

A stylized sun graphic on the left side of the slide. It features a solid yellow circle at the bottom left, with several yellow dashed lines of varying lengths radiating upwards and to the right, suggesting rays of light. The background is a gradient from orange to white.


Water Sponge - Carbon Sink: Creating a Resilient City

**Deborah Reid, Technical Director
Greater Edwards Aquifer Alliance**



Using Green Infrastructure to meet our Goals

The natural world is valued in many ways including as a set of assets, supplying goods and services that the economy and society benefit from and can be measured by their quantity and value.



What is Green Infrastructure?

- **Green infrastructure** or **blue-green infrastructure** is a network that can assist in solving urban and climatic challenges.
- The main components of this approach include stormwater management, climate adaptation, less heat stress, more biodiversity, food production, better air and water quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around towns and cities.

Green infrastructure or green spaces contain:

- Above ground vegetation which has been well documented on its benefits to mitigate greenhouse gases, stormwater runoff and promote energy conservation and water quality in our lakes and creeks, and
- Soils which are just emerging as a very effective mitigation strategy.
- Most mitigation programs focus on either stormwater runoff/water quality or greenhouse gas/carbon sequestration, but not both.

Why Trees Are So Cool

Experts say trees should be considered urban infrastructure, every bit as important and useful as sewage, drinking water and transportation systems. They are an important tool for cities to reduce urban heat island effects. Here are a few ways trees benefit our urban environments:

■ By intercepting and absorbing rain, they reduce stormwater runoff.

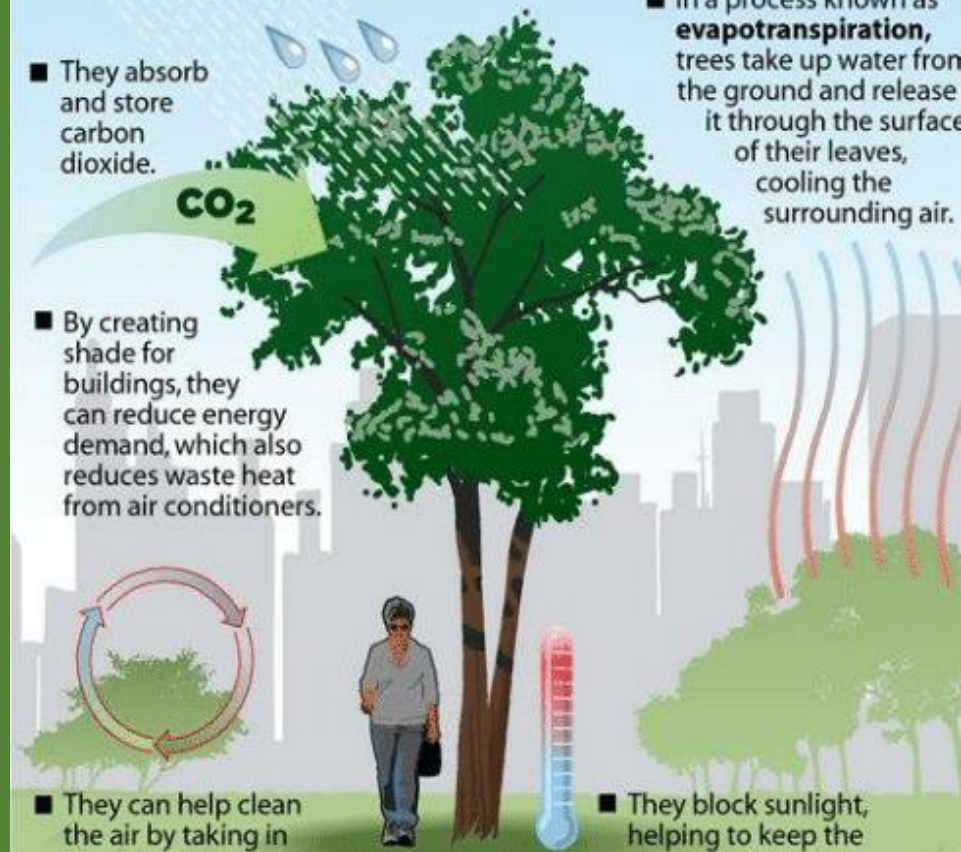
■ They absorb and store carbon dioxide.

■ By creating shade for buildings, they can reduce energy demand, which also reduces waste heat from air conditioners.

■ They can help clean the air by taking in air pollutants.

■ In a process known as **evapotranspiration**, trees take up water from the ground and release it through the surface of their leaves, cooling the surrounding air.

■ They block sunlight, helping to keep the ground below cool.



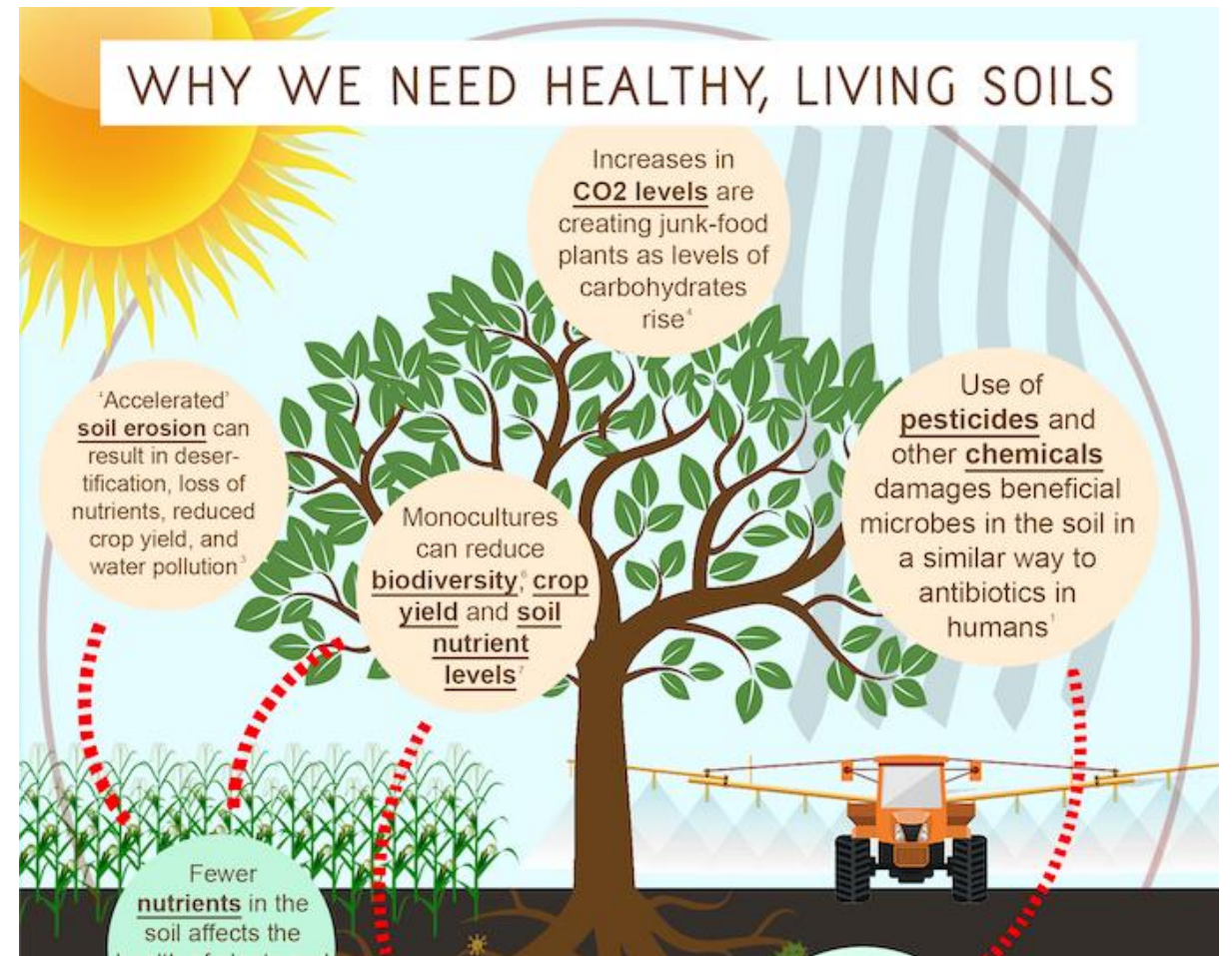
San Antonio can create a unique program to address both.

- Begin by focusing on our public green spaces especially parks and the existing linear creek trailways/floodplains.
- Outline goals and develop criteria necessary to meet those goals with a multi-disciplinary approach.
- Review existing City ordinances, Unified Development Codes, internal management practices (including floodplain and landscape maintenance contracts), programs and policies that could impact goals.
- Develop incentive and educational programs within the city and with city partners to promote goals and desired practices.



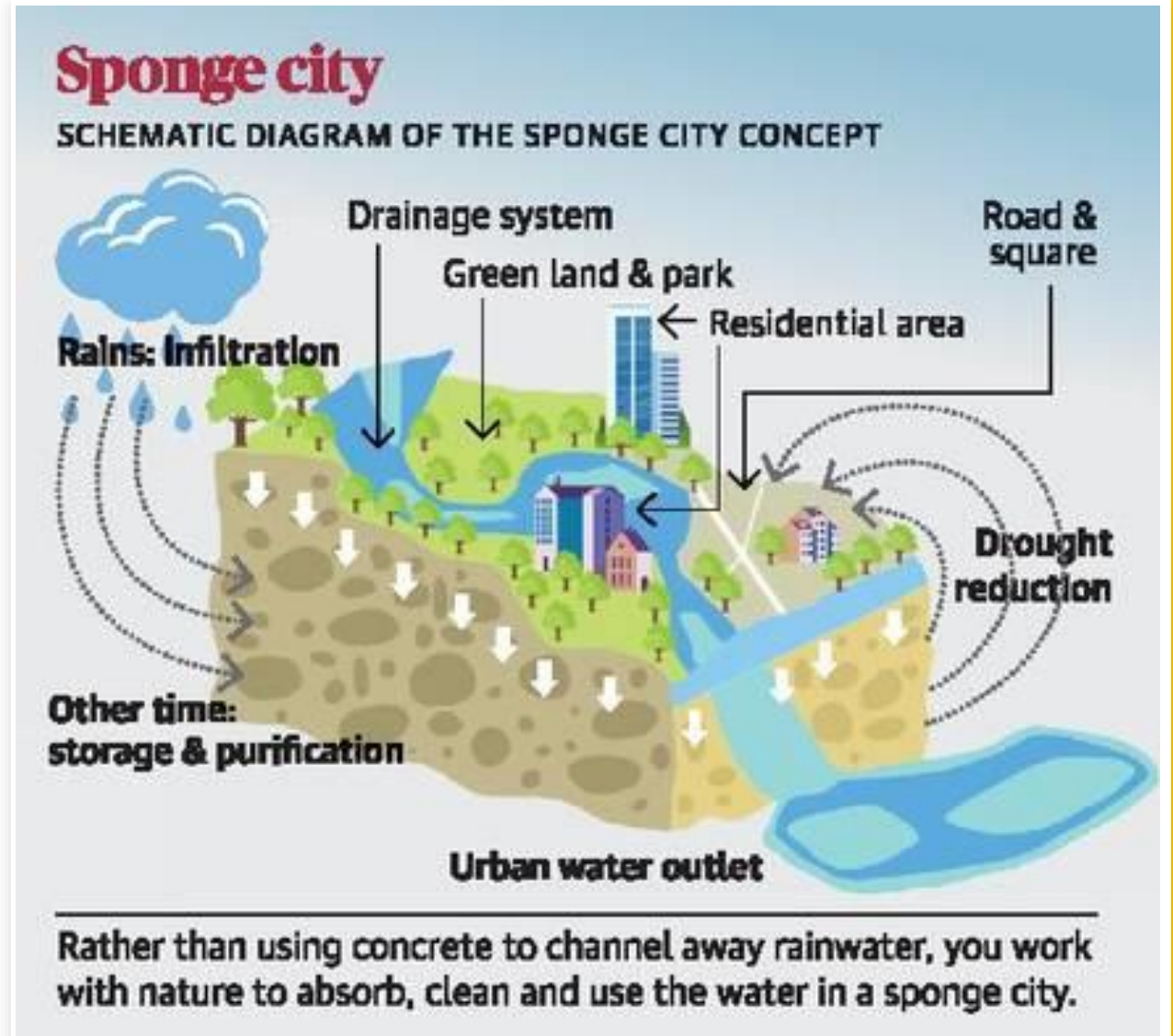
A little more on soils and their potential:

- Soil Organic Matter (SOM) is the basis of soil carbon. Increase the SOM and the amount of store carbon is increased.
- Data show that soils can sequester 3x more carbon than above ground vegetation.
- There is a hypothesis that a 2% increase in SOM of the world's soils can soak up the excess CO² within a decade.



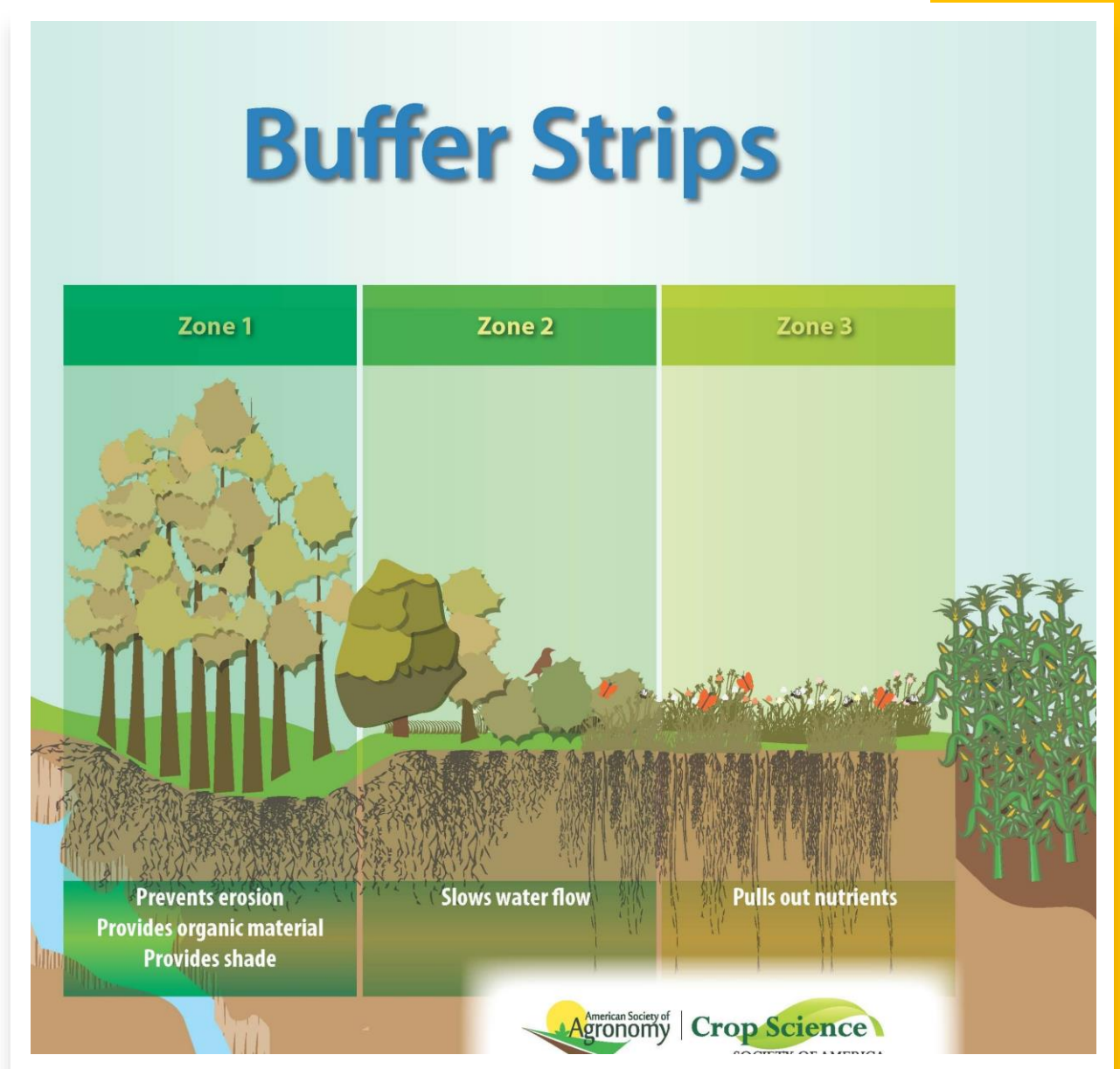
A little more on soils and their potential:

- New research is emerging, but there is little local data.
- But data show that soils can mitigate stormwater runoff and greenhouse gas emissions while improving water quality:
 1. Sequester carbon dioxide (CO²).
 2. Store an additional 20,000 gal of stormwater with a 1% increase in SOM.
 3. Allow this stored stormwater to filter and recharge lakes, creeks and rivers maintaining water levels.



A little more on soils and their potential:

- Data also show that location and soil types can impact their potential.
- For example, a floodplain with a forest can sequester more carbon, reduce more stormwater runoff and filter the stormwater better than turf grass.
- Deeper soils such as those along the Lower Salado Creek have more capacity than those on the northwest side of town.



That said, trees still play an important role: 2007 Ecosystem Analysis for San Antonio

San Antonio's 113,011 acres of tree canopy citywide manages:

- 974 million cubic feet of stormwater: value of \$624 million.
- 12.7 million lbs of air pollutants: value \$30.2 million per year
- Carbon Storage & Sequestration
 - Storage: 4.9 million tons of Carbon
 - Sequestration: 38,000 tons annually
- Economic Value: \$1,520,000



How do we use this information?



These dead and compacted soils no longer provide ecosystem services.

Using the Information:

Start with the low hanging fruit.

Modifying landscape practices has minimum costs and could save money while reducing emissions.

1. Keep soils covered.
2. Mow less often and at higher levels.
3. Keep heavy equipment off soils to prevent compaction.
4. Add compost to increase the SOM and the co-benefits.
5. Add a rain garden/bioswale to increase moisture for increased SOM and plant growth.

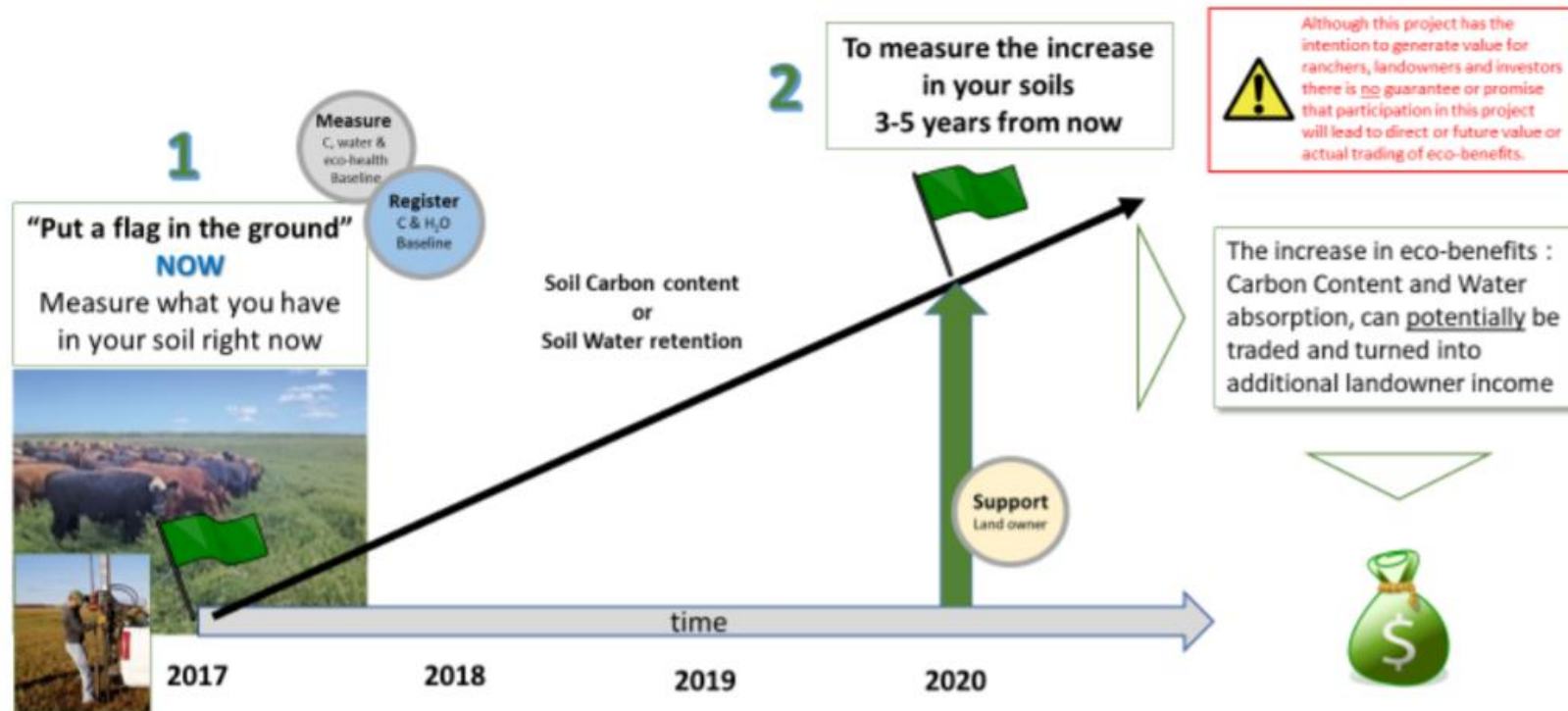


Programs are already being initiated to capture potential from modifying **landscape practices:**

Developing partnerships

1. The Natural Resource Conservation Service (NRCS) offers San Antonio an opportunity.
 - a. NRCS will take soil samples free of charge that and include:
 - Current soil carbon levels,
 - Soil percolation data,
 - Recommendations for increasing soil carbon with an opportunity to apply for a 50:50 match program to implement recommendations.
 - b. The City provides access to their public properties.
 - c. A draft MOU has begun circulation with Parks and Stormwater taking the lead and in coordination with the Office of Sustainability.

TCX – “Put a Flag in the Ground” – Reliably measure and register NOW



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Figure 2. Illustration of the basic concept of testing to initiate ecosystem service measurement. Note that no carbon transactions can occur without basepoint and subsequent testing.

Current carbon level data is necessary to monitor success of our programs.

Programs are already being initiated to capture potential from modifying **landscape practices**

Developing partnerships

2. The NRCS *Regional Conservation Partnership* 50:50 match program will require additional partners:


- a. Edwards Aquifer Authority expresses interest to partner using the Edwards Aquifer Protection Program's conservation easement properties.
- b. JBSA/AACOG has agreed that a partnership could be incorporated into their *Compatible Use Plan*. Ft Sam has already responded positively.

Programs being initiated to capture potential from low hanging fruit of modifying **landscape practices**

Developing partnerships

3. San Antonio Water System has put together a team for developing a new landscape program:

- Focus on the water sponge/carbon sink concepts with water conservation as the prime directive.
- Goals include:
 - a. Public education and demonstrations.
 - b. Incentives for transforming private residential landscapes.
 - c. Maybe based on a tier format with more points given for the more practices that are included.




Programs
being initiated
to capture
potential from
low hanging
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modifying
landscape
practices

Developing partnerships

4. Our increased carbon sequestration can be used for a carbon tax credit program.
 - a. Jim Blackburn, lead for Implementing the Texas Coastal Exchange program*, has met with our group including Office of Sustainability staff to create a Central Texas carbon exchange program.
 - b. Microsoft has expressed interest in creating a City Forest Credit registry program such as Austin's existing program.

* = The Texas Coastal Exchange establishes a trading clearinghouse where willing buyers and sellers could come together and enter into transactions involving the sale of ecological services.

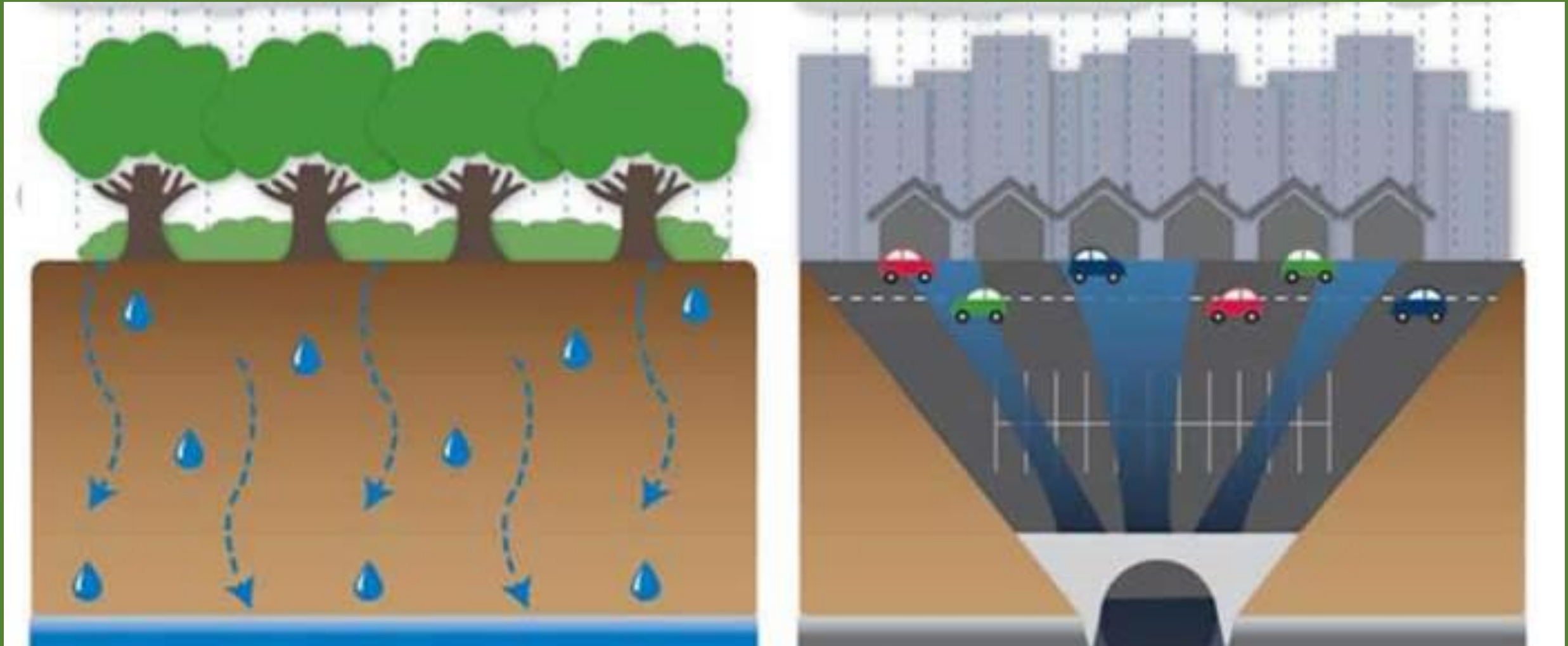


Using the
Information:
Not a low
hanging fruit,
but a paradigm
shift beginning
with stormwater
management.

**How to increase momentum
of the shift for how
stormwater is managed
regionally and locally**



Use information: Currently stormwater is managed primarily by gray infrastructure where it is funneled eventually to our streams and rivers with minimal filtration.





Conventional infrastructure with centralized stormwater facilities



Green infrastructure with distributed stormwater facilities

Shift flood control projects from focus in the floodplains to a watershed approach.

Use the information:

The watershed approach allows neighborhoods to be retrofitted with appropriately scaled green infrastructure which will:

- Enhance quality of life.
- Store more soil water and carbon.
- Cool temperatures.
- Improve water quality.



Soak Up the Rain with Green Infrastructure

www.epa.gov/soakuptherain



Tree Canopy



Rain Barrel



Rain Garden



Green Roof



Tree Planter Box



Porous Concrete

Learn more. Take Action.



Poster created by U.S. EPA Office of Wetlands, Oceans and Watersheds

Use the information:
This effort can be enhanced by:

- applying for grants/loans,
- offering grants and stormwater utility fee discounts to commercial properties for retrofitting their sites.



Use the information:

- Our parks system is an important part of the city's green infrastructure.
- Additional future directions:
 1. Increase public education and green space.
 2. Use 2020 UDC update to increase park lands and support Green Infrastructure.
 3. Support Parks and TCI to modify management practices and increase restoration efforts.
 4. Use LID and natural channel/drainage design on all public projects.

These changes will meet a variety of identified community goals:



Water quality



Air quality



Water conservation



Terrestrial and aquatic habitat



Biodiversity



Climate change and flood resiliency



Aesthetics and community health



Recreational activities



Acknowledgements and thanks to:

- Lissa Martinez for her role in representing the Master Naturalists in the Climate Action and Adaptation process where the practice to use public spaces for carbon sequestration was voted as the #1 mitigation strategy, her continued efforts to increase awareness on the capacity of soils to be used as a carbon sink, her initial contact with the NRCS and her continued support in this effort.
- Brenden Shue, GEAA's Trinity University intern who lead the effort on collecting data and drafting the white paper with citations.
- Greater Edwards Aquifer Alliance (GEAA) for its continued financial support to engage and coordinate partners in this endeavor.