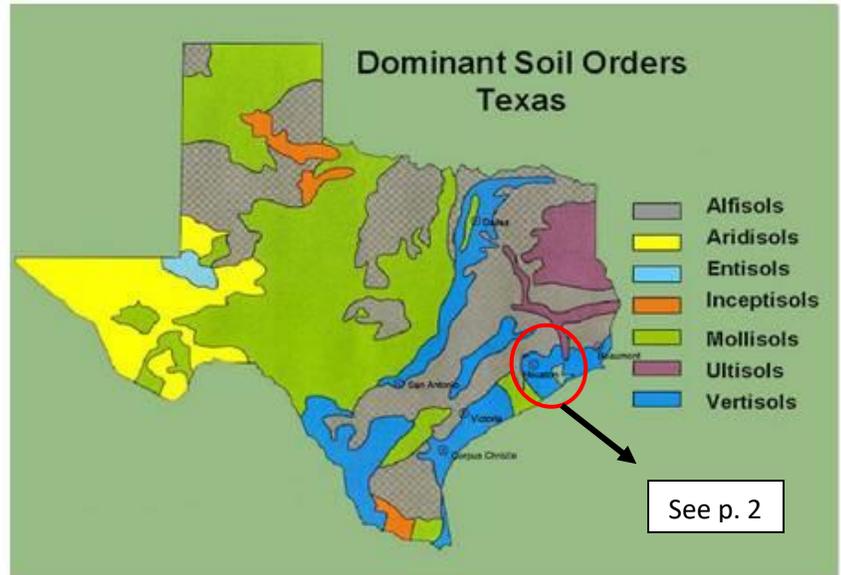


# Understanding the Soil Content of the 8-County Gulf-Houston Region

In working to enhance protected/preserved land (nature-based infrastructure) from 10% to 24% by 2040, our region's unique soils play a critical role. The National Resources Conservation Service (NRCS) classifies dominant soil types for the 8-County region as **Gulf Coast Prairie Soils**. The U.S. Dept. of Agriculture identifies twelve soil orders, with Texas containing seven of those twelve orders (see below). From those seven orders, four major urban regions of Texas all contain either **Vertisols** or **Alfisols** as their dominant soil orders.

Global (ice-free) Coverage Area

1. **Alfisols:** Mod. weathered (clay/sand) **10.1%**<sup>i</sup>
2. **Andisols:** Volcanic ash 1.0 %
3. **Aridisols:** Very dry 12.0%
4. **Entisols:** Newly formed 18.0%
5. **Gelisols:** Frozen 9.1%
6. **Histosols:** Organic, wet 1.2%
7. **Inceptisols:** Slightly developed 15.3%
8. **Mollisols:** Deep, fertile 7.0%
9. **Oxisols:** Very weathered 7.5%
10. **Spodosols:** Sandy, acidic 4.0%
11. **Ultisols:** Weathered 8.1%
12. **Vertisols:** Shrink/swell (mainly clay) **2.7%**



## Texas Soil Is Rare in the World

NRCS: [https://www.nrcs.usda.gov/wps/portal/nrcs/detail/tx/home/?cid=nrcs144p2\\_003094](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/tx/home/?cid=nrcs144p2_003094)

Vertisols are very unique soils and only occupy less than 3 percent of the continental land area on Earth, mainly in the Deccan Plateau of India, the Al-Jazīrah region of Africa, eastern Australia, Texas in the United States, Paraná basin of South America, and Mexico/Central America.<sup>ii</sup> Estimated global vertisols soil coverage area totals 300 million hectares (mh), equaling 741,316,144 acres or just 2.7% of continental land.<sup>iii</sup>

|  | Major Areas of Vertisol | Vertisol Cover (hectares) | Percent Cover of 2.7% |
|--|-------------------------|---------------------------|-----------------------|
|  | USA (Texas)             | 6.5 million               | 2.1%                  |
|  | Turkey                  | 600,000                   | 0.2%                  |
|  | South America           | 6 million (est)           | 2.1% (est)            |
|  | Mexico/Central America  | 12 million (est)          | 5% (est)              |
|  | India                   | 70 million                | 23%                   |
|  | Africa                  | 100 million               | 33%                   |
|  | Australia               | 70.5 million              | 23%                   |

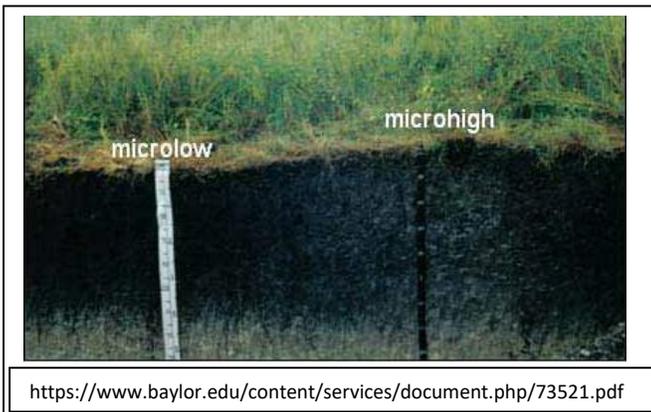
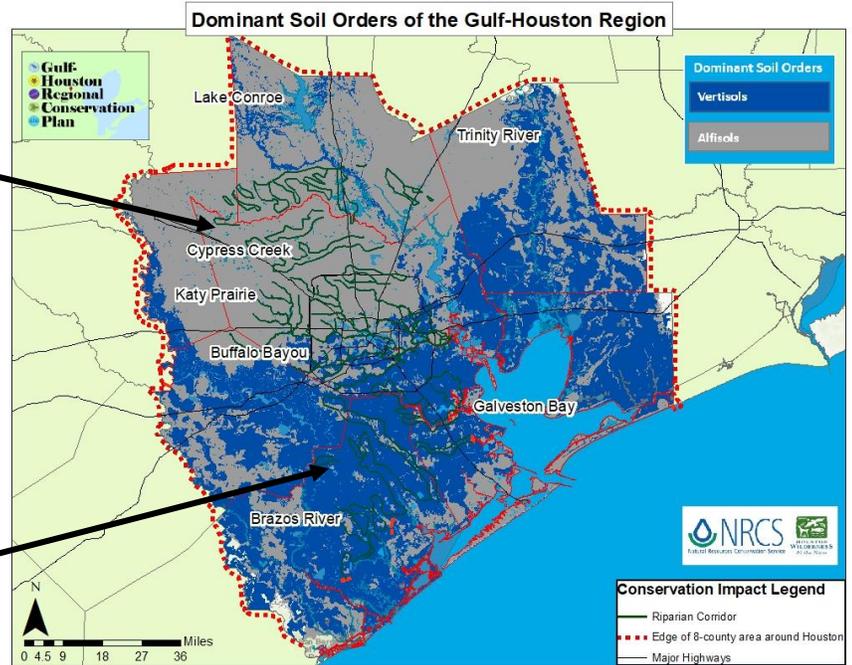
  

Alfisol & Vertisol general pattern of soils

## Vertisols and Alfisols in the 8-County Region

**Alfisols** contain topsoil and up to 20-40 inches of sandy loam (sand mixed with clay) before reaching a clay pan. These soils typically form under grassland vegetation.<sup>iv</sup> Surface runoff is slow to very slow, permeability is very slow, and the available water holding capacity is high<sup>7</sup> due to high clay content at depth.

**Vertisols** are clay-rich soils (40-75% clay content) that shrink when dry, swell when wet, and consist of topsoil sitting atop a deep clay pan. When dry, vertisols form large cracks that may be more than three feet deep and several inches wide.<sup>v</sup> These cracks greatly influence the infiltration and runoff behavior particularly during rain events, and are responsible for many building foundation and road repairs.<sup>vi</sup> Vertisols typically form under grassland vegetation and are self-mulching, highly fertile soils due to their high clay content.<sup>vii</sup> The vertisol's self-mulching allows for unique surface features called **gilgai**, which consists of subtle topographic changes of microhighs surrounding circular microlows (mounds & depressions) – see image below.<sup>viii</sup> The subsurface clays become saturated quickly during rain events, causing runoff to pool on the surface. Depressions associated with gilgais allow the excess runoff to be detained until evaporation or drainage to a waterway. Historically these depressions were used as temporary watering holes and habitat for wildlife and as a natural farming irrigation system.<sup>ix</sup>



### Soil Considerations for 24% by 2040 Strategy

As thousands of local and regional projects continue to be funded to increase ecosystem services, particularly related to storm-resilience, the Gulf-Houston Regional Conservation Plan (RCP) 24% by 2040 Strategy can be reached by preserving and restoring the region's nature-based infrastructure, including riparian corridors, coastal prairies and wetlands, forests and coastal areas (See Working List of Projects here: [www.gulfhoustonrcp.org](http://www.gulfhoustonrcp.org)). Knowledge and understanding of our region's unique Vertisols and Alfisols can help guide the discussion on the importance of (1) the need to "spread out" protected land to naturally hold water necessary to mitigate

downstream flooding, (2) create and maintain additional detention basins throughout targeted parts of our region that allow for additional storage of water during large rain events, (3) encourage increased native plants and trees on all available lands in our region, and (4) target measurable carbon sequestration as a major factor in restoration/enhancement efforts. Houston Wilderness works with the 8-county region to facilitate the Gulf-Houston RCP and the 24% by 2040 Strategy. For more information, see [www.houstonwilderness.org](http://www.houstonwilderness.org).

<sup>i</sup> <https://globalrangelands.org/topics/rangeland-ecology/twelve-soil-orders>

<sup>ii</sup> [www.britannica.com/science/Vertisol-FAO-soil-group](http://www.britannica.com/science/Vertisol-FAO-soil-group)

<sup>iii</sup> [www.fao.org/Wairdocs/ILRI/x5493E/x5493e04.htm](http://www.fao.org/Wairdocs/ILRI/x5493E/x5493e04.htm)

<sup>iv</sup> <https://www.soils.org/discover-soils/soil-basics/soil-types/alfisols>

<sup>v</sup> [www.fao.org/Wairdocs/ILRI/x5493E/x5493e04.htm](http://www.fao.org/Wairdocs/ILRI/x5493E/x5493e04.htm)

<sup>vi</sup> Pathak et al. 2012. Hydrological behavior of Alfisols and Vertisols in the semi-arid zone: Implications for soil and water management. *Agricultural Water Management*. Vol 118. 12-21.

<sup>vii</sup> [www.soils.org/discover-soils/soil-basics/soil-types/vertisols](http://www.soils.org/discover-soils/soil-basics/soil-types/vertisols)

<sup>viii</sup> [www.soils4teachers.org/files/s4t/k12outreach/tx-state-soil-booklet.pdf](http://www.soils4teachers.org/files/s4t/k12outreach/tx-state-soil-booklet.pdf)

<sup>ix</sup> [www.revolvy.com/page/Vertisol](http://www.revolvy.com/page/Vertisol)