

LBA-ECO CD-04 Logging Damage, km 83 Tower Site, Tapajos National Forest, Brazil

Summary:

This data set contains the results of a survey of logging damage in a 18-ha plot (300 m N-S, 600 m E-W) east (upwind) of the eddy flux tower at km 83, Tapajos National Forest, Para, Brazil. Data collected include type of damage, snap height, and log dimensions, as well as calculated biomass of stems and canopy either damaged or removed in logging. There are two comma-delimited data files with this data set.

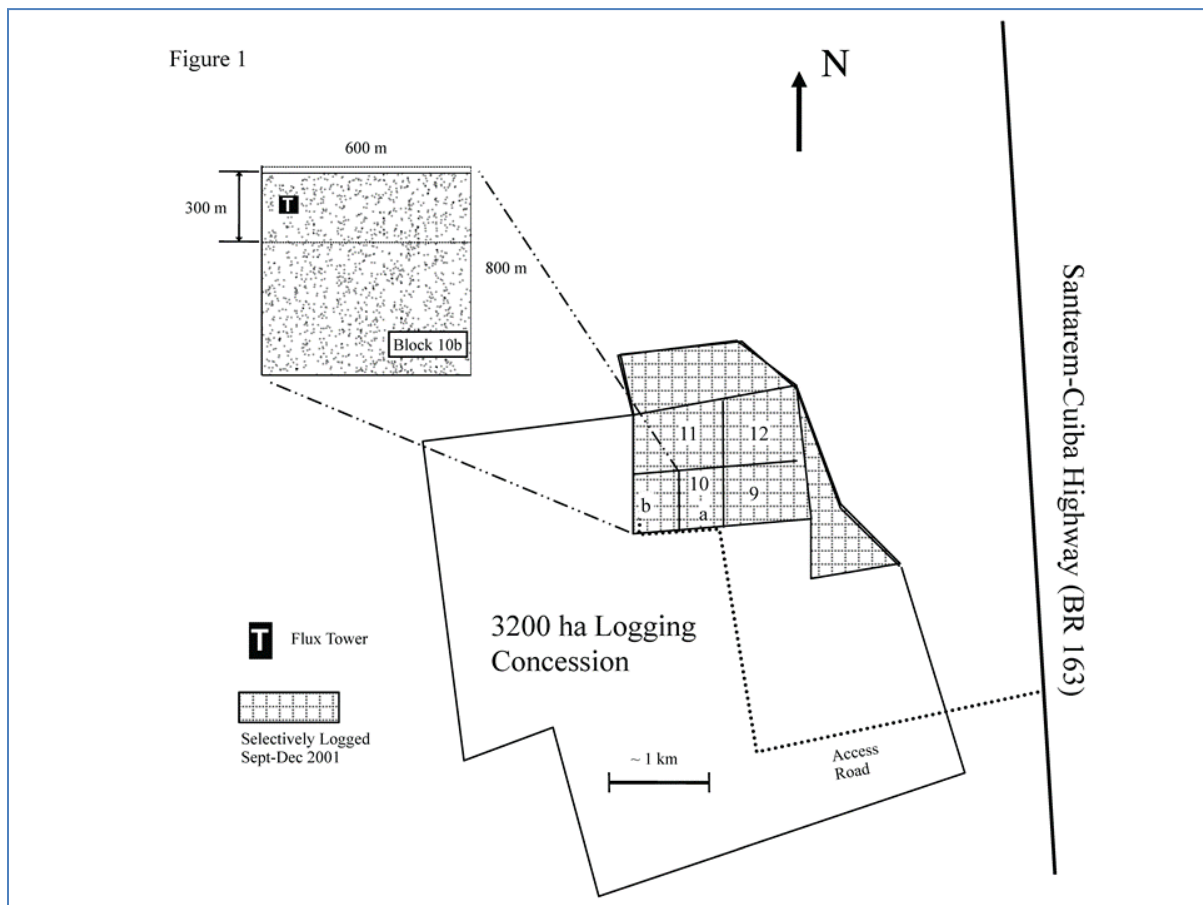


Figure 1. Diagram of logging concessions area. From Figueira et al. 2008.

Data Citation:

Cite this data set as follows:

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Data users should use the Investigator contact information in this document to communicate with the data provider. Alternatively, the LBA Web Site [<http://lba.inpa.gov.br/lba/>] in Brazil will have current contact information.

Data users should use the Data Set Citation and other applicable references provided in this document to acknowledge use of the data.

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1. Data Set Overview:

Project: LBA (Large-Scale Biosphere-Atmosphere Experiment in the Amazon)

Activity: LBA-ECO

LBA Science Component: Carbon Dynamics

Team ID: CD-04 (Goulden / Rocha)

The investigators were Goulden, Dr. Michael L.; Menton, Mary Catherine; Miller, Dr. Scott D.; Rocha, Prof. Humberto Ribeiro da; Freitas, Helber Custodio de; Figuera, Michela; Sousa, Cleilim Albert Dias de; Elliot, Rob and Read, Edward L. You may contact Miller, Dr. Scott D. (smiller@albany.edu).

LBA Data Set Inventory ID: CD04_Logging_Damage

This data set contains the results of a survey of logging damage in a 18-ha plot (300 m N-S, 600 m E-W) east (upwind) of the eddy flux tower at km 83, Tapajos National Forest, Para, Brazil. Data collected include type of damage, snap height and log dimensions as well as calculated biomass of stems and canopy either damaged or removed in logging.

Related data Sets

- [LBA-ECO CD-04 Soil Respiration, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Soil respiration measurements collected from the km 83 site following selective logging)
- [LBA-ECO CD-04 Biomass Survey, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Biometric tree survey performed at km 83 site in March 2000 before logging began)
- [LBA-ECO CD-04 Dendrometry, km 83 Tower Site, Tapajos National Forest, Brazil](#) (Dendrometry study conducted at the km 83 site after reduced impact logging from November 2000 to November 2004)
- [LBA-ECO CD-04 CO2 Profiles, km 83 Tower Site, Tapajos National Forest](#) (Atmospheric CO2 concentrations throughout the canopy at the same site with overlapping sampling periods)
- [LBA-ECO CD-04 CO2 and Heat Flux, km 83 Gap Tower Site, Tapajos National Forest](#) (CO2 measurements at the same site from June, 2002-January, 2004)
- [LBA-ECO TG-07 Soil CO2 Flux by Automated Chamber, Para, Brazil: 2001-2003](#) (Similar measurements made at the intact forest site 16 km north of the logged site)

2. Data Characteristics:

Data are presented in two comma-delimited ASCII files:

File #1: CD04_KM83_Damaged_Tree_Statistics.csv

Common_name, Species, and Family for trees with LBA tag numbers installed in 2000 maybe obtained from the related data set, [LBA-ECO CD-04 Biomass Survey, km 83 Tower Site, Tapajos National Forest, Brazil](#).

Column	Heading	Units/format	Description
1	Gap_no	ROW-NUM	Location within the 18-ha grid where damaged tree was located. See accompanying documentation for map
2	Tree_id		LBA tag number installed 2000
3	Damage_code		Tree damage key: BS=bole snapped; CL=crown loss; DN=entire tree down; SL=severe lean; ST=standing
4	Live_dead		L= live and D=dead
5	DBH	cm	Diameter at breast height (DBH) measured in centimeters (cm). There are 6 trees with no recorded DBH which were given a value of 18.17 cm, which represents mean DBH. These 6 trees with Gap_no/Tree_id include: A-18/736, B-9/1216, C-18/-999, C-18/237, D-10/464, and D-4/-999
6	Snap_ht	m	Height of bole snap measured in meters (m). One tree, Gap_no/Tree_id = A-11/-999, with no recorded snap height, was given a value of 3.12 m which represents the mean for the data set

7	Crown_damaged		Fraction of tree crown lost
8	Biomass_total_Manauas	kg	Total tree biomass dry weight calculated using the allometric equations in Chambers et al. (2001), reported in kilograms (kg)
9	Biomass_crown	kg	Tree crown biomass dry weight calculated using the equations in Chambers et al. (2001), reported in kilograms (kg)
10	Biomass_bole	kg	Tree bole biomass dry weight calculated using the equations in Chambers et al. (2001), reported in kilograms (kg)
11	Biomass_total_TMF	kg	Total tree biomass dry weight calculated using the tropical moist forest equations in Chambers et al 2001, reported in kilograms (kg)
12	Bole_ht	m	Estimated total bole height calculated using the equations in Chambers et al. (2001), reported in meters (m)
13	Bole_snap_fraction	fraction	Fraction of bole snapped calculated as 1 - (Snap_ht divided by Bole_ht). Bole_snap_fraction was set to 1 for trees where Snap_ht (estimated in the field) was greater than Bole_ht (calculated from allometric equations)
14	Bole_snap_mass	kg	Mass of bole snapped calculated by multiplying Biomass_bole by Bole_snap_fraction
15	Leaf_area_total	m2	Total tree leaf area calculated using the equations in Chambers et al. (2004), reported in meters squared (m2)
16	Leaf_area_lost	m2	Amount of leaf area leaf area lost to damage calculated as Crown_damaged multiplied by Total_leaf_area reported in meters squared (m2)
17	Canopy_mass_lost	kg	Total mass of canopy lost to damage calculated as Crown_damaged multiplied by Biomass_crown reported in kilograms (kg)
Note: missing data represented by -999			

Example data records

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Gap_no,Tree_id,Damage_code,Live_dead,DBH,Snap_ht,Crown_damaged,Biomass_total_Manauas,Biomass_crown,Biomass_bole,Biomass_total_TMF,Bole_ht,Bole_snap_fraction,Bole_snap_mass,Leaf_area_total,Leaf_area_lost,Canopy_mass_lost
A-11,474,CL,L,38.9,0,0.15,1584.01,527.46,1014.2,1487.42,16.47,1,1014.2,150.99,22.65,79.12
A-11,475,CL,L,38.6,0,0.3,1556.52,517.11,997.33,1459.36,16.41,1,997.33,149.47,44.84,155.13
A-11,-999,BS,D,35.9,15.51,1,1317.99,428.5,850.45,1219.79,15.84,0.02,13.14,135.67,135.67,428.5
A-11,-999,BS,D,24.3,9.98,1,506.47,147.09,339.55,453.29,13.61,0.21,72.47,74.95,74.95,147.09

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File #2: CD04_KM83_Logged_Tree_Statistics.csv

Column	Heading	Units/format	Description
1	Gap_no	ROW-NUM	Location within the 18-ha grid where stump was located.
2	Notes		Notes
3	Tree_id_LBA		LBA tag number installed 2000
4	Tree_id_Cemex		CEMEX tag number installed 1984
5	Common_name		Tree common name
6	Species		Tree species
7	Family		Tree family
8	Azimuth	degrees	Direction of tree fall from stump to crown in degrees
9	Stump_longitude	UTM	Location of stump in UTM longitude units based on GPS measurements
10	Stump_latitude	UTM	Location of stump in UTM latitude units based on GPS measurements
11	Log_length	m	Log length in meters estimated as distance from stump to crown. Tree_id_LBA =403, and Grid_no = F-9 had no recorded log length and was given mean log length value of 19.87 m for calculation purposes
12	DBH	cm	Logged tree diameter at breast height (DBH). Two trees with no tag or missing DBH were given the mean DBH value of 82.5 cm. These trees, with Grid_no/Tree_id_LBA are A-11/473 and F-3/-999
13	Biomass_total_Manauas	kg	Total tree biomass dry weight calculated using the allometric equations developed for Manaus in Chambers et al. (2001), reported in kilograms (kg)
14	Biomass_crown	kg	Tree crown biomass dry weight calculated using the equations in Chambers et al. (2001) reported in kilograms (kg)
15	Bole_bole	kg	Tree bole biomass dry weight calculated using the equations in Chambers et al. (2001) reported in kilograms (kg)
16	Biomass_total_TMF	kg	Total tree biomass dry weight calculated using the general tropical moist forest equations from Chambers et al. (2001), reported in kilograms (kg)
17	Bole_ht	m	Estimated total bole height calculated using the equations in Chambers et al. (2001), reported in meters (m)
18	Bole_removed		Fraction of bole removed as log calculated as Log_length divided by Bole_ht
19	Bole_remaining	m	Length of bole remaining calculated as Bole_ht minus Log_length and reported in kilograms (kg)
20	Bole_mass_removed	kg	Mass of bole removed in logging operations calculated as Biomass_bole multiplied by Bole_removed and reported in kilograms (kg). For trees where the Log_length was greater than Bole_ht, Bole_removed was set to 1 and

			Bole_mass_removed was calculated accordingly
21	Bole_mass_remaining	kg	Mass of bole remaining in logging operations calculated as Biomass_bole minus Bole_removed and reported in kilograms (kg)
22	Leaf_area_total	m2	Total tree leaf area calculated using the equations in Chambers et al. (2004), reported in meters squared (m2)
Note: missing data represented by -999. The absence of notes = none provided			

Example data records

Gap_no,Notes,Tree_id_LBA,Tree_id_Cemex,Common_name,Species,Family,Azimuth,Stump_longitude,Stump_latitude,Log_length,DBH,Biomass_total_Manauas,Biomass_crown,Biomass_bole,Biomass_total_TMF,Bole_ht,Bole_removed,Bole_remaining,Bole_mass_removed,Bole_mass_remaining,Leaf_area_total

A-11,none provided,473,2453,Abiu casca grossa,Pouteria biloculares (Winkler)Baehni,Sapotaceae,157,210725724,9666130,24.8,65.7,4547.4,1746.77,2795.11,5114.41,23.36,1.09,-1.44,3040.56,-245.45,267.59

A-11,-none provided,477,2450,Tauari,Couratari guianensis Aubl.,Lecythydaceae,156,210725702,9666184,19.4,64.6,4415.6,1689.48,2716.54,4924.26,23.03,0.8,3.63,2161.65,554.89,263.6

A-11,missing DBH,473,2457,Capitiu,Dendrobangia sp.,Icacinaeae,-999,-999,-999,11.8,82.5,6530.09,2626.92,3980.89,8401.74,29.08,0.34,17.28,1338.26,2642.63,320.49

A-18,none provided,738,2110,Macaranduba,Manilkara huberi (Ducke) Chev.,Sapotaceae,-999,-999,-999,24.84,6700.28,2703.58,4083.39,8727.68,29.65,0.76,5.65,3086.43,996.96,324.52

A-2,none provided,111,3000,Ucuuba terra firme,Virola melionii (Ben.)Warb.,Myristicaceae,304,210725487,9666032,27.4,74.7,5622.46,2220.45,3436.65,6789.4,26.27,1.06,-1.13,3645.72,-209.08,297.75

B-0,none provided,6,3281,Macaranduba,Manilkara huberi (Ducke) Chev.,Sapotaceae,309,210725416,9666075,19.5,103,8680.91,3597.87,5293.85,13245.65,37.99,0.44,18.49,2318.01,2975.83,367.18

B-1,none provided,2,3279,Macaranduba,Manilkara huberi (Ducke) Chev.,Sapotaceae,80,210725429,9666082,22.78,6010.54,2393.68,3668.92,7454.22,27.42,0.75,5.42,2742.45,926.48,307.74

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Site boundaries: (All latitude and longitude given in decimal degrees)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum
Para Western (Santarem) - km 83 Logged Forest Tower (Para Western (Santarem))	-54.9707	-54.9707	-3.017	-3.017	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 2000/11/01 to 2002/03/31
- Temporal Resolution: Fall 2001 and Spring 2002

Platform/Sensor/Parameters measured include:

- FIELD SURVEY / HUMAN OBSERVER / BIOMASS
- FIELD SURVEY / HUMAN OBSERVER / LOGGING DAMAGE
- FIELD SURVEY / HUMAN OBSERVER / LAND RESOURCE DEPLETION

3. Data Application and Derivation:

These data allow a quantitative evaluation of the amount of biomass affected by reduced impact logging in a mature lowland tropical forest.

4. Quality Assessment:

The data have been checked and no further changes are anticipated. For calculation purposes missing DBH and snap or log lengths were replaced with mean values for each as noted below.

For the CD04_KM83_Damaged_Tree_Statistics.csv file, trees with no recorded DBH were given a value of 18.17 cm which represents mean DBH, and for trees with no recorded snap height, a value of 3.12 m was used, which represents the mean for the data set. Trees for which Snap_ht (estimated in the field) was greater than Bole_ht (calculated from allometric equations), Bole_snap_fraction was set to 1.

For the CD04_KM83_Logged_Tree_Statistics.csv file, trees with no tag or missing DBH were given the mean DBH value of 82.5 cm, and trees with no recorded log length were given mean log length value of 19.87 m for calculation purposes. For trees where the Log_length was greater than Bole_ht, Bole_removed was set to 1 and Bole_mass_removed was calculated accordingly.

5. Data Acquisition Materials and Methods:

In March 2000, a 18-hectare plot (30 0m N-S by 60 0m E-W) directly east of the eddy flux tower at km 83, Tapajos National Forest, Para, Brazil, was surveyed. A grid of transects 25 meters apart was established and for all trees with a diameter at breast height (DBH) > 35 centimeters, diameter, commercial and total height, location within the plot, species common name, and condition (live, dead, damaged etc.) were recorded (Menton et al., 2011).

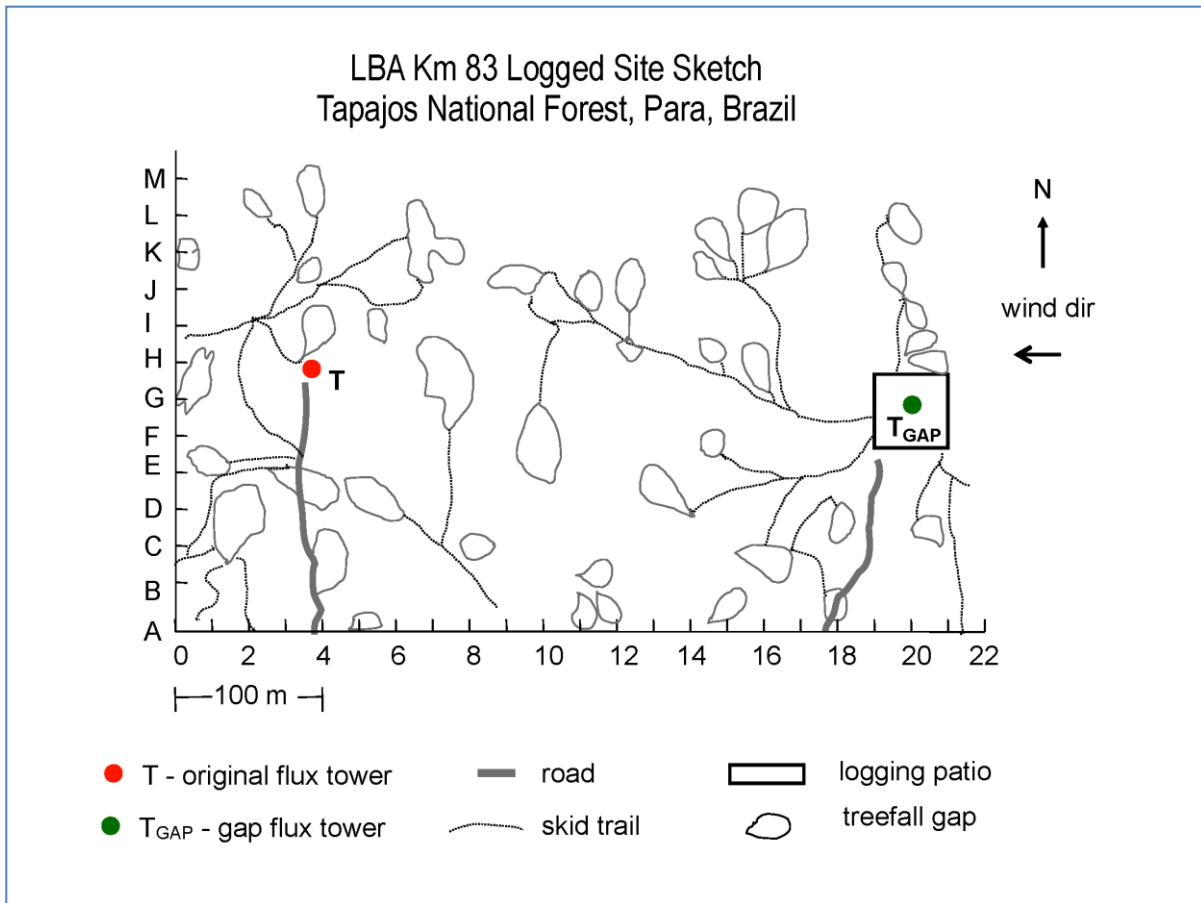


Figure 2. Diagram of the Km 83 logged survey sites. **Gap_no** in the data files references locations on this map. Locations are coded as ROW-NUM, for example, A-11 and B-1.

Between September and December 2001, the area was subjected to a reduced impact logging which removed 2-3 trees per hectare. As part of the reduced impact management, individual trees targeted were identified, vines cut to avoid damage to adjacent trees, and skid trails and logging patios planned out well in advance. After the logging operations were complete, the plot was resurveyed, and for every stem with significant damage from the logging operations and every stem cut, standing stem (snap) height, DBH, and species were recorded. For the trees cut, the dimensions of the logs removed were also recorded, and for non-target trees that were damaged, the type of damage was also recorded. From allometric equations (Chambers et al., 2001) total tree biomass, crown biomass, bole biomass, and bole height were estimated. From these values, the mass removed from the forest as logs, as well as the biomass left on site as slash and associated damage, was estimated on the stem level.

6. Data Access:

This data is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Data Archive Center:

Contact for Data Center Access Information:

E-mail: uso@daac.ornl.gov

Telephone: +1 (865) 241-3952

7. References:

Chambers, J.Q., J. dos Santos, R.J. Ribeiro and N. Higuchi. 2001. Tree damage, allometric relationships, and above-ground net primary production in central Amazon forest. *Forest Ecology and Management* 152:73-84

Menton, M., M. Figueira, C.A.D. de Sousa, S.D. Miller, H.R. da Rocha, and M.L. Goulden. 2011. LBA-ECO CD-04 Biomass Survey, km 83 Tower Site, Tapajos National Forest, Brazil. Data set. Available online [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. [doi:10.3334/ORNLDAAC/990](https://doi.org/10.3334/ORNLDAAC/990)

Related Publications:

- Figueira, A.M.E.S., S.D. Miller, C.A.D. de Sousa, M.C. Menton, A.R. Maia, H.R. da Rocha, and M.L. Goulden. 2008. Effects of selective logging on tropical forest tree growth. *Journal of Geophysical Research-Biogeosciences* 113. G00B05
- Miller, S.D., M.L. Goulden, and H.R. da Rocha. 2007. The effect of canopy gaps on subcanopy ventilation and scalar fluxes in a tropical forest. *Agricultural and Forest Meteorology* 142(1):25-34.