Wildfire emissions estimation and reporting in the U.S.

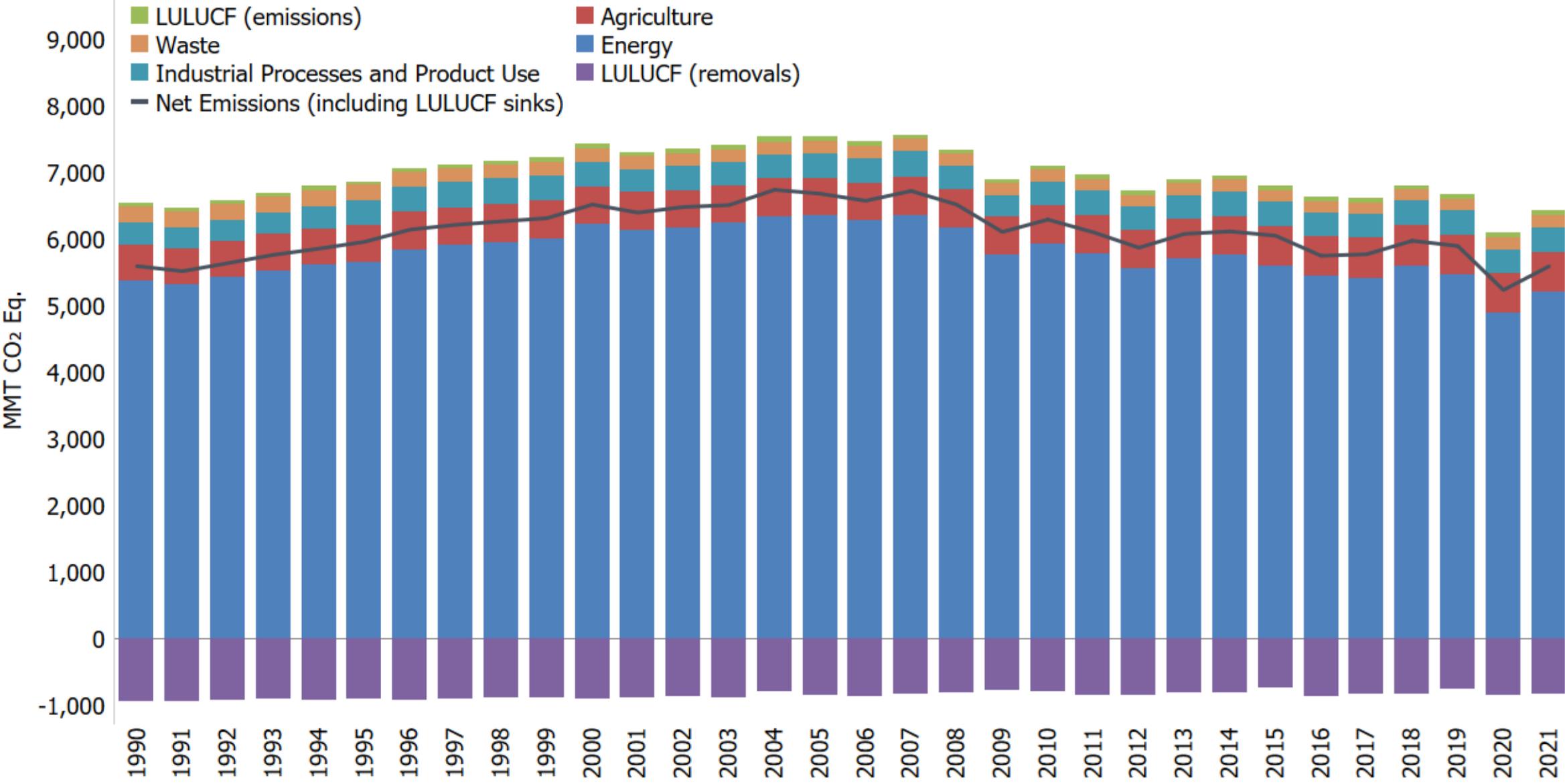**Grant Domke**, grant.m.domke@usda.gov

USDA Forest Service, Northern Research Station

Forest Service cooperators: Brian Walters (NRS), Jim Smith (NRS), Jon Knott (NRS), Chris Woodall (NRS), John Coulston (SRS), Sean Healey (RMRS), Andrew Gray (PNW), James Westfall (NRS), Chris Swanston (NRS), Greg Liknes (NRS), Andrew Hudak (RMRS), Matt Reeves (RMRS), Jason Reinhardt (RMRS), among many others
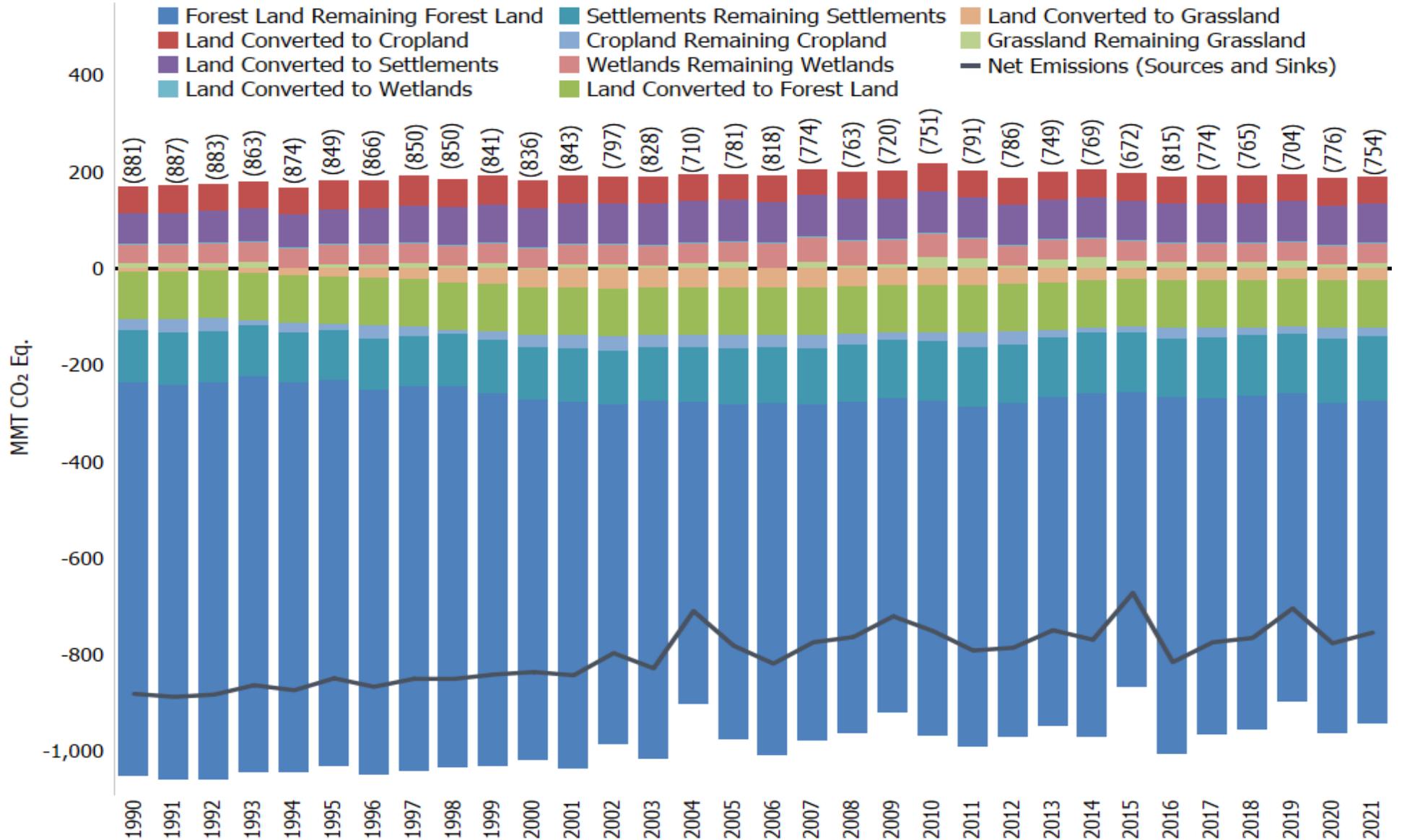
University and Agency cooperators: Stephen Ogle (CSU), Chad Babcock (UMN), Chris Edgar (UMN), Lucas Nave (UMichigan), Songlin Fei (Purdue U), Andy Finley (MSU), Sassan Saatchi (NASA JPL), Nancy French (MTU), Michael Billmore (MTU), Phil Radtke (VPI), Kenna Rewcastle (EPA), Jeremy Lichstein (UFlorida), Margaret Evans (UArizona), among many others

Context - U.S. GHG emissions by sector, 1990-2021

LULUCF

LULUCF

Forest Land Remaining Forest Land (695.4)

Legend:
- Carbon Stock Change
- Non-CO₂ Emissions

Values labeled |< 0.5| for:
- Non-CO₂ Emissions from Peatlands Remaining Peatlands
- Non-CO₂ Emissions from Drained Organic Soils
- CH₄ Emissions from Land Converted to Flooded Land
- CH₄ Emissions from Land Converted to Coastal Wetlands
- Land Converted to Wetlands
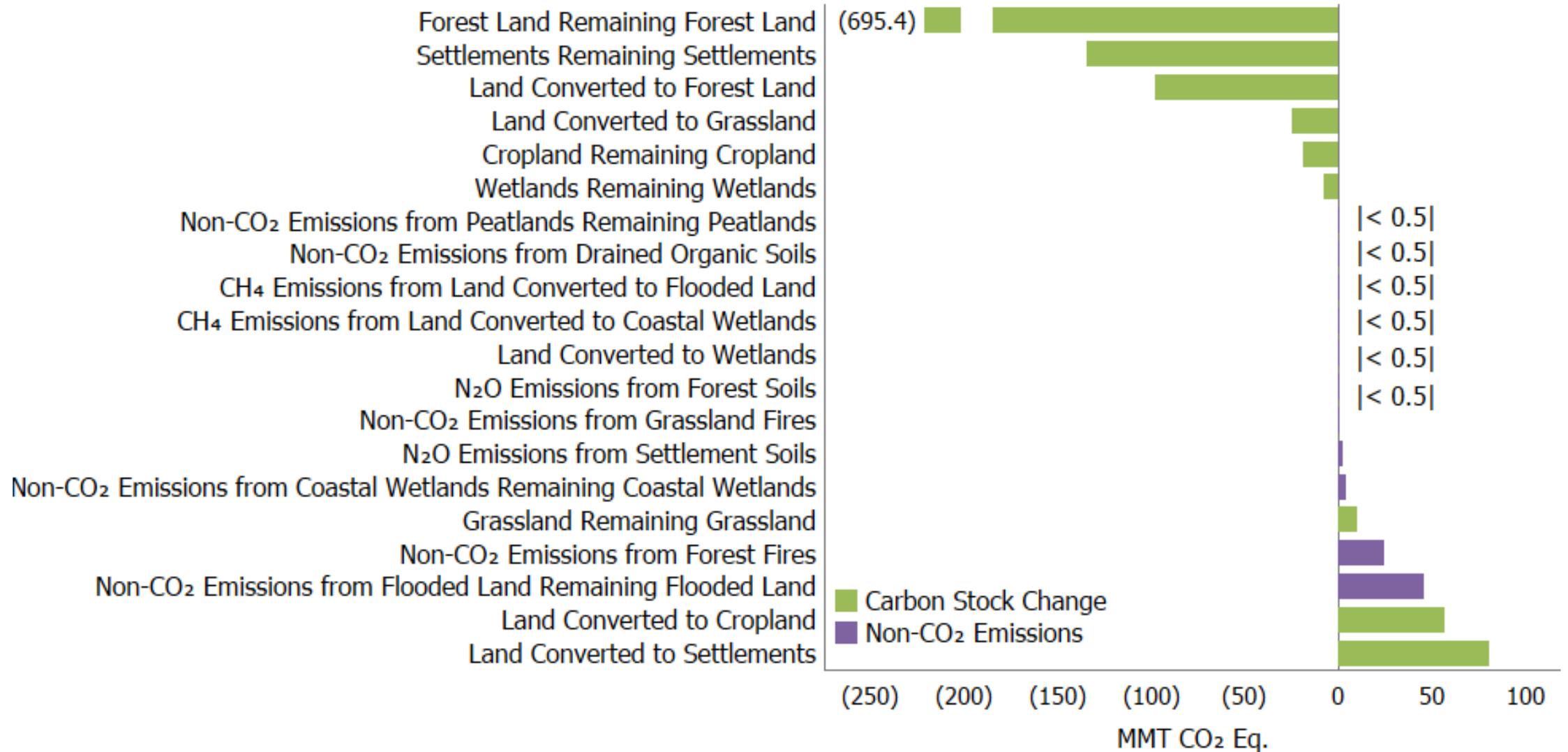- N₂O Emissions from Forest Soils

X-axis: MMT CO₂ Eq.

U.S. Environmental Protection Agency [U.S. EPA]. 2023. Inventory of U.S. greenhouse gas emissions and sinks: 1990–2021. EPA 430-R-23-002. Washington, DC: U.S. Environmental Protection Agency.
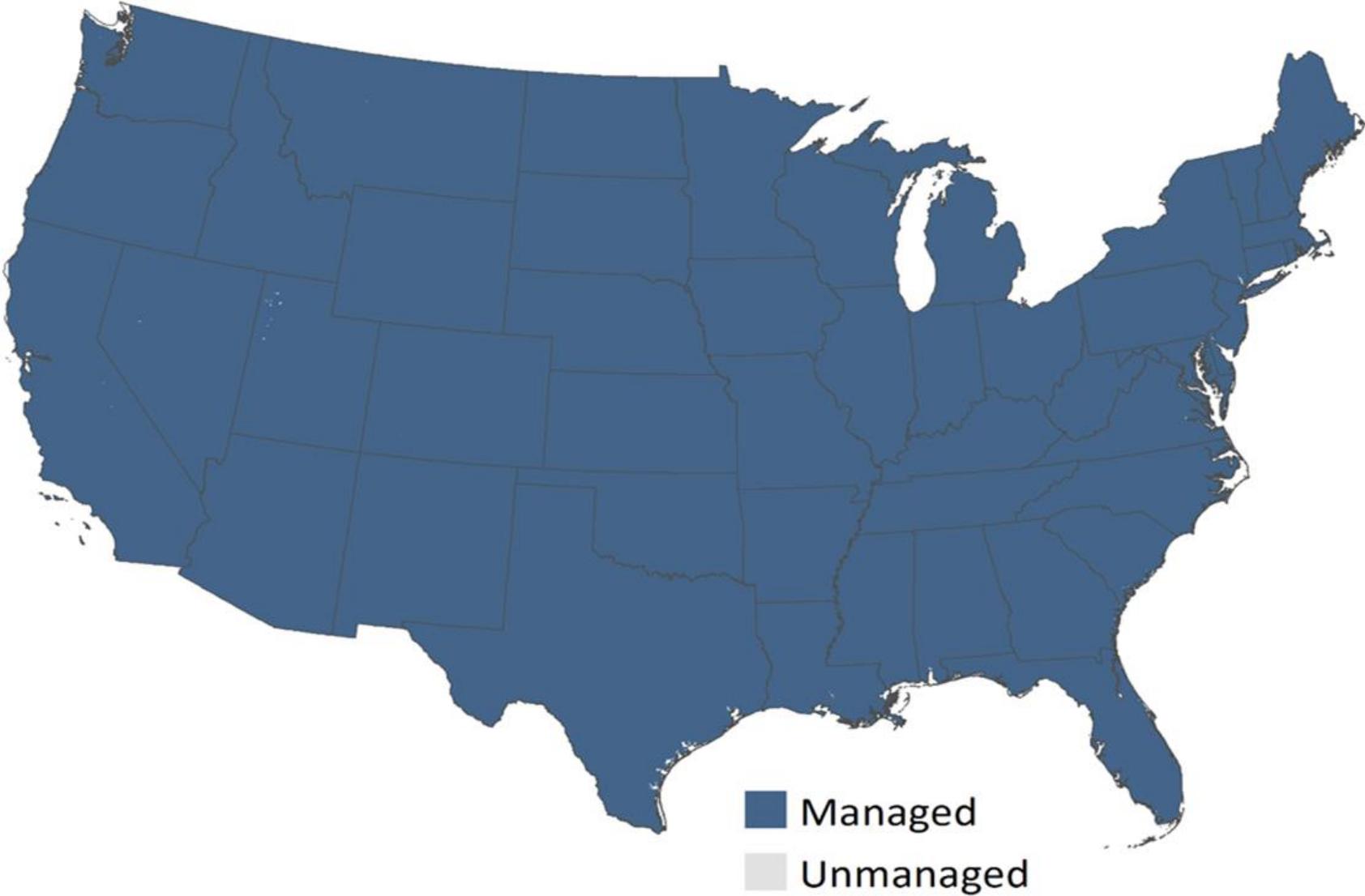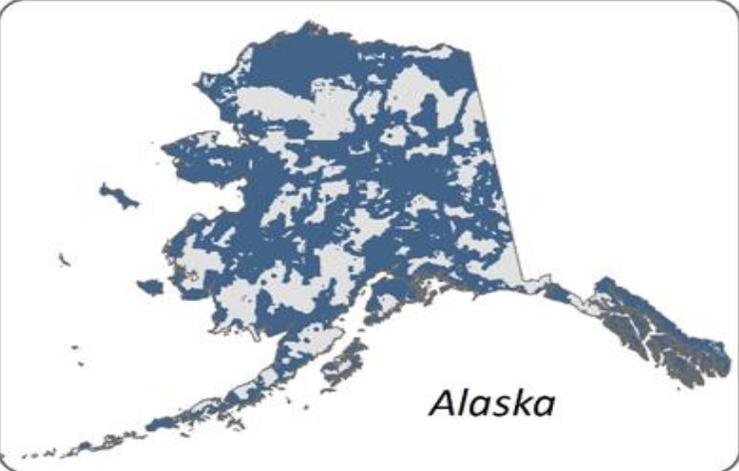https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2021

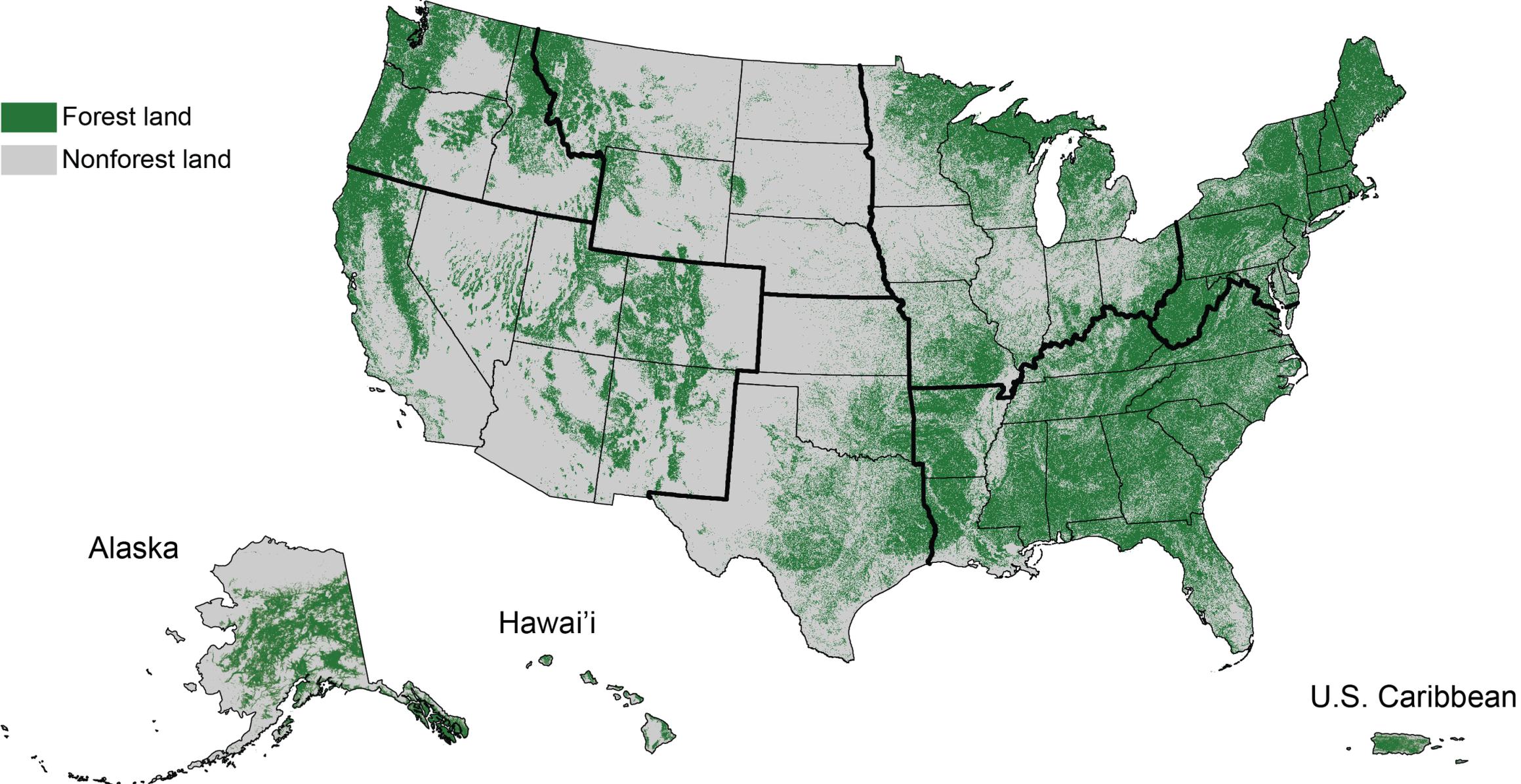# What land is included in the U.S.?

Managed
Unmanaged

Ogle, S.M., Domke, G.M., Kurz, W.A., Rocha, M.T., Huffman, T., Swan, A., Smith, J.E., Woodall, C.W., Krug, T., Wirth, T. 2018. Delineating Managed Land for Reporting National Greenhouse Gas Emissions to the United Nations Framework Convention on Climate Change. Carbon Balance and Management. 13:9

Distribution of forest land in the U.S.

Forest land
Nonforest land

Alaska

Hawai'i

U.S. Caribbean

Managed and unmanaged forest land in the U.S.

Managed Land
Managed Forest Land
Unmanaged Forest Land

Ogle, S.M., Domke, G.M., Kurz, W.A., Rocha, M.T., Huffman, T., Swan, A., Smith, J.E., Woodall, C.W., Krug, T., Wirth, T. 2018. Delineating Managed Land for Reporting National Greenhouse Gas Emissions to the United Nations Framework Convention on Climate Change. Carbon Balance and Management. 13:9
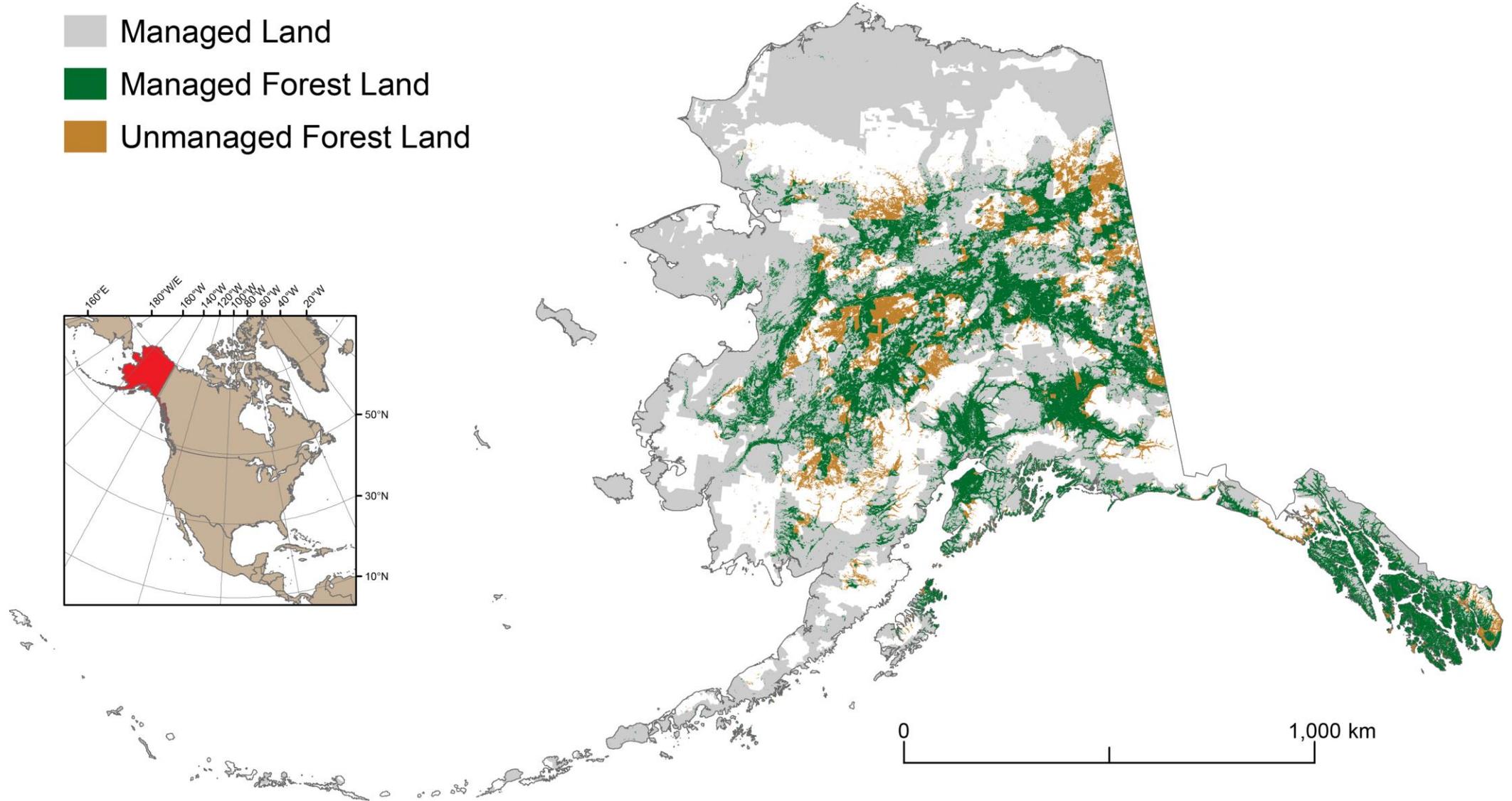
Emissions = area burnt × fuel × combustion × emission factor
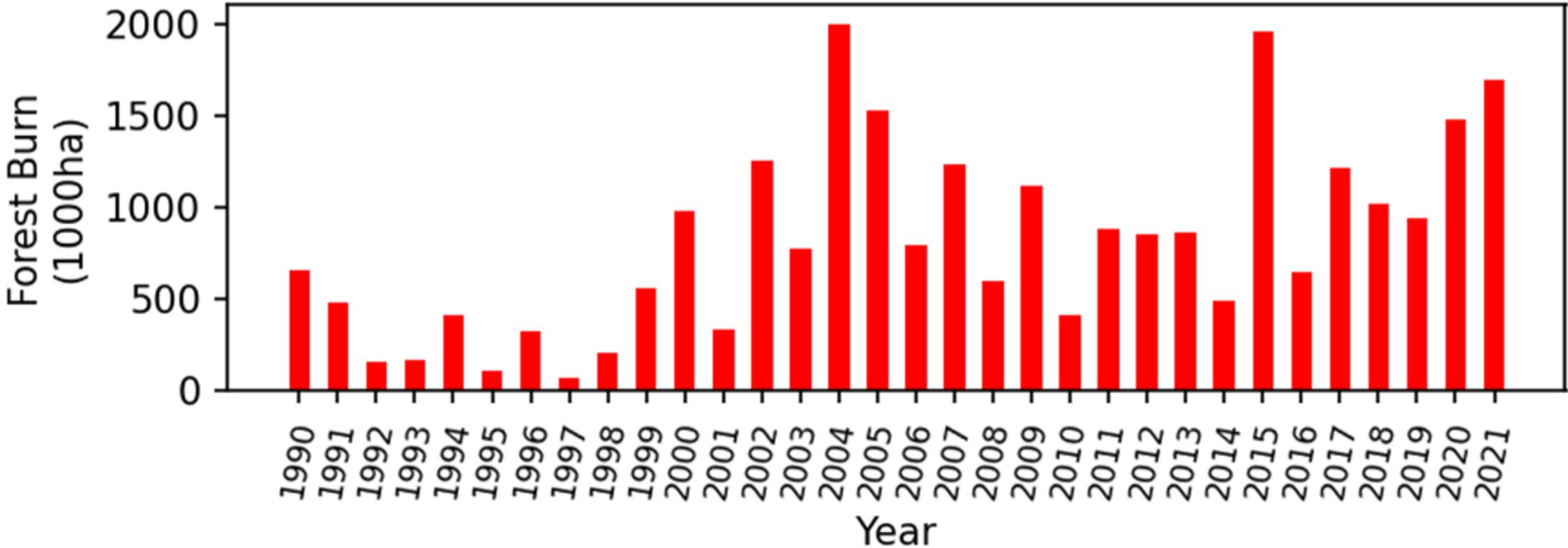
Various Sources

Wildland Fire Emissions Inventory System (WFEIS)

Area burnt (managed forest land), 1990-2021

MTBS records: 1984 – 2021

MODIS records: 2001 – 2022

WFIGS records: mid-teens (varies) – 2022

Wildland Fire Emissions Inventory System v2.2022.08

Home | **Calculator** | Data | About

Michigan Tech
Research Institute

Search by fire name/ID OR use the filters below:

BURNED AREA SOURCE ⓘ -

MODIS MCD64A1 Burned Area (v6.1) ⌄

Nov 01, 2000 through Jun 30, 2023

DATE RANGE -

Select year...

Select... ⌄

...or customize range:

Start: 2009-09-08

End: 2009-09-08

AREA-OF-INTEREST -

Click to draw...

Polygon: ⬠

Rectangle: ☐

...click to load...

GeoJSON

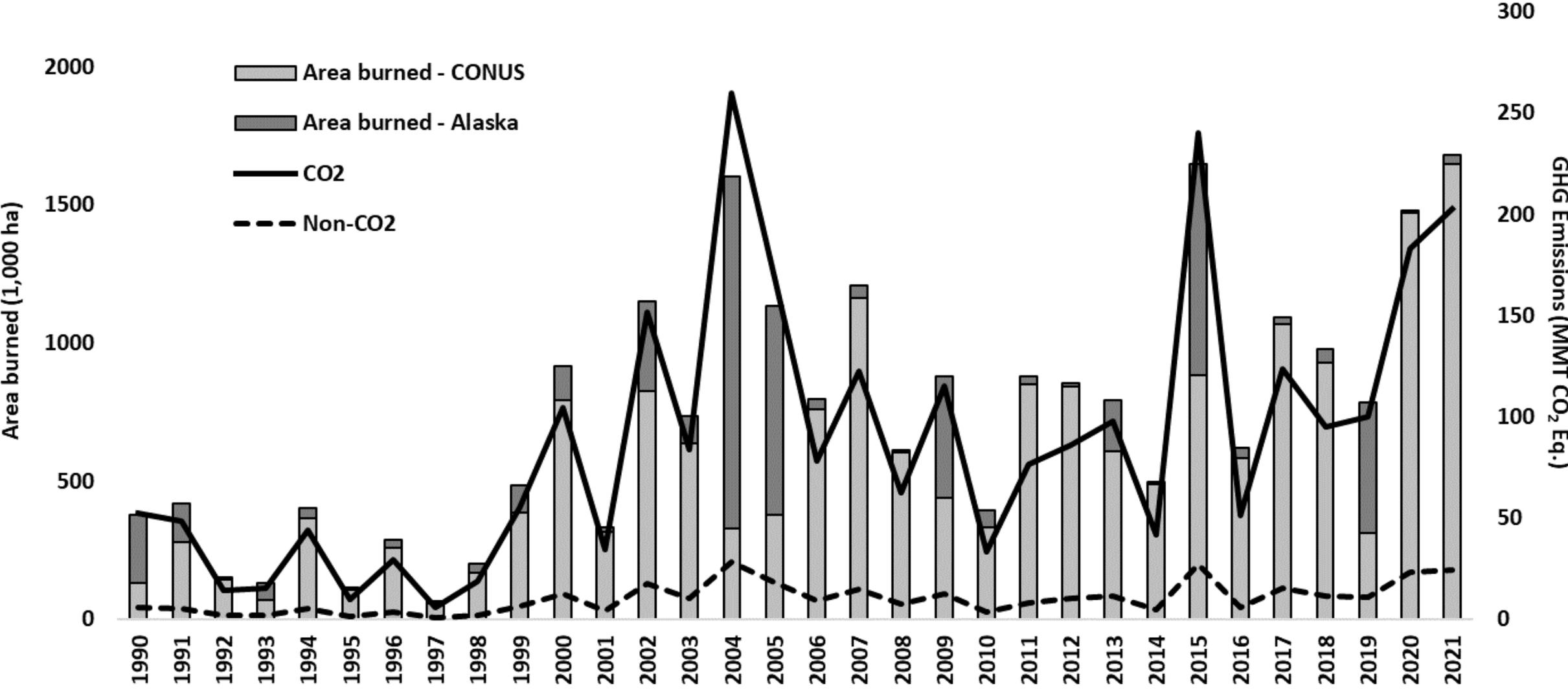Upload SHP

...or select below:

Category: Select... ⌄

Name: Select... ⌄

Filter results: -- burned areas (-- km^2)

Leaflet

Area burnt and forest fire emissions (managed forest land)

Domke, G.M. et al. 2023. Greenhouse gas emissions and removals from forest land, woodlands, urban trees, and harvested wood products in the United States, 1990–2021. Resource Bulletin WO-101. Washington, D.C.: U.S. Department of Agriculture, Forest Service, Washington Office. 10 p. https://doi.org/10.2737/WO-RB-101.

Prescribed fire on (managed) forest land
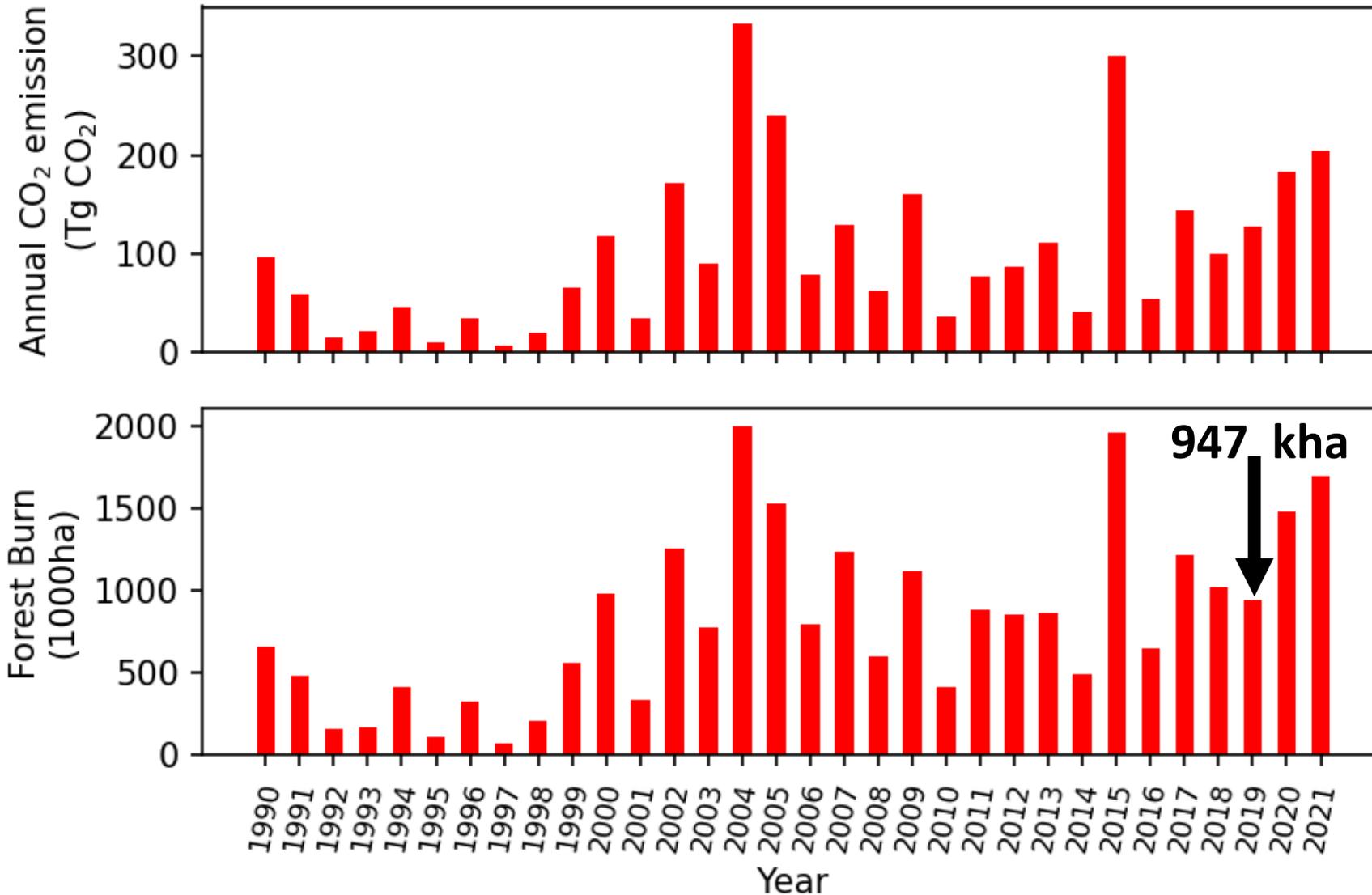
- Reported 947 kha forest burned in 2019 over 49 states, and of that, 234 kha is labeled prescribed according to MTBS

- National Interagency Fire Center lists 2,452 kha of prescribed fires for 2019

- The Coalition of Prescribed Fire Councils lists 4,048 kha of prescribed burn on forest and range land (and excluding ag. land) for the 50 states in 2019

Smith, S.E., Billmire, M., French, N.H.F., Domke, G.M. In prep. Application of the Wildland Fire Emissions Inventory System to estimate fire emissions on forest lands of the United States. Intended outlet: Carbon Balance and Management.

Toward net-zero

- Account for emissions and removals on all lands

- Better use existing data and emerging sources

- Consider fire within the context of climate and other drivers of change

- Move toward carbon stewardship

- Be realistic about the potential of the land sector

Thank you

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FIA program: https://www.fia.fs.usda.gov/

FIA carbon: https://www.fia.fs.usda.gov/forestcarbon/