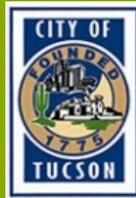


# III Border Green Infrastructure Forum



*"Resilience and Competitiveness for Cities of the US-Mexico Border"*

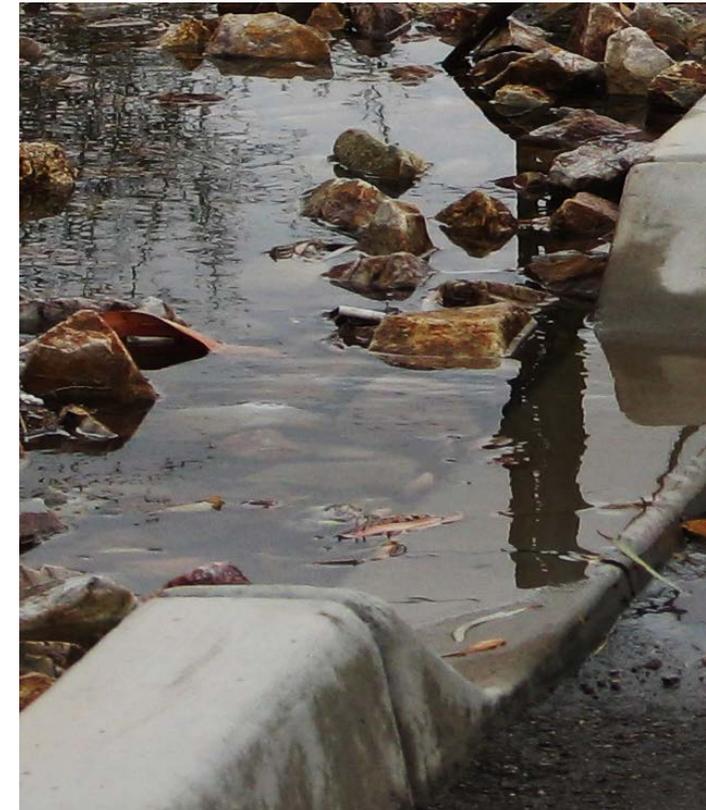
## Green Infrastructure & Climate Change



Irene Ogata, PLA, ASLA  
Urban Landscape Manager  
Public Information & Conservation Office  
Tucson Water



III Border Infrastructure Forum  
Saltillo, Coahuila, MX  
September 21 & 22, 2016





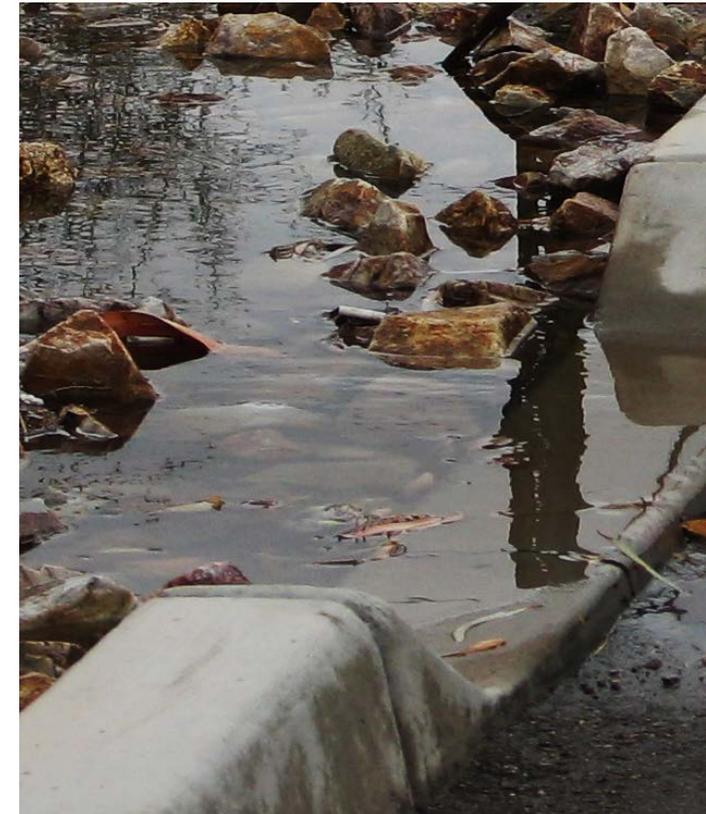
## "Resilience and Competitiveness for Cities of the US-Mexico Border"

# Green Infrastructure & Climate Change

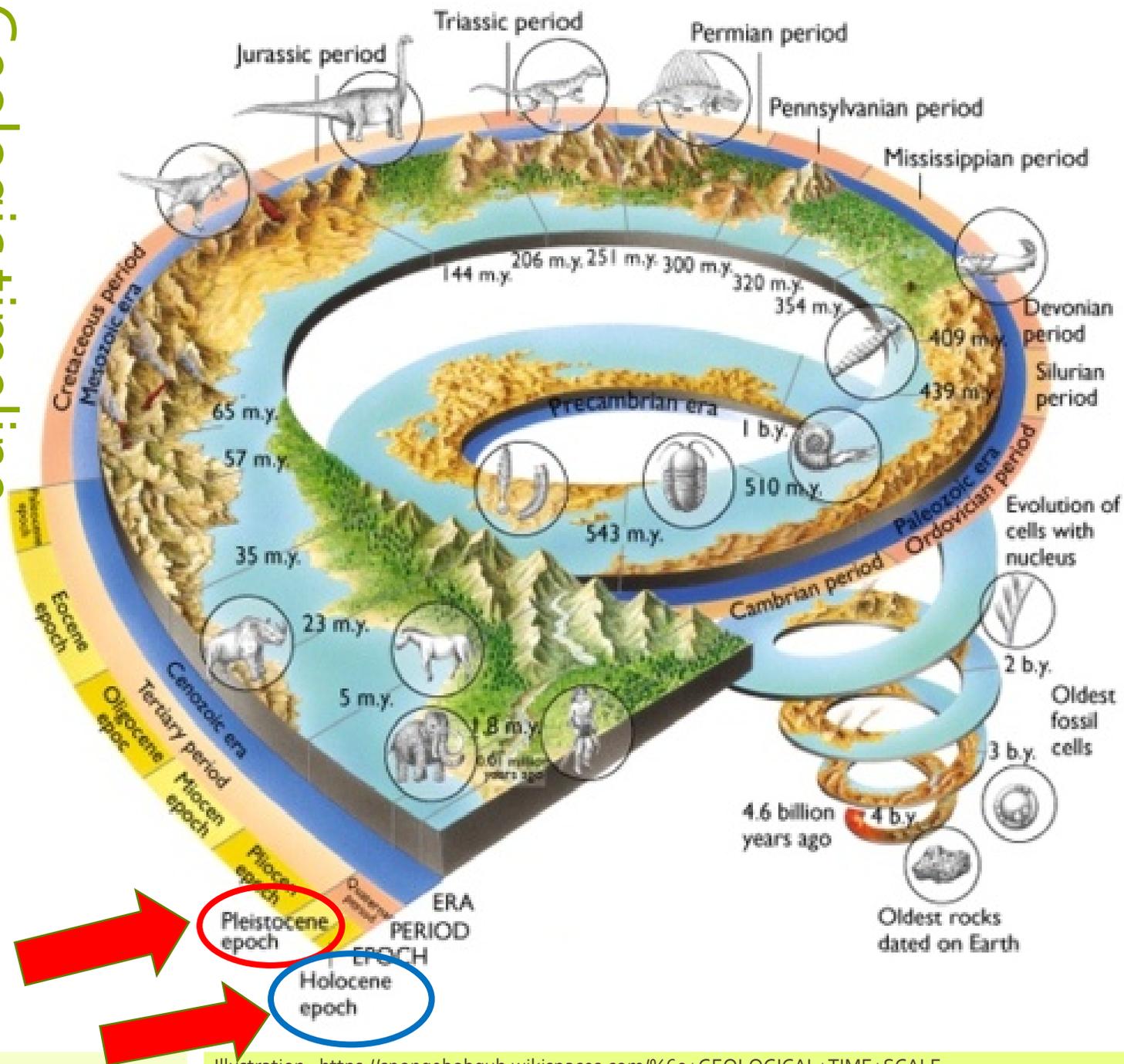
- *Changes: Latest Normal*
- *UHI: Shade & Water Resources*
- *Community: Building Resiliency*



The **Border Environment Cooperation Commission** helps to **preserve, protect and enhance** the environment and human health of the U.S.-Mexico border region through project certification, technical assistance and capacity building.

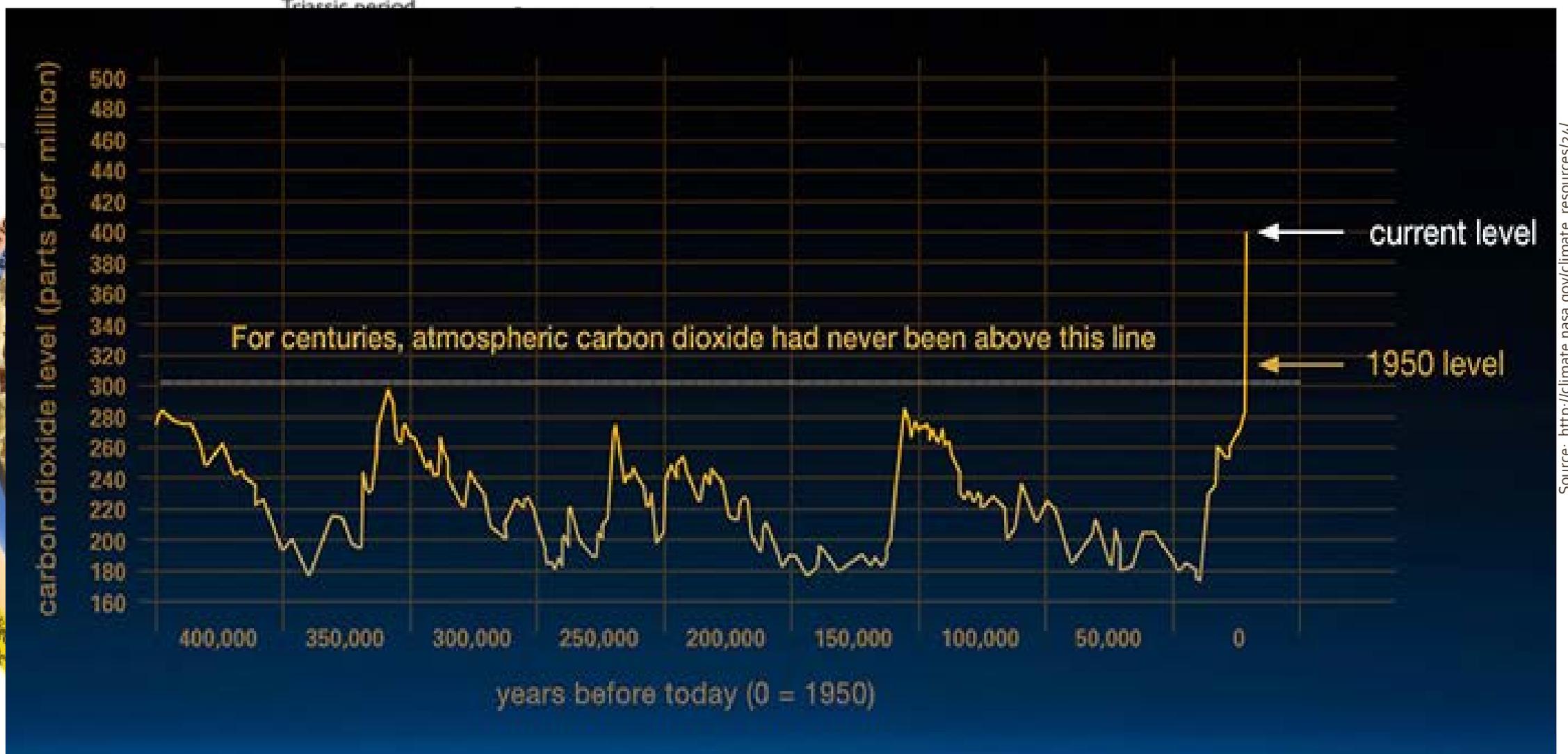


# Geologic timeline

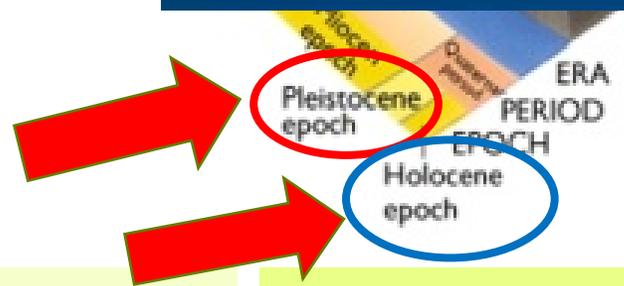


# Geologic timeline

Tertiary period



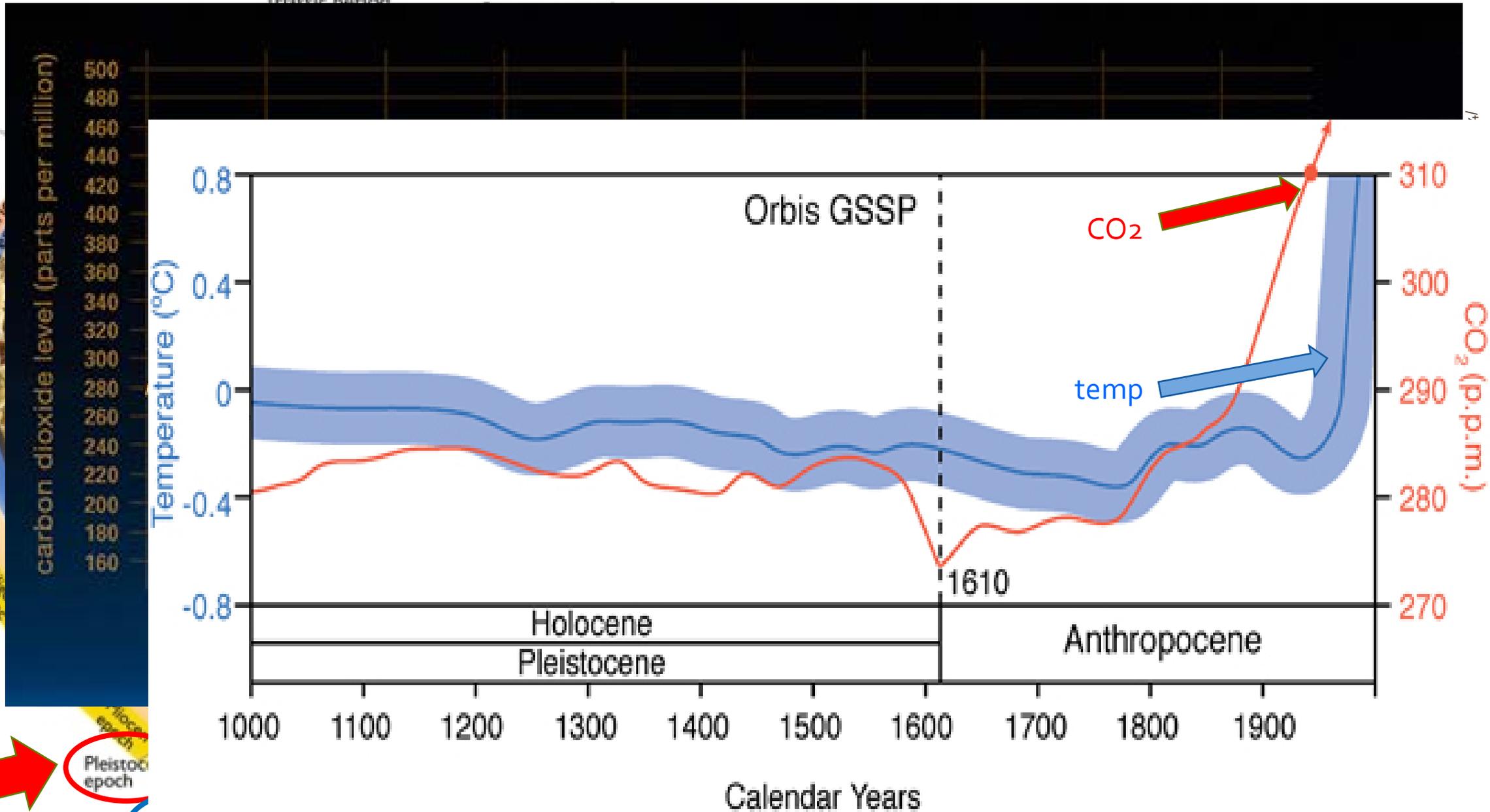
Source: [http://climate.nasa.gov/climate\\_resources/24/](http://climate.nasa.gov/climate_resources/24/)



Oldest rocks dated on Earth

# Geologic timeline

Tertiary period



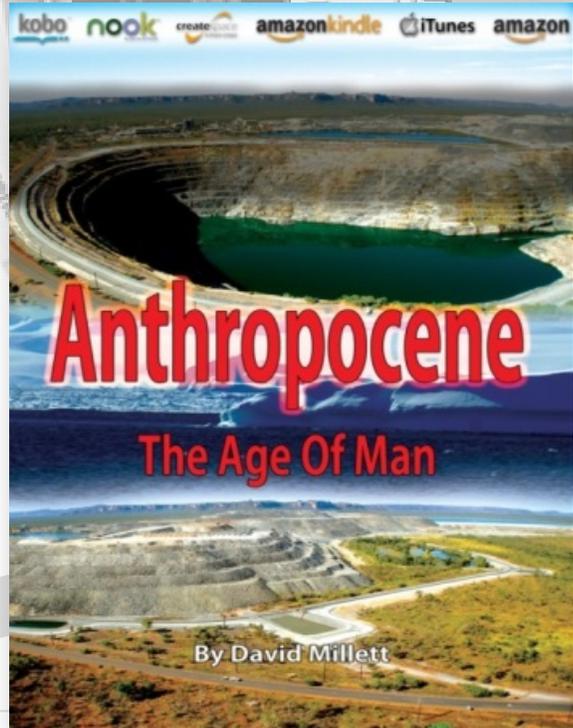
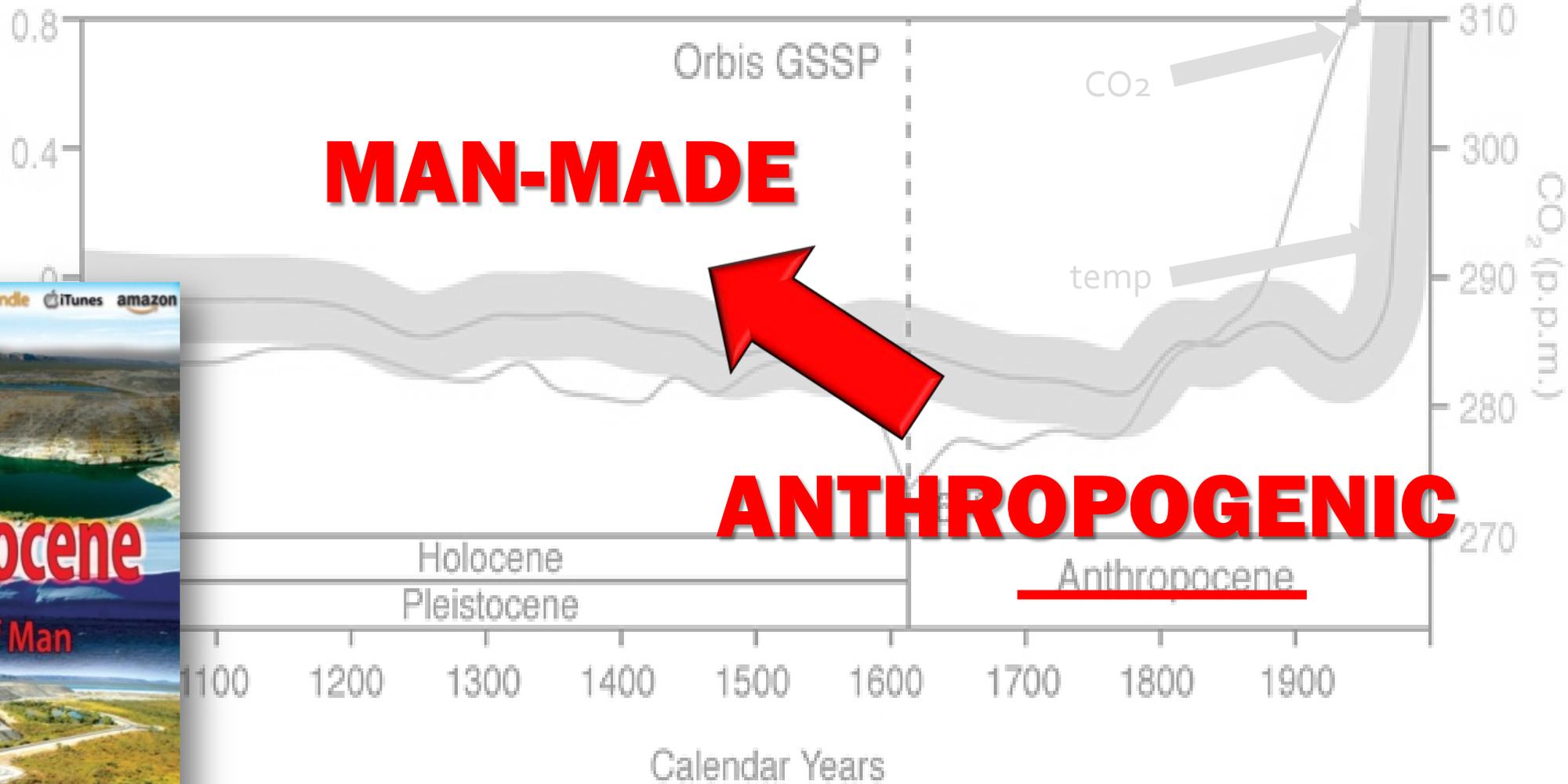
Source: <http://www.scientificamerican.com/article/mass-deaths-in-americas-start-new-co2-epoch/>

Triassic period

CO<sub>2</sub> level (parts per million)

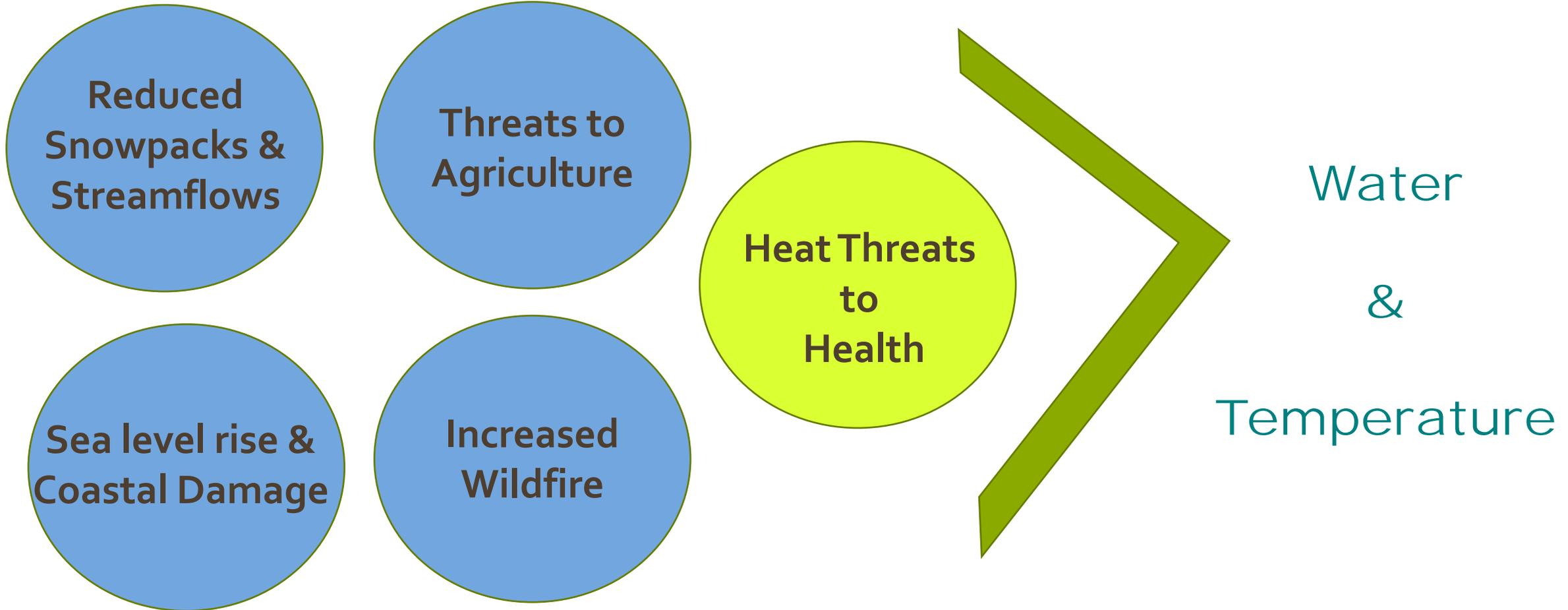
500  
480  
460  
440  
420  
400  
380  
360  
340  
320  
300  
280

0.8  
0.4  
0

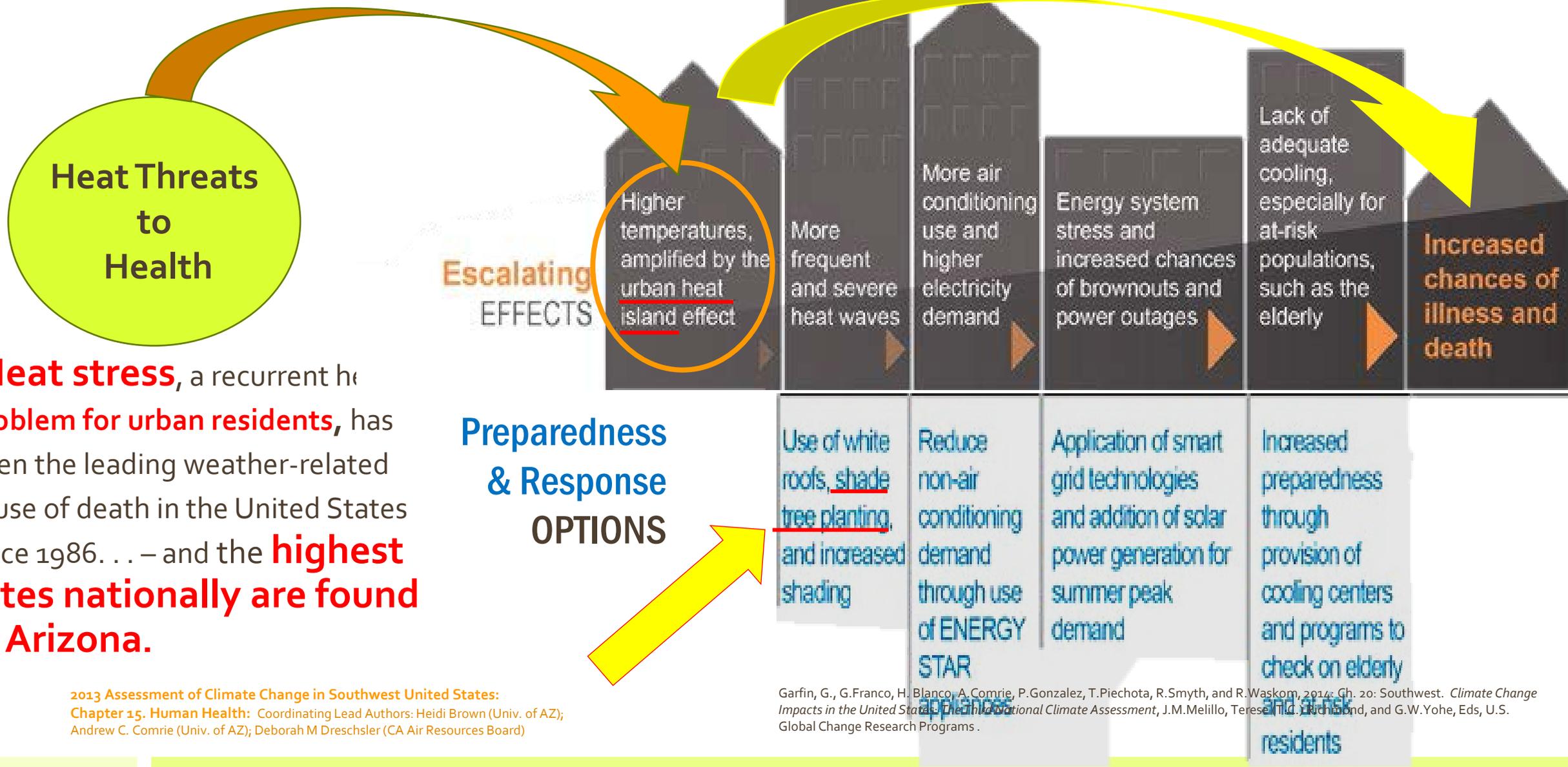


Source: <http://www.scientificamerican.com/article/mass-deaths-in-americas-start-new-co2-epoch/>

# Climate Change Impacts: Southwest Region | 5 Sectors



# Climate Change: Connecting the Urban Dot



“**Heat stress**, a recurrent health problem for urban residents, has been the leading weather-related cause of death in the United States since 1986. . . – and the **highest rates nationally are found in Arizona.**”

2013 Assessment of Climate Change in Southwest United States: Chapter 15. Human Health: Coordinating Lead Authors: Heidi Brown (Univ. of AZ); Andrew C. Comrie (Univ. of AZ); Deborah M Dreschsler (CA Air Resources Board)

Garfin, G., G.Franco, H. Blanco, A. Comrie, P. Gonzalez, T. Piechota, R. Smyth, and R. Waskom, 2014. Ch. 20: Southwest. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J.M. Melillo, Terese T. C. Richmond, and G.W. Yohe, Eds, U.S. Global Change Research Programs.



### **Shade in urban areas:**

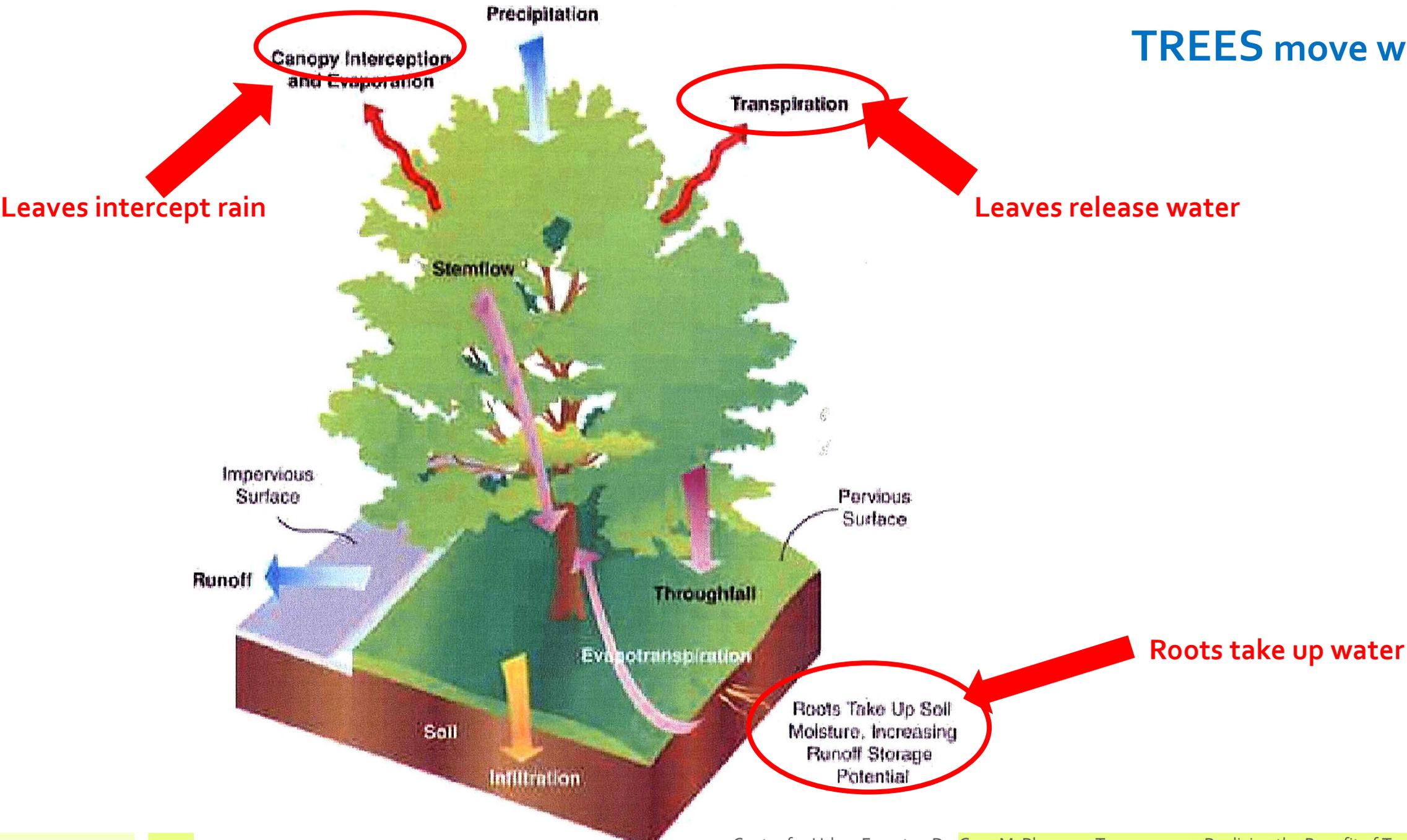
- Drought tolerant trees
- Native
- Low water use

## Living Shade:

- Water
- Maintenance



# TREES move water

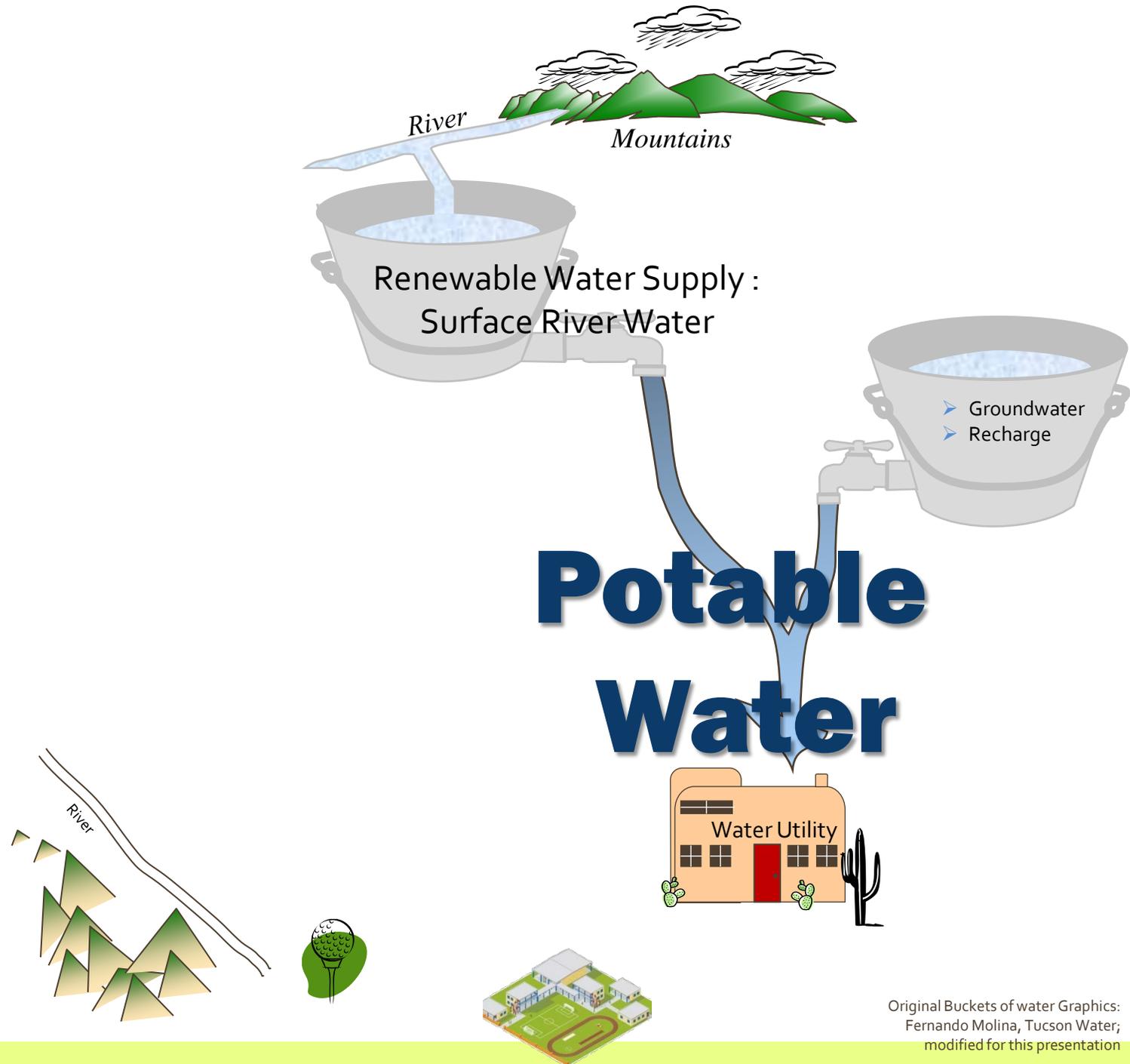




## Green Infrastructure

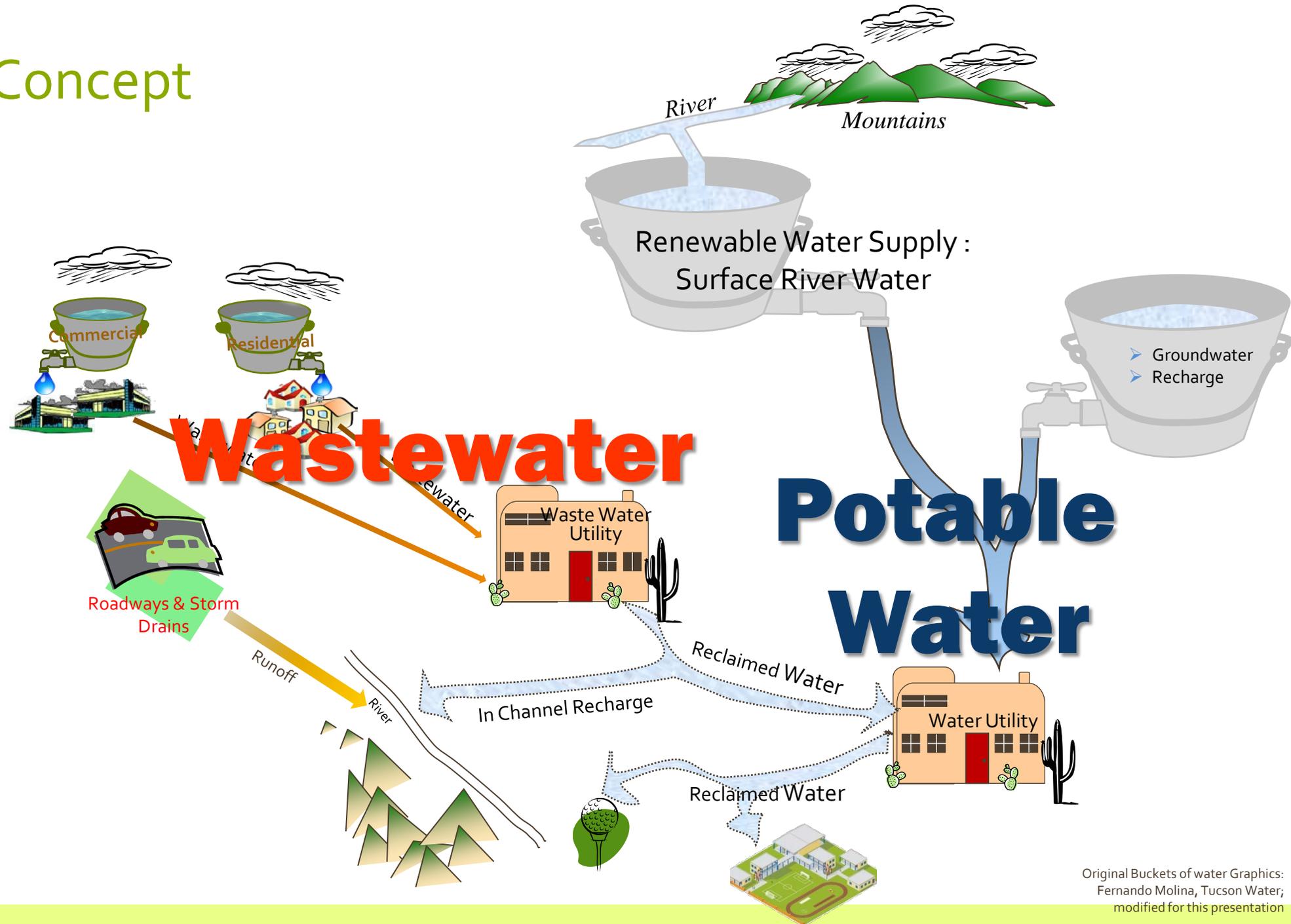
- Gathers rainwater
- Divert stormwater – small event management
- Water resource for vegetation = SHADE

# One Water Concept



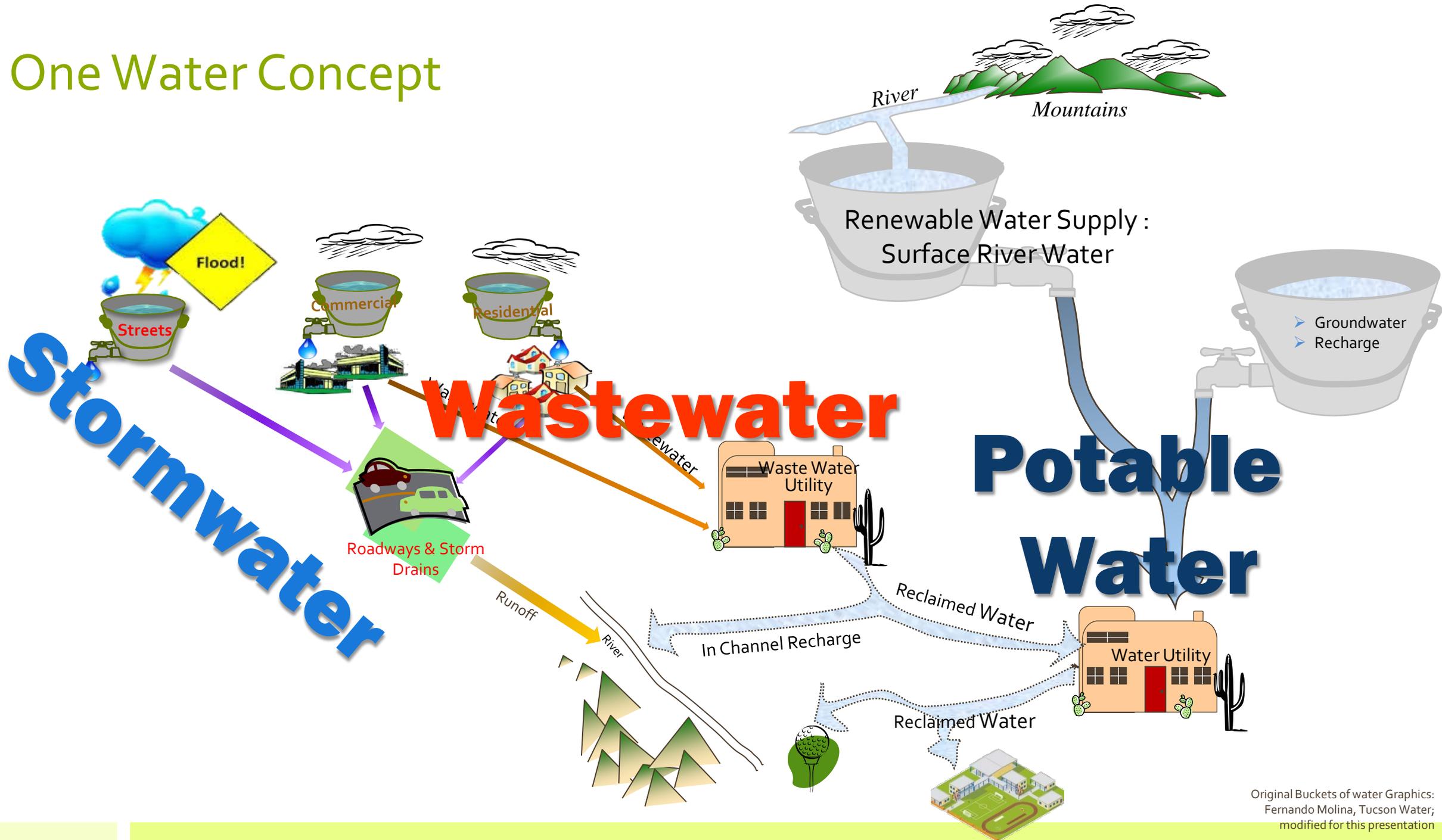
Original Buckets of water Graphics:  
Fernando Molina, Tucson Water;  
modified for this presentation

# One Water Concept



Original Buckets of water Graphics:  
Fernando Molina, Tucson Water;  
modified for this presentation

# One Water Concept



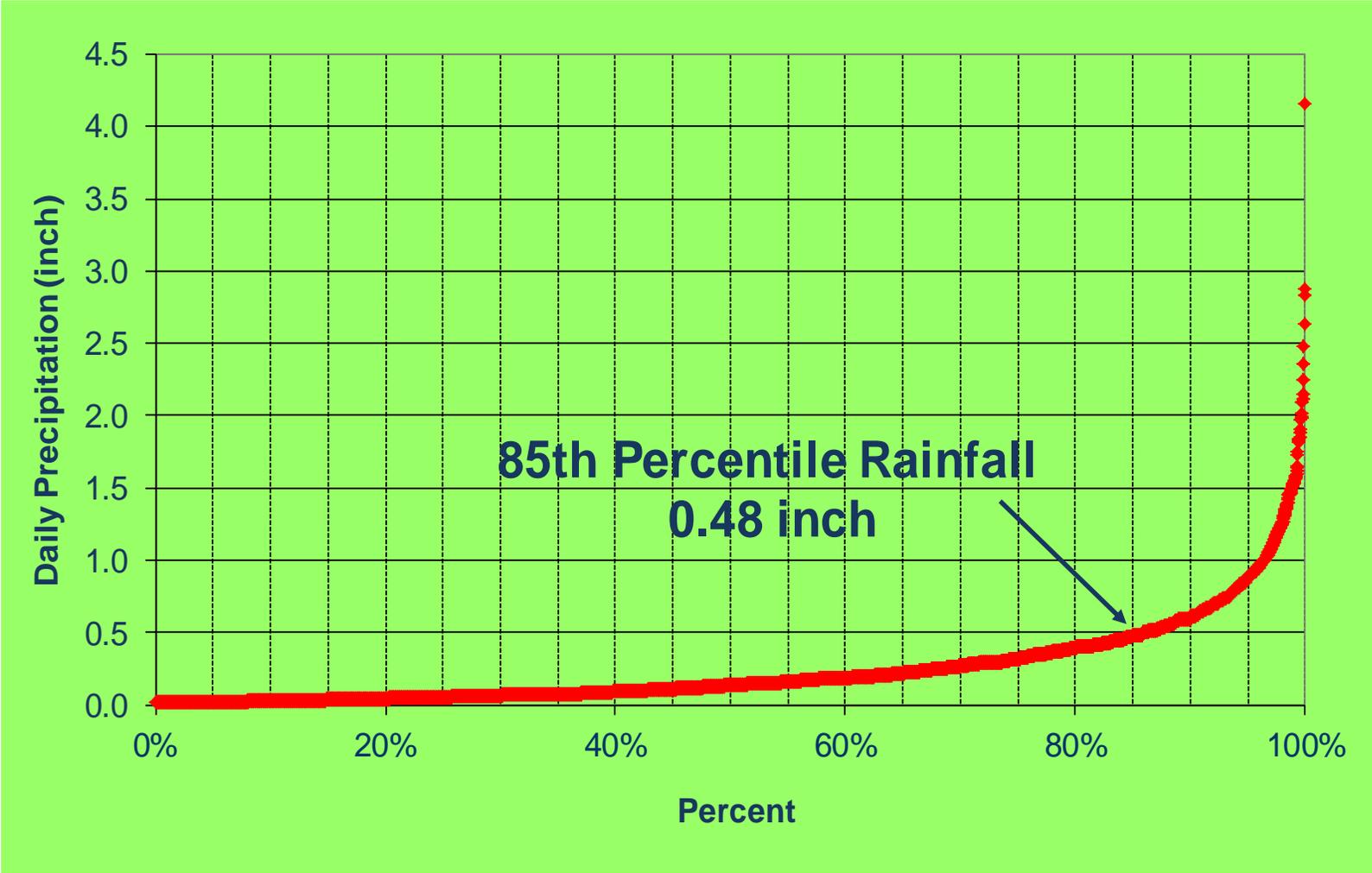
Original Buckets of water Graphics:  
Fernando Molina, Tucson Water;  
modified for this presentation

# Public Health = Flooding & Safety



Scale: large events  
Vs  
Smaller events

# Scale = Green Infrastructure – 1/2 inch event (smaller event)



**Capture rainwater** = greater frequency, smaller event

# Connecting Water, UHI and Shade Trees : Development of Standards



Curbs allowed by TDOT

# Connecting Water, UHI and Shade Trees : Involving community volunteers



Photo: basin & cistern; Watershed Management Group (WMG)

# Connecting Water, UHI and Shade Trees : Involving community volunteers



City | County | University staff volunteers



City Parks assisting neighborhood volunteers



City Transportation assisting neighborhood volunteers

# Connecting Water, UHI and Shade Trees : University of Arizona | Civano

University of Arizona Campus



Photo: <http://www.environment.arizona.edu/sites/default/files/styles/news-large/public/enr2-large.jpg?itok=pAKb4wyi/>



Photo: <http://tucsoncitizen.com/morgue/2009/01/12/107340-water-harvesting-a-tasty-deal-for-area/>

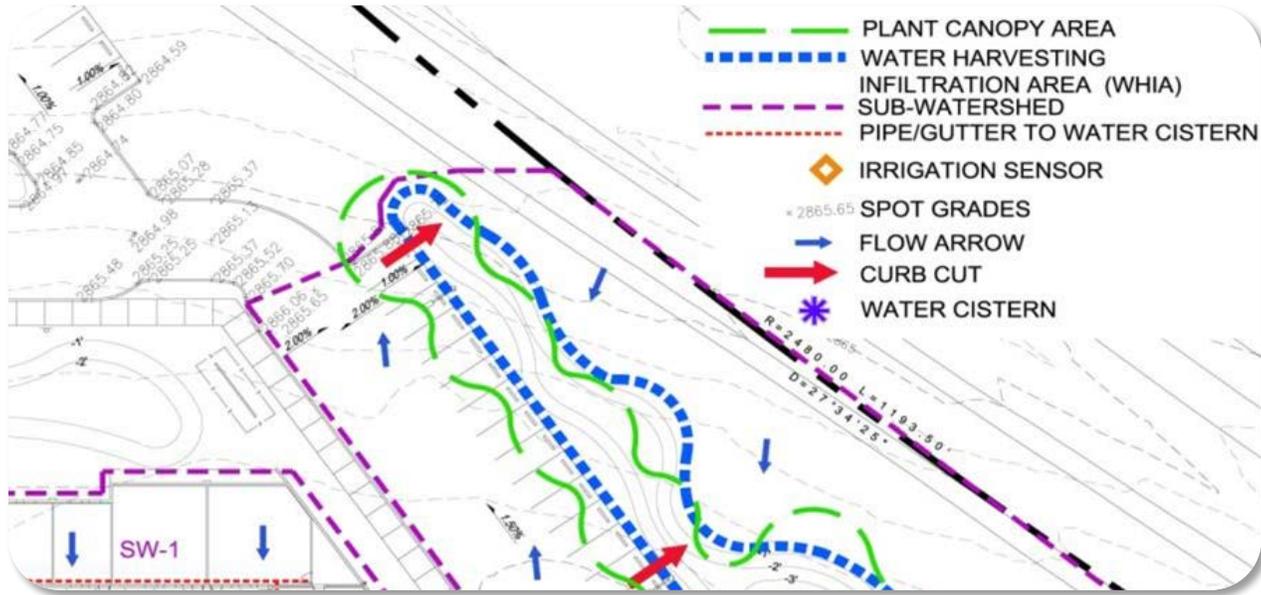


Photo: <https://www.asla.org/sustainablelandscapes/sonoran.html> : Bill Timmerman

Civano Neighborhood



# Connecting Water, UHI and Shade Trees : Commercial RWH Ordinance



## The Water Budget

Rainfall  
 + Plant H<sub>2</sub>O Need  
 + Basin area needed  
 = Minimum Required H<sub>2</sub>O Volume  
 for healthy plant survivability

Water Resources  
Research Center



# Connecting Water, UHI and Shade Trees: TDOT APG Green Streets

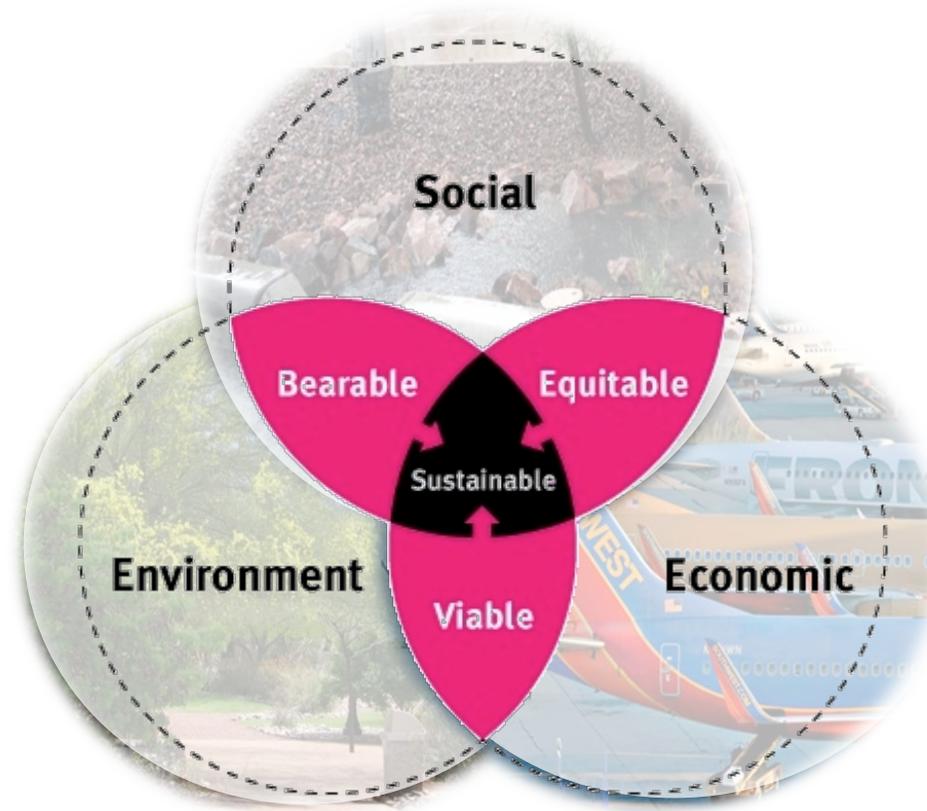


TDOT : Houghton Road

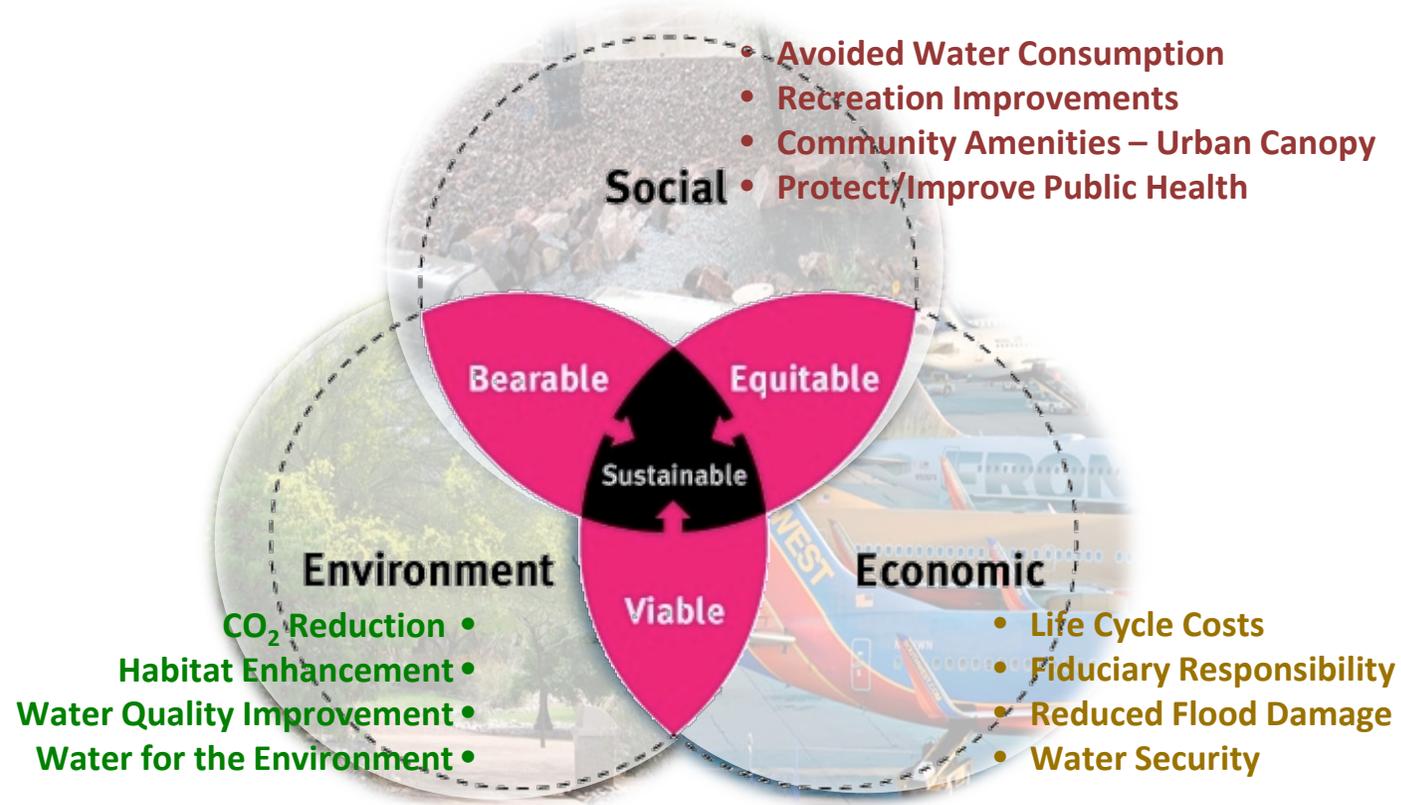


TDOT : St. Mary's Rd | Downtown Links

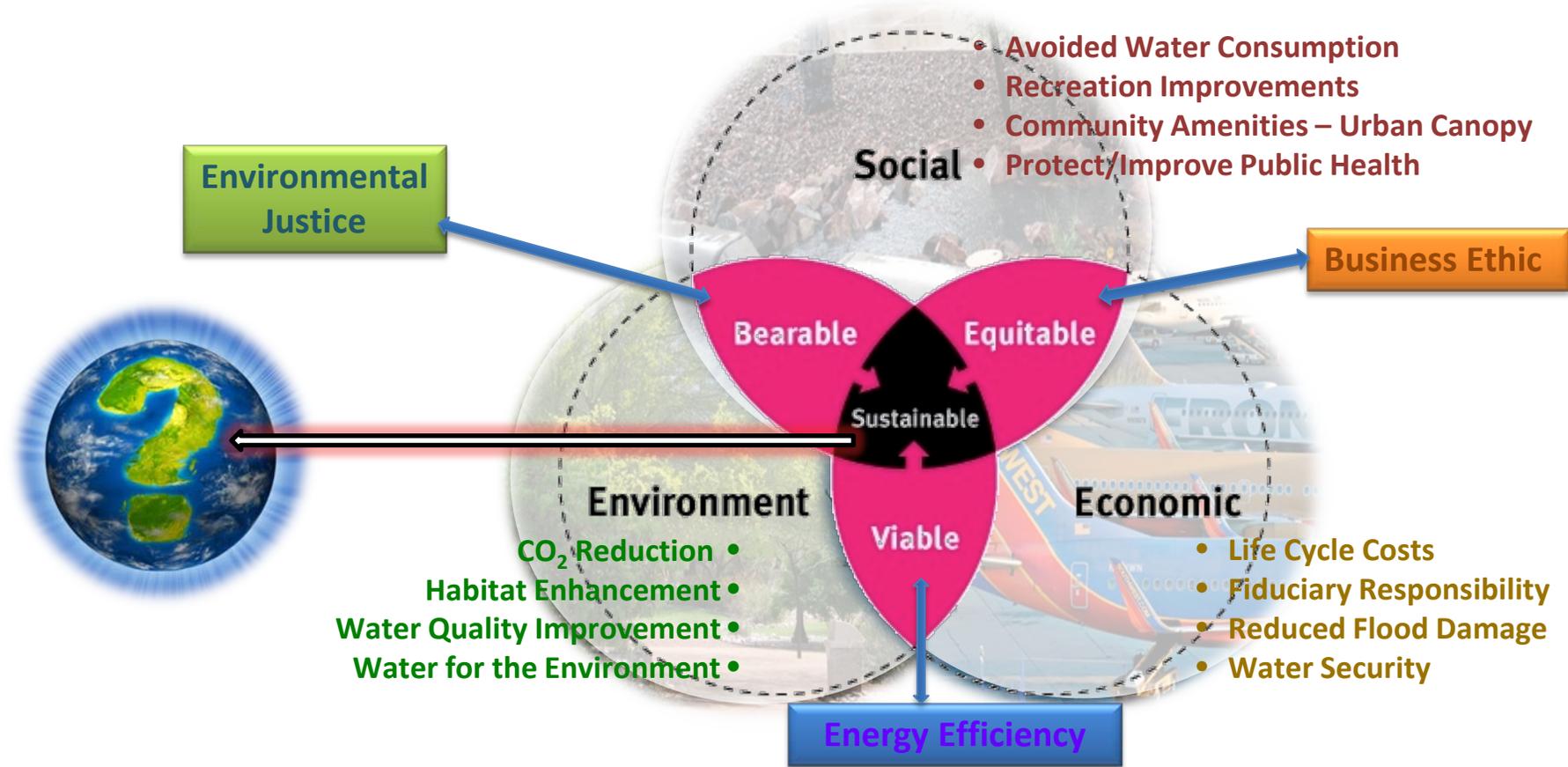
# Building Community Resiliency



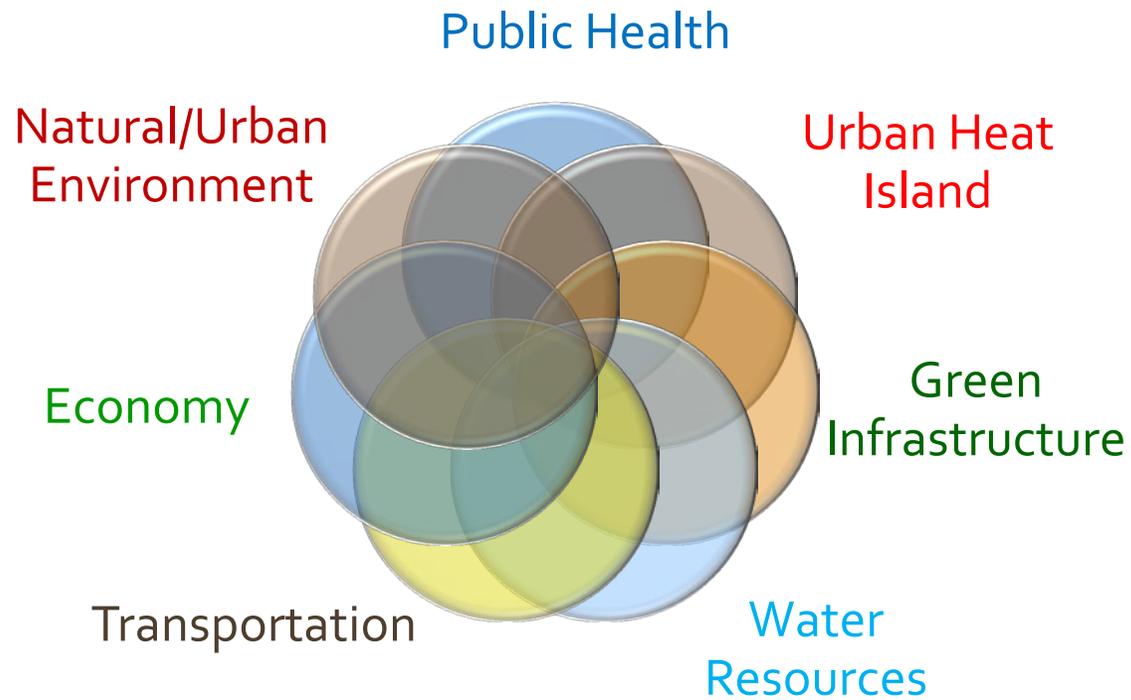
# Building Community Resiliency



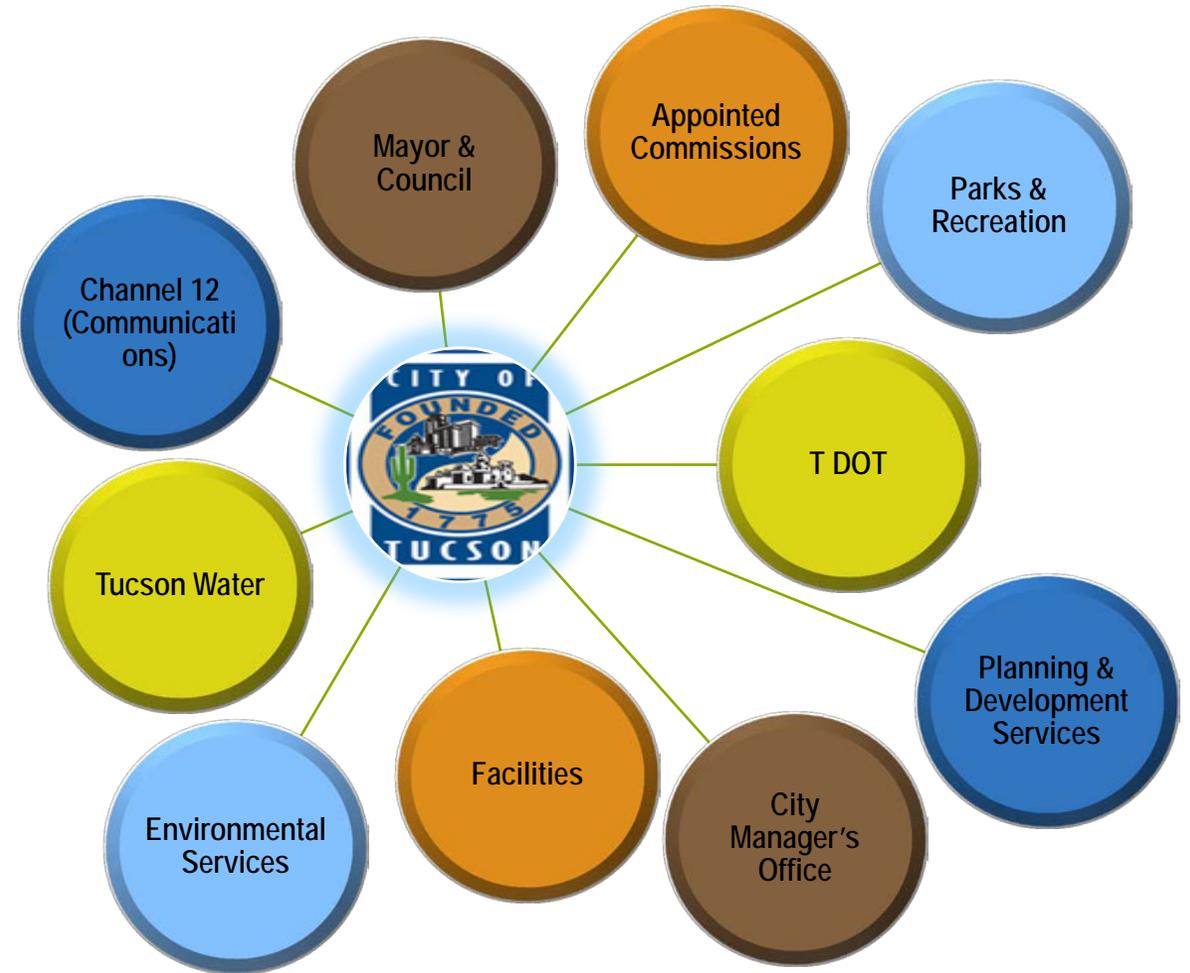
# Building Community Resiliency



# Integrative Practice of Green Infrastructure



**Multiple Overlapping Elements**



**Multiple Interacting Players**

[this illustrates Public Sector Depts]



# RESOURCES

**Univ. of Arizona Water Resource Research Center newsletter article:**

<https://wrrc.arizona.edu/LID-green-infrastructure>

**Rainwater Harvesting Ordinance:**

<http://www.tucsonaz.gov/ocsd/sustainability/wter/rainwaterharvesting.php>

**Tucson Department of Transportation Green Street Active Practice Guideline:**

[http://cms3.tucsonaz.gov/files/transportation/Green\\_Streets\\_APG\\_Signed\\_by\\_Director.pdf](http://cms3.tucsonaz.gov/files/transportation/Green_Streets_APG_Signed_by_Director.pdf)

**City Transportation Landscape Details:**

<http://tdot.tucsonaz.gov/tdot/landscape>

**Rainwater Harvesting Guidance Manual:**

<http://www.tucsonaz.gov/files/transportation/2006WaterHarvesting.pdf>

**Green Infrastructure for Southwestern Neighborhoods:**

<http://watershedmg.org/download-green-infrastructure-manual>

**Single-family Rainwater Harvesting Incentive Rebates:**

<http://www.tucsonaz.gov/water/rwh-rebate>



Irene Ogata, PLA, CPM, ASLA, AzAPA  
[irene.ogata@tucsonaz.gov](mailto:irene.ogata@tucsonaz.gov)  
Tucson Water  
City of Tucson