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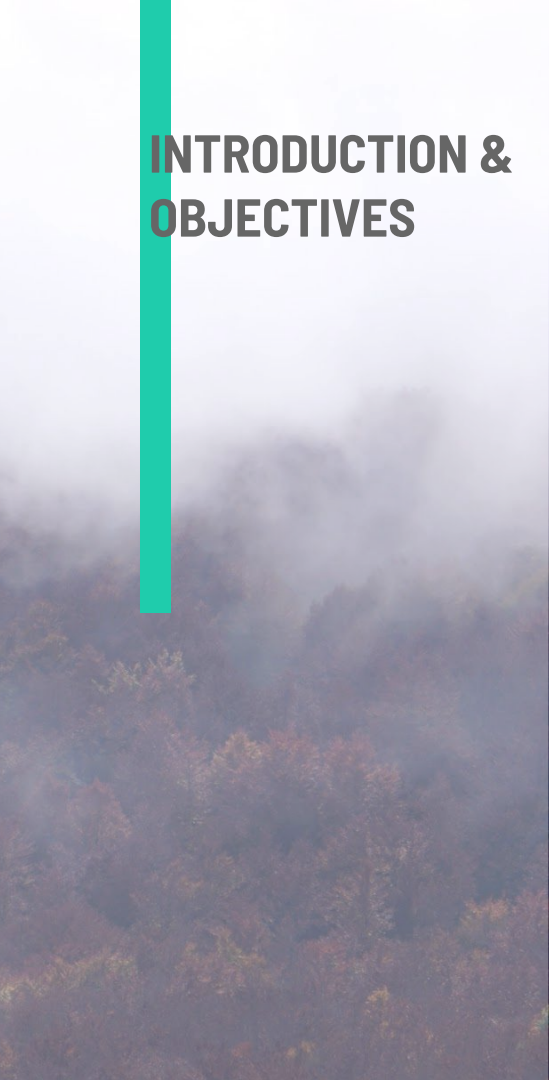
Health status assessment of state-owned forest soils in the Northern Apennines (Italy)

EGU General Assembly, Vienna, Austria 23-27 May 2022

INTRODUCTION & OBJECTIVES



Forest soil health

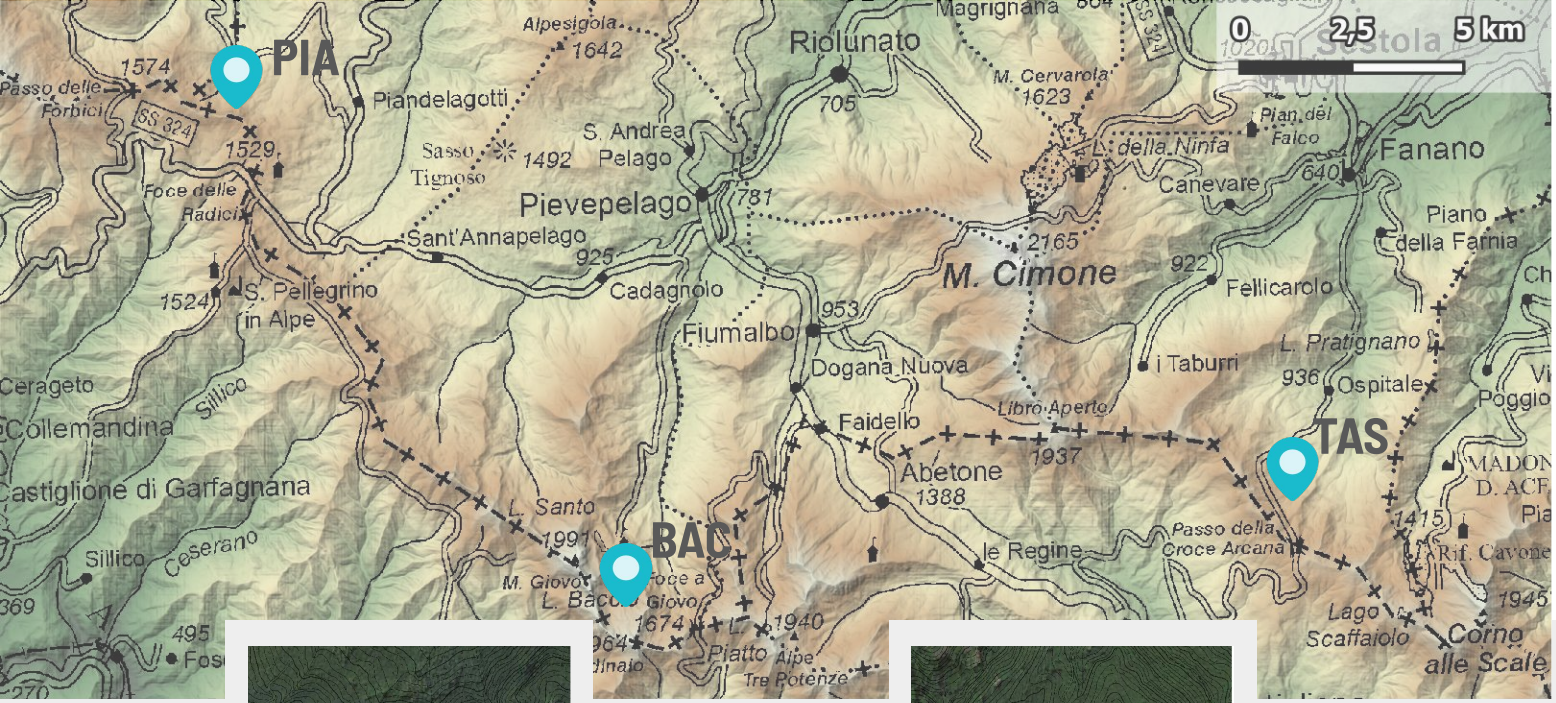
Defined as the continued capacity of soil to function as a **vital living system**. Needs to be protected and promoted by **correct forest management** practices.

RDP "Boschiamo"

Strengthen the **sustainable management and multi-functionality** of some publicly owned forests while **monitoring carbon sequestration** in the soil and plant biomass.

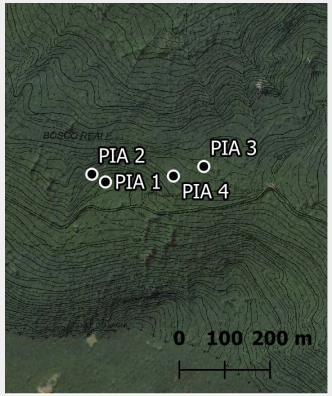
Our aim

To **assess the soil health** of three forest sites via physicochemical and biological analyses and the calculation of **Dilly's index** and the **Biological Fertility Index (BFI)**



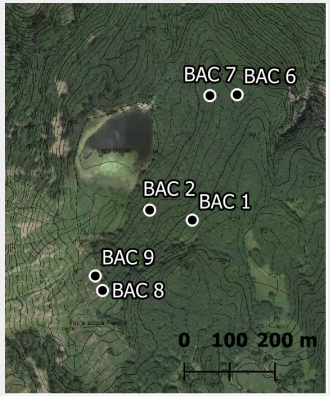
PIA

High forest (2-3-4) or coppice beech (1) Sandstone (medium alterability)



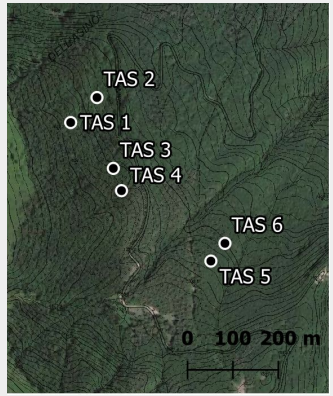
BAC

Coppice beech (1-2-6-7) or blueberry (8-9) Sandstone (lowest alterability)



TAS

High forest beech (1-2), spruce (3-4) or beech + silver fir (6-7) Sandstone (highest alterability)



SAMPLING

Soil profiles till at least BC horizon were dug and each horizon was described and sampled

LAB ANALYSES

Physicochemical and biological analyses were performed

INDEXES

Dilly's Index
Biological Fertility Index

Biological Fertility Index (BFI)

Parameters / Score	1	2	3	4	5
SOM	<1	1-2.5	2.5-3.5	3.5-4.5	>4.5
Cmic	<100	100-200	200-300	300-400	>400
qCO2	>0.6	0.5-0.6	0.4-0.5	0.3-0.4	<0.3
qM	<0.75	0.75-1.25	1.25-1.75	1.75-2.25	>2.25
Sum of scores (BFI)	**4**	**5-8**	**9-12**	**13-16**	**17-20**
Biological fertility class	I	II	III	IV	V
	alarm	stress	medium	good	excellent

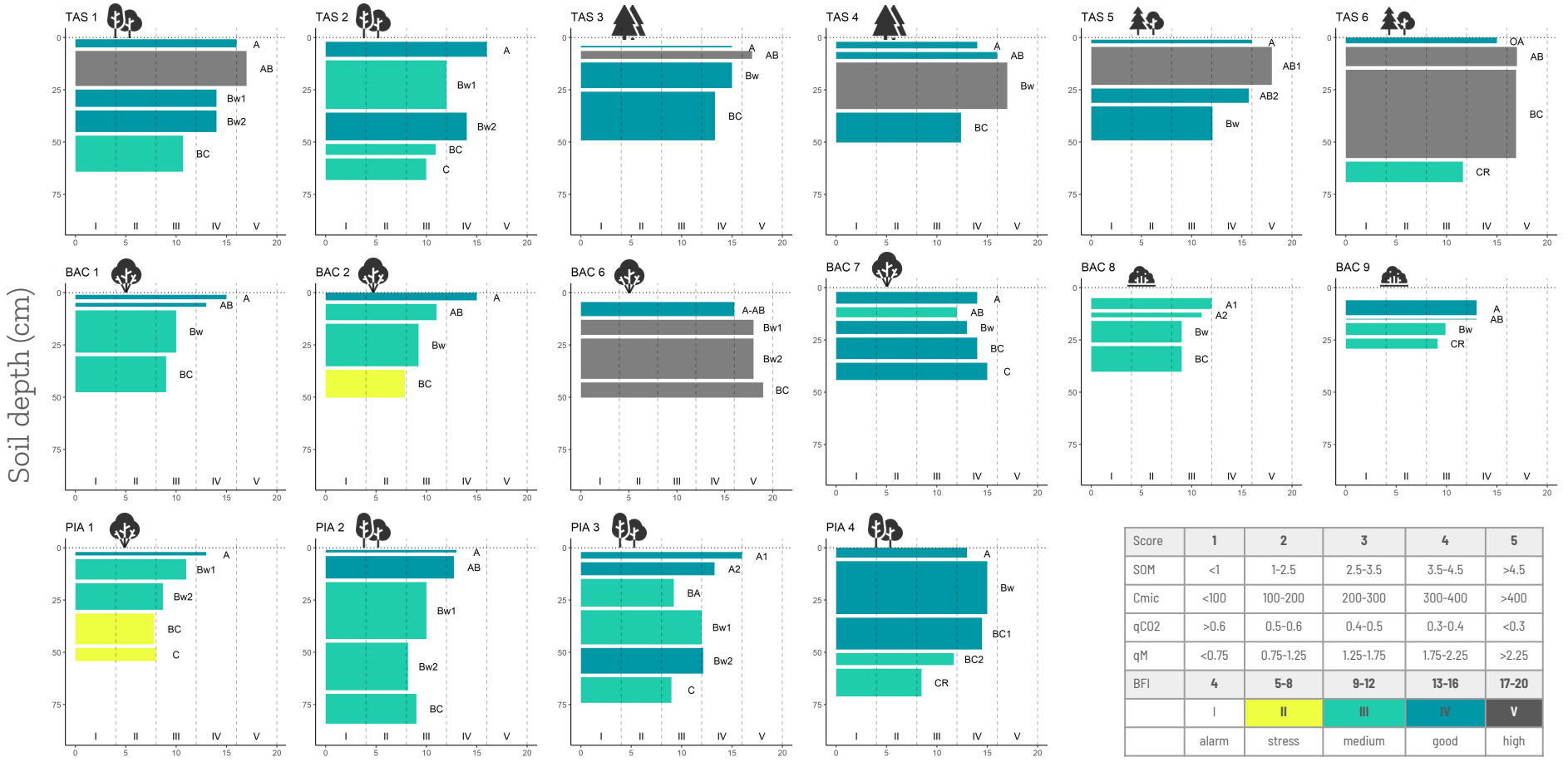
Vittori Antisari, L., Ferronato, C., De Feudis, M., Natali, C., Bianchini, G., & Falsone, G. (2021). Soil biochemical indicators and biological fertility in agricultural soils: A case study from northern Italy. Minerals, 11(2), 219.

Dilly's Index of carbon use efficiency

DI = qCO2/SOC*10000

Dilly, O. (2005). Microbial Energetics in Soils. In: Varma, A., Buscot, F. (eds) Microorganisms in Soils: Roles in Genesis and Functions. Soil Biology, vol 3. Springer, Berlin, Heidelberg.

SOM: Soil organic matter (%)
Cmic: Microbial carbon (mg/kg)
qCO2: Metabolic quotient = SBR/Cmic*100
SBR: Soil basal respiration (mgC-CO2/h/kg)
qM: Mineralization quotient = RCUM/SOC
RCUM: Cumulative respiration (mg C-CO2/kg)
SOC: Soil organic carbon (g/kg)



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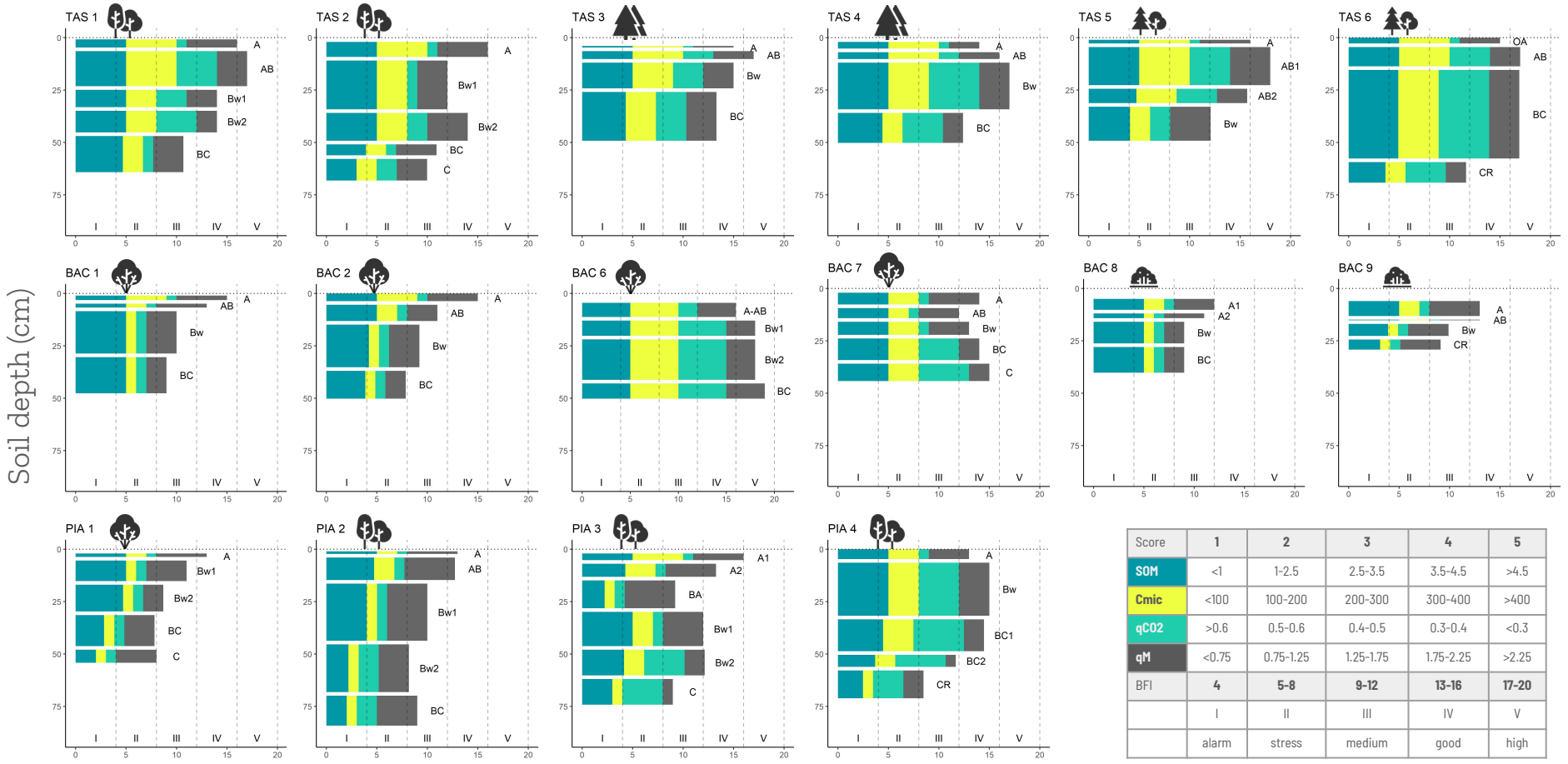

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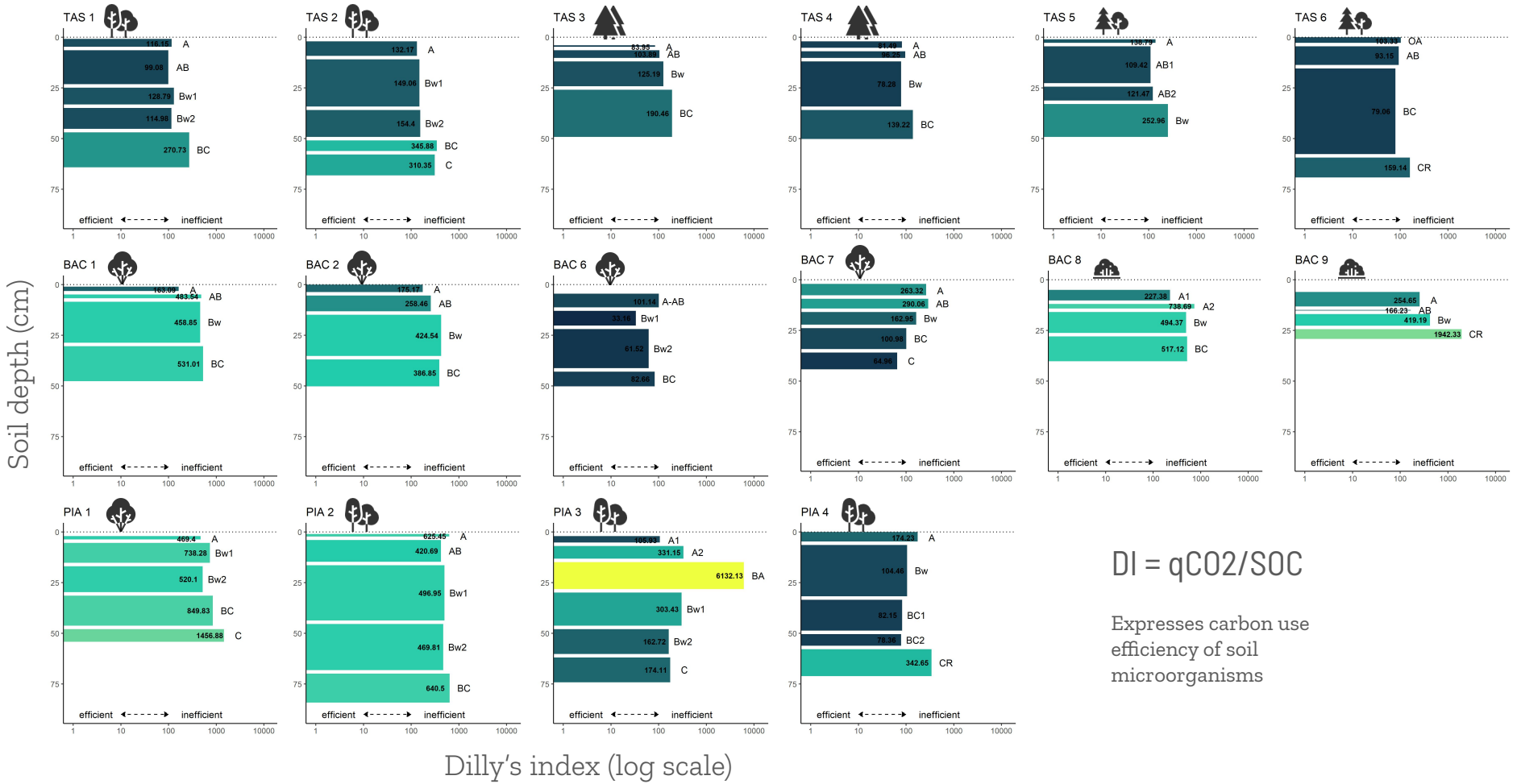

DI = qCO2/SOC

Expresses carbon use efficiency of soil microorganisms

CONCLUSIONS

- Overall good health
- Variation in BFI due mostly to microbial activity, more evident in the subsoil
- Dilly's index very variable both in space and in depth, generally efficient carbon use
- Best index values over most alterable sandstone (TAS area) and under coniferous or mixed forest

NEXT STEP → repeat after timber harvest to assess the impact of different logging techniques (mules, cable crane or chuting) on soil carbon sequestration

THANK YOU FOR YOUR ATTENTION

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