

Nature, Health, and Climate Change: A Research Agenda

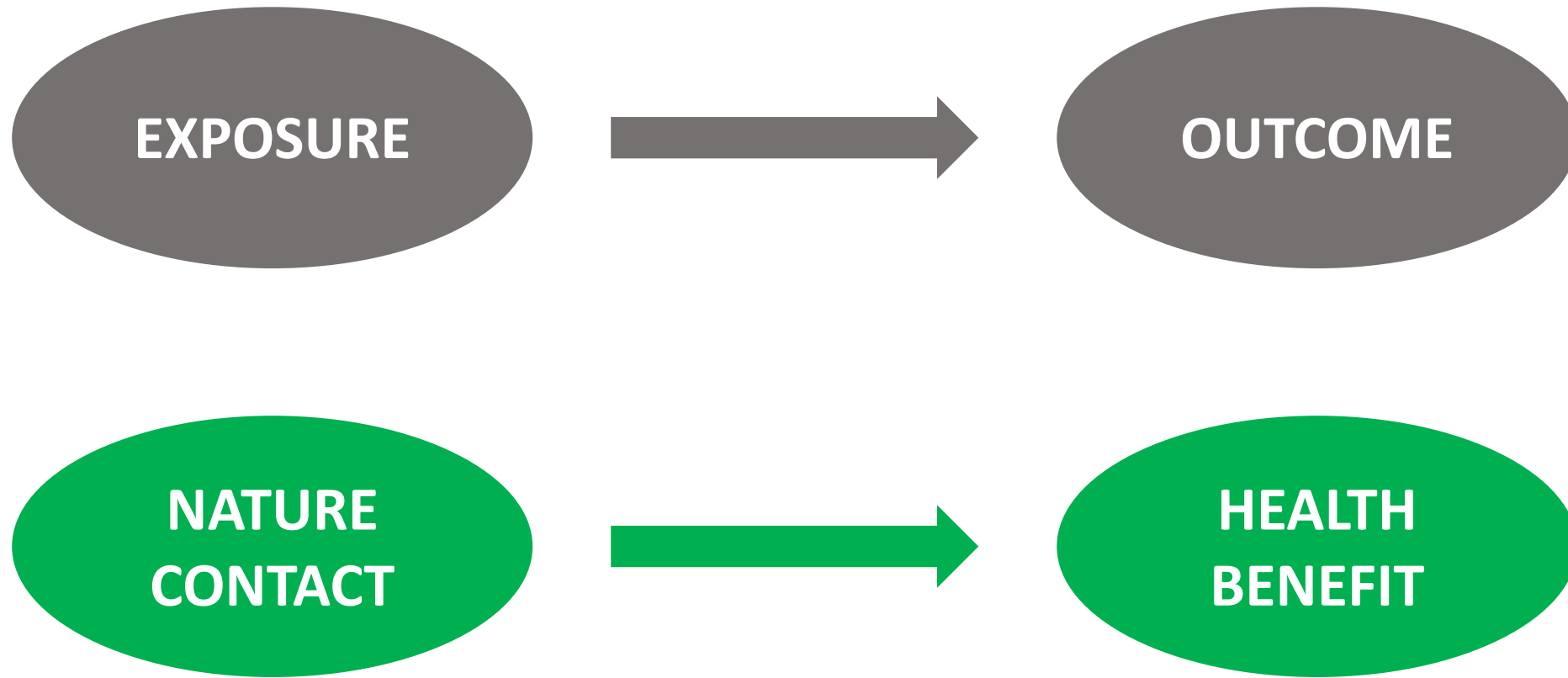
Medical Society Consortium on Climate and Health
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The environmental health paradigm



Health benefits of nature contact



↓ STRESS



IMPROVED SLEEP



↓ ANXIETY & DEPRESSION



GREATER HAPPINESS



↓ AGGRESSION



PROSOCIAL BEHAVIOR



REDUCED ADHD SYMPTOMS



PHYSICAL ACTIVITY



↓ BLOOD PRESSURE



FASTER POST-OP RECOVERY



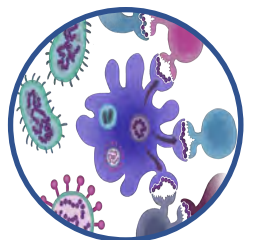
IMPROVED BIRTH OUTCOMES



PAIN CONTROL



↓ OBESITY



↑ IMMUNE FUNCTION



↓ DIABETES



BETTER EYESIGHT



+/- ASTHMA IMPACTS



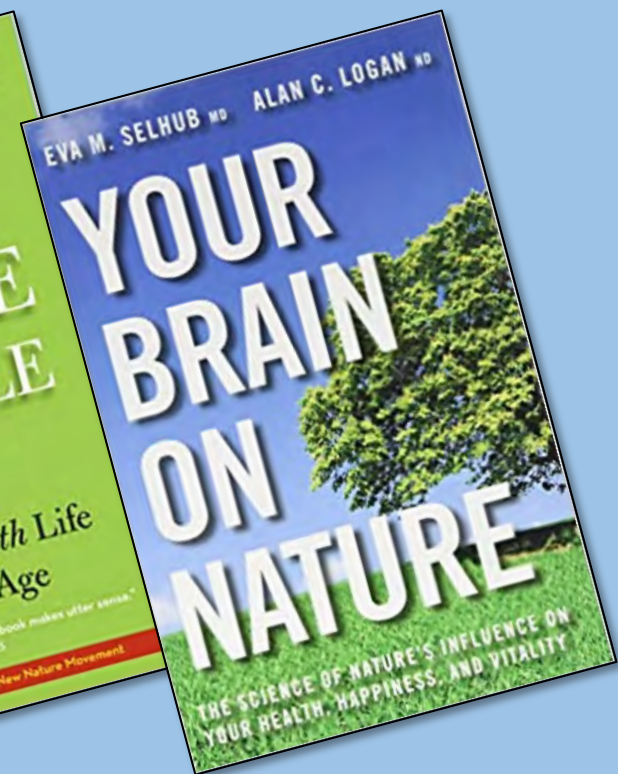
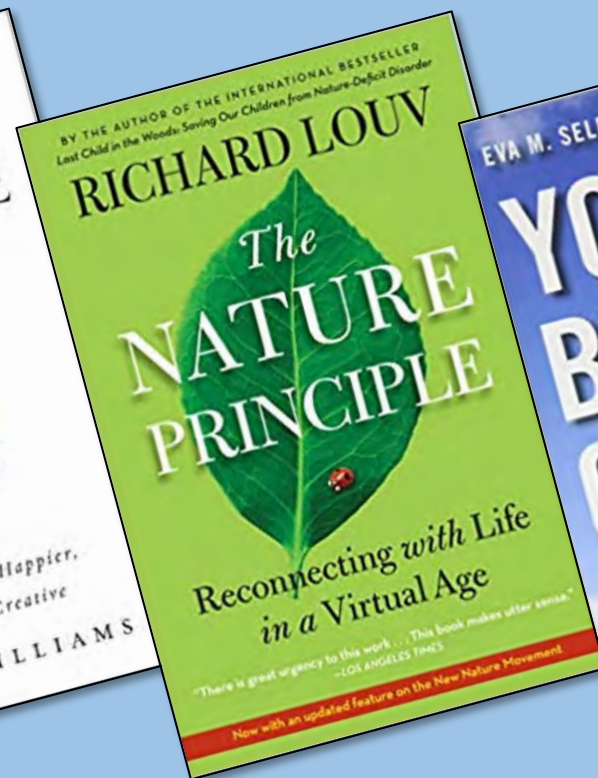
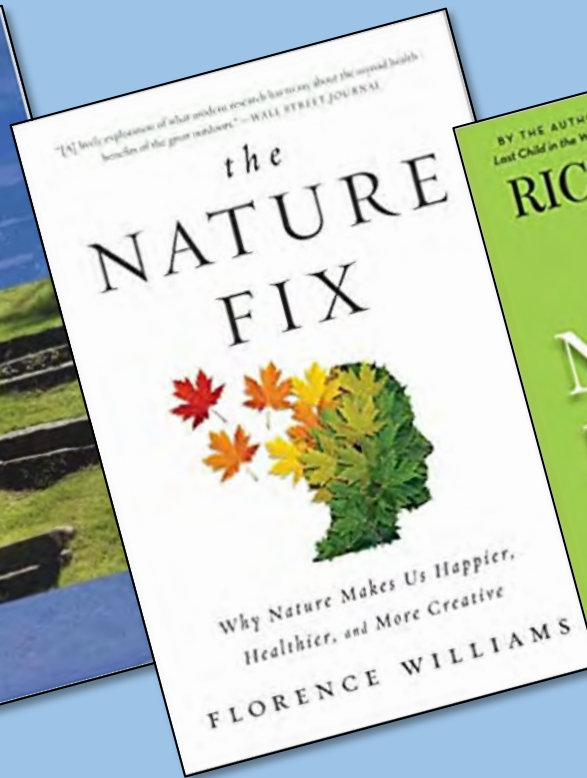
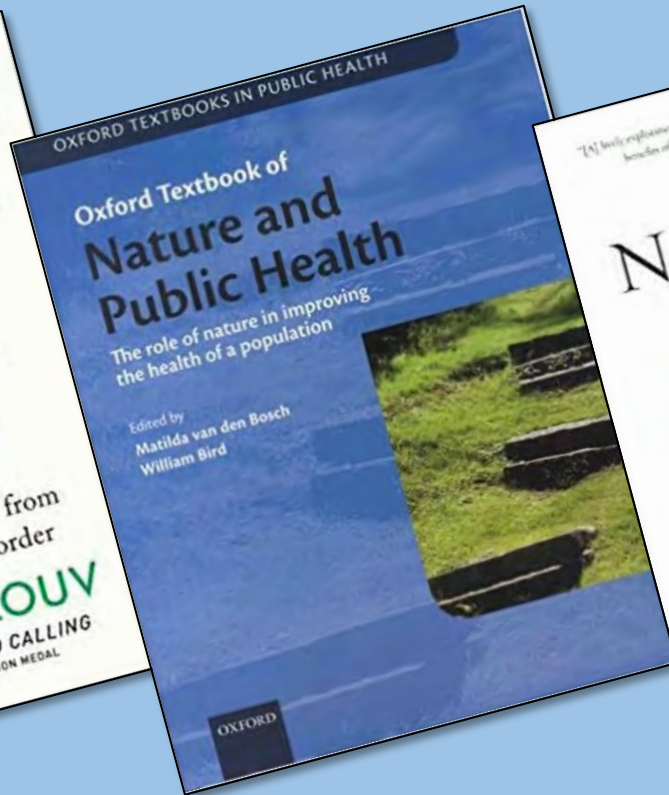
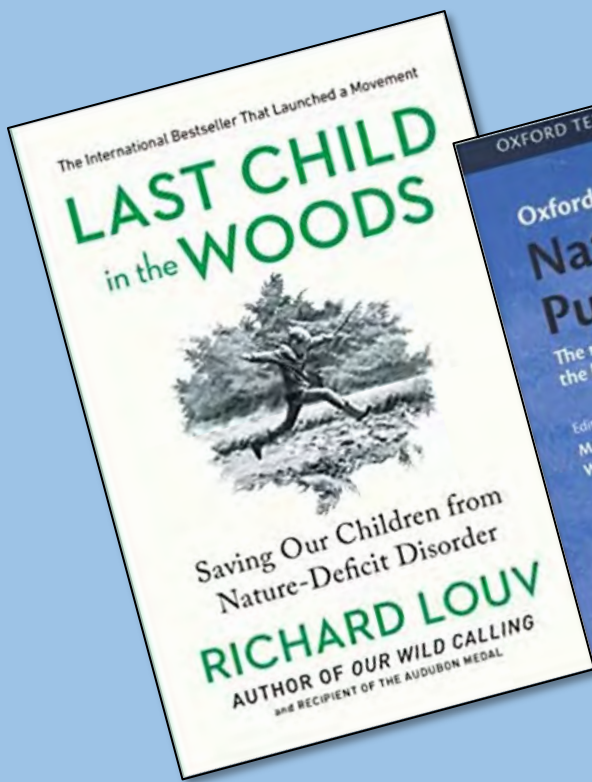
↑ HEALTH IN CANCER PTS



↑ GENERAL HEALTH



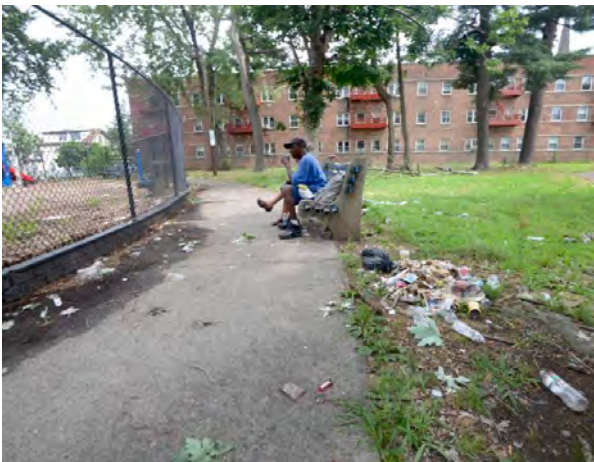
LONGER LIVES



Healthy Parks Healthy People

Health benefits of nature contact: Diversity & equity

Disparities in access



Health benefits of nature contact: Diversity & equity

Disparities in access

Cultural variation in nature preferences



Health benefits of nature contact: Diversity & equity

Disparities in access

Cultural variation in nature preferences

Disproportionate nature benefits for vulnerable populations?



Effect of exposure to natural environment on health inequalities: an observational population study

Richard Mitchell, Frank Popham

Health benefits of nature contact: Diversity & equity

Disparities in access

Cultural variation in nature preferences

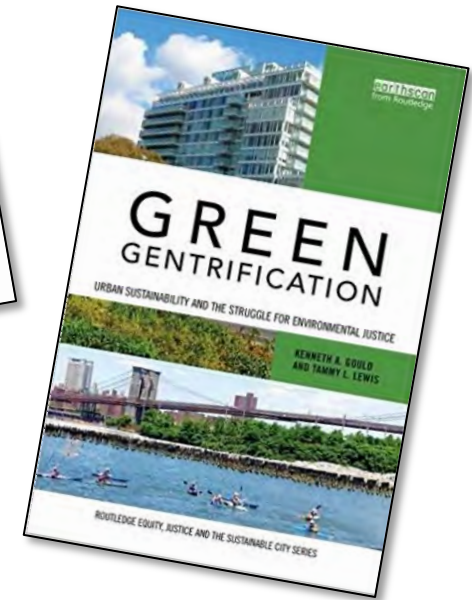
Disproportionate nature benefits for vulnerable populations?

Green gentrification

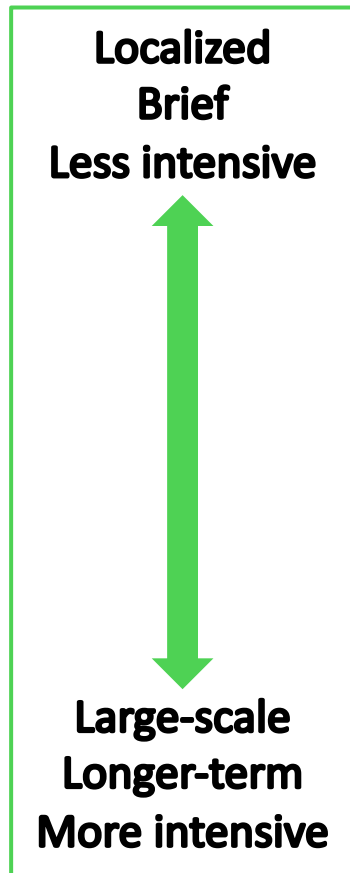


Effect of exposure to natural environment on health inequalities: an observational population study

Richard Mitchell, Frank Popham



Where does nature contact happen?



- Small-scale nearby nature (e.g. potted plants in a room)
- Visual contact with nature (e.g. viewing a landscape through a window)
- Residential proximity (e.g. living in a green neighborhood or near a park).
- Hands-on engagement (e.g. gardening).
- Exercise in natural settings (“green exercise”)
- Therapeutic contact with nature (e.g. horticultural therapy)
- Immersive experiences (e.g. wilderness adventures)

When does nature provide not just **health benefits**, but also **climate benefits**?



Urban parks and greenspace



Health benefits

- Venues for physical activity
- Social connectedness
- Protection from sunlight
- Mental health and spiritual fulfillment
- Noise reduction



Climate benefits

- Cooling hot cities
- Reduced energy demand
- Carbon sequestration
- Decreased air pollution

Large-scale land conservation



Health benefits

- Healthy food
- Source water protection
- Recreational opportunities
- Mental health and spiritual fulfillment



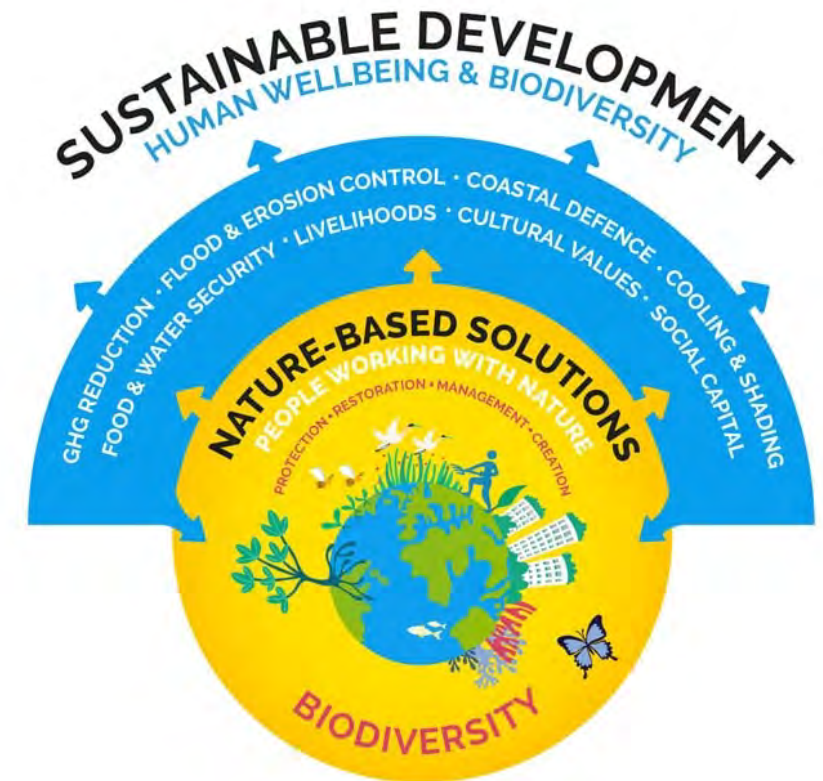
Climate benefits

- Carbon sequestration (vegetation, soil)
- Biodiversity protection

Nature-based solutions

“Working with nature to address societal challenges, providing benefits for both human well-being and biodiversity”

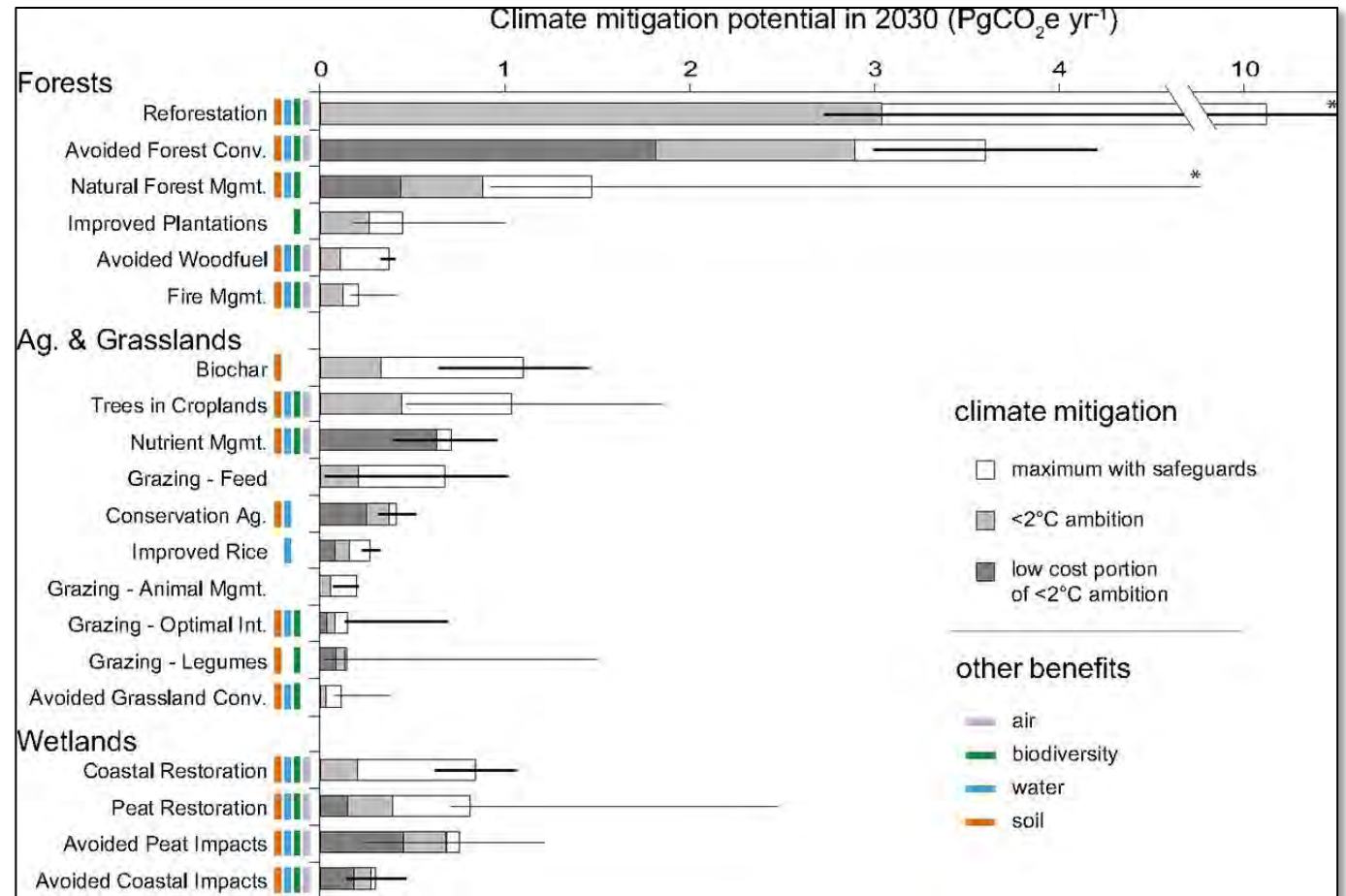
- Protecting, restoring, and managing natural and semi-natural ecosystems.
- Sustainably managing aquatic systems and working lands such as croplands or timberlands.
- Creating novel ecosystems in and around cities.



Natural climate solutions

“Conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions in landscapes and wetlands”

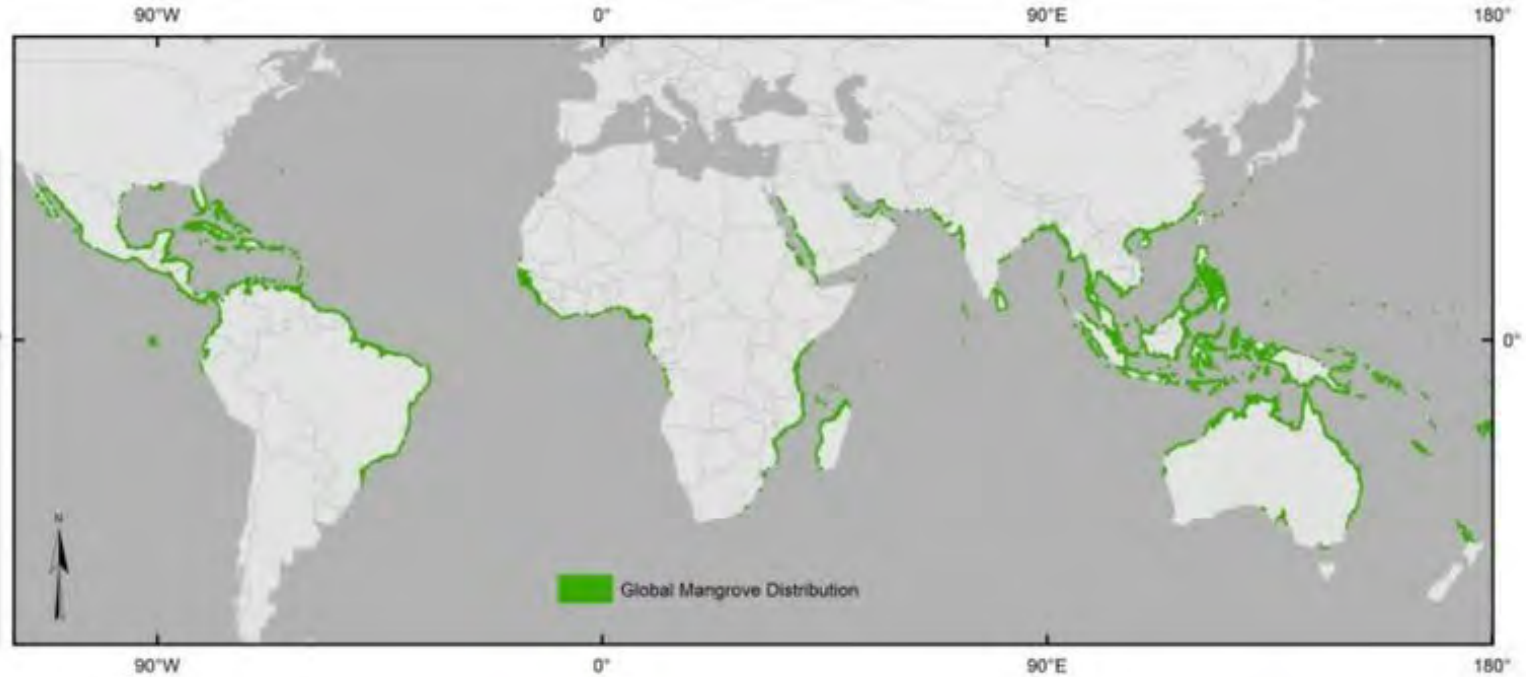
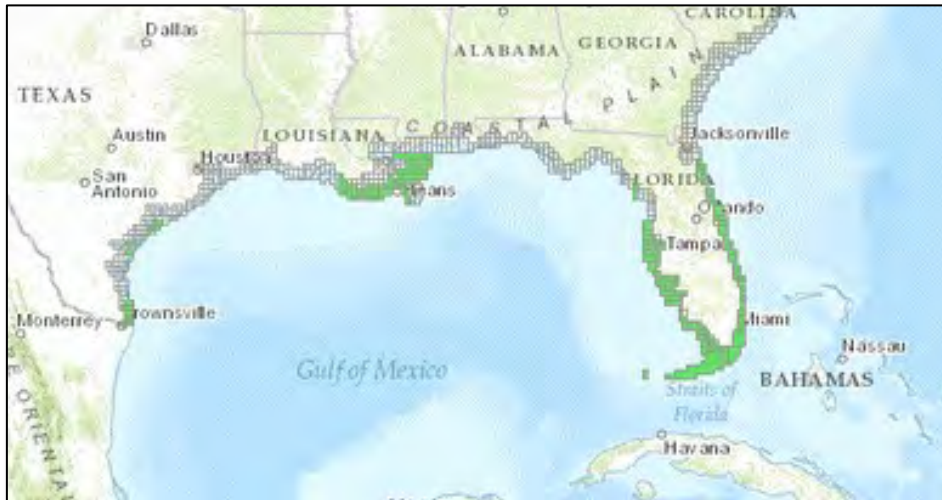
- Could provide up to 37% of needed CO₂e mitigation through 2030 for 2°C pathway.



Mangrove forests



Mangrove forests, US and global



Osland MJ, Enwright N, Day RH, et al. Winter climate change and coastal wetland foundation species: salt marshes vs. mangrove forests in the southeastern United States. *Global Change Biology* 2013;19(5):1482-94.

<http://www.coastalwiki.org/wiki/File:MangroveWorldMap.jpg>

Mangrove forests: Flood protection

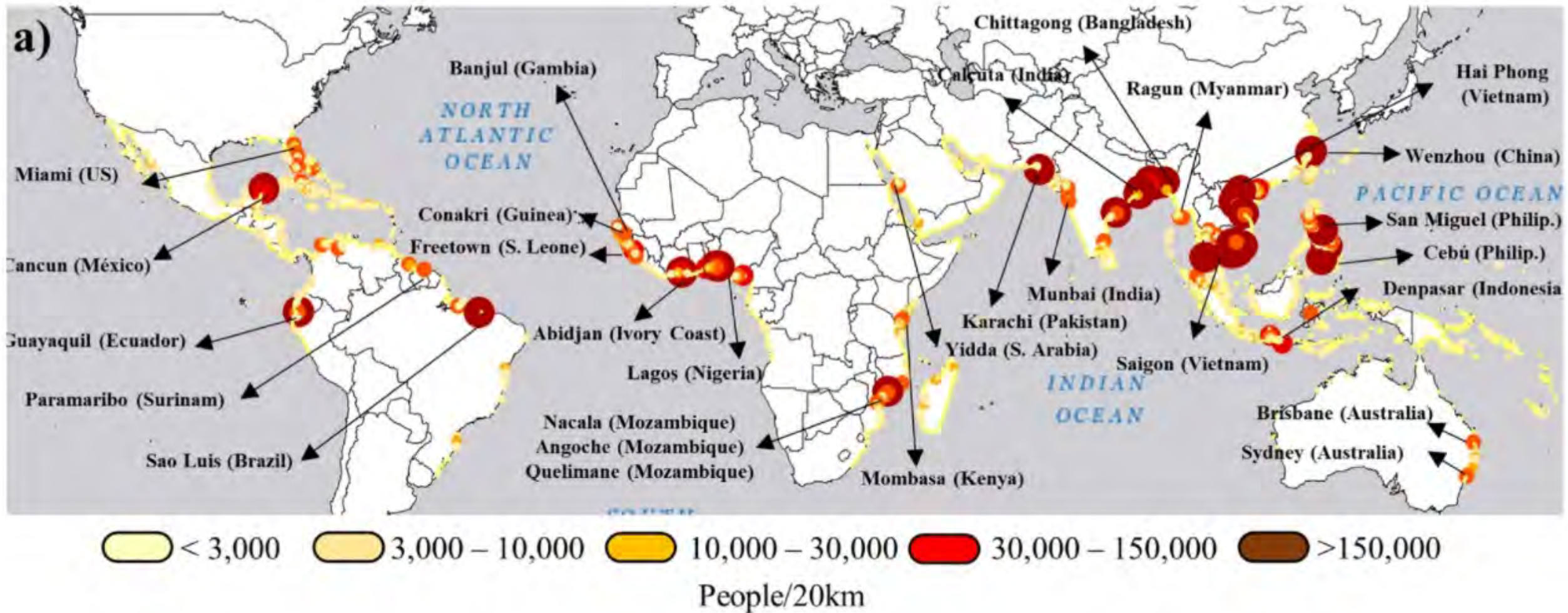
**IMPACT WITH
MANGROVES**



**IMPACT WITHOUT
MANGROVES**



Mangrove forests: Human benefits of flood protection



Health benefits of mangroves

- Flood protection
- Food
- Water quality
- Economic benefits (fish nurseries, forest products)
- Medications

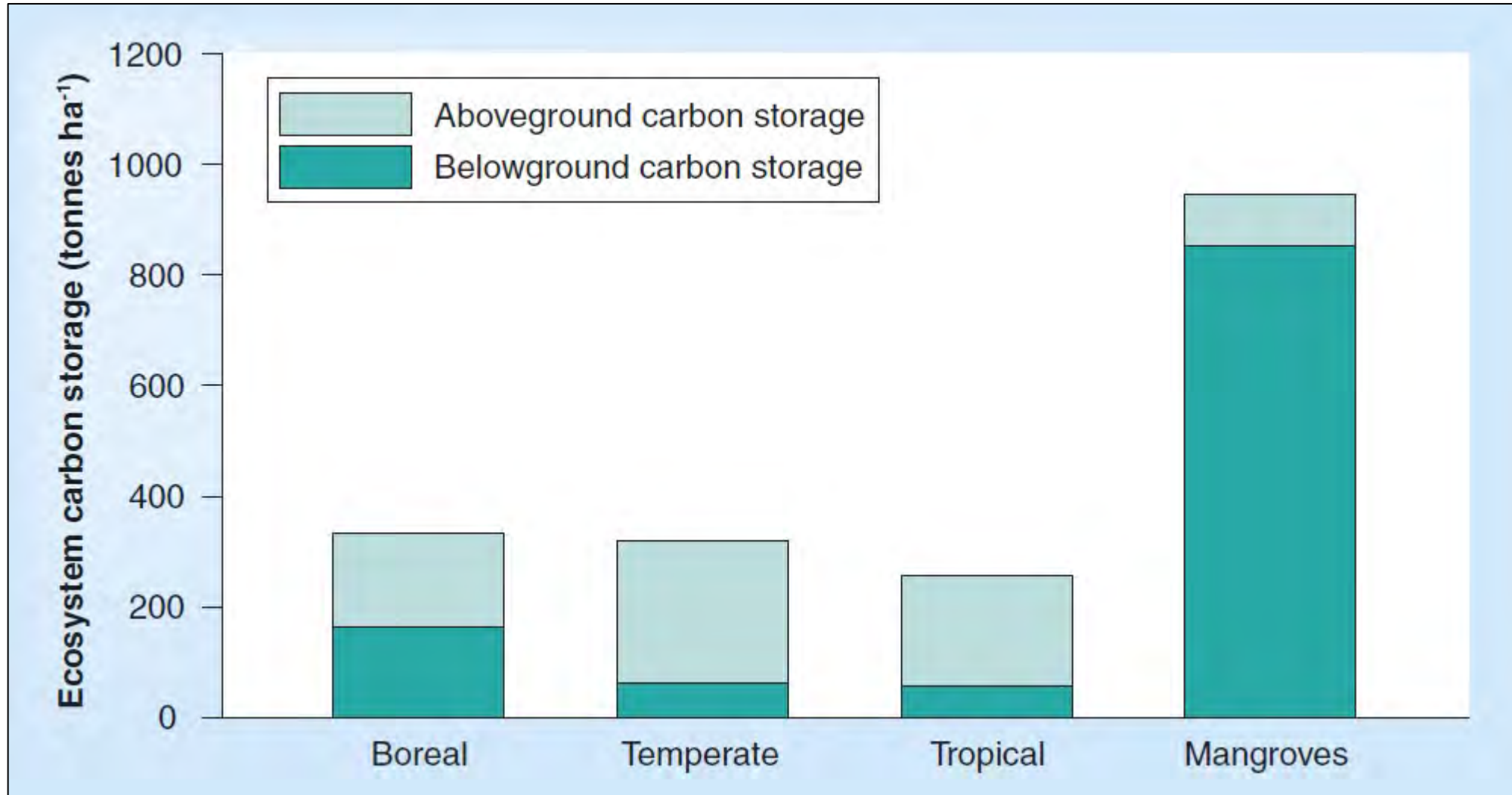


Review
Carbon sequestration in mangrove forests
Daniel M Alongi
Pages 313-322 | Published online: 10 Apr 2014

Traditional and medicinal uses of mangroves
[W.M. Bandaranayake](#)
[Mangroves and Salt Marshes](#) 2, 133-148(1998) | [Cite this article](#)

Mangroves: nurseries for the world's seafood supply

Mangrove forests: Prodigious carbon storage



Yanweizhou Park, Jinhua City, eastern China



Hunter's Point South Park, Long Island City NY: A climate-resilient park that is “both amenity and armor”



Chulalongkorn University Centenary Park, Bangkok



An 11-acre park including Thailand's largest green roof directs rainwater into a 1-million-gallon retention system, reducing pressure on underground drainage and sewer systems, and reducing the urban heat island.



Streetscape stormwater management



Sheffield, UK: Permeable lane surfaces, planters, rain gardens for stormwater management.

Nature, health, and climate change: Federal solutions

- American Jobs Plan
 - “President Biden’s plan will protect and, where necessary, restore nature-based infrastructure – our lands, forests, wetlands, watersheds, and coastal and ocean resources.”
- America the Beautiful Plan: Conserve 30% of the nation’s land and water by 2030
- President’s 2022 budget
 - ↑ DOI funding including for national parks, Civilian Climate Corps, post-wildfire ecosystem rehabilitation

American Jobs Plan Investment	Funding (\$ billion)
Transportation	\$621
Home care	\$400
Manufacturing	\$300
Housing	\$213
R&D	\$180
Water	\$111
Schools	\$100
Digital infrastructure	\$100
Workforce development	\$100
VA hospitals, Fed. bldgs.	\$18

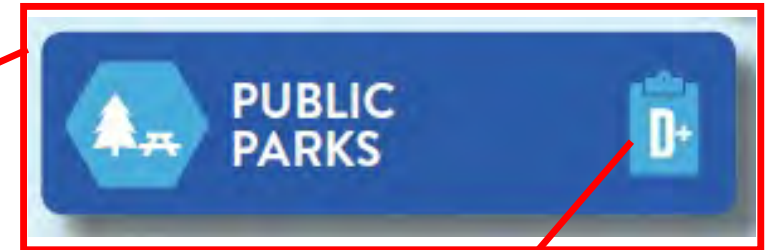
Nature, health, and climate change: Federal solutions

- Executive orders
 - Moratorium on oil and gas leases in ANWR
 - Review reduction of Bears Ears & Grand Staircase–Escalante National Monuments
- Legislation
 - Great American Outdoors Act (2020):
 - Land and Water Conservation fund (\$900M/year)
 - NPS funding (includes \$1.9B/year x 5Y for maintenance backlog)

Deferred park maintenance:

- National parks: \$12 billion

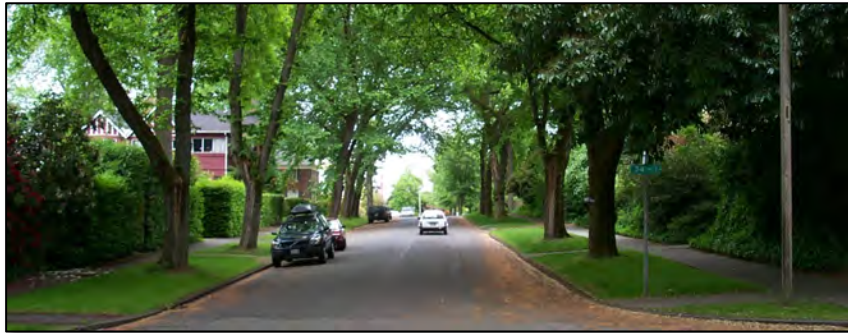
Nature, health, and climate change: State & local solutions



Deferred park maintenance:

- State parks: \$5.6 billion
- Local parks: \$60 billion

Nature, health, and climate change: State & local solutions



- State and local park funding
 - Climate resilience
 - Equity
- Nature-based climate solutions
 - Tree canopy
 - Coastal defenses
 - Stormwater management
- Urban agriculture

Summary

- Nature contact offers a wide range of health benefits
- These benefits are inequitably distributed
- Nature contact occurs across a range of settings and spatial scales
- Health – climate co-benefits arise in
 - Urban parks and greenspace
 - Land conservation
 - Nature-based solutions
- Multiple policy implication
 - Federal
 - State and local