The many simple ways

Daniel Millikin
Memorial Park Conservancy

Joy Columbus
Houston Botanic Garden
How do you see nature?
The Many Simple Ways

Houston Botanic Garden

Joy Columbus
Vice President, Horticulture
FROM GOLF TO GARDEN

Low Diversity to High Diversity
We know quality, sustainable soil systems are the key
How can we get there?
Global Garden

Houston Botanic Garden
Houston, TX
- 4.1 acres
- 8 soil profiles
- 350 species
- X cy of soil
The Money

Full Import Soils : $878,333
Deduct Amendment : $96,000
$/cy for Import: 89$ installed
$/cy for Amended on site: 77$ installed
Rebuilding Soils at the Houston Botanic Garden

• Tight “gumbo” clay
• Endured years of intense chemical treatments and turf monoculture
• Potential for rich structure and biology
70 Years an Intensely Managed Golf Course

• Intensive Chemical Use
  • Fertilizers
  • Pesticides

• Irrigation

• Heavy Pedestrian Traffic
Still, There Are Relatively Healthy Areas

- Strong trees
- Deep-rooted grasses
- Healthy soil
SOIL PILOT, The Method

- 10 plots x 3
- Tillage to varying depths of 6 inches to 12 inches deep.
- Compost application amounts, including 6-inch and 3-inch deep compost applications to be tilled and incorporated into the soil.
- Two compost sources were used for the test, each coming from differing compost vendors in the Houston area.
- Four different cover crops, including sorghum Sudan grass (*Sorghum bicolor*, var. *Sudanese*), white clover (*Dalea candida*) and Sunn hemp (*Crotalaria juncea*), and tillage radish (*Raphanus sativus*, var. *niger*) were planted to see which plant combinations were most effective at aerating and adding nutrients to the soil.
- Plants were allowed to grow utilizing only natural rainfall until early March of 2019 when plants were harvested and the soil was examined by a soil scientist.
Tillage radish and White clover

March, 2018
Germination of winter cover crops

November, 2018

December, 2018
April, 2019-Preparation of plots

Top growth was cut, removed; compost and root growth tilled in

Tilled plot showing remaining root structure of tillage radish
Growth, week 9, sorghum sudan grass
What Does This Mean for Horticulture and the Healthy Gardens?

Using biology as a performance indicator
Preliminary Outcomes

• Compost opens soil pores that allows water infiltration, oxygen exchange, and root growth

• Further decomposition of compost releases nutrients for plants to grow.

• Plants in turn release sugars produced through photosynthesis that feeds beneficial bacteria and fungi.

• Fungi grow in search of nutrients and water to bring back to plant, bacteria foster nutrient transitions for plant uptake.

• Fungi release carbonaceous compounds that build stable and active organic matter and build soil structure.
Expectations

• New plant growth (and different plant types) will continue root development and microbial population expansion

• Root growth combined with fungi will keep soil broken into ped or aggregates

• Fungal and bacterial biomass will go through life cycles and organic matter content will increase

• Nutrients will recycle

• Soil will be enriched
LOGISTICS OF SOIL MAKING

Cut 1 - For wetland/stormwater detention (1ft depth): 85,839.96 ft³

Cut 2 - For Coastal Prairie/floodplain mitigation (1ft depth): 162,318.44 ft³

Cut Total: 188,158.319 ft³

- Tree Protection Zone
- Limit of Work
EXISTING IN SITU SOIL

'A' HORIZON (5-6")
'B' HORIZON (7-10")

RECLAIMED SOIL PROFILE

'B' HORIZON (7-10")
'A' HORIZON (5-6")

+ COMPOST
HBG Soils Project - Layer Cake
How Can Soil Planning/Design Be Integrated to Any Site/Garden System

• Summary
  • Planning Process
    • Goals
    • Economics
    • Logistics
The many simple ways

Daniel Millikin
Memorial Park Conservancy
Composting program turning tree trimmings, clippings, and logs into rich, compost and mulch for use throughout the Park, improving soil biology.
Balancing the Carbon:Nitrogen ratio:
• all MPC Green waste
• elephant and horse waste
• wood chips from area arborists
• innoculates and amendments
Native grasslands threatened by aggressive, invasive, exotic species Kleberg bluestem (*Dichanthium annulatum*), King Ranch bluestem (*Bothriochloa ischaemum*), and Macartney rose (*Rosa bracteata*).
Upland Forest and Savannah

- Clear invasive understory
- Soil preparation
- Planting
  - Seedlings and Plugs
  - Seed
- Management
Partnership with local government and non-profit organizations to supply member organizations with a consistent and cost effective source of native plants for revegetation and restoration projects.
Thank you