



American Hardwood Assured 2024 deforestation-risk assessment

Annual Report

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Author’s note

This report has been produced independently by George White and commissioned for the American Hardwood Assured (AHA) Platform by the American Hardwood Export Council (AHEC).

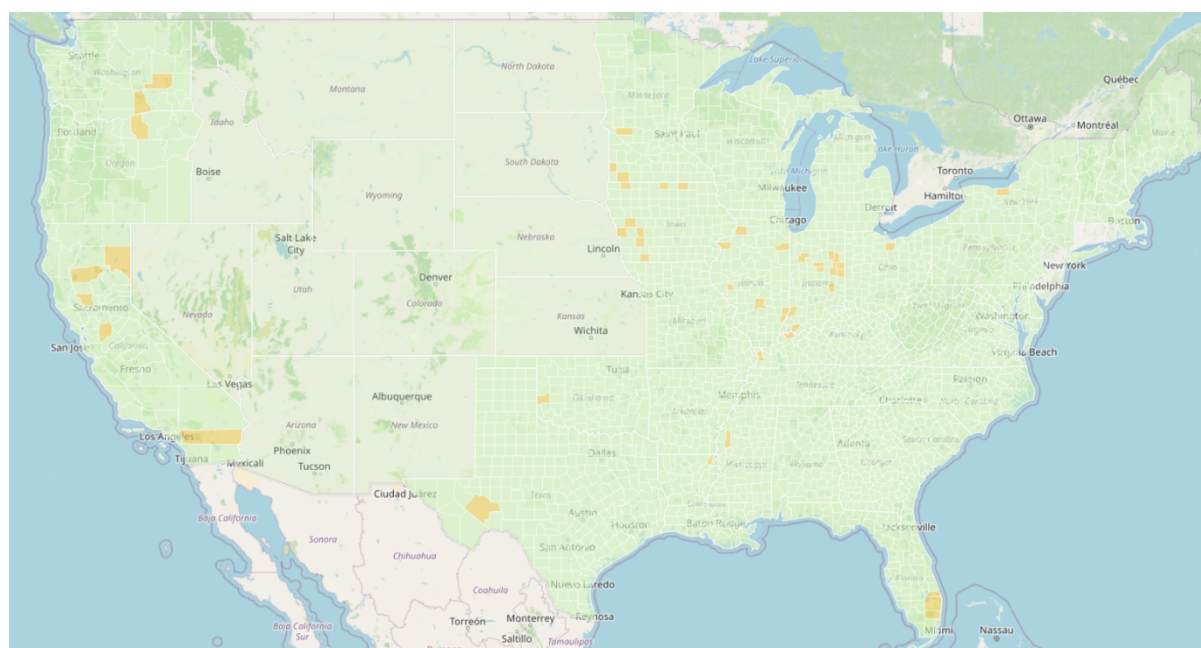
The views expressed herein are those of the author and do not necessarily reflect the official opinion of the AHA Platform or American Hardwood Export Council.

1. Background

1.1 The AHA Platform

The AHA Platform is a bespoke tool exclusively designed for US-based exporters to deliver a robust assurance of the legal and deforestation-free status of hardwoods that originate in the United States. Aside from determining the level of legality risk at a State level, the system uniquely determines the potential level of hardwood forest conversion to agriculture at a county ('micro-jurisdiction') level. Thanks to the US Department of Agriculture's long term earth observation-based monitoring of crop land and forest land in combination with the latest developments in artificial intelligence (AI), the AHA Platform has been available to American hardwood exporters since September 2025.

Using the latest GIS and AI technology, AHA's independent assessment of deforestation risk is based on the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL). The CDL is an annual geo-referenced, crop-specific land cover data layer produced using satellite imagery and extensive agricultural ground reference data. Annual review of the CDL data, which has a spatial resolution of 30 meters (increasing to 10 meters starting in 2024), allows the rate and immediate drivers of hardwood forest conversion (in terms of the crops or other land uses that replace forests) to be readily identified.



The AHA Platform features a view of the U.S. mapping the level of legality risk at State level and potential level of hardwood forest conversion to agriculture at a county level.

To enhance the accuracy of the assessment, AHA is developing a procedure to bring expert human eyes to bear on any sites flagged by AI analysis of satellite data as potentially at risk of deforestation. Even the best algorithms can struggle to accurately distinguish between sites subject to sustainable timber harvesting operations; or that are damaged by pests, fires or windthrow; or that are undergoing conversion. In practice, some sites must be scrutinised by experts with knowledge of local forestry practices using higher-resolution satellite data, or even by putting feet

on the ground. Over time, the results of this “truthing” exercise will be used to refine the AI analytical procedures.

AHA’s future annual analysis of CDL data will be combined with an analysis of deforestation risks and drivers, prepared by the U.S. Forest Service, using the extensive sample-based inventory data collected across all the U.S., as part of the Forest Inventory and Analysis (FIA) Program.

1.2 Why focus deforestation analysis on U.S. counties?

Following two years of technical and consultative work starting in early 2023, AHA concluded that assessing deforestation risk and providing geolocation data for individual hardwood harvesting sites at a property level with each export consignment is technically impossible due to several structural realities of the U.S. hardwood industry. Due to the naturally diverse composition of US hardwood forests and fragmentation of ownership across 9.4 million family forests in hardwood-producing regions with average holdings of just 9 hectares, a single harvest produces only a very small volume of each hardwood species, size, and grade. As a result, US hardwood exporters need to rely on extensive aggregation across numerous harvest locations to create viable export consignments, resulting in a single shipment potentially containing material from thousands or tens of thousands of individual properties.

This creates significant technical challenges at a time when the resolution and accuracy of publicly accessible satellite data, and the algorithms that detect land-use change, are still not sufficient for confident assessment and attribution of deforestation events at the level of non-industrial private properties in the U.S. However, publicly accessible data and existing land-use change algorithms are more than adequate to accurately assess deforestation risk at a county level in the U.S., particularly to identify counties where deforestation events are extremely rare or non-existent.¹

In the U.S. hardwood sector, satellite analysis of deforestation events is also greatly complicated by the time factor. Unlike for agricultural crops where their contribution to deforestation can be assessed by determining if they are on land that was previously a forest after a certain cut-off date – i.e. assessing a past event – in the

¹ A paper published in Nature on 18 July 2025 summarizes the current status in terms of resolution and level of public access to Earth Observation (“EO”) data for EUDR conformance (K. Berger, M. Herold, Z. Szantoi, *Earth observation as enabler for implementing the EU regulation on deforestation-free products* at <https://www.nature.com/articles/s44168-025-00276-9>). The paper highlights that existing monitoring systems using Landset data (30m resolution) are “limited in reliably detecting small-scale disturbances (e.g., selective logging or narrow clearings) that are visible only at higher resolutions.” Monitoring is now improving with the introduction of Sentinel-2 data (at 10m resolution) which “has proven its abilities in monitoring large-scale monoculture crops like oil palm and rubber.” However, “for monitoring small-scale or agroforestry systems like coffee and cocoa, optical very high-resolution (VHR) imagery with a pixel size <5 m offers better monitoring performance.” AHEC’s technical work confirms that the small-scale low intensity harvest operations typical in the U.S. hardwood sector fall into the latter category and that even Sentinel-2 data combined with the best algorithms cannot yet accurately categorize land-use change in the U.S. hardwood forest at the level of individual properties. The current technological status dictates a county-based approach in the U.S. hardwood sector rather than a property-based approach. The Nature paper effectively confirms this is the most appropriate approach under current technological conditions when it refers to the “critical role” of EO in identifying “high-risk zones” in the specific context of smallholders. As noted in the Nature paper, “the situation of EO capability will improve in the early 2030s with Sentinel-1 NextGeneration (NG) and Sentinel-2NG, providing higher temporal, enhanced spectral and better spatial resolutions compared to the current systems. This will specifically enhance the ability to monitor dynamic land use practices and smaller-scale changes.” This holds out the prospect of individual harvest sites for US hardwoods being accurately identified, classified, and monitored at property level through the AHA Platform in the future, but not for at least another five years.

U.S. hardwood sector it is only possible to assess the probability that harvesting will be followed by deforestation in the future. It typically takes several years – sometimes up to a decade – before satellite data can confirm, or otherwise, that harvesting has been followed by forest regrowth. Therefore, satellite data cannot be used at the time U.S. hardwoods are exported to check there was no deforestation at the specific site where harvesting occurred. In this sector, satellite data is most effectively used to determine if there is a systemic risk of conversion within specific counties over a longer time horizon, and what are the drivers of deforestation where it occurs. From that, strategies and plans can be developed to mitigate risk in the future.

According to U.S. forest inventory data, there are 1,589 counties in the U.S. where hardwood sawlogs are harvested, each with an average area of 183,000 hectares and harvesting 56,500 m³ of hardwood sawlogs per year². These figures are comparable to those of typical state forest areas or industrial forest landholdings in both the U.S. and other countries. Counties represent the frontline of elected governance and function as key administrative units within states throughout the U.S. with significant responsibilities for land management and resource planning. They therefore provide an appropriate unit for assessment of deforestation risk and development of action plans to mitigate this risk where necessary.

1.3 Definitions

To facilitate broad acceptance in the global market, the AHA assessment of deforestation risk in U.S. hardwood forests is based, as far as possible, on internationally recognised definitions of deforestation by the United Nations Food and Agriculture Organisation (UN FAO). It also takes account of the definitions used in the EU Deforestation Regulation (EUDR).

As the focus is on the risk of commodity-driven deforestation of hardwood stands, the analysis quantifies the extent of conversion of deciduous and mixed deciduous/coniferous forest to agricultural land. Unless otherwise stated, the term “hardwood forest area” in this report refers specifically to the area of deciduous and mixed deciduous/coniferous forest in hardwood producing states of the United States. The term “deforestation” refers to the conversion of deciduous and mixed deciduous/coniferous forest in hardwood producing states of the United States to agricultural land. “Hardwood producing states” are those for which FIA Program data identifies that hardwood sawlog harvests are being undertaken.

Drawing on the analysis and in consultation with stakeholders, AHA has determined a threshold level for deforestation at county level. For each U.S. county, the AHA assessment identifies the percentage of hardwood forest area potentially converted to agricultural land between 2020 and 2024 and classifies counties as follows:

- Negligible risk – deforestation confirmed as less than 0.5% over the four year period (0.125% average per year).

² AHA analysis of USDA Forest Industry Analysis (FIA) database, latest state annual inventory 2020-2023 depending on state.

- Unspecified risk – deforestation possibly more than 0.5%. Further assessment using the Expert Eye tool (see sections 2.2 and 2.3 below) is needed before negligible risk can be confirmed.
- Specified risk – deforestation confirmed as more than 0.5% following further assessment using the Expert Eye tool.

Where hardwood derives from U.S. counties identified as “unspecified” or “specified” risk, U.S. hardwood exporters using the AHA Platform must declare the actions taken to mitigate the risk of sourcing products from sites that may be converted to agricultural land in those counties.

2. Methodology to identify potential deforestation

2.1 AI Analysis of Satellite Imagery

Artificial Intelligence (AI) analysis for potential deforestation detection utilizes satellite imagery and sometimes other data sources to detect changes in forest cover. This involves training AI models to recognize patterns of deforestation, such as tree loss and especially changes to land use.

To identify areas of potential deforestation, AHA has undertaken analysis of changing land use since 2016 across 33 states which contain over 2,500 counties. The 2024 assessment has covered a total land area of 510,819,845 hectares. This has been through a combination of statistical analysis, artificial intelligence (AI) and expert human examination.

The primary source of data has been the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL)³ which itself draws primarily on 30m resolution Landsat data and more recently (i.e., for 2024) 10m resolution Sentinel-2 satellite data. This dataset (from the years 2016 to 2025 inclusive) has then been re-sampled at different spatial and temporal frequencies to provide training data for a deep convolutional neural net. A deep convolutional neural network is a type of artificial neural network designed primarily for processing grid-like data, such as images, by automatically learning complex features through multiple layers of operations. In this context it is used to identify trends from year to year at local, regional and state level, and to assess the likelihood that any given area of tree-cover loss is related to forest clearance to make way for food. The AHA Platform bespoke AI has been trained to recognize patterns in the data that suggest deforestation through analysis of images over time to detect changes, such as patterns indicative of potential deforestation. These changes include changes in forest cover (especially tree cover density), road construction, housing, or industrial development, quarrying or mining, or, most importantly, establishment of agricultural row crops.

Areas which are highlighted as being potentially deforested or which are identified by the CDL as being deforested but where the AI analysis suggests that this is unlikely are then examined by an expert using high resolution satellite imagery across several years in order to ascertain whether deforestation has indeed occurred. The

³ https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php

expert results inform our statistical analysis and are fed back into our AI model in order to improve its future capabilities.

The CDL has been updated annually since 2008 with new data released, usually in January each year, reflecting the crop and forest types occupying land during the previous growing season. The AHA deforestation-risk assessment for each year is updated as soon as possible after the CDL annual update becomes available.

2.2 Expert Eye land use truthing tool

An Expert Eye land use truthing tool has been developed to improve the accuracy of deciduous forest conversion assessments made using AI alone. To enhance the accuracy of the assessment, AHA has developed this procedure to bring expert human eyes to bear on any sites flagged by AI analysis of satellite data as potentially at risk of deforestation. Even the best algorithms can struggle to accurately distinguish between sites subject to sustainable timber harvesting operations; or that are damaged by pests, fires or windthrow; or that are undergoing conversion. In practice, some sites must be scrutinised by experts with knowledge of local forestry practices using higher-resolution satellite data, or even by putting feet on the ground. Over time, the results of this “truthing” exercise will be used to refine the AI analytical procedures.

The initial assessments made by AI compares the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL)⁴ from 2020 (which itself draws primarily on 30m resolution Landsat data) with the CDL for 2024 (which draws primarily on the 10m resolution Sentinel-2 satellite data).

Whilst the Expert Eye tool itself focuses on specific sites of interest, the wider AHA applies smart geolocation to identify the U.S. county of origin of hardwoods where regular independent expert analysis of satellite, forest inventory and forest governance data confirms negligible deforestation and illegality risk. Working at a county level ensures the number of geolocations remains manageable (circa 1600 counties account for 100% of U.S. hardwood sawlog production, compared to 9.5 million individual smallholders) and avoids imposing unnecessary costs and burdens on small producers. The average area of U.S. counties supplying hardwoods is 160,000 hectares, equivalent to the area of many single state or industry forest holdings. County level analysis allows geolocations to be checked using plant-chemistry-based provenance techniques and addresses antitrust, commercial confidentiality and privacy concerns associated with provision of geolocation data on individual private landowners. Counties are also in the front line of elected government, are often the most fundamental administrative division of the state and play an essential role in almost every community in the U.S, particularly in relation to land and resource-use planning. Counties are sufficiently compact to ensure a homogenous level of deforestation risk, a situation less likely at the scale of states.

Application of AI to the pre-prepared USDA CDL allows vast areas to be assessed whilst still giving relatively high levels of confidence in the assessments produced.

⁴ https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php

The process is not 100% accurate though, and further checks are required to improve accuracy and to eliminate errors. The expert eye tool therefore exists to improve the level of accuracy. The importance of truthing is especially pertinent in counties where the estimated deciduous forest conversion rate is relatively close to the threshold used by AHA. Set at 0.5% conversion over the period 2021-2024 (or 0.125% per annum) the rate determines whether a county is classified as negligible risk (below 0.5% over the 4 years) or specified risk (over 0.5% over 4 years). The tool focuses on sites in counties which are close to the 0.5% threshold to ensure that mis-categorisation is reduced, or risk is specified only where it is very likely to be present.

Accuracy is important as the initial assessment relies upon certain assumptions:

- That the USDA Crop Data Layer is an accurate satellite analysis of crop land and forest.
- Sentinel-2 images can accurately determine a change in land use between 2020 and 2024.

The tool allows these assumptions to be challenged using a range of other visual data and human input that can reveal greater detail and the wider context for the potential change in land use, such as proximity to other crops, previously invisible infra-structure developments, or signs of fire and pest damage that the AI might mistake for conversion.

2.3 Initial results of Expert Eye tool

The initial phase using the Expert Eye tool identified a total of nearly 270 sites worthy of consideration. These ranged in size from sites as small as 1 acre through to sites spanning more than 100 acres. Priority was attached to sites in counties close to the risk threshold where truthing will allow the county to be correctly identified as either “specified risk” or “negligible risk”.

Table 1: Summary of initial analysis using the ‘expert eye’ truthing tool

‘Expert eye’ determined status	Number of sites assessed	% share of total
Agricultural land – no change 2020-2024	68	25
Forest land – no change 2020-2024	73	27
Forest land converted to agricultural land 2020-2024	90	33
Forest land converted for development 2020-2024	12	4
Unidentified / unknown land use either in 2020 or 2024	26	10

The analysis concluded that 52% of the “deforestation” identified / suspected by the AI was not actual deforestation. It concluded that this land either remains as forest land (27% of the sites assessed) or remained as agricultural land (25% of the sites).

The analysis also concluded that 37% of the potential deforestation identified/suspected by AI was likely to be actual deforestation. It either was forest land in 2020 and in 2024 had become agricultural land (33%) or has been developed into a non-agricultural or non-silvicultural land use, such as through some form of development (4%). Development sites identified ranged from industrial sites, through to housing sites and mining sites.

For 10% of sites suspected as “deforestation” identified by the AI, these cannot be determined. This is due to the image quality being too poor or situations where the past and/or present land use cannot be identified. In this situation it is often clear that forest land has been cleared but there is no subsequent image available to reveal the intended land use.

At the time of publication of this annual report the expert eye truthing process has not been used to adjust the levels of risk within the main dataset. Additional reviews of the selected sites have been determined as being required prior to any amendments being made. Additional scrutiny will ensure that any changes are credible and reflect the expert opinion of more than a single expert. Where there is agreement between experts, learning for the AI algorithm will be incorporated where possible into future analysis.

The main dataset of the AHA Platform deforestation risk assessments will only be amended when there is sufficient confidence that a range of experts have each independently drawn comparable conclusions on the deforestation status of flagged sites. Initial results suggest that a number of sites will be assessed at lower levels of deforestation than suggested by the AI. In turn this might lead to a small number of counties falling below the 0.125% potential deforestation per year threshold set by AHA (for example some counties within Illinois, Kentucky and Indiana which are just above the threshold).

Results of the expert eye truthing process will be integrated in the 2025 annual report.

3. Deforestation risk at national and state level

3.1 National level risk

Considering the deforestation risk from across the states producing hardwoods, the risk of wood being from deforested land is extremely low. AHA estimates of deforestation for the period 2020-2024 suggest that in total these states contained over 112 million hectares of hardwood forest in 2020. In the four years from 2020 to 2024 potentially 44,700 ha of this land had been converted to agriculture, representing 0.0099% of the forest land being converted annually. These same states produce over 92 million cubic metres of hardwood per year of which less than 9,149 would have been sourced from potentially cleared land in 2024. Wood obtained from land potentially cleared represented 0.0099% of the total wood harvested in 2024.

Table 2: Determination of deforestation risk for US hardwoods for 2024: all counties in 33 assessed states

Area of hardwood forest in 2020 (ha)	112,448,754
Area potentially converted to crop land (ha 2020-2024)	44,736
Annual area converted to crop land (ha)	11,184
Exposure to risk - Annual percentage converted annually (%)	0.009946
Total hardwood production per year (m ³)	92,055,750
Exposure to risk by volume per year (m ³)	9,149
Exposure to risk by volume per year (%)	0.010275

Not all counties included within the assessment are recorded as producing hardwoods for commercial use. Closer examination of counties actually producing hardwoods reveals that the level of risk of deforestation is even lower. The assessment reveals that 33,130 hectares of forest land was potentially converted in these counties between 2020 and 2024, with an annual total of 8,232 hectares potentially converted. For counties producing hardwoods, 0.0084% of the forest land was potentially converted annually. **Using this risk exposure, around one cubic metre of logs for every 10,000 cubic meters entering supply chains would have originated from land potentially converted to agriculture.**

Table 3: Determination of deforestation risk for US hardwoods in 2024: counties producing hardwoods in 33 assessed states

Forest area in 2020 (ha)	98,845,000
Area potentially converted to crop land (ha 2020-2024)	33,130
Annual area converted to crop land (ha)	8,282
Exposure to risk - Annual percentage converted annually (%)	0.008409
Total hardwood production per year (m ³)	92,055,750

3.2 International comparisons

To provide context for this level of risk, it is worth making comparison with some other countries. The table below makes similar calculations for Democratic Republic of Congo, Indonesia, Brazil and Myanmar.

Table 4: Determination of deforestation risk for selected countries

Country	Deforestation ha/year	Production (m ³)	Forest area 2020 (ha)	Annual conversion (%)	Exposure to risk by volume per year (m ³)
Brazil	1,700,000	30,245,000	496,620,000	0.342	103,533
Democratic Republic of Congo	1,101,400	400,000	126,155,000	0.873	3,492
Indonesia	650,000	33,114,000	92,133,000	0.706	233,620
Myanmar	294,000	2,200,000	28,544,000	1.030	22,660

As indicated in the table above, the risk of sourcing hardwoods potentially originating from land cleared for agriculture from any of these four countries is significantly higher than for US hardwoods. For every 10,000 m³ of American hardwood logs, the risk is for one (1) log m³ to be from agriculturally driven deforestation; compared to 87 m³ from DR Congo, 71 m³ from Indonesia and 34 m³ from Brazil. In this comparison the relative level of risk for American hardwoods is negligible, both relatively, and in absolute terms.

Considering a couple of temperate countries which have experienced modest forest loss in the period 2010-2020 provides further context.

Table 5: Determination of deforestation risk for selected temperate countries

Country	Deforestation ha/year (average 2010-2020)	Forest area 2020 (ha)	Annual conversion (%)
Japan	3,100	24,935,000	0.012
Belgium	100	689,000	0.015

Both Japan and Belgium have annual conversion rates that are higher than the American hardwood producing states, at 0.012% and 0.015% compared to circa 0.009%. The level of risk in all three cases must be considered extremely low (negligible by any measure).

In the global context, FAO reports that annual deforestation covered 4.7 million hectares per year for 2015-2020 with an annual conversion rate of 0.116%.⁵ This

⁵ FAO (2020) *Op. Cit.*

global average figure is approximately 12 times the level of risk of American hardwoods.

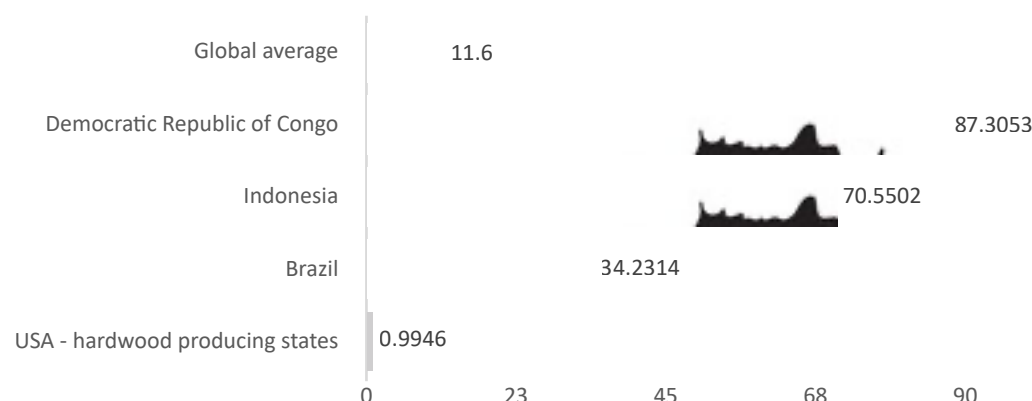


Figure 1: Comparison of risk exposure across a range of countries. N=1 estimated number of sawlog m³ originating from deforestation per 10,000 m³ of sawlog production in 2024

3.3 State level risk

The 2024 AHA potential deforestation analysis considers 33 States. The analysis reveals that the area of forest land potentially converted per state over the four-year period of 2020 to 2024 varies widely. The 2025 analysis will include an additional 4 States to increase coverage to 37 hardwood producing States.

The States with the largest forest area potentially converted between 2020 and 2024 are Illinois (5,924 ha / 14,683 acres), Indiana (3,927 ha / 9,704 acres), Michigan (3,117 ha / 7,702 acres) and Kentucky (3,022 ha / 7,468 acres). Conversely the states with the lowest areas potentially converted during this period are Oregon (7 ha / 17 acres), Washington (8 ha/20 acres) and New Hampshire (9 ha / 22 acres). On an annual basis, the area potentially deforested per year shows enormous disparities ranging from a high in Illinois (1,486 ha / 3,671 acres) to a low in New Hampshire of 2 ha / 5 acres.

The volume of hardwood sawlog harvested in each state varies widely with states such as Virginia, Tennessee and Michigan producing over 6 million cubic metres per year; compared to states such as Rhode Island and Delaware producing less than two hundred thousand cubic metres.

Using the percentage of forest area potentially converted per year it is possible to calculate the volume of hardwood sawlog exposed to this risk per year. The highest exposure to risk in absolute sawlog harvest volume terms occurs in Indiana (1,162 m³), Kentucky (952 m³), Illinois (788 m³) and Michigan (671 m³). The lowest exposure to risk on a volume basis occurs in Massachusetts (1m³), Rhode Island (1m³), Vermont (1m³) and New Hampshire (2 m³).

For context, Indiana harvests over 2.6 million cubic metres of hardwood sawlogs each year and Kentucky harvests annually over 6 million cubic metres. The volumes potentially exposed to deforestation risk are, by comparison, almost vanishingly small.

Table 6: Overview of potential deforestation and risk exposure for hardwood producing States

State	Hardwood forest area potentially converted to crop 2020-2024 (Ha)	Hardwood forest area 2020 (Ha)	Total hardwood sawlog production (m³)	% potentially converted 2020-2024	% potentially converted annual	Volume exposed to risk per annum (m³)	Area potentially converted to crop land per year (Ha)	Area potentially converted to crop land per year (Acres)
Alabama	354	3,652,953	3,623,796	0.010	0.002	93	88	219
Arkansas	1,143	4,192,074	2,868,888	0.027	0.007	185	286	706
California	140	294,296	619,699	0.048	0.012	63	35	87
Delaware	295	130,970	185,438	0.225	0.056	92	74	182
Florida	1,563	2,753,976	617,761	0.057	0.014	6	391	966
Georgia	485	3,933,223	3,576,199	0.012	0.003	117	121	300
Iowa	2,349	1,267,264	593,407	0.185	0.046	316	587	1,451
Illinois	5,942	2,311,779	1,213,364	0.257	0.064	788	1,486	3,671
Indiana	3,927	2,277,657	2,634,470	0.172	0.043	1,162	982	2,426
Kentucky	3,022	5,276,822	6,081,121	0.057	0.014	952	756	1,867
Louisiana	1,255	2,274,394	1,852,178	0.055	0.014	378	314	775
Massachusetts	18	940,984	256,431	0.002	0.000	1	5	11
Maryland	426	1,005,290	698,169	0.042	0.011	76	106	263
Maine	74	3,920,006	2,327,681	0.002	0.000	13	19	46
Michigan	3,117	6,922,622	6,090,097	0.045	0.011	671	779	1,925
Minnesota	2,459	5,849,915	2,352,397	0.042	0.011	219	615	1,519
Mississippi	895	3,200,331	2,855,383	0.028	0.007	145	224	553
Missouri	3,524	6,640,327	3,013,311	0.053	0.013	411	881	2,177
North Carolina	1,783	4,689,438	5,282,083	0.038	0.010	574	446	1,102
New Hampshire	9	1,228,008	743,968	0.001	0.000	2	2	5
New Jersey	376	761,245	205,605	0.049	0.012	20	94	233
New York	1,228	5,883,211	3,889,569	0.021	0.005	281	307	759
Ohio	2,258	3,375,203	3,168,686	0.067	0.017	561	565	1,395
Oklahoma	197	3,202,214	452,977	0.006	0.002	3	49	121
Oregon	7	294,961	1,417,898	0.002	0.001	12	2	4
Pennsylvania	2,002	6,573,093	6,248,751	0.030	0.008	359	500	1,237
Rhode Island	11	139,583	71,220	0.008	0.002	1	3	7
South Carolina	466	2,085,194	2,413,480	0.022	0.006	176	116	288
Tennessee	1,340	5,067,072	6,434,075	0.026	0.007	383	335	828
Texas	302	3,444,688	1,060,204	0.009	0.002	14	75	186
Virginia	814	4,830,185	6,716,277	0.017	0.004	331	203	503
Vermont	16	1,366,715	576,981	0.001	0.000	1	4	10

State	Hardwood forest area potentially converted to crop 2020-2024 (Ha)	Hardwood forest area 2020 (Ha)	Total hardwood sawlog production (m ³)	% potentially converted 2020-2024	% potentially converted annual	Volume exposed to risk per annum (m ³)	Area potentially converted to crop land per year (Ha)	Area potentially converted to crop land per year (Acres)
Washington	8	282,769	1,617,925	0.003	0.001	7	2	5
Wisconsin	2,791	6,440,886	3,509,063	0.043	0.011	457	698	1,724
West Virginia	104	4,846,821	3,686,110	0.002	0.001	8	26	64

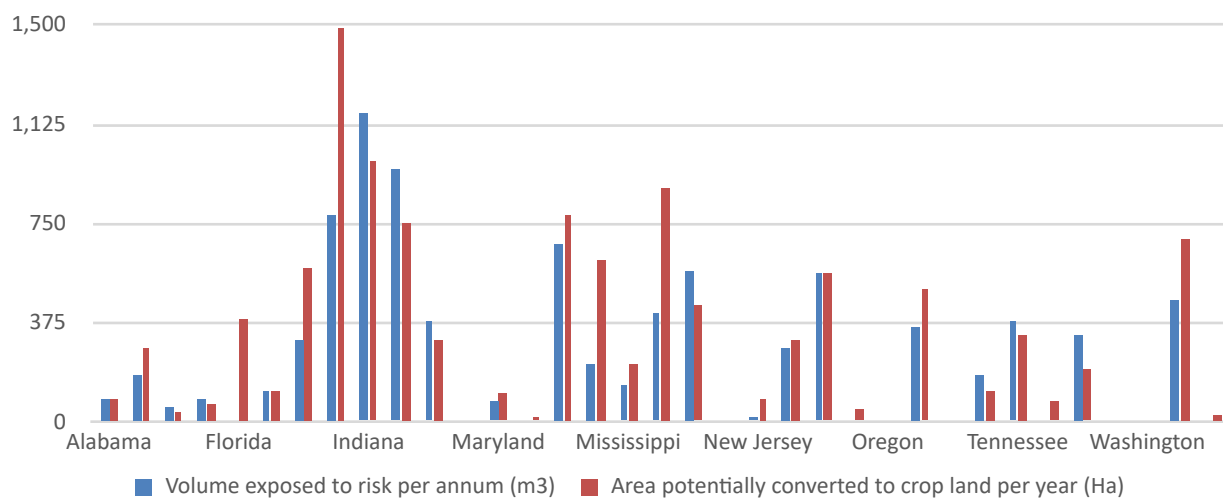


Figure 2: Area of hardwood forest potentially converted per year and hardwood sawlog harvest volume exposed to risk per year by hardwood producing state.

As previously noted, for every 10,000 m³ of American hardwood saw logs, the risk for the entire 33 states assessed is for one (1) cubic metre of logs to be from agriculturally driven deforestation per year. Considering this risk at a state level reveals some variation. In terms of risk per 10,000 cubic metres of log volume, hardwood logs from Illinois carry the highest potential risk with an estimated 6.5 m³ of logs per 10,000 m³ of production. Other states with relatively high figures include Iowa (5.3 m³ per 10,000 m³), Delaware (5 m³ per 10,000 m³) and Indiana (4.4 m³ per 10,000 m³). At the other end of the scale, Washington has an exposure to risk of 1 log m³ in every 25,000 m³, Vermont 1 log m³ in every 40,000 m³, and West Virginia 1 log m³ in every 50,000 m³.

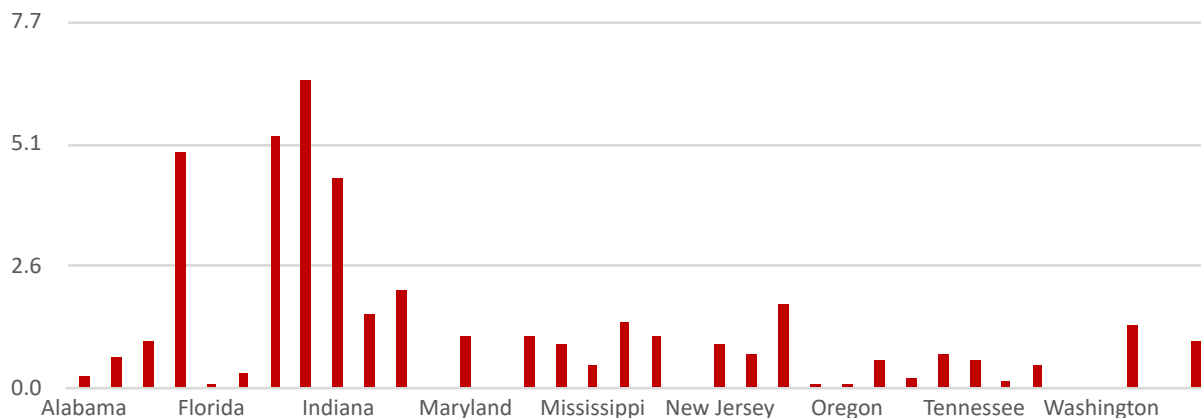


Figure 3: Comparison of risk exposure across a range of hardwood producing States. N=1 cubic metres volume of logs potentially originating from deforestation per 10,000 cubic metres of log production in 2024

4. County level deforestation risk

4.1 Overview

AHA's overall assessment considers changes in land use in 2,505 counties across 33 States. Of these counties, 1,547 were recorded⁶ as harvesting hardwood sawlogs in 2024 and 958 had no record of such harvests. Hardwood sawlog harvest volumes across these producing counties ranged from a high of 461,000 m³ to a low of 257 m³ per county per year, with an average annual harvest volume of 57,558 m³. Hardwood producing counties had a forest area of 98.8 million ha (244 million acres) in 2020 and an annual hardwood sawlog harvest volume of 92 million m³.

The assessment determined that an area of 44,736 hectares of hardwood forest was potentially converted to agriculture in the period 2020 to 2024. On closer inspection, 31,384 hectares were potentially cleared in counties with recorded hardwood sawlog harvests, and 13,352 hectares were potentially cleared in counties with no such harvests. It is assumed that any wood harvests in these counties were either of softwood or hardwood below the sawlog size threshold.

Focusing solely on the counties that produce hardwood sawlogs further reduces the level of risk exposure to 0.0084% on a land area basis with an area of 8,849 ha potentially converted per year (see Table 3).

The average area potentially converted per year varies between counties with and without hardwood sawlog harvests. The average area potentially converted each year per county is circa 18 hectares, rising to over 21 hectares in hardwood sawlog producing counties and dropping to around 12 hectares in counties not producing hardwood sawlogs. It is surmised that either the average area potentially converted in counties that do not produce hardwood sawlogs is partially influenced by historic forest conversion having already depleted the forest area to a point where hardwood sawlog production has become minimal or zero; or the counties produce only softwoods that are not the focus of this assessment.

⁶ US Forest Inventory Analysis (FIA) data <https://research.fs.usda.gov/programs/nrum#data-and-tools->

Table 7: Average area of hardwood forest potentially converted – hardwood producing vs non-hardwood producing counties

Hectares	Type of county
17.9	Average area potentially converted to crop land per county - all counties
21.4	Average area potentially converted to crop land per county - hardwood producing counties
12.1	Average area potentially converted to crop land per county - non-hardwood producing counties

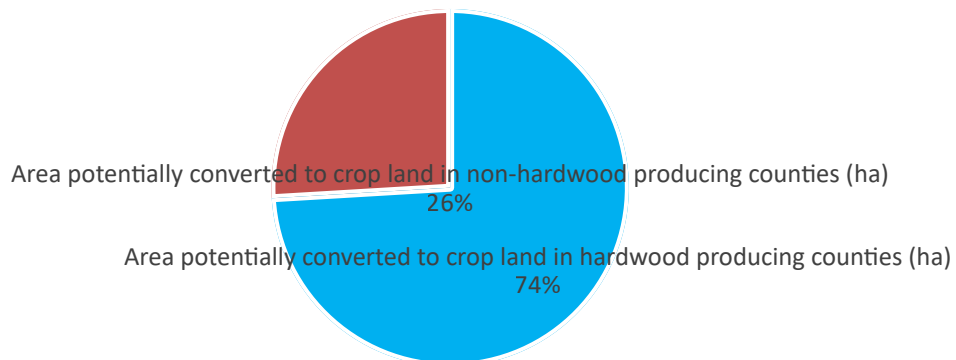


Figure 4: Area of hardwood forest potentially converted to agriculture 2020-2024 – hardwood producing vs non-hardwood producing counties

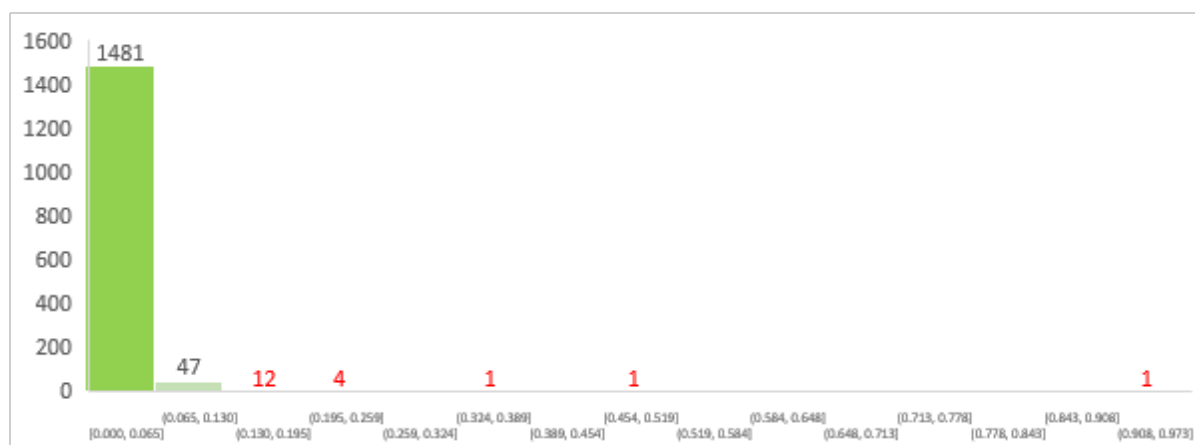


Figure 5: Distribution of hardwood producing counties with respect to annually potentially converted hectares as a share of forest area in 2020. Red highlighted ranges represent the 19 counties investigated in more detail. [n = number of counties within each potential deforestation percentage band]

As indicated in the figure above, within the lowest potential deforestation band, which includes 1,481 counties, there are 360 counties assessed as having zero (0%) risk of deforestation. This lowest band within the chart also includes a further 308 counties where the risk of deforestation is assessed as at or below 0.0001% per year. In volume terms, these figures represent a likelihood in many cases of just one (1) cubic metre of hardwood per year originating from forest land potentially deforested for agriculture in each of these counties. This is tantamount to an unmeasurably low level of risk.

The analysis indicates there are 47 counties in the next highest band of risk, though these are still below the threshold set by AHA for deforestation risk to be considered as a specified risk (i.e., at or over 0.125% of hardwood forest conversion to agriculture per year).

Of the 1,547 counties identified as producing hardwood sawlogs in the most recent state forest inventory⁷, only nineteen are assessed as potentially having conversion rates significant enough to be considered as unspecified risk, i.e., above 0.5% potential deforestation over a 4-year period (or over 0.125% per year), using 2020 as the baseline year. These nineteen counties collectively harvest around 550,000 m³ of hardwood sawlogs per year, around 0.6% of total U.S. hardwood sawlog harvest (89.79 million m³). Production in unspecified risk countries is distributed across a range of species (Figure 6).

⁷ Years 2020 to 2023 depending on state.

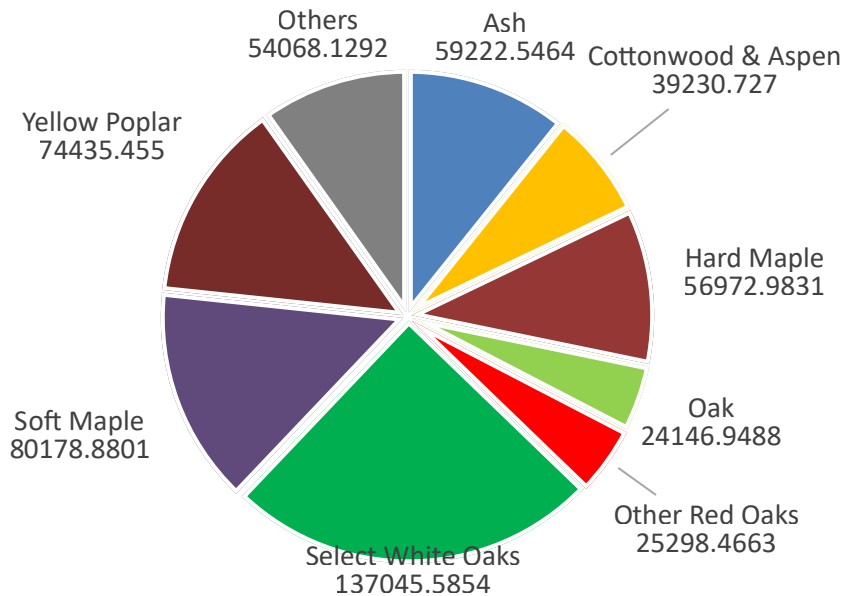


Figure 6: Hardwood sawlog harvests in 19 specified risk counties by species and volume (m³) in 2024. Source: AHA analysis of US Forest Inventory Analysis (FIA) downloaded from EVALIDator API in January 2025 using data from the most recent annual inventory, year 2020 to 2023 dependent on state.

4.2 Counties with highest levels of potential deforestation risk

The nineteen hardwood sawlog producing counties identified as unspecified risk are, unsurprisingly, concentrated in those areas of the United States where agricultural land is more prevalent. Of the nineteen counties, there are eight in Indiana, three in Kentucky, two in each of Iowa and California, and one in each of New York, Ohio, Louisiana, and Illinois.

Hardwood forest area in the nineteen counties varies widely, ranging from 709 hectares to over 63,121 hectares. The area potentially converted per year across the counties is extremely small compared to the forested area and within the range of 1 (one) hectare and 151 hectares (Table 8 and Figure 8). The volume of hardwood sawlogs harvested per year across the nineteen counties also varies considerably, ranging from under 1,700 m³ to over 73,000 m³. The level of risk exposure by hardwood sawlog production volume ranges from 4 m³ to 176 m³ per county per year (Table 8 and Figure 9).

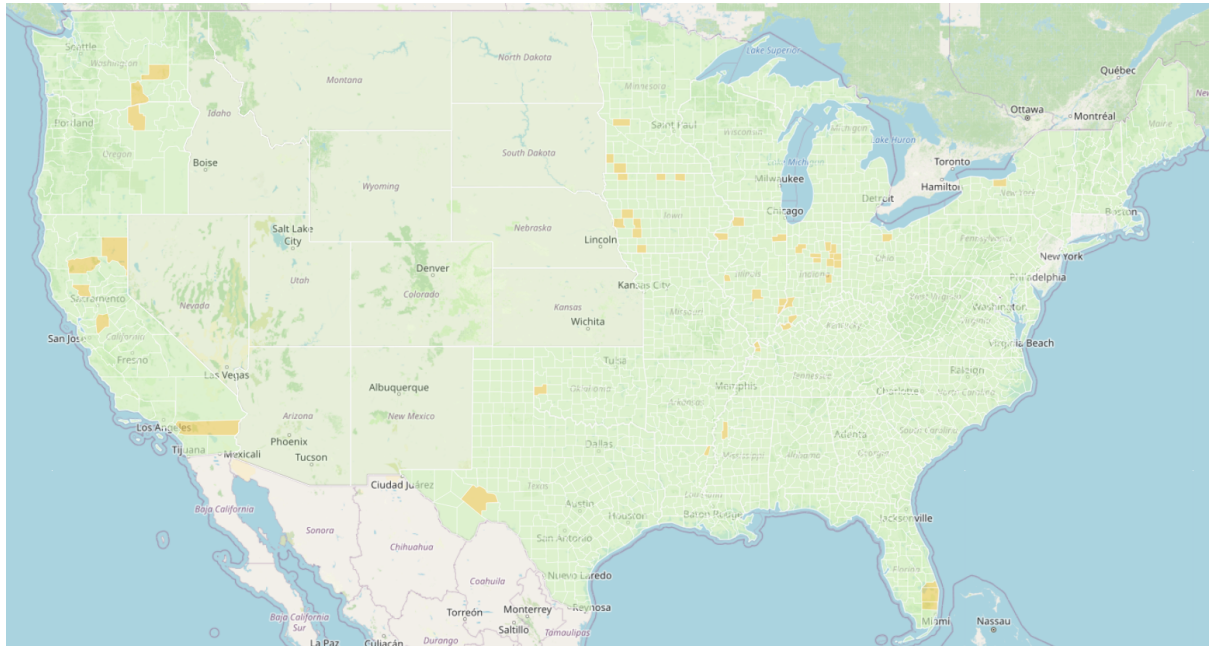


Figure 7: AHA County Deforestation Risk, 2024 analysis, Assessment Covers 33 Leading Hardwood Producing States.

Counties coloured Amber are Unspecified Risk, Counties coloured Green in assessed states are Negligible Risk. 43 counties are identified as Unspecified risk, of which only 19 harvest hardwood sawlogs. Source: <https://www.hardwood.us/>

Table 8: Hardwood producing counties with potential specified risk of hardwood forest conversion

STATE / county	Area potentially converted to crop land per year (Ha)	Forest area in 2020 (Ha)	Annual hardwood sawlog harvest (m ³)	% potentially converted 2020-2024 (Ha)	% potentially converted annual (Ha)	Volume exposed to risk per year (m ³)	Area potentially converted to crop land per year (Ha)
NY: Wayne	432	63,121	73,249	0.684	0.171	125	108
IN: Warrick	218	34,969	62,177	0.624	0.156	97	55
OH: Huron	146	24,306	17,790	0.601	0.150	27	37
KY: Henderson	110	20,940	30,542	0.527	0.132	40	28
KY: Ballard	188	19,271	71,986	0.978	0.244	176	47
LA: West Carroll	359	17,426	32,887	2.062	0.515	170	90
IN: Knox	155	16,860	61,787	0.918	0.229	142	39
KY: Carlisle	602	15,486	8,639	3.890	0.973	84	151
IA: Harrison	84	14,589	10,268	0.574	0.144	15	21
IL: Whiteside	74	14,003	5,700	0.527	0.132	8	18
IN: Jay	59	9,623	9,014	0.616	0.154	14	15
IN: Delaware	50	9,055	29,739	0.554	0.138	41	13
IN: Randolph	119	8,668	6,099	1.376	0.344	21	30
IN: Rush	43	7,438	13,881	0.578	0.145	20	11
IN: White	46	6,835	7,783	0.678	0.170	13	12
IN: Wells	63	6,659	37,785	0.949	0.237	90	16
IA: Mitchell	28	5,173	47,129	0.538	0.134	63	7
CA: Tehama	30	2,966	1,659	1.016	0.254	4	8
CA: Riverside	4	709	22,488	0.584	0.146	33	1

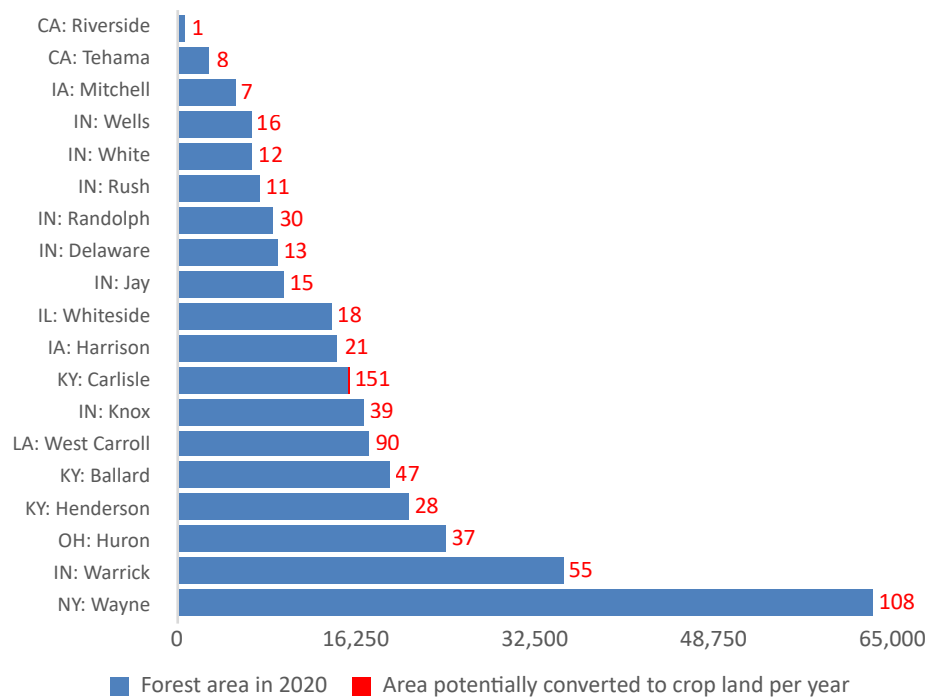


Figure 8: Hardwood forest area and potential area converted per year for selected hardwood producing counties

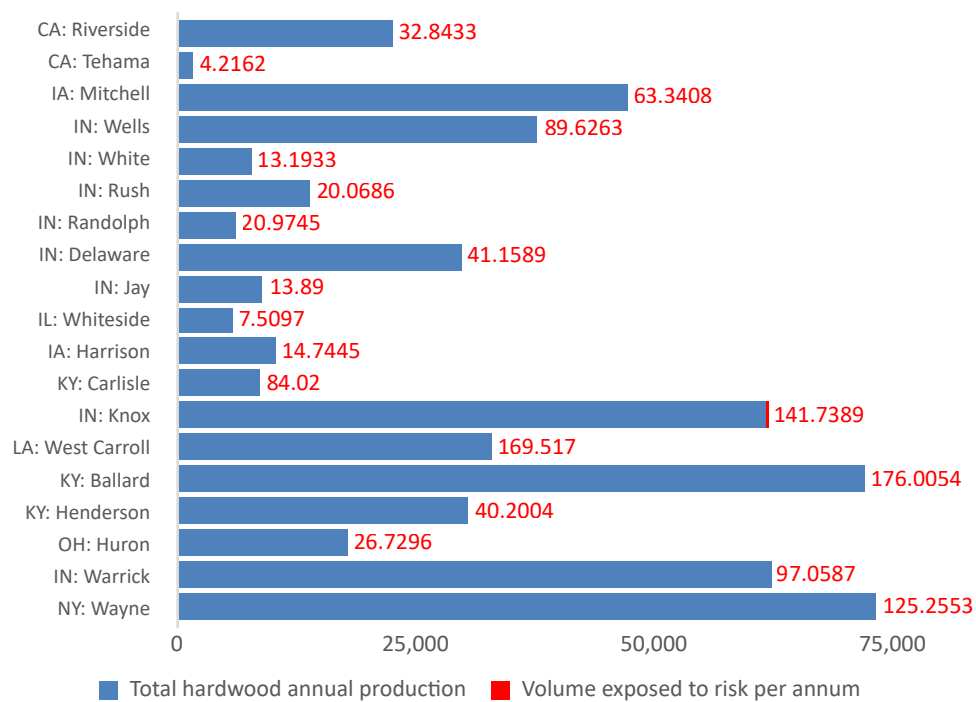


Figure 9: Annual hardwood production and volume exposed to deforestation risk for selected hardwood producing counties (m³)

5. Agricultural deforestation drivers in the U.S.

5.1 Historic drivers of deforestation

The forest landscape today across the hardwood producing states of the United States reflects the changing land use patterns of the past two centuries. During the 19th century, America experienced widespread deforestation, primarily driven by the expansion of agriculture and timber harvesting. This period saw a significant reduction in forest cover, particularly in the Eastern United States, as settlers cleared land for farms and timber was extracted for construction and other uses.

Prior to European settlement, about half of the United States was forested. By the late 19th century, a substantial portion of this forest had been cleared, with some areas in the Northeast being particularly impacted. Settlers cleared vast areas of forest to create farmland and pastureland. The demand for timber for construction, fuel, and other uses led to extensive logging.

In New England deforestation and agricultural expansion were particularly pronounced in between 1830 and 1880. In the Great Lakes, South, and Pacific Northwest there was rapid deforestation in the post-Civil War era (post 1865) as the timber industry expanded westward.

In the 20th century, the eastern United States experienced a significant reforestation trend, particularly after the 1930s. This reforestation involved the replanting of forests and the assisted and natural regrowth of trees on abandoned farmland.

5.2 Forest ownership structure and attributes

Today's hardwood forest resource across the US is primarily made up of previously logged over forests and forests growing on what was a century before farmland (and which was often forest land a century before that). Less than one percent of US hardwood forests outside of protected areas might be considered as previously unlogged forest. A significant portion of remaining 'old-growth' forest is found on federal lands managed by the US Forest Service (USFS) and the Bureau of Land Management (BLM), with estimates suggesting around 18% of USFS and BLM-managed lands are 'old growth'.⁸

Outside of government land the hardwood forest landscape is dominated by private owners. Over 50% of U.S. forest land is owned and managed by more than 10 million private owners. Private ownership is particularly prevalent in the Eastern United States which is the main source of hardwoods. Nearly 90% of all hardwood sawlog production derives from private land. Most of this land is family and individually owned and the average parcel size is smaller than 25 acres / 10 hectares. These owners represent a diverse group of people who have many reasons for owning their forests.

⁸ <https://www.science.org/content/article/how-much-u-s-forest-old-growth-it-depends-who-you-ask> (2022)

An estimated 93% of this family-owned forestland is in holdings of 10 or more acres, but most (62%) family forestland owners have holdings between 1 and 9 acres in size. Nationwide (excluding interior Alaska), there are an estimated 3.7 million family forestland owners of 10+ acres who collectively own 253 million forested acres. The latest National Woodland Owner Survey (NWOS) report released in February 2021⁹ gives a picture of what “family forestland owners” look like. According to survey respondents, the most common reasons for owning family forests are “to enjoy beauty or scenery,” “to protect or improve wildlife habitat,” “to protect nature or biological diversity,” and “for privacy”.

Table 9: Reasons for owning woodland. Source: NWOS https://www.fs.usda.gov/nrs/pubs/jrnl/2022/nrs_2022_shanafelt_001.pdf.

N= Responses are ranked from not important (1) to very important (5)

Reason for owning woodland	Ranking
Beauty or scenery	4.26
Protection of nature or biodiversity	4
Protection of water resources	3.92
Protection or improvement of wildlife habitat	4.2
Land investment	3.56
Privacy	3.97
To raise a family	3.52
To pass land on to children/heirs	3.97
Firewood	2.36
Harvest of timber products	2.78
Harvest of non-timber products	1.82
Hunting	3.44
Recreation, other than hunting	3.48
Other	4.5

What is clear from the NWOS is that the majority of private owners are not driven by timber production with this land use in fact being one of least importance to many. The low status of timber production in turn shows a dichotomy in the hardwood supply chain as log supply is conversely of highest importance to sawmills.

Due to the diverse composition of US hardwood forests and fragmentation of ownership across 9.4 million family forests in hardwood-producing regions with average holdings of just 9 hectares, a single harvest produces only a very small volume of each hardwood species, size, and grade. As a result, US hardwood exporters often need to rely on multiple primary sawmills and extensive aggregation.

⁹ <https://research.fs.usda.gov/programs/nwos>

Individual packs of lumber for export are almost certain to be the result of numerous harvest locations to create viable export consignments, resulting in a single shipment potentially containing material from thousands or tens of thousands of individual properties.

In practice private owners are free agents and not obligated to conserve forest. But the NWOS implies most are minded to do so, and the overall governance framework encourages such conservation, even if it does not necessarily mandate it in state law. The AHA Jurisdictional Risk Assessments consider forest governance across the hardwood producing states¹⁰. Whilst concluding in all 33 states that there is negligible risk of hardwoods being produced unlawfully, the reports also highlight the various different ways that individual states practice forest governance. Some states have all encompassing “forest acts” that mirror legislation in other countries which focuses on regulating timber production through specific forest and lumber focused laws. The majority of states assessed do not have such acts and rely on a mix of legislative measures that often indirectly regulate the hardwood industry. It is evident that in effect it is the culture of forest ownership that is often as important in safeguarding forests as the legal system that underpins the system. This mirrors research from Europe¹¹ which concluded that jurisdictions with “enduring westernised socio-political backgrounds” grant significantly greater degrees of freedom to private owners than former socialist jurisdictions. Tying in with the NWOS results the AHA risk assessments indicate that it is a combination of legislation and a “forest culture” that together create good forest governance.

While there are no explicit rules prohibiting forest conversion in U.S. private forests, private owners are the target of a wide range of regulatory measures, incentive programs, state extension activities, and conservation offset initiatives, all of which serve to reinforce their pre-existing instinct to conserve the natural environment of their own property.

5.3 Current deforestation trends

In 2024 agriculturally driven deforestation is still evident in some counties, though at levels far reduced from the 18th and 19th century. Other drivers are also at play, including development for infrastructure, homes, industrial uses, mines, quarries, and power generation. US forests have also experienced, and continue to experience, large-scale degradation of tree cover due to pests and diseases and forest fires. Typically, such degradation is temporary, in the sense that the forest usually is allowed to regenerate naturally or is replanted, though regeneration rates vary dependent upon climate, the degree of human intervention and intensity of grazing, typically by deer.

A closer examination of the 19 counties identified as having the highest potentially deforested area reveal that there is an extremely diverse range of agricultural crops

¹⁰ <https://www.hardwood.us/aha-jra-results>

¹¹ Nichiforel, L. *et al* (20118) How private are Europe’s private forests? A comparative property rights analysis. Land Use Policy. <https://doi.org/10.1016/j.landusepol.2018.02.034>. (<https://www.sciencedirect.com/science/article/pii/S0264837717305999>)

being grown (see Annex 1). Ranging from almonds, dates, and apples through to vegetables and cereal crops for grain, two main crop types predominate. Soybean production and corn (maize) for grain are the main crop types *potentially* driving deforestation in this selection of counties; combined the two crops accounting for 88% of the agricultural land use.

Soybean uses and market outlook

In the US, soybeans are primarily used for animal feed, human food, and biofuel production. A large portion of the soybean crop is processed into soybean meal, which is a high-protein ingredient in livestock feed for poultry, pigs, cattle, and fish. The other major component, soybean oil, is used for cooking oil, biodiesel, and various industrial products.

The leading soybean producing states in the US are Illinois, Iowa, Indiana, Minnesota, and Ohio. These five states consistently account for a significant portion of the total US soybean production.¹²

US soybean prices in mid-2025 are currently mixed, with some contracts seeing slight increases while others show slight decreases. The overall market sentiment seems to be somewhat bearish due to favourable weather and a lack of strong demand from China. China is currently prioritizing Brazilian soybeans due to ongoing trade tensions and other factors.¹³

U.S. soybean crush for oil for marketing year (MY) 2025/26 is forecast at a record-high 2.54 billion bushels (64.5 million tons¹⁴). The higher soybean crush volume is supported by higher domestic use of soybean oil for biofuel production. In June 2025, the U.S. Environmental Protection Agency (EPA) proposed to increase the Renewable Fuel Standard volumes for calendar year 2026 and 2027 and also reduced the number of Renewable Identification Numbers (RINs) generated from imported biofuels and biofuels produced from foreign feedstocks starting in 2026. As a result, the proposed rule will likely increase the demand for domestically produced feedstocks, including soybean oil.¹⁵

Corn for grain market outlook

Four states dominate in corn¹⁶ farming. Iowa, Illinois, Nebraska and Minnesota make up the Corn Belt, which is responsible for almost half of all US corn production.

¹² <https://www.statista.com/statistics/192076/top-10-soybean-producing-us-states/>

¹³ <https://www.farmprogress.com/markets-and-quotes/morning-market-review>

¹⁴ 1 bushel = 0.0254 metric ton. <https://grains.org/markets-tools-data/tools/converting-grain-units/>

¹⁵ <https://www.ers.usda.gov/topics/crops/soybeans-and-oil-crops/market-outlook#:~:text=U.S.%20soybean%20crush%20for%20marketing,soybean%20oil%20for%20biofuel%20production.>

¹⁶ 'Corn', in the American sense of the term, is in British English known as 'maize'. Corn is grown for use as grain, fodder and for popcorn.

In recent years, the US corn farming industry has experienced volatile revenue largely driven by changes in corn prices, production levels and crop yields. Up to 2023, corn prices saw a significant increase, which resulted in considerable revenue growth for farmers. This increase was fuelled by high demand for biofuels and animal feeds and limited global supplies. However, as production ramped up both domestically and internationally, the industry experienced downward pressure on corn prices. Record yields led to oversupply, driving prices downward and increasing market competition. While sectors like livestock agriculture and industrial production have supported demand, the surplus has outpaced consumption and kept prices lower, causing challenges for farmers trying to maintain profit as fertilizer and seed prices stay high. Industry revenue has grown to reach an estimated \$66.9 billion in 2025.

The 2024-25 corn crop is projected to achieve strong yields despite challenges such as hurricanes and droughts that have limited overall production. These conditions have tightened stocks and stabilized prices, though they continue to pressure farmers' profit. The tariff on US corn exports will make these products significantly less competitive in China, one of its largest markets.¹⁷

At the end of June 2025, USDA, National Agricultural Statistics Service released the annual Acreage report and the quarterly Grain Stocks report. New data shape expectations for a net decrease for new crop feed grains production. Corn area harvested was lowered 626,000 acres to 86.8 million acres and supports a 115-million-bushel reduction in corn production. In combination with changes for other grains, the 2025/26 U.S. feed grains supply is lowered by 3.8 million metric tons to 451.8 million, the highest since 2016/17.¹⁸

Is agriculture driving deforestation in unspecified risk counties?

The area potentially converted across the 19 counties identified as “unspecified risk” in this assessment is small and within the range of one (1) hectare and 151 hectares per county per year. At this scale it is difficult to determine with any degree of accuracy whether agriculture *per se* is responsible for this modest loss. The counties concerned generally have been heavily deforested in the 18th and 19th centuries and the remaining forest land in private ownership on farms is typically less than 10% of the land area in what is a predominantly agricultural landscape. With the numbers being so small, the decision of a single landowner within a county can in effect equate to the total land area potentially deforested in a single year.

It would appear reasonable to suggest that agriculture, driven by markets for soybeans and corn for grain are a source of economic pressure and in turn contribute to the modest levels of deforestation occurring within these counties for the period 2020 to 2024. The economics of agriculture and silviculture are the defining factor: where forested land has low economic value and new agricultural land has a higher economic value - market forces will rationally drive deforestation. Conversely, marketing hardwood products from standing U.S. hardwood forests

¹⁷ <https://www.ibisworld.com/united-states/industry/corn-farming/8/>

¹⁸ <https://www.ers.usda.gov/topics/crops/corn-and-other-feed-grains/market-outlook>

actively discourages their conversion. Studies have shown though that many private, and typically smaller forest landowners, are not driven by economics and often choose to retain forest land for a wide range of reasons.¹⁹

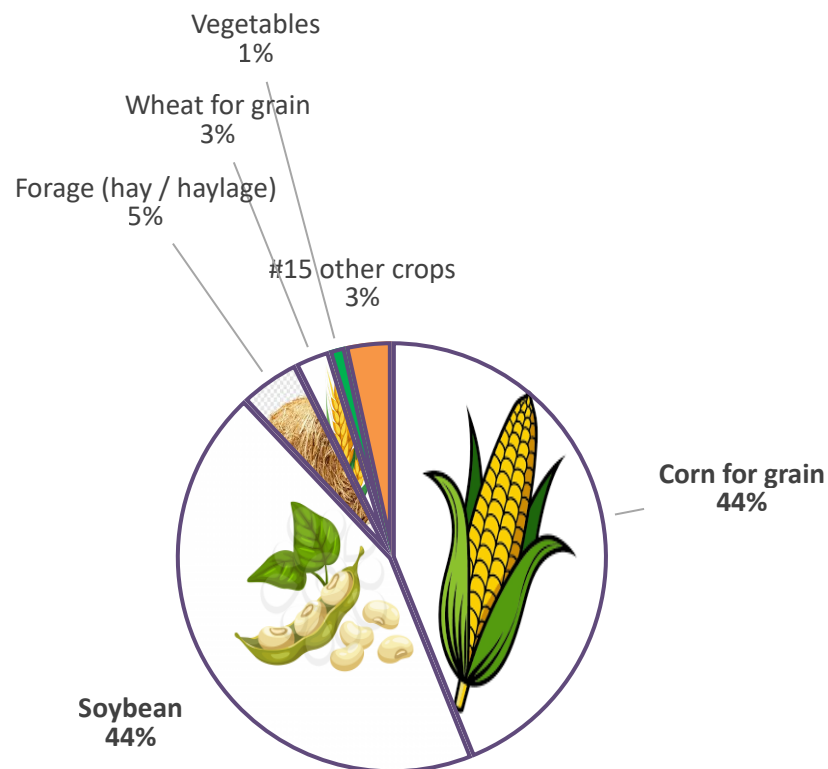


Figure 10: The major agricultural crops in the 19 counties identified with the highest potential risk of deforestation. N=acres

Generally, there are few restrictions on how farmers utilise their land and few laws that prohibit them from converting forest land (farm woodland) in to crop land. Right to Farm Acts define certain farm uses, operations, practices, and products; to provide certain disclosures; to provide for circumstances under which a farm shall not be found to be a public or private nuisance; to provide for certain powers and

¹⁹ <https://research.fs.usda.gov/programs/nwos>

duties for certain state agencies and departments; and to provide for certain remedies for certain persons.²⁰

Right to Farm protections typically are broad but many include specific mention of growing and harvesting of forest products upon forest land, and any other forestry or lumber operations.²¹ In essence the Right to Farm acts generally enshrine the right of the private landowner to harvest timber on their own land. By extension landowners often can lawfully clear and deforest their own land. What is evident is that in the main the vast majority of smaller private woodland owners have no intention of clearing their forests and in fact treasure these spaces for a wide variety of reasons as discussed in Section 5.2.

It is evident that agriculture is a potential threat to American hardwood forests and in some limited circumstances, in some counties, forests are being cleared to produce row crops. Whilst perhaps of concern locally, in a national and international context, the areas involved are extremely small.

The hardwood region is not without forest sustainability challenges. The most cited sustainability issues identified in state forest action plans relate to forest health, particularly the impact of invasive pests and wildfire. Hardwood forests located in close proximity to rapidly growing urban areas are also under pressure from development and other land use changes. While these challenges can be formidable, they do not present significant risk to overall sustainable hardwood production and exports. Strong markets for US hardwood products, including exports, provide an incentive to private landowners to maintain their properties in forest cover.²²

²⁰ <https://alec.org/model-policy/right-to-farm-act/>

²¹As an example, for Massachusetts see: <https://www.mass.gov/doc/model-right-to-farm-by-law/download>

²² Goetzl, A et al (2019) *Assessment of Lawful Sourcing and Sustainability: U.S. Hardwood Exports*. Seneca Creek Associates, LLC

Annex 1: Data sources for the AHA platform

A1.1 Land use image sources used by the AHA platform

The initial assessments made by AI compares the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL) from 2020 - which itself draws primarily on 30m resolution Landsat data - with the CDL for 2024. The CDL for 2024 draws primarily on 10m resolution Sentinel-2 satellite data.

A1.2 Land use imagery used by the AHA platform 'Expert Eye' truthing tool

Aside from Sentinel-2, which produces images at 10x10m or 20x20m resolution, a number of other free to access data sets are available and have been utilised in truthing the initial assessment.

Esri images²³ in the continental United States are at 0.3-meter resolution and were produced in 2020 and 2024. Unfortunately, 2020 images can only be guaranteed to be taken in 2020 or before. Images labelled as 'Esri 2024' were produced in 2024 or before. In some cases, images labelled as 2024 are clearly identical to images labelled as '2020'. Esri does not adhere to a strict, predetermined schedule for updating its imagery base maps.

Google Maps images are a mosaic of data from various sources, including satellites and aeroplanes, and the resolution can differ depending on location and the specific data source. Large areas often have a resolution of 1 meter or less. Experience has shown that the majority of images were created 2022-2024. Google Maps satellite images are updated on an irregular schedule, with some areas updated more frequently than others. While major cities and areas with frequent changes might see updates every few months or even monthly, other areas could see updates every few years. It is likely that the areas AHA are focused on are updated less frequently.

MapTiler images²⁴ provides 1-2 meters per pixel resolution, while aerial imagery can achieve even higher resolutions, potentially down to 8cm per pixel in some areas, according to MapTiler. The specific resolution depends on the source imagery and the zoom level. Unfortunately for temporal analysis MapTiler images are undated. Experience indicates that many of the images currently available appear to be from 2023. In some cases, MapTiler images appear older or virtually identical to the latest Google image. MapTiler integrates Maxar's satellite imagery for global coverage, with data claimed as no older than two years.

A1.3 Other sources not used by the AHA platform

A multitude of image sources are available for assessing deforestation and tree cover loss. Global Land Analysis and Discovery (GLAD) laboratory at the University

²³ [https://doc.arcgis.com/en/data-appliance/2022/maps/world-imagery.htm#:~:text=This%20imagery%20ranges%20from%200.3,:280%20in%20select%20communities\).](https://doc.arcgis.com/en/data-appliance/2022/maps/world-imagery.htm#:~:text=This%20imagery%20ranges%20from%200.3,:280%20in%20select%20communities).)

²⁴ <https://www.maptiler.com/satellite/>

of Maryland, in partnership with Global Forest Watch (GFW), and the EU Observatory are two of the most widely used sources.

GLAD / GFW provides annually updated global-scale forest loss data, derived using Landsat time-series imagery. These data are a relative indicator of spatial-temporal trends in forest loss dynamics globally. However, inconsistencies exist due to the following factors²⁵:

- Differences in Landsat sensor technology
- Data richness, or the number of viable land observations available as inputs to analysis
- Algorithm adjustments, including modifications of training data

Landsat 8 has a spatial resolution of 15 meters for its panchromatic band and 30 meters for its multispectral bands. This means that each pixel in the panchromatic image represents a 15m x 15m area on the ground, while each pixel in the multispectral images represents a 30m x 30m area.²⁶

The Sentinel-1 and Sentinel-2 satellites—jointly developed and operated by the European Space Agency (ESA) and the European Commission—alongside NASA's Landsat series, form the backbone of operational forest change monitoring due to their global coverage, open data policies, and suitability for long-term trend analysis⁸. Landsat enabled the creation of thematic products, such as the 30 m-resolution global forest change (GFC), dataset, which tracks forest loss and gain since 2000 and serves as a baseline for many systems, e.g., the global land analysis and discovery (GLAD-L). However, Landsat's 30 m spatial resolution can limit the detection of small-scale deforestation or subtle forest degradation. GLAD-S2 extends the system to Sentinel-2, providing near-real-time detection of primary forest loss at 10 m resolution. The radar for detecting deforestation (RADD) is a near-real-time radar-based (Sentinel-1) alert system for the tropics provided by Global Forest Watch (GFW). GFW recently introduced DIST-ALERT, which significantly expands monitoring capabilities, but with its 30 m resolution, the system is limited in reliably detecting small-scale disturbances (e.g., selective logging or narrow clearings) that are visible only at higher resolutions. Additionally, the $\geq 30\%$ vegetation loss threshold means that subtle degradation events or disturbances in sparse-canopy forests (10–30% cover) may be missed.²⁷

Another open-access platform that has become available in 2025 is *OpenForis*²⁸. OpenForis is an initiative that provides free and open-source solutions for forest and land monitoring. Developed with the belief that innovative, accurate, and transparent forest monitoring can unlock the potential of forests for climate action and other benefits. It is working towards digital public goods offered by the Food and

²⁵ <https://data.globalforestwatch.org/documents/941f17325a494ed78c4817f9bb20f33a/explore>

²⁶ [https://www.usgs.gov/landsat-missions/landsat-8#:~:text=Landsat%208%20images%20have%2015,km%20\(115%20mi\)%20swath.](https://www.usgs.gov/landsat-missions/landsat-8#:~:text=Landsat%208%20images%20have%2015,km%20(115%20mi)%20swath.)

²⁷ Berger, K., Herold, M. & Szantoi, Z. (2025) *Earth observation as enabler for implementing the EU regulation on deforestation-free products*. npj Clim. Action 4, 68. <https://doi.org/10.1038/s44168-025-00276-9>

²⁸ <https://www.openforis.net/>

Agriculture Organization of the United Nations (FAO), making cutting-edge forest monitoring capabilities widely accessible. Its foundational principle is being free and open source, which ensures the long-term sustainability of monitoring capacities by sharing solutions, documentation, and source code, fostering self-sufficiency, transparency, and eliminating vendor dependence. This approach also provides a cost-effective way to monitor forest cover and other critical land types.

Developed in collaboration with partners including Google, NASA, and international research institutions, OpenForis is a suite of ten different inter-related platforms. Some imagery from OpenForis have been used within this report, primarily to validate some of the observations drawn as to potential deforestation drivers. The limitations of OpenForis, and in particular the deforestation driver's data set is that the resolution is extremely low – at a 1-kilometre resolution. Global Forest Watch (GFW), in partnership with Land & Carbon Lab and Google DeepMind, released a new global data set on the drivers of tree cover loss at 1-kilometer resolution from 2001 to 2024, representing a tenfold increase in spatial detail over the previous 10-km product. The data were generated using a customized Residual Neural Network (ResNet) trained on nearly 7,000 visually interpreted samples from Landsat 7 & 8 and Sentinel 2 imagery, supplemented by biophysical and population data, and validated against an independent stratified random sample of 3,574 plots, achieving an overall accuracy of 91 ± 1 %. In addition to classifying each grid cell by its most likely loss driver, the data set includes seven probability layers—one per driver class—enabling users to apply custom thresholds for region-specific analyses directly in GFW's map interface or via Google Earth Engine.

This data distinguishes seven driver classes—permanent agriculture, hard commodities (mining and energy), shifting cultivation, logging, settlements and infrastructure, wildfire, and other natural disturbances—enabling finer discrimination between permanent deforestation and temporary or small-scale disturbances. The data do not differentiate natural forests from plantations or resolve co-located events below 1 km, and thus do not disentangle rapid successive drivers in the same cell.

From the perspective of determining potential deforestation on a site-by-site basis a resolution of 1 kilometre is unsuitable in a US hardwood forest context.

The AHA platform has chosen the Crop Data Layer as it offers an impeccable, US focused source, and high resolution (at 10m). The NASS CDL also is able to differentiate forest types, including mixed coniferous and temperate forest types. Its focus on agriculture intrinsically assesses the crop types visible at any given moment and therefore is a complete package for assessing land use and potential drivers of forest conversion.

AHA will continue to monitor other sources of information and to assess the efficacy of the CDL as its primary data source. It will also continue to utilise other sources of data to monitor accuracy and trends.

A1.4 Discussion on both the strengths and weaknesses of land use imagery

The resolution of the NASS CDL imagery has improved between 2020 and 2024. This is positive for current and future assessments; primarily as higher resolution allows for greater accuracy both in AI assessment and in any truthing process. The cut-off year of 2020 remains problematic in that the assessment for that year was made at 30m resolution. As can be seen above, resolution has greatly improved since 2020, but it is the 2020 data that must continue to form the baseline for assessments. Future assessments, such as in 2025 will continue to be made against the relatively low-level resolution conducted in 2020; thereby ensuring that there will be an on-going issue of not comparing like-for-like. A fuzzy image from 2020 will inevitably remain as the baseline.

The NASS CDL will continue to form the most appropriate source of imagery for making potential deforestation assessments. Supported by the US Department of Agriculture (USDA) and inextricably linked to USDA's role in monitoring and analysing agricultural trends the data can be both trusted in terms of quality and valued as a component within a wider system focused on agriculture. When considering potentially agriculturally driven deforestation there can be no better context for obtaining data on an annual basis.

The CDL imagery is rightly focused on agriculture and designed to highlight the changing dynamics of agriculture. It was not designed for monitoring forests generally, and deciduous or mixed forests in particular. It is extremely useful for monitoring changes at scale, such as areas deforested to become agricultural row crops. The imagery is less accurate in identifying areas that have experienced a selection harvest.

In tropical and sub-tropical climates clearance or harvesting and visible signs of replanting with trees or agricultural crops can be observed quite rapidly. In the space of one to three years of observation it can be determined with high levels of accuracy what the current land use is. In temperate conditions, prevalent across most of the US, the visible changes in land use can take much longer to observe. Marked by relatively slow growth an area harvested, perhaps as a clear cut, may take some years before its current land use can be determined. The combination of slow regeneration, often combined with high levels of deer grazing hampering re-establishment efforts, can lead to areas with an indeterminate land use when observed from above.

The perfect scenario would allow a trained human to observe the more difficult to analyse sites first-hand. Such genuine ground truthing would allow for closer examination of the land use, the status of any regeneration and perhaps most importantly, an understanding of the wider context of land use. Taking this a step further, consultation with the landowner would provide the clearest understanding of all. Such ground truthing is likely prohibitively expensive in most cases and could not be undertaken at scale. Ground truthing could be appropriate in very localised areas where there are consistent potential errors arising within the AI assessment and where 'expert eye' type analysis cannot improve accuracy. An example of a county where genuine ground truthing might be considered in future is Wayne County, New York. The interrelationship between hardwood forests, fruit and nut bearing hardwood trees and the interaction between agriculture and silviculture have

proven difficult for both the AI and the human observer to determine where there is deforestation.

The U.S. Forest Service is currently implementing a strategic plan for enhanced integration of remote sensing information into the FIA Program, with special emphasis on so-called “small area estimation” (SAE) techniques. This effort will engage a broad range of stakeholders to assist the U.S. Forest Service in meeting a Congressional directive to “implement procedures to improve the statistical precision of estimates at the sub-State level”. As in AHA’s analysis of CDL data, the U.S. Forest Service is focused on improving the level of precision and access to data at county level, to support regulatory compliance and environmental claims in markets for forest products and agricultural commodities.

The U.S. Forest Service is actively working on integrating remote sensing information into its Forest Inventory and Analysis (FIA) program to enhance the program’s capabilities and data quality. This integration is part of a broader strategy to build a more robust and comprehensive national inventory and monitoring program.²⁹

The FIA program is reported as adopting an integrated framework that combines traditional field-based data collection with remote sensing technologies. This integration aims to improve the accuracy, efficiency, and spatial detail of forest inventory data. The FIA program is a national effort to collect, analyse, and report on the status and trends of forest resources across the United States. The enhanced data and information from the integrated program will support better forest management decisions and policies. The FIA program aims to integrate data across different scales, from local to national levels, providing a comprehensive view of forest resources. The FIA program has evolved over time, with recent enhancements building upon its historical foundation and statistical documentation.³⁰ The results of this initiative should help inform future AHA potential deforestation analysis and provide further insight as to deforestation drivers.

²⁹ <https://www.ossoff.senate.gov/es/press-releases/sens-ossoff-cassidy-introduce-bipartisan-bill-to-strengthen-forest-management>

³⁰ Smith, W.B. (2002) *Forest inventory and analysis: a national inventory and monitoring program*, Environmental Pollution, Volume 116, Supplement 1. [https://doi.org/10.1016/S0269-7491\(01\)00255-X](https://doi.org/10.1016/S0269-7491(01)00255-X).

Annex 2: Profiles of Unspecified Risk Counties

A2.1 Wayne County in New York

New York's agricultural sector is a major contributor to the state's economy, generating over \$5.3 billion annually and providing nearly 200,000 jobs when including processing. The state boasts a diverse range of agricultural products, with New York ranking among the top ten nationally for 30 different commodities. Key agricultural areas include dairy, apples, grapes, onions, sweet corn, tomatoes, and maple syrup.³¹

Wayne County boasts a significant fruit industry, particularly known for its apple production, making it a major player in the state's agricultural landscape. The county's location in the fertile Lake Ontario fruit belt, combined with its historical role in the fruit industry, has contributed to its 200-year prominence in apple growing and processing.³² While apples are a major focus, the county also produces other fruits like cherries, other berries, and nuts. USDA census of agriculture data from 2017 suggests that 14% of the county's farmland is designated as "woodland". The major agricultural crops, by acreage in Wayne County are³³:

- Apples - 23,685 acres
- Corn (for grain) - 21,527 acres
- Soybean - 21,375 acres
- Forage (for hay / haylage) - 12,657 acres
- Corn for silage - 5,723 acres

In Wayne County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing, infrastructure and mines.³⁴

From an earth observation perspective, the fruit trees in Wayne County pose a special challenge. Fruit trees and fruit orchards are classified as agricultural land and therefore their removal and re-establishment form a normal part of the fruit growing system, though on a much longer growing cycle than any other form of row crop. From a visual perspective, older orchards appear very similar to hardwood forests. The inclusion of nut trees in the landscape compounds the difficulty of identifying deforestation to establish new agricultural land or the removal of fruit or nut trees within an agricultural system. A fruit or nut tree, such as cherry, pecan or walnut, is both a hardwood forest tree and a fruit or nut bearing tree in an agricultural landscape. Under certain conditions, especially where orchards are intermingled with

³¹ <https://agriculture.ny.gov/>

³² <https://www.scribd.com/document/29172728/NY-Comptroller-Economic-Impact-of-Agriculture-in-NYS>

³³ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/New_York/cp36117.pdf

³⁴ <https://www.globalforestwatch.org/dashboards/country/USA/33/60>

forest in the landscape, differentiation between the two visually similar situations by AI or by human eye is very difficult.

Images available from OpenForis via Global Forest Watch (GFW), in partnership with Land & Carbon Lab and Google DeepMind, released a new global data set on the drivers of tree cover loss at 1-kilometer resolution from 2001 to 2024. The figure [left] focuses on Wayne County. The orange-coloured areas indicate areas of what are described as “forest loss due to permanent agriculture”.³⁵

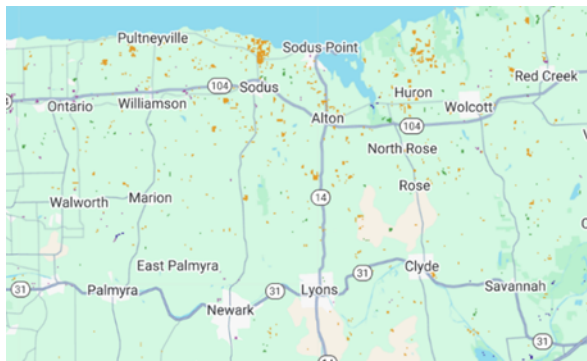


Figure A1: OpenForis / Earth Map image of Wayne County indicating areas claimed as deforested due to permanent agriculture.



Figure A2: Image of mixed forest and fruit tree landscape within Wayne County, illustrating young fruit orchards in rows (top); softwood plantation (left) and indeterminate logged area (centre – right). Source image: Google Earth pro

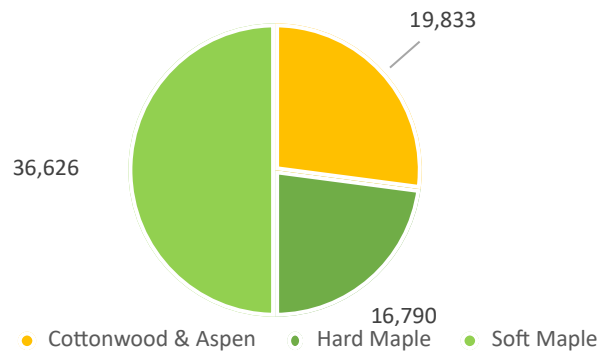


Figure A3: Hardwood production in Wayne County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA)

Table A2.1: Summary for Wayne County

	Wayne
Area potentially converted to crop land 2020-2024 (Ha)	432
Forest area in 2020 (Ha)	63,121
Annual hardwood sawlog harvest (m³)	73,249
% potentially converted 2020-2024 (Ha)	0.684
% potentially converted annual (Ha)	0.171
Volume exposed to risk per year (m³)	125
Area potentially converted to crop land per year (Ha)	108

A2.2 Counties in Indiana

Corn and soybeans are the State's most important crops, accounting for a large portion of Indiana's agricultural cash receipts. While corn and soybeans dominate, Indiana also produces a wide variety of other crops like wheat, oats, popcorn, tomatoes, watermelons, pumpkins, and apples. Specialty crops such as walnuts, potatoes, and Christmas trees also contribute to Indiana's agricultural diversity.³⁶

Randolph County is primarily an agricultural county with only 3% of farmland designated as "woodland". The main agricultural crops³⁷ by land area are:

- Soybeans - 114,239
- Corn for grain - 97,621
- Forage (hay/haylage) - 4,991
- Wheat for grain - 4,078
- Corn for silage - 830

³⁶ https://www.in.gov/isda/files/Brochure_Indiana-agriculture-small.pdf

³⁷ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18135.pdf

In Randolph County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, driven by agriculture.³⁸ Annual hardwood sawlog hardwood harvest is reported as 6,099 m³ of Hard Maple in 2024.

Wells County is primarily an agricultural county with only 2% of farmland designated as “woodland”. The main agricultural crops³⁹ by land area are:

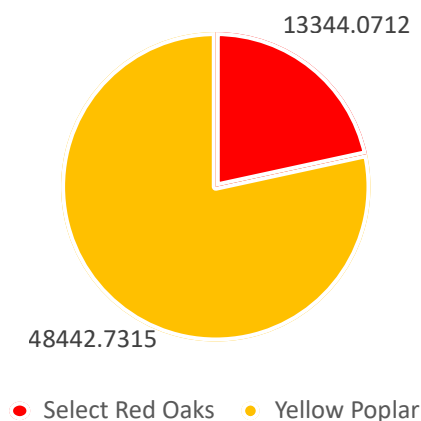
- Soybeans - 116,635
- Corn for grain - 85,283
- Wheat for grain - 4,070
- Forage (hay / haylage) - 3,590
- Popcorn - 1,580

In Wells County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure.⁴⁰ Annual hardwood sawlog production is reported as 37,785m³ of White Oak in 2024.

Knox County is primarily an agricultural county with only 3% of farmland designated as “woodland”. The main agricultural crops⁴¹ by land area are:

- Soybeans- 134,151
- Corn for grain - 127,821
- Wheat for grain - 12,522
- Vegetables - 8,691
- Watermelons - 4,346

In Knox County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, mining, housing and infrastructure.⁴²



³⁸ <https://www.globalforestwatch.org/dashboards/country/USA/15/69/>

³⁹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18179.pdf

⁴⁰ <https://www.globalforestwatch.org/dashboards/country/USA/15/91>

⁴¹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18083.pdf

⁴² <https://www.globalforestwatch.org/dashboards/country/USA/15/42>

Figure A4: Hardwood production in Knox County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

Warrick County is primarily an agricultural county with only 2% of farmland designated as “woodland”. The main agricultural crops⁴³ by land area are:

- Corn for grain - 141,116
- Soybeans - 105,434
- Popcorn⁴⁴ - 10,954
- Forage (hay/haylage) - 2,592
- Wheat for grain - 1,685

In Warrick County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as mining, agriculture, housing, and infrastructure.⁴⁵

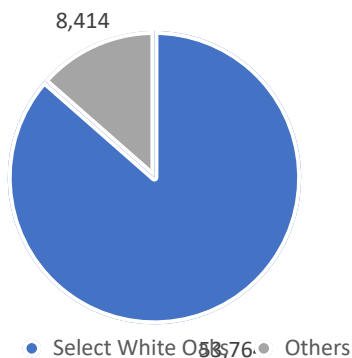


Figure A5: Hardwood production in Warrick County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

Many ash trees in the USA are being harvested due to the devastating impact of the emerald ash borer (EAB). This invasive beetle from Asia has killed hundreds of millions of ash trees across North America, necessitating the removal of affected trees for safety and to prevent further spread. The EAB was first discovered in Indiana in 2004. It was confirmed in all 92 counties of the state by 2010.⁴⁶ EAB control measures may account for the dominance of Ash harvesting in a number of Indiana counties.

⁴³ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18173.pdf

⁴⁴ Nearly all of the world's popcorn production is in the United States, with 25 states growing the crop. Over one quarter of the national production is in Nebraska, and Indiana produces only slightly less. Other major popcorn-producing states are Illinois, Ohio, and Missouri. <https://www.nal.usda.gov/exhibits/speccoll/exhibits/show/popcorn>

⁴⁵ <https://www.globalforestwatch.org/dashboards/country/USA/15/88>

⁴⁶ <https://www.in.gov/dnr/entomology/regulatory-information/emerald-ash-borer/>

White County is primarily an agricultural county with only 6% of farmland designated as “woodland”. The main agricultural crops⁴⁷ by land area are:

- Soybeans - 41,573
- Corn for grain - 36,150
- Forage (hay/ haylage) - 4,239
- Wheat for grain - 1,334

In White County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure and mining.⁴⁸ Annual hardwood production is reported as 7,783m³ of Ash in 2024.

Jay County is primarily an agricultural county with only 4% of farmland designated as “woodland”. The main agricultural crops⁴⁹ by land area are:

- Soybeans - 101,783
- Corn for grain - 68,075
- Wheat for grain - 6,093
- Forage (hay / haylage) - 4,224
- Corn for silage - 908

In Jay County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing, infrastructure and mining.⁵⁰ Annual hardwood production is reported as 9,014m³ of Ash in 2024.

Rush County is primarily an agricultural county with only 3% of farmland designated as “woodland”. The main agricultural crops⁵¹ by land area are:

- Corn for grain - 90,820
- Soybeans - 88,427
- Wheat for grain - 5,567
- Forage (hay / haylage) - 4,640
- Corn for silage - 528

In Rush County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure and mining.⁵² Annual hardwood production is reported as 13,881m³ of Ash in 2024.

⁴⁷ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18181.pdf

⁴⁸ <https://www.globalforestwatch.org/dashboards/country/USA/15/92>

⁴⁹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18075.pdf

⁵⁰ <https://www.globalforestwatch.org/dashboards/country/USA/15/38>

⁵¹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18139.pdf

⁵² <https://www.globalforestwatch.org/dashboards/country/USA/15/71>

Delaware County is primarily an agricultural county with only 2% of farmland designated as “woodland”. The main agricultural crops⁵³ by land area are:

- Soybeans - 91,442
- Corn for grain 59,148
- Forage (hay / haylage) - 2,448
- Wheat for grain - 1,228

In Delaware County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure and mining.⁵⁴ Annual hardwood production is reported as 29,739m³ of Hard Maple in 2024.

Table A2.2: Summary for counties in Indiana

	Delaware	Jay	Knox	Randolph	Rush	Warrick	Wells	White
Area potentially converted to crop land 2020-2024 (Ha)	50	59	155	119	43	218	63	46
Forest area in 2020 (Ha)	9,055	9,623	16,860	8,668	7,438	34,969	6,659	6,835
Annual hardwood sawlog harvest (m ³)	29,739	9,014	61,787	6,099	13,881	62,177	37,785	7,783
% potentially converted 2020-2024 (Ha)	0.554	0.616	0.918	1.376	0.578	0.624	0.949	0.678
% potentially converted annual (Ha)	0.138	0.154	0.229	0.344	0.145	0.156	0.237	0.170
Volume exposed to risk per year (m ³)	41	14	142	21	20	97	90	13
Area potentially converted to crop land per year (Ha)	13	15	39	30	11	55	16	12

A2.3 Huron County in Ohio

Ohio is a top producer of various crops and livestock, with a diverse range of agricultural activities that generate billions of dollars in revenue annually. Over half of Ohio's land area is devoted to agriculture, making it a significant agricultural state. Ohio's diverse soil types and favorable growing conditions allow for the production of a wide variety of crops, including corn, soybeans, tomatoes, bell peppers, pumpkins, and squash. Different regions of Ohio specialize in different agricultural products, with the northwest part of the state being primarily agricultural.⁵⁵

Huron County is primarily an agricultural county with only 7% of farmland designated as “woodland”. The main agricultural crops⁵⁶ by land area are:

- Soybeans - 121,114 acres

⁵³ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Indiana/cp18035.pdf

⁵⁴ <https://www.globalforestwatch.org/dashboards/country/USA/15/18>

⁵⁵ <https://www.usda.gov/about-usda/news/blog/heart-buckeye-state>

⁵⁶ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Ohio/cp39077.pdf

- Corn for grain - 57,728 acres
- Wheat for grain - 14,111 acres
- Forage (for hay / haylage) - 6,391 acres
- Vegetables - 4,121 acres

In Huron County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure.⁵⁷

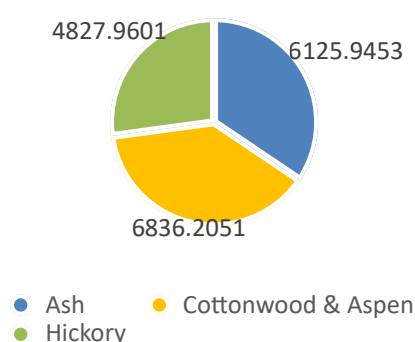


Figure A6: Hardwood production in Huron County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

Table A2.3 Summary for Huron County

	Huron
Area potentially converted to crop land 2020-2024 (Ha)	146
Forest area in 2020 (Ha)	24,306
Annual hardwood sawlog harvest (m3)	17,790
% potentially converted 2020-2024 (Ha)	0.601
% potentially converted annual (Ha)	0.150
Volume exposed to risk per year (m3)	27
Area potentially converted to crop land per year (Ha)	37

A2.4 Counties in Kentucky

Kentucky's agricultural sector is diverse, contributing significantly to the state's economy with a wide range of crops and livestock. Key agricultural products include poultry, cattle, corn, soybeans, and horses.

⁵⁷ <https://www.globalforestwatch.org/dashboards/country/USA/36/39>

Corn and Soybeans are the major crops, with much of the corn used as livestock feed and some used for bourbon production. While acreage is declining, Kentucky remains a top producer of tobacco, although it is a smaller portion of total farm cash receipts than in the past. Hay, wheat, and various fruits and vegetables are also grown in Kentucky.⁵⁸

Carlisle County is primarily an agricultural county with only 9% of the farmland area designated as “woodland”⁵⁹. Carlisle County is not a large county, with a population of just over 5,000 people, and it is primarily rural, characterized by farmland and forests, according to a report by the U.S. Census Bureau.⁶⁰ The top crops in terms of acreage are:

- Soybeans - 36,161 acres
- Corn for grain - 27,701 acres
- Wheat for grain - 6,127 acres
- Forage (hay / haylage) - 3,158 acres
- Tobacco – 154 acres

In Carlisle County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture and other development.⁶¹

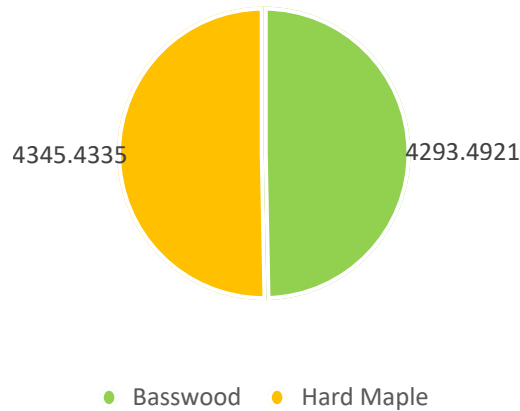


Figure A7: Hardwood production in Carlisle County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

⁵⁸ www.kyfoodandfarm.info

⁵⁹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Kentucky/cp21039.pdf

⁶⁰ <https://www.carlislecountyky.com/>

⁶¹ <https://www.globalforestwatch.org/dashboards/country/USA/18/20/>

Ballard County is primarily an agricultural county with only 9% of the farmland area designated as “woodland”⁶². The top crops in terms of acreage are:

- Soybeans - 40,629 acres
- Corn for grain - 23,313 acres
- Wheat for grain - 10,419 acres
- Forage (hay / haylage) - 4,237 acres
- Barley for grain

In Ballard County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and Infrastructure.⁶³

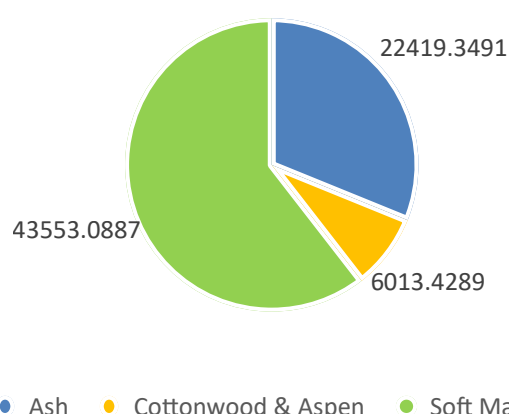


Figure A8: Hardwood production in Carlisle County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

Henderson County is primarily an agricultural county with only 7% of the farmland area designated as “woodland”⁶⁴. The top crops in terms of acreage are:

- Soybeans - 82,582 acres
- Corn for grain - 57,928 acres
- Forage (hay / haylage) - 5,465 acres
- Wheat for grain - 2,595 acres
- Sorghum for grain

In Henderson County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, minerals, housing and infrastructure.⁶⁵

⁶² https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Kentucky/cp21007.pdf

⁶³ <https://www.globalforestwatch.org/dashboards/country/USA/18/4/>

⁶⁴ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Kentucky/cp21039.pdf

⁶⁵ <https://www.globalforestwatch.org/dashboards/country/USA/18/51/>

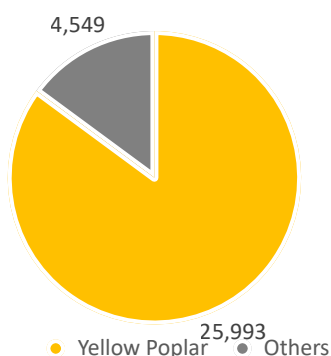


Figure A9: Hardwood production in Henderson County by species and volume (m³) in 2024. Source: US Forest Inventory Analysis (FIA) data

Table A2.4: Summary for counties in Kentucky

	Ballard	Carlisle	Henderson
Area potentially converted to crop land 2020-2024 (Ha)	188	602	110
Forest area in 2020 (Ha)	19,271	15,486	20,940
Annual hardwood sawlog harvest (m³)	71,986	8,639	30,542
% potentially converted 2020-2024 (Ha)	0.978	3.890	0.527
% potentially converted annual (Ha)	0.244	0.973	0.132
Volume exposed to risk per year (m³)	176	84	40
Area potentially converted to crop land per year (Ha)	47	151	28

A2.5 West Carroll Parish in Louisiana

Louisiana's agriculture sector is a significant part of the state's economy. The state boasts a diverse range of agricultural products, including crops like cotton, sugarcane, soybeans, rice, and corn, as well as livestock like poultry and cattle. Louisiana's rich soils and favorable climate, particularly in the Mississippi River's alluvial plains, support substantial crop production. Key crops include: Cotton, sugarcane, soybeans, rice, and corn. Tree farming, especially softwood production, is a significant agricultural activity.⁶⁶

West Carroll Parish (county) is primarily an agricultural county with only 16% of the farmland area designated as "woodland". The top crops in terms of acreage are⁶⁷:

- Soybeans - 50,247 acres
- Corn for grain - 30,072 acres
- Forage (hay / haylage) - 9,471 acres
- Vegetables - 2,062 acres
- Sweet potatoes - 1,793 acres

⁶⁶ <https://www.usda.gov/about-usda/news/blog/2025/03/18/agriculture-across-arkansas-louisiana-and-mississippi>

⁶⁷ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Louisiana/cp22123.pdf

In West Carroll, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by agriculture.⁶⁸

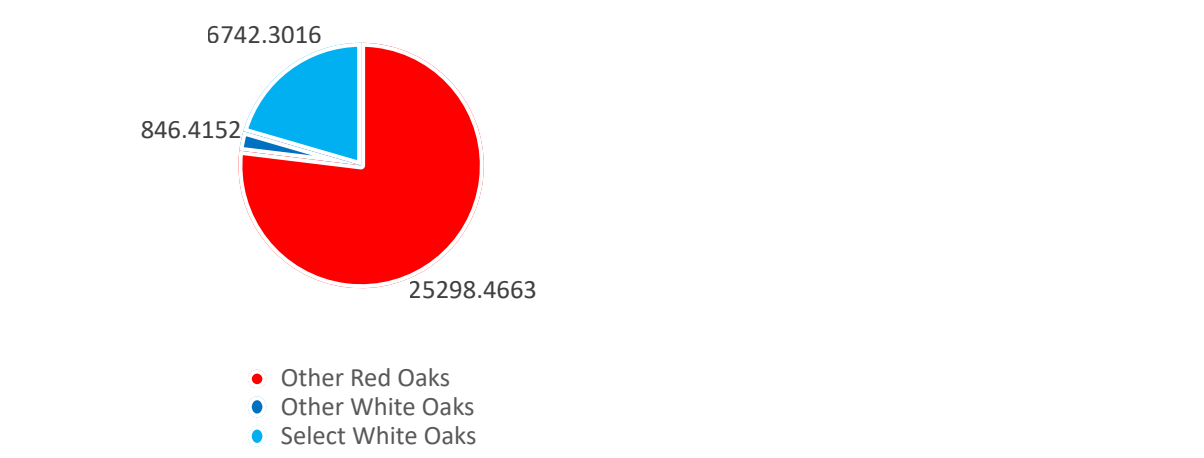


Figure A10: Hardwood production in West Carroll by species and volume (m3) in 2024. Source: US Forest Inventory Analysis (FIA) data

	West Carroll
Area potentially converted to crop land 2020-2024 (Ha)	359
Forest area in 2020 (Ha)	17,426
Annual hardwood sawlog harvest (m³)	32,887
% potentially converted 2020-2024 (Ha)	2.062
% potentially converted annual (Ha)	0.515
Volume exposed to risk per year (m³)	170
Area potentially converted to crop land per year (Ha)	90

A2.6 Counties in Iowa

Iowa is a major agricultural powerhouse in the United States, ranking highly in numerous crop and livestock productions. It leads the nation in corn, soybean, and pork production, and is a top producer of eggs. Over 85% of Iowa's land is farmed, with a significant portion dedicated to cropland. While agriculture is a major industry, a substantial portion of Iowa's economy is also driven by manufacturing and services.⁶⁹

⁶⁸ <https://www.globalforestwatch.org/dashboards/country/USA/19/62>

⁶⁹ <https://publications.iowa.gov/135/1/profile/8-7.html>

Harrison County is primarily an agricultural county with only 3% of the farmland area designated as “woodland”⁷⁰. The top crops in terms of acreage are:

- Corn for grain - 173,293 acres
- Soybeans - 135,758 acres
- Forage (hay / haylage) - 5,424 acres
- Popcorn – 400 acres
- Corn for silage – 335 acres

In Harrison County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, minerals, housing and infrastructure.⁷¹

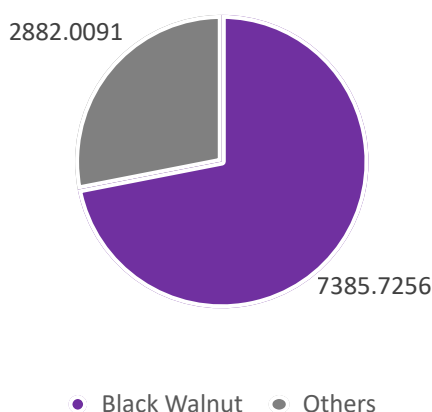


Figure A11: Hardwood production in Harrison County by species and volume (m3) in 2024. Source: US Forest Inventory Analysis (FIA) data <https://research.fs.usda.gov/programs/nrum#data-and-tools->

Mitchell County is primarily an agricultural county with only 2% of the farmland area designated as “woodland”⁷². The top crops in terms of acreage are:

- Corn for grain - 146,369 acres
- Soybeans - 94,299 acres
- Corn for silage - 8,356 acres
- Forage (hay / haylage) - 6,452 acres
- Oats for grain – 312 acres

In Mitchell County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure.⁷³

⁷⁰ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Iowa/cp19085.pdf

⁷¹ <https://www.globalforestwatch.org/dashboards/country/USA/16/43>

⁷² https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Iowa/cp19131.pdf

⁷³ <https://www.globalforestwatch.org/dashboards/country/USA/16/66>

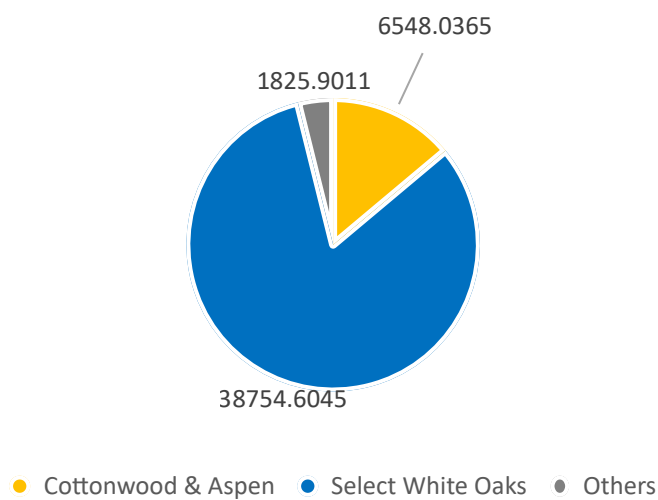


Figure A12: Hardwood production in Mitchell County by species and volume (m3) in 2024. Source: US Forest Inventory Analysis (FIA) data <https://research.fs.usda.gov/programs/nrum#data-and-tools>

Table A2.6 Summary for counties in Iowa

	Harrison	Mitchell
Area potentially converted to crop land 2020-2024 (Ha)	84	28
Forest area in 2020 (Ha)	14,589	5,173
Annual hardwood sawlog harvest (m3)	10,268	47,129
% potentially converted 2020-2024 (Ha)	0.574	0.538
% potentially converted annual (Ha)	0.144	0.134
Volume exposed to risk per year (m3)	15	63
Area potentially converted to crop land per year (Ha)	21	7

A2.7 Whiteside County in Illinois

Illinois is a major agricultural state, renowned for its vast corn and soybean production, which ranks it among the top producers in the nation for these crops. Beyond grains, Illinois also boasts significant production of other commodities like pigs, cattle, wheat, oats, hay, and various specialty crops. The state's fertile soil, largely shaped by glaciers, is well-suited for agriculture, with nearly 75% of the state's land dedicated to farming. Corn and soybeans are the most significant crops, with corn accounting for a large percentage of Illinois's agricultural exports, according to Illinois Extension. Illinois also has a growing specialty crop sector, including horseradish, pumpkins, buckwheat, and Christmas trees.⁷⁴

Whiteside County is primarily an agricultural county with only 3% of the farmland area designated as “woodland”⁷⁵. The top crops in terms of acreage are:

- Corn for grain - 216,805 acres

⁷⁴ <https://agr.illinois.gov/about/facts-about-illinois-agriculture.htm>

⁷⁵ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Illinois/cp17195.pdf

- Soybeans - 91,218 acres
- Forage (hay / haylage) - 5,484 acres
- Vegetables - 2,895 acres
- Corn for silage - 2,224 acres

In Whiteside County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing and infrastructure.⁷⁶ Annual hardwood production is reported as dominated by 3,087m³ of Black Walnut in 2024.

Table A2.7: Summary for Whiteside County

	Whiteside
Area potentially converted to crop land 2020-2024 (Ha)	74
Forest area in 2020 (Ha)	14003
Annual hardwood sawlog harvest (m3)	5700
% potentially converted 2020-2024 (Ha)	0.527
% potentially converted annual (Ha)	0.132
Volume exposed to risk per year (m3)	8
Area potentially converted to crop land per year (Ha)	18

A2.8 Counties in California

California's agriculture industry ranks as the world's fifth-largest food supplier and generated nearly \$59 billion in agricultural sales in 2022. The state is the nation's leading producer of many crops, including almonds, pistachios, walnuts, raisins, olives, plums, and table grapes. California also produces a significant portion of the country's vegetables and fruits. California grows over 400 different crops. Roughly 40 million acres of California land, or 40% of the state, are used for agriculture, including irrigated crops and grazing lands.

Tehama County is primarily an agricultural county with only 13% of the farmland area designated as "woodland"⁷⁷. The top crops in terms of acreage are:

- Walnuts ('English') - 24,671 acres
- Forage (hay / haylage) - 11,722 acres
- Almonds - 8,164 acres
- Plums and prunes - 6,519 acres
- Olives - 4,555 acres

In Tehama County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as

⁷⁶ <https://www.globalforestwatch.org/dashboards/country/USA/14/99/>

⁷⁷ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/California/cp06103.pdf

agriculture, housing and infrastructure.⁷⁸ Changes in landscape in the period 2020-2024 have been dominated by wildfires. Annual hardwood production is reported as 1,659m³ of Oak in 2024.

From an earth observation perspective, the fruit trees in Tehama County pose a special challenge. Nut trees and fruit orchards are classified as agricultural land and therefore their removal and re-establishment form a normal part of the fruit growing system, though on a much longer growing cycle than any other form of row crop. From a visual perspective, older orchards appear very similar to hardwood forests. The inclusion of nut trees in the landscape compounds the difficulty of identifying deforestation to establish new agricultural land or the removal of fruit or nut trees within an agricultural system. A fruit or nut tree, such as walnut, is both a hardwood forest tree and a fruit or nut bearing tree growing in an agricultural landscape. Under certain conditions, especially where orchards are intermingled with forest trees in the landscape, can make differentiation between the two visually similar situations by AI or by human eye difficult.

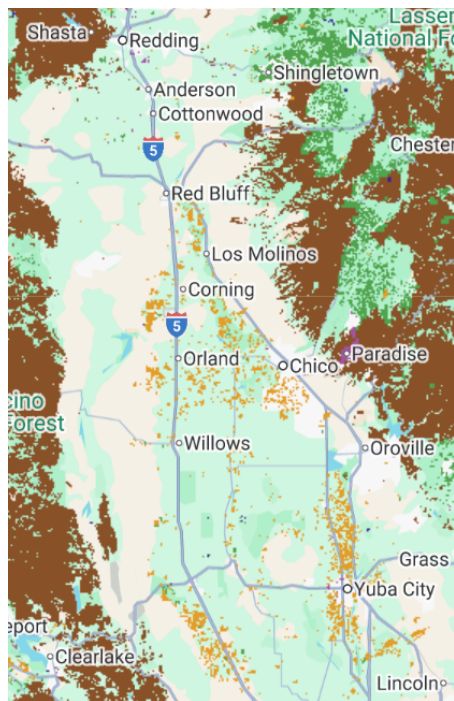


Figure A13: OpenForis / Earth Map image of Tehama County (and surrounding areas) indicating areas claimed as deforested due to permanent agriculture 2001-2024 (showing as orange shaded areas). Source: <https://earthmap.org> Note fire damaged areas in brown.

Riverside County is primarily an agricultural county with only 1% of the farmland area designated as “woodland”⁷⁹. The top crops in terms of acreage are:

- Forage (hay / haylage) - 55,820 acres
- Vegetables - 23,784 acres
- Grapes - 13,528 acres

⁷⁸ <https://www.globalforestwatch.org/dashboards/country/USA/5/52/>

⁷⁹ https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/California/cp06065.pdf

- Wheat for grain - 13,369 acres
- Dates - 9,176 acres

In Riverside County, land use change is characterized by a decrease in natural forest cover and an increase in other land uses, potentially driven by factors such as agriculture, housing, infrastructure and minerals.⁸⁰ As indicated in the figure below, wildfires are the primary risk to the forest land in Riverside County. Annual hardwood production is reported as 22,488m³ of Oak in 2024.

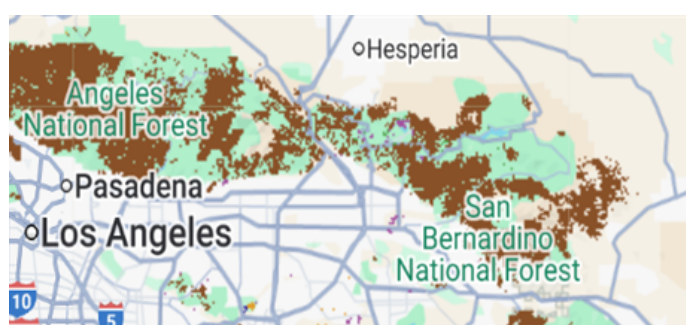


Figure A14: OpenForis / Earth Map image of Riverside County (and surrounding areas) indicating areas claimed as affected by wildfire 2001-2024 indicated in brown. Source: <https://earthmap.org>

Table A2.8: Summary for California counties

	Tehama	Riverside
Area potentially converted to crop land 2020-2024 (Ha)	30	40
Forest area in 2020 (Ha)	2966	709
Annual hardwood sawlog harvest (m3)	1,659	22,488
% potentially converted 2020-2024 (Ha)	1.016	0.584
% potentially converted annual (Ha)	0.254	0.146
Volume exposed to risk per year (m3)	4	33
Area potentially converted to crop land per year (Ha)	8	1

⁸⁰ <https://www.globalforestwatch.org/dashboards/country/USA/5/33>