

Overview of land representation and forest land emissions and removals in the United States GHG Inventory

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Introduction

As signatories to the United Nations Framework Convention on Climate Change (UNFCCC), the United States (US) is required to report economy-wide greenhouse gas (GHG) emissions and removal estimates each year from 1990 to two years before present. Here we briefly describe methods used to compile estimates of land use and land use change as well as estimates of carbon stocks and stock changes on forest land from the most recent GHG Inventory submission to the UNFCCC. We also highlight recent advances towards national consistency, completeness, and accuracy.

Representation of the US Land Base

The managed land base (Fig. 1) in the US has been classified into the 36 Intergovernmental Panel on Climate Change (IPCC) land use/land-use conversion categories using definitions developed to meet national circumstances, while adhering to IPCC guidelines (2006). In practice, the land was initially classified into land use subcategories within the National Resources Inventory, Forest Inventory and Analysis (FIA), and National Land Cover Database datasets (Approach 3 data), and then aggregated into the 36 broad land use and land-use change categories identified in IPCC (2006). Total managed and unmanaged land by land use category is presented in Table 1.

Table 1.—Managed and unmanaged land area by land-use categories for all 50 US States (thousands of hectares).

| Land Use Categories | 1990 | 2005 | 2018 | 2019 | 2020 | 2021 | 2022 |
|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Managed Lands | 886,533 | 886,530 | 886,531 | 886,531 | 886,531 | 886,531 | 886,531 |
| Forest | 282,375 | 281,806 | 280,971 | 280,440 | 281,067 | 281,071 | 281,041 |
| Croplands | 174,498 | 165,632 | 161,394 | 160,693 | 160,112 | 160,079 | 160,033 |
| Grasslands | 337,867 | 340,022 | 338,927 | 339,801 | 339,562 | 339,260 | 339,048 |
| Settlements | 33,427 | 40,172 | 45,971 | 46,312 | 46,641 | 46,960 | 47,185 |
| Wetlands | 37,456 | 38,310 | 38,495 | 38,551 | 38,430 | 38,478 | 38,566 |
| Other | 20,911 | 20,588 | 20,773 | 20,734 | 20,718 | 20,682 | 20,657 |
| Unmanaged Lands | 49,708 | 49,711 | 49,710 | 49,710 | 49,710 | 49,710 | 49,710 |
| Forest | 9,766 | 9,782 | 9,814 | 9,815 | 9,817 | 9,818 | 9,819 |
| Croplands | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grasslands | 25,090 | 25,154 | 25,268 | 25,266 | 25,265 | 25,264 | 25,262 |
| Settlements | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wetlands | 4,118 | 4,057 | 3,936 | 3,935 | 3,935 | 3,935 | 3,936 |
| Other | 10,734 | 10,718 | 10,693 | 10,693 | 10,693 | 10,693 | 10,693 |
| Total Land Areas | 936,241 | 936,241 | 936,241 | 936,241 | 936,241 | 936,241 | 936,241 |
| Forest | 292,140 | 291,588 | 290,784 | 290,255 | 290,883 | 290,889 | 290,861 |
| Croplands | 174,498 | 165,632 | 161,394 | 160,693 | 160,112 | 160,079 | 160,033 |
| Grasslands | 362,957 | 365,176 | 364,195 | 365,068 | 364,827 | 364,524 | 364,310 |
| Settlements | 33,427 | 40,172 | 45,971 | 46,312 | 46,641 | 46,960 | 47,185 |
| Wetlands | 41,574 | 42,366 | 42,430 | 42,486 | 42,365 | 42,413 | 42,502 |
| Other | 31,645 | 31,306 | 31,466 | 31,428 | 31,411 | 31,375 | 31,350 |

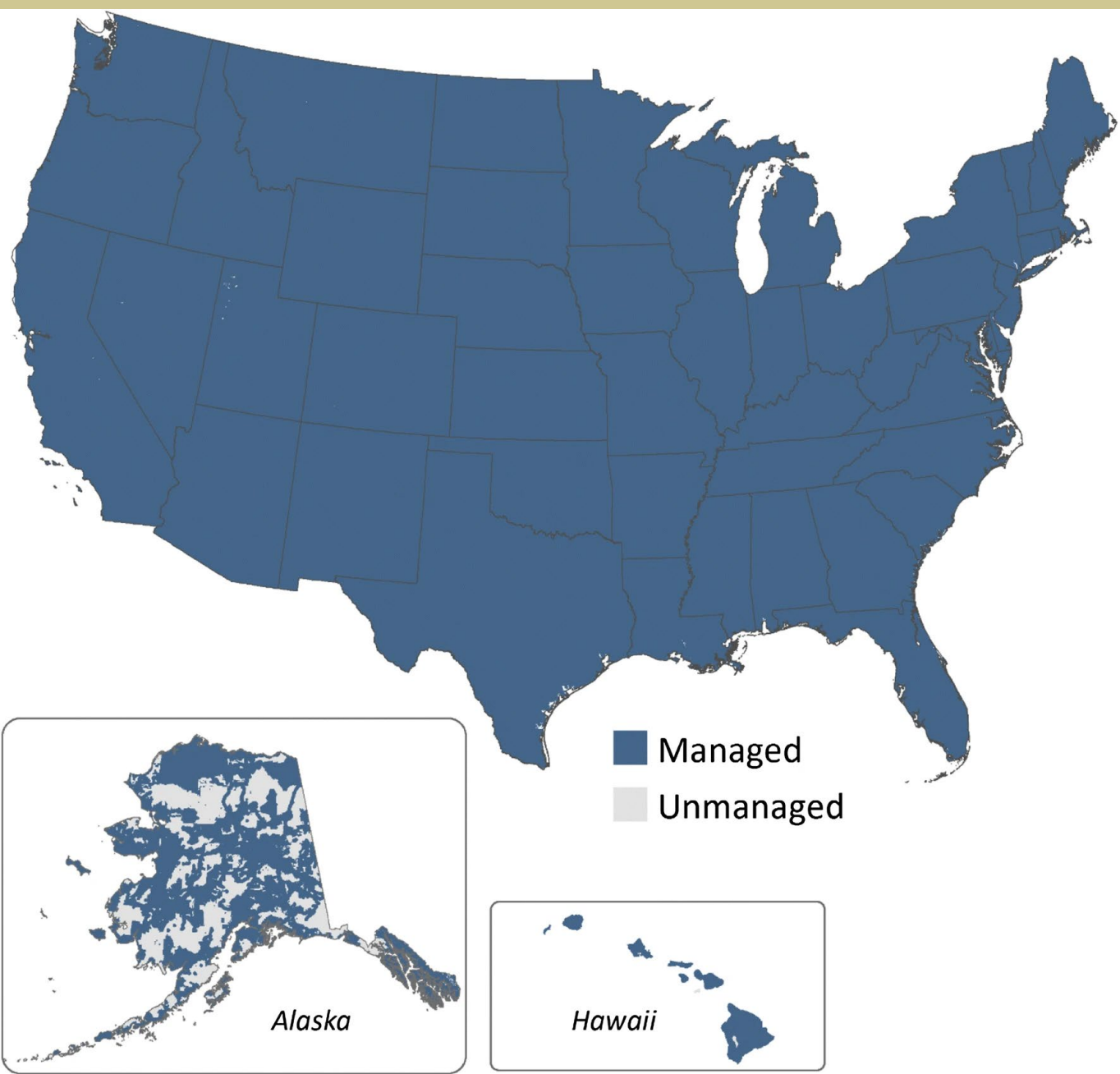


Figure 1.—Distribution of managed and unmanaged land in the United States.

National Forest Inventory and GHG estimation and reporting

All estimates of carbon attributes included in the national forest inventory (NFI) in the US are obtained from models which rely on field measurements (Fig. 2) of variables describing location, site conditions, vegetation biophysical parameters (e.g., tree species, diameter, and height), and/or lab analyses of materials (e.g., soil) collected during field visits of permanent forested NFI plots. Increasingly, NFI plots are intersected with geospatial data to support different applications including the development of models useful in characterizing forest conditions. Collectively, this information can be used to develop statistical models to enhance the precision of estimates constructed from NFIs. The predictions obtained from these models can be used for resource reporting (e.g., UNFCCC) and to meet the needs of stakeholders who are interested in forest attributes that are not directly measured on NFI plots. The latest time series of GHG emissions and removals from forest land, land conversions to and from forest land, and harvested wood products are described in Fig. 3.

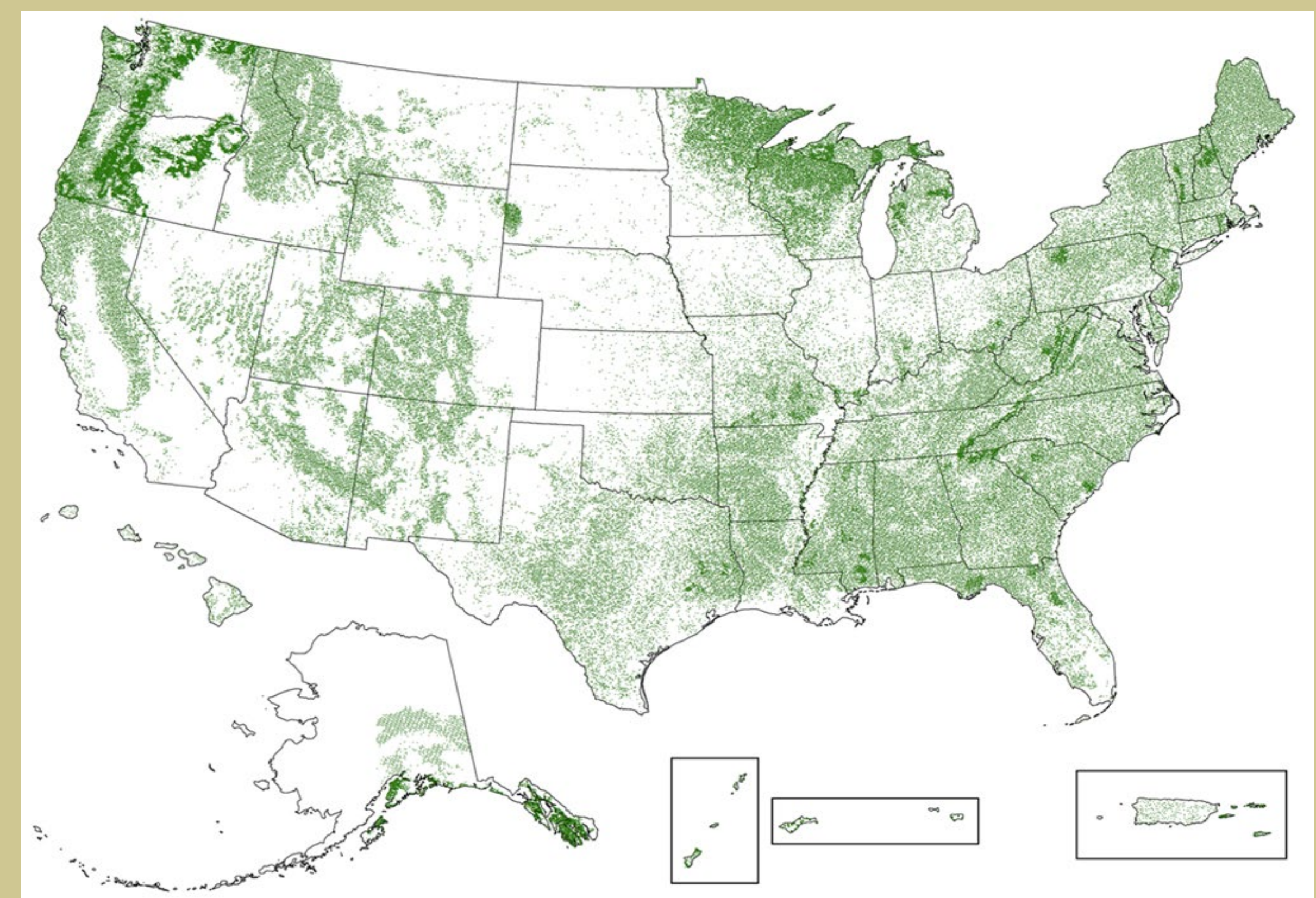


Figure 2.—Distribution of perturbed NFI plot locations in the US with at least one forest condition.

- > 140,000 plots with forest condition (1 per ~2400 ha)
- Permanent plots remeasured every 5-10 years
- Publicly available in multiple formats

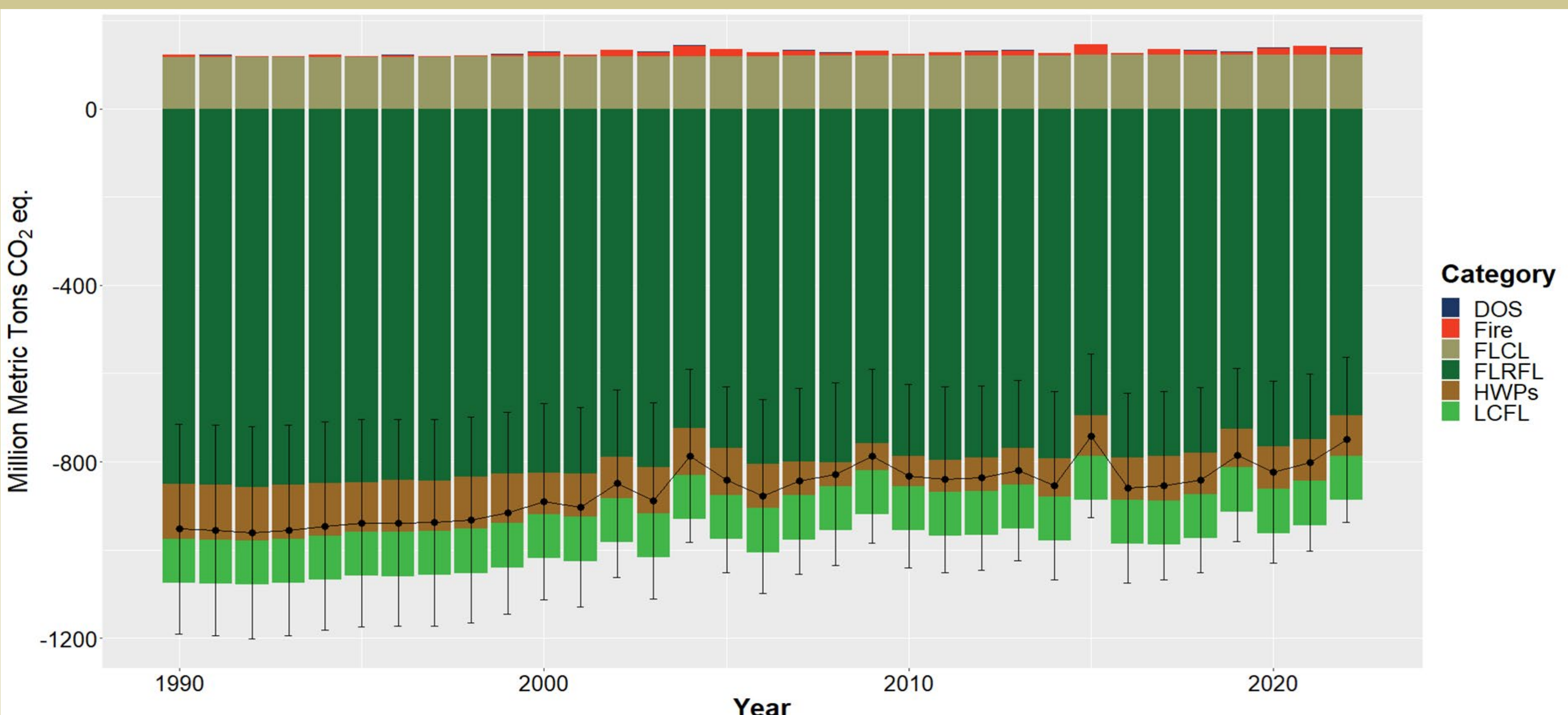


Figure 3.—Time series estimates of CO₂ (MMT) and non-CO₂ emissions and removals from forest land. DOS: drained organic soils, Fire: prescribed and wildfire, FLCL: forest land converted to land, FLRFL: forest land remaining forest land, HWPs: harvested wood products, LCFL: land converted to forest land.

Improvements in the 2024 US GHG Inventory

- Implemented the National Scale Volume Biomass model framework
- Included forest land in Hawaii and Territories of the US for the first time
- Utilized the stock-difference method for Southeast/Coastal Alaska
- Included refined litter and soil carbon model parameters adopted in the FIA program
- Incorporated the latest FIA activity data

For more information on the methods, models, and data used in the Land Use, Land Use Change, and Forestry chapter of the latest US GHG Inventory please visit this link.



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