The Vertical Structure of Urban Soils

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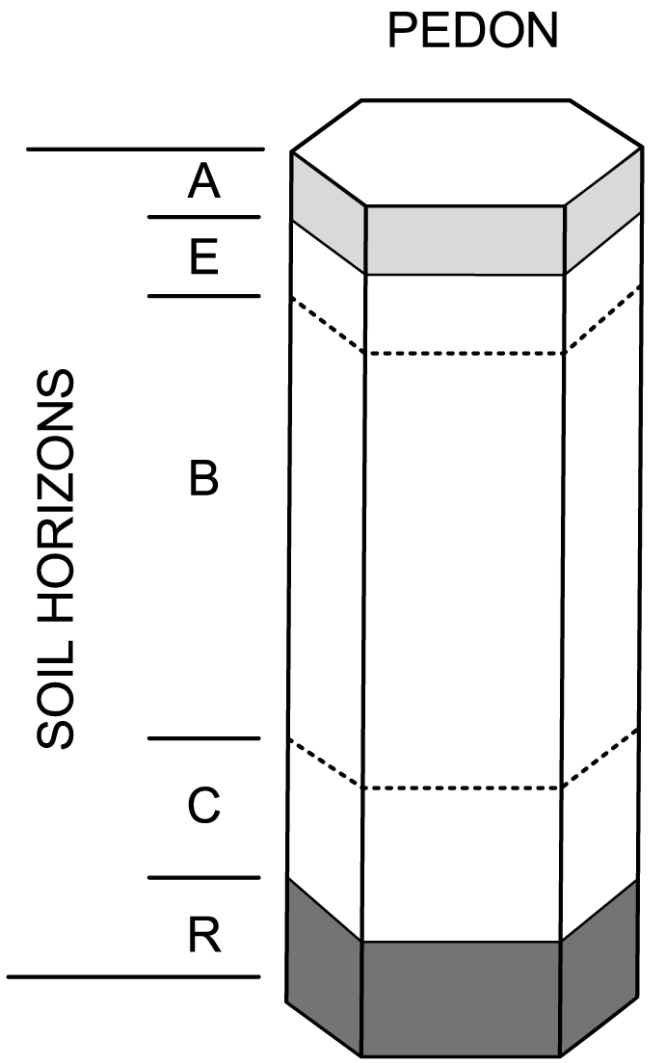


Soils [are] arranged in a relatively predictable vertical structure

Chapin et al. 2002. Principles of Terrestrial Ecosystem Ecology

Most urban soils have been transported or displaced…at least partially destroying their…horizon arrangement

Craul 1999. Urban Soils in Landscape Design

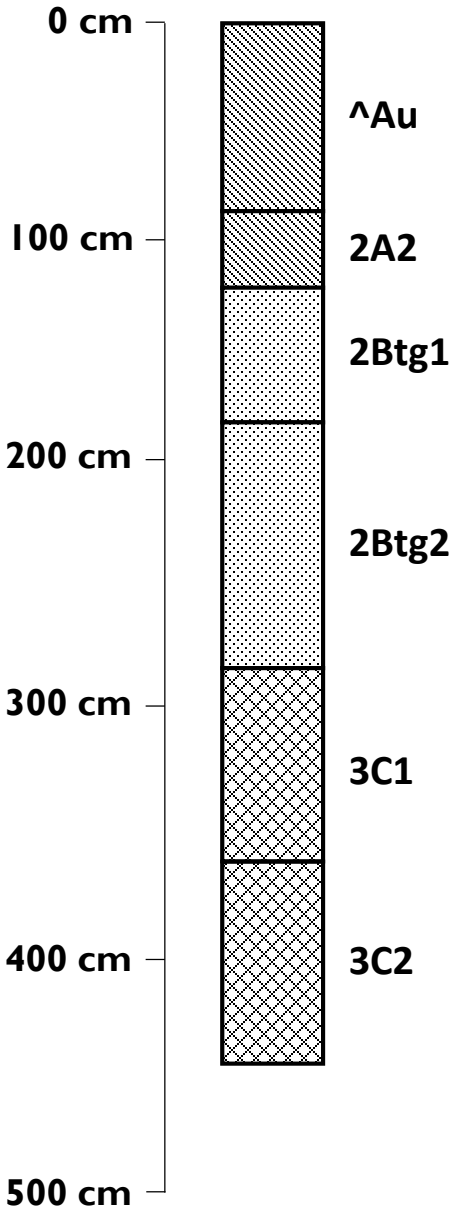
Do urban soils have a relatively predictable vertical structure?

Arrangement of horizons

Degree of horizonation

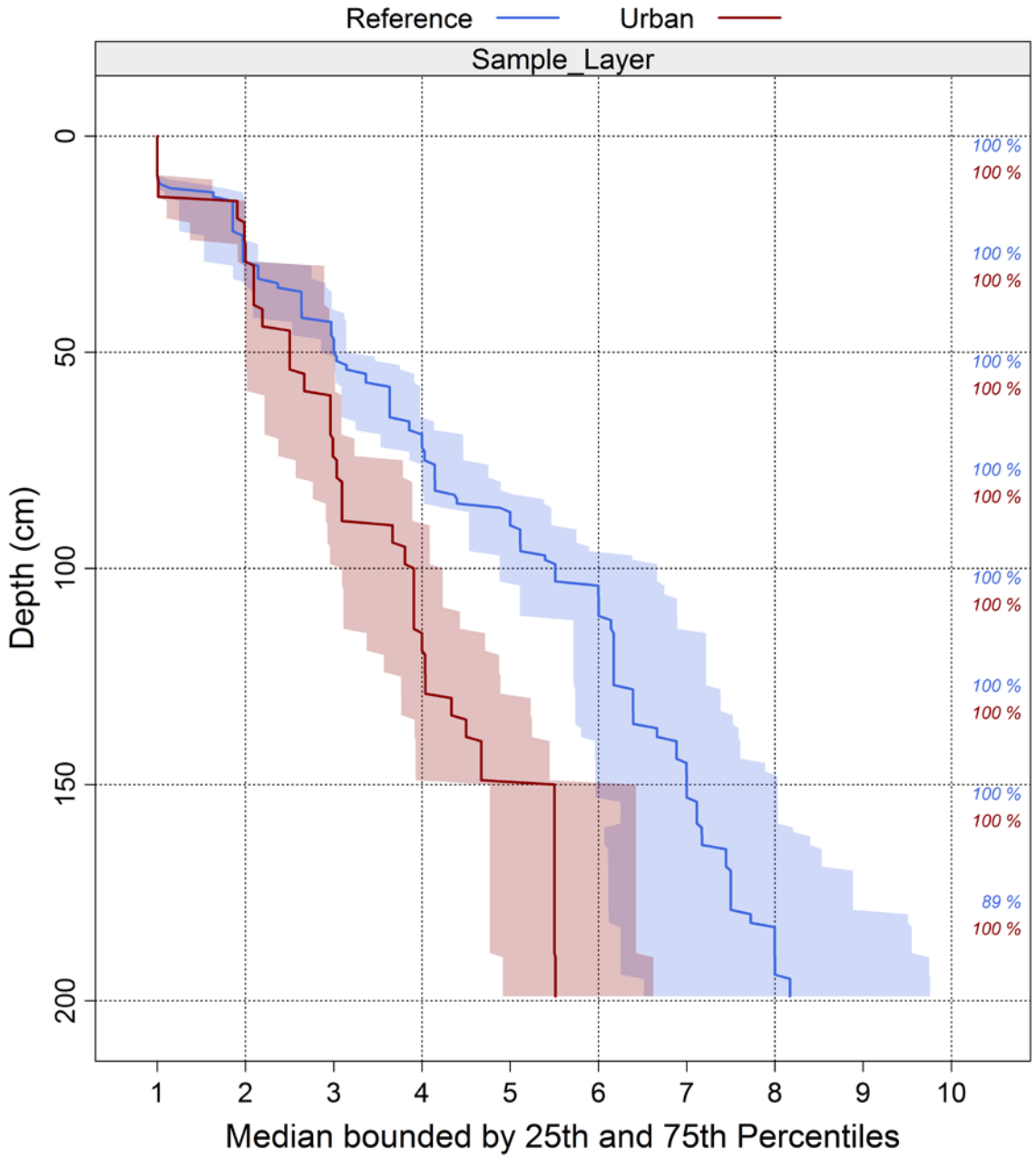
Presence/absence of horizons

Atlanta
Camden
Cleveland
Cincinnati
Detroit
New Orleans
Omaha
Phoenix
Portland
San Juan
Tacoma

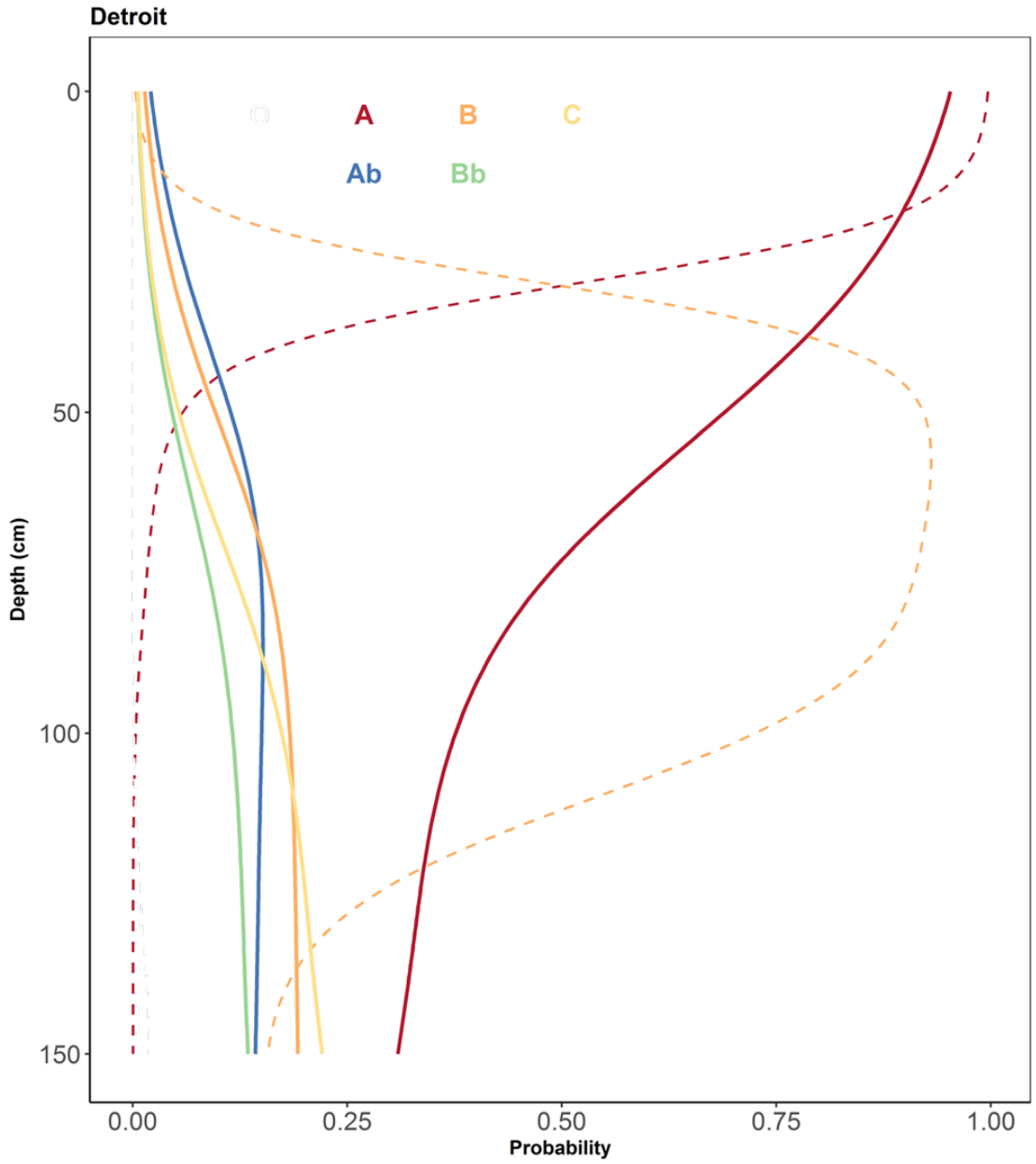


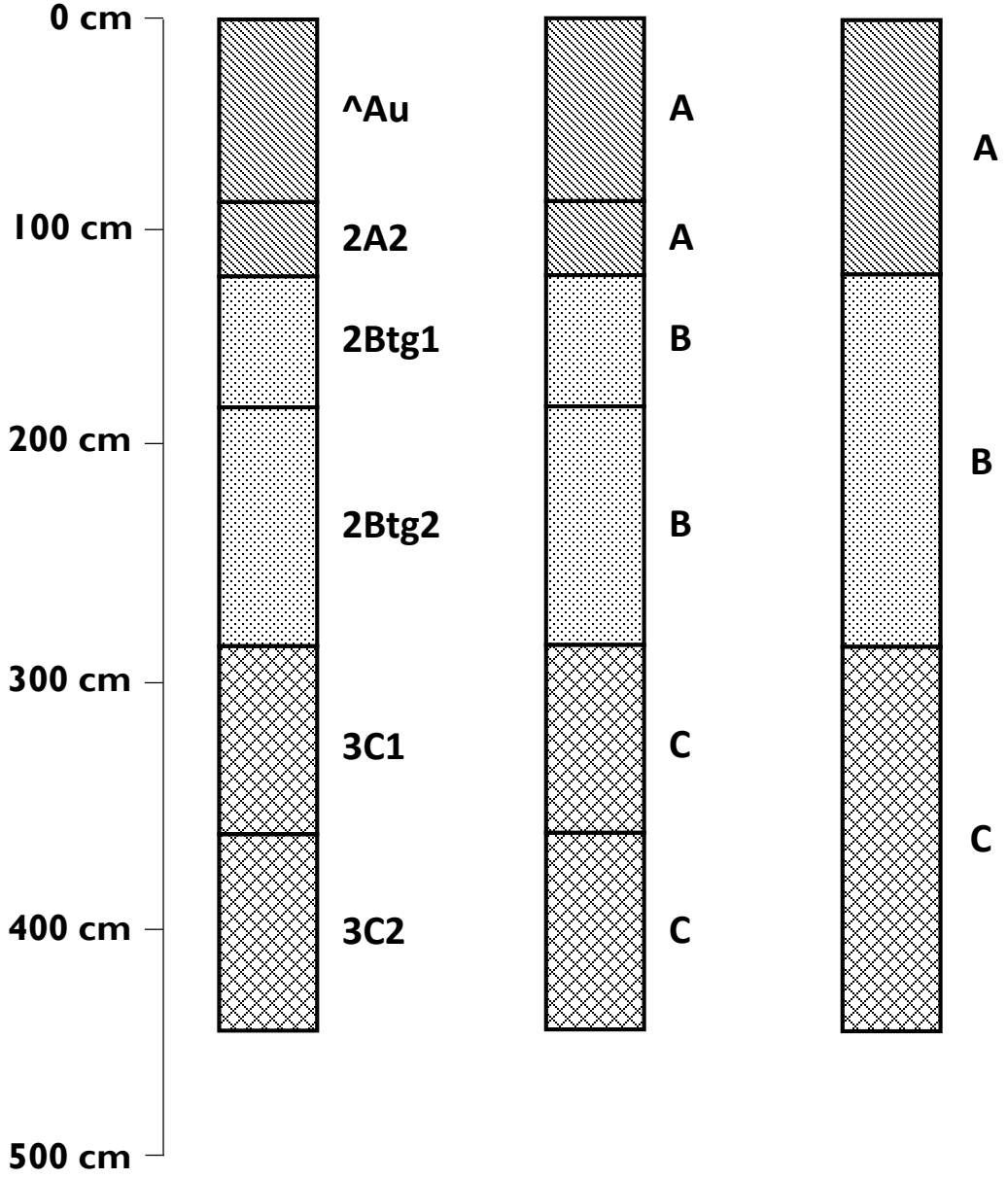
	Urban Soil	Reference Soil
Pedons	we characterized in the urban landscape	Non-urban pedons from the NASIS database
	Identified likely pre-urban soil series	From same soil series as the urban soil

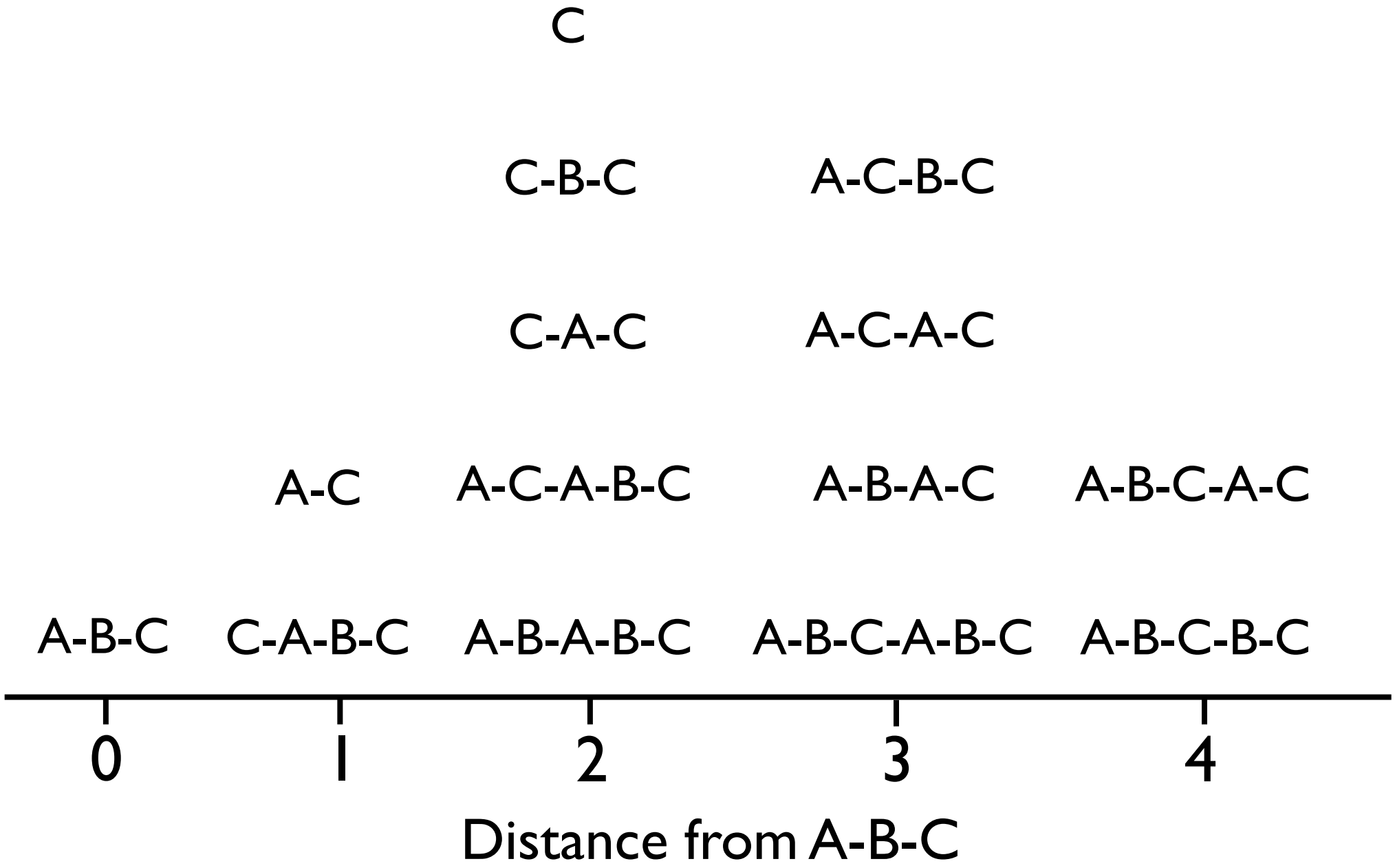
Horizonation



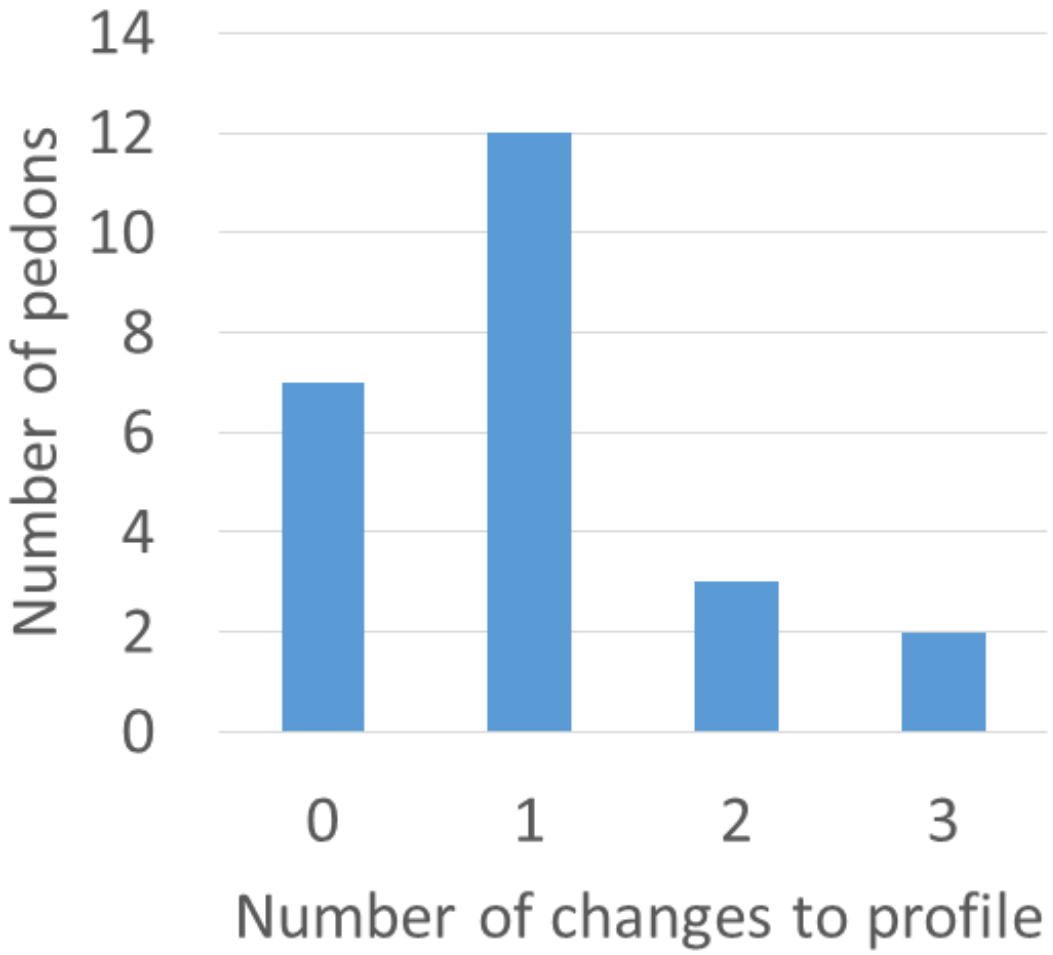
Presence/ absence of horizon




0 cm
100 cm
200 cm
300 cm
400 cm
500 cm
^Au
2A2
2Btg1
2Btg2
3C1
3C2
A
A
B
B
C
C
A
B
C


C
C-B-C
A-C-B-C
C-A-C
A-C-A-C
A-C
A-C-A-B-C
A-B-A-C
A-B-C-A-C
A-B-C
C-A-B-C
A-B-A-B-C
A-B-C-A-B-C
A-B-C-B-C
0
1
2
3
4
Distance from A-B-C

Distance from A-B-C ordering



Finding 1: Simplification

Urban soils have fewer horizons than reference soils

These is a homogenization aspect: simplification of horizonation is due primarily to loss of B and E horizons

It is in these horizons where a lot of ecosystem services are supported (B), or developed (as a result of E-type activity)

Finding 2: Loss of B (and E) horizon

Urban soils have fewer B horizons than their respective reference soils

Timeline for re-horizonation after losses from urbanization processes longer than estimated time potentially available for soil development in urban core areas

Finding 3: Most likely horizon arrangements are those with the least distance from A-B-C

Most common horizon arrangements, other than A-B-C, were 1 or 2 modifications displaced from A-B-C

Finding suggests physical constraint on which of these arrangements are common

Caveat: Our model constrains the calculation of distance to the shortest path from A-B-C to observed; distance measures are thus conservative

Synthesis

Urban soils have a greater diversity of and different arrangements than wildland or agricultural land soils, but

We found evidence for urban soils having a relatively predictable vertical structure

Experimental designs and hypotheses for studies on urban soil ecosystem services and functions should consider the unique vertical structures of urban soils

Questions?

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