The Other Part of Flow Regime: How Sediment Distribution Shapes Riparian Environments

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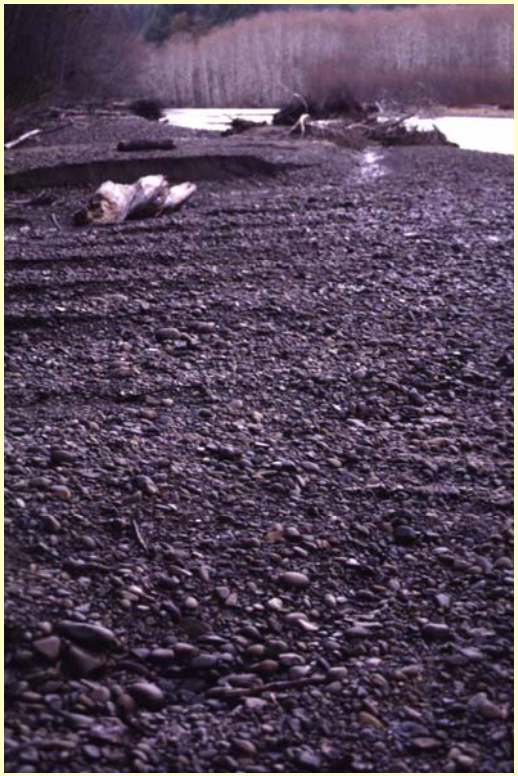
Floodplains soils:

growing medium for plants

reservoir for nutrients and carbon

Floodplains soils:

develop rapidly, highly productive, short-lived



OM and organic acids

Nutrients and water

Soil

- moisture
- temperature
- physical template

Particle size is a master soil variable

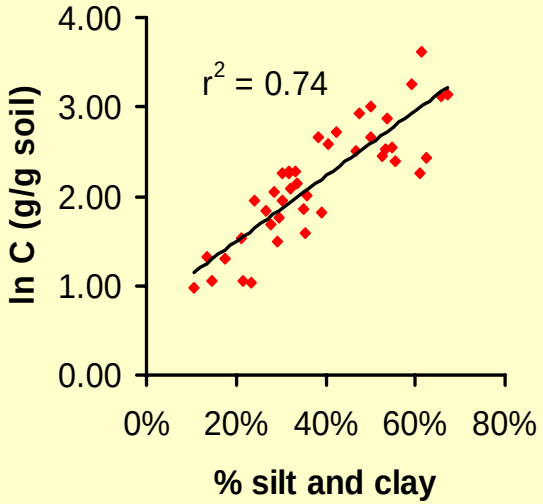
Fine sediments (silt and clay)

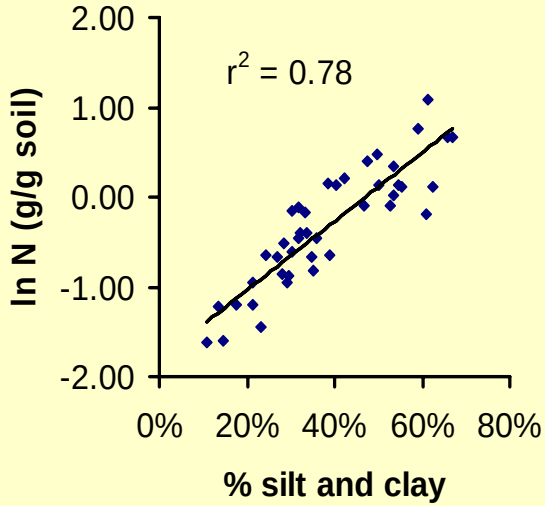
- inhibit decomposition

- reduce leaching losses

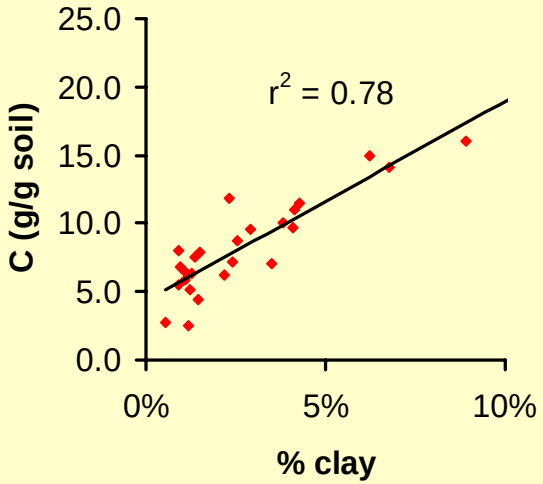
Fluvial sediment redistribution is the defining characteristic of floodplains

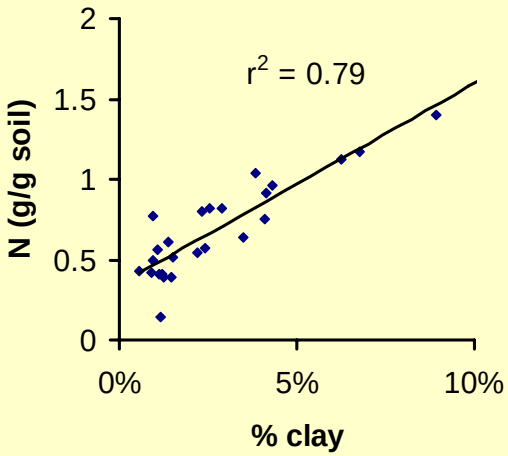
South Africa





Queets River





Objective: Quantify the fluvial influence on floodplain development

-soil C and N accumulation

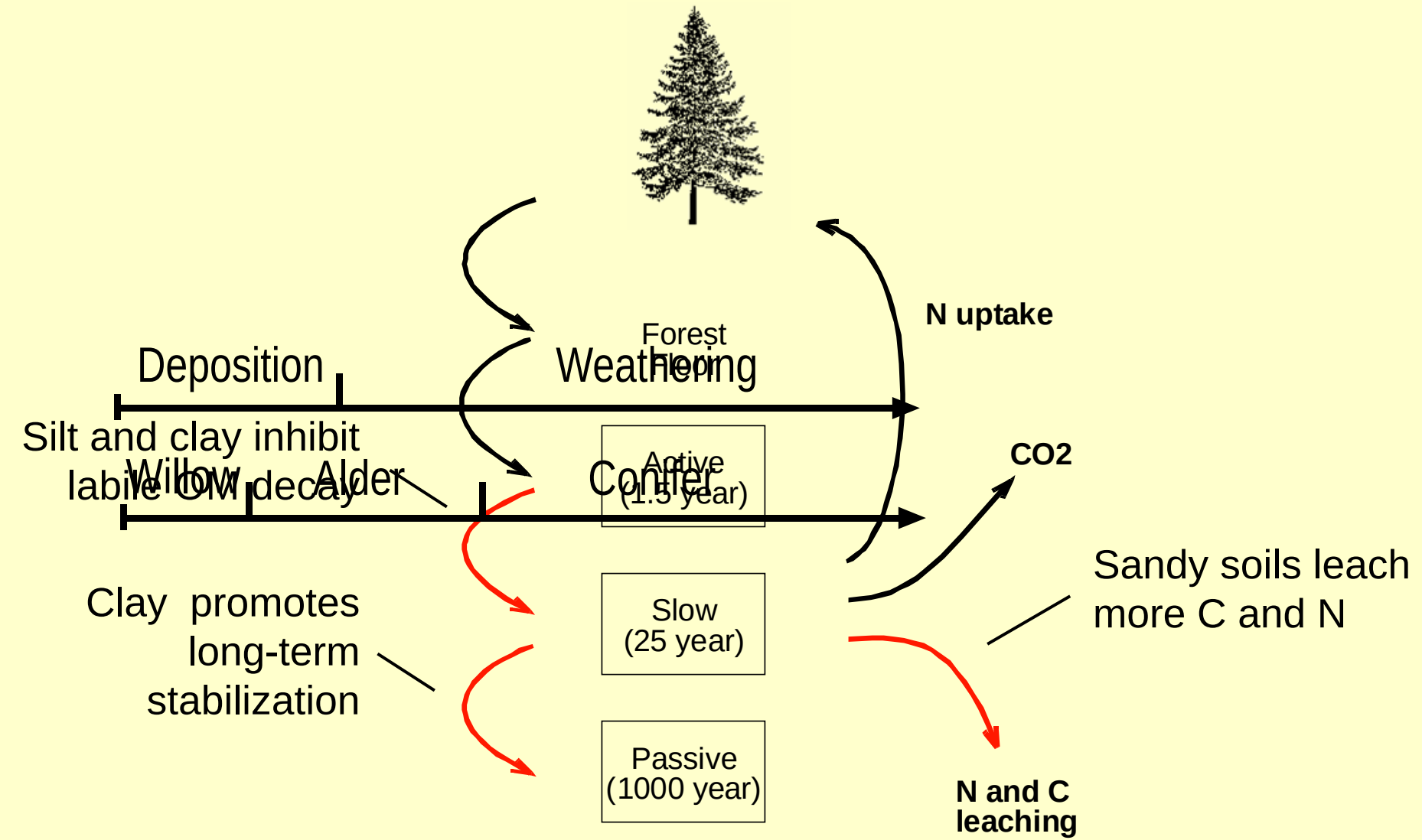
-aquatic C and N through leaching and erosion

Method: CENTURY soil organic matter model

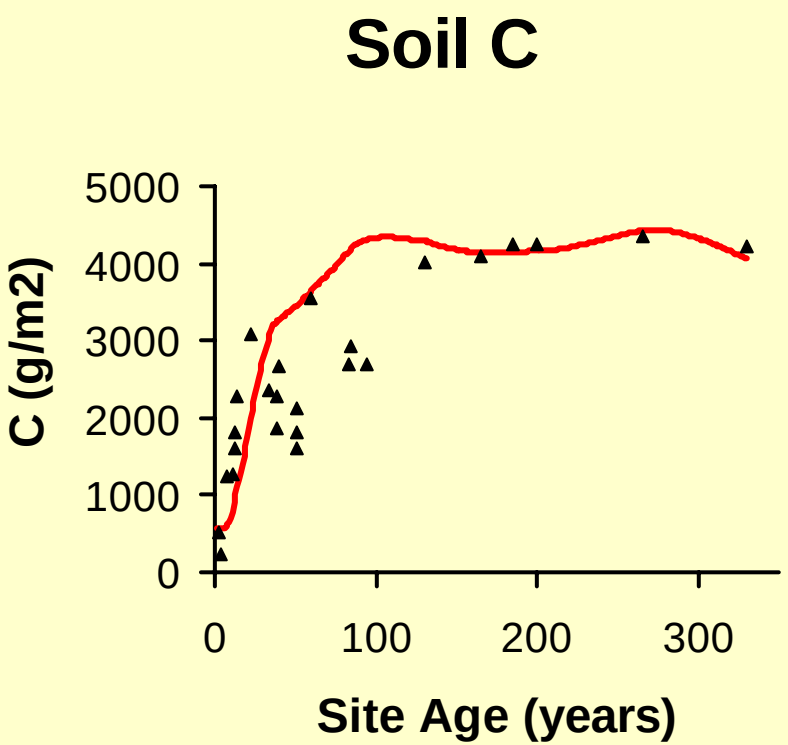
-Added simulation of sediment and OM deposition

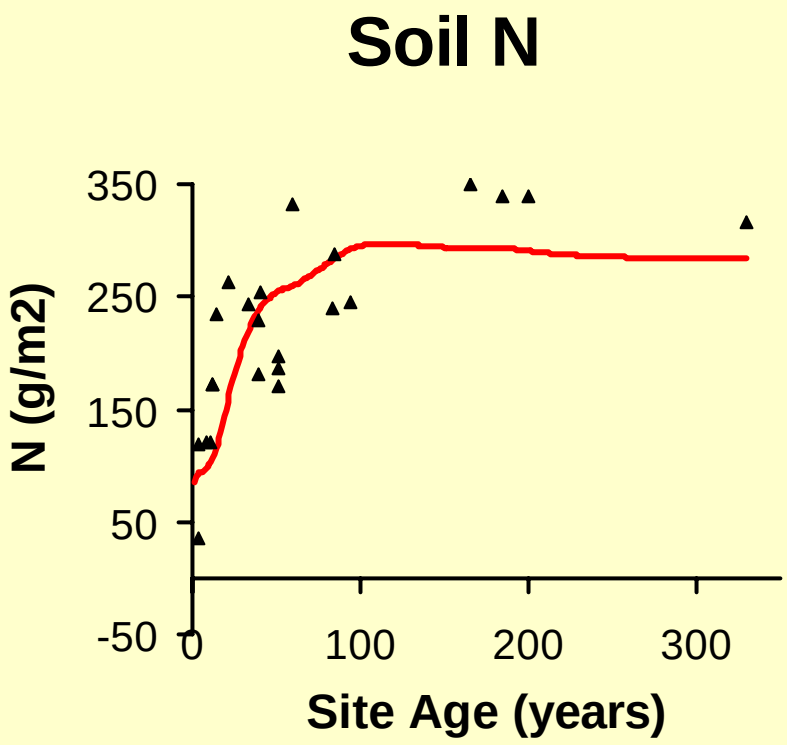
-Vegetation and litterfall data collected from Queets River

-Compared with measured Queets soil C and N.

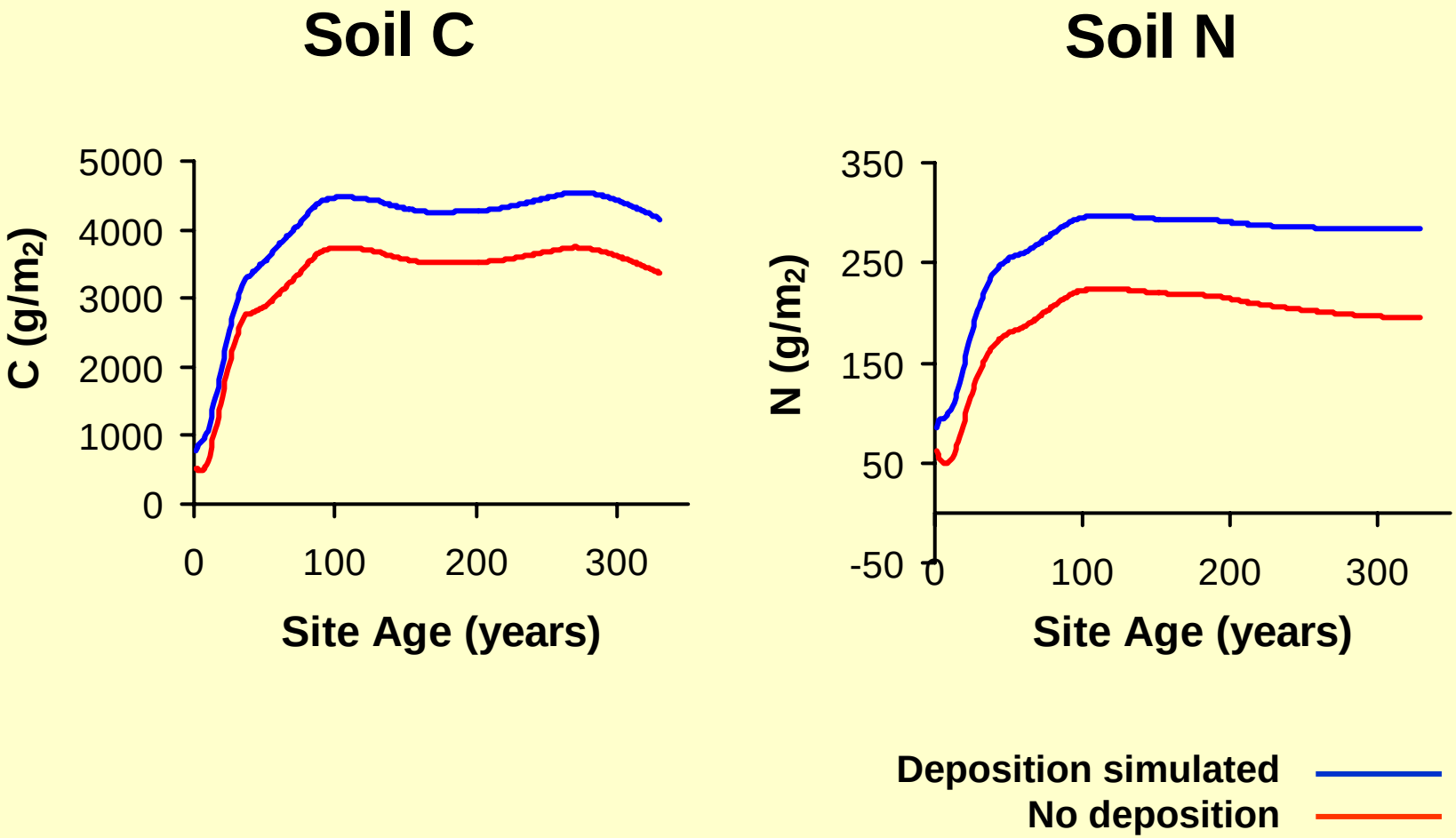

Deposition
Weathering
Forest Floor
N uptake
Silt and clay inhibit labile OM decay
Willow
Alder
Conifer
Active (1.5 year)
CO2
Clay promotes long-term stabilization
Slow (25 year)
Sandy soils leach more C and N
Passive (1000 year)
N and C leaching

CENTURY predicted soil C and N well

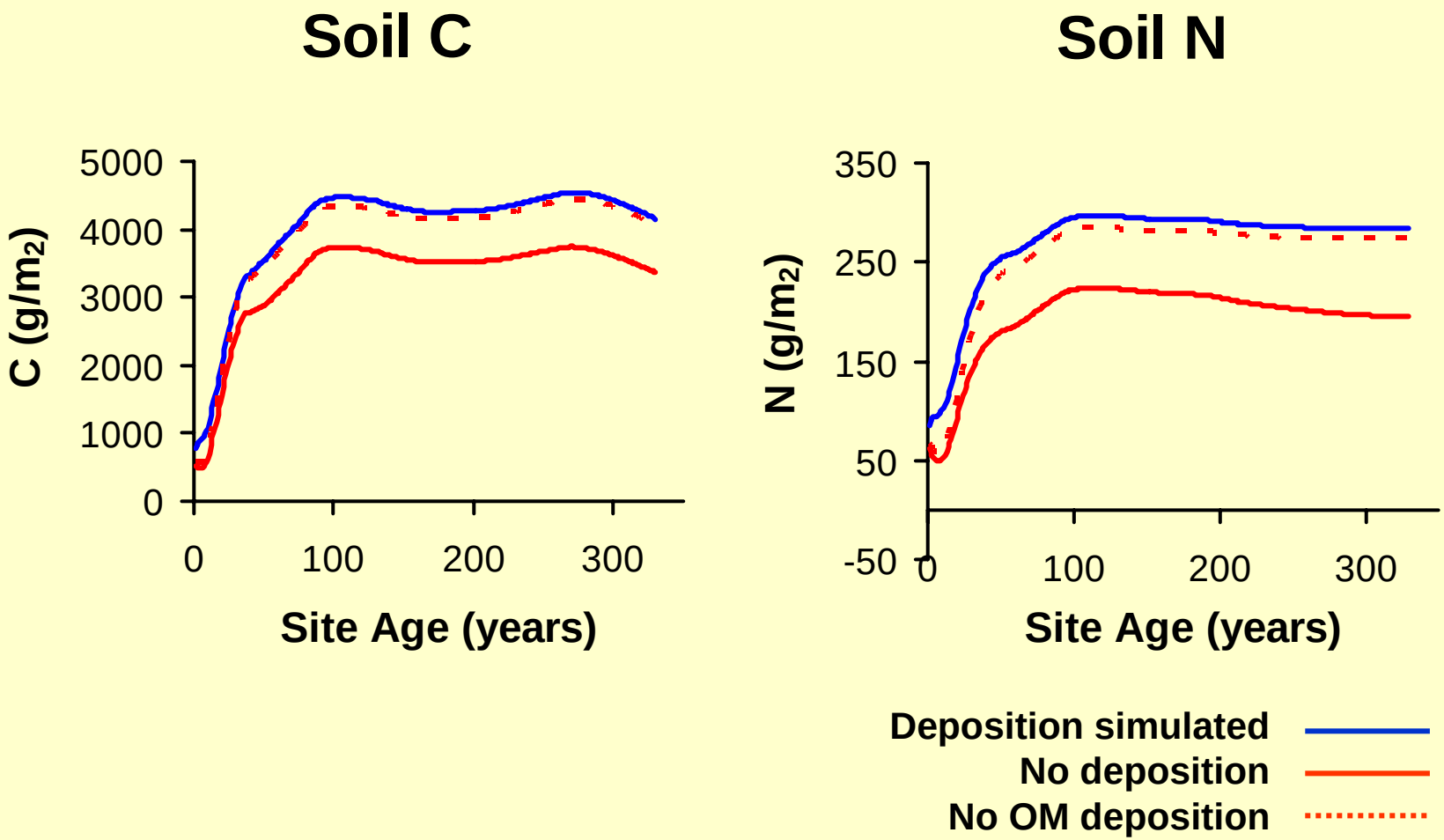




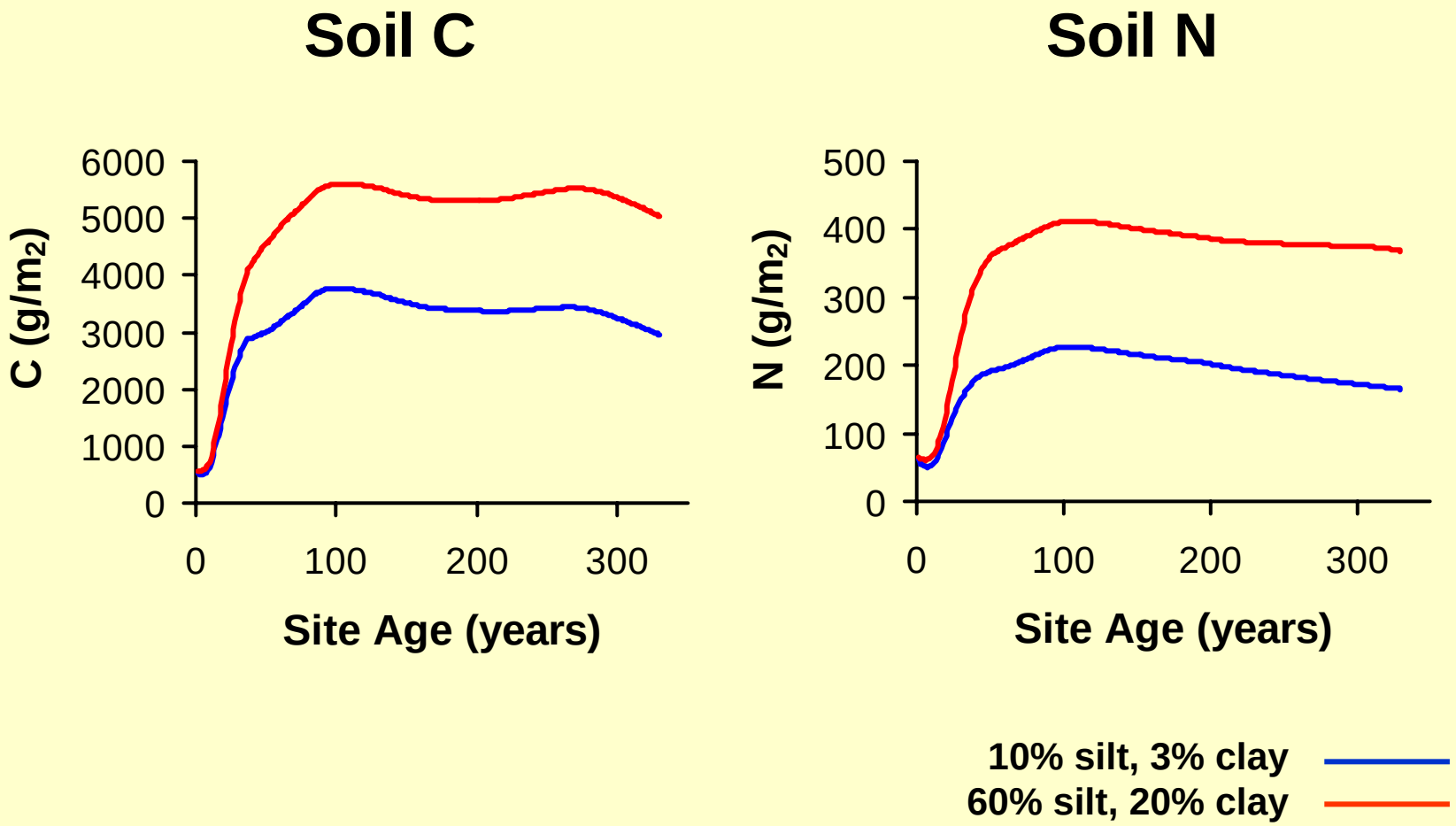
Fluvial deposition resulted in 20% more C and 35% more N



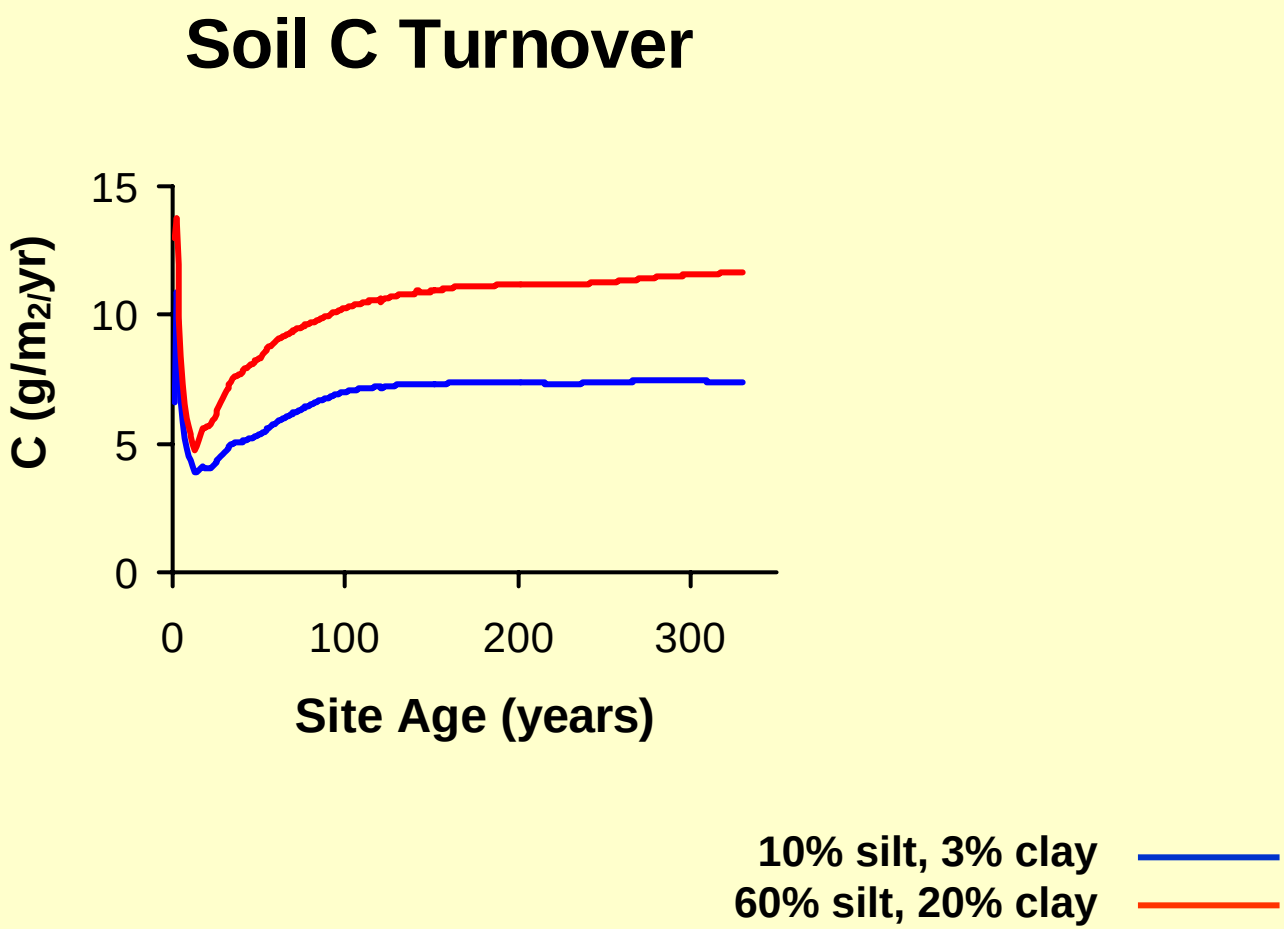
... which resulted from changes in retention capacity, not OM deposition



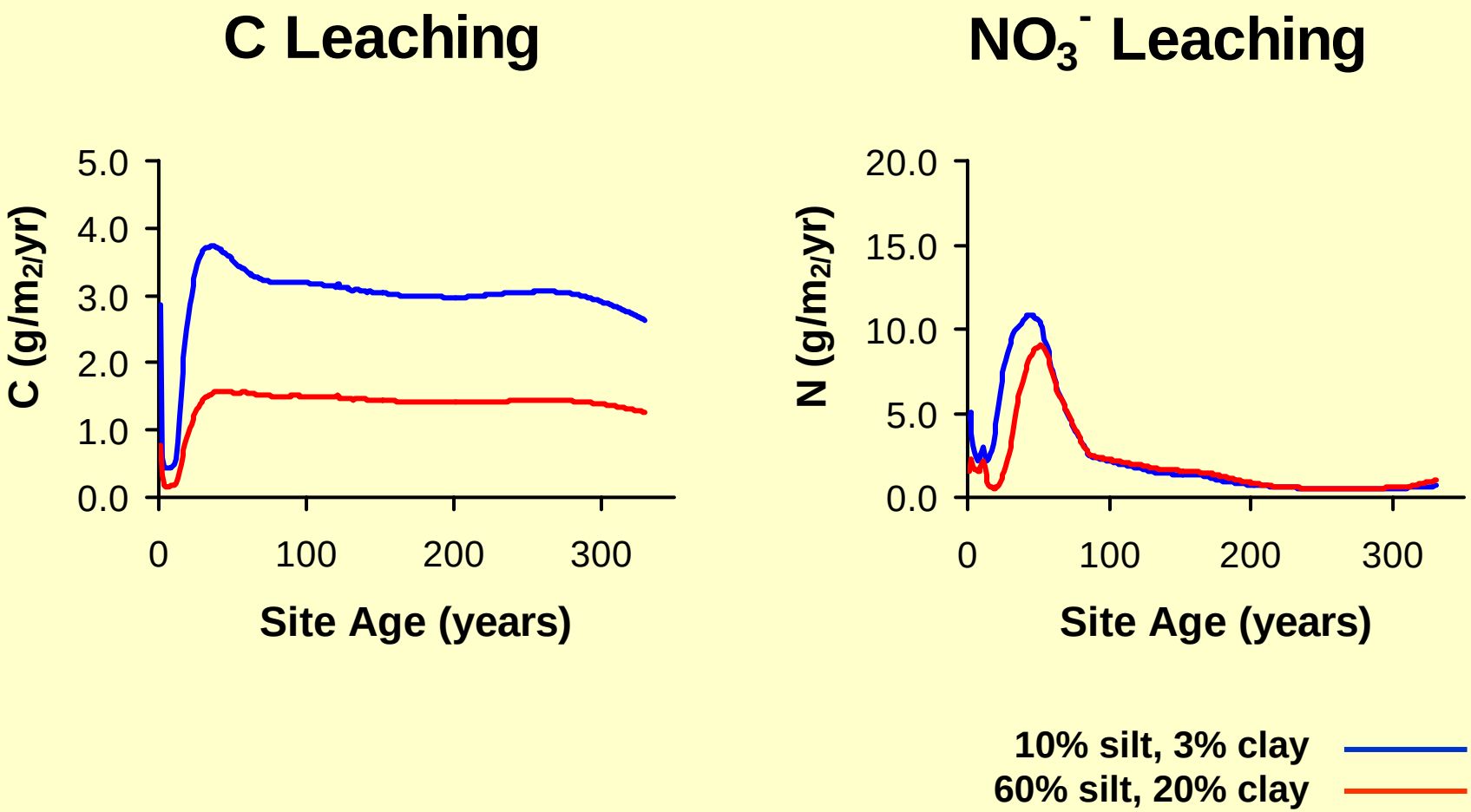
Fine-textured soils had twice the C and N as coarse soils



Decomposition was slower in fine soils



Coarse soils leached much more C and N



Sediment distribution influences:

- soil OM retention and turnover
- material exchanges with rivers
- ecological heterogeneity

Human activity:

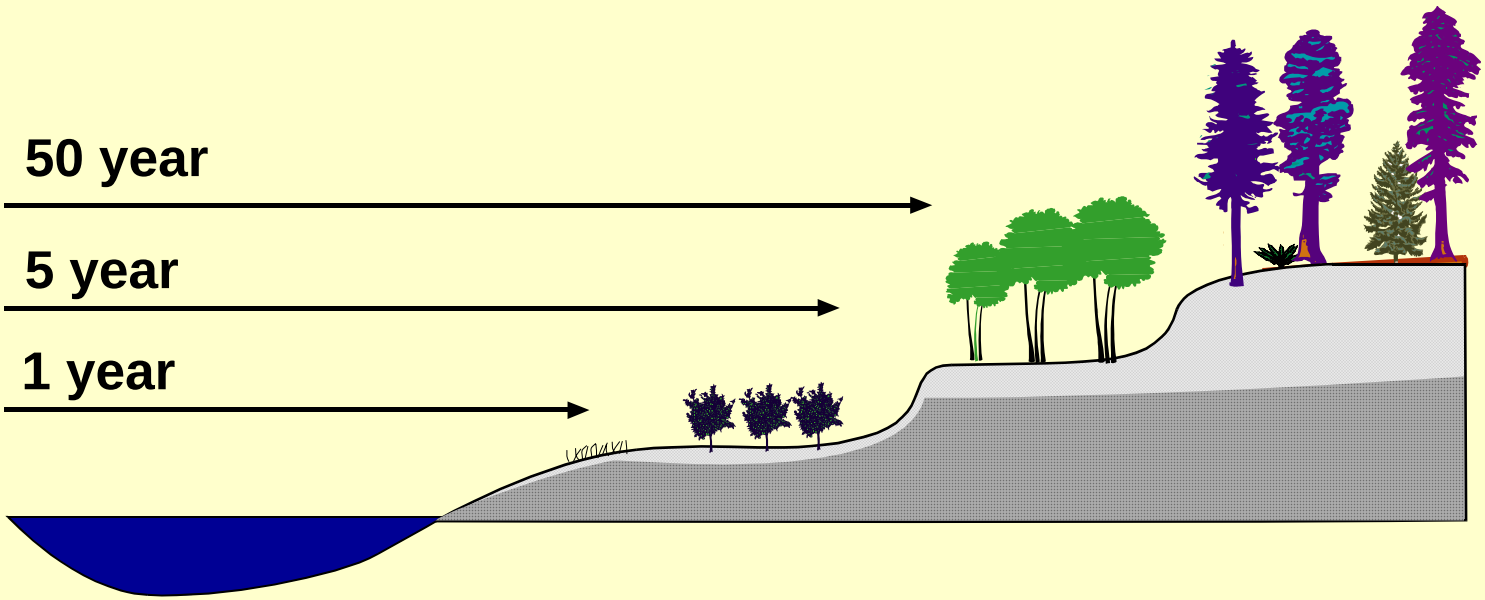
changes in sediment supply

-road construction, dams

changes in sediment routing

-channelization, flow abstraction

Natural floodplains interact with rivers across a range of flows



Natural flow regimes, *including both sediments and water*, **are necessary to the ecological health of rivers.**

Acknowledgments

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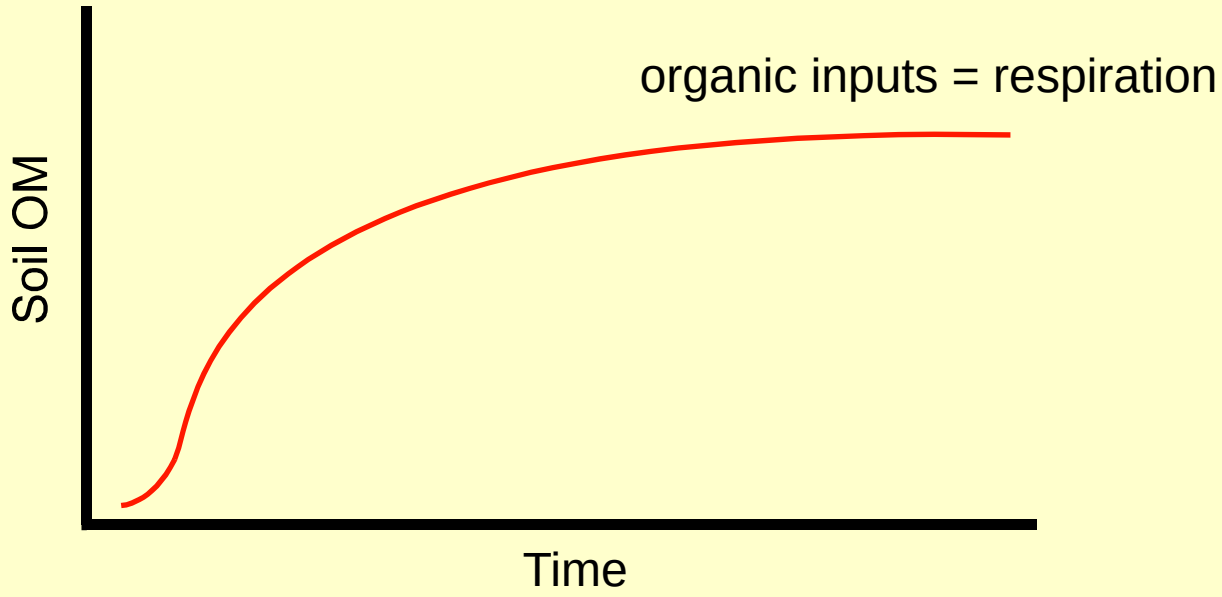
organic inputs = respiration
Soil OM
Time