Atmospheric Elemental Carbon (EC): Deposition to Oak Trees and Litterfall Flux to Soil in an Urban Area

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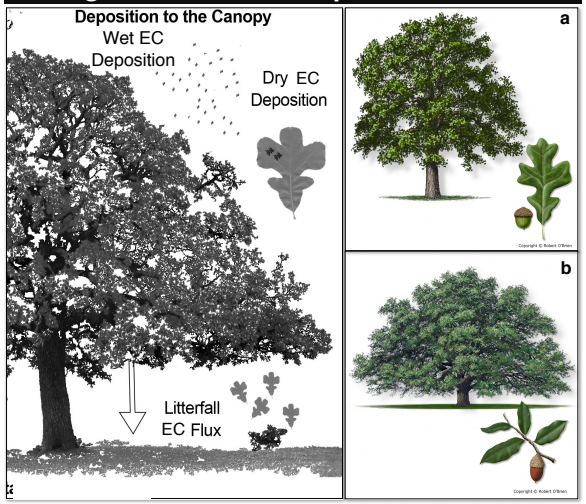
Introduction

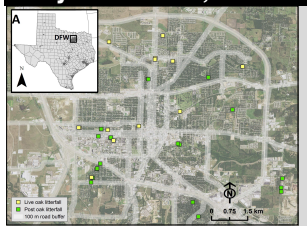
- Elemental carbon (EC) is a component of fine particulate matter ($PM_{2.5}$) that contributes to climate warming and poor air quality[1].
- In urban areas, diesel engines are a major source of EC to the atmosphere[1].
- At the surface, urban tree canopies have been found to be an important sink for $PM_{2.5}$ [2][3][4], but the role of urban trees in removing EC remains unexplored.
- Here, we build on this work by quantifying 1) the magnitude of EC retention in leaf waxes (in-wax EC) and 2) EC fluxes to soil via leaf litterfall under two oak species in a rapidly growing urban area in the Dallas-Fort Worth (DFW) Metroplex.

Background and Focal Species



Left: EC deposition to leaf surfaces occurs via wet and dry deposition. Some fraction of this EC can become embedded in leaf waxes and fall directly to the ground via leaf litterfall.
Right: a) *Quercus stellata* (post oak) is a deciduous tree native to North Texas. **b)** *Quercus virginiana* (live oak) is a non-native evergreen tree that is widely planted in residential yards and urban greenspaces.

City of Denton, Dallas-Fort Worth Metroplex



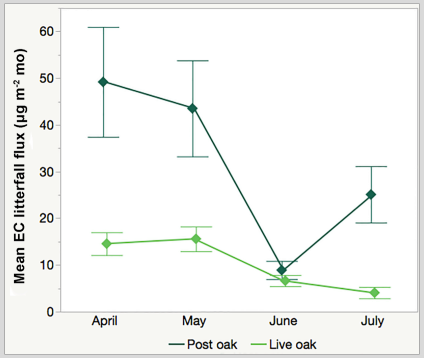
Left: Litterfall samplers in Denton, Texas. Litterfall was collected under 20 post and 15 live oak trees every other week (Apr-Jul). Litterfall was sorted, dried and weighed.

Foliar Sampling and EC Extraction

Left: Foliar samples were collected monthly (Apr-Jul) from 10 pairs of co-located post oak and live oak trees.

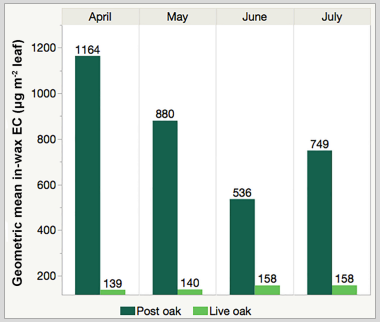
Right: Leaves were extracted with chloroform to remove EC from leaf waxes. Extracts were filtered onto quartz-fiber filters and analyzed on a Sunset OC/EC Analyzer.

Litterfall EC Flux



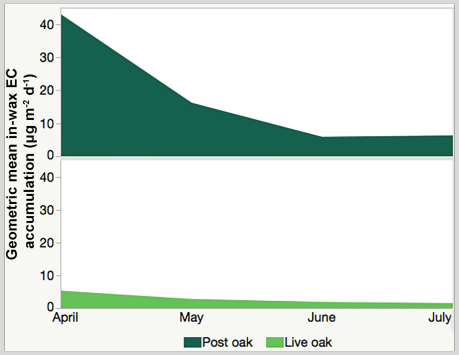
- Post oaks delivered 1.5-3.5 times more EC to the ground via leaf litterfall than live oaks.

EC Retention in Leaf Waxes



- Post oak leaves retained 3-8 times more EC in their waxes than live oaks.
- Post oaks had slightly lower LAI (2.4 ± 0.20) than live oaks (3.4 ± 0.24). Thus, at the canopy scale, post oak trees retained more EC than live oak trees.

Net EC Accumulation



- Net EC accumulation decreased over time in the leaves of both species.

Acknowledgments & References

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