Public lands and climate change: Carbon sequestration for soil health and land reclamation

Robert Fuerstenberg
Sr. Ecologist
And Members of the Carbon Project
The Carbon Project

- Peggy Leonard, Wastewater Division
- Lisa Vogel, Wastewater Division
- Roberta King, Wastewater Division
- Josh Marx, Solid Waste Division
- Laura Belt, Solid Waste Division
- David Kimmett, Parks Division
- Scott Snyder, Parks Division
- Kristi McClelland, Water and Land Division
- Robert Fuerstenberg, Water and Land Division
- Jason Finlinson, Roads Maintenance Division
- Sally Brown, University of Washington
- Kate Kurtz, University of Washington
Main Components of the King County Climate Plan

- Emission reductions from transportation, agricultural, and forestry operations;
  - Maintain/increase carbon stored in forestland biomass
  - Reduce losses from agricultural soils
- Adaptation to climate changes
- Response to disruptions
  - Health
  - Water supply
  - Hazards
What’s missing?

Active management of carbon stores by direct ecological manipulation of landscapes
Active carbon sequestration in the soil affords an immediate and effective mechanism to offset and even reduce CO$_2$ concentrations in the atmosphere until emission reductions are sufficient to meet global targets.
The Carbon Cycle

- **Land Plants**: 600 GtC
- **Atmosphere**: 700 GtC
- **Soil**: 1,500 gigatons of carbon (GtC)

1 gigaton of carbon = one billion metric tons of carbon
Sequestration across ecosystem types

Carbon Sequestered in the Landscape

(after Andrus et al. 1998)
Benefits of soil carbon sequestration

- Sink for CO$_2$: 35 to 65 year storage life
- Increased soil quality and fertility:
  - Higher yields
  - Higher food quality?
- Increased soil moisture capacity
  - Decreased runoff
  - Reduced soil erosion
  - Ecosystem support (including agroecosystems)
    - Resilience
    - Biodiversity
    - Sustainability
An opportunity for King County

- Over 30,000 acres of public land
- 20,000 acres of farm and forest resource lands;
- 5,000 acres of ecological lands;
- 7500+ acres of derelict lands—pits, storage sites;
- Variety of restoration projects;
- Virtually all of the lands have depleted soils and degraded vegetation:
  - Soil carbon declines of 60 to 70%;
  - Soil structure lost;
- Significant resource in organic residuals:
  - Bio-solids, food waste, yard waste, woody debris
Suitable public lands in King County should be used to actively sequester carbon as a method to reduce rising CO$_2$ concentrations, to initiate soil recovery, ecosystem recovery, and improve resilience to climate change.

Use organic residuals as the main component to initiate soil recovery and carbon storage.

Four elements:
- Identify County lands suitable for sequestration
- Establish test plots at the Vashon Island landfill borrow pit
  - Recover the borrow pit site
  - Initiate broad-scale carbon sequestration
Borrowpit Project objectives

Using KC organic residuals to create fine to coarse grained compost mixes:

- Compare effectiveness of mixes to capture and store carbon;
- Evaluate N$_2$O emissions associated with organic amendments;
- Compare plant growth on the test plots;
Sampling and evaluation

- 16 - 75’ X 75’ plots
- 2 replicates of each compost mix;
- ½ plot layered, ½ plot ripped
- Sterile grass mix planted 1st year
- Various tree seedlings after 1st year

- Soil texture, bulk density;
- Carbon content, nitrogen, N₂O emissions
- Water infiltration rate;
- Plant density, growth rate, total biomass
Each color square = 1 treatment measures 75' x 75'
<table>
<thead>
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<th>Treatments</th>
<th>Compost</th>
<th>Wood</th>
<th>Fill</th>
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<tr>
<td>Restoration mix</td>
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<td>Cedar Grove compost + fill</td>
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Amendment Composition

- Groco- Class A biosolids compost made with sawdust. Screened fully cured
- Restoration mix- Class A biosolids compost made with storm clearing debris
- Cedar Grove- Class A compost made with yard waste and food scraps
- Clean fill – inorganic soil material, meets all testing requirements
- Woody debris- chipped storm clearing woody debris
Island Center Forest
Broadscale-application
Other Cooperators

- Natural Resources Conservation Service
- US Geologic Survey
- Washington Dept. of Ecology
- KC DDES
- Friends of Island Center Forest
- Vashon Forest Stewards