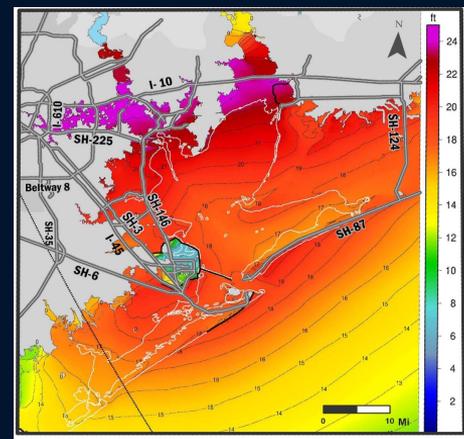
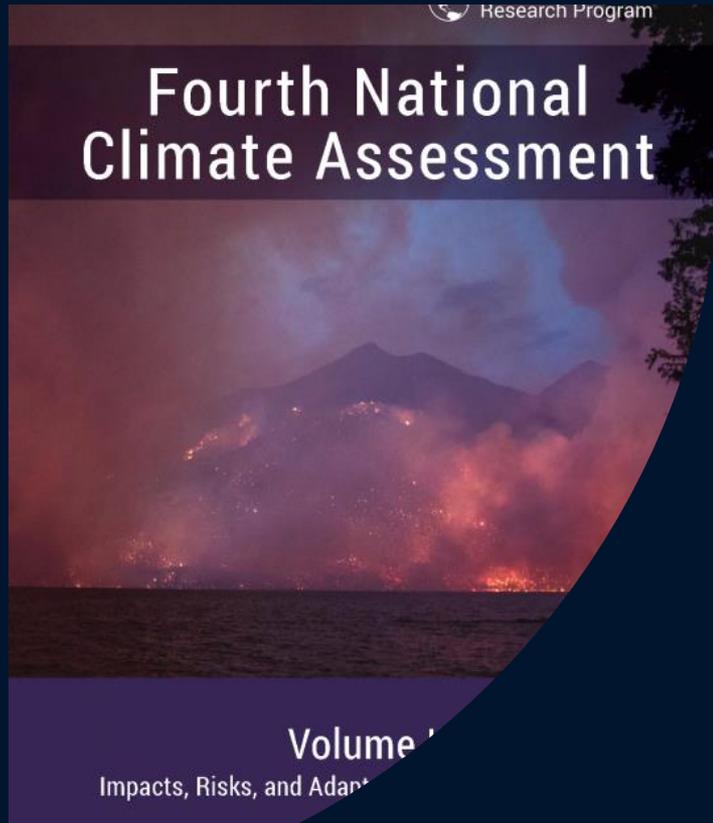


Climate, Flooding and Money: A NOAA NED Talk

**By Jim Blackburn
Rice University Civil Engineering Department,
SSPEED Center and Baker Institute
September 28, 2020**



Post Ike Research at Rice University's SSPEED Center



**We Keep Getting Hit
With One Key Issue**

**Our Climate Is Changing
And**

**We Don't Know How To
Address It Yet**

BUT WE MUST

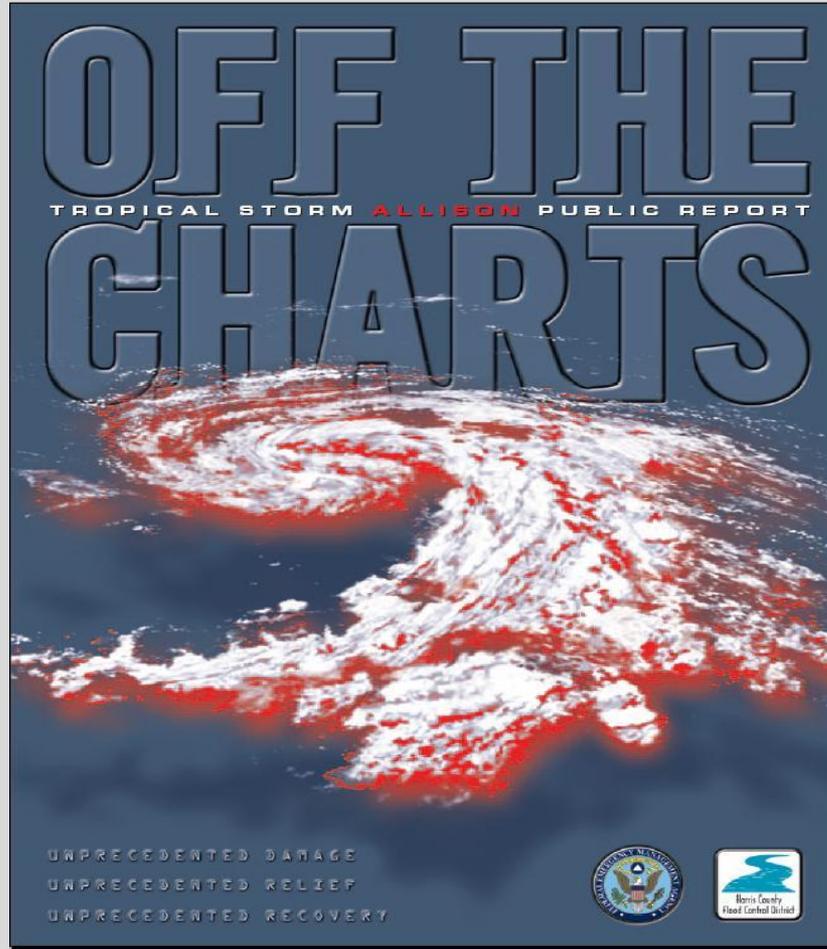
Three Key Situations

- **Rainfall Flooding Protection**
- **Structural Protection For the Developed Western Shoreline of Galveston Bay**
- **Nonstructural Flood Protection Along the Coast**

All Involve Climate and Money in One Way or Another

Vision

**Are We
Being
Honest
About
Climate
Change?**

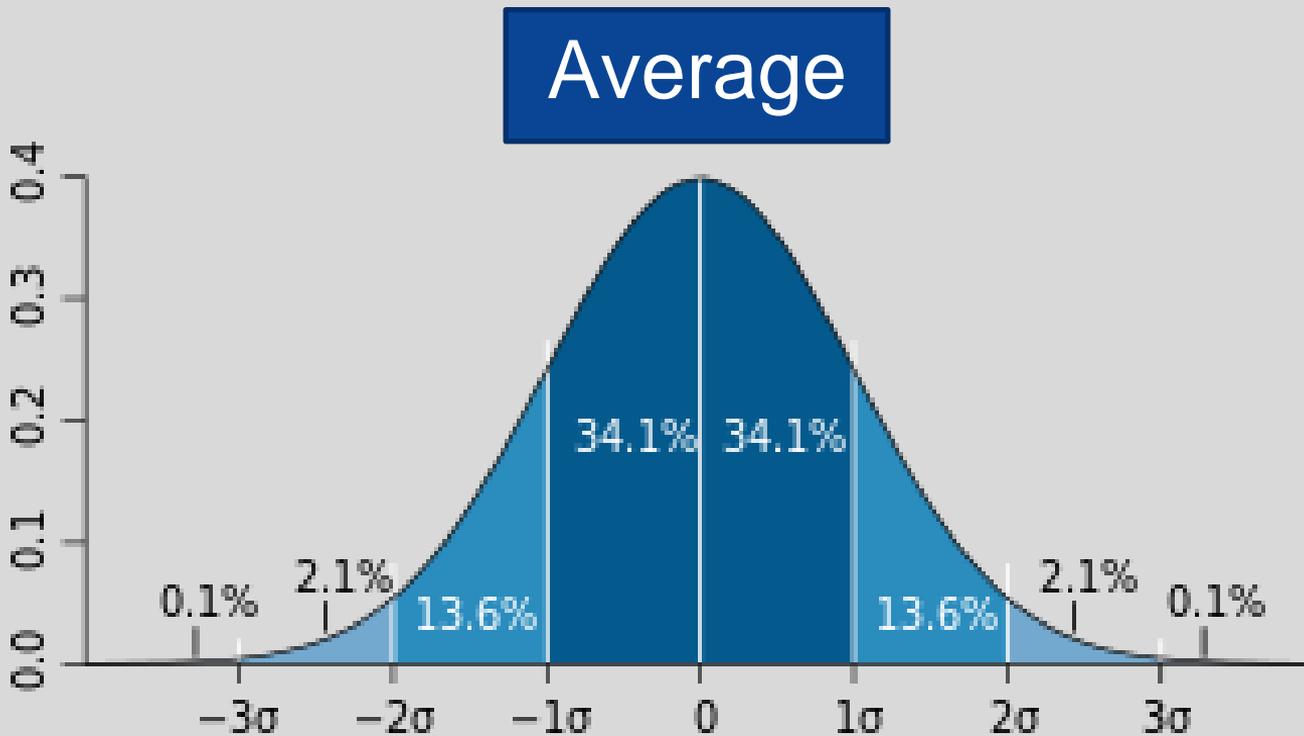


**Rice SSPEED
Center Conference
February 2018**

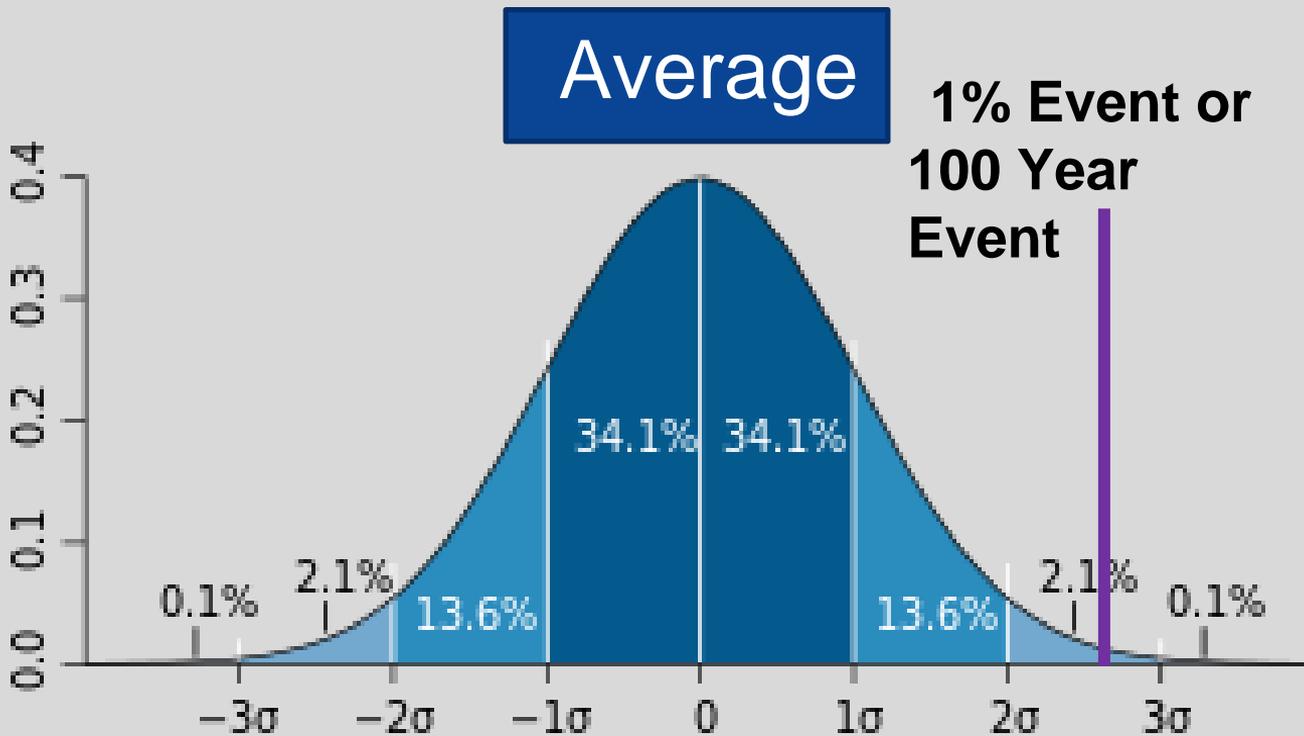
**Scientist after
scientist
discussed the
increasing rainfall
due to climate
change**

**Consensus that
future storms will
be bigger**

Bell Curve Of Standard Distribution 100-Year Flood

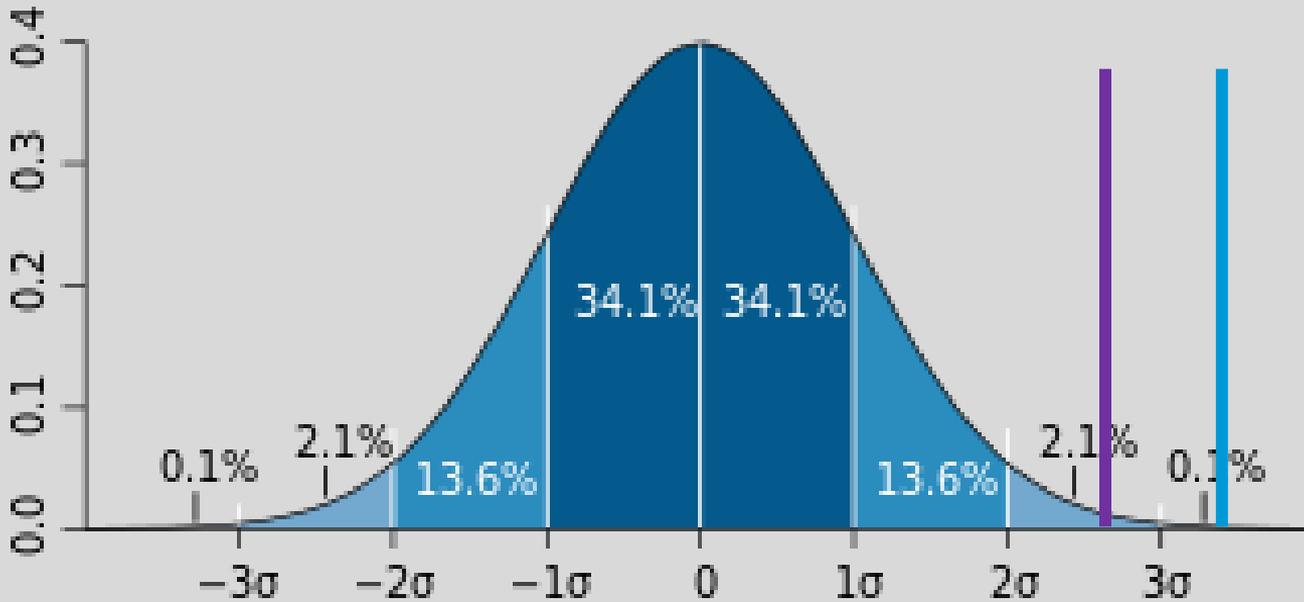


Bell Curve Of Standard Distribution 100-Year Flood

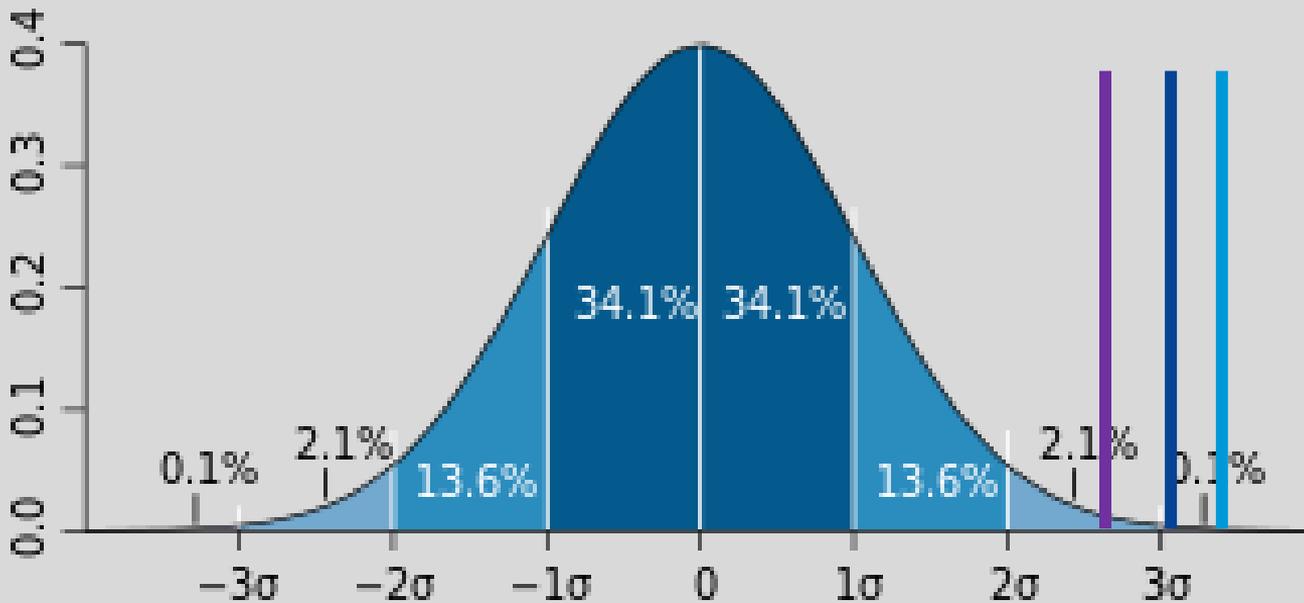


Bell Curve Of Standard Distribution

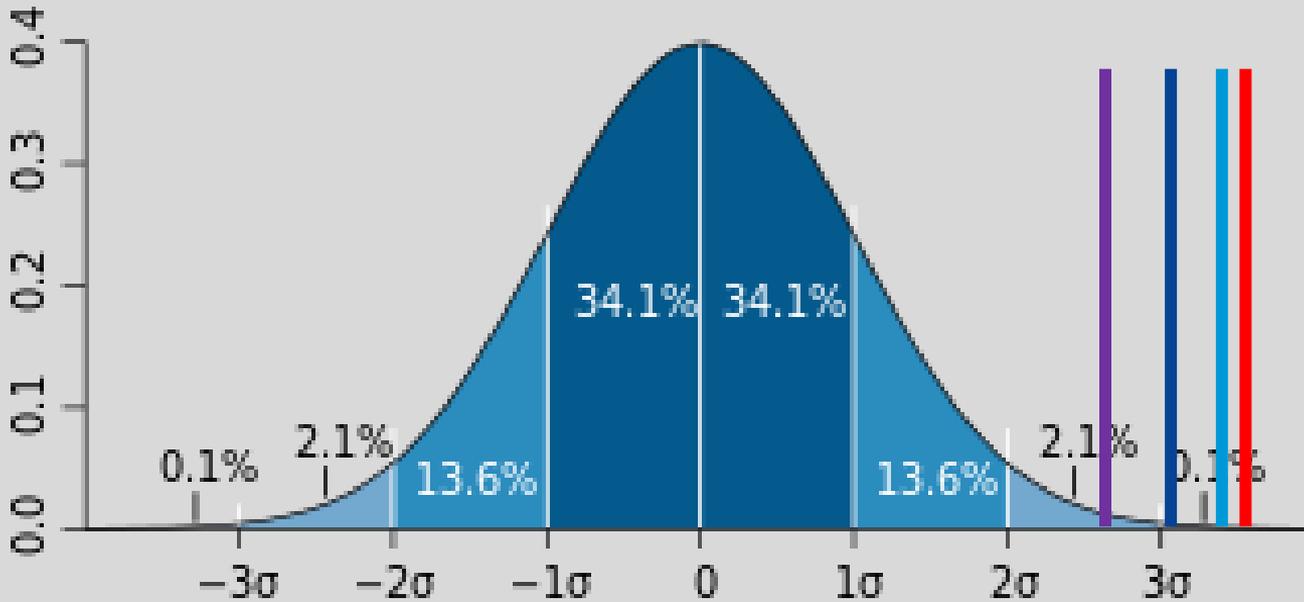
Allison 2001



Bell Curve Of Standard Distribution Tax Day 2015

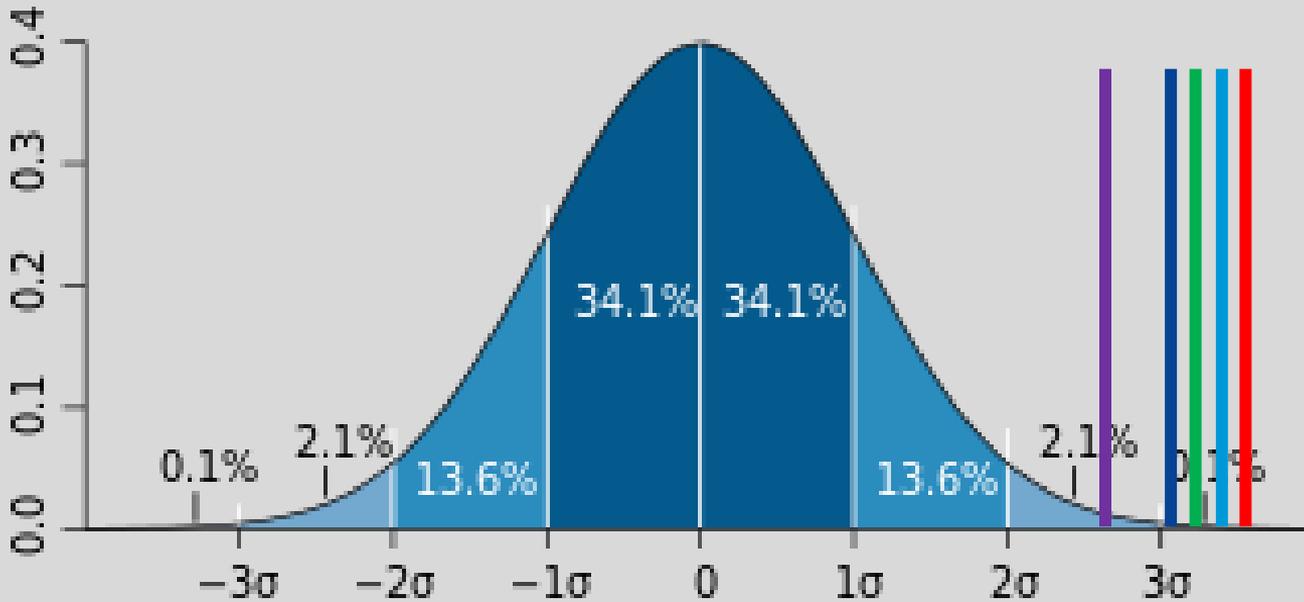


Bell Curve Of Standard Distribution Harvey 2017

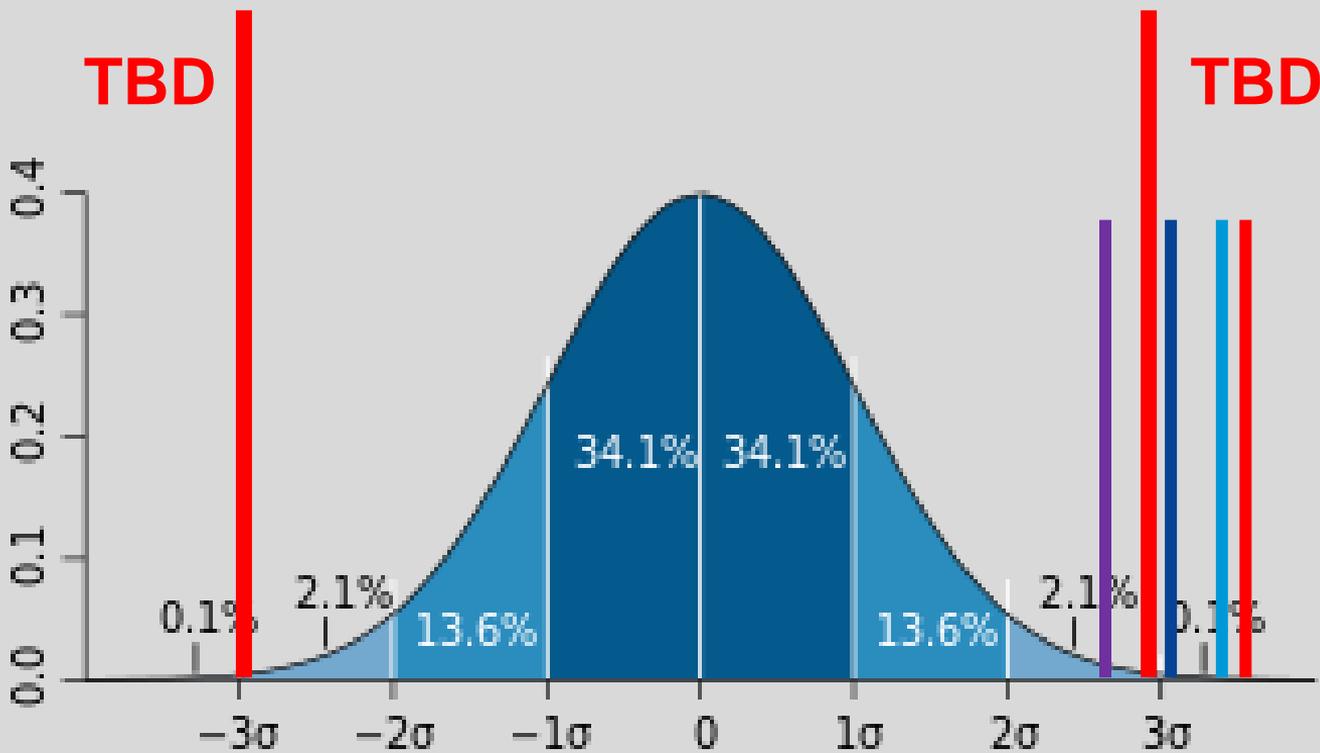


Bell Curve Of Standard Distribution

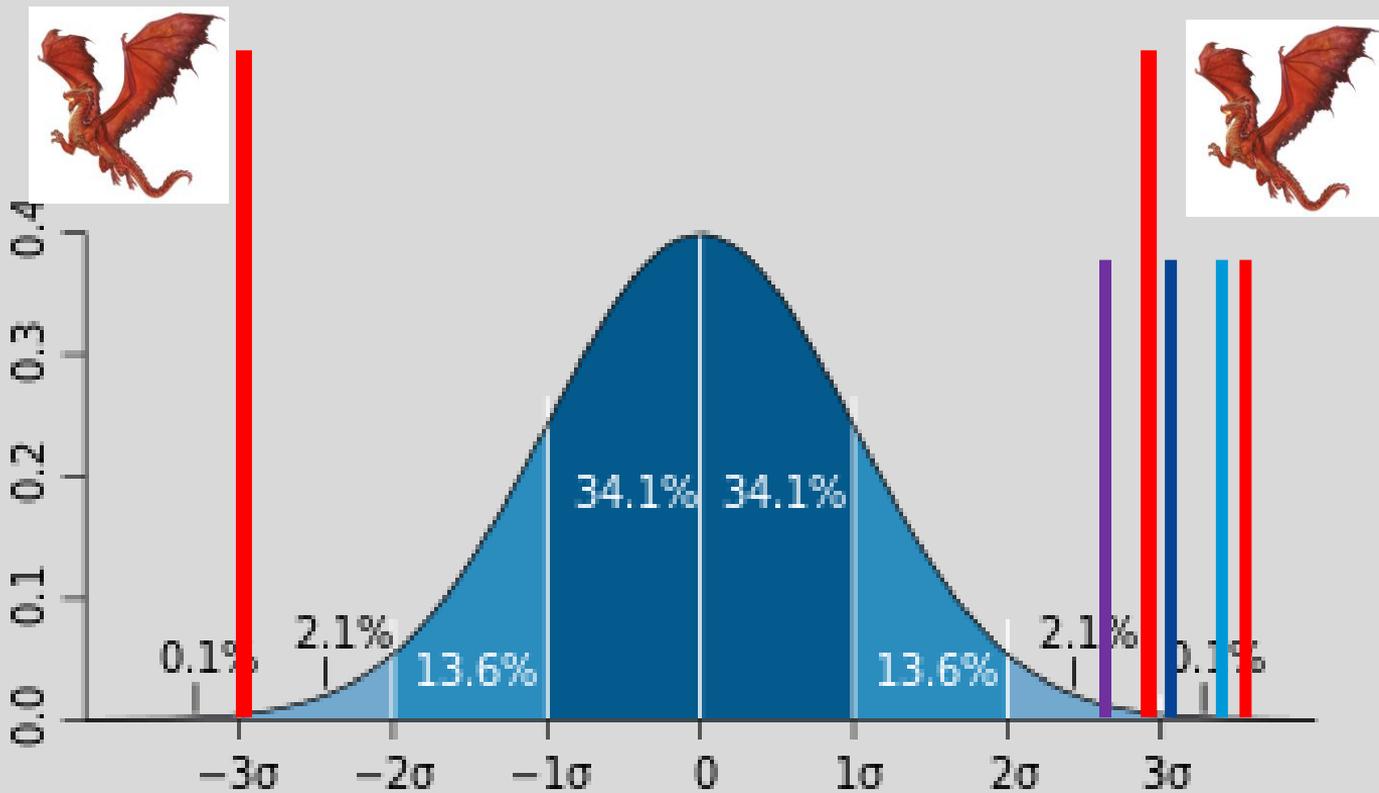
Imelda 2019

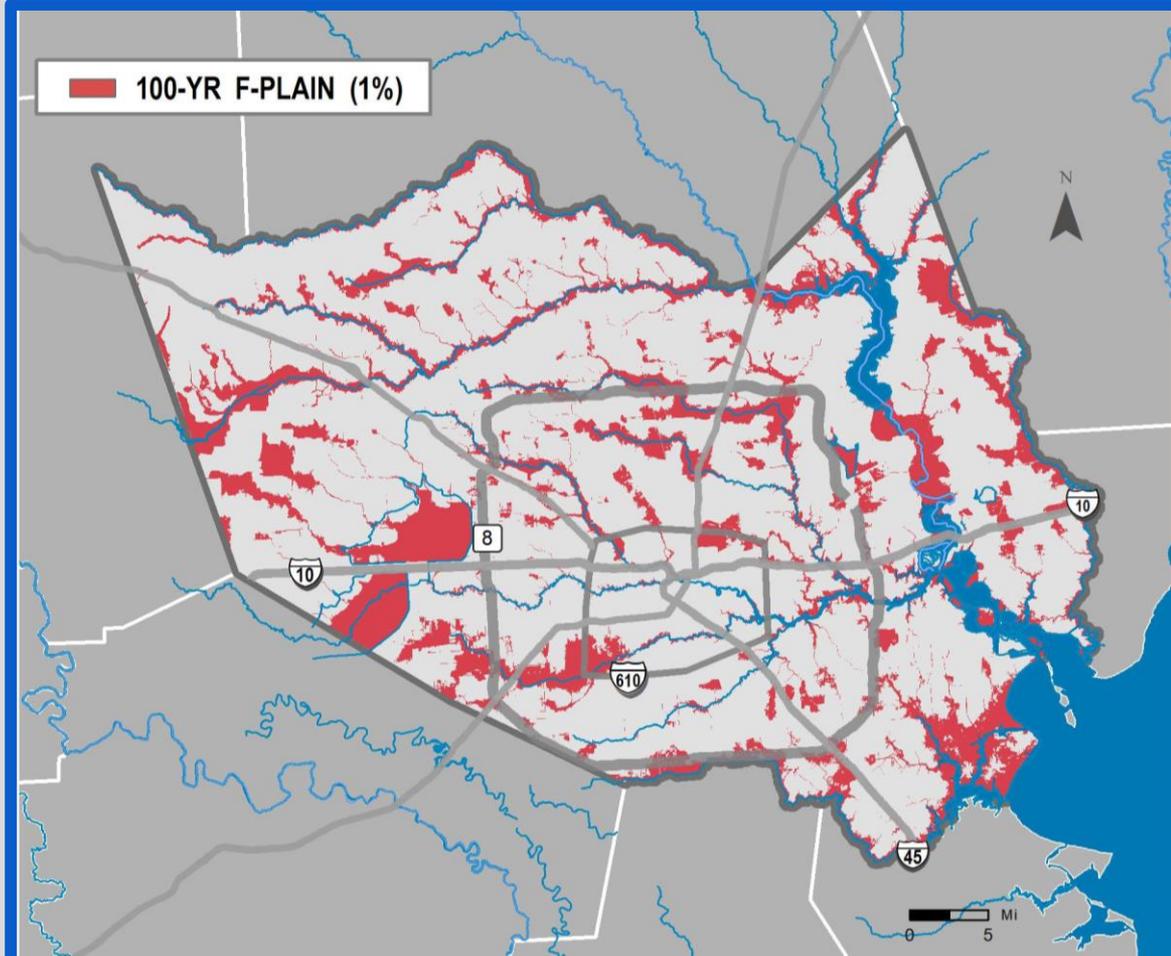


Bell Curve Of Standard Distribution



Bell Curve Of Standard Distribution



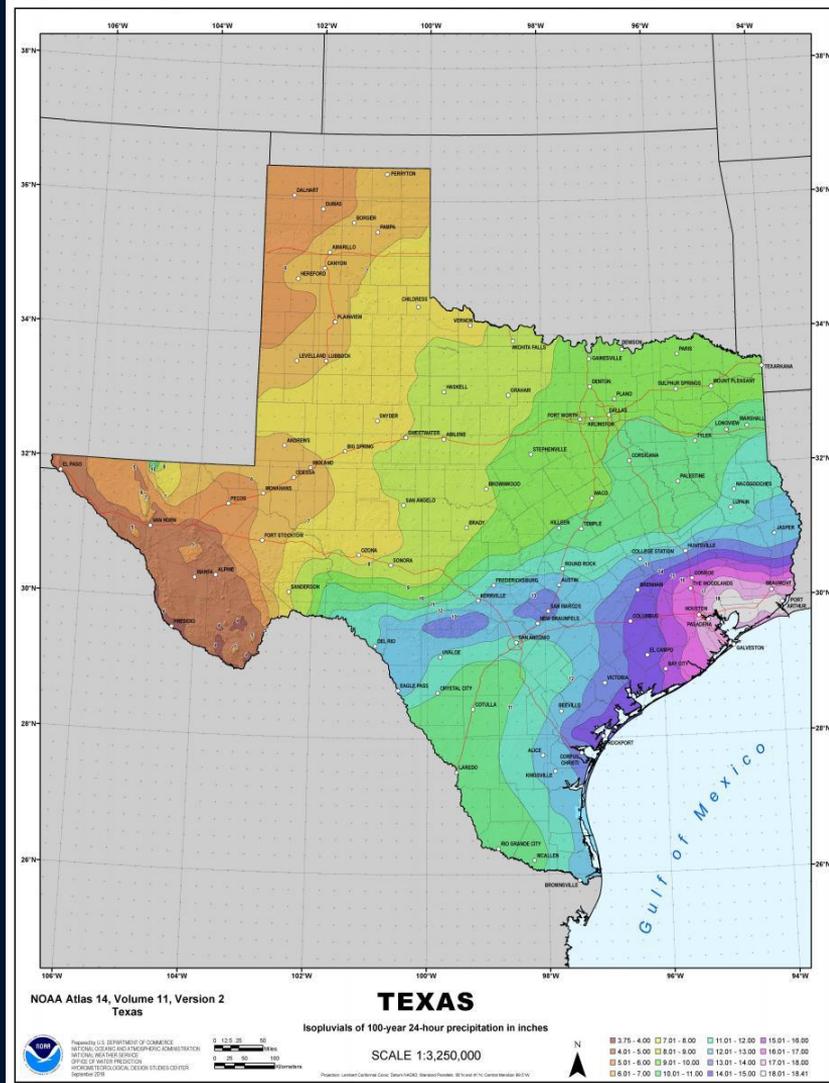


**Current
100-Year
Flood Plain**

**OBSOLETE
And
DANGEROUS
INFORMATION**

NOAA Atlas 14 and Changes in Rainfall Frequency

Data compiled through 2017



NEDTalks

Duration	100 Year Rain Event	500 Year Rain Event	NOAA Atlas 14 100 Year	NOAA Atlas 14 500 Year	Imelda Sept. 2019	Harvey Aug. 2017	Tax Day April 2016	Allison June 2001	October 1994
1-hr	4.3	5.5	4.8	6.4	6.4	6.8	4.7	5.7	3.7
2-hr	5.7	7.6	7.0	9.7	9.2	11.9	7.3	9.9	4.7
3-hr	6.7	9.2	8.6	12.4	10.9	14.8	8.3	13.5	5.3
6-hr	8.9	12.8	11.4	17.0	14.3	18.9	13.9	21.2	7.2
12-hr	10.8	15.5	14.1	21.2	17.9	20.9	16.7	28.3	12.0
24-hr	13.2	18.9	17.0	25.4	21.1	25.6	17.4	28.4	20.9
2 days	14.5	20.0	20.5	29.6	29.1	35.2	17.5	28.5	23.1
4 days	15.9	21.1	23.1	32.5	29.7	47.7	N/A	38.5	28.9



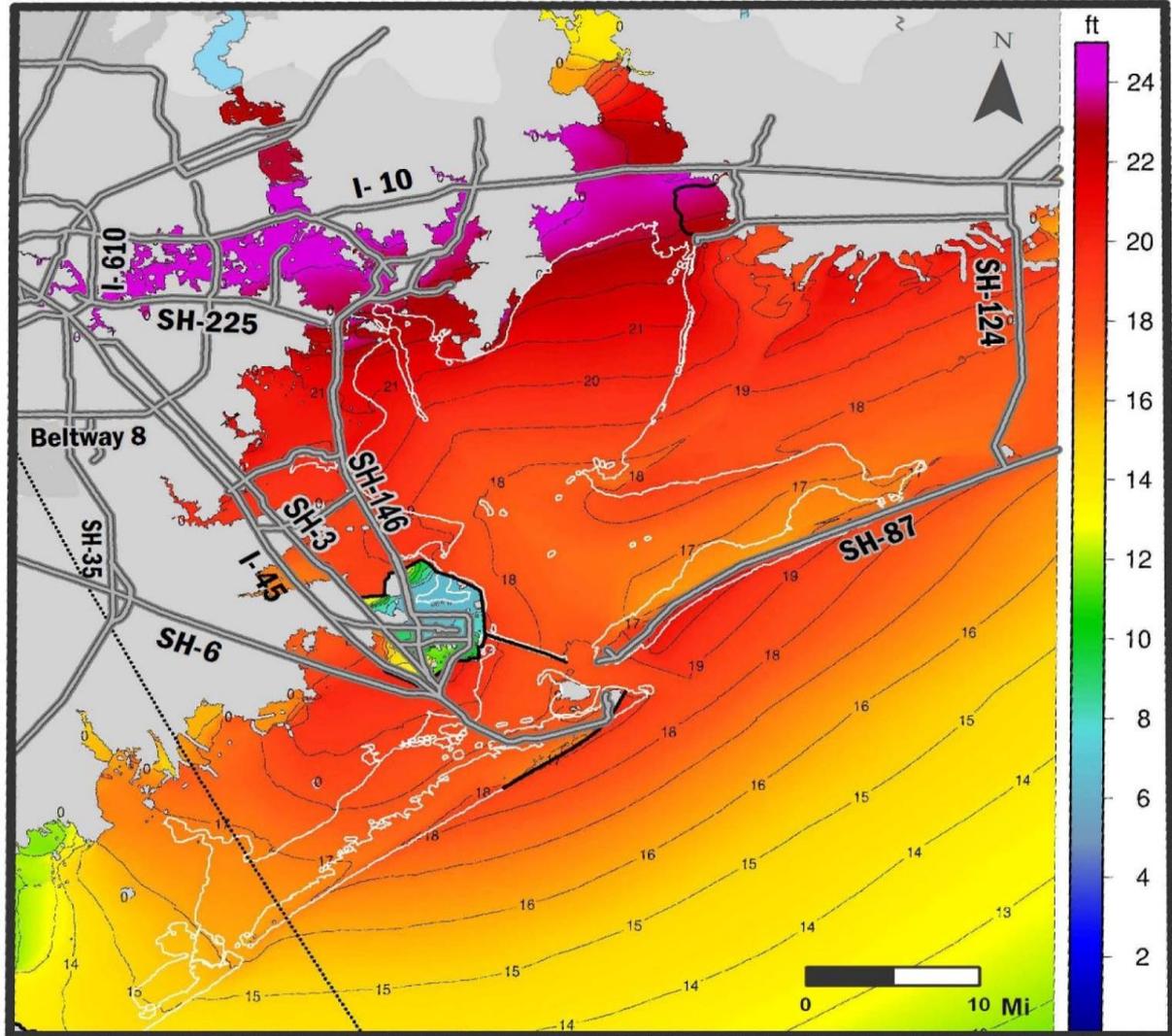


**Would You Drive Using Only
Your Rear-View Mirror?**

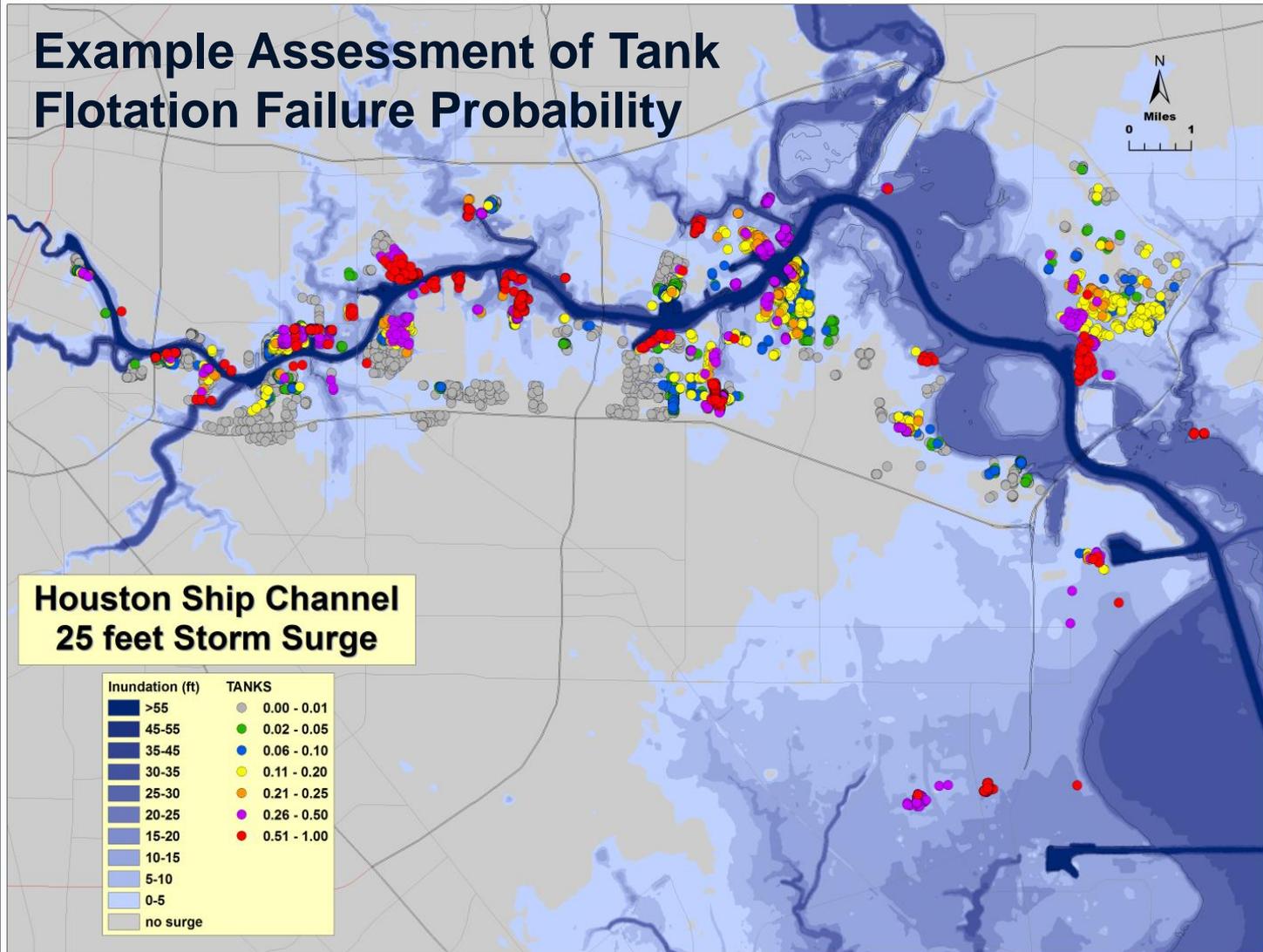
- **How Do We Project Forward?**
- **We Need Rainfall Predictions for the Future, not the Past.**
- **True for flood plain mapping and project development**



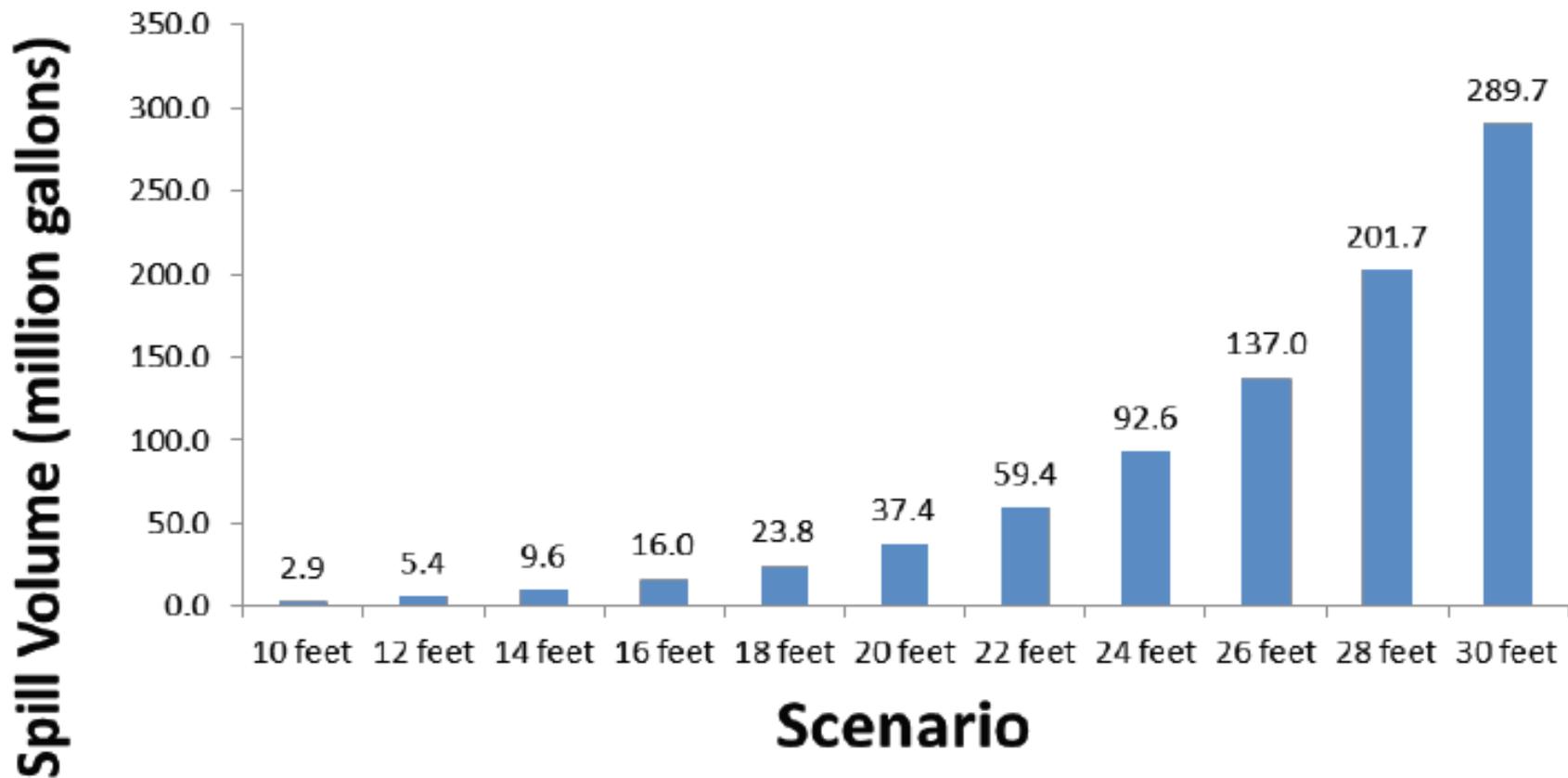
Ike + 15% Landfall Near San Luis Pass

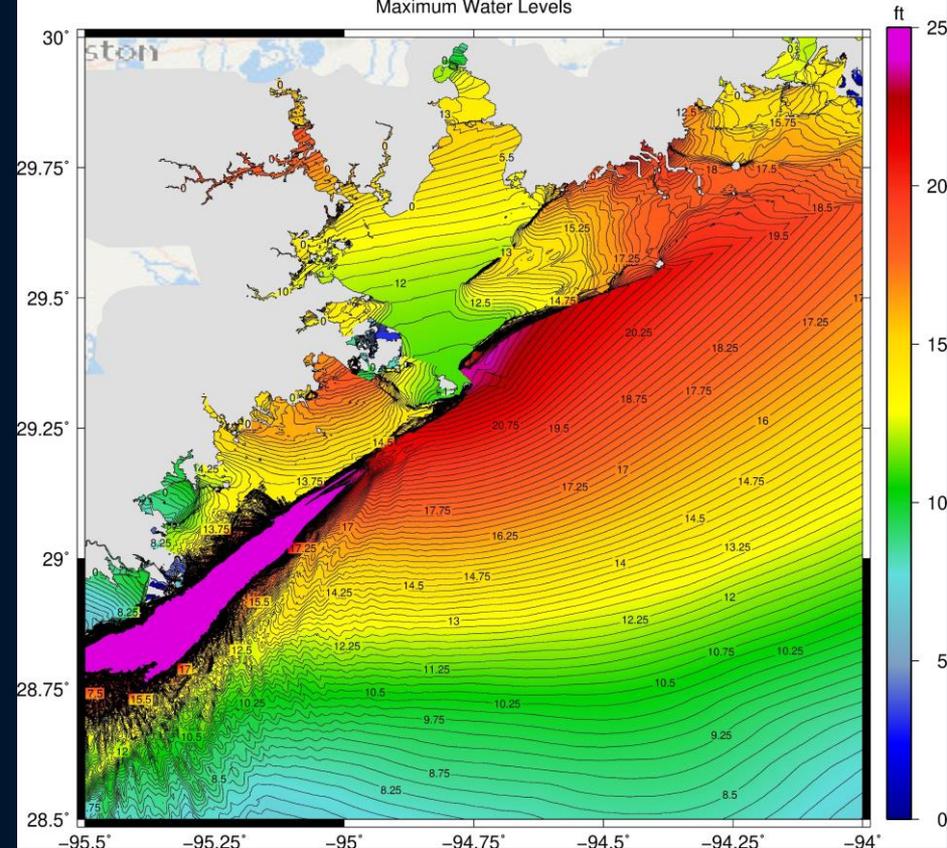
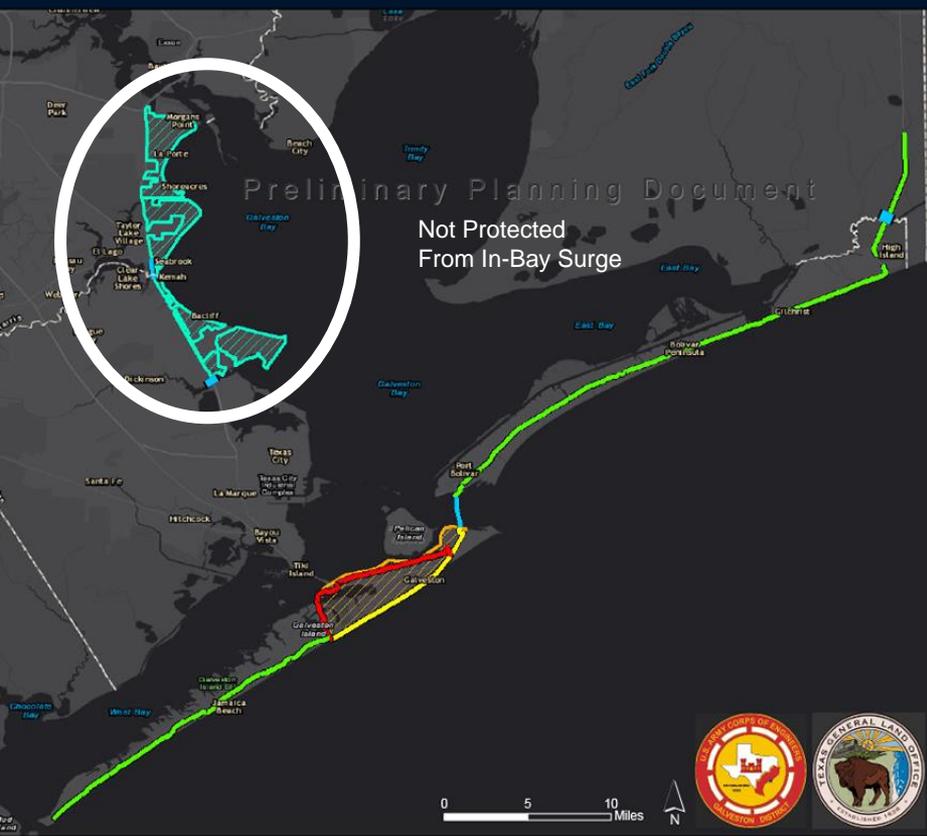


Example Assessment of Tank Flotation Failure Probability

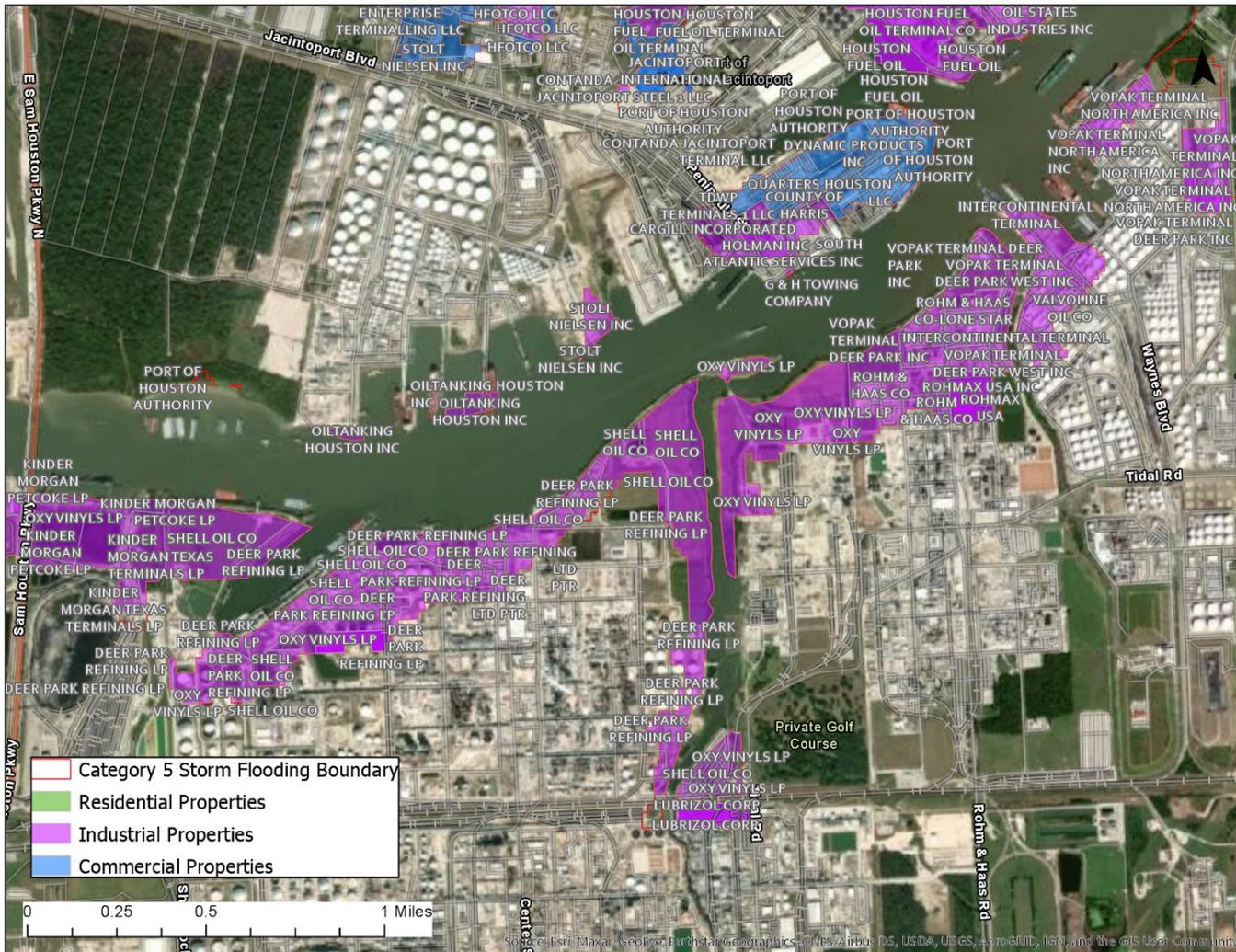


Spill Volume





USACE PREFERRED OPTION





Galveston Bay Park Plan Levee

Compatible with Corps Coastal Spine

Compatible with Port Project 11 to Widen Houston Ship Channel

Galveston Bay Park Plan Vision



NEDTalks



Post Ike Research at Rice University's SSPEED Center

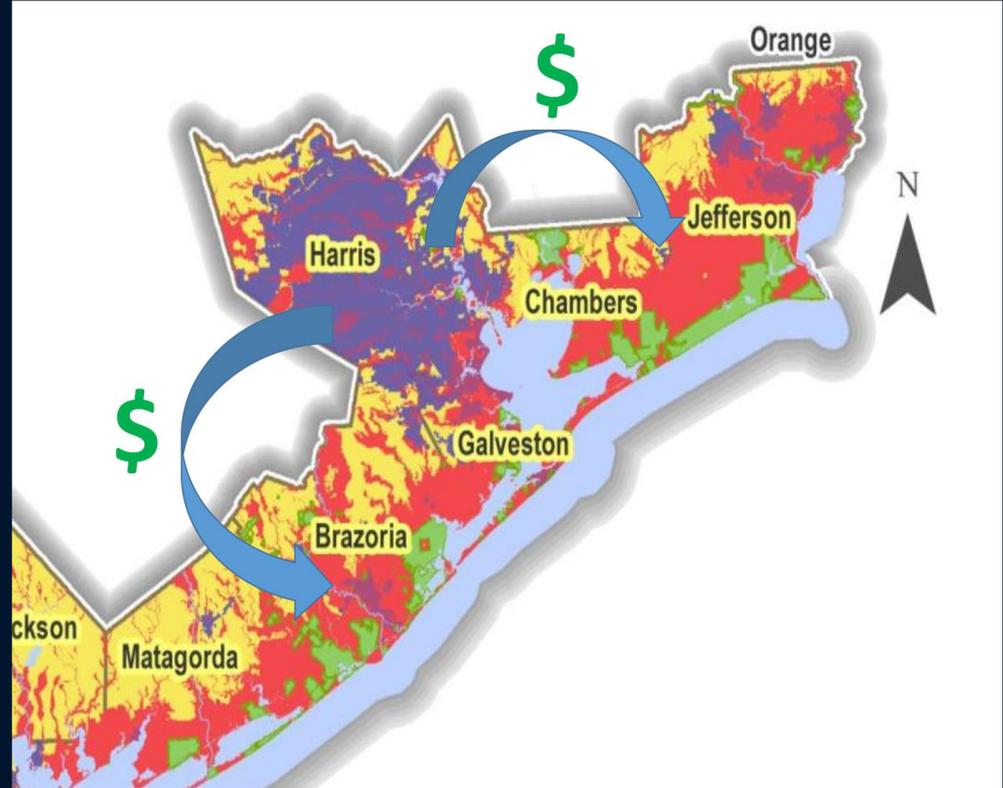
Non-Structural Coastal Protection

NEDTalks

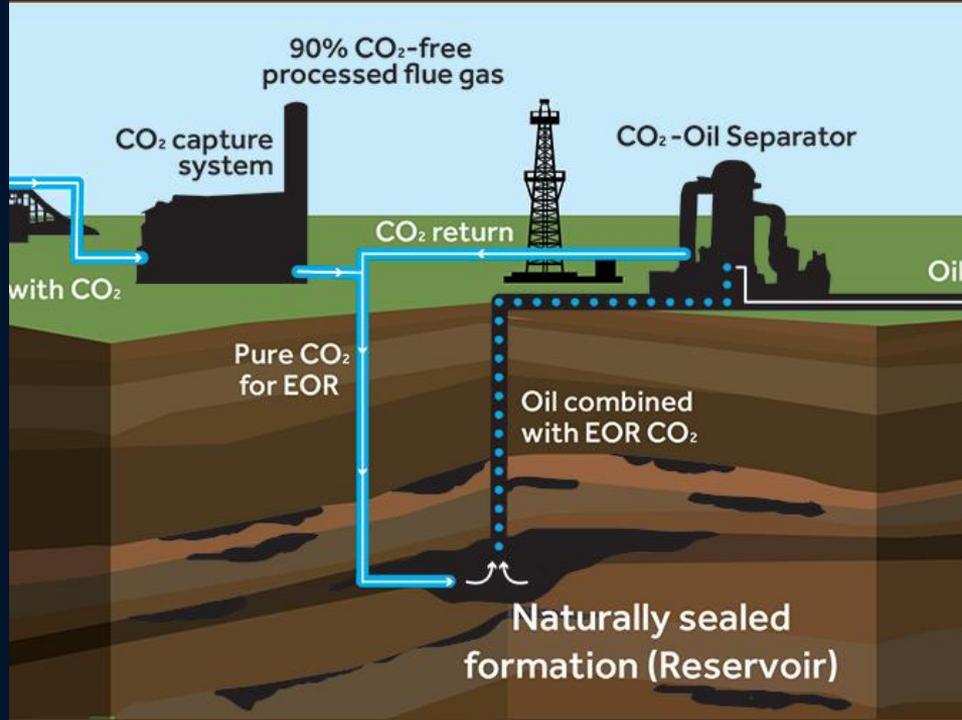


What Could Landowners Sell? Ecological Services

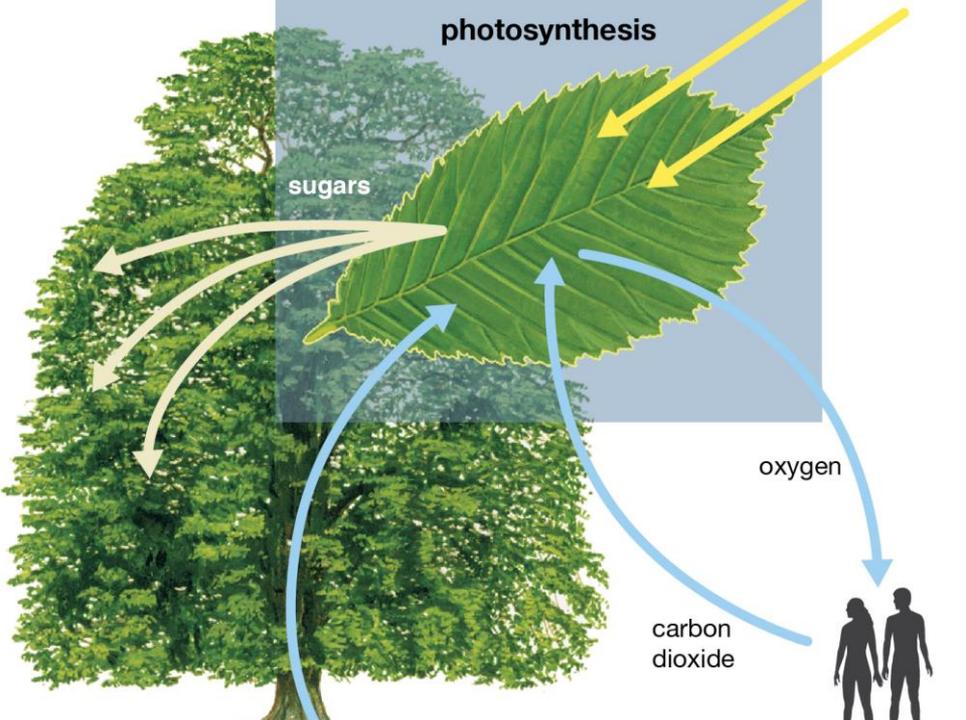
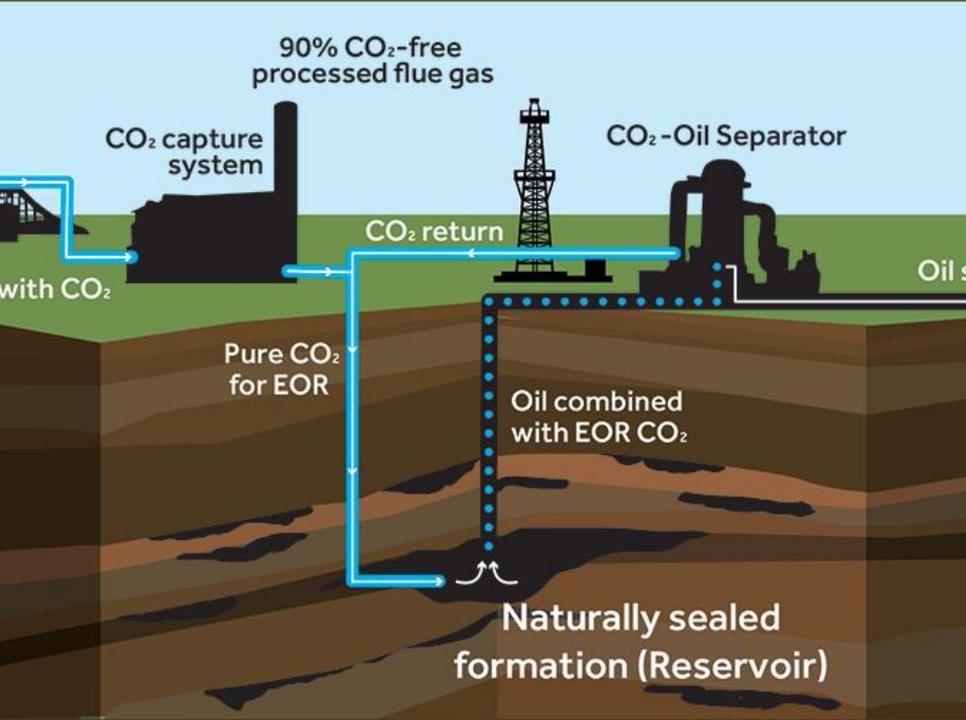
- Flood Storage
- Conservation of Existing Habitat
- Neo-tropical Migrant Habitat
- Coastal Wetland Creation
- Waterfowl Habitat Creation
- **Carbon Sequestration**
- Endangered Species Habitat
- Prairie Habitat Creation
- Forest Lands Habitat Creation



NEDTalks

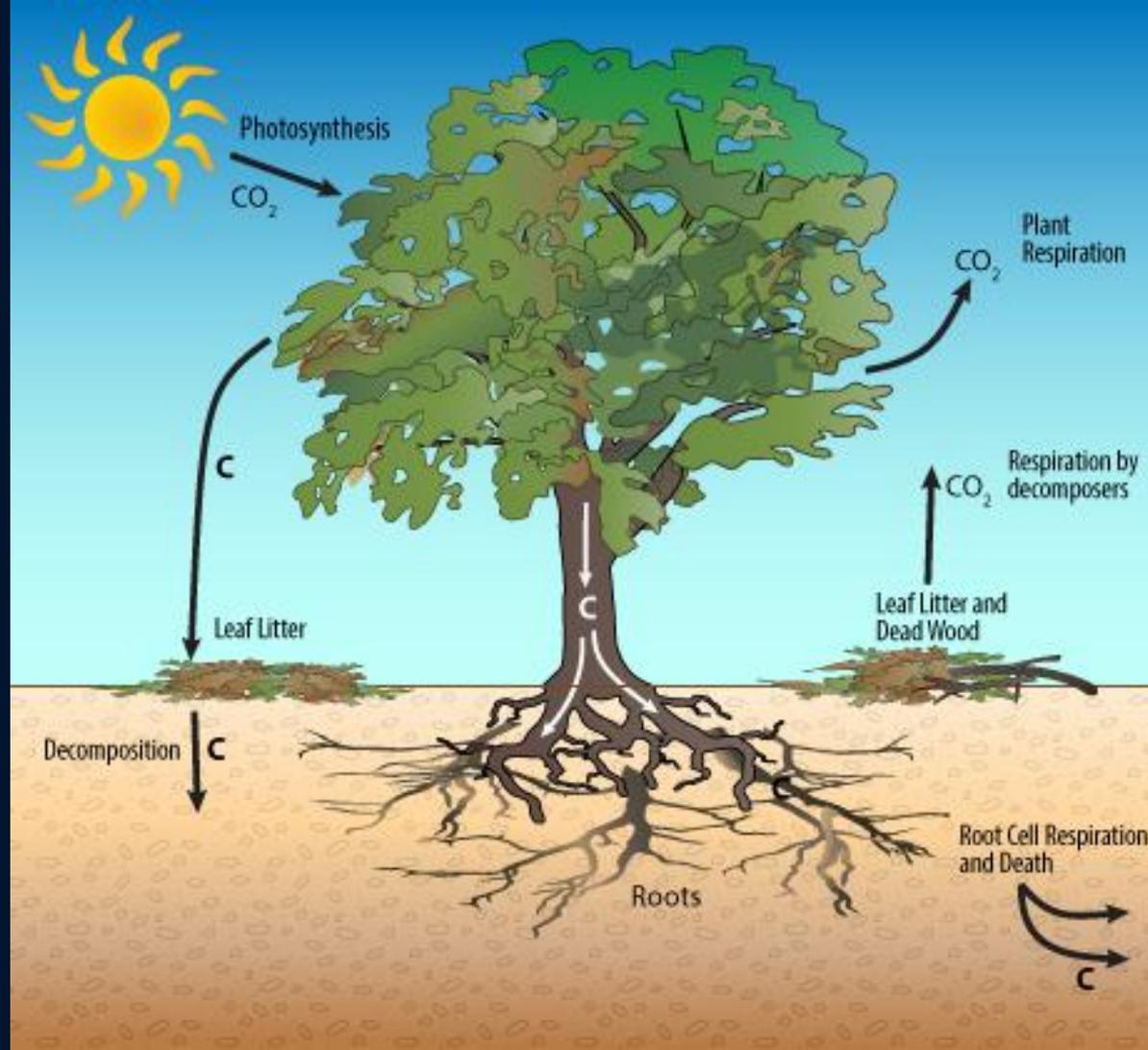


CONCEPTS OF CARBON CAPTURE AND STORAGE

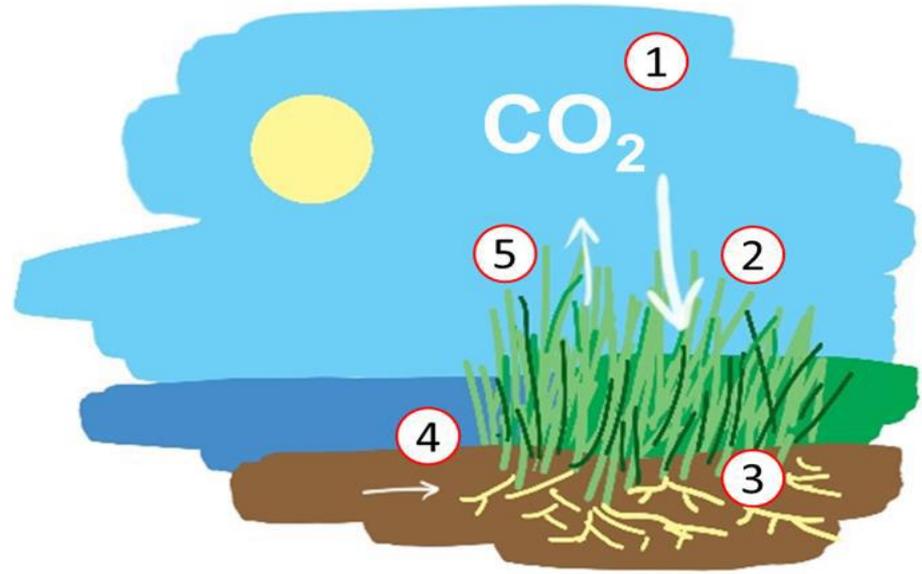


CONCEPTS OF CARBON CAPTURE AND STORAGE

Carbon Cycle of Single Tree



Carbon Dioxide Removal and the Coastal Marsh

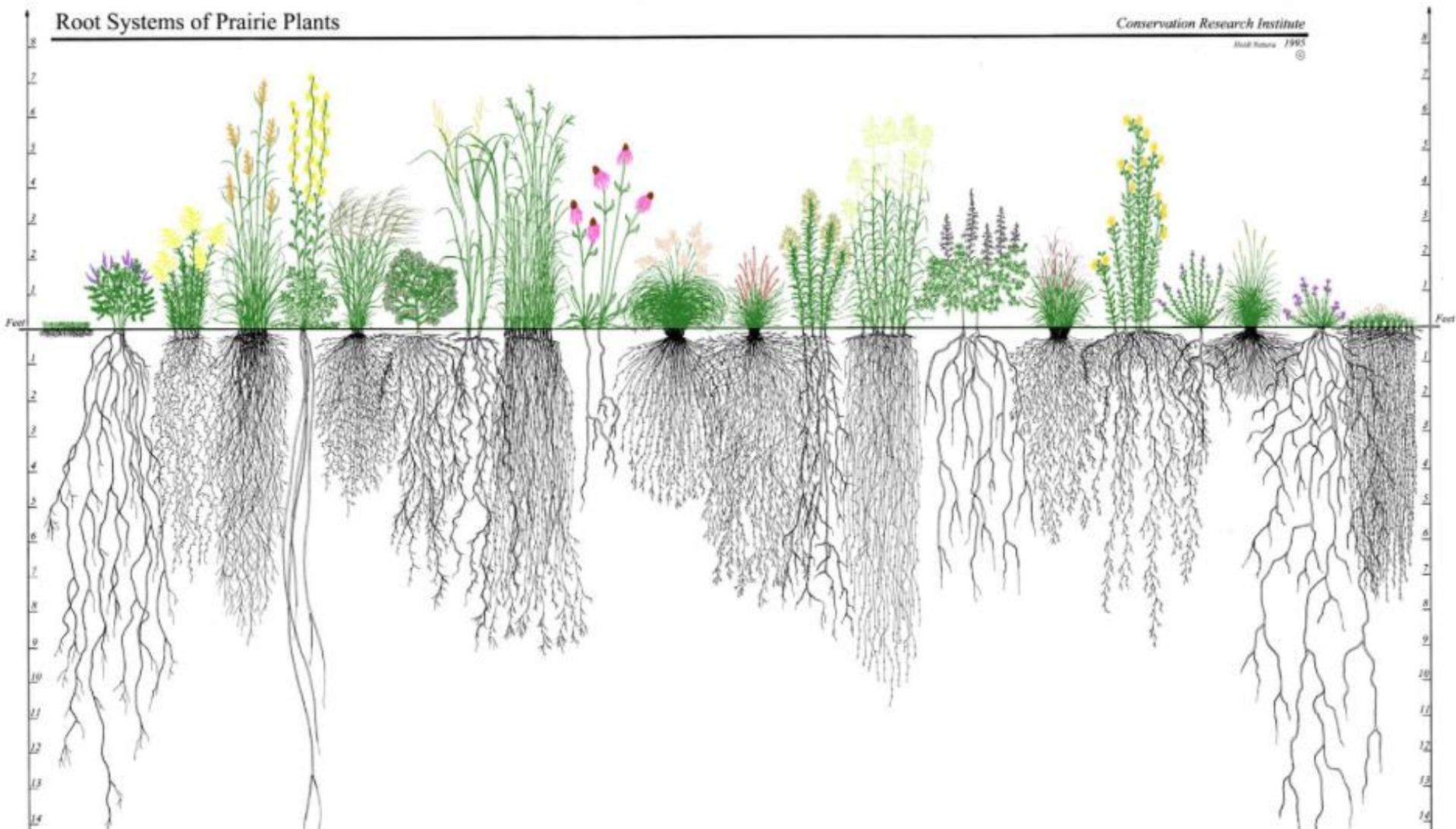


1. CO₂ In Atmosphere
2. Photosynthesis in Marsh Plant
3. Carbohydrate deposited in plant and roots
4. Carbohydrate becomes carbon in soil
5. Some CO₂ back to the atmosphere

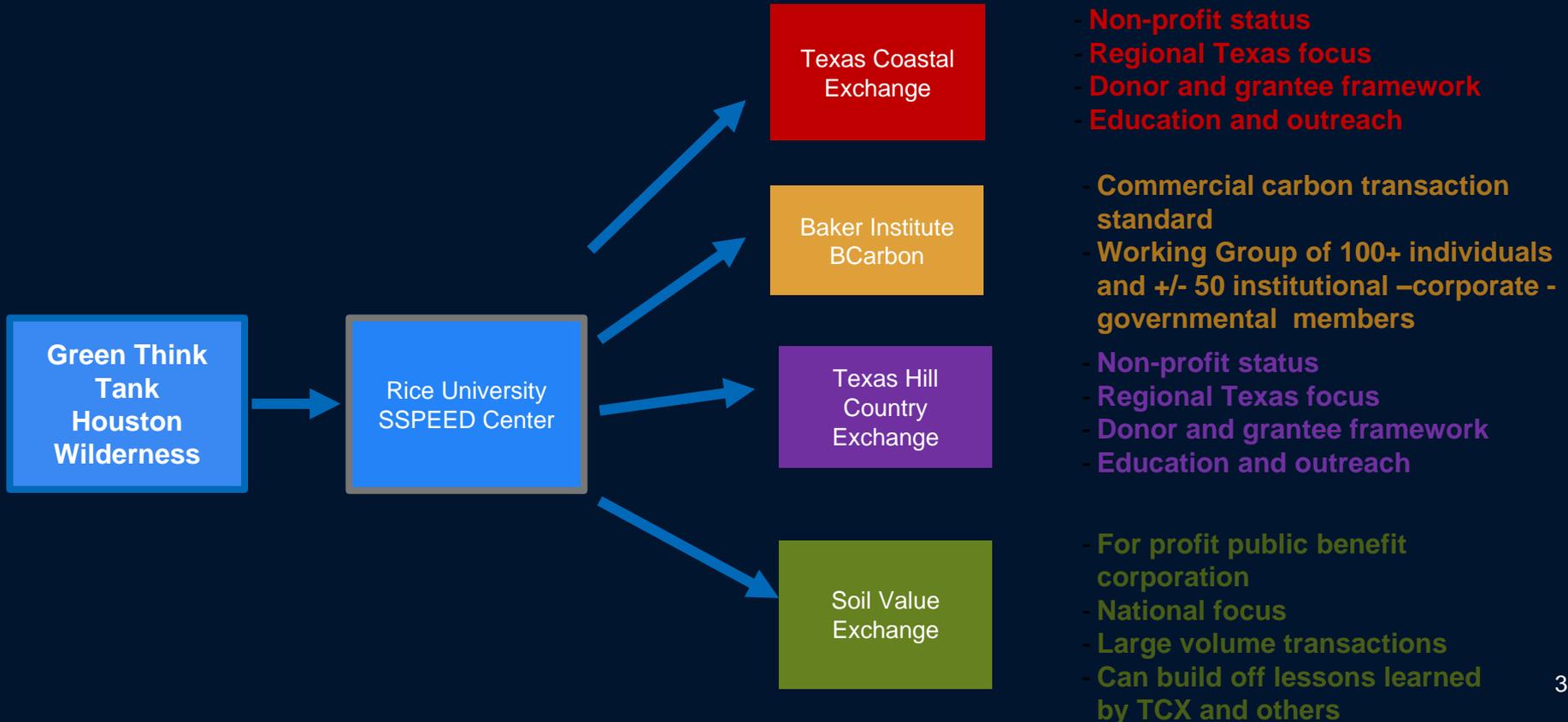
Root Systems of Prairie Plants

Conservation Research Institute

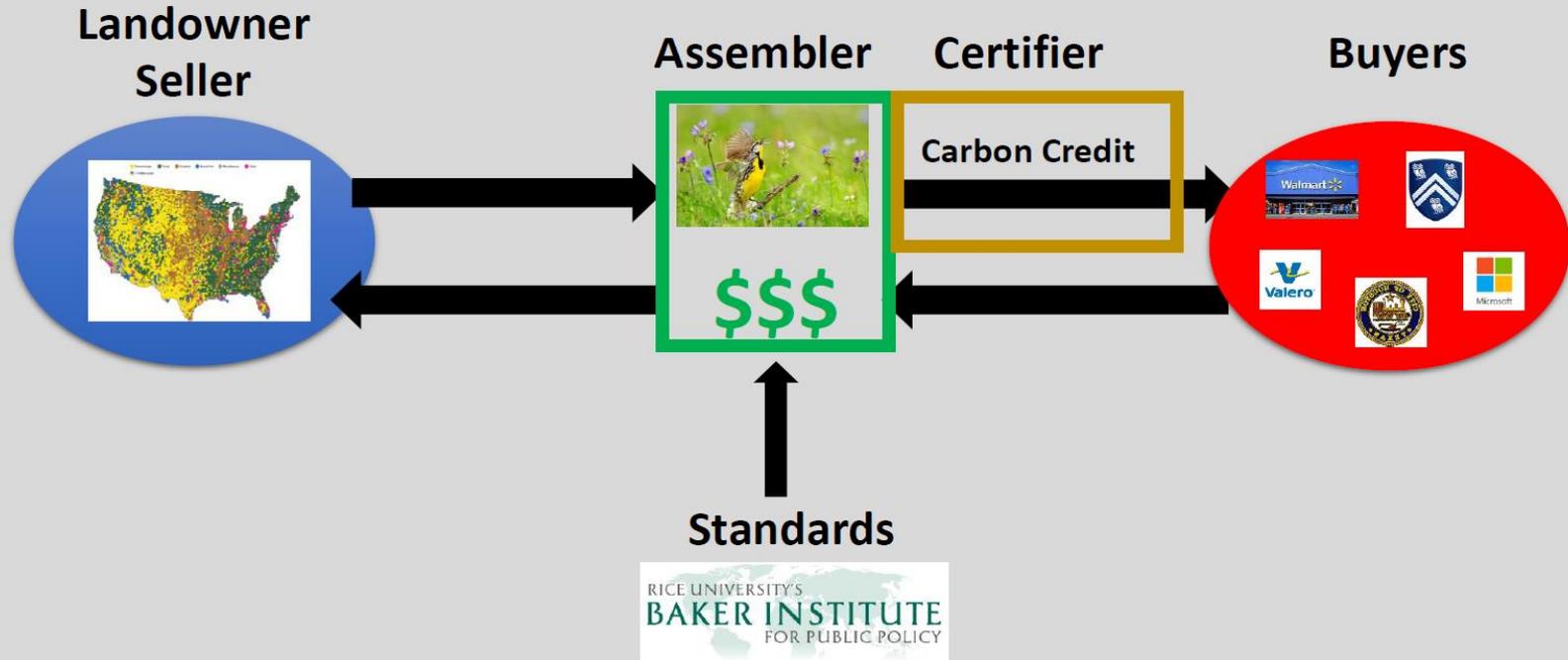
David Johnson 1995



Rice-Derived Carbon Market Concepts



Design A Standard To Create A Soil Carbon Market



NEDTalks



Gensler

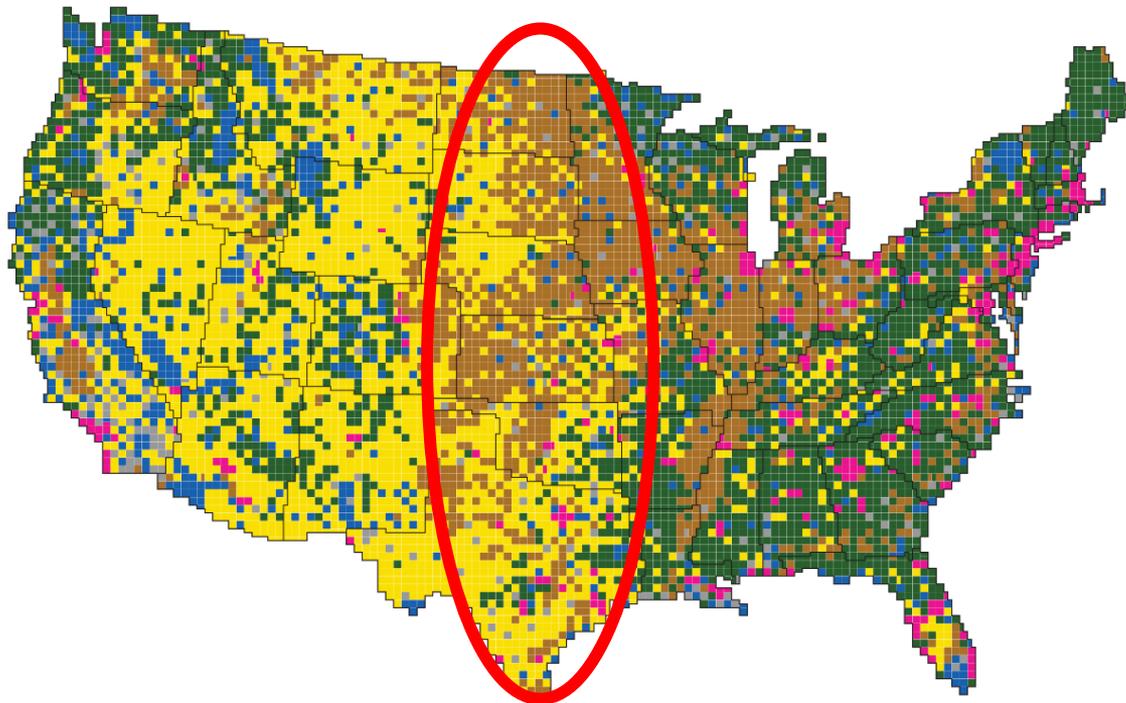


United States Business Council
for Sustainable Development

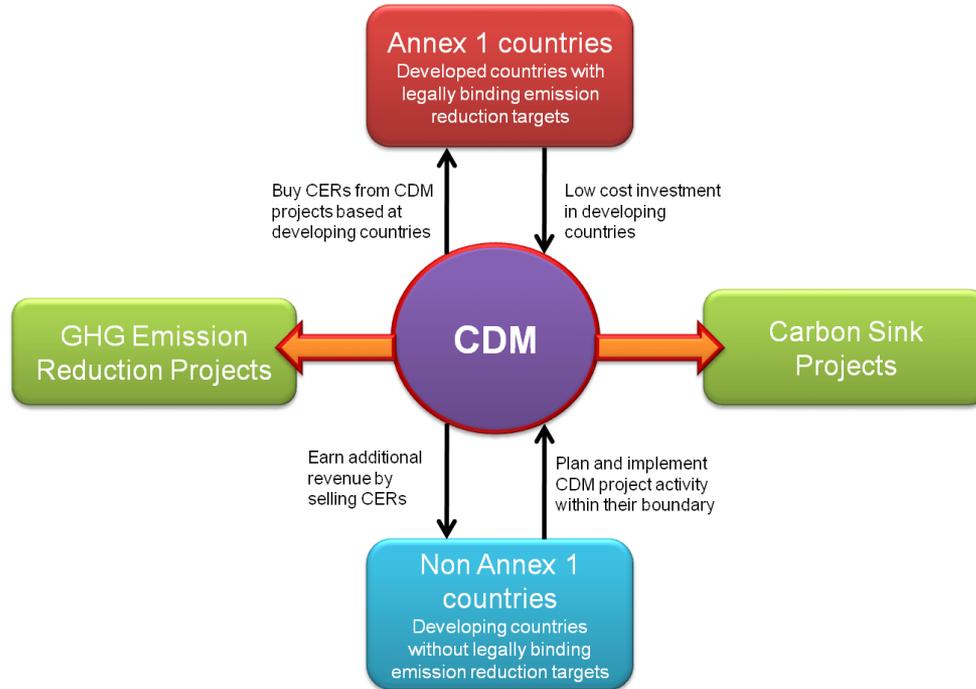


Standard Designed to Store Up To 1 Billion Tons CO2 Potential \$20 Billion Market @\$20/ton

■ Pasture/range ■ Forest ■ Cropland ■ Special Use ■ Miscellaneous ■ Urban
■ = 1 million acres

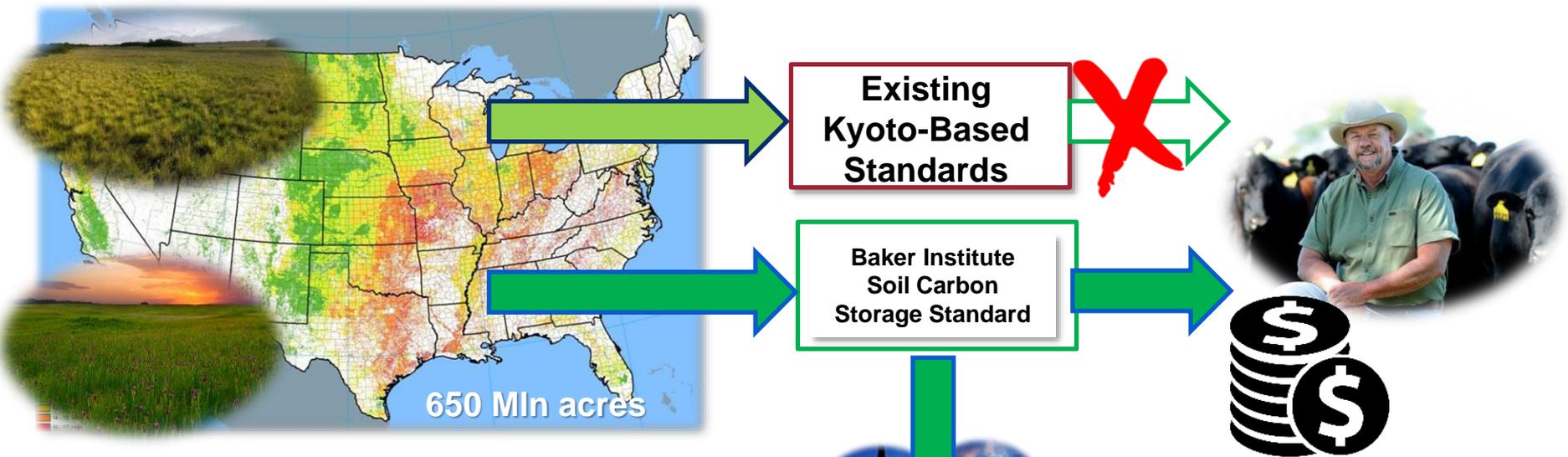


All Soil Storage Transactions Currently Follow Clean Development Mechanism of Kyoto Protocol



The Baker Standard Is Fair

Removes Unnecessary Impediments to Market Creation



US grasslands can store 0.6 – 1.5 Bln tCO₂/yr

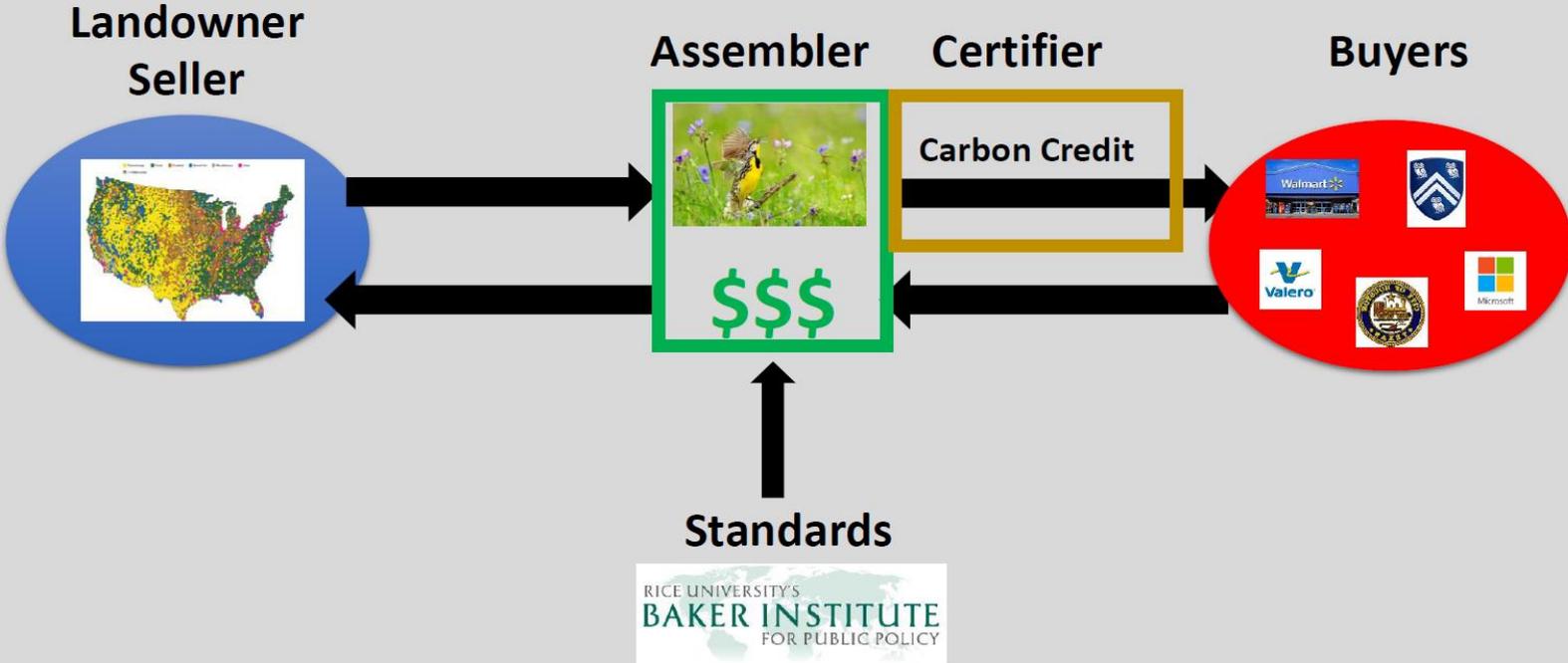
Reliable, measurement-based,
Soil Carbon storage credits

The new Baker standard is designed to work for landowners and carbon storage buyers.

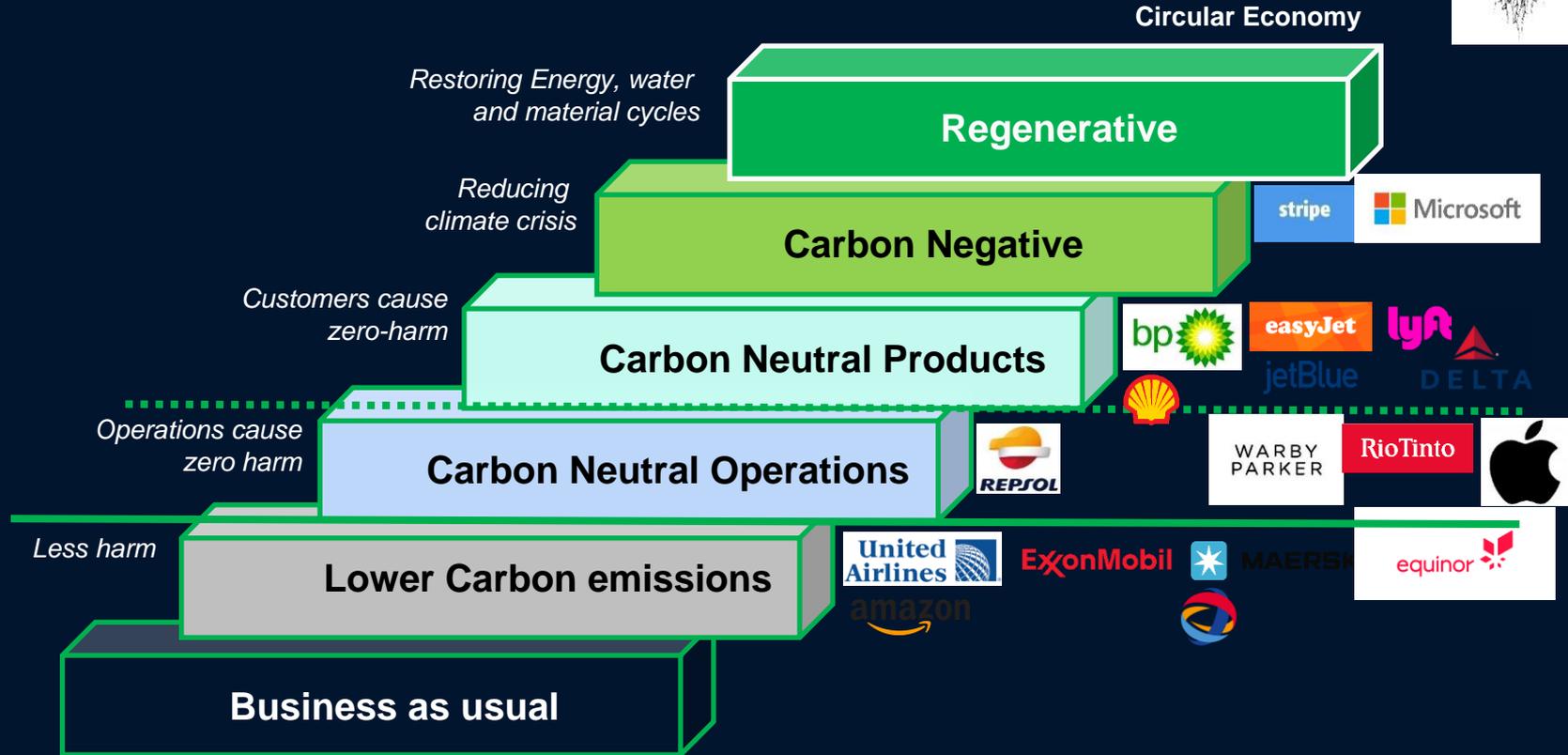
Basic Concepts of the Baker Soil Carbon Storage Standard Approach

- **Based on photosynthesis as a carbon capture and storage technology**
- **Landowner friendly – respects property rights**
- **Measurement based**
- **Creates viable markets**

Design A Standard To Create A Market



Trends in Corporate Carbon Thinking



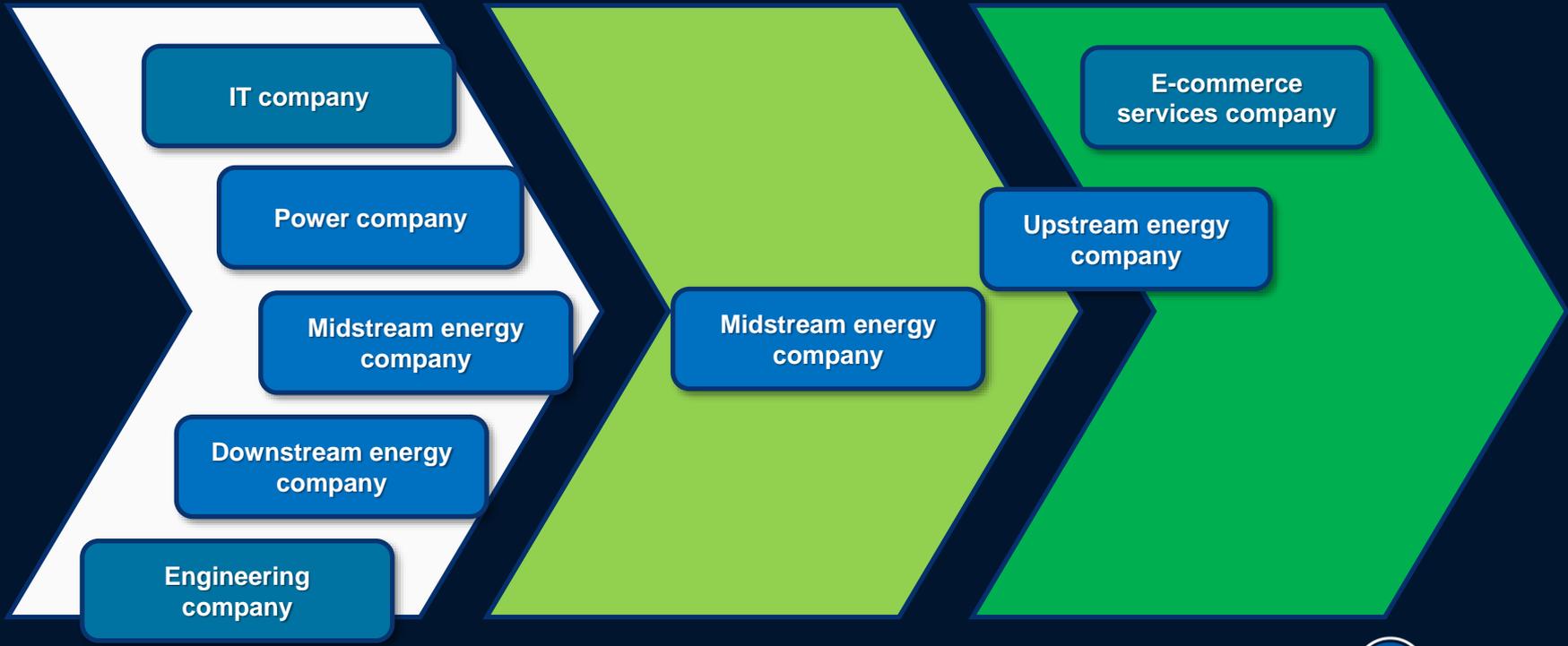
Soil Value Exchange is experiencing very strong recent interest



Due diligence

Negotiating

Agreement



Larry Fink

Jan 14, 2020

BlackRock will begin to:

- exit investments in coal production,
- introduce funds that ban fossil-fuel stocks and
- vote against corporate management who aren't making progress on fighting climate change.





**A New
Houston
Vision
For \$**

Contact Jim Blackburn:

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713-501-9007

