Shrub encroachment, land management, and litter decomposition

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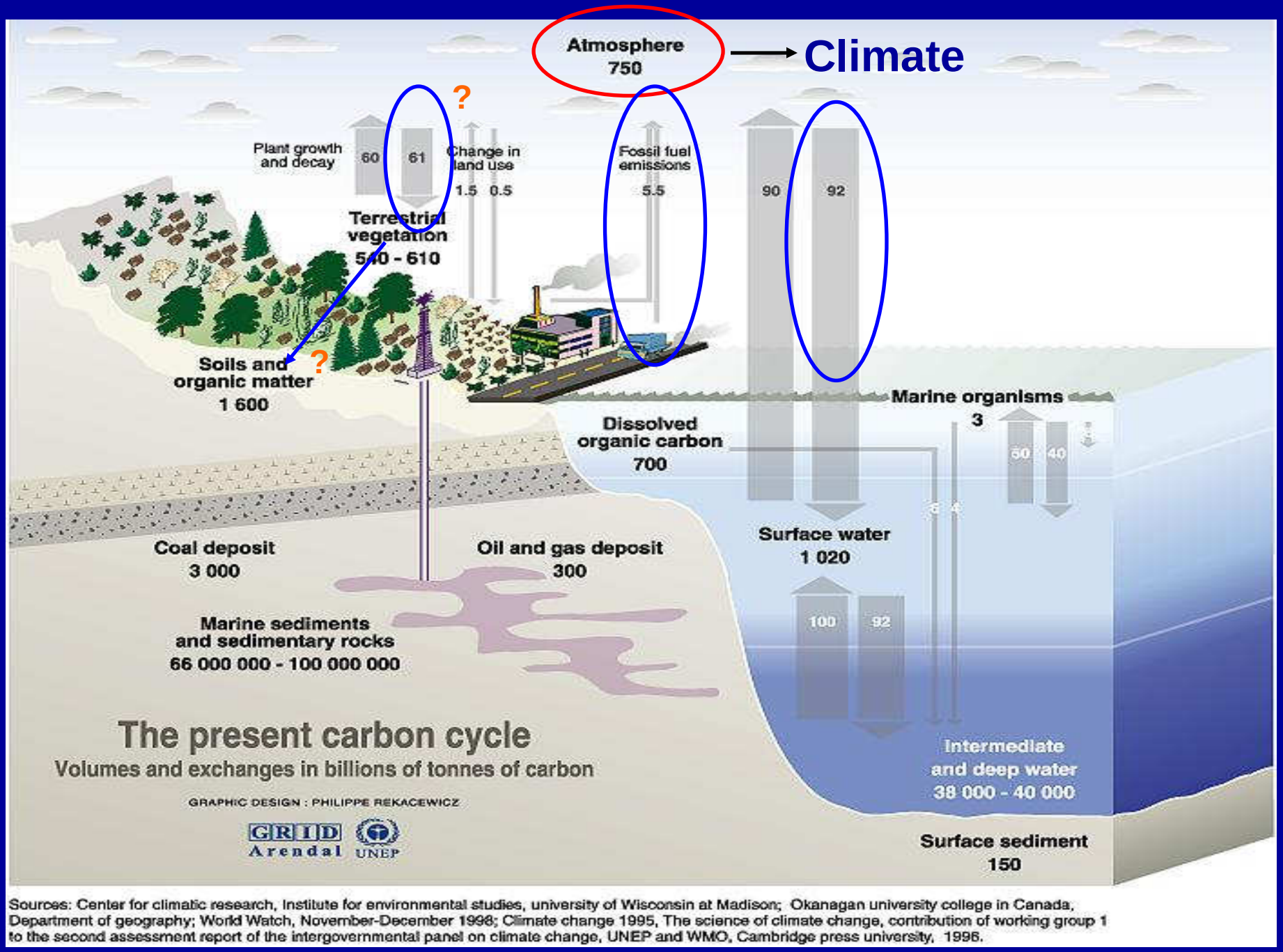


Sources: Center for climatic research, Institute for environmental studies, university of Wisconsin at Madison; Okanagan university college in Canada, Department of geography; World Watch, November-December 1998; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996.

Intergovernmental Panel on Climate Change, 2001

US Carbon Sink

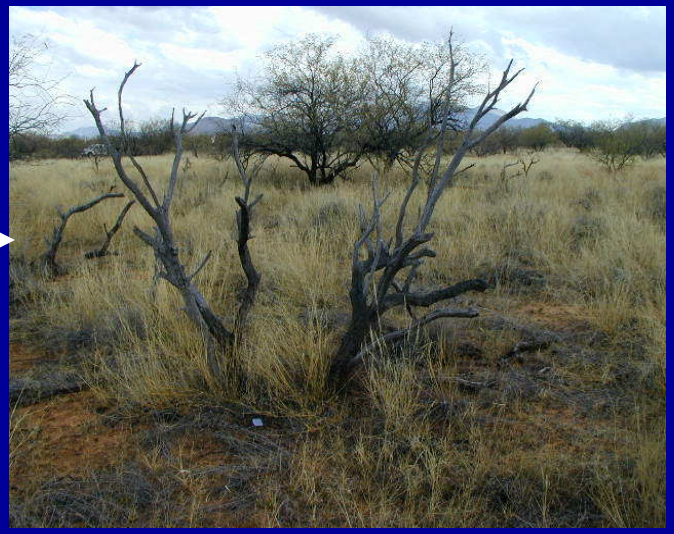
Pacala *et al*. 2001, Science

- US C sink ~0.30-0.58 Pg C yr^{-1}
  - Forest trees -- 0.11 - 0.15
  - Woody encroachment -- 0.12 - 0.13
  - Other forest organic matter -- 0.03 - 0.15
  - Exports (rivers + trade) -- 0.07 - 0.13
  - Wood products -- 0.03 - 0.07
  - Sedimentation -- 0.01 - 0.04
  - Cropland soils -- 0.00 - 0.04

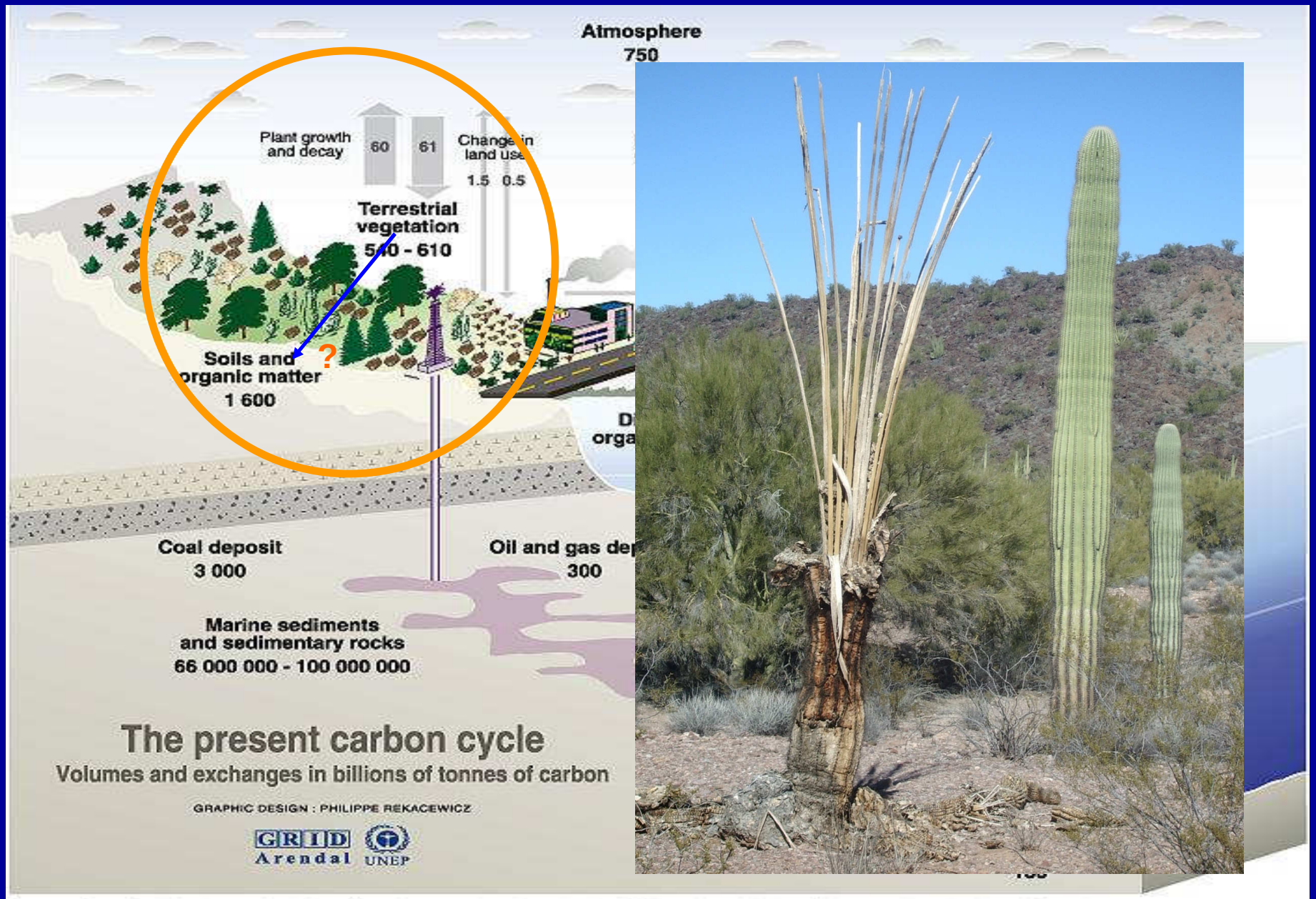
Woody encroachment at the SRER

Rob Wu, Santa Rita Experimental Range

Land Management at SRER



SRER photo archives



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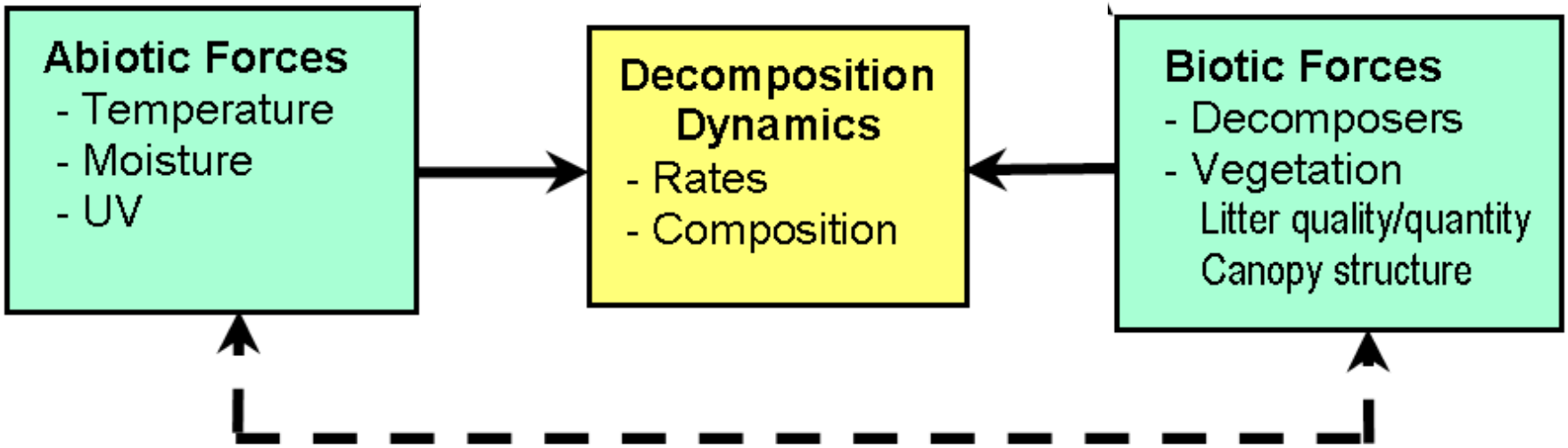


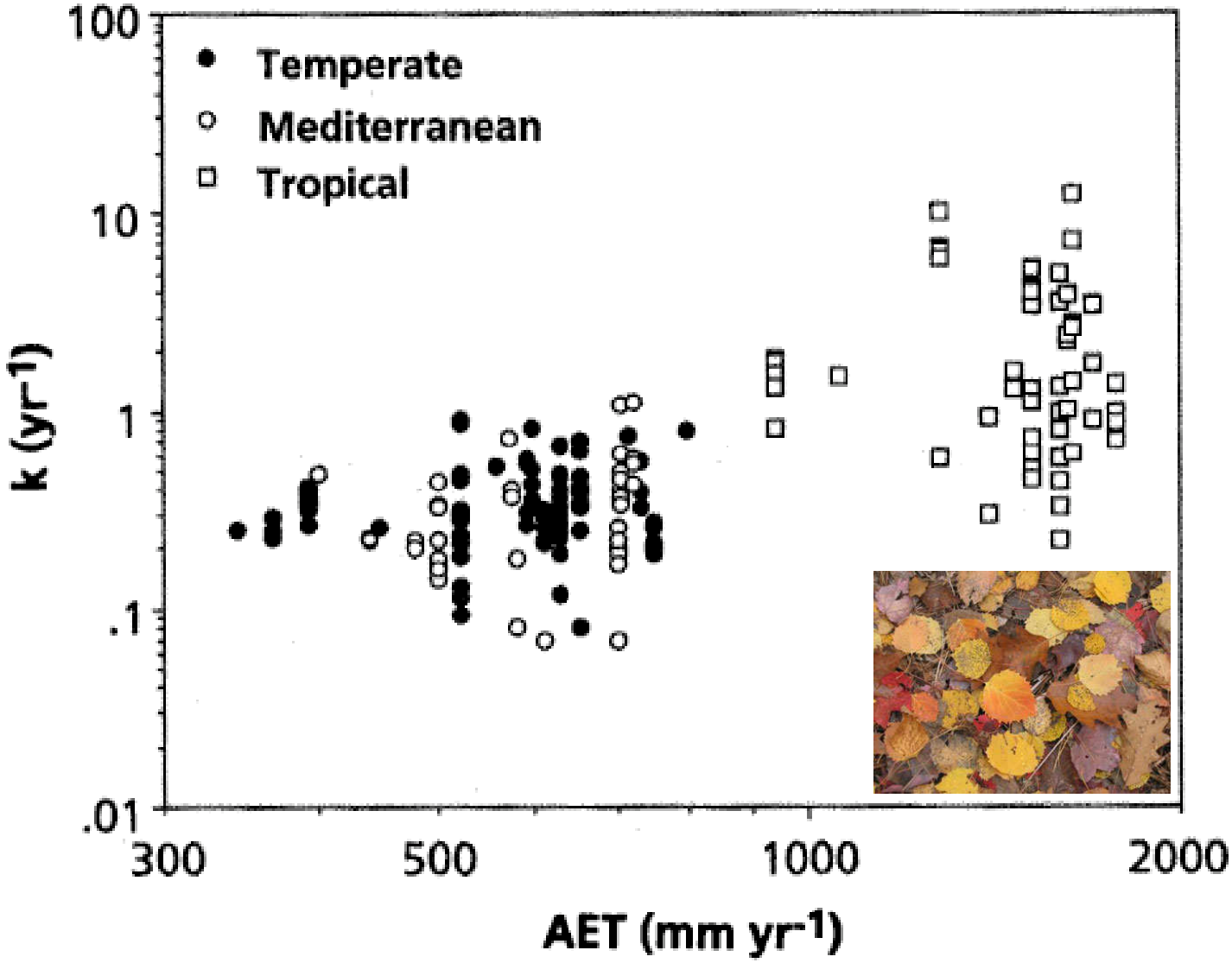
Throop & Archer, *Progress in Botany*, 2008

Climate variables strongly predict globally decomposition patterns …

Fast

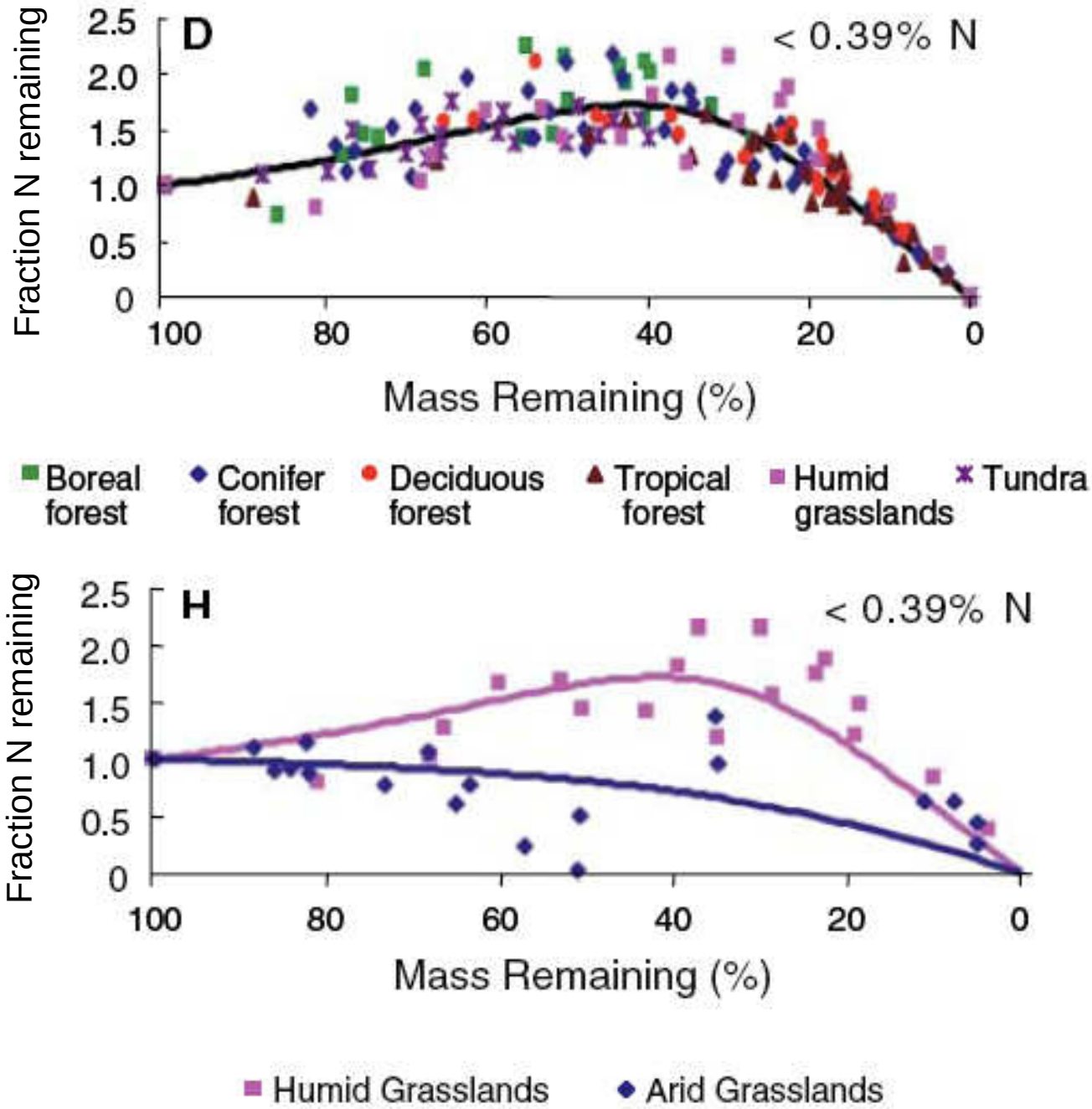
Decay constant

Slow



Aerts 1997 *Oikos*

… except
in drylands



Parton *et al*. 2007 *Science*

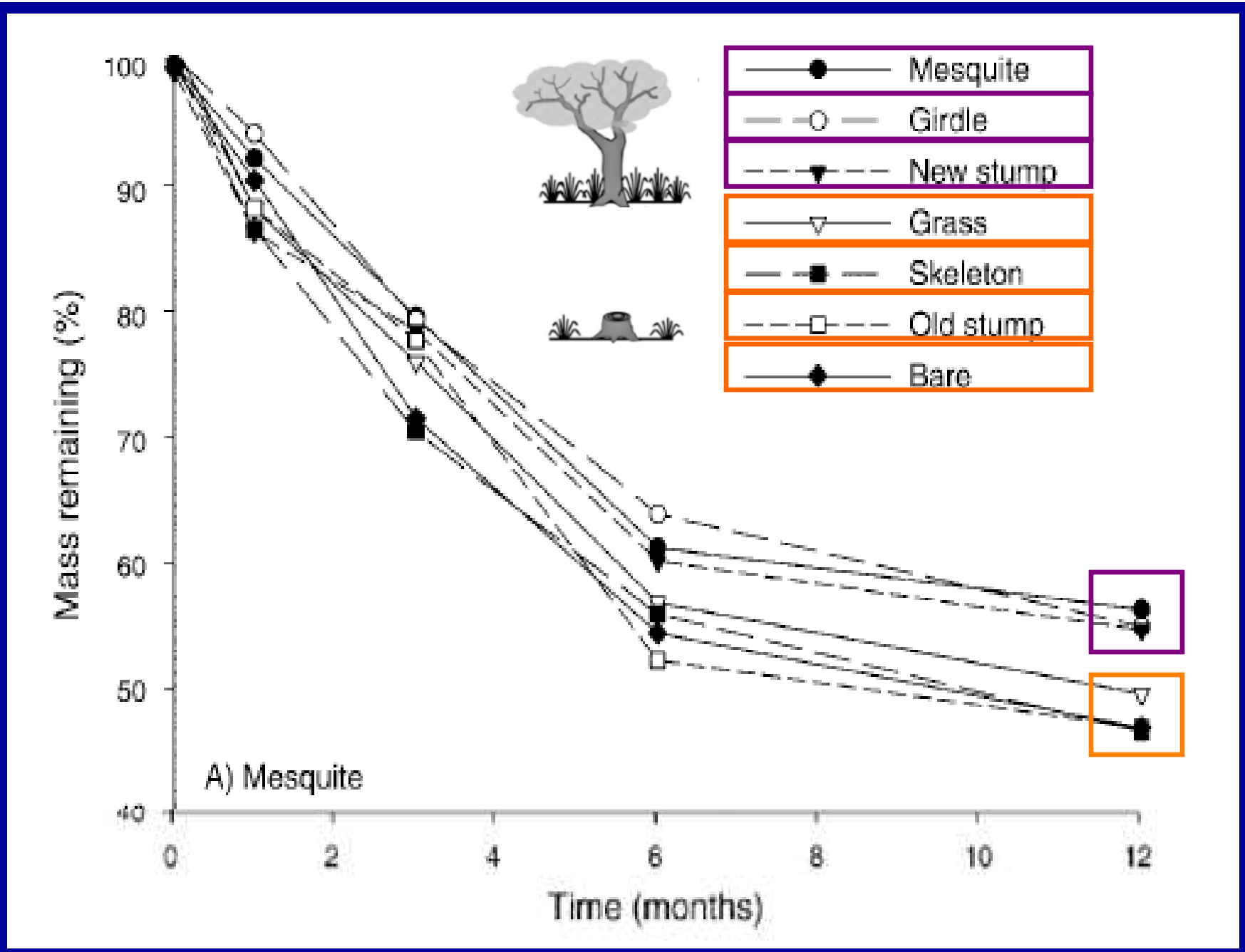
SRER Decomposition & Land Management Study

- 2 litter types
    - -mesquite
    - -Lehmann lovegrass

- 7 land cover trts

- Litterbags deployed 0, 1, 3, 6, 12 months

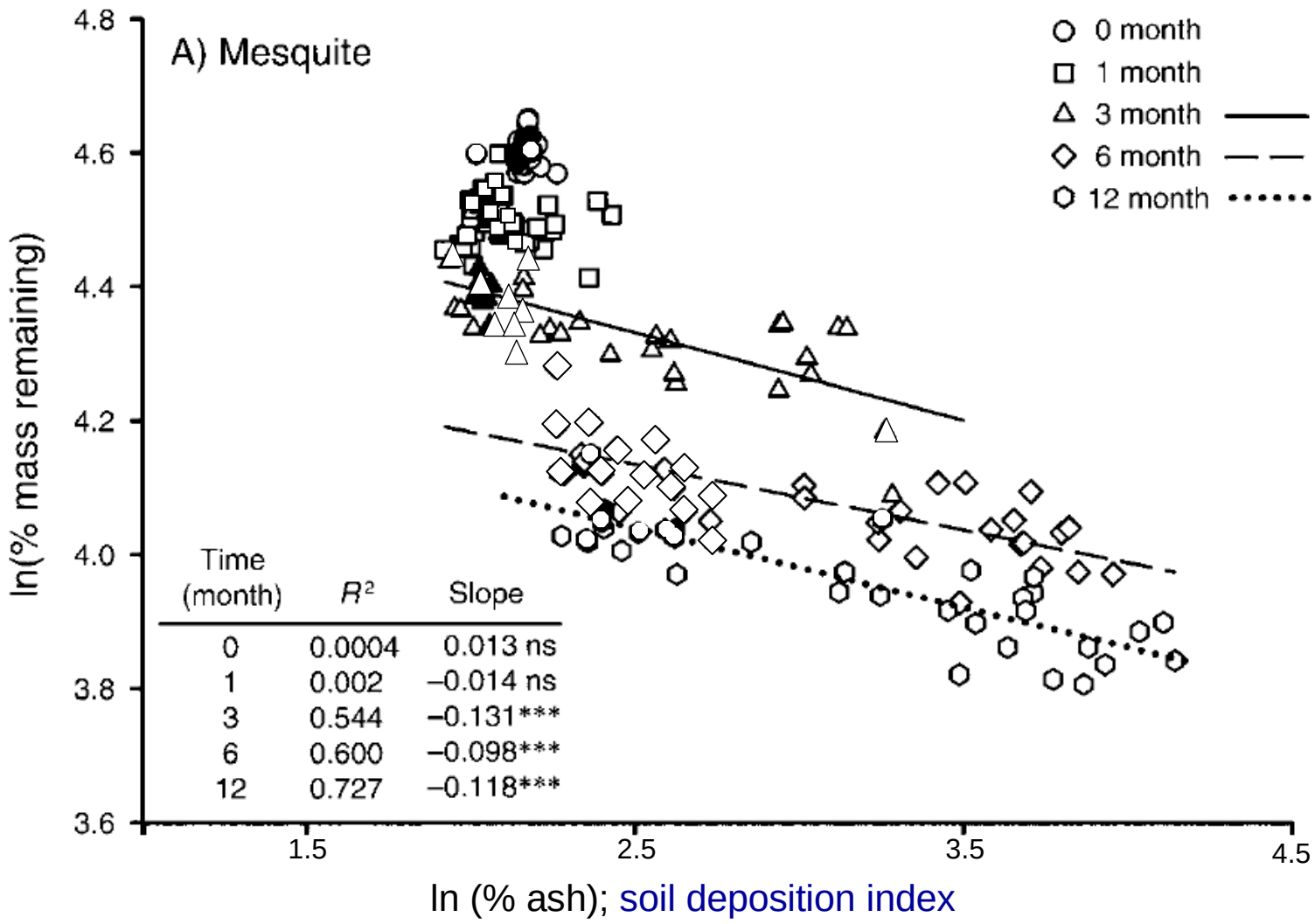
- Analyses: mass, %C, %N



Throop & Archer 2007 *Ecological Applications*

Soil movement drives decomposition

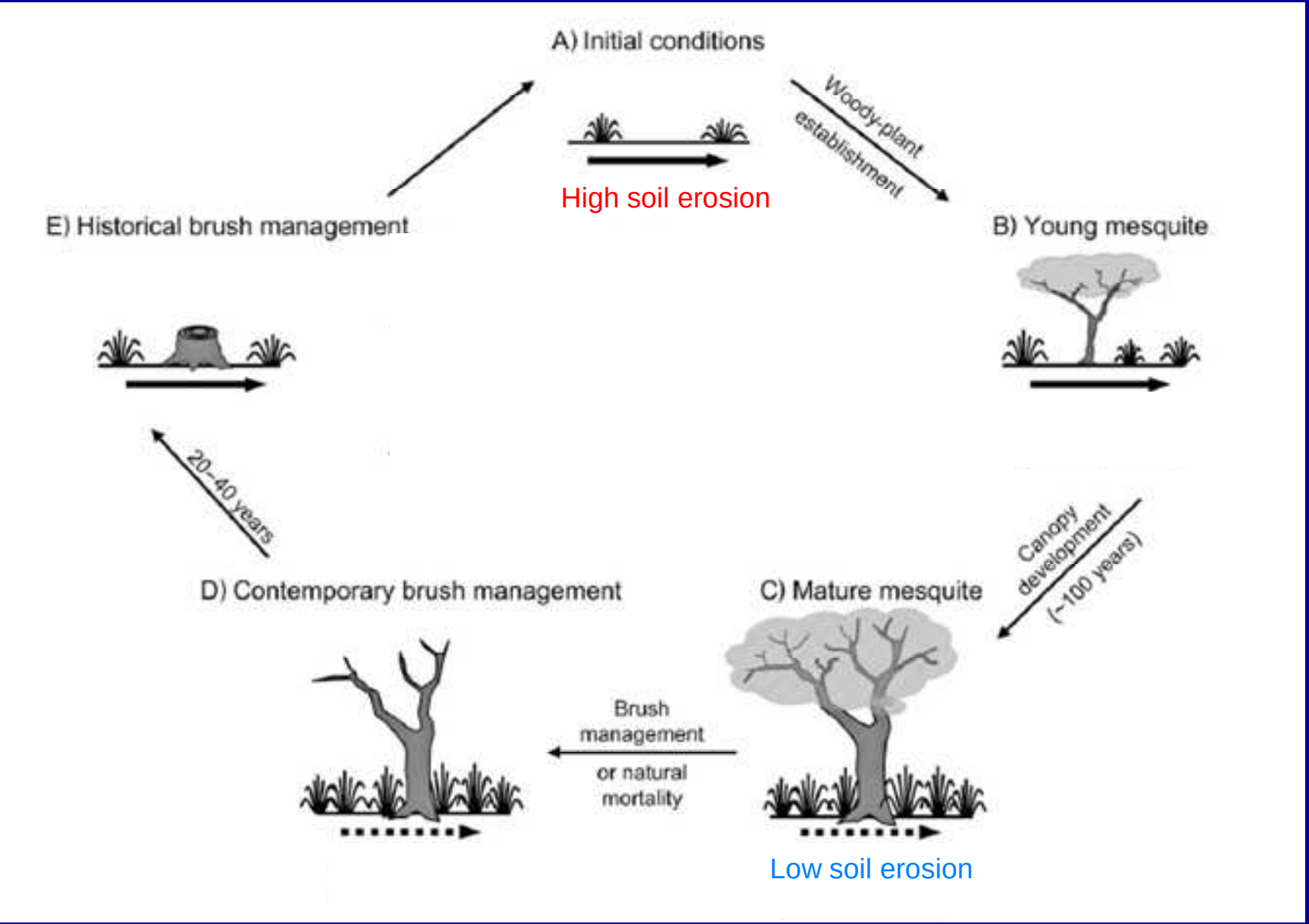
microbial colonization? microclimate buffering? abrasion?



Time (month)	R^2	Slope
0	0.0004	0.013 ns
1	0.002	–0.014 ns
3	0.544	–0.131***
6	0.600	–0.098***
12	0.727	–0.118***

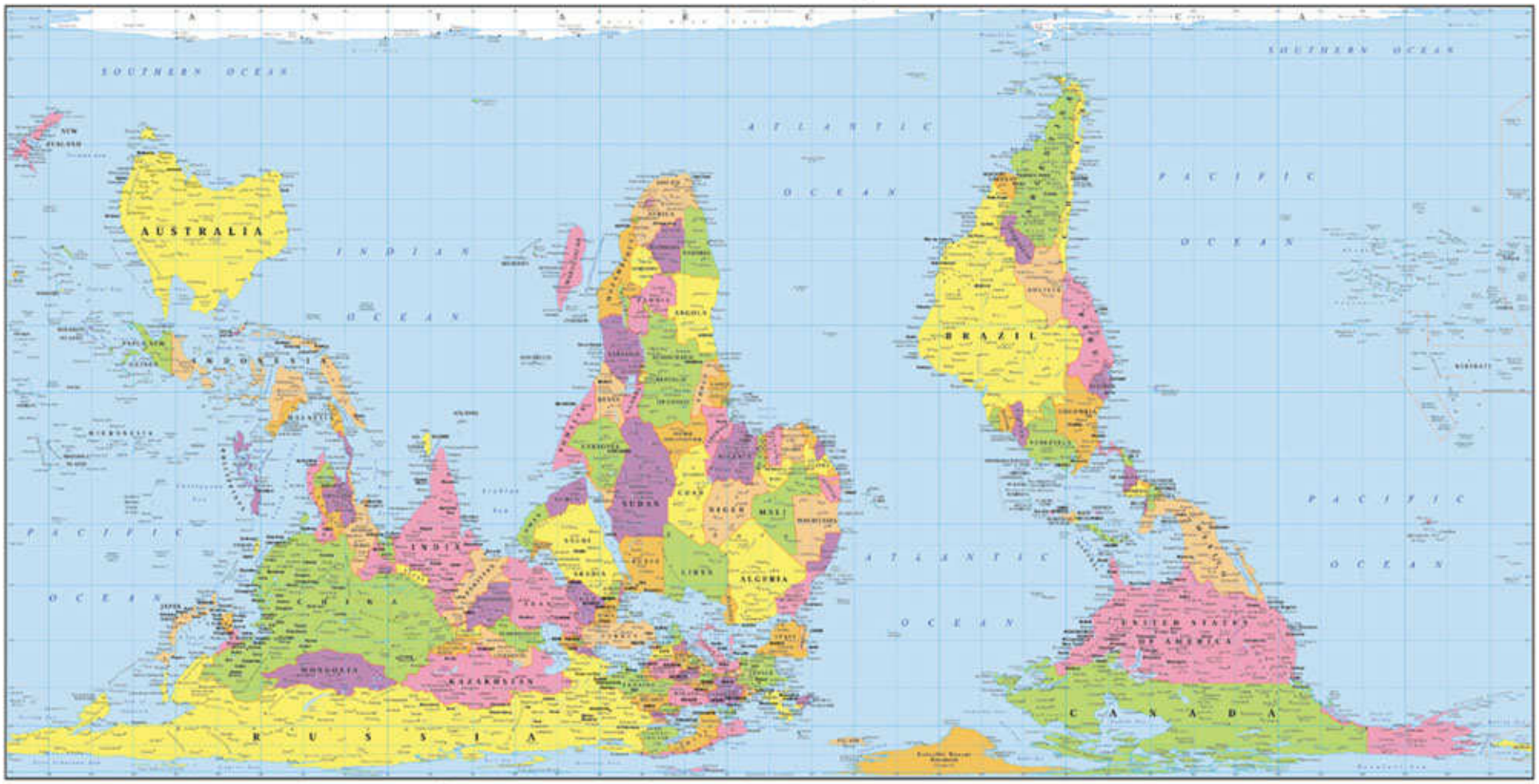
Throop & Archer 2007 *Ecological Applications*

Conceptual model of brush management/decomp at SRER

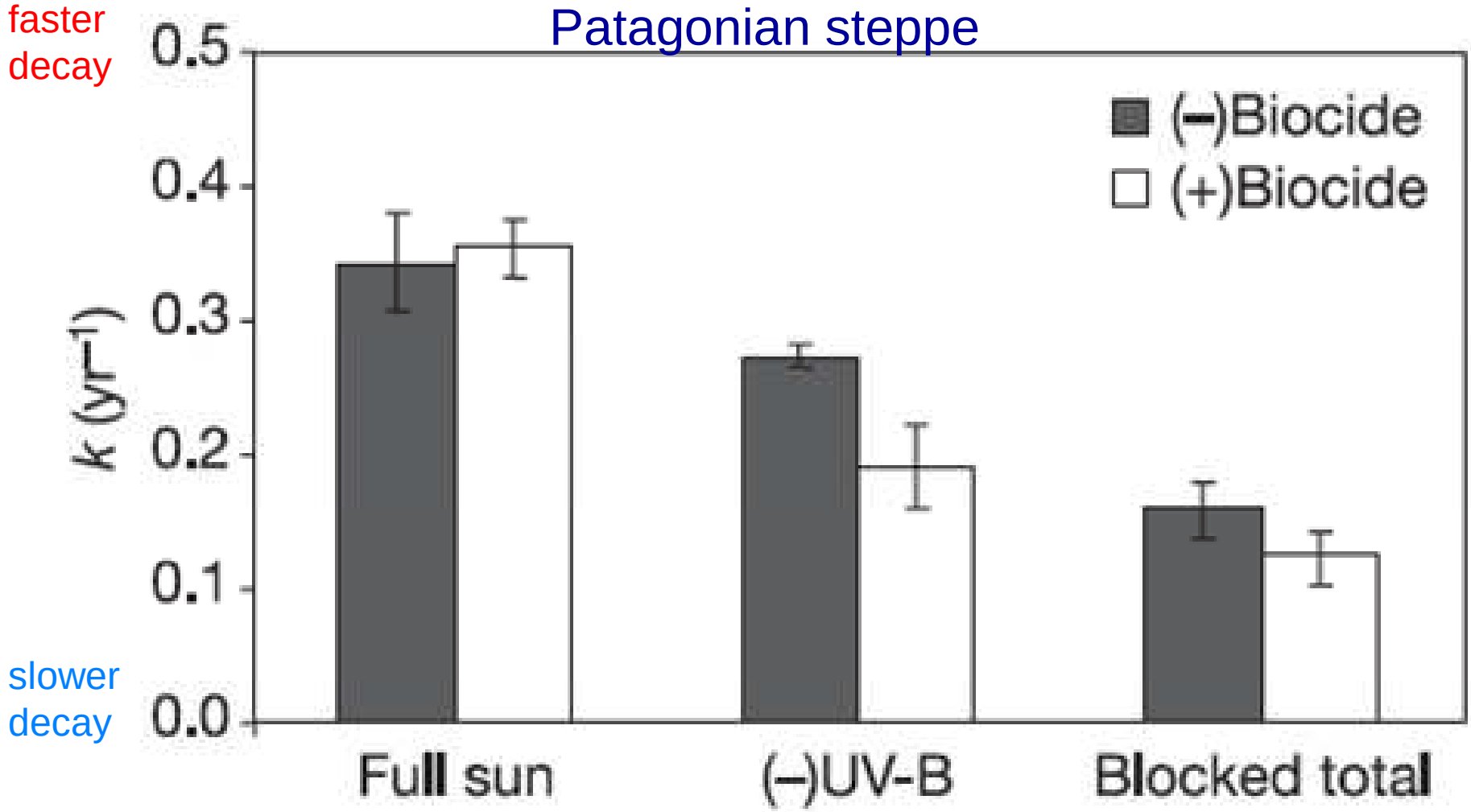


Throop & Archer 2007 *Ecological Applications*

Meanwhile in the Southern Hemisphere…

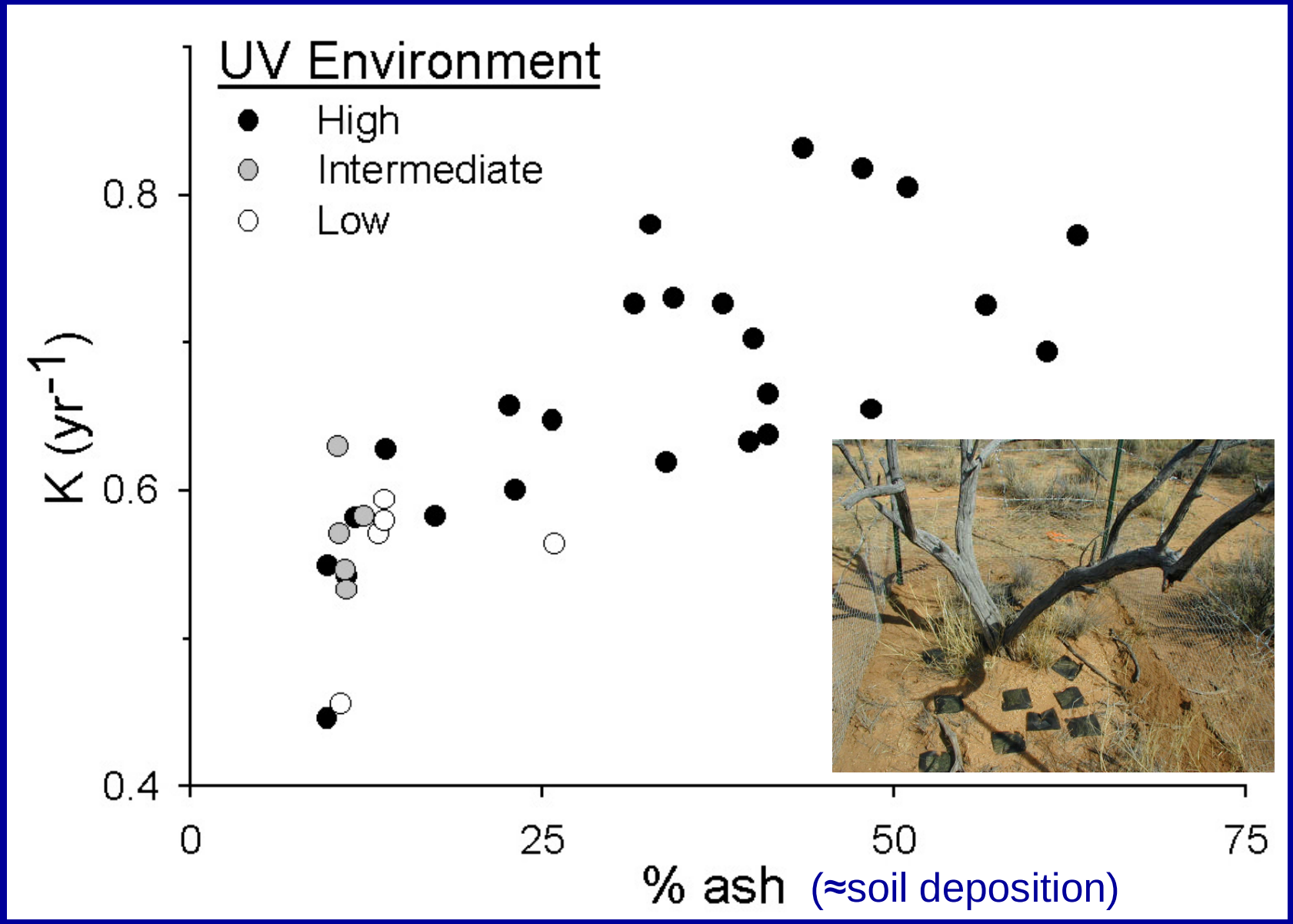


Solar radiation strongly affected decomposition



Austin & Vivanco 2006 *Nature*

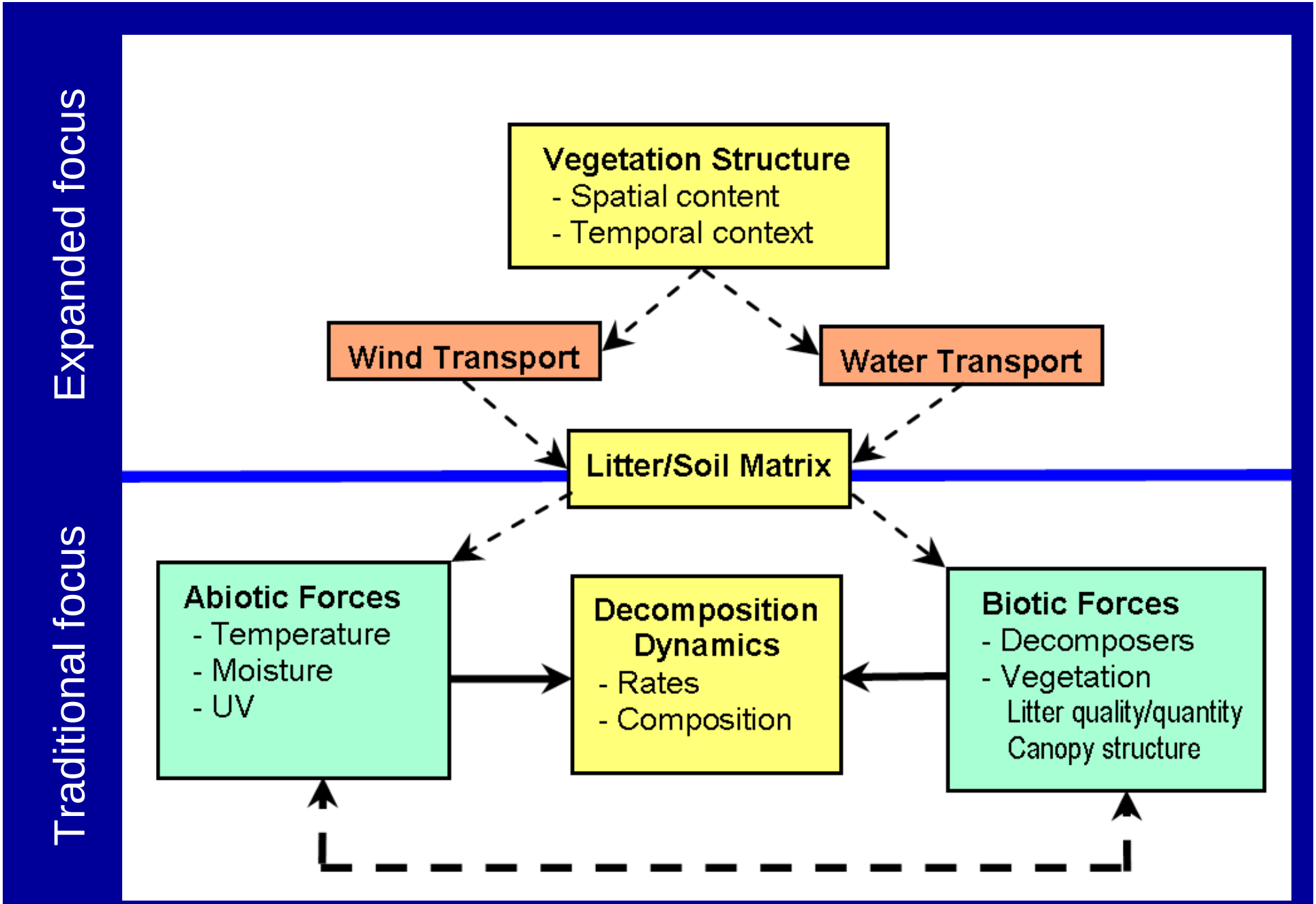
Santa Rita Experimental Range



Throop & Archer 2008 *Progress in Botany*

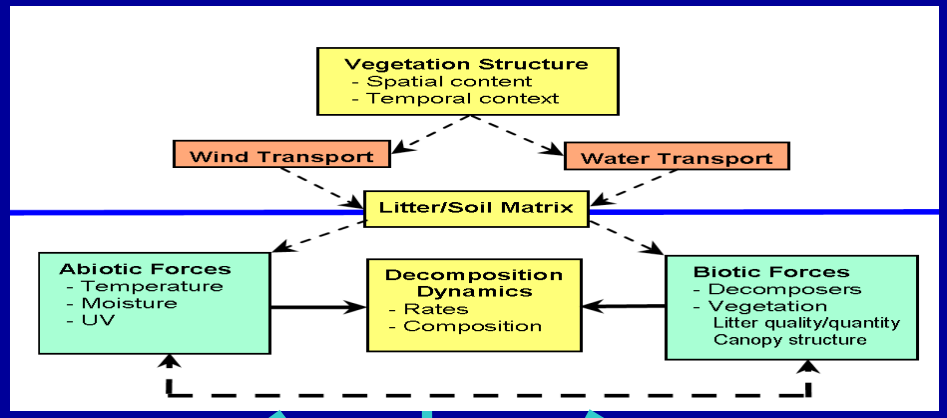
How do soil movement and UV interact to affect decomposition?

Soil Deposition



Throop & Archer 2008 *Progress in Botany*

Check back in a few years…



Decomposition in drylands: Soil erosion and UV interactions

Differentiation of biotic and abiotic decomposition using stable isotopes

Fire, vegetative cover, and decomposition in the Chihuahuan Desert

IALC INTERNATIONAL ARID LANDS CONSORTIUM

People thrive when deserts survive

Thanks to…

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Throop Lab: Tim Clawson, Lisa Ebbs, Daniel Hewins, Jessi Fitzgerald, Jeremy Lewis, Jesus Adrian Perez, Jane Smith