Final Conference of LIFE PROGNOSES :

Characteristics and Ecosystem Services of European Old-Growth Beech Forests



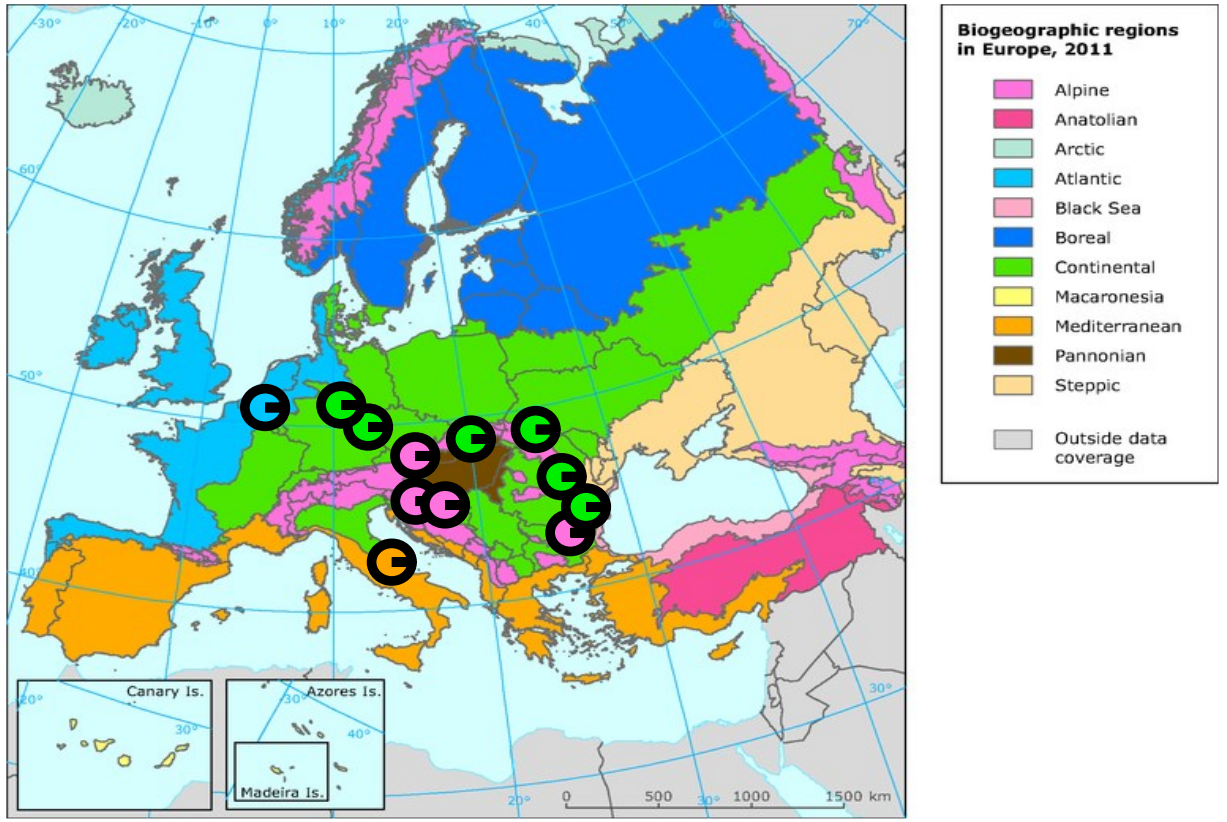
Carbon stocks in European old-growth forests

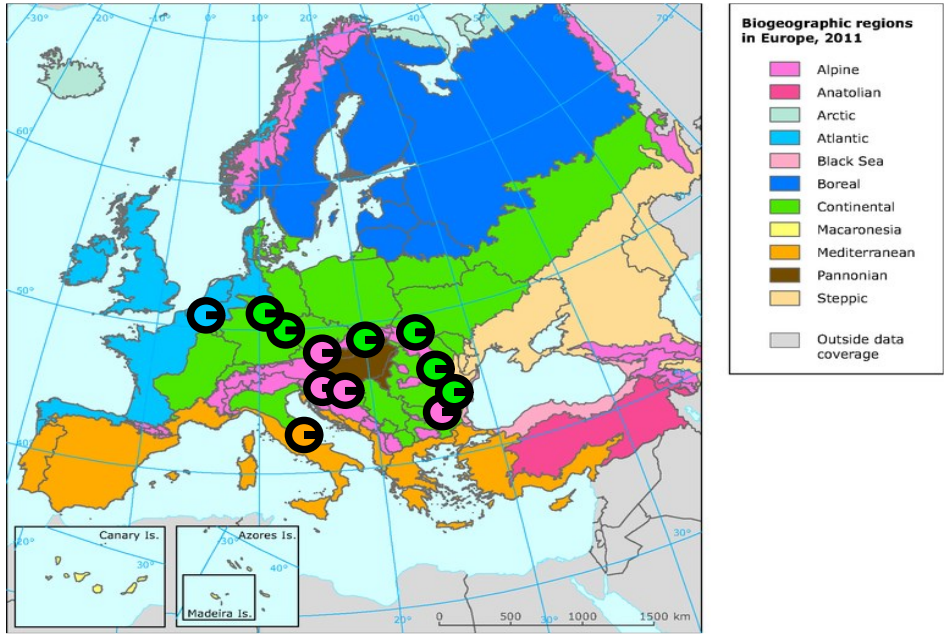
Prof. Dr. Alfredo Di Filippo

Univ. of Tuscia, Dept. Of Agriculture and Forest - DAFNE, Italy

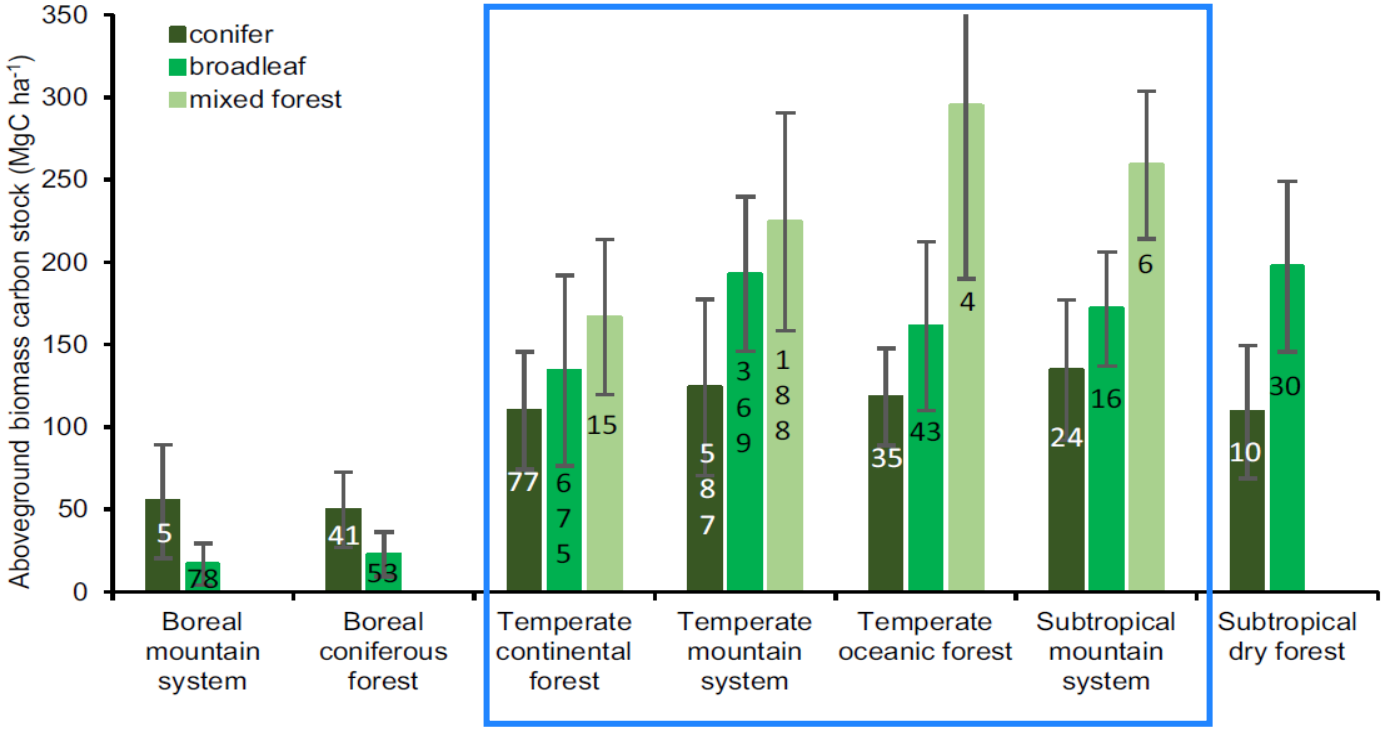
Overview

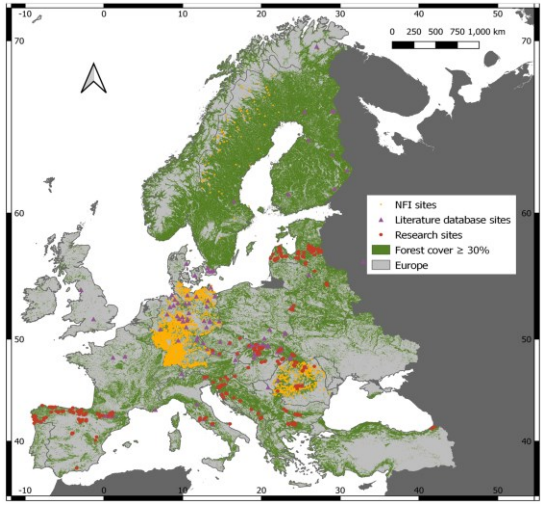
- UNESCO WH Site 1133
- 12 sites
- Compare beech-dominated forests along a gradient of naturalness:
  - *managed*, <25 y
  - *set-aside*, unmanaged 25-75 y
  - *long-untouched*, unmanaged >75 y
  - *primary*, no signs of past use
- **Compare C stocks in living and dead trees + soil**





site	Area sampled (ha)	n. plots total	managed	set aside	long untouched	primary	data origin [a]	year	soil	wood
Abruzzo NP	4.74	151	50	21	-	80	prognoses	2022	30	x
Central Balkan NP	3.77	120	17	41	16	46	prognoses	2022-23	-	x
Hainich NP	19.66	393	-	393	-	-	existing	2020-21	-	-
Kalkalpen NP	4.59	146	11	51	84	-	prognoses	2022	30	x
Kellerwald NP	48.98	979	895	-	84	-	existing	2018 [d]	19	-
Klenovský Vepor	2.10	14	7	-	-	7	existing	2019, 2022 [e]	14	-
Krokar	0.94	30	10	-	-	20	prognoses	2022	-	-
Sinca forest	1.46	20	8	-	-	12	existing	2023, 2024	-	-
Snežnik-Ždrocle	0.94	30	9	-	21	-	prognoses	2022	-	-
Sonian forest	6.56	145	133	12	-	-	existing + prognoses	2020, 2023 [f]	30	-
Stara Planina	6.30	42	-	-	-	42	existing	2022	-	-
Uholka forest	11.91	238	-	-	-	238	existing	2019	-	-





communications earth & environment

Article

https://doi.org/10.1038/s43247-024-01416-5

Carbon carrying capacity in primary forests shows potential for mitigation achieving the European Green Deal 2030 target

Check for updates

Heather Keith[1], Zoltàn Kun[2], Sonia Hugh[1], Miroslav Svoboda[3], Martin Mikoláš[3], Dusan Adam[4], Dmitry Bernatski[5], Viorel Blujdea[6,7], Friedrich Bohn[8], Jesús Julio Camarero[9], László Demeter[10,24], Alfredo Di Filippo[11], Ioan Dutcă[6,12], Matteo Garbarino[13], Ferenc Horváth[10], Valery Ivkovich[14], Āris Jansons[15], Laura Ķēniņa[15], Kamil Kral[4], Dario Martin-Benito[16], Juan Alberto Molina-Valero[3], Renzo Motta[13], Thomas A. Nagel[3,17], Momchil Panayotov[18], César Pérez-Cruzado[19], Gianluca Piovesan[20], Cătălin-Constantin Roibu[21], Pavel Šamonil[4], Ondřej Vostarek[3], Maxim Yermokhin[22], Tzvetan Zlatanov[23] & Brendan Mackey[1]

Life Prognoses



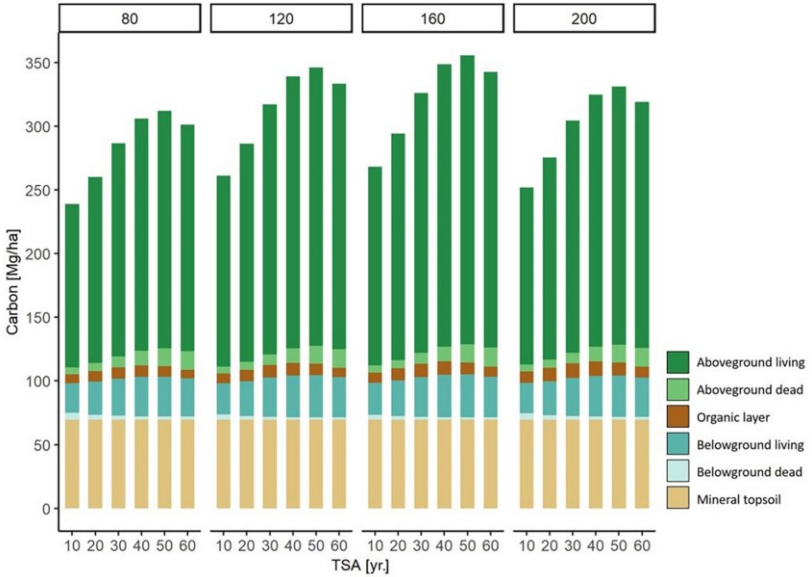




Managed, <25 y
set-aside, unmanaged 25-75 y
long-untouched, unmanaged >75 y
primary, no signs of past use

Strict forest protection: A meaningful contribution to Climate-Smart Forestry? An evaluation of temporal trends in the carbon balance of unmanaged forests in Germany

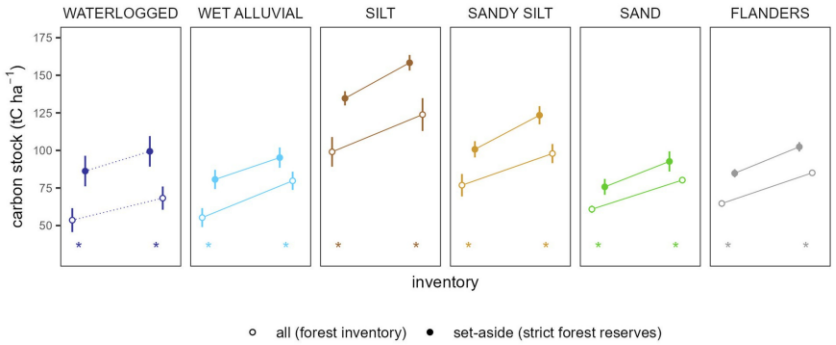
Rouven Nagel[1,2]*, Peter Meyer[1], Markus Blaschke[3] and Eike Feldmann[1]



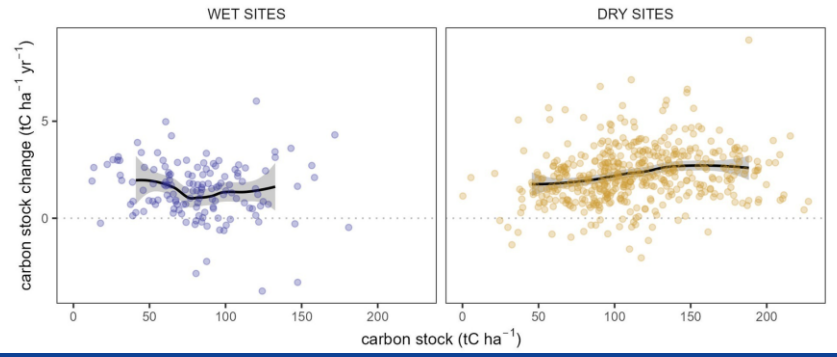
Time since abandonment (Germany)

Site-specific additionality in aboveground carbon sequestration in set-aside forests in Flanders (northern Belgium)

Margot Vanhellemont[1], Anja Leyman[1,2], Leen Govaere[2], Luc De Keersmaeker[1] and Kris Vandekerkhove[1]*



Successive inventories (Belgium)



Methods

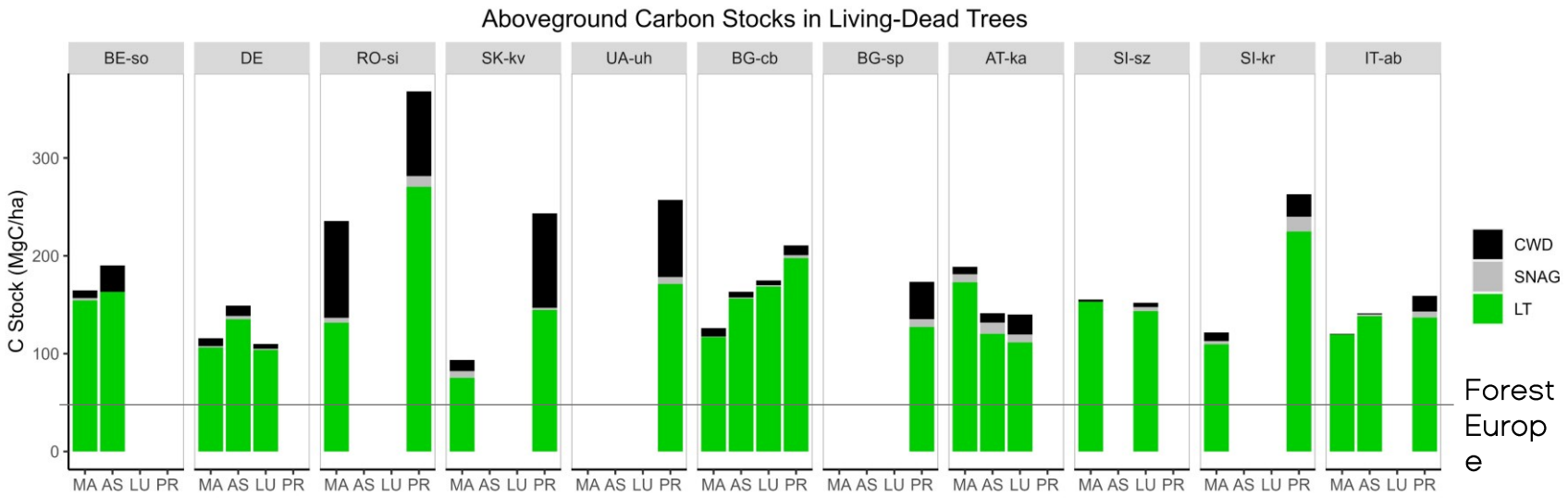
- Sampled 12 sites through circular plots to quantify carbon in aboveground living tree biomass.
- In a subset of sites, we sampled soil with mini-pits or auger to quantify Soil Organic Carbon (SOC, 5 sites) and SOC stock (4 sites) in mineral layers up to 30 cm.
- In 2 sites, Belgium Italy SOC stock distribution was described up to the maximum depth (1 m)

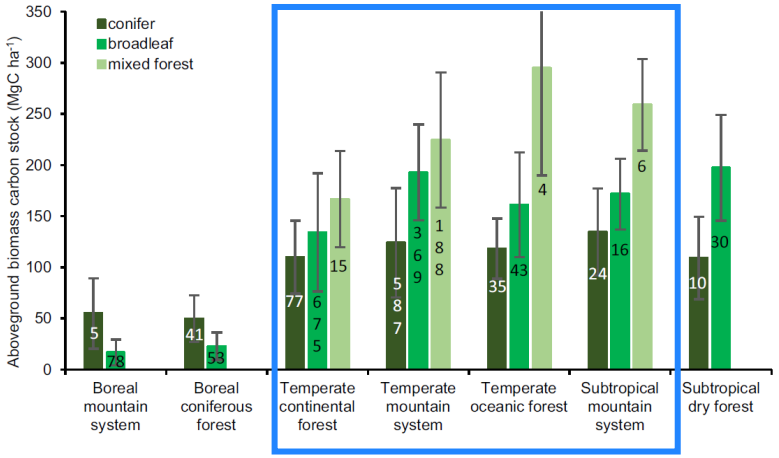


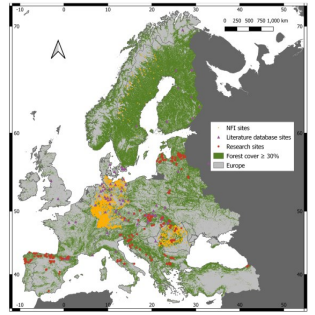
Final Conference of LIFE PROGNOSES :

Characteristics and Ecosystem Services of European Old-Growth Beech Forests

Carbon Stock in Aboveground Carbon in Living Tree (AGCLT)







communications earth & environment — Article

https://doi.org/10.1038/s43247-024-01416-5

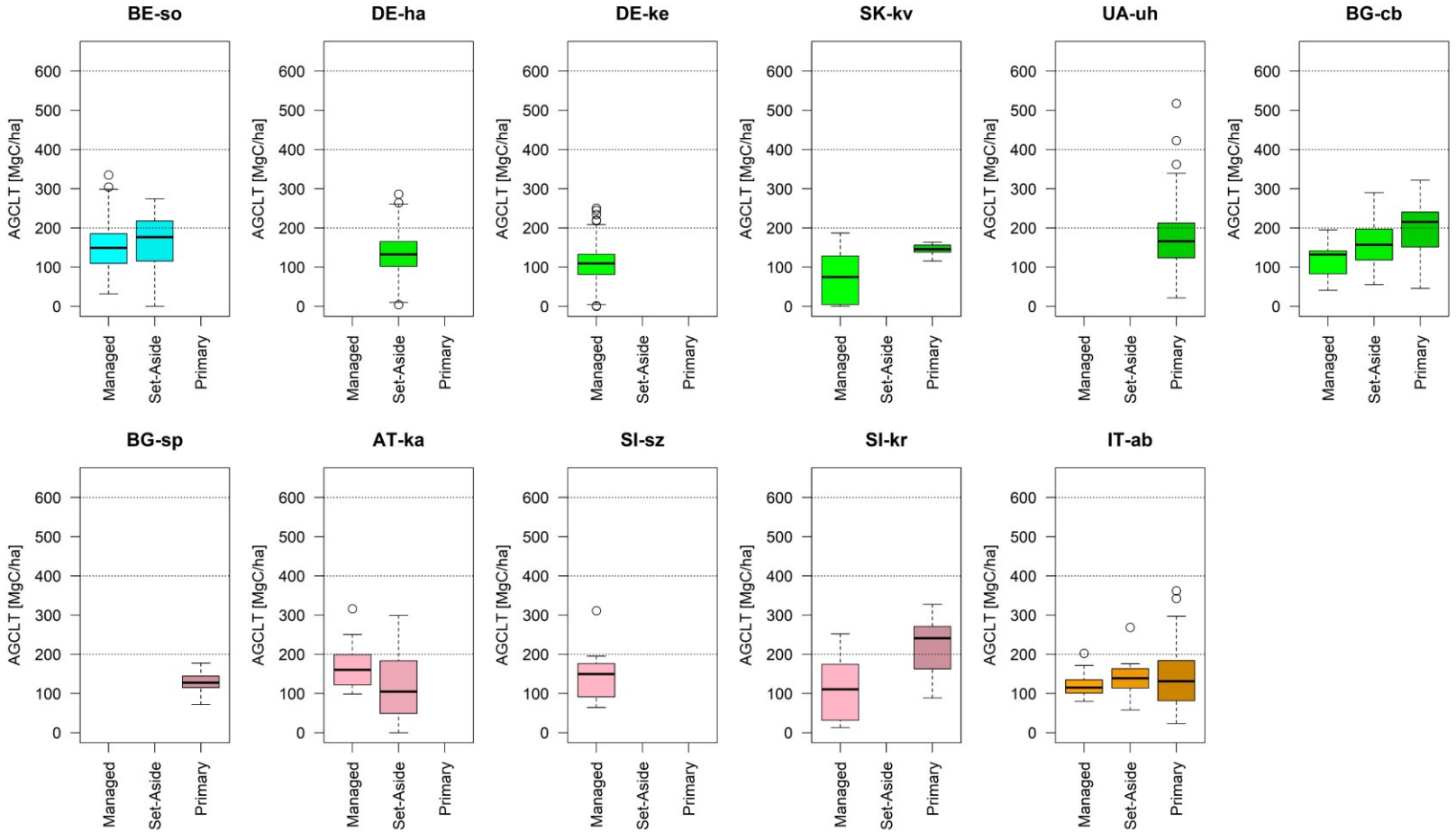
Carbon carrying capacity in primary forests shows potential for mitigation achieving the European Green Deal 2030 target

Check for updates

Heather Keith, Zoltán Kun, Sonia Hugh, Miroslav Svoboda, Martin Mikoláš, Dusan Adam, Dmitry Bernatski, Viorel Blujdea, Friedrich Bohn, Jesús Julio Camarero, László Demeter, Alfredo Di Filippo, Ioan Dutca, Matteo Garbarino, Ferenc Horváth, Valery Ivkovich, Āris Jansons, Laura Könina, Kamil Král, Dario Martin-Benito, Juan Alberto Molina-Valero, Renzo Motta, Thomas A. Nagel, Momchil Panayotov, César Pérez-Cruzado, Gianluca Piovesan, Cătălin-Constantin Roibu, Pavel Šamonil, Ondřej Vostarek, Maxim Yermokhin, Tzvetan Zlatanov & Brendan Mackey

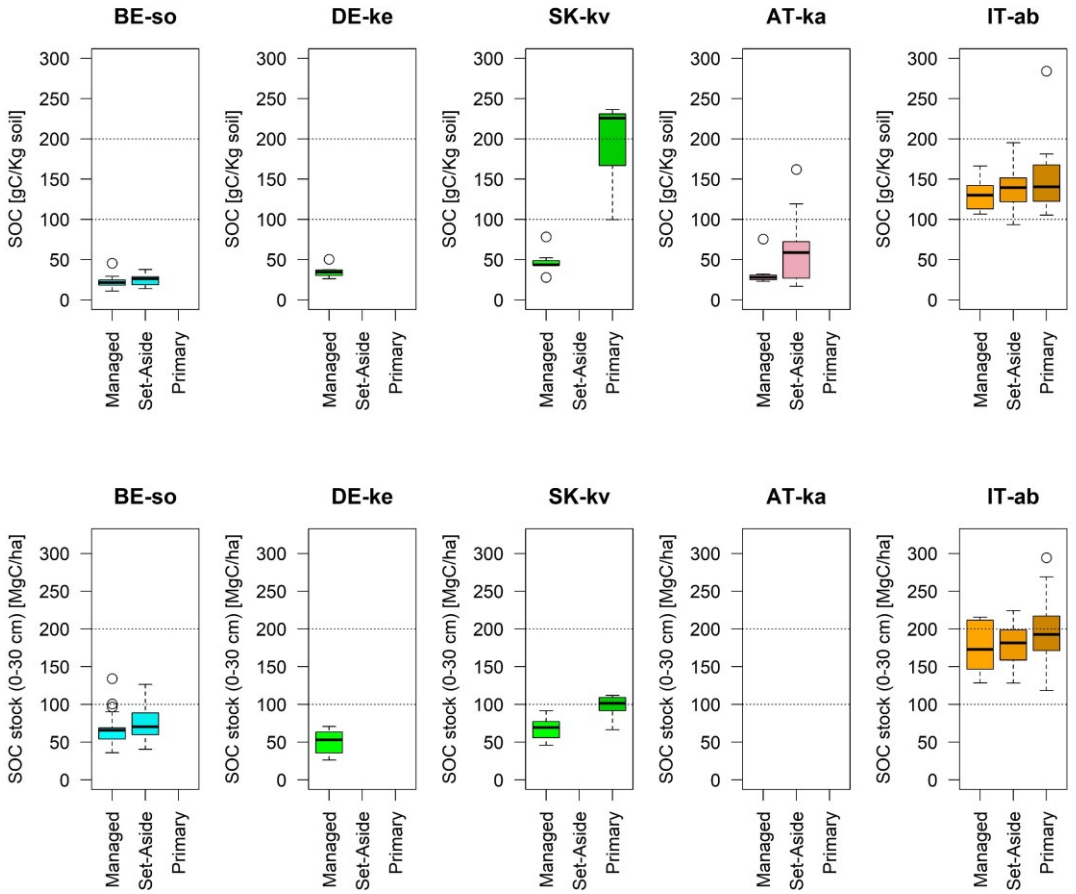
MA: Managed ; **AS**: Set-Aside ; **LU**: Long-Untouched ; **PR**: Primary

Between-Plot Variability in Carbon Stock in Aboveground Carbon in Living Tree (AGCLT)



Variability in Soil Organic Carbon [SOC and Stock 0-30 cm]

- SOC
- SOC Stock



Large Trees Dominate Carbon Storage in Forests East of the Cascade Crest in the United States Pacific Northwest

David J. Mildrexler[1], Logan T. Berner[2], Beverly E. Law[3], Richard A. Birdsey[4] and William R. Moomaw[4,5]*

frontiers in Forests and Global Change

ORIGINAL RESEARCH
published: 05 November 2020
doi: 10.3389/ffgc.2020.594274

ARTICLE
https://doi.org/10.1038/s41467-020-14369-y OPEN
nature COMMUNICATIONS

The megabiota are disproportionately important for biosphere functioning

Brian J. Enquist[1,2*], Andrew J. Abraham[3], Michael B.J. Harfoot[4], Yadvinder Malhi[5] & Christopher E. Doughty[3]

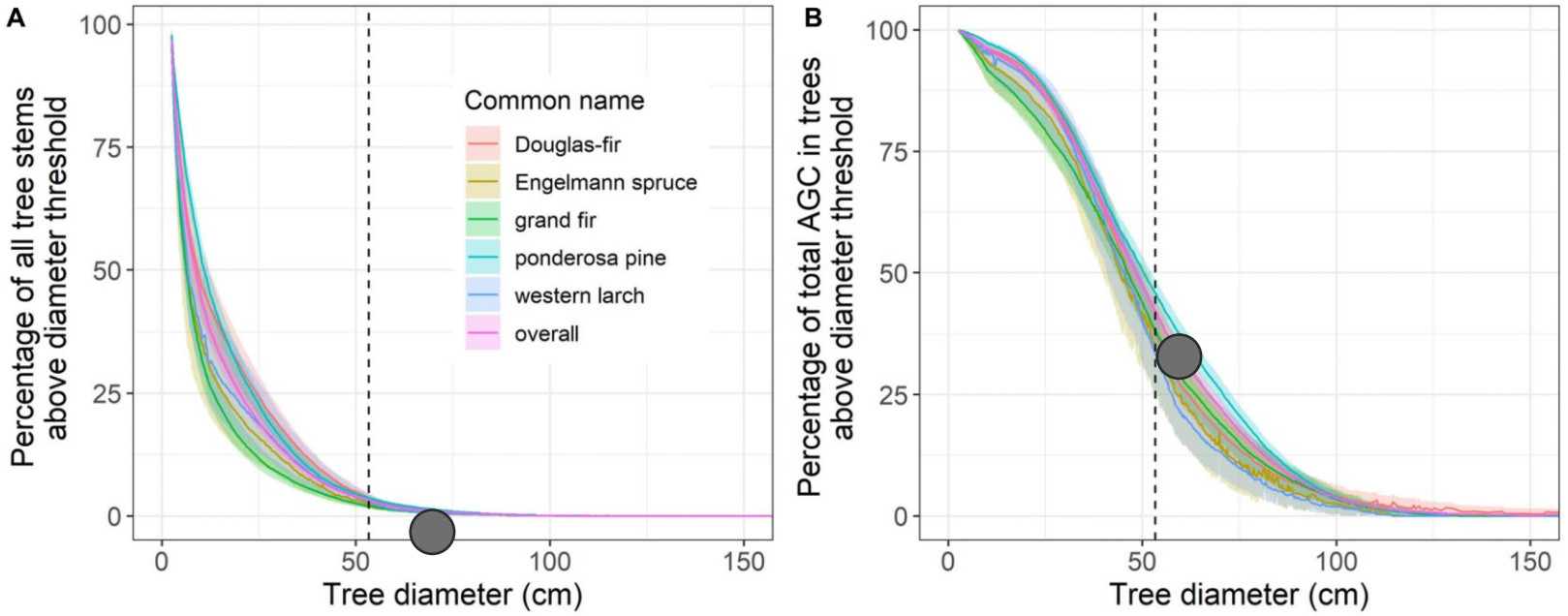
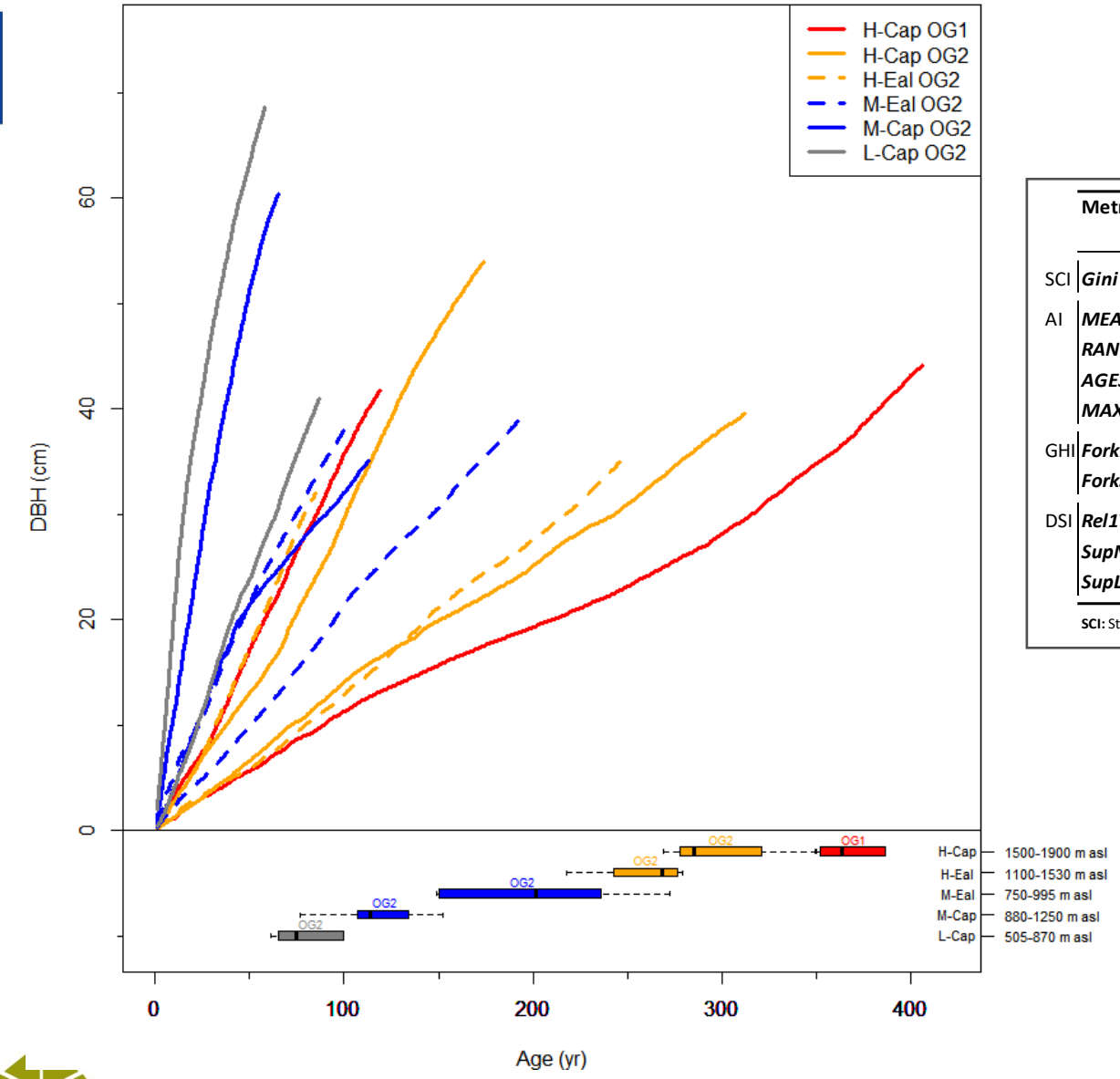


FIGURE 3 | Percentage of **(A)** all tree stems and **(B)** total aboveground carbon that occur in trees above a given diameter threshold by species based on measurements from USFS inventory plots located in the six eastside national forests. The dashed vertical lines represent a 21 in (53.3 cm) tree DBH. These estimates and 95% confidence intervals were derived by resampling ($n = 10^4$) measurements from inventory plots (n = 3,335). For example, trees with ≥21 in diameter represent 3.7 [3.2, 4.2]% of all ponderosa pine and account for 45.8 [42.8, 48.8]% of all aboveground carbon stored by this species on these inventory plots. Only ~0.002% of trees exceeded 150 cm diameter, so for visual clarity we limited the x-axis to 150 cm.



Journal of Applied Ecology

Journal of Applied Ecology 2016 doi: 10.1111/1365-2664.12793

Tree ring-based metrics for assessing old-growth forest naturalness

Alfredo Di Filippo[1*], Franco Biondi[2], Gianluca Piovesan[1] and Emanuele Ziaco[1,2]

	Metric	Unit	High-mountain		Mountain	Low-elevation
			OG1	OG2	OG2	OG2
SCI	***Gini Coefficient***	-	74-80	56-65	39-58	37-42
AI	***MEAN***	years	312-385	216-308	136-284	83-110
	RANGE3	years	322-371	105-257	74-199	49-57
	AGE3	years	514-528	342-435	185-320	114-132
	MAX	years	548-559	348-520	220-351	115-136
GHI	***ForkRANGE3***	years	266-268	110-185	70-95	46-74
	ForkSLOW3	years	360-397	242-309	100-243	66-106
DSI	***Rel1Yr.D***	-	82-90	83-90	53-79	68-73
	SupN.5	n	4.0-5.2	3.0-4.4	1.2-3.0	1.4-1.6
	SupL.5	years	70-117	49-77	14-36	10-21

SCI: Structural Complexity Indices. **AI, GHI, DSI:** Age, Growth History, Disturbance-Suppression Indicators.

Concluding remarks

- Important **biogeographic effects on C-stock**, especially on C distribution within compartments: effects on soil C accumulation and abundance of large vs small trees
- Past Management: historical perspective → **restoration pathways**
- **Assess factors affecting C-stock variability** → reliability of estimations, including the sampling approach
  - Between-Sites: biogeographic region, composition (pure vs mixed), disturbance regime
  - Within Sites: geomorphology, local fertility, past management, structural phases
- **Improve Estimation and Allometries** (→ Life Prognoses Final Conference Oct 2nd):
  - Important contribution from deeper soil sampling
  - Tree Wood cores (in progress): refine basal scontribution of site ecology, tree size and past management/ tree growth history to wood density

Q&A

Thank you for your attention

