Houston Wilderness Carbon Sequestration Scenario

Background: The 3rd Key Goal of the 8-County *Gulf-Houston Regional Conservation Plan* is to provide research and advocacy toward an annual increase of carbon sequestration in the region by 4‰ in native soils, plants, trees, and oyster reefs. The 4‰ increase was chosen for its overlap with the global 4per1000 Initiative established in 2015 at COP21. In the figures below, Houston Wilderness demonstrates a scenario below in which current carbon stocks in the 8-county region could be increased to meet the 3rd key goal of the HW RCP.

HOUSTON WILDERNESS
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Baseline Estimates of Carbon Sequestration:

Current Carbon Stock in 8-County RCP land cover: 28-33 tons/acre (8-county region x 30 tons/acre = 148,765,710 tons) [1]

Amount of Carbon Sequestration/Stock Needed to Meet 4‰ Annual Increase: 600,000 tons/year

Maximum Carbon Stock Possible in RCP Region: 64-77 tons/acre – **will take 10+ years to reach high stocks** [2]

Example Scenario of Large-Scale Native Tree Planting to Meet 3rd Key Annual Goal: [3]

Species of Native Tree[3&6]	**Number of Trees Planted (in 1 year)**	**Amount of Carbon Sequestered per Tree (lbs./year)** [3]	**Total Carbon Sequestered After Planting (lbs./year)**
Live Oak	150,000	268	40,200,000
River Birch	50,000	215	10,750,000
Green Ash	10,000	200	2,000,000
Willow Oak	10,000	142	1,420,000
Laurel Oak	75,000	194	14,550,000
Water Oak	20,000	173	3,460,000
Boxelder	20,000	159	3,180,000
Sweetgum	30,000	150	4,500,000
Red Maple	50,000	139	6,950,000
White Ash	10,000	118	1,180,000
American Elm	25,000	114	2,850,000
American Sycamore	20,000	111	2,220,000
Loblolly Pine	50,000	106	5,300,000
Total	**520,000**		98,560,000
Total in tons (trees only)			**50,000 tons**[3, 6]
Carbon Added to Soil (mulch, composting, OM) [4] [5]			400,000 tons
No till" ag lands			45,000 tons
Native grasses[7] & oyster reefs[8]			105,000 tons
Existing carbon seq. with forestation in region	90 million		**+**
Total in tons			**600,000 tons**
Percent Carbon Sequestration Increase			**4‰**

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Tools in the Resilience Toolbox

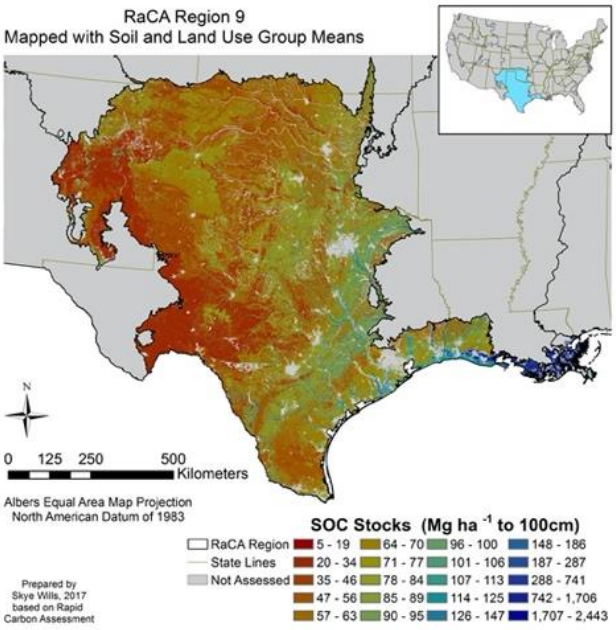
(1) Targeting Native Tree Species based on Ecosystem Services abilities

(2) *Resilient Houston Plan* Goal of 4.6 Million Native Trees Planted by 2030

(3) Research on large-scale use of native grasses

(4) Major soil enhancements – compost and mulch

(5) Carbon Credits Trading (public and private)



Discussion of Methodology:

Baseline of current carbon stocks in the RCP Region was determined by the SoilGrids and NRCS Soil databases[1, 2] and baseline estimates of "Super Tree" prevalence in the Greater Houston provided by CUFR Carbon Calculator (CTCC). The number of each "Super Tree" species that will be planted is determined by the annual average needed to meet 4.6 million trees planted by 2030 and their respective carbon sequestration per tree per year is calculated by pre-existing research from Houston Wilderness' Regional Native Tree Ranking Chart.[3] Additionally, the amount of carbon added to the soil by mulch, composting, native grasses, "no till" ag lands and oyster reefs was calculated by averaging findings from comprehensive studies under as similar a condition as possible to the RCP Region. [4, 5, 7, 8] Finally, all of the carbon sequestration calculations are converted into tons and then used as the numerator in the fraction of amount of carbon added to soil over the current carbon stock in the soil (Carbon added to soil by above-listed items/Current Carbon Stock).

References:

1. SoilGrids Data (2019) – current carbon stock based on 95% of disturbed lands across the region (https://soilgrids.org/); 8-County Gulf-Houston Region's total acreage = **4,958,857 acres**
2. NRCS Soil Data (2019) – based on carbon sequestration capacity of the region's clay and sandy loam soils (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053179.pdf)
3. HW Regional Native Tree Ranking Charts – 10 year (2019) (https://houstonwilderness.org/46-million-trees-by-2030-goal) – highlights 14 Super Trees with high ecosystem services benefits
4. Jianling Fan, Weixin Ding, Jian Xiang, Shenwu Qin, Jiabao Zhang, Noura Ziadi, Carbon sequestration in an intensively cultivated sandy loam soil in the North China Plain as affected by compost and inorganic fertilizer application, Geoderma, Volumes 230–231, 2014, p. 22-28
5. Gulab Singh Yadav, Anup Das, Rattan Lal, Subhash Babu, Mrinmoy Datta, Ram Swaroop Meena, Somanagouda B. Patil, Raghavendra Singh, Impact of no-till and mulching on soil carbon sequestration under rice (Oryza sativa L.)-rapeseed (Brassica campestris L. var. rapeseed) cropping system in hilly agro-ecosystem of the Eastern Himalayas, India, Agriculture, Ecosystems & Environment, Volume 275, 2019, p. 81-92
6. Calculation for total tons of carbon sequestered by planting of "Super Tree" species (sum of all carbon sequestered by each "Super Tree" species
7. Hungate BA, Barbier EB, Ando AW, et al. The economic value of grassland species for carbon storage. *Sci Adv*. 2017;3(4):e1601880. Published 2017 Apr 5. doi:10.1126/sciadv.1601880
8. Fodrie FJ, Rodriguez AB, Gittman RK, Grabowski JH, Lindquist NL, Peterson CH, Piehler MF, Ridge JT. 2017 Oyster reefs as carbon sources and sinks. Proc. R. Soc. B 284: 20170891.