

October 21, 2022

To:  
Office of Science and Technology Policy  
Office of Management and Budget  
Department of Commerce

From:  
Yale Carbon Containment Lab  
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**Yale Carbon Containment Lab Response to the “National Strategy to Develop Statistics for Environmental-Economic Decisions: A U.S. System of Natural Capital Accounting and Associated Environmental-Economic Statistics.”**

To the Interagency Policy Working Group:

On behalf of the Yale Carbon Containment Lab (CC Lab), we express enthusiastic support for the National Strategy to Develop Statistics for Environmental-Economic Decisions. Measurement of the nation’s natural capital will illuminate the enormous value of our country’s resources and inform better management and climate policy. We have two recommendations described in greater detail below. First, we recommend that natural capital statistics include carbon stocks and flows. Second, we recommend that the government should use data and statistics generated from natural capital accounts to inform the management of federal resources as soon as practicable.

Many lessons from endowment management apply to the management of federal natural assets. Much like an endowment, federal natural resources represent a portfolio of assets that generate benefits and value over the very long term.

First, annual benefits and costs are comparable to net income, and changes in net asset value are like unrealized investment gains or losses. Performance assessment over any period should include the concept of total return, combining net income and changes in asset values net of liabilities. Much like building improvements to a real estate property, annual expenditures that reduce liability or enhance value are not solely an expense for management decision purposes. Deferring necessary fire sprinkler repair is not saving money; instead, it is risking human lives and catastrophic property damage. Likewise, deferring much-needed wildfire prevention methods like thinning creates a potential liability endangering lives, public health, and forest health.

Second, natural assets are like a portfolio of businesses, each with distinct profit and loss characteristics. Tracking the proper indicators for each natural asset class can yield insights and facilitate significant value creation in the long term. For example, forests provide multiple economic benefits, including commercial saw timber, recreation, and — importantly — carbon removal and storage. Forests are also subject to multiple loss cases: fire, drought, disease, or mismanagement. Measuring both growth and mortality in individual properties can distinguish high-performing areas from those requiring more attention, informing the allocation of resources. Often a private sector company finds the easiest way to improve overall performance and profitability is to stop losses from poor-performing divisions. Federal agencies can use environmental-economic statistics to cost-effectively reduce or even reverse underperformance of natural capital.

But such interventions require comprehensive, high-quality accounting. The proposed National Strategy and resulting environmental-economic statistics will enable policies that grow and protect our natural assets. Critically, many of these resources are both vulnerable to climate change and central in the fight against it. Natural capital accounting can thus arm us with the information necessary to take care of our nation and our planet.

Respectfully submitted,

A handwritten signature in blue ink that reads "Dean Takahashi".

Dean Takahashi

*Founder & Executive Director, Yale Carbon Containment Lab*

*Former Senior Director, Yale Investments Office*

**About the Carbon Containment Lab:**

The Yale Carbon Containment Lab (CC Lab) is a non-profit within Yale University's School of the Environment that develops and implements low-cost, safe, and scalable approaches to carbon removal and containment. The CC Lab works with academic advisors, technical experts, and other collaborators to pursue concrete quantitative goals: 30 million metric tons of carbon dioxide equivalent (tCO<sub>2</sub>e) contained by 2030, and 500 million tCO<sub>2</sub>e by 2050. The Lab helps pioneer novel technologies, performs bench-scale and field-scale pilot tests, and assists and supports entrepreneurs and other innovators. As a non-profit, the CC Lab is funded entirely by individual gifts.

## Comments on the Draft National Strategy

The CC Lab has two key recommendations for the development and implementation of natural accounts. First, the environmental-economic framework should explicitly include carbon stocks and flows for systems that have large carbon storage capacity. Second, the administration should begin to incorporate findings from the development of Core Statistical Products into near-term federal decision-making.

***Key Recommendation:*** *Valuation of the United States' natural capital should include stocks and flows of carbon and other greenhouse gases. Moreover, these data should enter into the calculation of any headline statistic (like Change in Natural Asset Wealth).*

The draft National Strategy states that supporting sustainable growth, engaging the private sector, and renewing U.S. leadership in the development of environmental accounting standards are core outcomes for the initiative. The CC Lab considers rigorous carbon accounting across the nation's natural systems to be essential to these goals. We recommend that such measures be included in the development of Core Statistical Products, as well as in the calculation of any headline statistic.

As the U.S. aims to encourage resource-efficient development, reduce emissions, and scale up carbon removal, quantifying the carbon (or carbon equivalent) stocks and flows of natural assets is necessary to understanding their full value. The draft Strategy recognizes the importance of both tracking industrial greenhouse gas emissions (p. 28) and quantifying geologic carbon storage capacity (p. 48). But many other natural systems included in the proposed framework — for example, forests, soils, wetlands, peatlands, and oceans — also have the potential to store or emit greenhouse gases. In addition to providing information crucial to the fight against climate change, these metrics are often coupled to the general health of a natural system. The draft refers to this fact but does not explicitly incorporate carbon stocks or flows into its accounts. (See the Case Study below for a discussion of existing carbon flow data taken from federal forests, and how this could be folded into the proposed Strategy.)

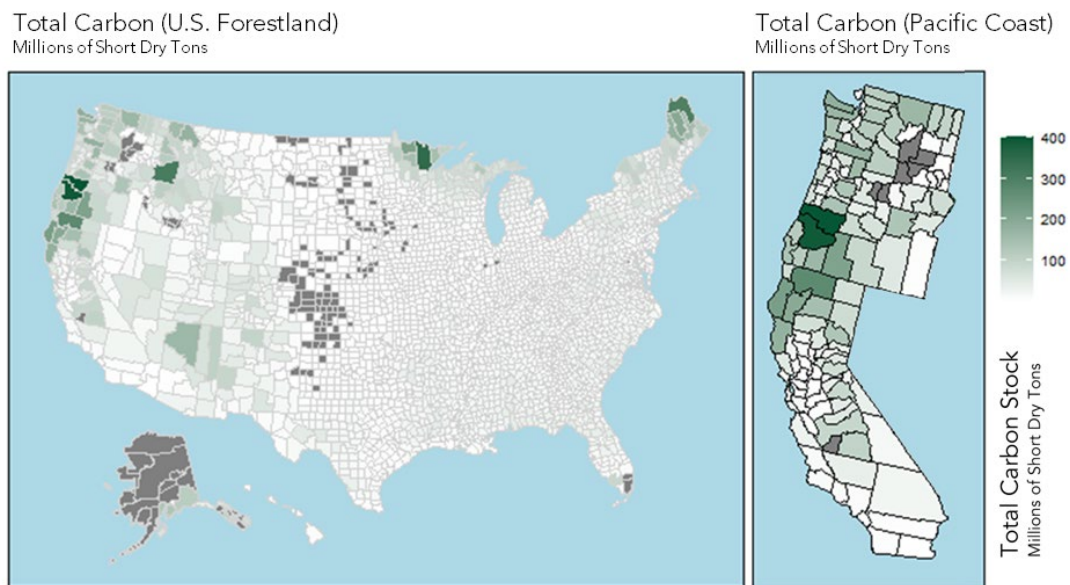
Estimation of carbon stocks is often a complex undertaking, and some of these systems have fluxes that are easier to measure than others. But the inclusion of carbon stocks and flows generally complements and builds upon prior agency work. For example, the EPA's "Inventory of U.S. Greenhouse Gas Emissions and Sinks" already accounts for the carbon

storage capacity of forests, vegetation, and soils. Where feasible, the government should expand this work across its collection of environmental-economic statistics.

### *Case Study: Natural Capital Accounting and Federal Forests*

As the Strategy notes, U.S. forests are a key natural resource and a critical component of calculating the nation’s natural capital value (p. 39). There are 765 million acres of forestland in the United States, of which the federal government owns 31% (238 million acres in total). Most federal forests are managed by the U.S. Forest Service (USFS) (61%) and the Bureau of Land Management (16%). Across the continental U.S., forests represent the greatest land-based source of carbon storage, holding ~45% of the carbon stored on land.<sup>1</sup> Incorporating carbon stocks and flows into their natural capital accounts is thus essential to capturing their value to our nation and environment.

The data to quantify forest carbon stocks and flows are already available in many regions. The USFS Forest Inventory and Analysis (FIA) Program collects and reports information on the status and trends of America’s forests, tracking details concerning ownership, health, mortality, and removals. It is managed by the Research and Development organization within the USDA Forest Service through a joint effort with the State and Private Forestry

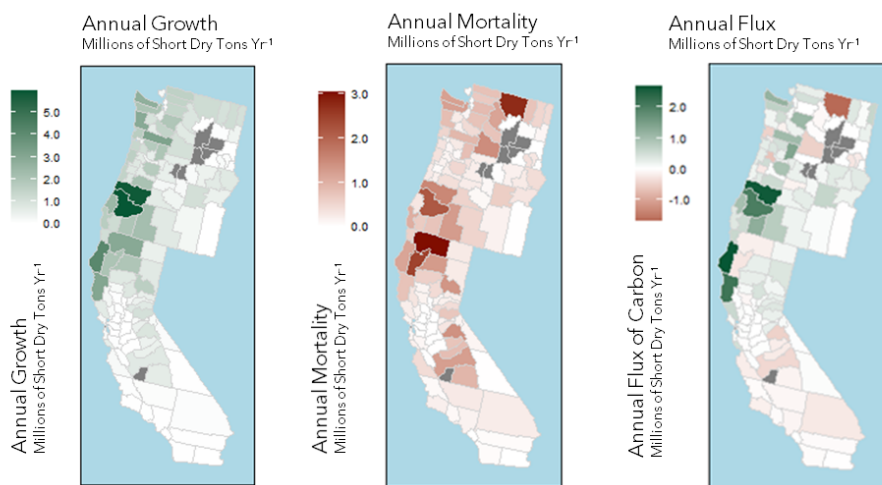


*Figure 1. Total forest carbon in the United States measured in millions of short dry tons (left). Total forest carbon in the Pacific Coast states measured in millions of short dry tons (right). Counties with no data are colored dark gray. All data is presented from the most recent collection date. Source: FIA.*

<sup>1</sup> Carlowicz, M. (2012). *Seeing Forests for the Trees and the Carbon: Mapping the World’s Forests in Three Dimensions*. Available at: [<https://earthobservatory.nasa.gov/features/ForestCarbon>].

and National Forest Systems. The FIA was formed out of the McSweeney McNary Forest Research Act of 1928 and has been continuously publishing reports since its inception in 1930. The FIA uses tens of thousands of monitored plots across the country to record detailed annotations regarding a host of features, including basal area, tree size, species, and the quantity of carbon stocks. In total, the FIA measured a stock of 47.2 billion tons of carbon contained in U.S. forestland (Figure 1).<sup>2</sup>

Assessed at a national or state level, as above, forests appear to be healthy and stable. But this does not give a full picture of forest and carbon stock viability. When considered at the county level and across multiple time points, there are stark differences in forest health across the country. On the Pacific Coast, for example, over 30% of counties are carbon sources, rather than sinks (Figure 2), and recent fires have compounded this problem.



*Figure 2. Annual growth (left), mortality (center), and net flux (right) of forest biomass. Data were compiled from FIA Evaluator tool from the two most recent time points and then scaled to annual rates. Source: U.S. FIA; Analysis: Nick Dabl, Yale Carbon Containment Lab, 2020.*

Measurement of these counties' carbon fluxes reveals not only greenhouse gas emission liabilities, but also general forest degradation. In addition to source versus sink distinction, the FIA data show which federal forests are most overstocked and at risk of severe wildfire — and therefore where to prioritize fire prevention activities. Similarly, these measurements can help inform where reforestation efforts can expect to have the greatest impact on the value of forest ecosystem services. Such an approach, grounded in carbon stock and flow accounting, would better inform funding and policies for management decisions: federal and state tree nursery expansion, for example, or pest and invasive species eradication. The ultimate result would be healthier, more productive forests with higher carbon removal and storage capacity.

<sup>2</sup> Data and tools published by the FIA are available here: <https://www.fia.fs.usda.gov/tools-data/index.php>

Federal forests are just one of many natural assets with carbon storage potential. Across all its ecosystems, the U.S. has an opportunity to set the standard for the explicit inclusion of carbon stocks and flows in natural capital accounting. In addition to establishing U.S. leadership in environmental economics, this will increase the utility of the statistics for the private sector, which already generally anchors its natural capital commitments within a carbon intensity framework (emissions reductions targets or net zero commitments, for example). Accounting for carbon as a natural asset would provide an important framework in which other environmental-economic statistics included in the Strategy could be analyzed. This would enhance the overall coherence of the insights drawn from the accounting system.

***Key Recommendation:** The government should use the data and statistics generated within its natural capital accounts to inform the management of federal resources. In many instances, the administration need not wait until the Core Statistical Products are fully developed to begin shaping policy decisions with certain indicators.*

The National Strategy has the potential to immediately enable impactful environmental policy and best focus efforts on climate change mitigation and adaptation. Use of these data is essential for addressing many of today's climate crises, such as wildfire on federal forests or the loss of carbon-storing wetlands.

First, statistics for environmental-economic decisions will provide the measurement framework to promote better management of federal natural assets. More precise, asset-specific natural resource accounts will improve our understanding of the gains or losses associated with various management practices. The insights created by these statistics will allow the federal government to care for its assets and curb unsustainable uses. For instance, a set of natural capital accounts could allow for the more accurate pricing of federal leases for oil and gas development, such that they reflect the full cost of emissions that they generate. As another example, updating the inventory of key geologic carbon storage resources would outline the potential of carbon storage on federal land. Access to this information would de-risk the project planning and implementation processes for carbon sequestration projects. Furthermore, the government can increase the value of such sites by processing licensing and permitting applications such that private sector sponsors can more confidently pursue projects without risk of delay or blockage.

Second, recognition of natural asset values, particularly of carbon, will foster innovation. For example, the U.S. is facing difficult policy decisions as natural disasters such as hurricanes become more frequent and intense. A framework for natural capital accounting will provide critical inputs for resilience and adaptation measures like shoreline replenishment, wetland protections and restoration, and sea wall construction. These statistics will inform the design of such solutions and incentivize decisions that ensure longer-term ecosystem health.

The National Strategy should enable the federal government to start making policy decisions informed by their impacts on the performance of natural assets. We recommend that the insights provided by this new accounting shape management decisions in the near-term, as they have the potential to catalyze much-needed action on climate.