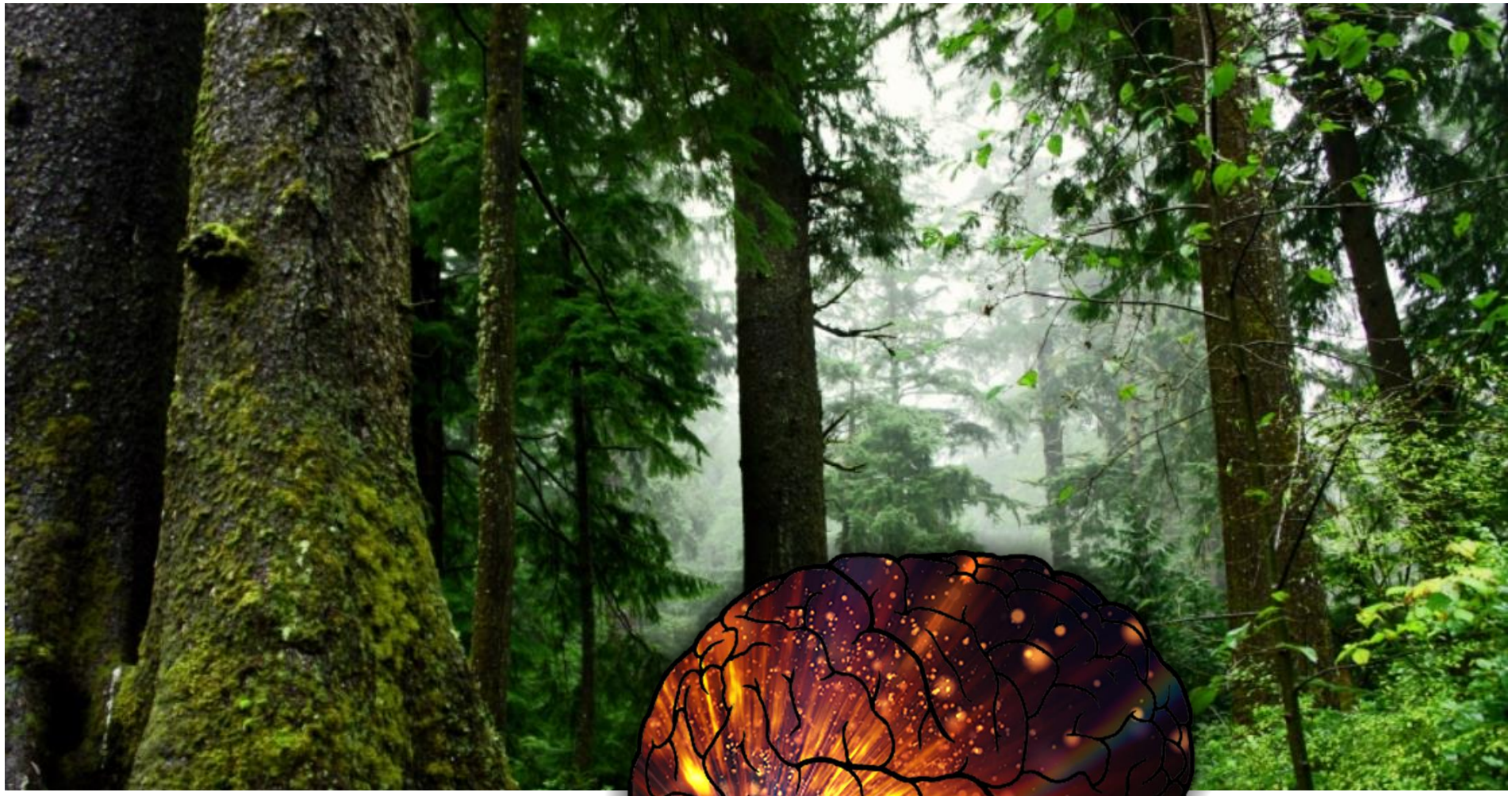


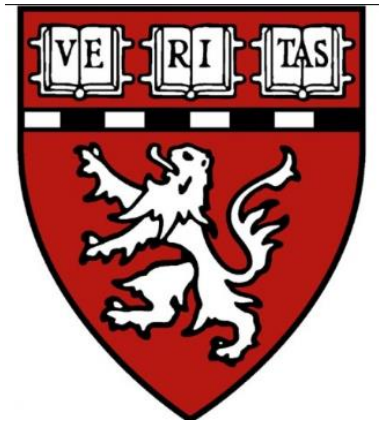
Susan A. Masino, Ph.D.

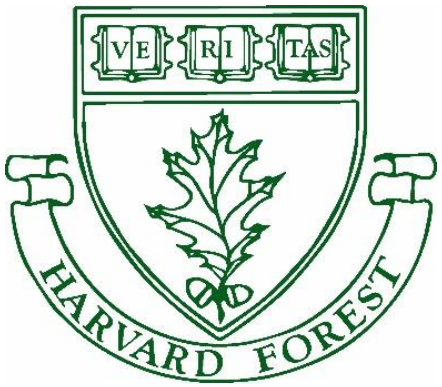
Professor of Applied Science, Trinity College
Charles Bullard Fellowship in Forest Research
Harvard Forest/Harvard Medical School (2018-2019)

Co-Chair
Science and Technology Working Group
Governor's Council on Climate Change (GC3)

We need nature.

Public Policy Should Support Brain Health

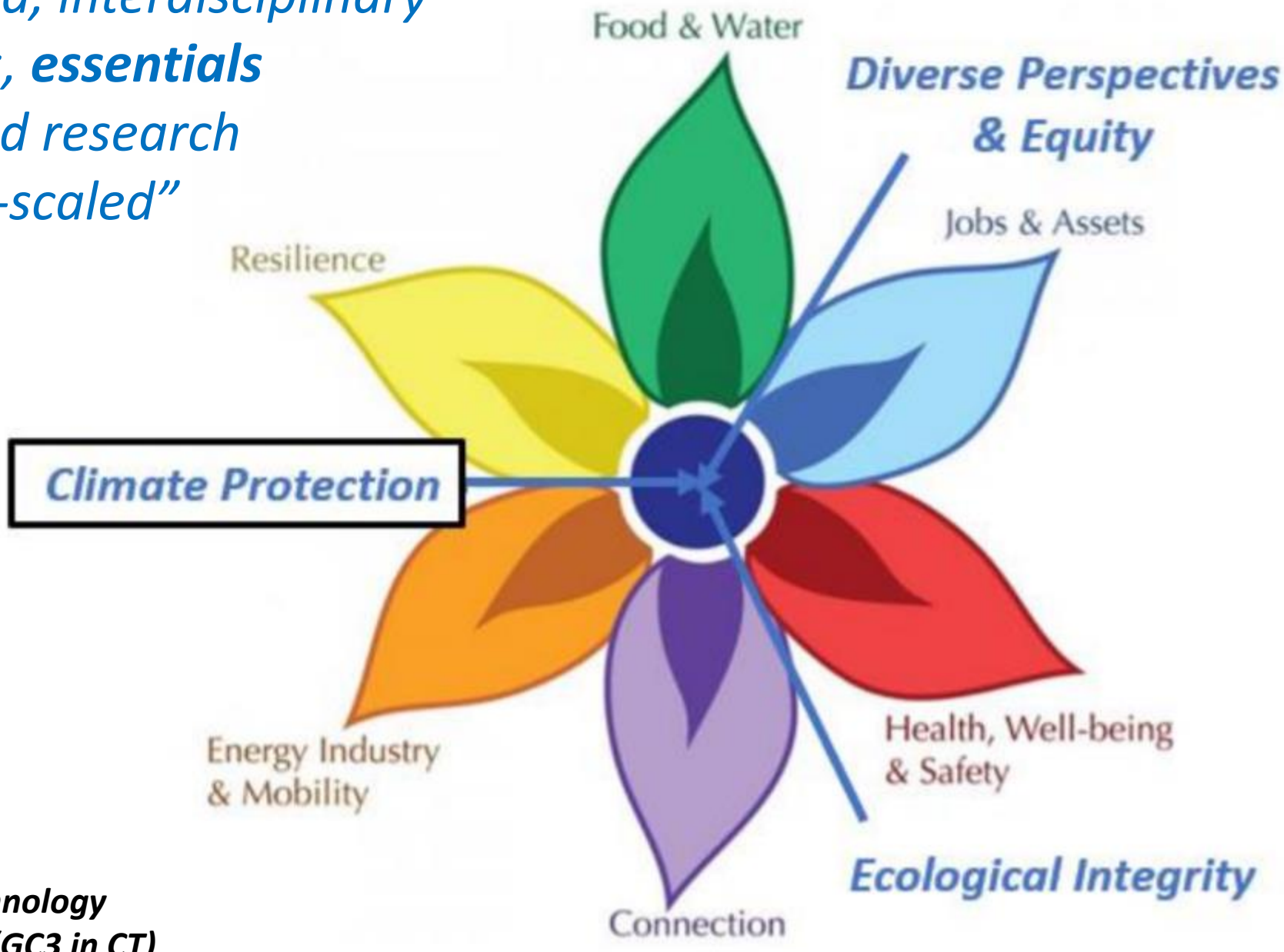




Multisolving . . . .

There are common solutions with multiple benefits . . .

- *unbiased, interdisciplinary*
- *impacts, **essentials***
- *data and research*
- *“locally-scaled”*
- *positive*



Science and Technology Working Group (GC3 in CT)

“Science and everyday life cannot and should not be separated.”

Rosalind Franklin, PhD (1920-1958)

Essentials and Lifelines Related to Natural Solutions

WATER RESOURCES: ***"it's all important"***

Essentials and Lifelines Related to Natural Solutions

WATER RESOURCES: ***"it's all important"***

Specific areas need strong protection / buffering from unnecessary disruption:

headwaters, wetlands, vernal pools, riparian corridors, etc.

Opportunities to leverage green infrastructure – self-sustaining, evolving benefits;

Opportunities for restoration: wetlands, invasives, erosion, depaving; (prevention)

There is no "*away*."

A watershed can be a pilot region for multiple benefits.

http://www.dnrec.delaware.gov "Green Infrastructure Primer"

Green Infrastructure Is Multisolving:

store more carbon
clean air/water
food . . .
biodiversity
flood mitigation
health / equity
decrease energy use
jobs and education

Beavers are multisolvers

Chapter 9

Forest-Stream Interactions in Eastern Old-Growth Forests

Dana R. Warren, William S. Keeton, Heather A. Bechtold, and Clifford E. Kraft

Old-growth forests are multisolvers

Barton and Keeton (2018)
Ecology and Recovery of Eastern Old-Growth Forests

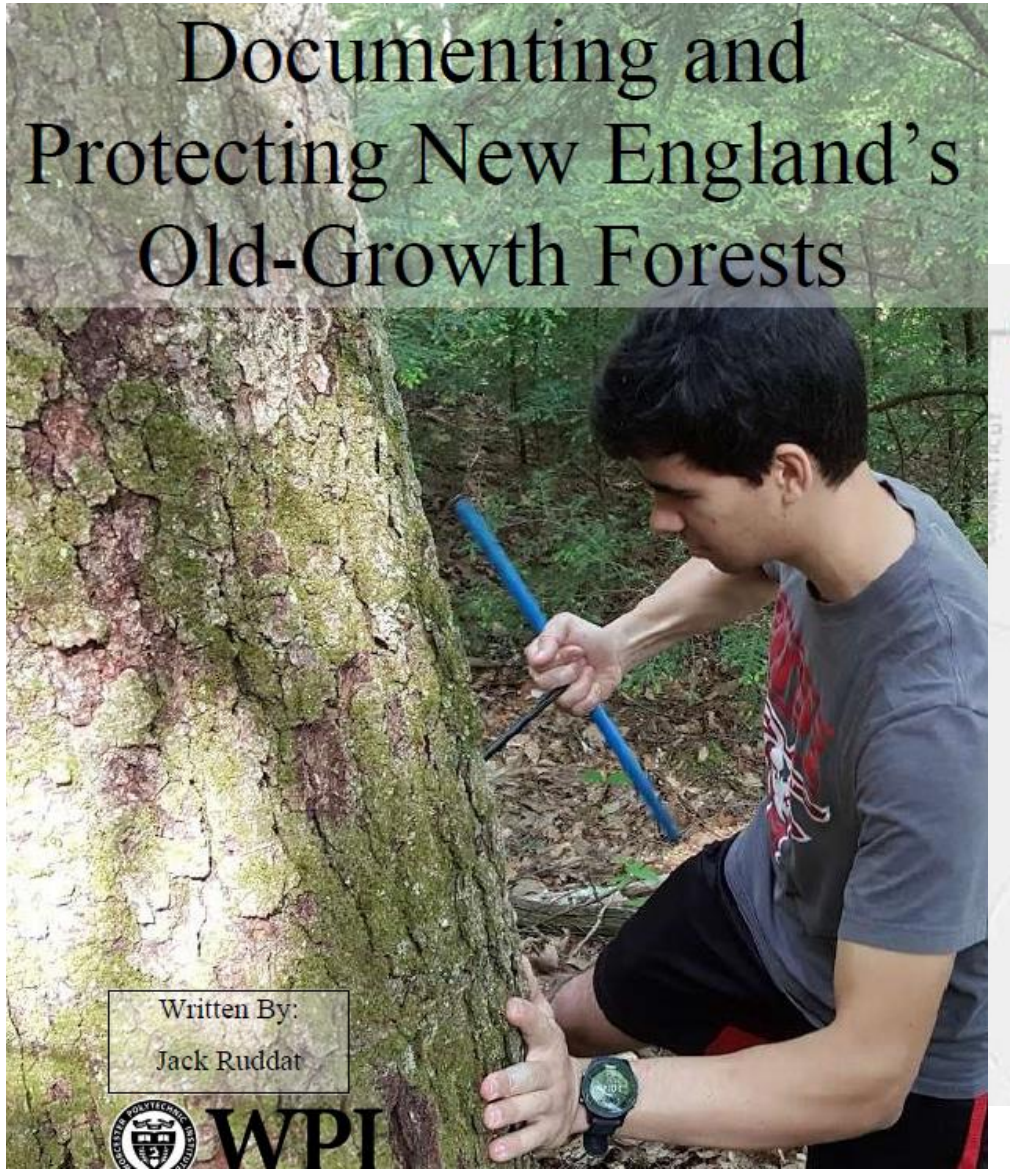
(Stein et al., Current Biology, 2019)

NATURE

The World's Oldest Fossil Forest Was Just Found in New York, And It's Magnificent

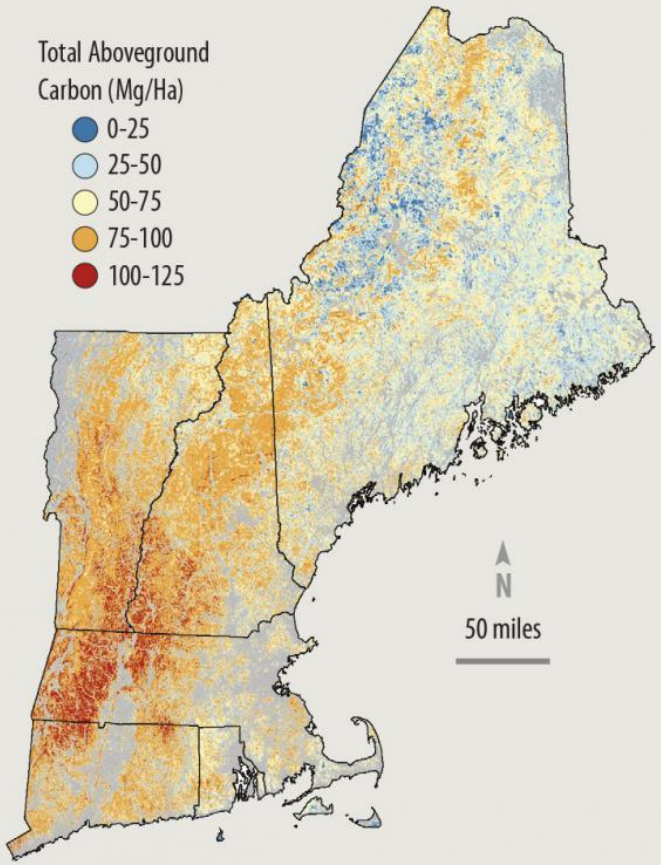
CARLY CASSELLA 20 DEC 2019

www.ParkWatershed.org
https://www.parkwatershed.org/wp-content/uploads/2020/01/Park_EnvEd-report.pdf

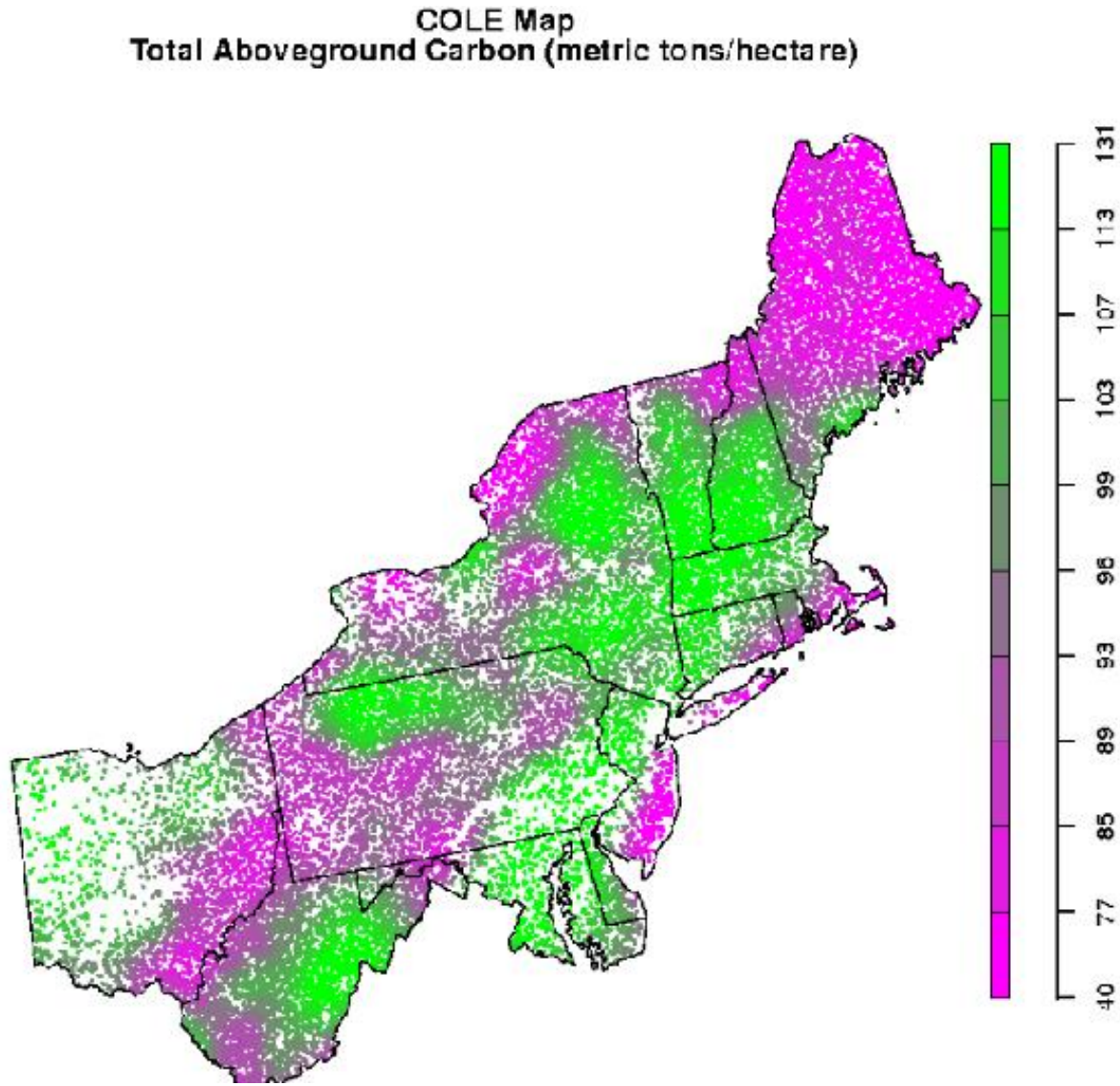

Documenting and Protecting New England's Old-Growth Forests
Written By:
Jack Ruddat
WPI


Sages Ravine (CT)
Brassi Brook (south)
Falls Brook
Tobey Pond
Roberts Brook
Lost/Dolphin Pond
Enders Falls
Wildcat Swamp
Matthies Grove
The Cathles
Talcott Mountain
Mohawk Mountain
State Park
Black Spruce Bog
Park River Tract
Hartford
Catlin Woods

Forests Store Carbon

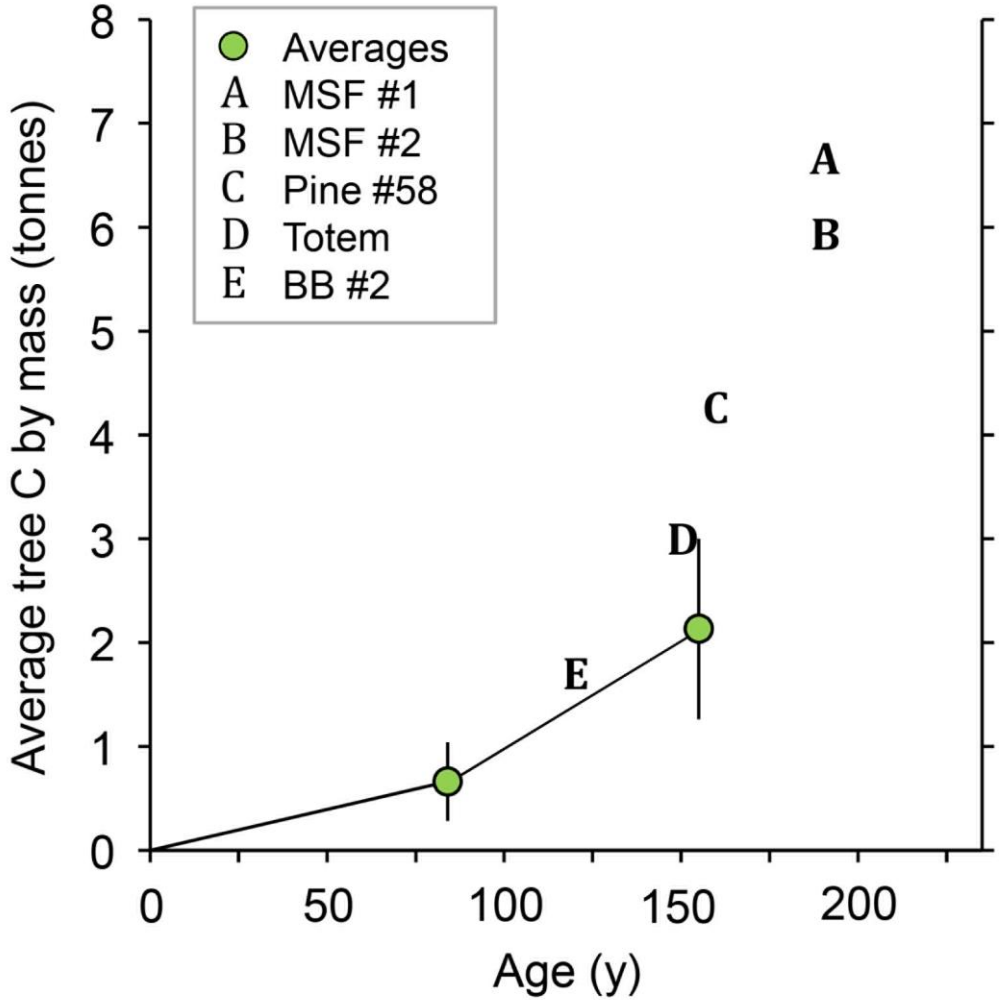


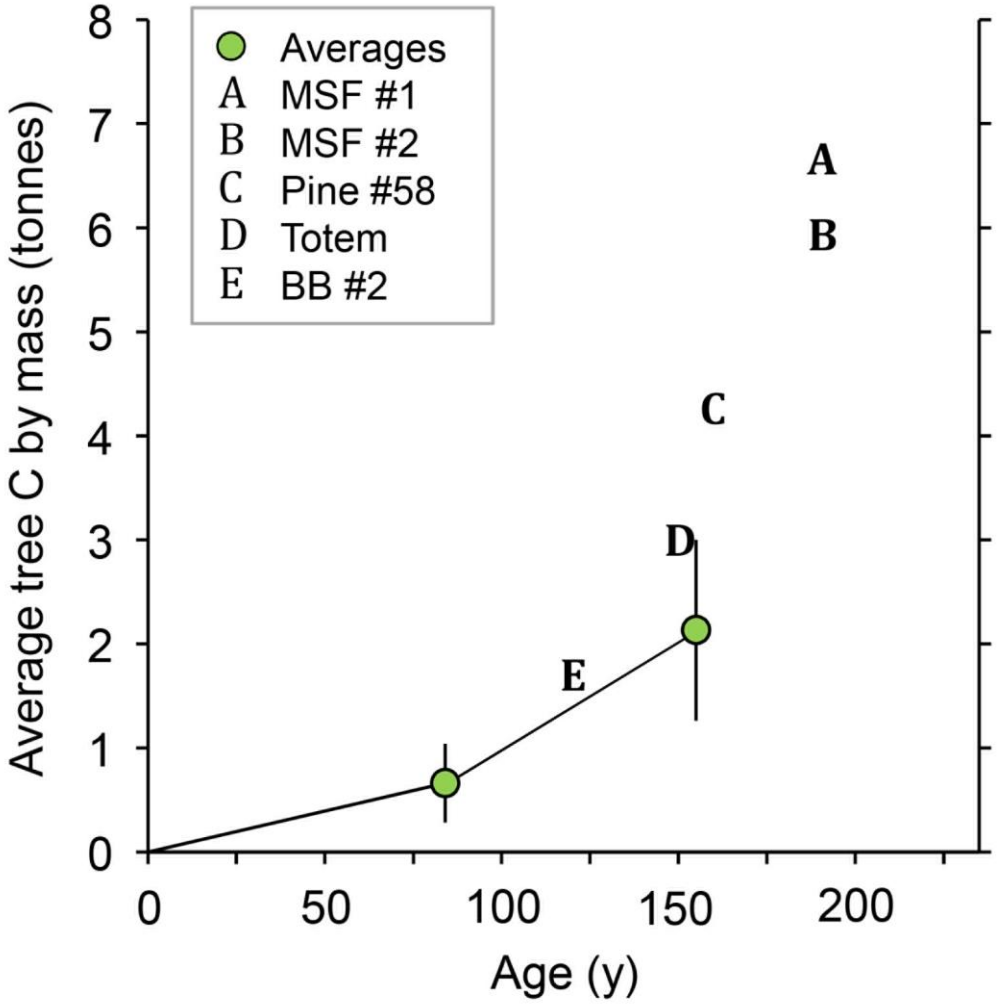
New England's forests provide a vast store-house of carbon that helps mitigate global climate change. Variation in the amounts of carbon, wood, and the size of trees across the region is largely due to the history of timber harvesting. Data are not represented for gray areas that are predominantly agricultural or densely populated.

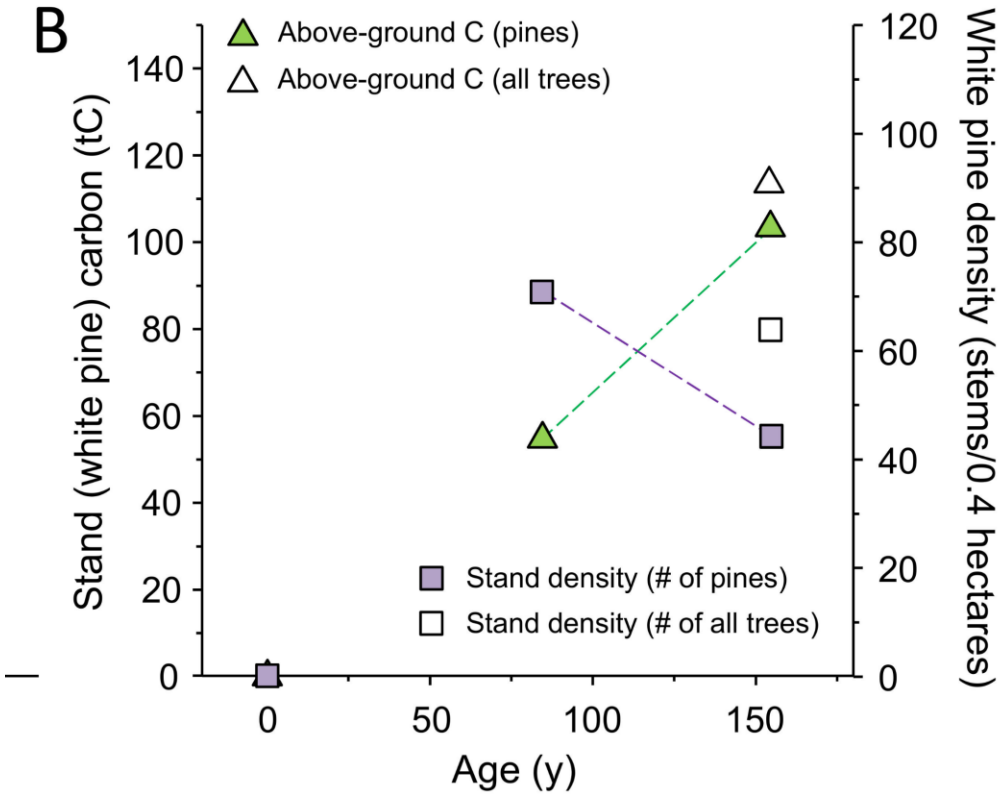


Older eastern white pine trees and stands sequester carbon for many decades and maximize cumulative carbon

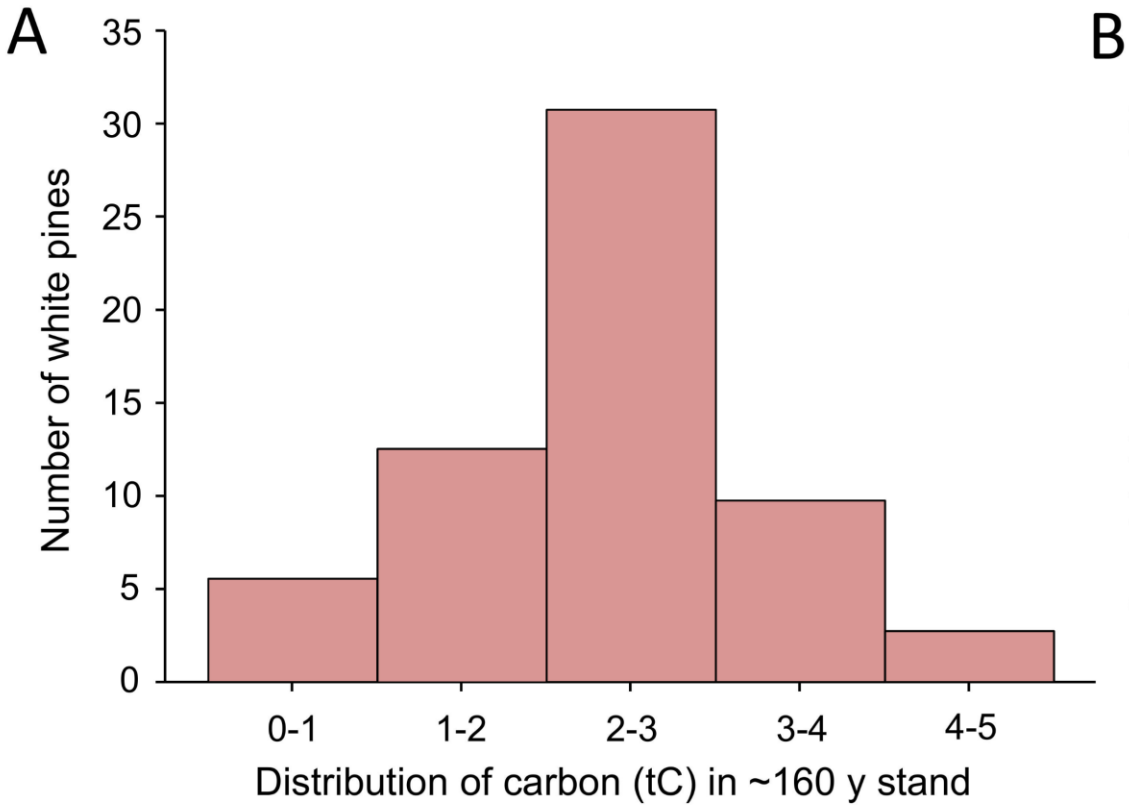
Robert T. Leverett, Susan A. Masino, William R. Moomaw

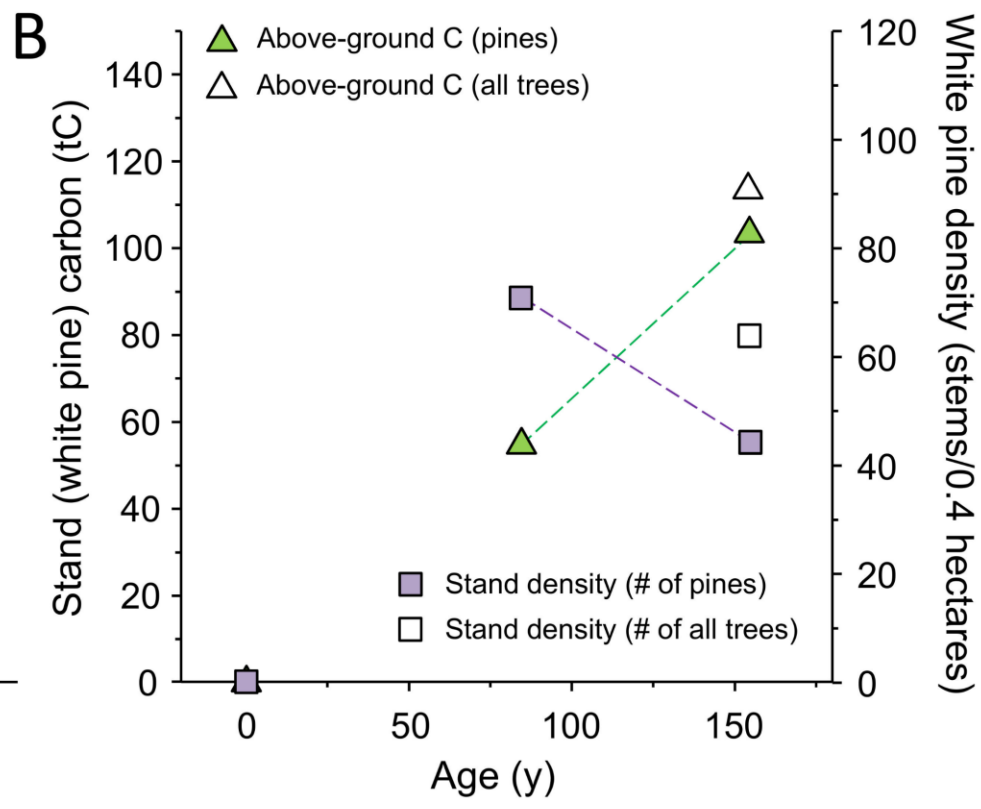






80 year old pine stand: 117.15 tC per hectare
160 year old (pine) stand: 236.0 tC per hectare





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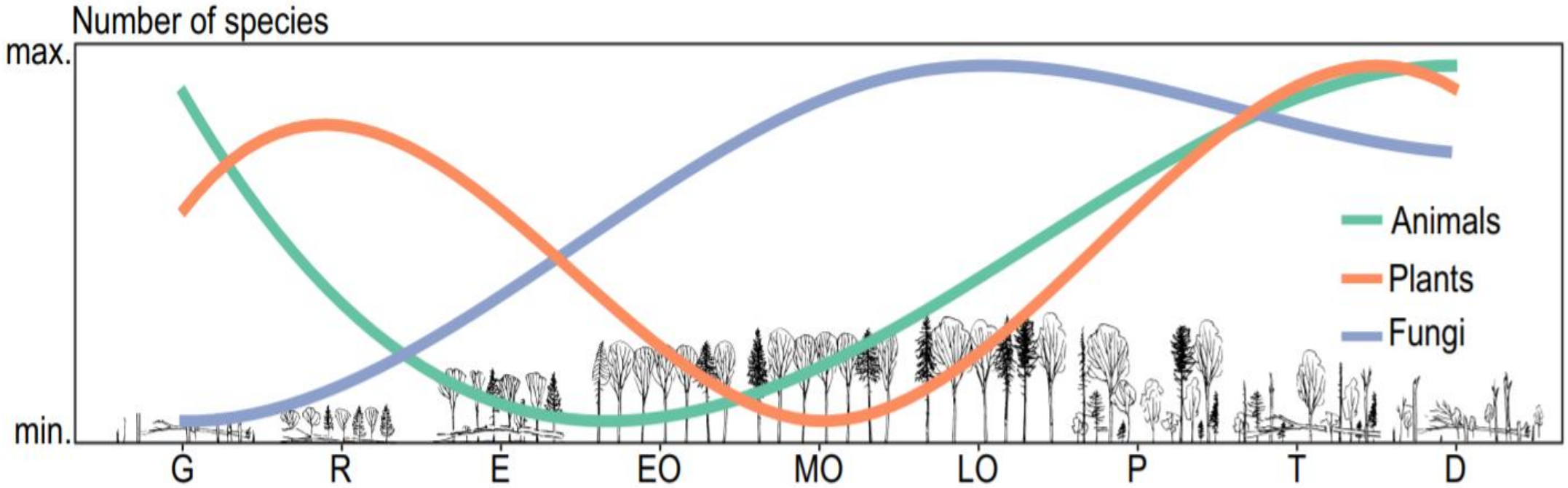
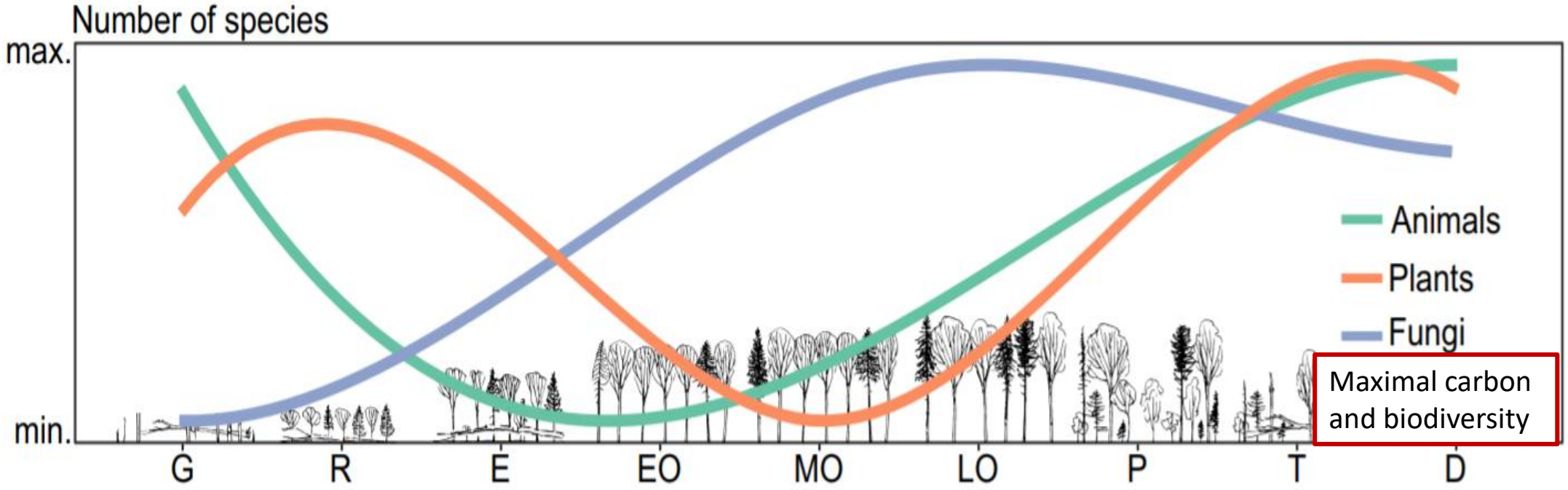


RESEARCH ARTICLE

Journal of Applied Ecology
BRITISH ECOLOGICAL SOCIETY

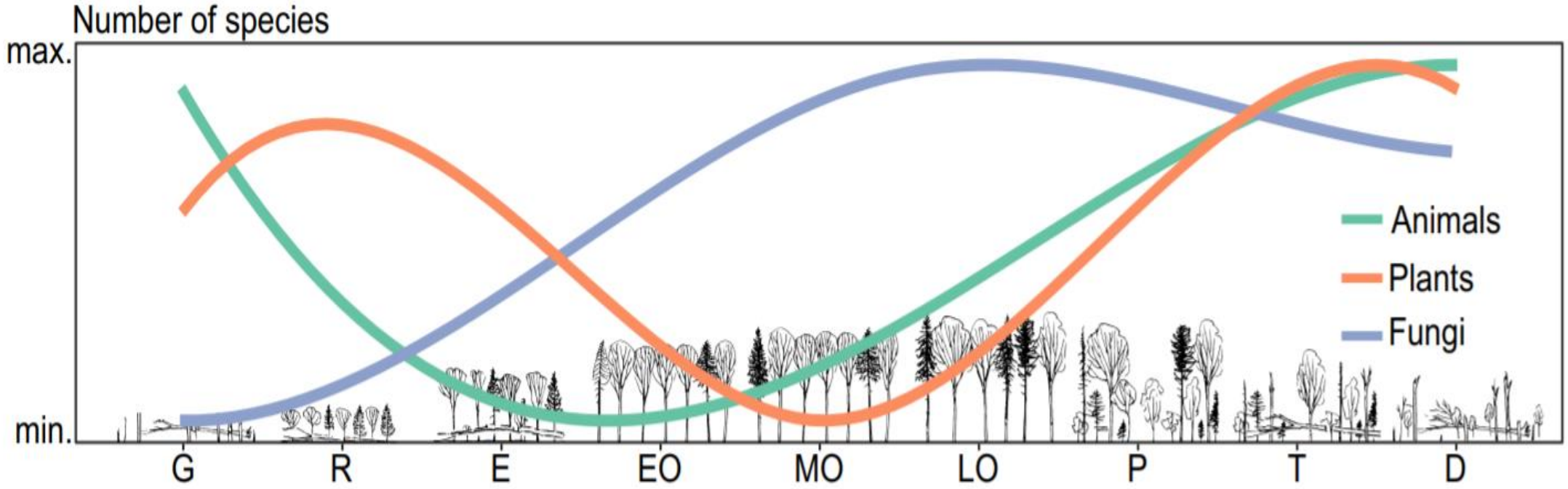
Biodiversity along temperate forest succession

Torben Hilmers[1] | Nicolas Friess[2] | Claus Bässler[3] | Marco Heurich[3] | Roland Brandl[2] | Hans Pretzsch[1] | Rupert Seidl[4] | Jörg Müller[3,5]



Current forests . . . . “old-growth”

genetic and epigenetic diversity . . . . . and so many unknowns . . . .

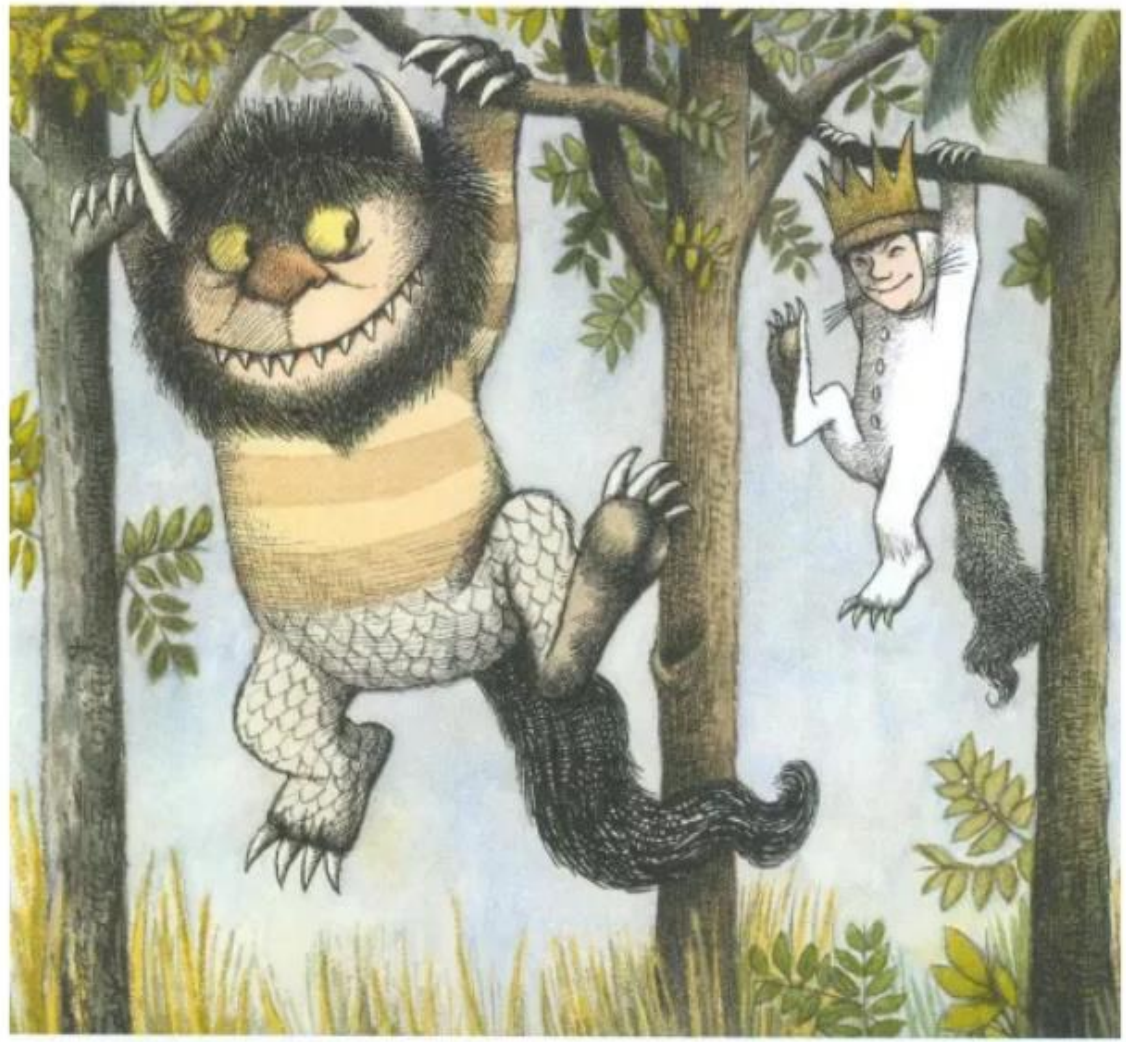


Wilderness areas halve the extinction risk of terrestrial biodiversity

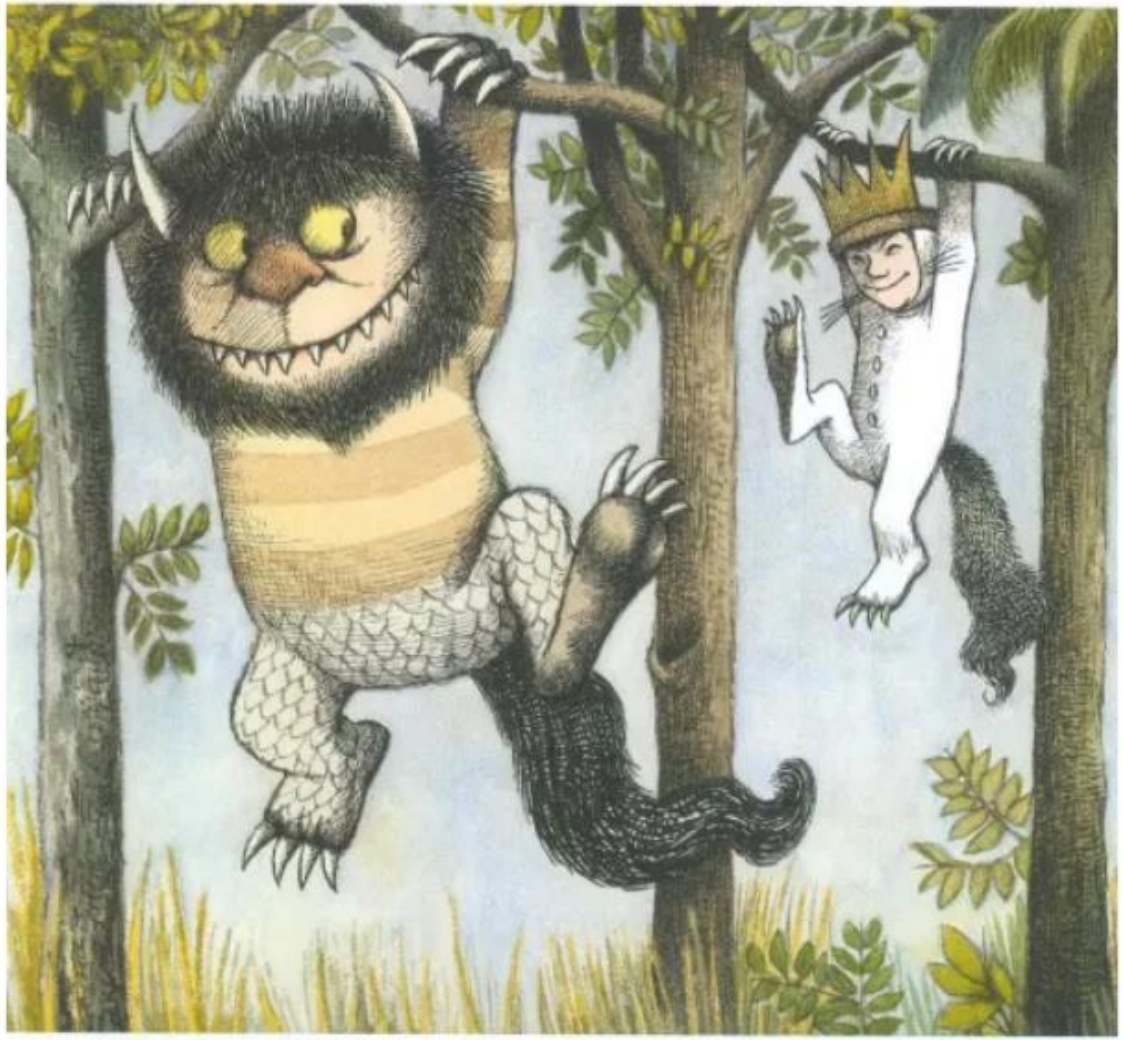
Moreno Di Marco[1,2*], Simon Ferrier[3], Tom D. Harwood[3], Andrew J. Hoskins[4] & James E. M. Watson[5,6]

Nature, 2019

WHERE THE WILD THINGS ARE



WHERE THE WILD WOODS ARE



Strategic Network of Nature

Research on East and West Coasts

Berkeley News

Rush of wild nature lowers PTSD in veterans, at-risk teens

The Healing Power of Awe

By Tom Valtin August 9, 2018

frontiers in Forests and Global Change

PERSPECTIVE
published: 11 June 2019
doi: 10.3389/ffgc.2019.00027

Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good

William R. Moomaw[1], Susan A. Masino[2,3] and Edward K. Faison[4]*

[1] Emeritus Professor, The Fletcher School and Co-director Global Development and Environment Institute, Tufts University, Medford, MA, United States, [2] Vernon Roosa Professor of Applied Science, Trinity College, Hartford, CT, United States, [3] Charles Bullard Fellow in Forest Research, Harvard Forest, Petersham, MA, United States, [4] Senior Ecologist, Highstead Foundation, Redding, CT, United States

Proforestation *is the practice of purposefully growing an existing forest intact* toward its full ecological potential . . . . to foster continuous growth for maximal carbon storage and ecological and structural complexity.*

**Managed as Gap 1 or Gap 2*

Ia Strict Nature Reserve: Category **Ia** are strictly protected areas to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.

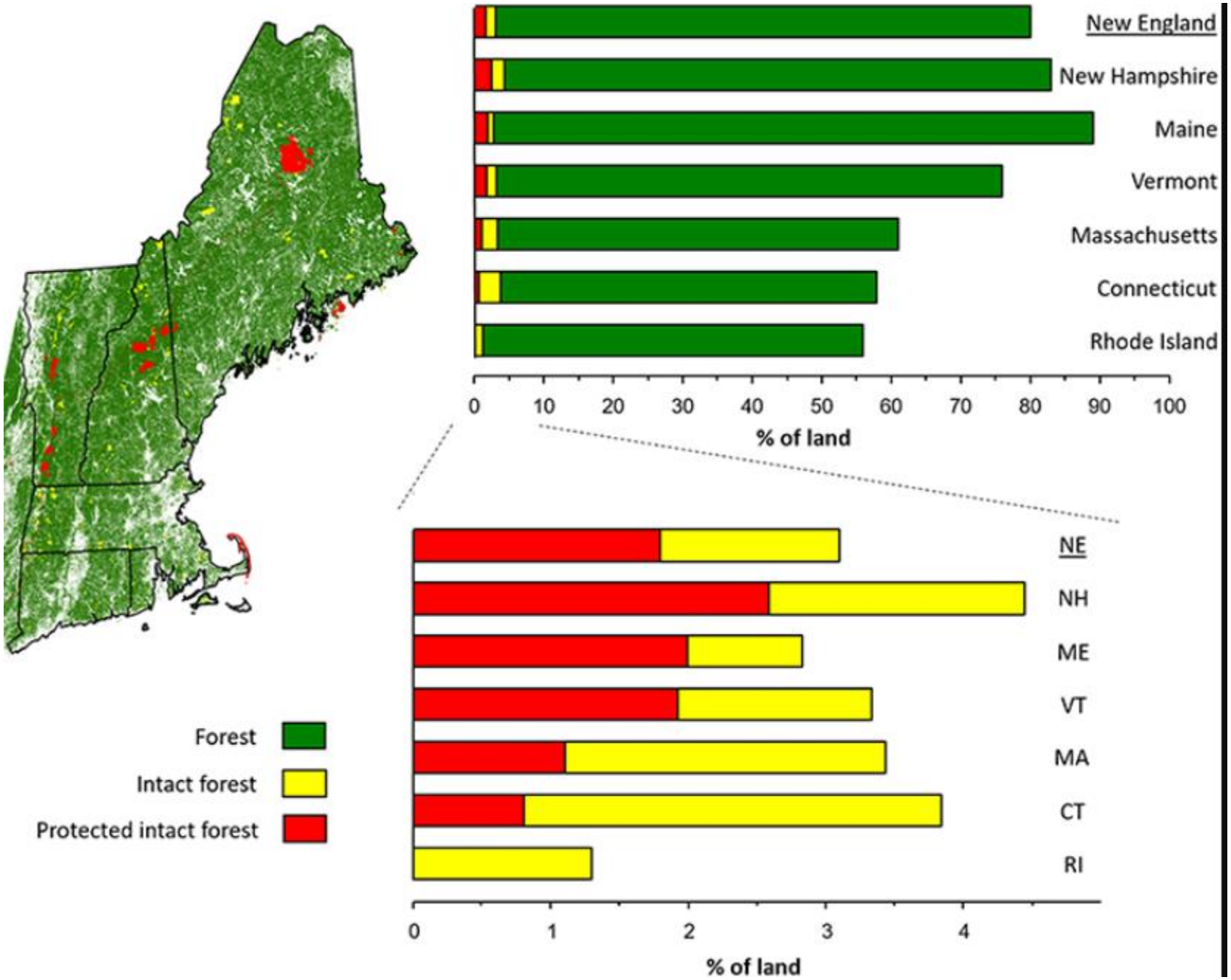
Ib Wilderness Area: Category **Ib** protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

II National Park: Category **II** protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.

“Natural Area Stewardship”

Only a tiny fraction of forest in New England is protected as an intact ecosystem.

(Gap 1/2)

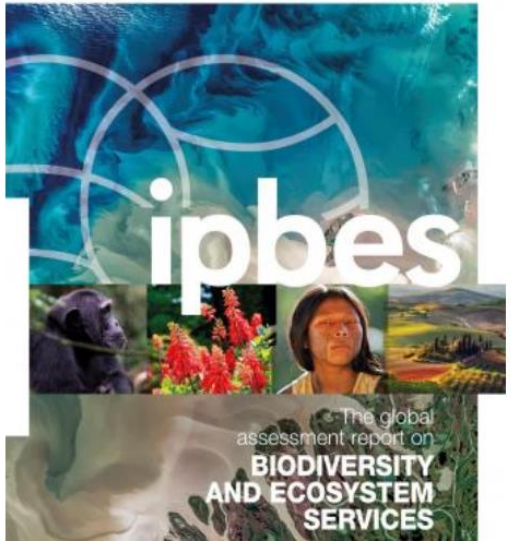


ECOSYSTEM CHARACTERISTICS				
Density of large trees (>60 cm DBH)	Eastern US	mid-Atlantic oak-hickory forests, northern hemlock-hardwood forests, and boreal spruce-fir forests	Intact (81% greater)	Miller et al., 2016
Proportion of old forest	Eastern US	Same as above	Intact	Miller et al., 2016
Basal area of dead standing trees	Eastern US	Same as above	Intact	Miller et al., 2016
Coarse woody debris volume	Eastern US	Same as above	Intact (135% greater)	Miller et al., 2016
Carbon storage	Pacific Northwest US	Douglas fir and western hemlock;	Intact (75–138% greater)	Harmon et al., 1990
Carbon storage	Northeastern US	Northern hardwood conifer	Intact (39–118% greater)	Nunery and Keeton, 2010
Forest fire burn severity	Western US	Pine and mixed conifer forests	Managed (two SEs greater)	Bradley et al., 2016
BIODIVERSITY				
Tree species richness	Eastern US	mid-Atlantic oak-hickory forests, northern hemlock-hardwood forests, and boreal spruce-fir forests	Intact	Miller et al., 2018
Proportion rare tree species	Eastern US	Same as above	Intact	Miller et al., 2018
Bird species richness and abundance	Northeastern Minnesota	Hemi-boreal	Intact (12–20% greater)	Zlonis and Niemi, 2014
Trunk bryophyte and lichen species richness	Northwestern Montana	Grand-fir	Intact (33% greater)	Lesica et al., 1991
Salamander density	Ozark Mountains, Missouri	Oak-hickory	Intact (395–9,500% greater)	Herbeck and Larsen, 1999
Probability of occurrence of invasive plant species	Eastern US	Deciduous and mixed forest	managed	Riitters et al., 2018

GLOBAL SAFETY NET

The first global-scale analysis of land areas requiring protection to solve the twin crises of biodiversity loss and climate change, upholding and strengthening Indigenous land rights.

Global Assessment Report on Biodiversity and Ecosystem Services



SCIENCE POLICY

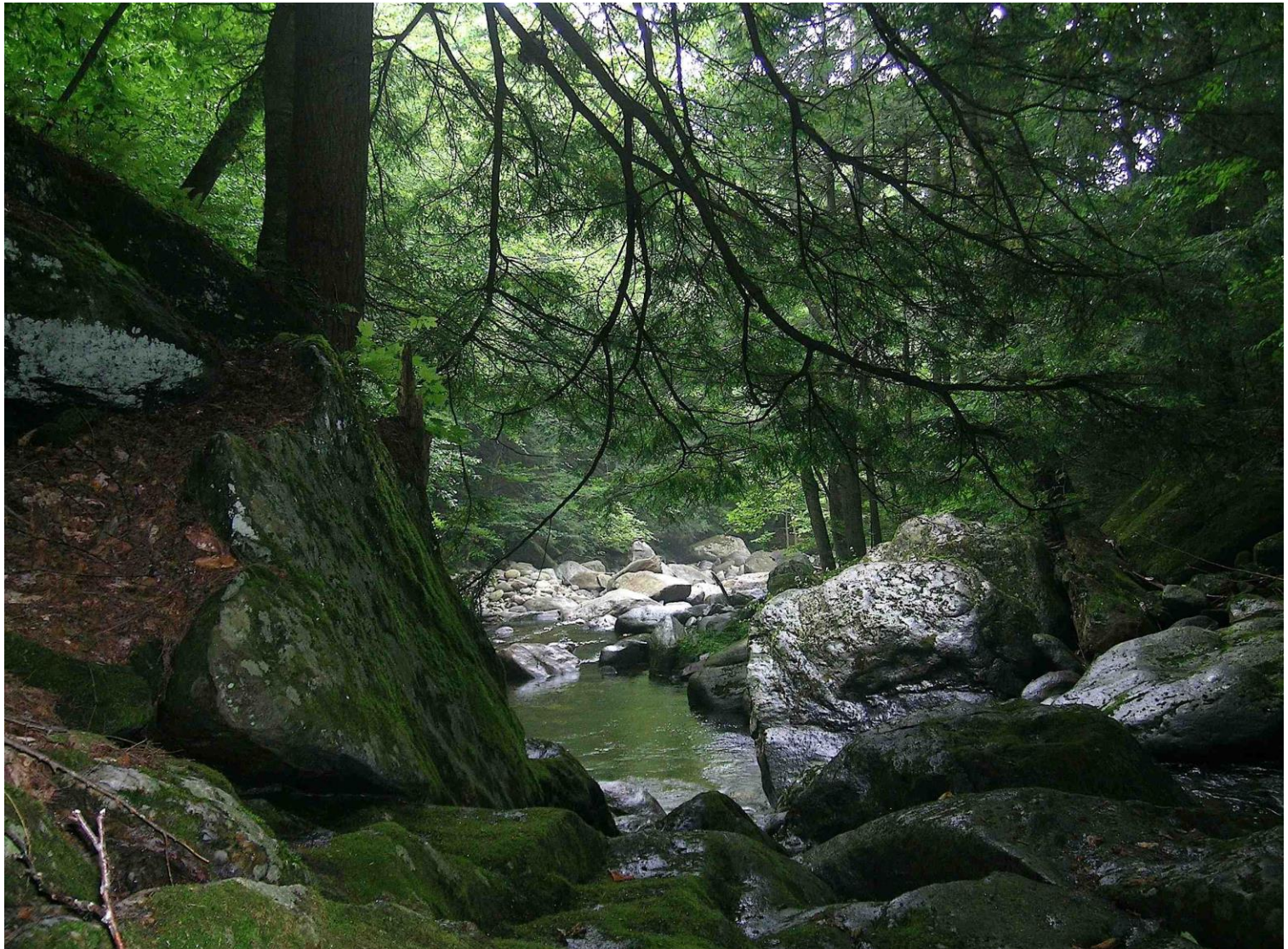
A Global Deal For Nature: Guiding principles, milestones, and targets

E. Dinerstein[1]*, C. Vynne[1], E. Sala[2], A. R. Joshi[3], S. Fernando[1], T. E. Lovejoy[4], J. Mayorga[2,5], D. Olson[6], G. P. Asner[7], J. E. M. Baillie[2], N. D. Burgess[8], K. Burkart[9], R. F. Noss[10], Y. P. Zhang[11], A. Baccini[12], T. Birch[13], N. Hahn[1,14], L. N. Joppa[15], E. Wikramanayake[16]

(1) protecting biodiversity
(2) mitigating climate change
(3) reducing threats to ecosystem intactness and persistence of species.

Multiple essential benefits of natural (forest) ecosystems:

mitigate climate change and flood risk; protect biodiversity, clean air and water; support working lands, public health and mental health; safeguard science, education, and the unknown.



Essentials and Lifelines Related to Natural Solutions

WATER RESOURCES: ***"it's all important"***

STRATEGIC NETWORK OF NATURE: ***Global Deal for Nature and "30 x 30"***

Specific areas that need strong protection: old-growth, natural (future old-growth) and core forests, special habitats, corridors, *areas without invasive plants.*

Opportunities to protect and connect intact ecosystems across the landscape.

Proforestation contributes to climate mitigation, biodiversity and public health.

Essentials and Lifelines Related to Natural Solutions

WATER RESOURCES: ***"it's all important"***

STRATEGIC NETWORK OF NATURE: ***Global Deal for Nature and "30 x 30"***

Opportunities to promote humility and compassion.
Opportunities for scientific discovery – "All Creatures Great and Small"
- soil microbiome, insects, epigenetics, ecological networks

Critical to balance areas for natural processes vs. research vs. resource extraction.
Energy policies and energy siting are critical factors. . . .

Essentials and Lifelines Related to Natural Solutions

WATER RESOURCES: *"it's all important"*

STRATEGIC NETWORK OF NATURE: *Global Deal for Nature and "30 x 30"*

LOCAL SYSTEMS: *farms, forest-based businesses – "community lifelines"*

PUBLIC HEALTH: *emerging research, local benefits; education and preventative medicine*

RESEARCH: *need baselines, control groups, long-term data collection (soil, insects)*

Local systems, resource use / reuse is multisolving

Equipment co-ops can expand products and access

WORKING LANDS – INVEST IN LOCAL:

Prioritize local farms with SNAP benefits ($2 for $1)

Support local farms and farmers in their *primary mission*.

Invest in local supply chains for money, jobs and resources.

Natural land supports working land – we need BOTH, and a strategic balance among active management, monitoring and stewardship.

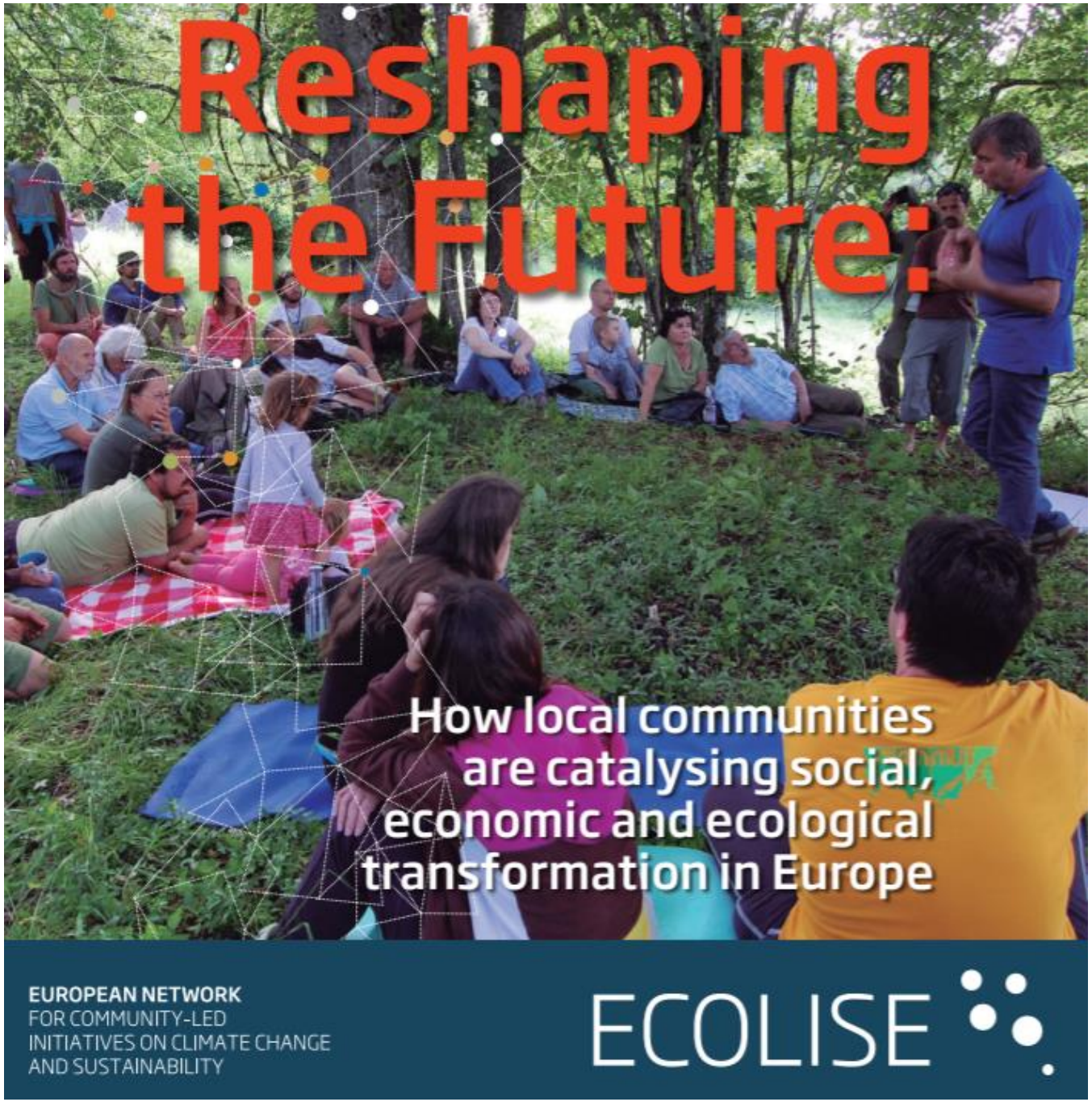
“Yankee values”

Community education and action leverages multisolving and is ***essential for change.***

An increased sense of ***fairness and compassion*** increases action on climate.

Demonstrate and quantify multiple benefits in pilot regions, centered on ***essentials***:

- *natural infrastructure*
- *clean water*
- *community resilience*



- *“It is no coincidence that some of the most carbon-rich ecosystems on land—natural forests—also harbor high levels of biodiversity. Evolution has generated carbon-rich forests by packing in long-lived trees that also feed stable soil carbon storage pools . . . . . made possible by high levels of coexistence among diverse species and growth forms . . . made possible by the biotic interactions that generate competition and defense . . . . pests, pathogens, pollinators, decomposers, and predators . . . . take the carbon out of the atmosphere.”*

Interdisciplinary Science + Common sense + Public Opinion + Fiscal Responsibility


Thank you!
susan.masino@trincoll.edu