

Progress Report:

Grant number: NCC5-705

Investigation Group: ND-11

Title: Carbon and Nutrient Stocks and Regrowth in Reduced Impact and Conventionally Logged Forests and Settlements in NW Mato Grosso, Brazil

PIs:

Eduardo Guimarães Couto - UFMT - Universidade Federal do Mato Grosso
Johannes Lehmann - Cornell University
Carlos Alberto Moraes Passos - UFMT - Universidade Federal do Mato Grosso
Susan Jean Riha - Cornell University
Flavio Luizão - INPA
Regina Luizão - INPA

1. Narrative of 2004 activities:

The following activities were conducted in Juruena, Mato Grosso, Brazil, and in the laboratories in Ji-Parana, Cuiaba and CENA:

1. Continuation of biomass inventory in transects:
 - a. Trees = 30 cm dbh and landscape position (trees 10-30 cm dbh in nested 5 x 10 m parcels) in 17 200-1100 m long transects totaling 11.1 ha;
 - b. Lianas > 1 cm dbh in 17 200-1100 m transects.
 - c. Vegetation < 10 cm dbh from 2 x 2 and 5 x 5 plots within transects;
 - d. Soil (0-20, 20-40, 40-60 cm every 25 m);
 - e. Vegetation composition;
 - f. Development of biomass and species frequency maps as using the Rohden commercial inventory of harvestable trees = 30 cm dbh in management units harvested in 2002, 2003, and 2004 (area of 3300 ha).
2. Tree volume, density and nutrients of 100 individuals harvested from Block 5.
3. Impact of tree falling on surrounding vegetation (on about 25 logging sites) and soil properties:
 - a. Gap dimensions and LAI;
 - b. Fall tree (canopy dimensions and "true" tree height);
 - c. Number of trees damaged or killed in each gap and nature of damage.
 - d. Mineral soil nitrogen to a depth of 8 m in 9 gaps.
 - e. Soil water dynamics measured gravimetrically to 8 m and weekly soil moisture via TDR access tubes in 9 tree-fall gaps.
4. Impact of different logging interventions in the forest structure
 - a. Natural regeneration (DBH < 10 cm)
 - b. Horizontal structure, and
 - c. Vertical structure
 - d. Soil samples
5. Frequency and extent of damage caused by tree removal and road building.
 - a. Mapped 100% of roads and patios in forest blocks logged in 2003 and 2004.
 - i. Measured road width, and ground damage and canopy opening caused by patio construction.
 - ii. Measured reductions in LAI in roads and patios.
 - b. Damage caused by skid trails and gaps caused by tree removal.

- i. Damage frequency measured along 16 line-intercept transects totaling 5500 m.
 - ii. Skid trail width, tree dbh and extent of damage(ex. minor, extensive, death) along 12 skid trails totaling 1100 m.
- 6. Water collection and analyses of dissolved organic carbon, dissolved inorganic carbon, nitrate, ammonium, phosphate, anions and base cations from stream water in 4 microbasins (weekly).
- 7. Hydrograph measurements in 4 microbasins.
- 8. Groundwater, leaching, throughfall and surface runoff measurements and element analyses as described under (4).
- 9. Litterfall, litter movement on soil surface; and coarse organic debris in streams (POC 0.7 microns-2mm, and CPOC >2mm).
- 10. Measurements of CO2 evolution from emergent groundwater using three different techniques (Headspace equilibration via infrared gas analyzer, CO2 electrode, soda lime).
- 11. Soil survey of microbasins (0-20, 20-40, 40-60 cm, and piezometers to 8 m). Analyses of texture, C, N, cations, P, nitrate and ammonium only in profiles.
- 12. Assembled all data layers in a GIS system (Landsat TM and MODIS time-series images, ASTER-derived digital elevation model, soil characterization, forest biomass and leaf area, logging damage, roads, patios, tree-fall gaps, etc) for geostatistical and spatial correspondence analysis between remotely-sensed attributes and ground data.

2004 activities that were conducted in Manaus, Amazonas, Brazil:

- 1. Tree growth, LAI, soil water depletion in secondary forests as affected by relaxed nutrient constraints, continuation (applications of P, P+lime, P+lime+gypsum to 10 forests) and finalization of 2003 activities.
- 2. Movement of Ca into acid subsoils.

2. Narrative of 2005 workplan:

The following activities will be conducted in Juruena, Mato Grosso, Brazil, and in the laboratories in JiParana, Cuiaba and CENA:

- 1. Impact of tree falling on soil water dynamics using TDR address tubes.
- 2. Water collection and analyses of dissolved organic carbon, dissolved inorganic carbon, nitrate, ammonium, phosphate, anions and base cations from stream water in 4 microbasins (weekly).
- 3. Hydrograph measurements in 4 microbasins.
- 4. Groundwater, leaching, throughfall and surface runoff measurements and element analyses as described under (2).
- 5. Litterfall, litter movement on soil surface; and coarse organic debris in streams (POC 0.7 microns-2mm, and CPOC >2mm).
- 6. Measurements of CO2 evolution from emergent groundwater using three different techniques (Headspace equilibration via infrared gas analyzer, CO2 electrode, soda lime).
- 7. Solute sampling during individual rain events using autosampler and complete water analyses as under 2.
- 8. Soil water balance monitoring (TDR, piezometers)to develop time-series ecohydrologic characterizations of the major forest communities (i.e. cerrado, palm, terra firme) in the Rohden tract.

9. Evaluation of biomass and nutrient content of vegetation and commercial species;

3. Description of any difficulties encountered or any issues to resolve (if needed):

1. Setting up a subcontract between UFMT and Cornell proved to be the only possibility to transfer funds to Brazil. The realization of the subcontract turned out to be very difficult. Money transfer through this mechanism was extremely difficult and slowed down operations in the laboratories significantly (by about 4-6 months).
2. Gold mining partly disrupted activities at the field site in 2003, and delayed activities by 2 months.
3. The Rohden Company in Juruena had great difficulties to obtain a logging permit from IBAMA in 2003. Through complications between Rohden and IBAMA, our team had to pull out of the site for a couple of months to not jeopardize the negotiations with IBAMA. After the permit was granted (after 2 months), the work was continued. Many of our experiments had to be suspended or were delayed by this complication.

These complications set back our activities by about 6-8 months.

4. Description of training activities conducted in 2004, including lectures, public outreach, and short courses:

1. In 2004 LBA data were used in several lectures at the University of Mato Grosso, Forestry Department and Soils Department.
2. Outreach activities regularly happen in the Juruena community through LBA participants. Venues are local fairs, town hall meetings.
3. LBA data found entry in many course materials at the newly founded course program in soil ecology at INPA.

5. The LBA-ECO Program Manager, Diane Wickland, strongly encourages LBA-ECO science teams to comply with the LBA Data Policy by registering metadata; sharing data sets with the LBA community; linking publications to data sets registered in the LBA-DIS; and providing good documentation for data sets to be archived.

Your team's LBA-DIS contact has been working with Merilyn Gentry to register datasets and link publications. Please verify your team's metadata and linked publications at:

http://www.lbaeco.org/cgi-bin/web/investigations/inv_pgp_datasets.pl?action=2&pgid=248

Please use the LBA Metadata Editor (LME) to create or modify metadata files for your data sets; the metadata file contains a section for publications related to each data set (for questions about using the LME, contact Merilyn Gentry <mgentry2@utk.edu>). Changes you make using the LME will be updated to the link

above overnight. Afterward, please copy and paste the updated data report from the link above into your progress report.

ND-11 Data sets (with related publications, if any):

Data Set Title: Coarse Particulate OM and C Export

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Selva_Producao_exportacao_carbono.pdf

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/CPOM_Carbon_Export.xls

Data Set Title: Liana diameters and biomass in transects in MT

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives_restricted/ND/ND-11/Jirka/liana-biomass-transects-jirka-2003.xls

---ftp://lba.cptec.inpe.br/posters/ND/ND-11/Shinjiro/Feldpausch_Pre-harvest_tree_and_vine_biomass_11-03.pdf

Data Set Title: Low-flow headwater stream nutrient

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Johnson_Low-flow_headwater_stream_nutrient.pdf

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Headwater_chemistry_lowflow_03.xls

Data Set Title: Natural regeneration carbon and density

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Natural_Regeneration_Carbon_Density.xls

Data Set Title: Natural regeneration inventory

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Natural_Regeneration_Inventory.xls

Data Set Title: Natural regeneration succession

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Natural_Regeneration_Treatment_Succession.xls

Data Set Title: Natural regeneration treatment

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Natural_Regeneration_Treatment_Succession.xls

Data Set Title: Nitrate leaching in microbasins under forest vegetation

- Related Publication(s): Please provide via LME.

- Data Download URL(s): Please provide via LME.

Data Set Title: Organic Carbon Concentrations in Microbasin Streamwater in Juruena, Mato Grosso

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/JohnsonM.LBA.2004.36.15-P.pdf

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/DOC-POC.xls

Data Set Title: Pre-harvest Tree and Vine Biomass in a Forest in NW Mato Grosso, Brazil

- Related Publication(s): Please provide via LME.

- Data Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Feldpausch_Pre-harvest_Tree_Vine_Biomass.pdf

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Pre-harvest_Tree_Vine_Biomass.doc

Data Set Title: Principal Component Analysis for soil attributes

- Related Publication(s): Please provide via LME.

- Data Download URL(s): Please provide via LME.

Data Set Title: Responses to fertilization of secondary forest growth following pasture abandonment in central Amazonia, Brazil

- Related Publication(s): Please provide via LME.

- Data Download URL(s):
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Secondary_forest_fertilization.doc

Data Set Title: Rohden Satellite Images

- Related Publication(s): Please provide via LME.

- Data Download URL(s):
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Rohden_Satellite_Images.pdf

Data Set Title: Spatial variability of soil attributes

- Related Publication(s): Please provide via LME.

- Data Download URL(s):
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Novaes_Aplicacao_da_geoestatistica_LBA_Brasilia.pdf
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Novaes_Aplicacao_da_geoestatistica_SBPC.pdf
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Arquivo_Unico_4Microbasias.xls
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Sato/Mapa_4microbasins.pdf

Data Set Title: Targeted vegetation biomass transects in MT in 2004

- Related Publication(s): Please provide via LME.

- Data Download URL(s):
---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/jirka-et-al-vegetation-soil-relationships.pdf
---ftp://lba.cptec.inpe.br/lba_archives_restricted/ND/ND-11/Jirka/vegetation-class-transects-jirka-2004.xls

ND-11 Posters (with related publications, if any):

Poster Title: Headwater stream low flow nutrient concentrations, Juruena 2003 (Poster)

- Related Publication(s): Please provide via LME.

- Poster Download URL(s):

ftp://lba.cptec.inpe.br/posters/OTHER/Fortaleza2003/Johnson/Headwater.catchments.lowflow.Johnson.et al.pdf

Poster Title: Krigagem and cokrigagem para estimar a materia organica

- Related Publication(s): Please provide via LME.

- Poster Download URL(s): Please provide via LME.

Poster Title: Tropical forest recovery following human disturbance in central Amazonia: post-pasture forest structure, canopy cover, biomass and nutrient dynamics

- Related Publication(s): Please provide via LME.

- Poster Download URL(s):

---ftp://lba.cptec.inpe.br/lba_archives/ND/ND-11/Posters/Feldpausch_Tropical_forest_recovery.pdf

6. Publications:

a. The LBA-ECO Project Office maintains a list of publications from ND-11 that are in print in the peer-reviewed primary scientific literature, including completed Master's theses and Ph.D. dissertations. The list for ND-11 is below. Please provide citations here for any publications that should be added.

b. Please also submit a PDF file, if available, to shumke@pop900.gsfc.nasa.gov of these publications.

c. If there are any publications that we have erroneously attributed to your team, please list them here.

d. List any other publications you would like to report (e.g. in press or submitted papers, commentaries, letters to the editor, or articles in popular magazines).

List of ND-11 Publications:

Peer-reviewed:

Feldpausch TR, Rondon MA, Fernandes ECM, Riha SJ, Wandelli E. (2004) Carbon and nutrient accumulation in secondary forests regenerating on pastures in central Amazonia. *Ecological Applications*, 14, S164.

Renck A and Lehmann J 2004 Rapid water flow and transport of inorganic and organic nitrogen in a highly aggregated tropical soil. *Soil Science* 169: 330-341.

Schwendener CM, Lehmann J, Camargo P and Fernandes ECM 2004 Nitrogen transfer between high- and low-quality leaves on a nutrient-poor Oxisol determined by ¹⁵N enrichment. *Soil Biology and Biochemistry*, in press

Johnson MS, Lehmann J, Steenhuis TS, Oliveira LV, and Fernandes ECM 2004 Spatial and temporal variability of soil water repellency of Amazonian pastures. *Australian Journal of Soil Science*, in press

Submitted publications:

Schwendener CM, Lehmann J, Rondon M, Wandelli EV and Fernandes ECM 2004 Soil mineral N dynamics beneath mixtures of leaves from legume and fruit trees in Central Amazonian multi-strata agroforests. *Acta Amazonica*, submitted

Pereira CN, Fernandes ECM, Lehmann J, Rondon M and Luizao FJ 2004 Inorganic and organic phosphorus pools in earthworm casts (Family Glossoscolecidae) and a Brazilian rainforest Oxisol. *Soil Biology and Biochemistry*, submitted

Pereira CN, Fernandes ECM, Lehmann J, Rondon M and Luizao FJ 2004 Agroforestry trees increase phosphorus availability in an oxisol of the Brazilian humid tropics. *Acta Amazonica*, submitted

Johnson MS, Lehmann, J, Selva EC, Abdo M, Riha S and Couto EG 2004 Organic carbon fluxes within and exports from headwater catchments in the Southern Amazon. *Hydrological processes*, submitted.

Feldpausch TR, Fernandes ECM, Riha SJ, Wandelli EV. Development of forest structure and leaf area in secondary forests regenerating on abandoned pastures in central Amazonia. *Earth Interactions*, submitted.

Theses:

McCaffery, KA 2003 Carbon and nutrients in land management strategies for the Brazilian Amazon. MS. Thesis, Cornell University, Ithaca, NY

Tomazi, Michely 2004 Modificações da dinâmica de nutrientes, dos atributos físicos, e das frações densimétricas da matéria orgânica sob diferentes usos em Latossolos de Juruena-MT. Dissertação (Agricultura Tropical), Universidade Federal de Mato Grosso, Cuiabá, MT

BOTELHO, PA 2004 Estoque de Madeira em Função da Área Basal em Floresta Ombrófila Aberta com Palmeira, em Juruena-MT. Undergraduate paper, Universidade Federal de Mato Grosso, Cuiabá, MT

FÜHR, SI 2004 Distribuição Espacial da Biodiversidade em Floresta Ombrófila Amazônica Meridional. Undergraduate paper, Universidade Federal de Mato Grosso, Cuiabá, MT

7. Participants in ND-11 are listed at:

http://www.lbaeco.org/cgi-bin/web/investigations/inv_pgp_participants.pl?pgid=248

a. People to remove from ND-11: Please indicate anyone listed who is no longer on your team.

b. People to add to ND-11: Please give the name and email address of anyone on your team who is not listed. We will contact these people directly to create LBA-ECO website accounts.

Name :
Email :

Name :
Email :