



Agriculture-Driven Deforestation in the United States: Data Assessment

U. S. agricultural and timber production is not driving deforestation in the United States. Authoritative U.S. forest and cropland monitoring data indicate overall stability in U.S. forest and cropland areas over the past 10 years. During this time, the largest gains in forest land area have been *reversions* of agricultural land into forest, with statistically insignificant forest to agricultural land-use shifts due primarily to dynamic cycling on previously cultivated land. Since 2010, forest carbon stocks in the United States have increased by nearly 2,000 MMT C (3.6 percent). The U.S. Department of Agriculture (USDA) is committed to advancing the sustainable management of forests through science, programming, and policy, supporting carbon sequestration, climate resilience, and biodiversity.

I. The United States monitors its forest and cropland dynamics with earth observation and survey data to ensure comprehensive and accurate analyses

The United States maintains several data collection efforts and analyses to assess land cover, land use, and associated resource dynamics. The United States uses a robust system that includes more than satellite data since these data have difficulty discerning subtleties associated with sustainable forestry management practices, tenure, and legality of land use, and/or socioeconomic or historical contexts. Other data sources the United States uses to monitor forest and cropland dynamics include nationwide statistically based survey data, along with forest structural analysis beyond coarse cover assessments, which are necessary to complement satellite data and reduce the uncertainty associated with deriving land use dynamics from land cover assessments alone. The Annex provides an overview of U.S. land-use and land-cover data and analyses.

II. The data show that agricultural and timber production in the United States is not driving deforestation

Over the past 10 years, overall U.S. forest and cropland area has been stable, with forest area at or near the largest than at any other time in nearly a century. Total forest carbon stocks in the United States have increased over 10 percent over the past three decades, and by nearly 2000 MMT C (3.6 percent) since 2010.

The largest threats facing U.S. forests and their associated carbon stocks are insects/disease, wildfires, episodic weather events (such as droughts and hurricanes), invasive species, and development. Conversion to urban development—not to cropland—is the primary driver of land use change in the United States. Detailed annual land-cover classifications dating back to 2008

show no significant areas of forest-land conversion due to cropland expansion (from soybeans or otherwise). In fact, the largest gains in forest-land area over the past decades are *reversions* of agricultural land into forest because of socioeconomic changes or incentive programs to encourage reforestation and/or healthy dynamic landscapes where private forests and agriculture come together, such as USDA's Conservation Reserve Program (CRP). Statistically insignificant marginal forestland to cropland conversion does occur, though it is primarily limited to land such as CRP land that was previously cultivated. These types of fluctuations are not associated with deforestation of primary or naturally regenerating forests.

III. The United States prioritizes the advancement of sustainable forest management

The United States is committed to global goals to halt and reverse forest loss by 2030 and restore critical ecosystems, as reflected in President Biden's 2021 [Executive Order on Tackling the Climate Crisis at Home and Abroad](#) and the resulting Biden-Harris Administration's [Plan to Conserve Global Forests: Critical Carbon Sinks](#). In addition, the United States joined in signing the [2021 Glasgow Leaders' Declaration on Forests and Land Use](#) and is playing a leadership role as co-chair of the [Forests and Climate Leaders' Partnership](#) (FCLP) launched at the COP27 Climate Change negotiations in Egypt in 2022. The United States is a founding partner of the internationally-focused [Forest Data Partnership](#), which is designed to leverage new advances in remote sensing, cloud infrastructure and machine learning to work toward a consistent geospatial data ecosystem. The United States participates in the [Montréal Process Criteria and Indicators](#) (C&I) for the Conservation and Management of Temperate and Boreal Forests, periodically releasing the [National Report on Sustainable Forests](#) to evaluate the sustainability of U.S. forests.

Domestically, President Biden's Earth Day 2022 [Executive Order on Strengthening the Nation's Forests, Communities, and Local Economies](#) aims at safeguarding mature and old-growth forests on federal lands, strengthening reforestation partnerships across the country, combating global deforestation and deploying nature-based solutions to address the climate crisis. In December 2023, USDA [announced plans](#) to amend all 128 forest land management plans to conserve and steward old-growth forests on national forests and grasslands. USDA's Forest Service is [making historic investments](#) in sustainable forest management, including investments for controlling wildfire under the [Wildfire Crisis Strategy](#) and combatting the impacts of climate change on the nation's forests and grasslands, communities and critical infrastructure. Innovative programs such as the [Forest Legacy Program](#) help encourage the protection of privately owned forest lands through conservation easement or land purchases. Through partnerships among federal government agencies, states, Tribes, nongovernmental organizations, and private landowners, the United States exceeded the [2020 Bonn Challenge](#) goal of 15 million hectares of U.S. forest land under restoration, with over 20 million hectares of forest land under restoration to date.

USDA investments in science, including investments in forest carbon monitoring and conservation, are advancing global understanding of the current and future ability of trees to absorb and store carbon, support biodiversity, and sustainably provide for people now and into the future. For example, USDA has developed a host of [tools and guidance documents](#) for carbon and carbon flux estimation that are used by stakeholders in the voluntary and compliance carbon markets, academia, and forest management and advocacy groups. Another example is

USDA's [Climate Hubs](#), which are a unique collaboration across the department's agencies, developing and delivering science-based, region-specific information and technologies to agricultural and natural resource managers that enable climate-informed decision-making, and to provide access to assistance to implement those decisions. USDA helped develop and co-leads the [Adaptive Silviculture for Climate Change Network](#) to co-produce science and education/outreach at operational scales to not only make a positive difference in people's lives as forests change, but empower them with adaptation strategies such as science-informed adaptation plantings.

ANNEX

Select U.S. Land-Use and Land-Cover Data Resources and Analyses

Earth observation data

- The U.S. Landsat Program, which is a series of Earth-observing satellite missions jointly managed by the National Aeronautics and Space Administration ([NASA](#)) and the U.S. Geological Survey ([USGS](#)), has been collecting 30-meter resolution, multispectral imagery across the U. S., and the globe, at a revisit rate of every eight days since 1999 (every 16 days back to 1983). The Landsat satellites were designed to have the optimal ground resolution and spectral bands to efficiently monitor land use and land cover change due to climate change, urbanization, drought, wildfire, biomass changes (carbon assessments), and a host of other natural and anthropogenic changes.
- The United States uses [Sentinel-2](#) multispectral imagery from the European Copernicus Program to complement and improve on Landsat data. Sentinel-2 has been imaging the world at 10m resolution with a five-day revisit rate since 2017. The finer spatial resolution compared to Landsat allows for even better discrimination of cover types and usage, particularly in complex landscapes.
- The National Agricultural Imaging Program ([NAIP](#)) is a USDA program providing “leaf on” aerial imagery at low cost during the peak growing season. The imagery is acquired as a 4-band product, which can be viewed as either a natural color or color infrared image. USDA uses NAIP to assess Common Land Unit (CLU) boundaries and assist with farm programs. A 3D version of NAIP is increasingly used for examining forest land dynamics due to the low cost, fine resolution of the data. NAIP data exist back to 2003.
- The Global Ecosystem Dynamics Investigation ([GEDI](#)) instrument on the International Space Station, which has been operating since 2018, has borne new lines of research into forest-resource monitoring based on laser scanning global forests to estimate structural attributes which is vital to assessment of forest land use and degradation.
- The joint NASA and Indian Space Research Organization partnership on synthetic aperture radar ([NISAR](#)), which builds on the GEDI mission and will launch in 2024, will be the first radar of its kind in space to systematically map Earth, using two different radar frequencies (L-band and S-band) to measure changes to the planet’s surface, including movements as small as a centimeter. The NISAR satellite will deepen understanding of the changing surface of the earth inclusive of vegetation such as climate change, deforestation, or glacier melt via observing Earth’s land and ice-covered surfaces globally with 12-day regularity on ascending and descending passes, sampling Earth on average every 6 days.

Map products

- The USGS-led National Land Cover Database ([NLCD](#)) contains maps of U.S. land cover at three-year intervals starting in 2001, documenting change in 16 broad cover types across time

periods. Landsat imagery is the basis of the 30m NLCD outputs. In 2024 the NLCD will be replaced with the USGS Land Change Monitoring, Assessment, and Projection ([LCMAP](#)), which will provide higher quality results at greater frequency with additional land cover and change variables.

- The U.S. Forest Service’s Landscape Change Monitoring System ([LCMS](#)) is a remote sensing-based system for mapping and monitoring landscape change across the United States. LCMS provides a “best available” map of landscape change that leverages advances in time series-based change detection techniques, Landsat data availability, cloud-based computing power, and big data analysis methods. The annual maps depict change (vegetation loss and vegetation gain), land cover, and land use from 1985 to present that can be used to assist with a wide range of land management applications. The LCMS Data Explorer is a web-based application that provides users the ability to view, analyze, summarize, and download LCMS data. Appropriate use includes regional to national assessments of vegetation cover, land cover, or land use change trends, total extent of vegetation cover, land cover, or land use change, and aggregated summaries of vegetation cover, land cover, or land use change.
- The USDA Cropland Data Layer ([CDL](#)), created annually for each summer growing season, provides 30-meter resolution land cover maps over the conterminous United States going back to 2008. The CDL’s basis is Landsat imagery, but it now fully incorporates Sentinel-2 as well. While the focus of the CDL is on crops, it also maps non-crop cover types including forests, providing the information necessary to document at field level areas that have transitioned from forests to croplands.

Field-based and survey-based data

- USDA’s [National Resources Inventory](#) (NRI) is a statistical survey of land use and natural resource conditions and trends on U.S. non-Federal lands. The resulting database is a longitudinal data set containing variables from 1982, 1987, 1992, 1997, and annually from 2000 through 2017. The location of NRI segments and points used to create the estimates and other identifying details are confidential information.
- The U.S. Forest Service’s [Forest Inventory & Analysis](#) (FIA) program, which for nearly a century has collected statistically-based data from plots across 50 states, U.S. territories, and current and former protectorates provides official estimates of forest extent, resources, and change in an unbiased and transparent manner. The FIA program includes the [Nationwide Forest Inventory](#), [National Woodland Owners Survey](#), [Timber Products Output](#), and [Urban Forest Inventory and Analysis](#) programs which characterize socioeconomic aspects of forests and tree use to inform long-term sustainable management.
- USDA collects and disseminates national, state, and county-level production statistics from the major commodity crops annually. This includes information about planted area. The data are primarily collected from long-standing probability surveys of farmers before, during, and after the growing season. USDA also conducts a more wide-ranging Census of Agriculture every five years. All survey and census information are available through [Quickstats](#).

- USDA maintains a domestic network of [84 experimental forests and ranges](#) across most U.S. forest types to examine long-term trends in forest ecosystems and statistically evaluate management outcomes. This research network provides an incredible wealth of records and knowledge of ecological change in natural and managed forest and grassland ecosystems across the United States

Integrative Analyses and Reports

- The U.S. Forest Service provides [forest and other tree related estimates](#) for the annual [U.S. greenhouse gas emission and removals](#) reporting to the United Nations Framework Convention on Climate Change. Reporting includes changes in land use, which is estimated using data sources such as FIA and NRI, as well as geospatially derived products such as NLCD. Land-use categories for reporting are forest land, cropland, grassland, wetland, settlements (including urban forests), and other land use. This reporting requires reconciliation of the data sources to produce a land-use change matrix between these land use categories.
- The U.S. Forest Service conducts the [Resources Planning Act \(RPA\) Assessment](#), which reports on the status, trends, and projected availability and condition of forests, forest product markets, rangelands, wildlife and fish, biodiversity, water, outdoor recreation, and urban forests, as well as effects of socioeconomic and climate change on these resources. [Land use and land cover](#) are key components of the projections.
- Every five years, USDA releases a report on [Major Uses of Land in the United States](#). This report presents findings from the most recent inventory of U.S. major land uses, drawing on data from USDA, the U.S. Census Bureau, the U.S. Department of Transportation, the USGS, the U.S. Department of the Interior, and other sources. The report provides estimates of several broad classes and subclasses of agricultural and nonagricultural land over time down to the State level. With respect to forest land, the report only provides estimates for commercial forest land use.