



**The International  
Long Term Ecological  
Research Network  
2000**

**LTER**

# The Mexican Long-term Ecological Research Network

Gerardo Ceballos, Manuel Maass, Miguel Equihua, Armando Equihua,  
Rodrigo Medellín, Lucina Hernández, Enrique Jardel, and Ricardo Ayala.

The participation by Mexico in the International Long-term Ecological Research Network is very important for several reasons. Mexico supports high levels of species and ecosystem diversity, representing a major fraction of the earth's biota (McNeely et al., 1989). It is imperative that the country understands and protects this heritage, because the combination of extended rural poverty, low technical support, distorted development patterns, socioeconomic disparity, and high population growth, have led to accelerated processes of environmental degradation and resource depletion (Challenger, 1998; INE, 1995). Additionally, Mexico is affected by ecological processes that operate at continental scales, such as the El Niño Southern Oscillation, that occur infrequently and can only be understood through large-scale collaborative efforts. Finally, the proximity of Mexico to a well-established network of

long-term studies creates the opportunity for scientific cooperation and development of human resources.

In order to implement the proposed Mexican LTER (MEXLTER) have organized a committee to structure the network (Ceballos et al., 1998). Presently, the committee has finished the proposal and is working with the government to define long-term funding mechanisms.

The objectives of the MEXLTER are the following ones:

1. Establishment of a network of sites to allow Mexican scientists to address in an interdisciplinary way ecological issues on broad spatial and temporal scales. A corollary is to understand the role of biological diversity in ecosystem processes and in the provision of services to the biosphere including humans.

2. The creation of a legacy of well-designed and documented ex-

Site name	Date	Principal biomes	Research themes	Types and lengths of data sets
<b>Chamela-Cuixmala Biosphere Reserve, Jalisco coast, Western Mexico</b>	1971	Tropical dry deciduous forests, mangroves, and wetlands	Ecosystems (forest structure, hydrology, biogeochemistry, productivity), vertebrates, invertebrates, resources management, conservation biology, ecological monitoring	Basic climatic data (25 y), micro meteorologic data (6 y), runoff (17 y), throughfall (10 y), litterfall (20 y), standing li (17 y), stem diameter increment (10 y), land use change (20 y), LAI (3 y), nutrient budgets (6 y), sediment yield (8 y). Small mammal populations (12 y).
<b>Chajul Tropical Biology Station, Montes Azules Biosphere Reserve, Chiapas</b>	1986	Rainforest, riparian forest, riverine and lake ecosystems	Successional processes, ecosystem productivity, nutrient cycles, human activities, mammal community and population ecology, seed dispersal, plant-animal interactions.	
<b>Site name: Mapimi biosphere reserve, located in the Mapimi Bolson area, in the vertex formed by the Mexican states of Chihuahua, Coahuila and Durango</b>	1978	Chihuahuan desert, desert scrubland, desert, salt shrublands.	Inventories, monitoring, weather, hydrology, vegetation, endangered species, populations, human systems, rangelands	
<b>Zoquiapan Experimental Station, located in the state of Mexico, in central Mexico.</b>	1972	Temperate coniferous forest	Inventories, monitoring, weather, hydrology, vegetation, endangered species, pests and forest diseases, fire, populations, productivity	Weather data set (from 1976). Flora and fauna (1974). Seed orchard (1987). Tree productivity (1976). Forest pests (1987)
<b>Sierra de Manantlán Biosphere Reserve, located in the states of Jalisco and Colima, in western Mexico</b>	1986	Subtropical mountain forests (pine-oak forests, cloud forests, tropical dry and subhumid forests), river ecosystems, and traditional agroecosystems	Biodiversity, inventories, forest ecology, restoration, landscape ecology, watershed management, wildlife ecology, agrarian dynamics, resources management	Inventories Lists of vascular plants and vertebrates, with distribution and habitat data (1977). Meteorological monitoring (1986). Geographical Information System at regional (1:250,000), reserve (1:100,000), and parcel (1:10,000 to 1:50,000) scales with information from 1971 to date. Permanent vegetation plots (succession and stand dynamics). Biodiversity studies in Las Joyas Research Station with data ranges from 10 years. Hydrology and water quality monitoring of the Ayuquila River (4 years). Biological, geographical and socioeconomic databases are integrated in the Sierra de Manantlán Regional Information System

ments and observations for future generations of society.

At present we are in the process of formally establishing the MEXLTER working in an agreement with the National Council of Science and Technology to obtain the funding for setting the network office and the initial network sites.

#### Network Management

The implementation of the LTER program in Mexico will require a coordinating mechanism that provides support for the establishment and funding of the research sites. The achievement of the common goals of the network will require centralization of certain processes such as training, network communication, and planning of meetings. In addition, by centralizing other elements such as acquisition of equipment and software, we anticipate improving efficiency and reducing cost. The basic structure for the coordination and operation of the Network consists of an Executive Committee, an Advisory Board, a Network Coordinator and a Coordinator for each Site. Management of the LTER Network will be by an Executive Group with representatives of each of the participating sites. To insure the success of development and implementation of the MEXLTER network several standards will be followed. The complexity of present-day environmental processes and problems, and the philosophy of the MEXLTER network to conduct ecological research on these issues, requires that all participating sites must use similar state of the art conceptual and technical tools, such as networking, data base management, geographic information systems, and modeling.

#### Partnerships

MEXLTER will work cooperatively with the National Council of Science and Technology (CONACyT), the National Commission on

Biodiversity (CONABIO), and the Secretary of the Environment, Natural Resources and Fisheries (SEMARNAP). Other partnerships will be developed with other government, academic institutions, and NGO's.

Collaboration of MEXLTER with the regional networks will be accomplished through regular regional conferences. Presently, the MEXLTER is actively involved with both the North American and Latin American regional networks. Collaboration with the global network will be through Internet and specific meetings.

#### Research

Seven core subjects, that address the most relevant functional and structural features of ecosystems, and the most pressing environmental issues for human welfare, will define the basic theoretical framework for the research carried out at the MEXLTER sites. The core areas are: 1) Patterns and control of ecosystem primary productivity; 2) Patterns and control of water, carbon and nutrients dynamics in ecosystems; 3) The role of biodiversity in the structure and functioning of ecosystem; 4) Patterns and frequency of ecosystem disturbance; 5) Effect of climate change on the structure and functioning of ecosystems; 6) Interactions at the interface level between managed and natural ecosystems; 7) Defining criteria for ecosystem management and conservation.

The MEXLTER program has been designed to encompass terrestrial and aquatic ecosystems, including managed ones. At a national level should allow comparisons within and across biomes. At an international level, it should make possible comparison within and across biomes in different geographical areas. Therefore, the network should have representation of the major biomes within the country.

All sites will be subject to continuous performance evaluation carried

Affiliation/ownership	Site manager/key contact	Area extent in hectares	Location/elevation	Travel distance to nearest town
Universidad Nacional Autónoma de México (UNAM). Fundación Ecológica de Cuixmala A.C.	Ricardo Ayala, Site Manager, Estación de Biología Chamela, UNAM. (chamela@mail.ibiologia.unam.mx) Gerardo Ceballos, Research Scientist, Instituto de Ecología, UNAM. (gceballo@miranda.ecologia.unam.mx) Manuel Maass, Research Scientist, Instituto de Ecología, UNAM. (maass@oikos.unam.mx) Efrén Campos, Site Manager, Fundación Ecológica de Cuixmala A.C.	Area: 13,141 hectares.	19°22'4"-19°35'29"N, 104°56'23"-105°3'36"W, 0-350 m	Manzanillo (Colima) is one and a half hour to the south. Puerto Vallarta (Jalisco) is 2 hours to the north.
Ministry of the Environment. Universidad Nacional Autónoma de México.	Rodrigo A. Medellín, Research Scientist, Instituto de Ecología, UNAM (medellin@miranda.ecologia.unam.mx) Rodolfo Dirzo, Research Scientist, Instituto de Ecología, UNAM (urania@miranda.ecologia.unam.mx).	331,200 hectares	16o 07' N, 90o 56' W; 120 m asl.	Chajul is about 80 km (2.5 hours) east of the city of Comitán, Chiapas
Instituto de Ecología A.C., Xalapa.	Miguel Equihua, Research Scientist, Instituto de Ecología A.C., Xalapa (equihuam@ecologia.edu.mx) Lucina Hernández Research Scientist, Centro Regional Durango, Instituto de Ecología A.C., Xalapa (lucina@sequia.edu.mx)	172,000 ha	26°11'-27°00'N, 103°23'104°07'W, 1100-1680 m.	
Universidad Autónoma Chapingo	Armando Equihua, Research scientist, Colegio de Posgraduados, Chapingo (equihuaa@colpos.colpos.mx).	1626 ha	190 12' 30"-190. 20°00'N, 980 42' 30"-980 30' 00"W, 3300-3700m.	56 km from Mexico City (Mexico- Puebla Highway).
Universidad de Guadalajara (Instituto Manantlán de Ecología y Conservación de la Biodiversidad, IMECBIO) and Secretary of Environment, Natural Resources and Fisheries (SEMARNAP).	Sergio H. Graf, Site Manager, SEMARNAP. Luis E. Rivera-Cervantes, Enrique J. Jardel (ejardel@fisher.autlan.udg.mx) Luis I. Íñiguez (liniguez@cucsur.udg.mx) Eduardo Santana C., IMECBIO.	139,500 hectares.	19°25' - 19° 45' N, 103°45' - 104°30' W, 350 - 2860 m	56 km from Mexico City (Mexico- Puebla Highway)

independently by peer reviewing. The minimum criteria for a site to be eligible for the Mexican LTER are: 1) critical scientific mass, 2) commitment to sharing of the resulting data and its long-term management, 3) participation of a Higher Level Institution, and evidence of its commitment, 4) institutional longevity or security of site for the future, 6) adequate infrastructure and logistics, and 7) existing knowledge base (availability of long-term databases).

The sites currently included in the MEXLTER network are protected areas where academic institutions have worked with a long-term commit-

ment for research and conservation. These sites include tropical rain and dry forests, subtropical mountain forests, desert scrub lands, and coastal ecosystems (Blanco et al., 1982; Ceballos et al., 1999; Halffter, 1981; Jardel et al., 1996).

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#### References—Mexico

Blanco, S., G. Ceballos, C. Galindo, M. Maass, A. Pescador, A. Suárez y R. Patrón. 1982.

Ecología de la Estación Experimental Zoquiapan: Descripción General, Fauna y Flora. Serie Cuadernos Universitarios # 2, Universidad Autónoma de Chapingo, México.

Ceballos, G., M. Maass, R. Medellín, M. Equihua, R. Dirzo, A. Equihua, A. García, M. Lazcano, L. Hernández and F. Noguera. 1998. The Mexican long-term ecological research network. Pp 52-57 in The International long-term ecological research network (R. Waide, ed). U.S. LTER Network, University of New Mexico, Albuquerque, New Mexico.

Ceballos, G. et al. 1999. Programa de Manejo de la Reserva de la Biosfera Chamela - Cuixmala. Instituto Nacional de Ecología, SEMARNAP, México D.F.

Challenger, A. 1999. Utilización y conservación de los ecosistemas terrestres de México. CONABIO - Instituto de Biología de la UNAM - Sierra Madre. México DF.

Halffter, G. 1981. The Mapimí Biosphere: local participation in conservation and development. *Ambio* 10 (2-3): 93-96.

INE (Instituto Nacional de Ecología). 1995. Programa Nacional de Medio Ambiente 1995 - 2000. Secretaría de Medio Ambiente, Recursos Naturales y Pesca. México D.F.

Jardel, E.J., E. Santana C. y S. Graf. 1996. The Sierra de Manantlán Biosphere Reserve: conservation and regional sustainable development. *Parks* 6 (1): 14-22

McNelly, J. A., K. R. Miller, W. V. Reid, R. A. Mittermeier, and T. B. Werner. 1990. Conserving the world's biological diversity. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, 193 pp.

## Mexico LTER Sites

- A. Chamela - Cuixmala
- B. Chajul
- C. Mapimí
- D. Zoquiapan (possible)
- E. Manantlán (possible)

