4.0 Education and Training Goals and Objectives

Training and education activities have two goals: (1) to increase the participants in LBA research through assistance in developing technical and scientific skills and expertise; and (2) to expand and strengthen the environmental and global change research community in Amazonia. Short courses, workshops, and technical training focus on science themes, scientific techniques, and project implementation exercises. Scientists serve as instructors for these activities, which are coordinated by the LBA Training and Education Committee. Each scientific investigation has a plan to contribute to training and education, such as the training of Master's, Doctoral, and Postdoctoral students, as well as internships, exchange programs, and technical instruction.

4.1 Specific Training & Education Plans for Individual Investigations

LC–01
Training of EcoCiencia staff members in use of remotely–sensed imagery;
Training of South American interviewers.

LC–02
Personnel exchange with LBA site in Santarém;
Training of South American student at Woods Hole Research Center (WHRC);
Development and presentation of short courses at Federal University of Acre – one per year;
Long–term residence of Principal Investigator in Acre;
Participation in planning and presentation of COSE (Curso de Operação de Sítio Experimentais);
Serve as Advisor for two Master's students at Federal University of Acre;
Personnel participation in LBA short courses.

ND–01
Training of three Ph.D. students – one from U.S., two from Brazil;
Visits of Brazilian researchers to University of California, Santa Barbara (UCSB);
Training of technicians in soil analysis techniques;
Co–PI to present remote sensing short course during long–term visit to INPE.

TG–01
Training of Brazilian students in mesoscale simulations;
Brazilian faculty and students to visit NASA Ames Research Center and NASA Goddard Space Flight Center.

ND–02
Training of Master's student;
Presentation of seminars at University of Pará;
Visits of Brazilian students to Woods Hole Research Center,

ND–03
Visits of Brazilian students to Marine Biological Laboratory;
Training of students at CENA.

CD–01
Training of Ph.D. and Post–Doctoral students;
Visits of University of São Paulo (USP) scientists to USCB;
Visits of USCB scientists to USP.

LC–03
Training of two Ph.D. students (one from Amazon area) at University of Michigan;
Two short–term exchanges (three months for three students each) at University of Michigan;
Three–month visit of U.S. student to South American institution;
Senior project scientists to present seminars (four to five per year) at South American institutions;
Strong probability of co–direction of research for students of collaborators, particularly at INPE.

CD–02
Ph.D. training at University of Utah for Brazilian student;
Training of Post–Doctoral researcher;
Support for Brazilian students in course on stable isotope ecology;
Development of stable isotope short course at University of São Paulo.

ND–04
Development of teaching materials and training activities for FUA;
Research opportunities for FUA faculty and students;
Assistantships for three Brazilian students.

CD–03
Training courses in micrometeorological methods;
Training of Brazilian Ph.D. student at State University of New York;
Brazilian Post–Doctoral researcher to assist in training.

LC–04
Training and education efforts to be coordinated with University of Viçosa.

ND–06
Project is literature review only – no training and education plans.

CD–04
Brazilian student to be recruited for training at University of California, Irvine;
Technical training for Brazilian technician;
Possibility of scientist serving as instructor for training course.

TG–02
Training of Post–Doctoral researcher at National Center for Atmospheric Research (NCAR);
Presentations at short courses developed by University of São Paulo;
NCAR scientist in São Paulo to set up biogenic Volatile Organic Compounds analysis laboratory at Instituto de Pesquisas Energéticas e Nucleares.

TG–03
University of São Paulo students to be involved in field work and, later, analysis at NASA Goddard Space Flight Center.

LC–06
Specific plans not yet identified.

TG–07
Training of Ph.D. student from Brazil at University of New Hampshire;
Training of two U.S. Ph.D. students, at UNH and University of California, Berkeley;
Training of Post–Doctoral researchers at UNH and EMBRAPA;
Training of technicians in Santarém;
Participation in development and presentation of COSE;
Development of guides in Portuguese for scientific instrument operation.

LC–05
Training of Master's and Ph.D. students at Oregon State University and NASA;
Training of Post–Doctoral researchers at Oregon State University and NASA;
Technical training in field sensing techniques, GPS referencing.

TG–04
Graduate student to learn to perform analyses at University of North Carolina.

ND–08
Training of Ph.D. student at Auburn University;
Technical training in laboratory techniques for carbon fractionation;
Training of Faculdade de Ciências Agrárias do Pará (FCAP) student in laboratory analysis;
Development and presentation of short course on Environmental Impact of Forestry Activities;
Participation of U.S. professors in training of FCAP M.S. students.

LC–07
Development and presentation of Remote Sensing training workshop at INPA in Manaus;
Support for Ph.D. Research for INPA employee;
Visits of INPE Ph.D. students to UCSB

LC–08
Support for Brazilian Ph.D. student.

LC–09
Semester–long exchange programs between Indiana University and INPE;
Development and presentation of short courses in Brazil;
Development of research protocols for training;
Training of Brazilian Ph.D. students at Indiana University.

CD–05
Support of research expenses for theses of eight graduate students;
Research to add to ecology field courses at University of Brasília, UFU, University of Campinas;
Visiting scholars to be in residence at Woods Hole Research Center.

TG–05
Training of Master's and Ph.D. students at NASA Ames Research Center.

CD–06 and ND–09
Support for laboratory sites at University of Rondônia.
Work to be conducted by graduate students.
Training of both U.S. and South American students. U.S. students will obtain their degree at the University of Washington (U.W.), whereas South American student will obtain their degree at their respective institution, with time spent at the U.W. campus.
Training of Postdoctoral fellows at U.W.
Technicians will be trained as needed.
Participation in planned LBA short courses.
Plan to present four short courses given twice during the 4 years of the project:

- Chemical and limnological analysis
- Biogeochemistry of watersheds
- Use of stable isotopes in environmental studies
- Geoprocessing

LC–10
Active recruitment of Brazilian and other Amazonian students for graduate studies;
Development of workshops.

CD–07
Specific plans not yet identified.

TG–06
Extended visits of Brazilian students, Post–Doctoral researchers, and collaborators to NOAA;
Development and presentation of two short courses at CENA, Piracicaba;
Training of Brazilian Post–Doctoral researchers;
Training of students at field sites.

CD–08
Training of Brazilian Ph.D. student at University of California, Irvine (UCI);
Visits of Post–Doctoral researchers to UCI;
Exchange of students between CENA and UCI;
Training of technical staff at UCI;
Participation in presentation of COSE;
Training of Ph.D. students from University of São Paulo.

CD–09
Training of Post–Doctoral researcher at Marine Biological Laboratory (MBL);
Modeling linkages/exchanges with other LBA sites;
Training of Brazilian Master's student at MBL;
Presentations of seminars at INPE;
Development of user–friendly ecosystem models for use in teaching.

CD–10
Training of Ph.D. student from INPE at monitoring station in Natal, possibly also at Harvard University;
Collaborations with students from University of São Paulo at tower sites.

ND–07
Specific plans not yet identified.

Table 4.1 LBA–Ecology Training and Education Table

	1	2	3	4	5	6	7	8	9
LC–01			#						
LC–02				#	#	#	#	#	#
ND–01	#		#		#	#	#	#	
TG–01			#		#				
ND–02	#				#	#			
ND–03					#	#			
CD–01	#	#			#				
LC–03	#				#		#		#
CD–02	#	#				#			
ND–04					#			#	
CD–03	#				#	#			
LC–04									#

1. Training of Master's and Ph.D. students in U.S. universities, conducting their research in the Amazon area
2. Training of Postdoctoral Fellows in U.S. universities
3. Internships and other technician training
4. Exchange programs with other LBA sites
5. Exchange programs for South American students at U.S. universities
6. Development and presentation of short courses for South American students
7. Seminars and long–term visits by U.S. scientists
8. Development of teaching and training materials for instructors
9. Other

	1	2	3	4	5	6	7	8	9
ND–06									#
CD–04	#		#			#			
TG–02		#				#	#		
TG–03									#
LC–06									#
TG–07	#	#	#			#		#	
LC–05	#	#	#						
TG–04					#				
ND–08	#		#		#	#			#
LC–07	#				#	#			
LC–08	#								
LC–09	#				#	#		#	

1. Training of Master's and Ph.D. students in U.S. universities, conducting their research in the Amazon area
2. Training of Postdoctoral Fellows in U.S. universities
3. Internships and other technician training
4. Exchange programs with other LBA sites
5. Exchange programs for South American students at U.S.universities
6. Development and presentation of short courses for South American students
7. Seminars and long–term visits by U.S. scientists
8. Development of teaching and training materials for instructors
9. Other

	1	2	3	4	5	6	7	8	9
CD–05	#				#	#		#	
TG–05									#
CD–06	#	#	#	#	#	#	#		#
ND–09	#	#	#	#	#	#	#		#
LC–10						#			#
CD–07									#
TG–06					#	#			#
CD–08	#	#	#		#	#			
CD–09		#		#	#		#	#	
CD–10	#				#				
ND–07									#

1. Training of Master's and Ph.D. students in U.S. universities, conducting their research in the Amazon area
2. Training of Postdoctoral Fellows in U.S. universities
3. Internships and other technician training
4. Exchange programs with other LBA sites
5. Exchange programs for South American students at U.S. universities
6. Development and presentation of short courses for South American students
7. Seminars and long–term visits by U.S. scientists
8. Development of teaching and training materials for instructors
9. Other

4.2 Outreach Efforts

Additional outreach efforts will include development of informational community programs, media relations, and production of educational and resource materials. Anticipated audiences include educational institutions and residents of the Amazon region. A variety of approaches will be used to explain LBA–Ecology's mission, to foster understanding of its goals and methods, to report on its progress, and to disseminate the scientific information gathered through its investigations.

Community–based programs and workshops are important components of the training and education effort. One such workshop, coordinated in conjunction with EMBRAPA, took place in Santarém in November 1998. This program combined presentations to the local scientific community, with informal opportunities for residents to meet and interact with LBA–Ecology scientists and staff.

A set of graphic materials summarized the LBA Project for the LBA Training and Education Committee. This presentation was developed for use by Amazonian institutions to promote awareness of the project and to encourage student participation in LBA. The images are available for downloading through the Web, and overhead transparency sets were distributed at the LBA Training and Education Workshop, held in Manaus in March 1997.

4.3 Media Relations

A variety of approaches for informing the public about the project will be pursued. These include contact with press representatives, development and distribution of press releases, and utilization of the LBA and LBA–Ecology Web. All such LBA–Ecology media contacts will be coordinated with the LBA–Project Office at CPTEC.

4.4 Short Courses and Workshops

Short courses and workshops that have been specially developed by the LBA Training and Education Committee will be offered. LBA–Ecology will contribute to and participate in these activities, as appropriate.

4.4.1 The Ecology of the Carbon Cycle

A short–term graduate course that focused on carbon, biogeochemistry, and ecology issues took place at the IBGE Ecological Reserve in Brasília in June1998. The course was coordinated by Heloisa Miranda of the University of Brasília and Adriana Moreira of the Woods Hole Research Center. Participants included students from Brazil and other Amazon region countries.

4.4.2 Operation of Experimental Sites

LBA–Ecology also provided support for a course that focused on practical and theoretical aspects of the operation of experimental sites. Issues such as safety, tower techniques, and

data collection were presented in a hands–on format. Antonio Nobre and Niro Higuchi of INPA coordinated the course, which was given at INPA Ecological Reserves in the Manaus area during October 1998. Several members of the LBA-Ecology Science Team from both Brazil and the United States participated as instructors.

4.4.3 Additional Short Courses

Additional courses planned by the LBA Training and Education Committee include *Chemistry and Physics of the Amazonian Basin Atmosphere*, to take place at the Institute of Physics of the University of São Paulo. Coordinators are Paulo Artaxo of the University of São Paulo, Tânia Tavares of the University of Bahia, and Pedro Leite da Silva Dias of the University of São Paulo. *Use of the Stable Isotope in Ecosystem Physiology*, to be given at CENA in Piracicaba, is being planned by Luiz Martinelli and Reynaldo Victoria, both of CENA.

Training and Education Workshop. A Training and Education Workshop was held in Manaus in March 1997. Representatives from Amazonian institutions and Brazilian organizations, other South American countries, the United States, and Europe participated. The workshop's objectives included definition of the training and education program, development of a network of educators and researchers in Amazonia, and dissemination of background material on LBA science. The committee's work has progressed in the organization of LBA–sponsored short courses and grant applications for fellowships and scholarships to train Amazonian scientists through LBA investigations.

4.4.4 GSFC Residencies in Database Management for LBA Project Office Personnel

LBA Project personnel from CPTEC have been invited to collaborate on LBA–DIS work at Goddard Space Flight Center. This arrangement offers the opportunity for them to exchange information about operational data base management for large–scale experiments, drawing on the expertise of GSFC personnel who have been involved with such projects. The LBA Project exchange personnel will share their expertise in Brazilian data systems and collaborate in the development of the LBA–DIS. They may also receive English language instruction and training in various software programs. One six–month training appointment has been completed, and LBA–Ecology will provide additional opportunities for personnel exchange from CPTEC and other LBA–associated institutions throughout the duration of the LBA Project.

4.4.5 Additional Workshops

LBA–Ecology has also organized and hosted the *LBA–DIS Conceptual Workshop* in July 1997 and a short workshop on *Light Aircraft Remote Sensing Instrumentation* in October 1997.