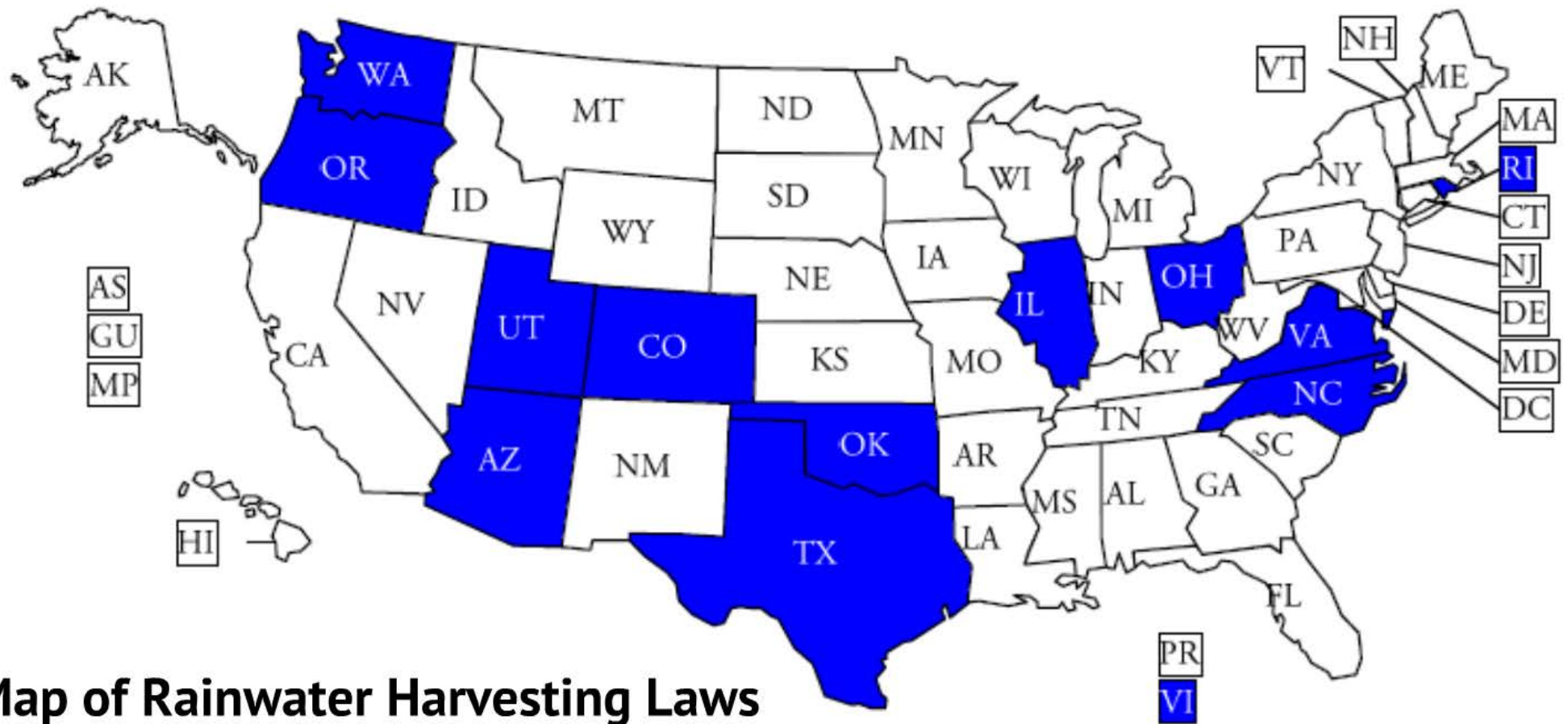






Outside Water Use Reduction





Map of Rainwater Harvesting Laws


 States with Rainwater Harvesting

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

Large Exterior Water Reduction Strategies

- Smart Irrigation Controllers
- Rain Water Catchment Systems
- Drought Resistant Plants

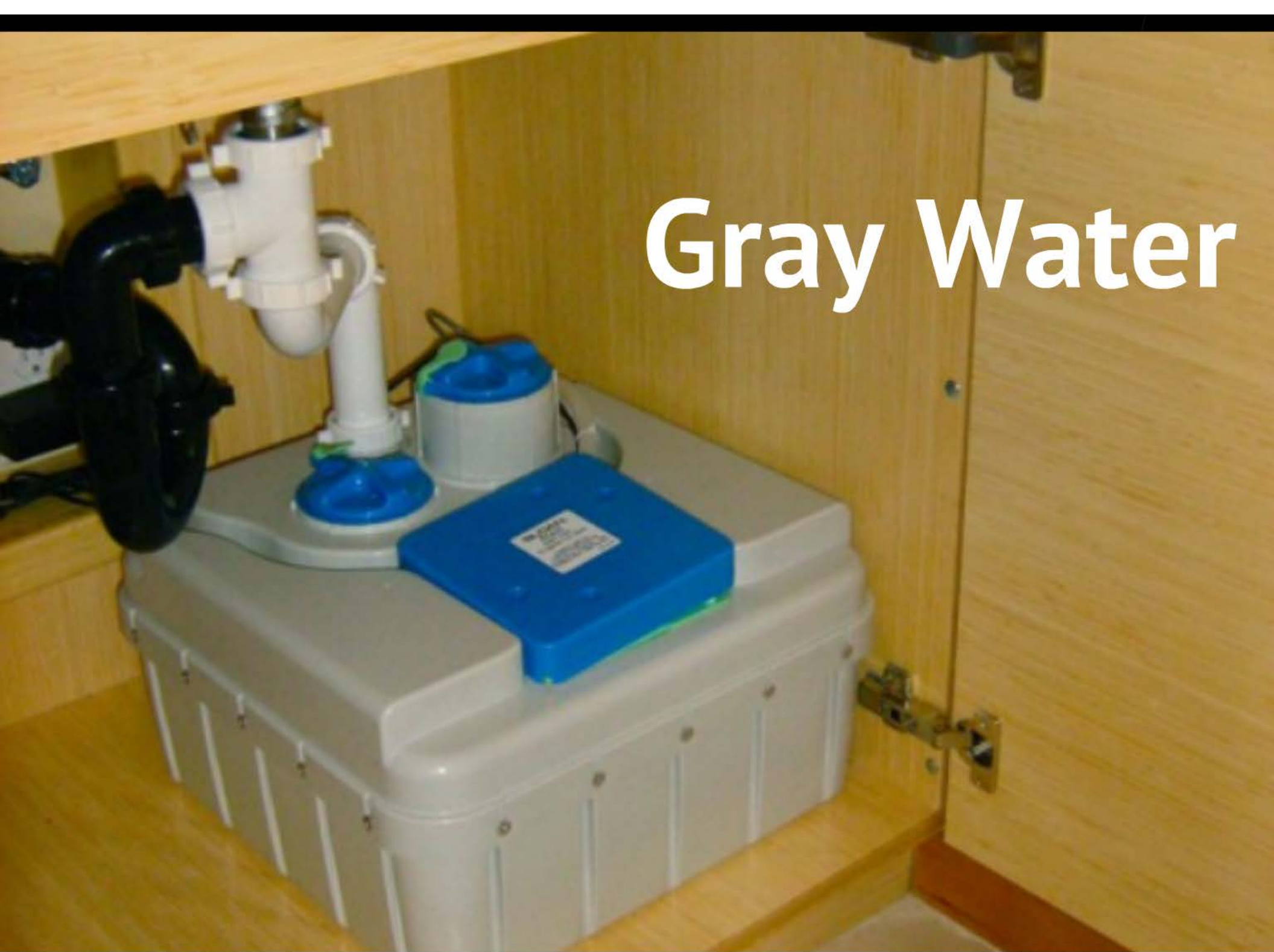




A white, boxy water dispenser with a black base and a black rectangular slot on top. The word "SlingShot" is printed in black on the front. A clear water bottle is inserted into the front-loading dispenser, which has a blue cap. The device is set against a dark background.

SlingShot

Gray Water

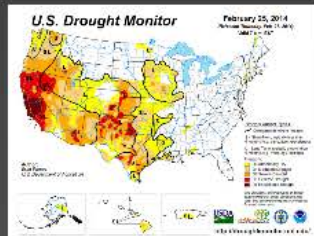


**Absolute numbers of people
don't influence water demand
as much as changing diet and
lifestyle**

Meat-eating Diet...1320 per meal
Vegetarian Diet.....620 per meal
Vegan Diet.....89 per meal

Data Rules

US Drought Monitor



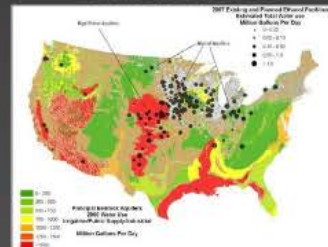
Water Sustainability Index (2050)



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)



Is water resilient?

Resilient:

- 1. Does it spring back; rebound?**
- 2. Does it return to the original form or position after being bent, compressed, or stretched?**
- 3. Does it recover readily from illness, depression, adversity, or the like; buoyant?**



Sustainable Quality of life = Sustainable Water



We can't wait!



THANK YOU