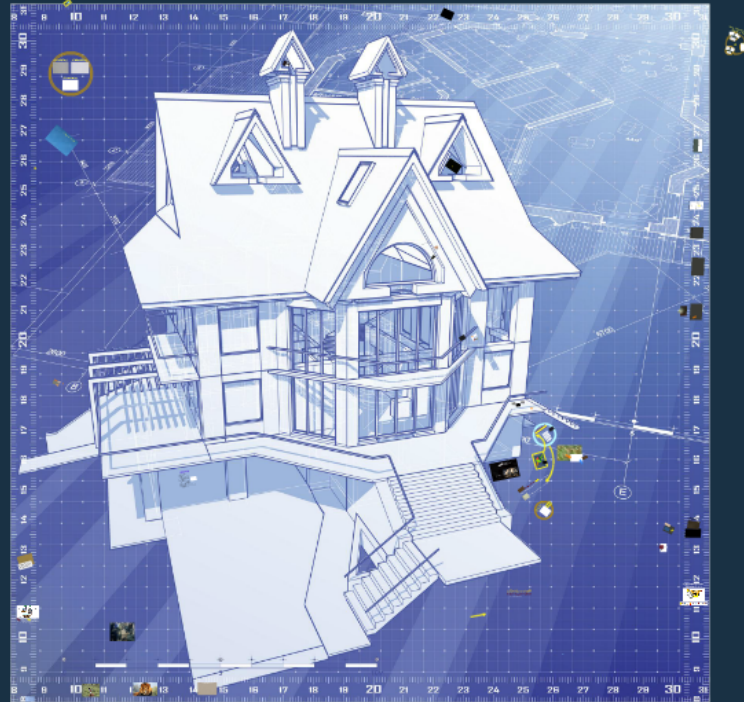
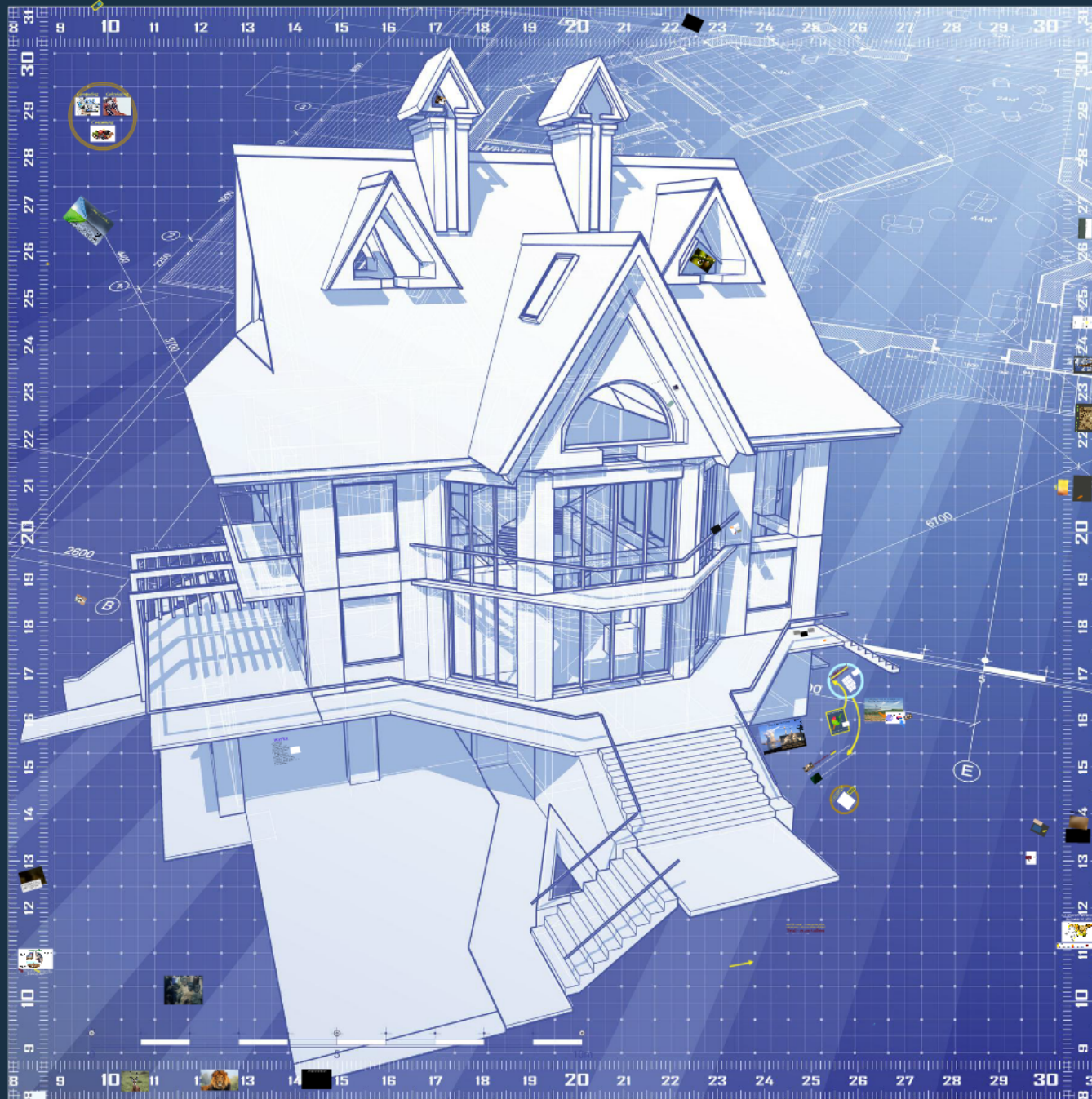




When Making a Difference, Really Makes a Difference



When Making a Difference, Really Makes a Difference



Computing



Calculating



Consuming



...change is everywhere



John F. Kennedy



Change is the law of life and those who look only to the past or present are certain to miss the future.

*We can't live today
nor tomorrow like*

**We can't live today like it will be like yesterday
nor tomorrow like it will be like today.**

John Scully, former CEO Apple



"Only through a radical shift in our thinking can we succeed in the new era. It calls for nothing but complete break with tradition-bound leaders and managers."

Tim Cook, CEO Apple



“Anything can change, because the smartphone revolution is still in the early stages.”

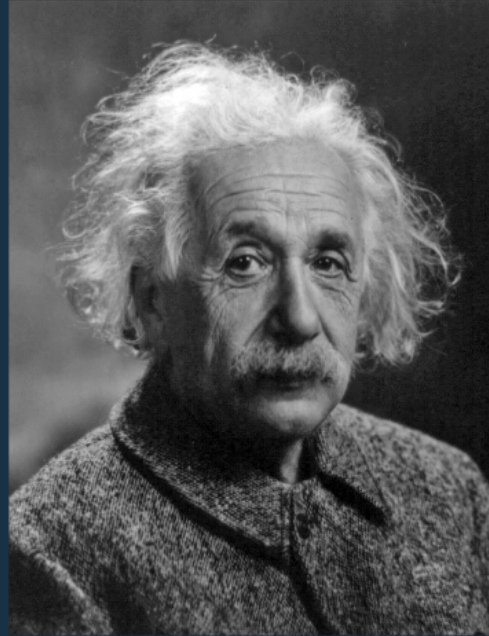
George Land



Today's change is not just: More rapid, more complex, more turbulent and more unpredictable...

Today's change is unlike any encountered before. The surprising fact is that *change itself has changed*

Albert Einstein



"We can't solve problems by using the same kind of *thinking* we used when we created them."

Pompeii
August 24, 79 A.D.

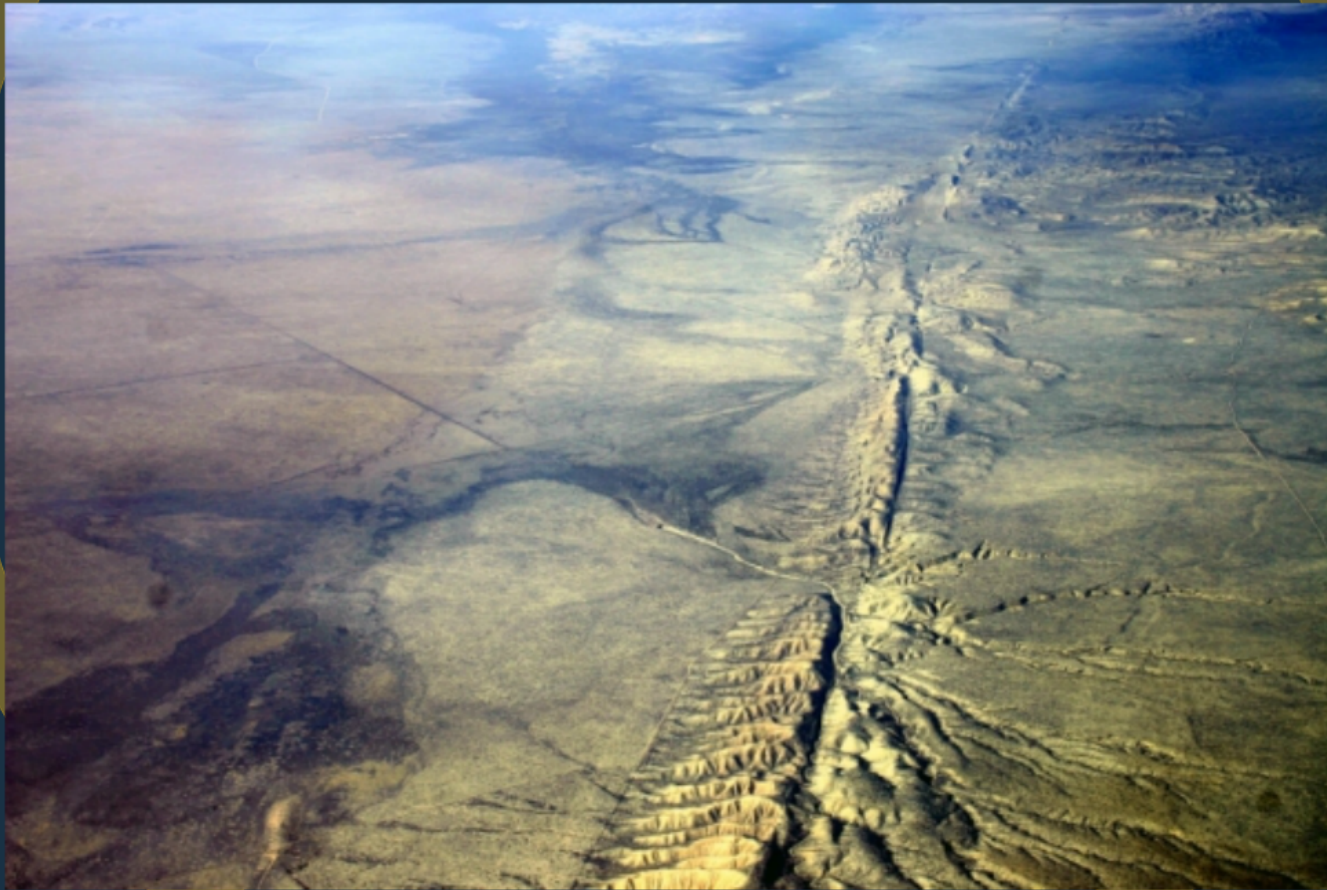


Naples, Italy
Pop. 961,257 (2010)



Mt. Vesuvius

San Andreas Fault



Los Angeles
Pop. 3.9 Million
2012



San Francisco

Pop. 825,863

2012



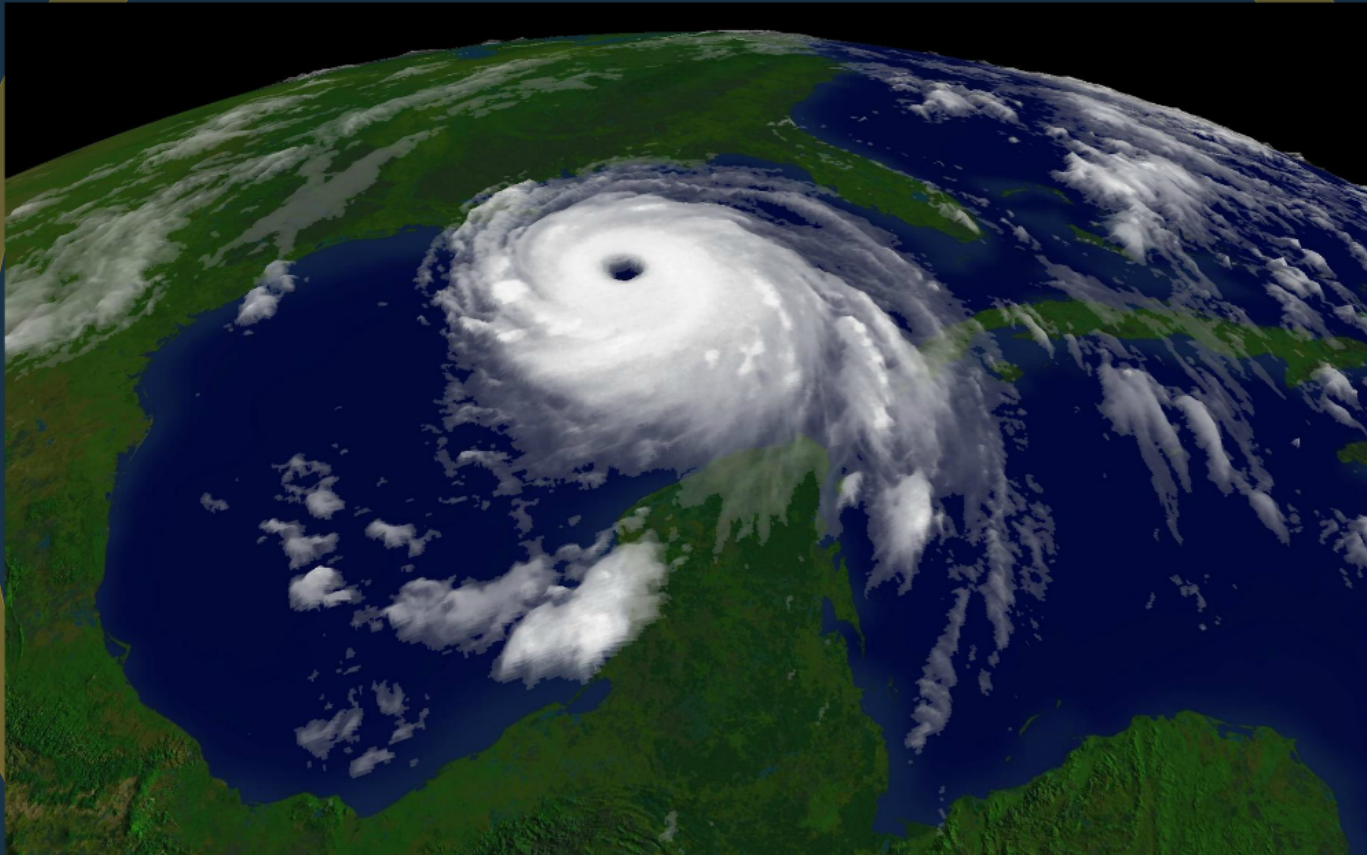
**Today is not
like yesterday**



**nor will tomorrow
be like today**

New Orleans
Pop. 369,250
2013







October 2012

Hurricane Sandy



7.9 million businesses and households are without electric power in 15 states and the District of Columbia.

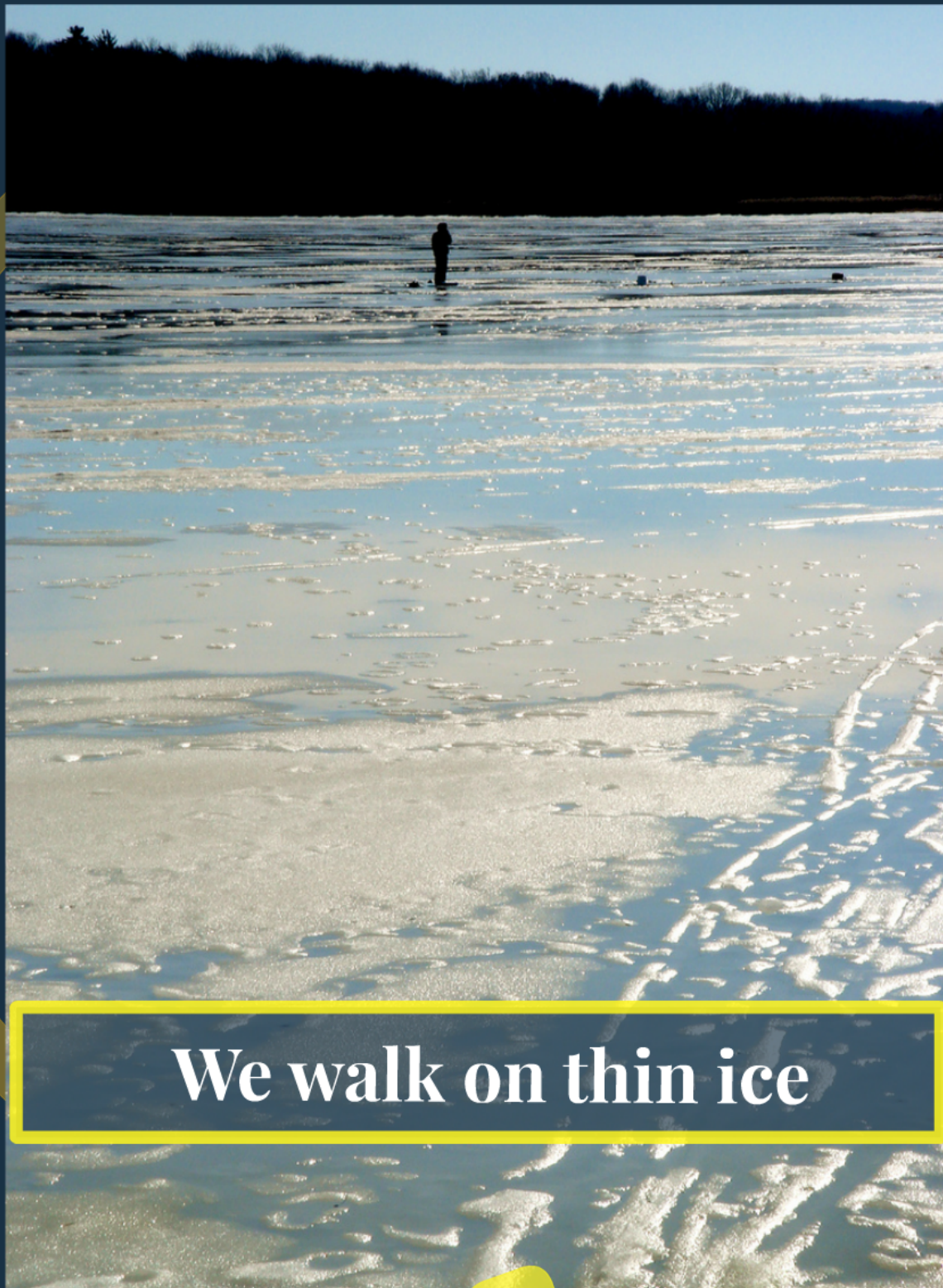




Tokyo, Japan
Pop. 13.4 million
May 1, 2014







We walk on thin ice

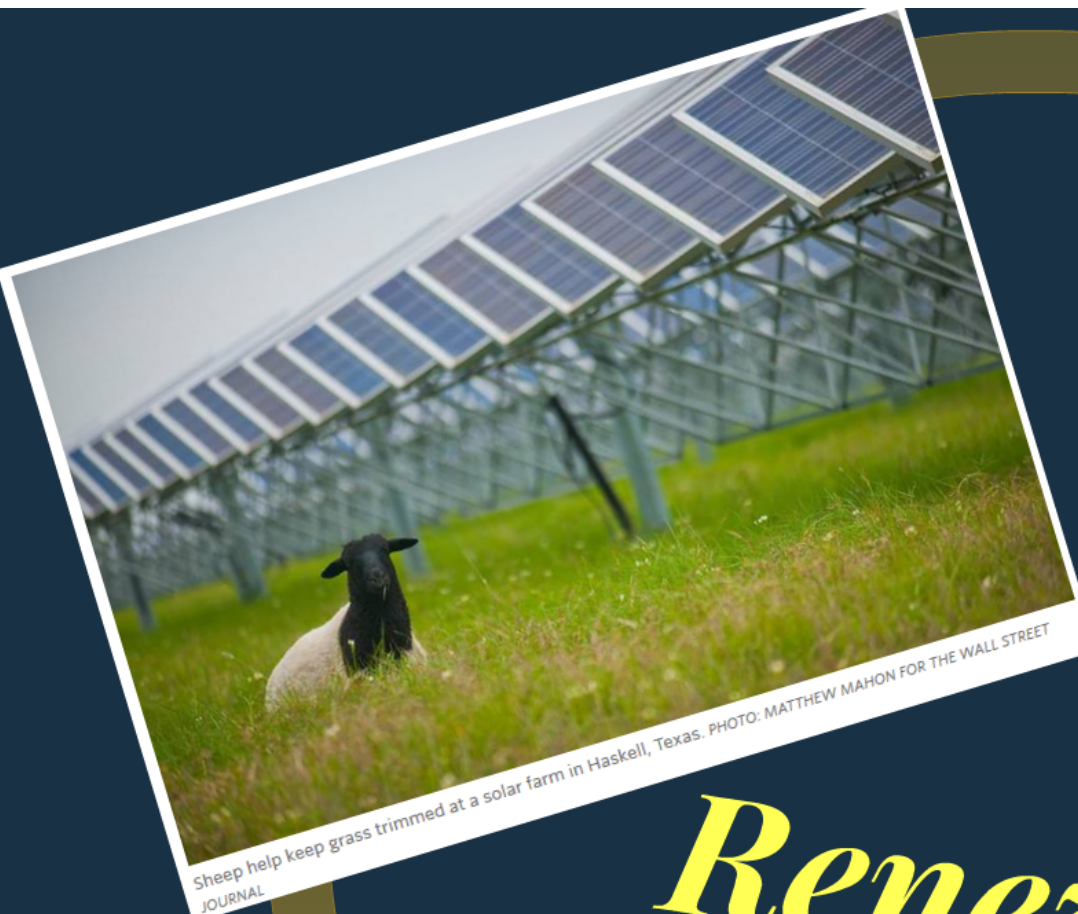


If we live as though today will be like yesterday or tomorrow will be like today.

Change Will Require Dedication and System Thinking



A system is a whole that derives its characteristics from the interactions of its essential parts and none taken separately.



Sheep help keep grass trimmed at a solar farm in Haskell, Texas. PHOTO: MATTHEW MAHON FOR THE WALL STREET JOURNAL



A truck rolls past a wind farm in Colorado City, Texas. PHOTO: SPENCER PLATT/GETTY IMAGES

Renewables



Sustainability

Economy

Society

Sustainable
Development

Environment





Efficiency





**We cannot plan our future looking
only in the rear view mirror.**

Your work is a ripple of hope!

A high-speed photograph of a single water droplet hitting a surface, creating a central column of water and concentric ripples that spread outwards. The background is a solid, deep blue color.

Each time a man stands up for an ideal, or acts to improve the lot of others, or strikes out against injustice, he sends forth a tiny ripple of hope.

Robert Kennedy

How many of us have children?



Our greatest value lies in what
we leave our children and
their children's children

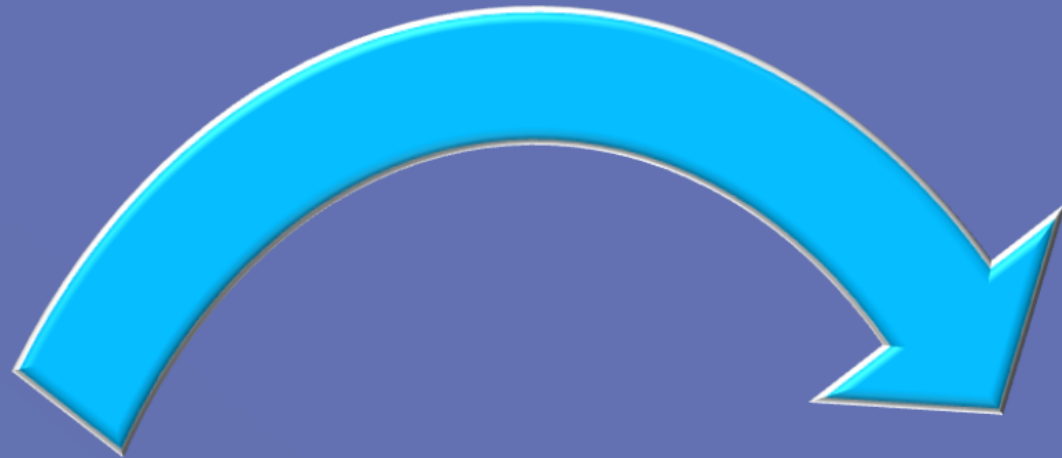
2030



U.S. Energy Use



Residential and commercial buildings account for near 40% of all energy use and 76% of all electricity used in the United States



Water is used to make

WATER

FUEL

Fuel is used to process





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

WATER

1. Land Subsidence*
2. Water Rights*
3. Salting 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







Aquifer Honeycomb Rocks

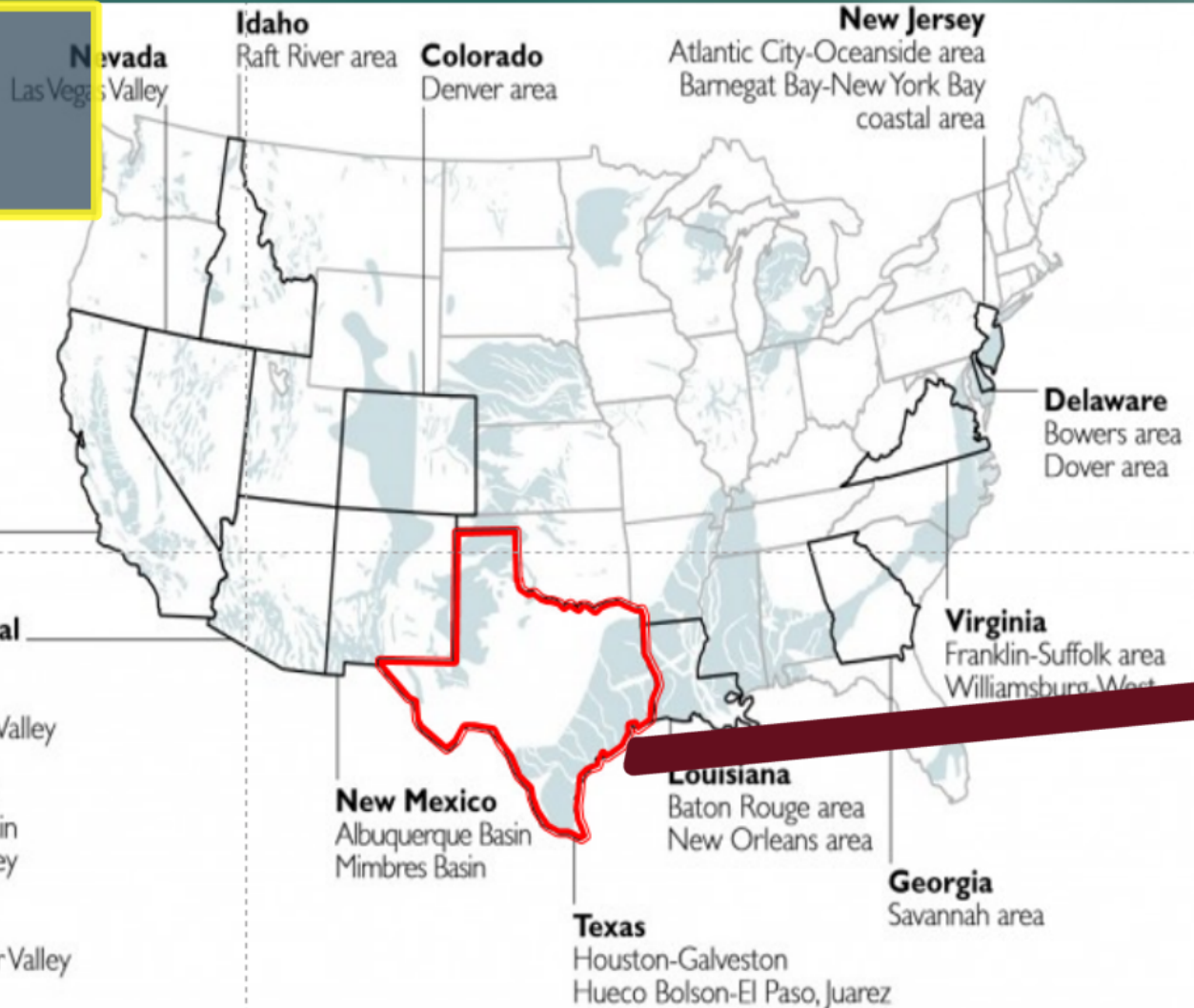


Areas where subsidence has been attributed to groundwater pumping

California

- Antelope Valley
- Coachella Valley
- Elsinore Valley
- La Verne area
- Lucerne Valley
- Mojave River Basin
- Oxnard Plain
- Pomona Basin
- Sacramento Valley

- Salinas valley
- San Benito Valley
- San Bernardino area
- San Gabriel Valley
- San Jacinto Basin
- San Joaquin Valley
- San Luis Obispo area
- Santa Clara Valley
- Temecula Valley
- Wolf Valley



(Modified from Clawges and Price, 1999)

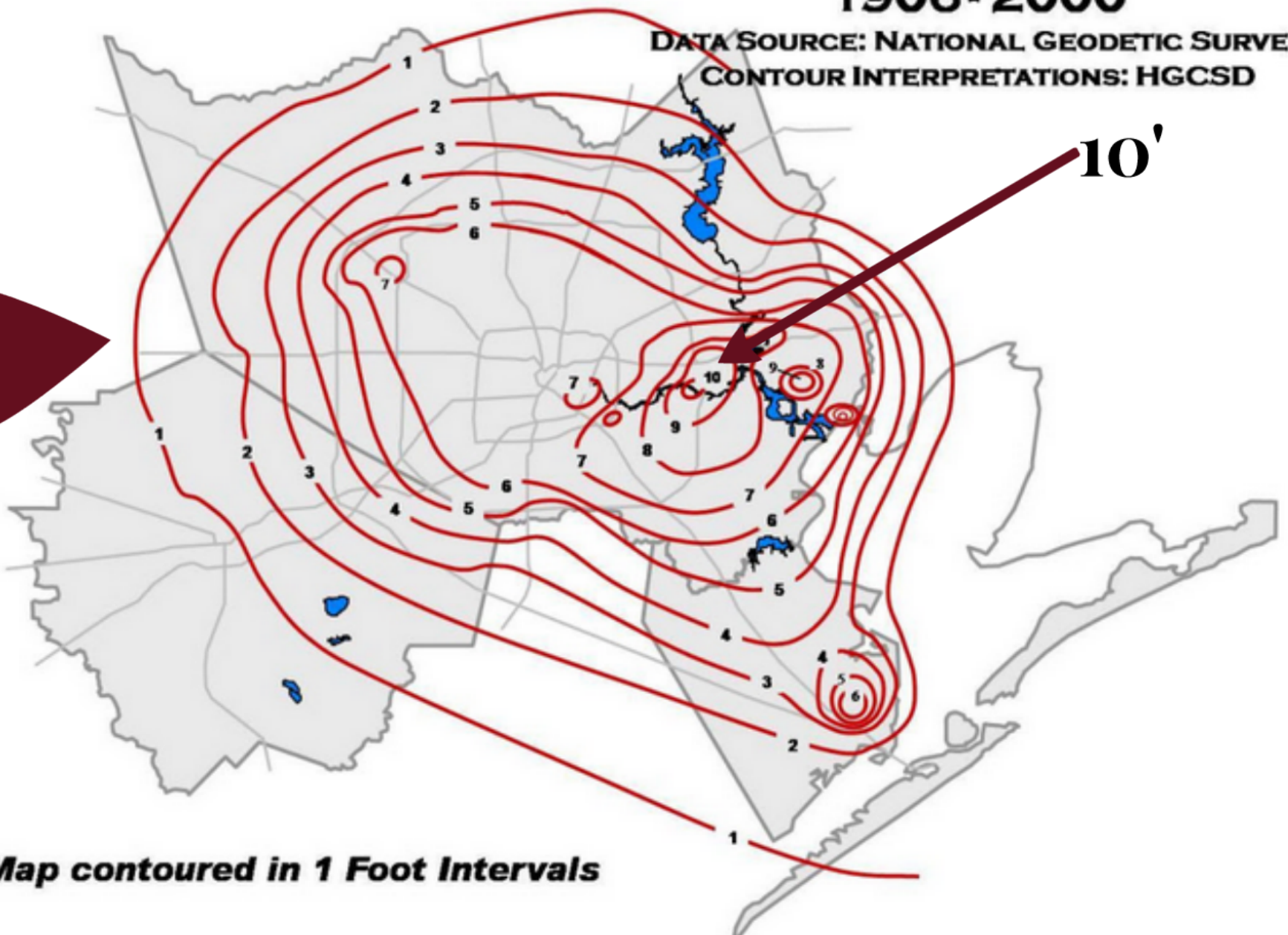
<http://water.usgs.gov/ogw/pubs/fs00165/>

Areas of Land Subsidence in the United States.

SUBSIDENCE

1906-2000

DATA SOURCE: NATIONAL GEODETIC SURVEY
CONTOUR INTERPRETATIONS: HGCSD

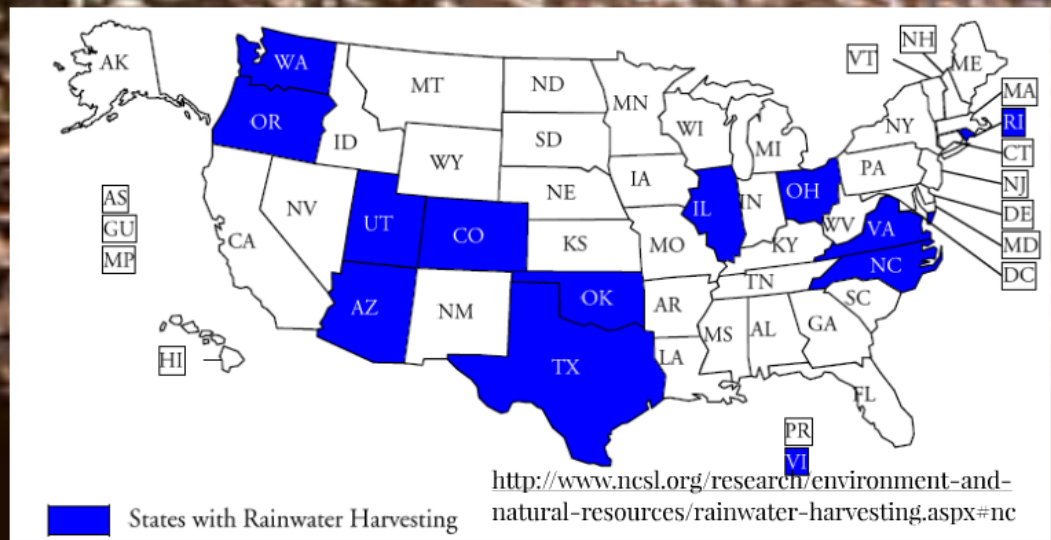
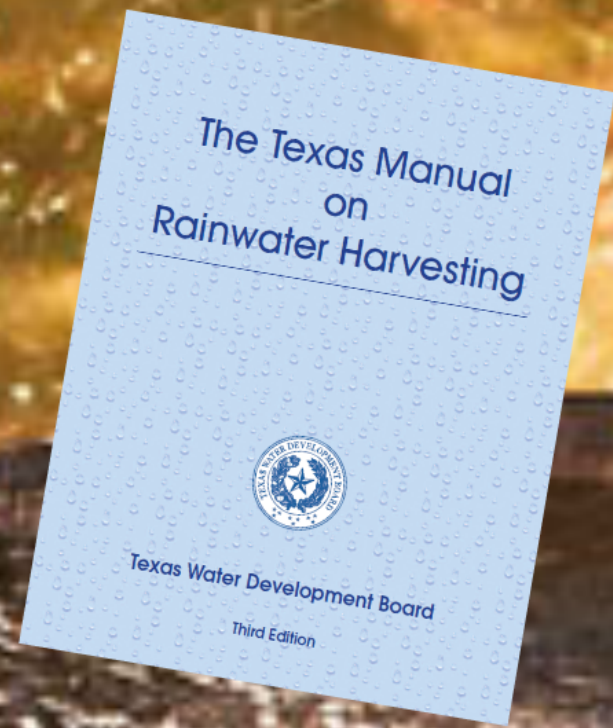


Map contoured in 1 Foot Intervals

WATER

1. Land Subsidence*
2. Water Rights*
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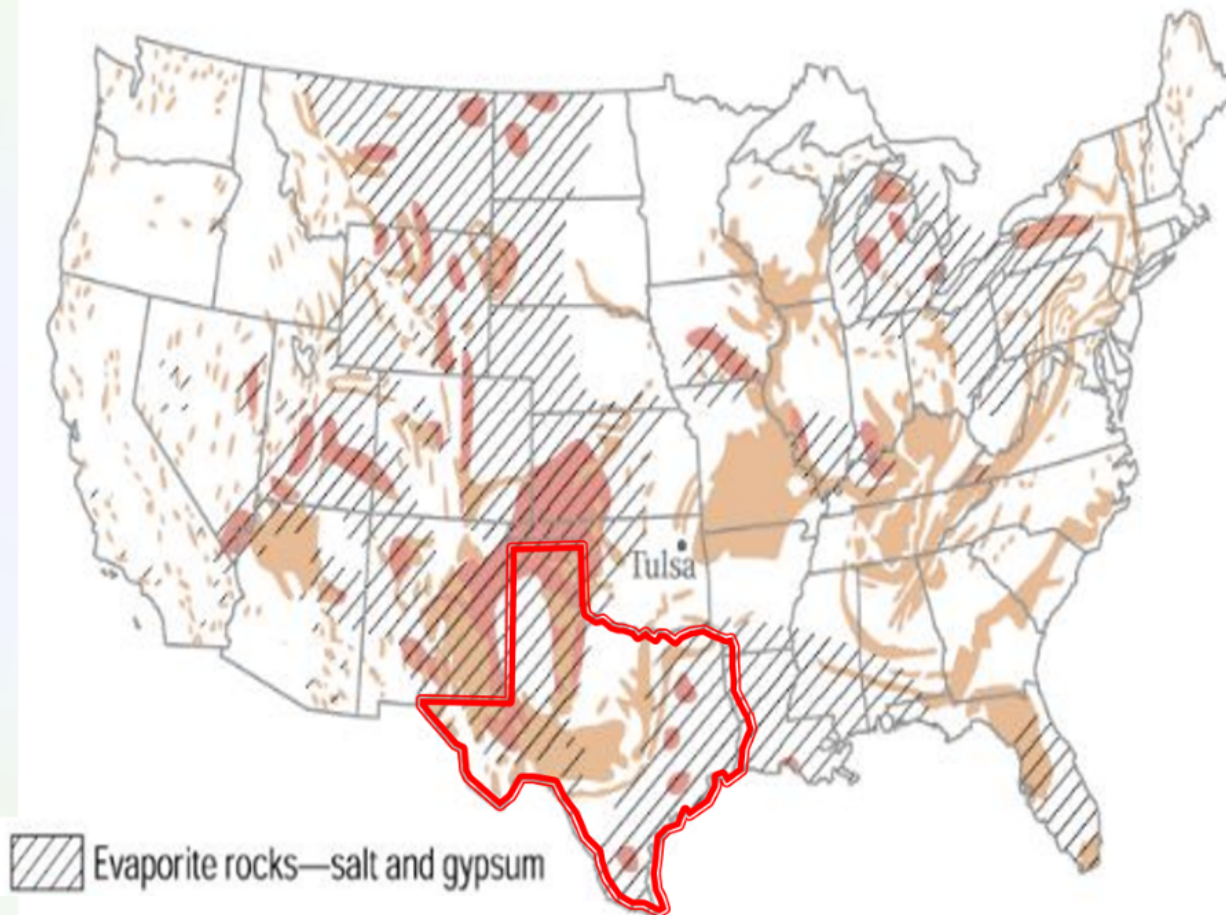





Figure 9. Salt and gypsum underlie about 40 percent of the contiguous United States. Carbonate karst landscapes constitute about 40 percent of the United States east of Tulsa, Oklahoma (White and others, 1995).

-  Evaporite rocks—salt and gypsum
-  Karst from evaporite rock
-  Karst from carbonate rock
(modified from Davies and Legrand, 1972)

WATER

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Rivers longer than 621 miles and percentage of those rivers remaining free-flowing

33

18%



North America

- 1. Mackenzie**
- 2. Athabasca (Mackenzie)**
- 3. Liard (Mackenzie)**
- 4. Yellowstone**
- 5. Fraser**
- 6. Kuskokwim**





MONEY

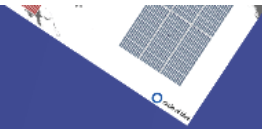
&

Flow in the same direction



WATER





2000 Years ??

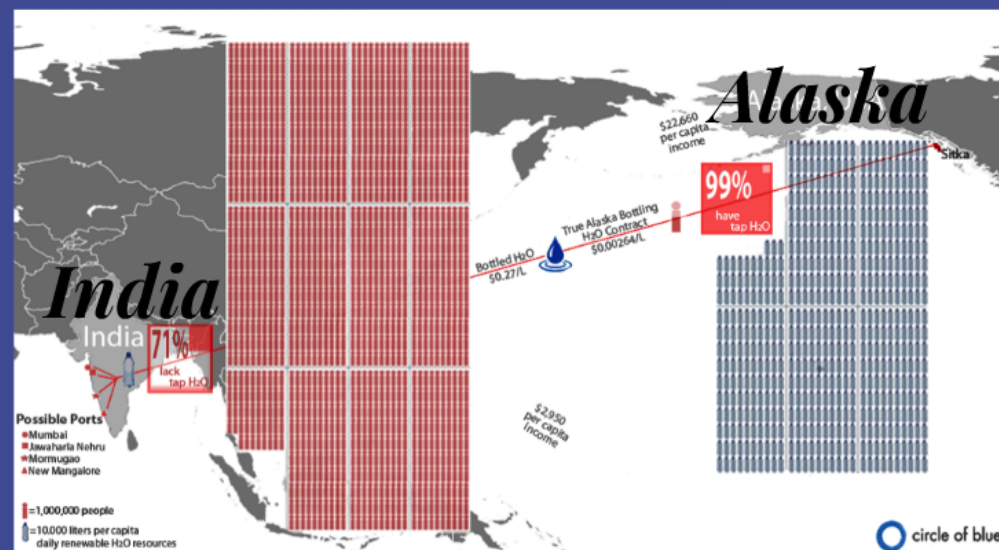
Water has been public

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

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, 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 Research, May 15, 2016

Blue Lake



India

India

71%
lack
tap H₂O

Possible Ports

- Mumbai
- Jawaharia Nehru
- ★ Mormugao
- ▲ New Mangalore

■ = 1,000,000 people
■ = 10,000 liters per capita
daily renewable H₂O resources

Alaska

\$22,660
per capita
income

Bottled H₂O
\$0.27/L

True Alaska Bottling
H₂O Contract
\$0.00264/L

99%
have
tap H₂O

\$2,950
per capita
income

- It takes large amounts of water to create energy.
- Water is used to cool thermoelectric power plants – fueled by
 - coal
 - oil
 - natural gas and
 - nuclear power
 - hydropower



Thermoelectric Power Plants

Consumptive
Evaporation (use)

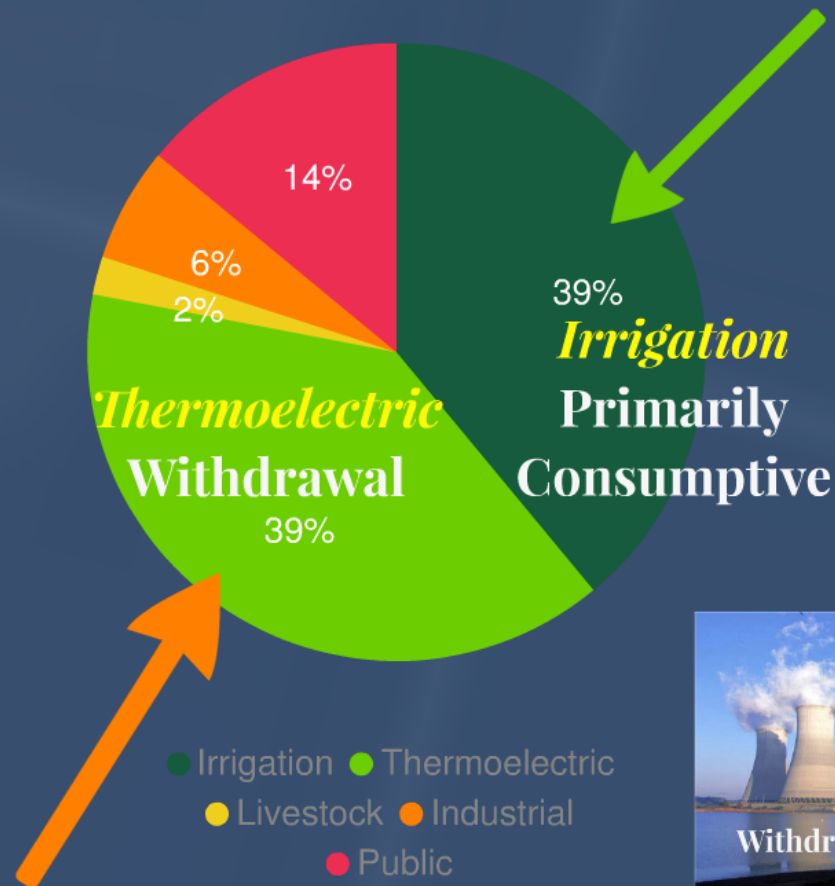


Withdrawal



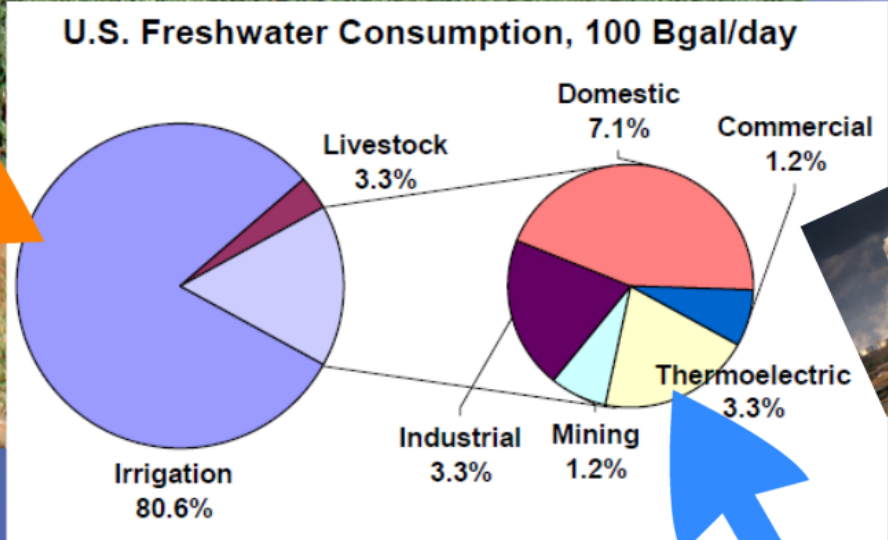
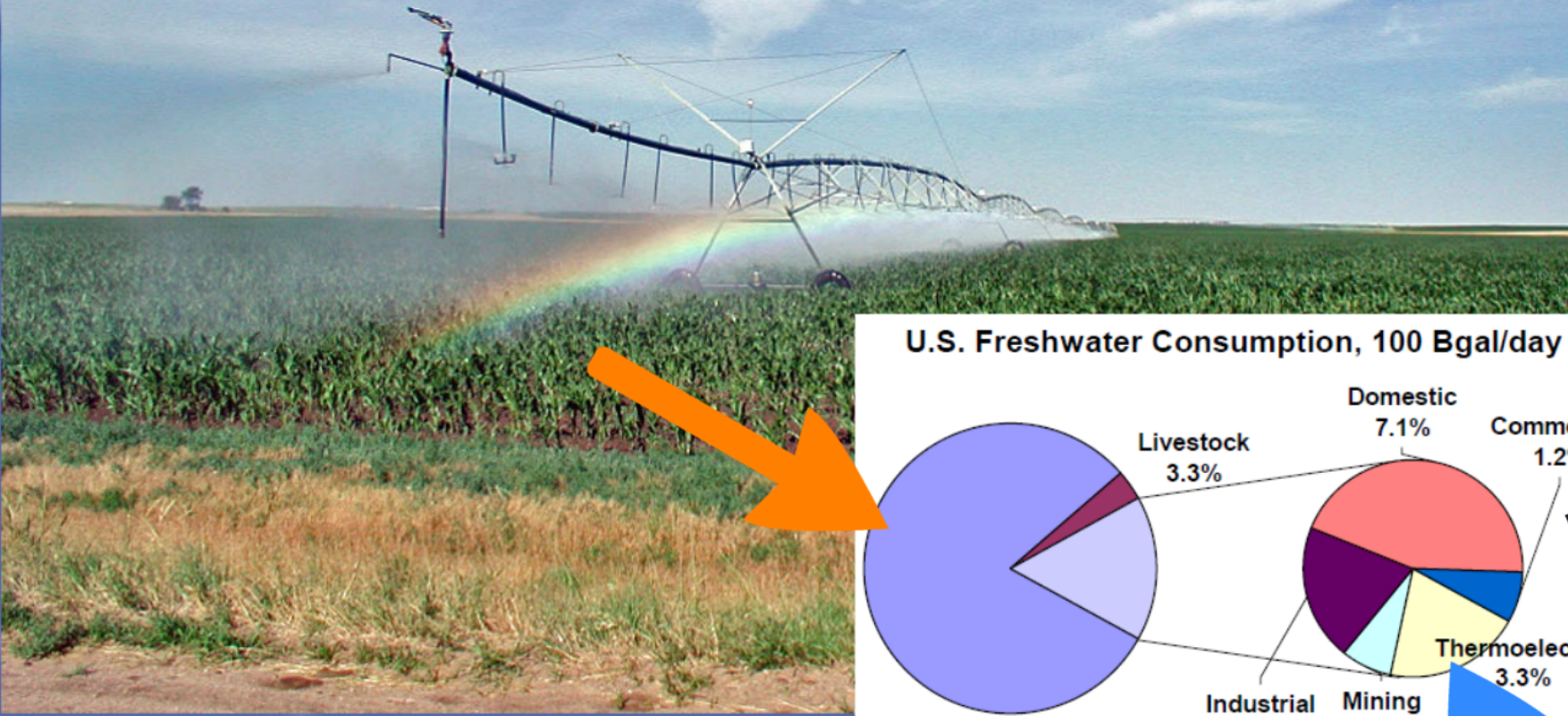


Water Withdrawals



Thermoelectric withdrawals are 136 Bgal/day

Most agriculture water used is consumptive and large , whereas the energy sector use is small



DOE report to Congress 2006



Evaporation - Use

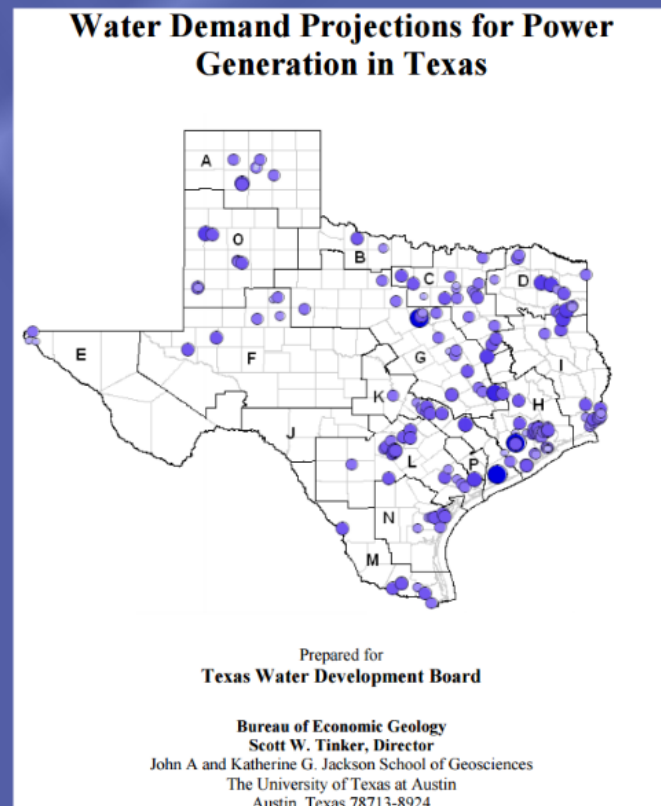
For every kWh our work saves = 1/2 Gallon water



Hydroelectric plants equal 18 gallons per kWh

Source: Consumptive Water Use for U.S. Power Production., NREL/TP-550-33905 December 2003

Up to 1 gallon of freshwater may be consumed for every kWh for some coal and natural gas plants in Texas



**Average rate of
0.39 gal/kWh**

Source: Texas Water Development Board

Withdrawal 19 Gallons per kWh



<http://water.usgs.gov/watuse/wupt.html>

**1000 kWh we saved = we save around 500 gallons
evaporation (use) and 19,000 gallons withdrawal**

Total - 19,500 Gallons

NREL/TP-550-33905 Consumptive Water Use for U.S. Power Production

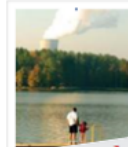
Withdrawal



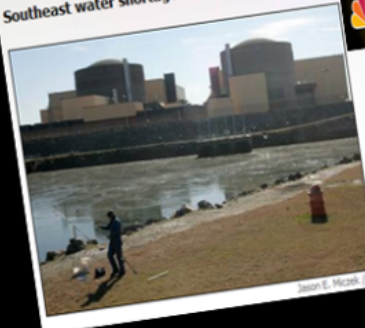
TRIANGLE BUSINESS JOURNAL

RALEIGH - North Carolina's electric utilities, among the largest water customers in the state, are dusting off contingency plans to manage their power plants if lake levels continue to drop due to the ongoing drought - plans that could lead to higher costs for consumers.

Both Progress Energy and Duke Energy say that if they don't...



Drought could shut down nuclear power plant
Southeast water shortage a factor in huge cooling requirements



A man fishes next to the outflows of the McGuire Nuclear Station near Lake Norman on Monday. Lake Norman dropped to about a foot - minimum level needed for system at the plant.

John E. Moore / AP

Water Shortage Could Dry Up Nuclear Power Plants in Southeast

6 Comments



Written by **Max Lindberg**
Published on January 23rd, 2008 in Environmental & Climate Science



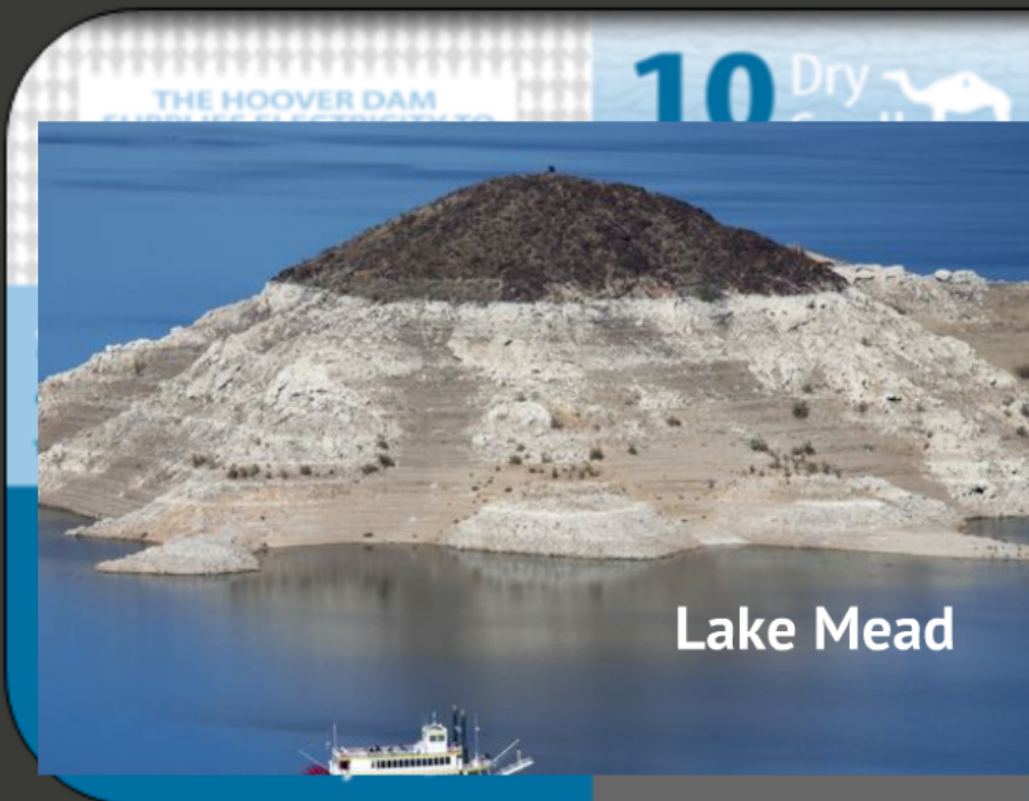
We've all read about the drought in America's Southeast, and if it doesn't let up very quickly, some nuclear power stations may have to either cut back operations or shut down temporarily because of a lack of water.

An Alabama reactor had to shutdown for a

brief period in the summer, and officials in the Southeast now say it is becoming a crisis.



Hoover Dam



Lake Mead

LAKE MEAD IS ONLY
41% FULL

The lake has
DROPPED 130 ft.
since 1999



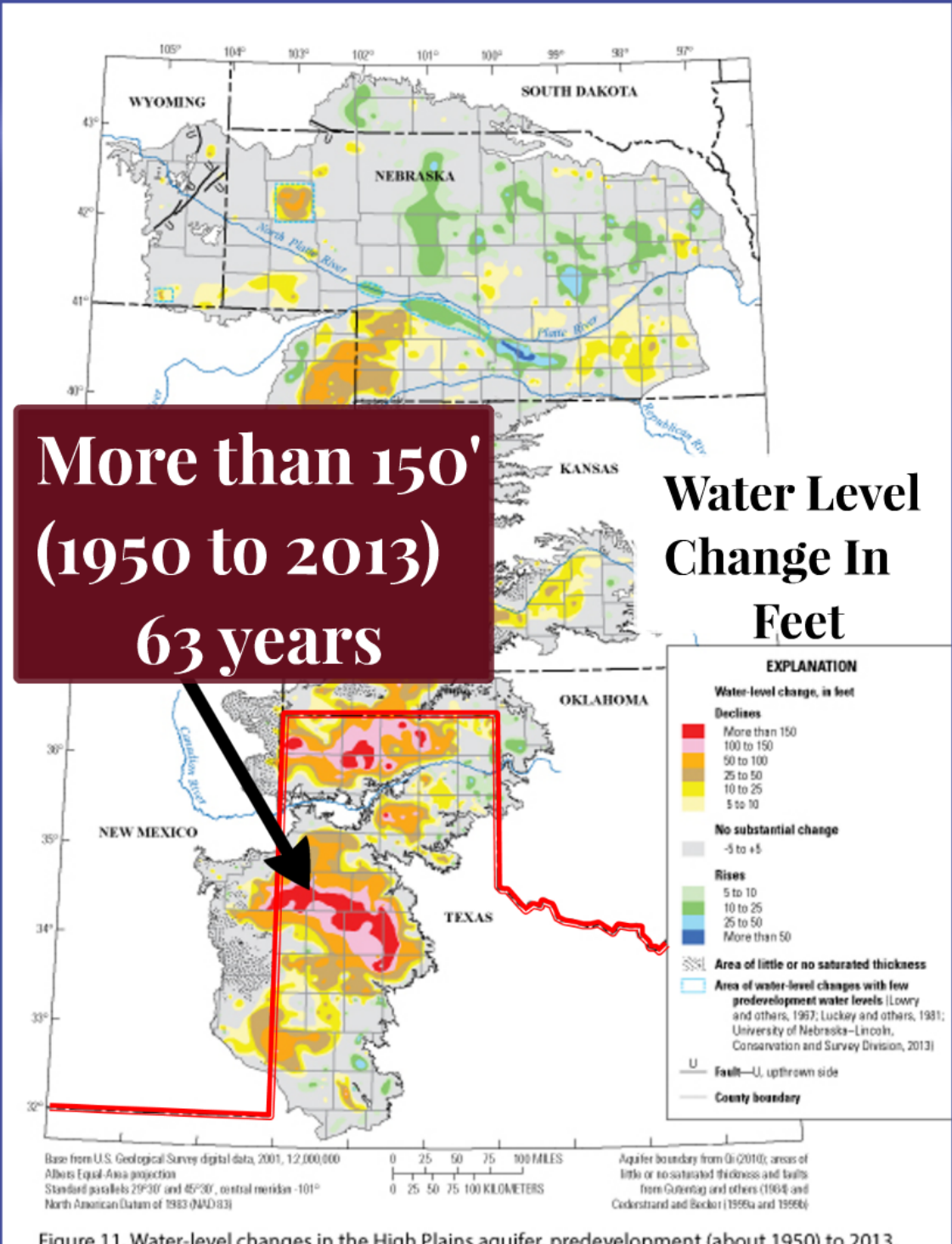
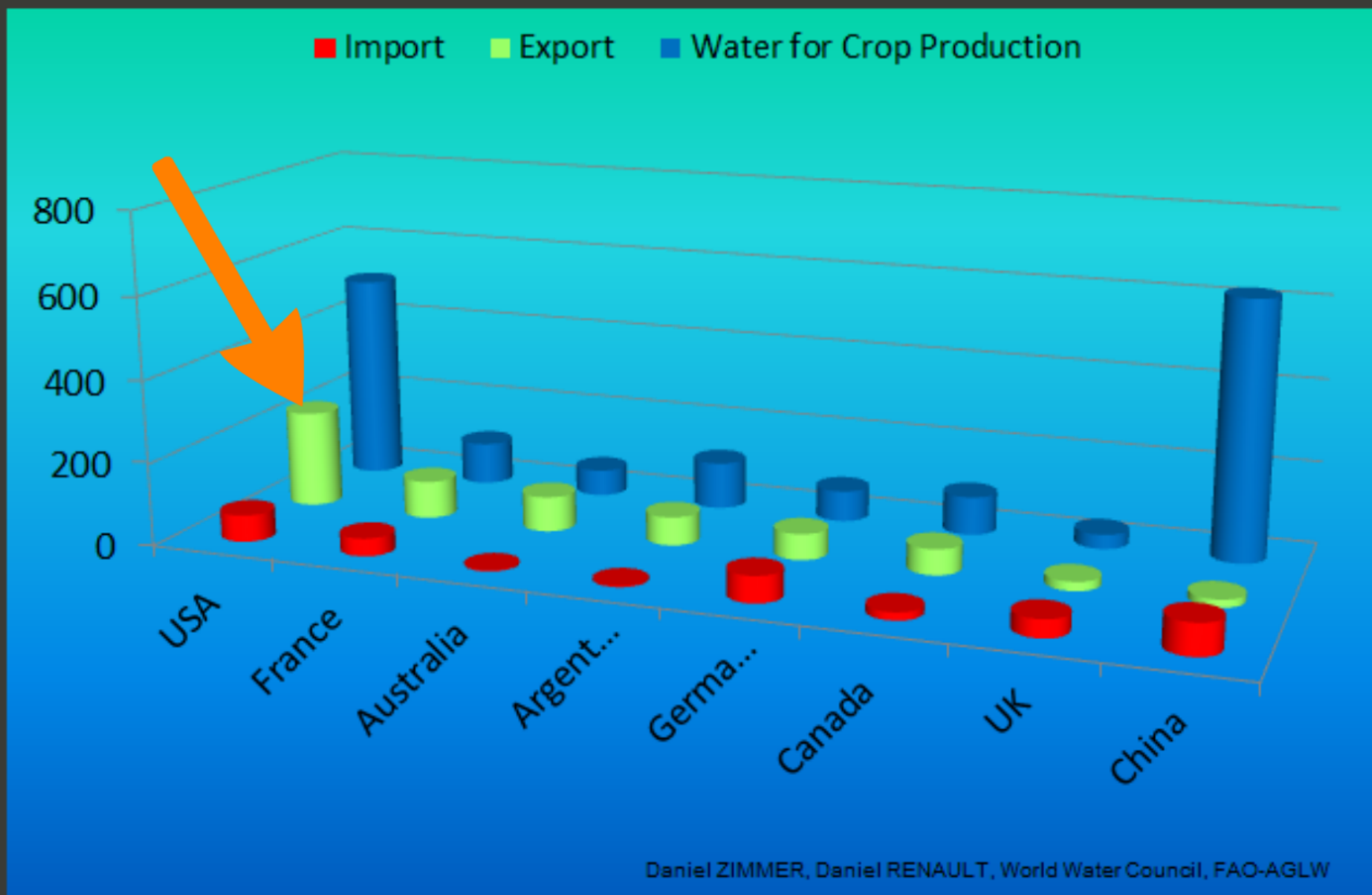


Figure 11. Water-level changes in the High Plains aquifer, predevelopment (about 1950) to 2013.

FOOD



VIRTUAL WATER IN FOOD PRODUCTION AND GLOBAL TRADE



Wilting corn causing spike in food prices



The World Needs Our Wheat



WATER FOR FOOD

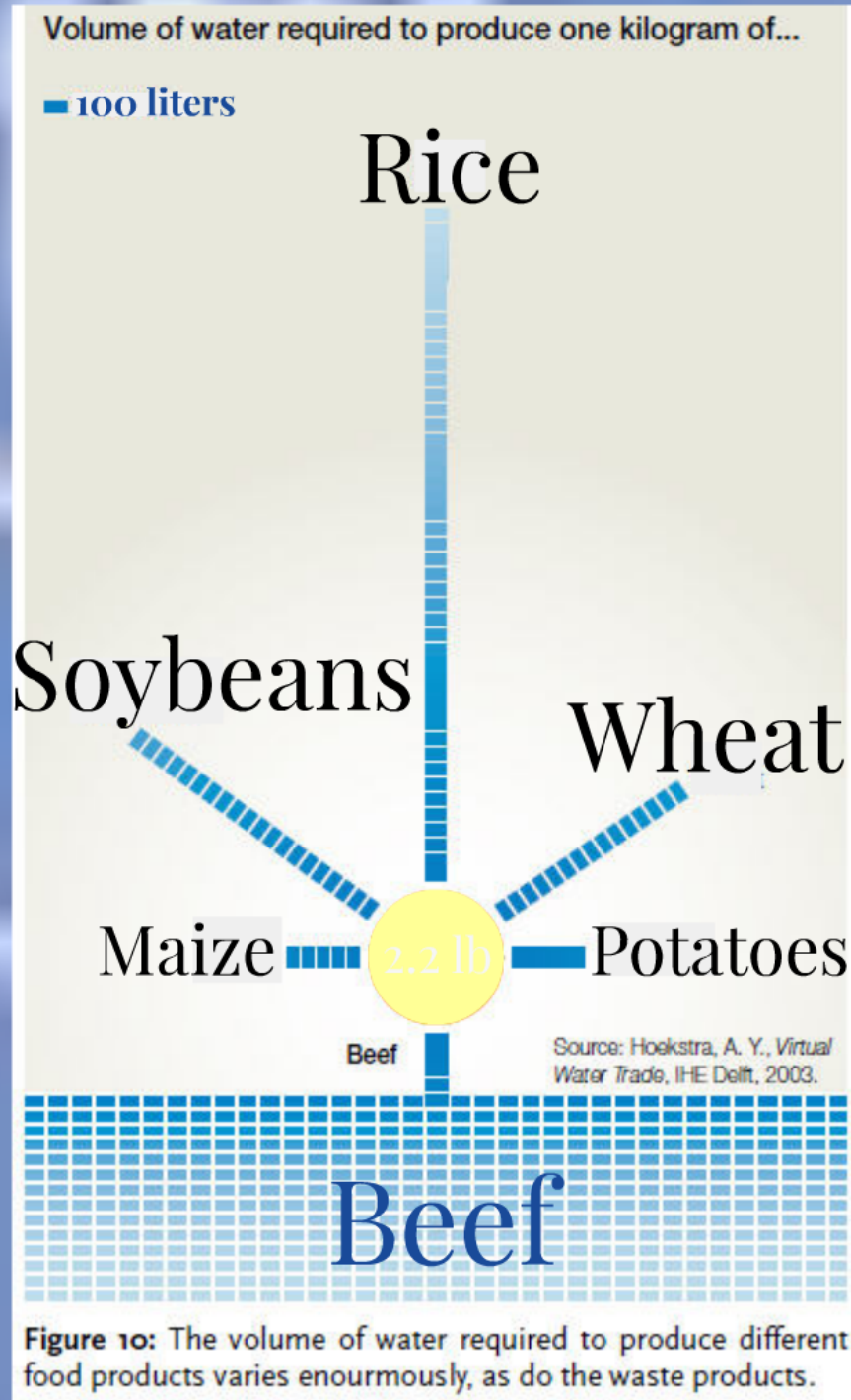
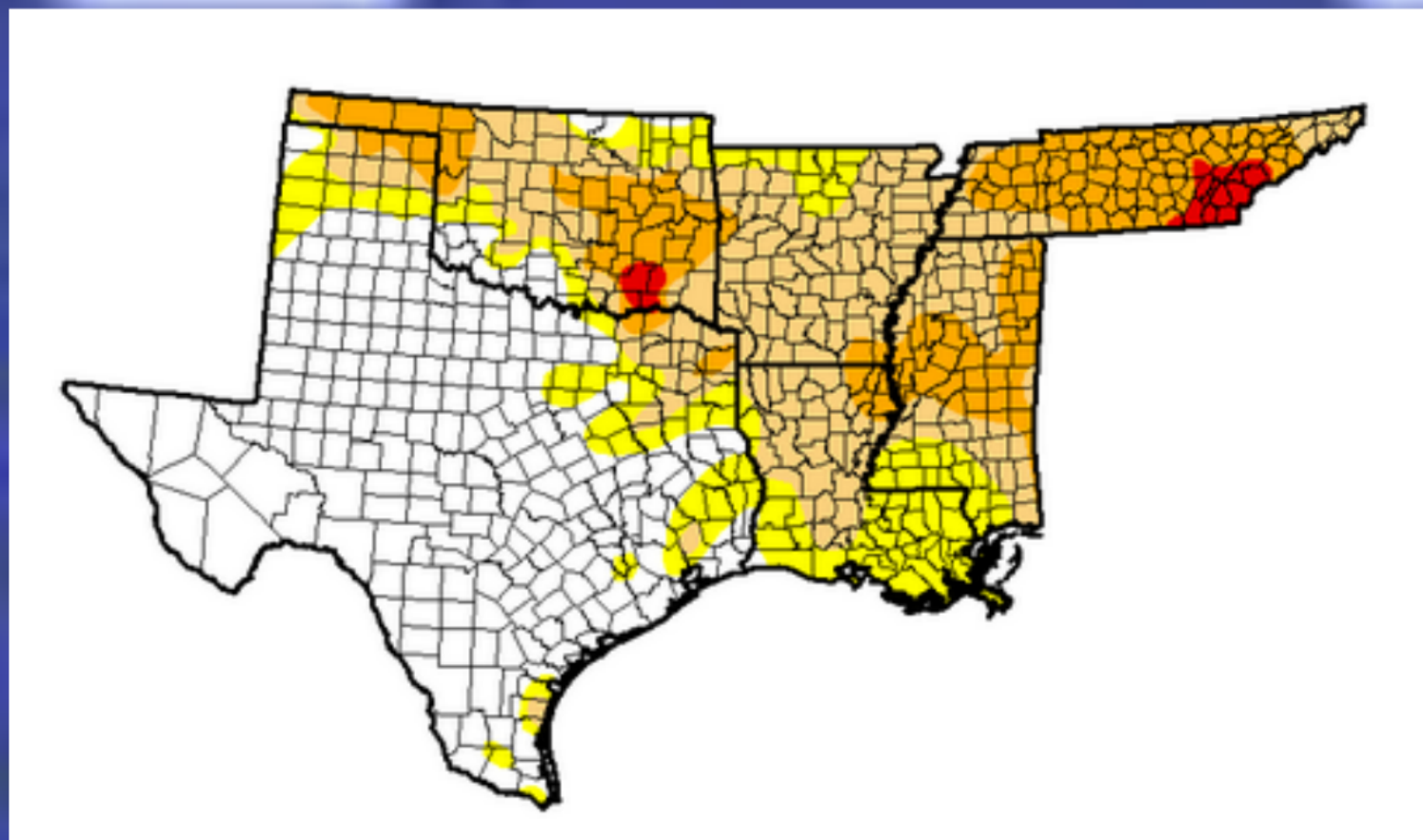


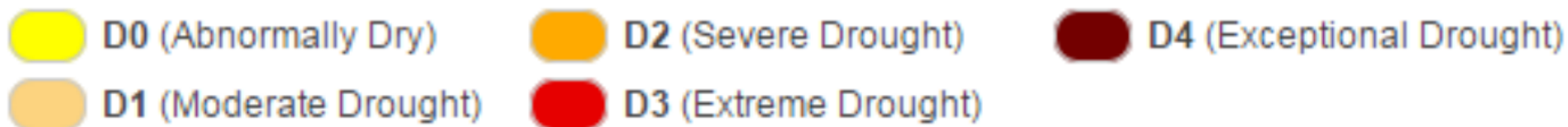
Figure 10: The volume of water required to produce different food products varies enormously, as do the waste products.

U.S DROUGHT MONITOR

December 16, 2016



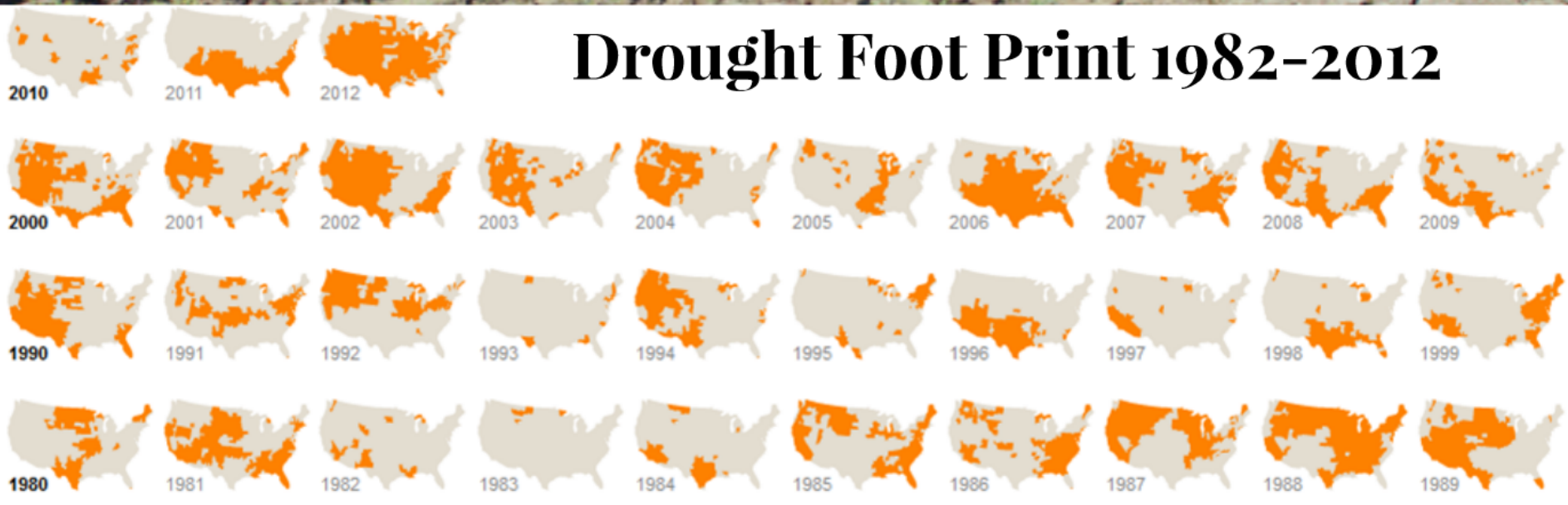
Intensity:

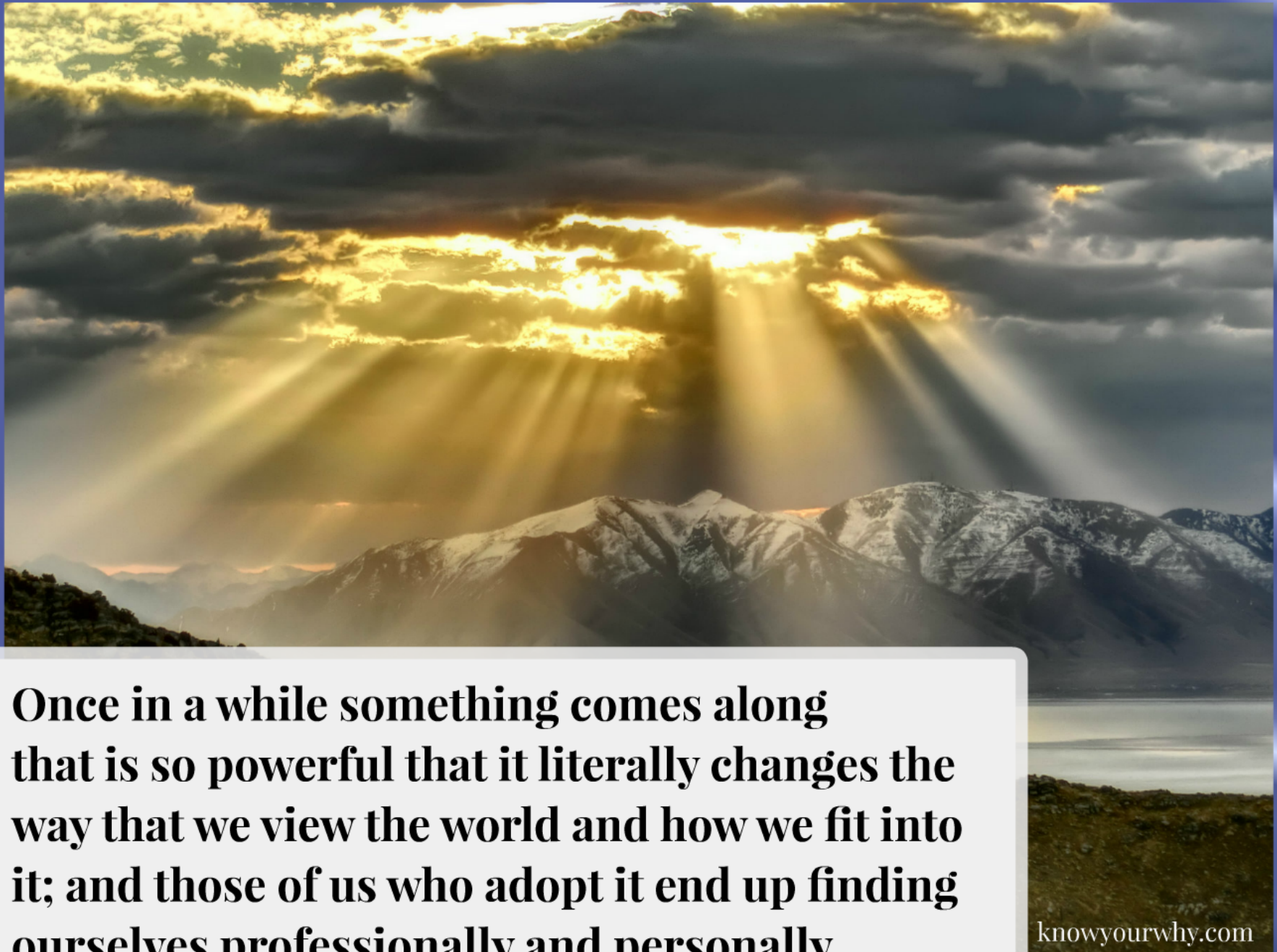


ENERGY - WATER - FOOD - AIR - \$\$ SAVED



Drought Foot Print 1982-2012





**Once in a while something comes along
that is so powerful that it literally changes the
way that we view the world and how we fit into
it; and those of us who adopt it end up finding
ourselves professionally and personally
transformed - forever**



Sustainable Quality of life = Sustainable
Water



We can't wait!







It's our time to run

