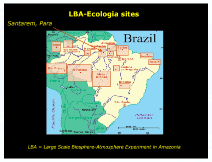

"Litterfall and Leaf Area Index Measurements Before and After Selective Logging in Tapajos National Forest, Santarem - Para - Brasil"

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Introduction

Biophysical processes and the generation of surface fluxes (water, energy and CO_2) inside an ecological system are associated with the physical structure of the canopy and the amount of green biomass (biological component), which regulate both the radiation balance within the canopy and canopy-atmosphere energy and CO_2 exchanges. As such, one of the key parameters in the estimation and quantification of these fluxes is Leaf Area Index (LAI), defined as leaf area pr unit of ground area (Monteith, 1973). The effect of perturbations such as logging on these processes is not well understood. This study examines the seasonal variability of litter biomass (leaves, flowers, fruits, and wood) and LAI before and after selective logging in order to better understand the effects of logging on forest structure. This study is done in conjunction with the LBA eddy-flux covariance study "Measuring the Effects of Logging on the CO_2 and Energy Exchange of a Primary Forest in the Tapajos National Forest".

Methods

Leaf biomass and Leaf Area Index:

In order to evaluate the production of leaves and other litter components, we installed 30 $1m^2$ litterfall traps (Fig.1), (the number recommended by Newbould (1997)), which were arrayed at 25-m intervals along two east-west transects in an 18-ha block (300m N-S, 600m E-W) upwind of the eddy covariance tower. Litter was collected bi-weekly (Fig.2) beginning in September 2000. The material was separated into leaves, wood and other parts (mainly flowers and fruits), oven dried and weighed. Prior to oven drying, the sub sample's leaf area was determined using a computer scanner (scanner HP Scanjet 6300C, output resolution 300) and image processing software (Rootedge). The relationship between weight and area measured was calculated for each subsample and used to derive an equation (Fig.4) which is used to estimate total leaf area for each litterfall trap.

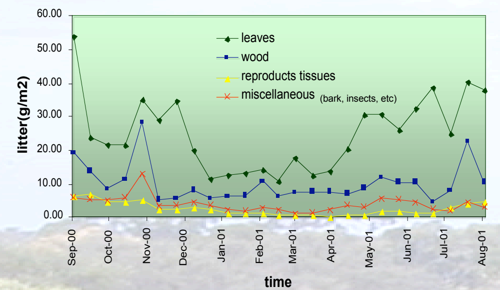
Figure 2: Litterfall collection

Figure 1: Litterfall trap

Figure 3. Samples of leaves

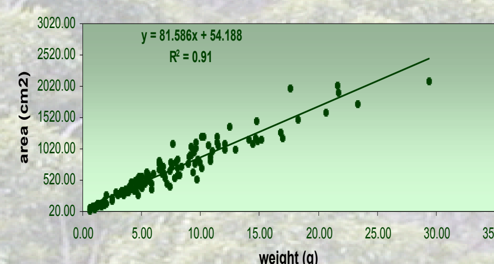
RESULTS

Figure 5. Litterfall - FLONA Tapajós Km83



Litterfall varied seasonally from September 2000 to September2001, with comparatively high rates beginning in May and continuing through the dry season (from July to December).

Figure 4. Area x weight



Relation between leaf dry weight and leaf area from litterfall

LITTERFALL:

•***PRE-LOGGING RESULTS*** - Annual litterfall rates were ***10.5 T ha^{-1} yr^{-1}***, most of it consisted of leaves ***(6.3T$ha^{-1}yr^{-1}$).***

•***POST-LOGGING RESULTS -*** Annual litterfall rates were **9.4 *T $ha^{-1}yr^{-1}$*** (***Leaves=5.2 T $ha^{-1}yr^{-1}$***), thus showing a decrease in leaf litter production of about 15% (Fig.7).

LEAF AREA INDEX:

•***PRE-LOGGING RESULTS -*** The integrated litterfall observations prior to logging suggest an overall LAI of ***$5m^2m^{-2}$***, which roughly agrees with independent assessments of LAI made by fisheye photography during 2001 ($6m^2m^{-2}$).

•***POST-LOGGING RESULTS-*** Preliminary post-logging results suggests a overall LAI of 4, which also agrees with the independent result of an LAI of 4 from the fisheye camera for the 3 months following logging.

The temporal variation of dry weight and leaf area (using the equation in Figure 4), shows a peak of leaf fall between November and December, which coincides with the end of the dry season (Fig.5).

Eddy-flux tower data show an increase in CO_2 uptake in January and February which coincides with increased photosynthesis for new leaf production following dry season leaf senescence in November and December.

Comparison of rainfall and leaf fall (Fig.6) shows that litterfall increases when rainfall decreases.

Figure 6: Leaf fall between collections and Rainfall before and after selective logging

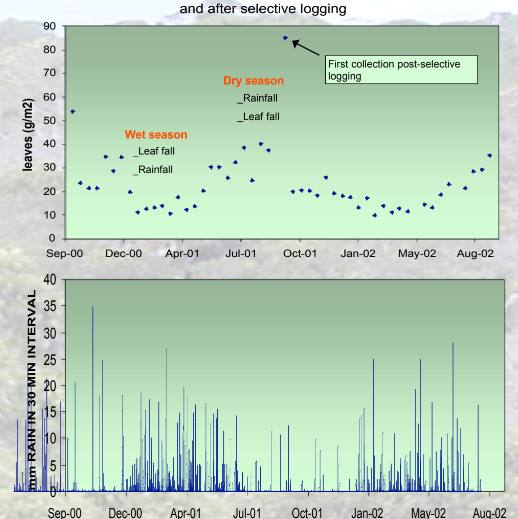
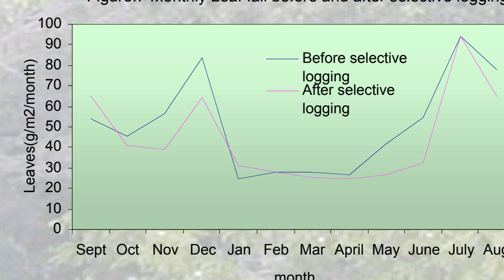


Figure.7 Monthly Leaf fall before and after selective logging



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