Bitte lesen Sie die folgende Hinweise zur Methodik der Kartenerstellung, um etwaige Fehlinterpretationen der Daten zu vermeiden.
Quelle: https://www.globalforestwatch.org, Zugriff am 18. Okt. 2019

Tree cover loss (Layer im ForstGIS: „Abnahme Bestockung pro Jahr“ und „Überschhirmung im Jahr 2000“)

(annual, 30m, global, Hansen/UMD/Google/USGS/NASA)

Function: Identifies areas of gross tree cover loss

Resolution: 30 × 30 meters

Geographic Coverage: Global land area (excluding Antarctica and other Arctic islands).

Source: Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” *Science* 342 (15 November): 850–53. Data available from: earthenginepartners.appspot.com/science-2013-global-forest.

Frequency of updates: Annual

Date of content: 2001-2018

Cautions:

In this data set, “tree cover” is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. “Loss” indicates the removal or mortality of tree cover and can be due to a variety of factors, including mechanical harvesting, fire, disease, or storm damage. As such, “loss” does not equate to deforestation.

Due to variation in research methodology and date of content, tree cover, loss, and gain data sets cannot be compared accurately against each other. Accordingly, “net” loss cannot be calculated by subtracting figures for tree cover gain from tree cover loss, and current (post-2000) tree cover cannot be determined by subtracting figures for annual tree cover loss from year 2000 tree cover.

The 2011-2018 data was produced using updated methodology. Comparisons between the original 2001-2010 data and the 2011-2018 update should be performed with caution.

The authors evaluated the overall prevalence of false positives (commission errors) in this data at 13%, and the prevalence of false negatives (omission errors) at 12%, though the accuracy varies by biome and thus may be higher or lower in any particular location. The model often misses disturbances in smallholder landscapes, resulting in lower accuracy of the data in sub-Saharan Africa, where this type of disturbance is more common. The authors are 75 percent confident that the loss occurred within the stated year, and 97 percent confident that it occurred within a year before or after. Users of the data can smooth out such uncertainty by examining the average over multiple years. Read our blog series on the accuracy of this data for more information.

Overview:

This data set, a collaboration between the GLAD (Global Land Analysis & Discovery) lab at the University of Maryland, Google, USGS, and NASA, measures areas of tree cover loss across all global land (except Antarctica and other Arctic islands) at approximately 30 × 30 meter resolution. The data were generated using multispectral satellite imagery from the Landsat 5 thematic mapper (TM), the Landsat 7 thematic mapper plus (ETM+), and the Landsat 8 Operational Land Imager (OLI) sensors. Over 1 million satellite images were processed and analyzed, including over 600,000 Landsat 7 images for the 2000-2012 interval, and more than 400,000 Landsat 5, 7, and 8 images for updates for the 2011-2018 interval. The clear land surface observations in the satellite images were assembled and a supervised learning algorithm was applied to identify per pixel tree cover loss.

In this data set, “tree cover” is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. Tree cover loss is defined as “stand replacement disturbance,” or the complete removal of tree cover canopy at the Landsat pixel scale. Tree cover loss may be the result of human activities, including forestry practices such as timber harvesting or deforestation (the conversion of natural forest to other land uses), as well as natural causes such as disease or storm damage. Fire is another widespread cause of tree cover loss, and can be either natural or human-induced.

This data set has been updated five times since its creation, and now includes loss up to 2018 (Version 1.5). The analysis method has been modified in numerous ways, including new data for the target year, re-processed data for previous years (2011 and 2012 for the Version 1.1 update, 2012 and 2013 for the Version 1.2 update, and 2014 for the Version 1.3 update), and improved modelling and calibration. These modifications improve change detection for

2011-2018, including better detection of boreal loss due to fire, smallholder rotation agriculture in tropical forests, selective losing, and short cycle plantations. Eventually, a future “Version 2.0” will include reprocessing for 2000-2010 data, but in the meantime integrated use of the original data and Version 1.5 should be performed with caution. Read more about the Version 1.5 update here.

When zoomed out (< zoom level 13), pixels of loss are shaded according to the density of loss at the 30 x 30 meter scale. Pixels with darker shading represent areas with a higher concentration of tree cover loss, whereas pixels with lighter shading indicate a lower concentration of tree cover loss. There is no variation in pixel shading when the data is at full resolution (≥ zoom level 13).

The tree cover canopy density of the displayed data varies according to the selection - use the legend on the map to change the minimum tree cover canopy density threshold.

Citation

Use the following credit when these data are displayed:
Source: Hansen/UMD/Google/USGS/NASA, accessed through Global Forest Watch

Use the following credit when these data are cited:
Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” *Science* 342 (15 November): 850–53. Data available on-line from:http://earthenginepartners.appspot.com/science-2013-global-forest. Accessed through Global Forest Watch on [date]. www.globalforestwatch.org

Tree cover gain (Layer im ForstGIS: „Zunahme Bestockung bis 2012“)

(12 years, 30m, global, Hansen/UMD/Google/USGS/NASA)

Function: Identifies areas of tree cover gain

Resolution: 30 × 30 meters

Geographic Coverage: Global land area (excluding Antarctica and other Arctic islands)

Source: Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. “High-Resolution Global Maps of 21st-Century Forest Cover Change.” *Science* 342 (15 November): 850–53. Data available from: earthenginepartners.appspot.com/science-2013-global-forest.

Frequency of Updates: Every three years

Date of content: 2001-2012

Cautions:

In this data set, “tree cover” is defined as all vegetation greater than 5 meters in height, and may take the form of natural forests or plantations across a range of canopy densities. “Gain” is defined as the establishment of tree canopy at the Landsat pixel scale in an area that previously had no tree cover. Tree cover gain may indicate a number of potential activities, including natural forest growth or the crop rotation cycle of tree plantations.

Due to variation in research methodology and date of content, tree cover, loss, and gain data sets cannot be compared accurately against each other. Accordingly, “net” loss cannot be calculated by subtracting figures for tree cover gain from tree cover loss, and current (post-2000) tree cover cannot be determined by subtracting figures for annual tree cover loss from year 2000 tree cover.

The authors evaluated the overall prevalence of false positives (commission errors) in this data at 24%, and the prevalence of false negatives (omission errors) at 26%, though the accuracy varies by biome and thus may be higher or lower in any particular location. Read our blog series on the accuracy of this data for more information.

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Overview:

This data set, a collaboration between the GLAD (Global Land Analysis & Discovery) lab at the University of Maryland, Google, USGS, and NASA, measures areas of tree cover gain across all global land (except Antarctica and other Arctic islands) at 30 × 30 meter resolution, displayed as a 12-year cumulative layer. The data were generated using multispectral satellite imagery from the Landsat 7 thematic mapper plus (ETM+) sensor. Over 600,000 Landsat 7 images were compiled and analyzed using Google Earth Engine, a cloud platform for earth observation and data analysis. The clear land surface observations (30 × 30 meter pixels) in the satellite images were assembled and a supervised learning algorithm was then applied to identify per pixel tree cover gain.

Tree cover gain was defined as the establishment of tree canopy at the Landsat pixel scale in an area that previously had no tree cover. Tree cover gain may indicate a number of potential activities, including natural forest growth or the crop rotation cycle of tree plantations.

When zoomed out (< zoom level 13), pixels of gain are shaded according to the density of gain at the 30 x 30 meter scale. Pixels with darker shading represent areas with a higher concentration of tree cover gain, whereas pixels with lighter shading indicate a lower concentration of tree cover gain. There is no variation in pixel shading when the data is at full resolution (≥ zoom level 13).

The tree cover canopy density of the displayed data is >50%.

Citation:

Use the following credit when these data are displayed:
Source: Hansen/UMD/Google/USGS/NASA, accessed through Global Forest Watch

Use the following credit when these data are cited:
Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53. Data available on-line from:http://earthenginepartners.appspot.com/science-2013-global-forest. Accessed through Global Forest Watch on [date]. www.globalforestwatch.org

Zur Genauigkeit der Daten

Quelle: https://blog.globalforestwatch.org/data-and-research/how-accurate-is-accurate-enough-examining-the-glad-global-tree-cover-change-data-part-1

Zugriff am 17. Okt 2019

In 2013, Dr. Matt Hansen and collaborators at the University of Maryland's Global Land Analysis and Discovery group (GLAD), Google, U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA) released the first global scale method for annually monitoring changes in tree cover using 30-meter resolution Landsat imagery, revolutionizing the way we measure and monitor forests. The GLAD tree cover change data (formerly referred to as the Hansen tree cover change data) set consists of two maps: one of annual tree cover loss from 2001 to 2014, and the other of cumulative tree cover gain during the 2000-2012 time period.

Global Forest Watch (GFW) makes this data freely available online for anyone to visualize and analyze through its easy-to-use interactive map. In addition to the analysis-rich platform, the GFW Blog aims to help non-experts understand the data by explaining the underlying methods and results in accessible terms. This blog is the first of a two-part technical series focusing on the accuracy of the GLAD global tree cover change data. In this piece, we explain how the authors measured the accuracy of the data, and in the second installment we explore what this means for users of the data.

How do we measure the accuracy of remotely sensed data?

In remote sensing, the accuracy of data is measured by comparing detected change for sample areas on a map to the true land cover change, also known as "truth data," which is generally determined using other satellite images or field visits. It is good practice to evaluate the "truth data" independently, or without looking at the map under evaluation because this ensures that researchers aren't biased in their evaluations. The overall accuracy is the percentage of the sample of pixels where the map and the truth data change match. However, overall accuracy can be overestimated when stable land cover (in this case, forest land with no change) is much more prevalent than the changes (loss and gain)—any mistakes in identifying changes are overwhelmed by how well the computer identifies stable land cover. Examining the false positives (also known as commission errors) and false negatives (also known as omission errors) of the changes can provide a more useful look at the accuracy of the data. A false positive is a 30 meter pixel labelled as "loss" or "gain" on the map, but that did not change in the real world. A false negative is the opposite—a pixel labelled as "no change" by the data that actually lost or gained tree cover.

Just how accurate is the GLAD tree cover change data?

The data's authors have published two accuracy assessments to date, the first in the original *Science* article by Hansen et al. (2013) and the second in a recent study by Tyukavina et al. (2015) on carbon loss in forests. In the first study, the authors independently evaluated the true change of 1,500 sample blocks (120 meters on each side) using Landsat, MODIS and Google Earth imagery. The truth data was then compared to the "loss" and "gain" maps globally and within the four major biomes – tropical, subtropical, temperate and boreal. At a global scale, the "loss" map had a 13 percent false positive rate and a 12 percent false negative rate. The "gain" map had a significantly higher rate of error, with a 24 percent false positive rate and a 26 percent false negative rate. The errors of "loss" and "gain" vary substantially between the four major biomes, suggesting that accuracy may be higher or lower depending on the particular location.

	LOSS		GAIN	
Biome	False Positives	False Negatives	False Positives	False Negatives
Global	**13.0 percent**	**12.2 percent**	**23.6 percent**	**26.1 percent**
Tropical	13.0 percent	16.9 percent	18.1 percent	52.0 percent
Subtropical	20.7 percent	20.6 percent	14.5 percent	17.6 percent
Temperate	11.8 percent	6.1 percent	38.0 percent	23.5 percent
Boreal	12.0 percent	6.1 percent	23.3 percent	1.6 percent

The authors conducted another test to determine the temporal accuracy of the "loss" data—the extent to which the map detects loss in the correct year. Using the same 1,500 blocks, the authors compared the year of "loss" in the map to the largest change in the validation blocks. They found that the year assigned to the observed tree cover loss was correct 75.2 percent of the time, and was correct within one year before or after 96.7 percent of the time. While the first study tells us about the accuracy at regional and global scales, the second study focused on accuracy of the data in the tropics, and at a higher resolution. The second study looked at the accuracy of 3,000 individual pixels (30 × 30 meters) spread across the tropics of sub-Saharan Africa, South and Southeast Asia and Latin America compared to truth data from Landsat and Google Earth imagery. They found false negative and false positive rates below 20 percent in all areas except for Sub-Saharan Africa, which had 48 percent false negatives. The authors suspect the low accuracy in Africa is related to the prevalence of small-scale disturbance, which is harder to map at 30 meter resolution. They also found that more than 85 percent of false negatives take place within one pixel of mapped "loss," suggesting that most of the missed loss occurs on the edges of other loss patches.

LOSS

Continent	False Positives	False Negatives
Sub-Saharan Africa	4 percent	48 percent
South/Southeast Asia	8 percent	14 percent
Latin America	4 percent	17 percent

What does it all mean?

It's important to understand how accuracy is measured and be aware of the errors baked into the data. But even if it isn't 100 percent accurate, can the GLAD tree cover change data still give us valuable insights? Check out Part 2 of this blog series, where we explore what these numbers all mean for users of the GLAD data.