



AREA OF FOREST OCCUPIED BY THE COLONIES OF MONARCH BUTTERFLIES IN MEXICO DURING THE 2021-2022 OVERWINTERING PERIOD

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Executive Summary

During the second half of December 2021, 10 colonies of Monarch Butterflies were registered covering 2.835 hectares (*ha*) of forest, this represents a 35% increase in relation to the area registered in 2020 (2.10 *ha*). Six colonies covering 2.174 *ha* were located inside the Monarch Butterfly Biosphere Reserve (MBBR) and four covering 0.661 *ha* were located outside the MBBR, five of those colonies were located in Michoacan and five in the State of Mexico. In Atlautla, east of the State of Mexico, butterflies were present, however, no colony was established.

Introduction

The Monarch Butterflies (*Danaus plexippus*) migrate from southeastern Canada and northeastern United States to overwinter in the Mexican forests, in Michoacan and the State of Mexico (Fig. 1). The main threats to these butterflies in North America are: i. the decline of milkweeds at the breeding sites, ii. Forest degradation in Mexico, and iii. Climate change (Pleasants & Oberhauser, 2012; Vidal *et al.*, 2013; Zylstra *et al.*, 2021). The WWF-Telmex Telcel Foundation Alliance and the National Commission of Natural Protected Areas (NCNPA) systematically monitor the overwintering sites of the monarch butterfly since 2004; in this report we include the forest area occupied by the colonies of these migratory butterflies in December 2021.

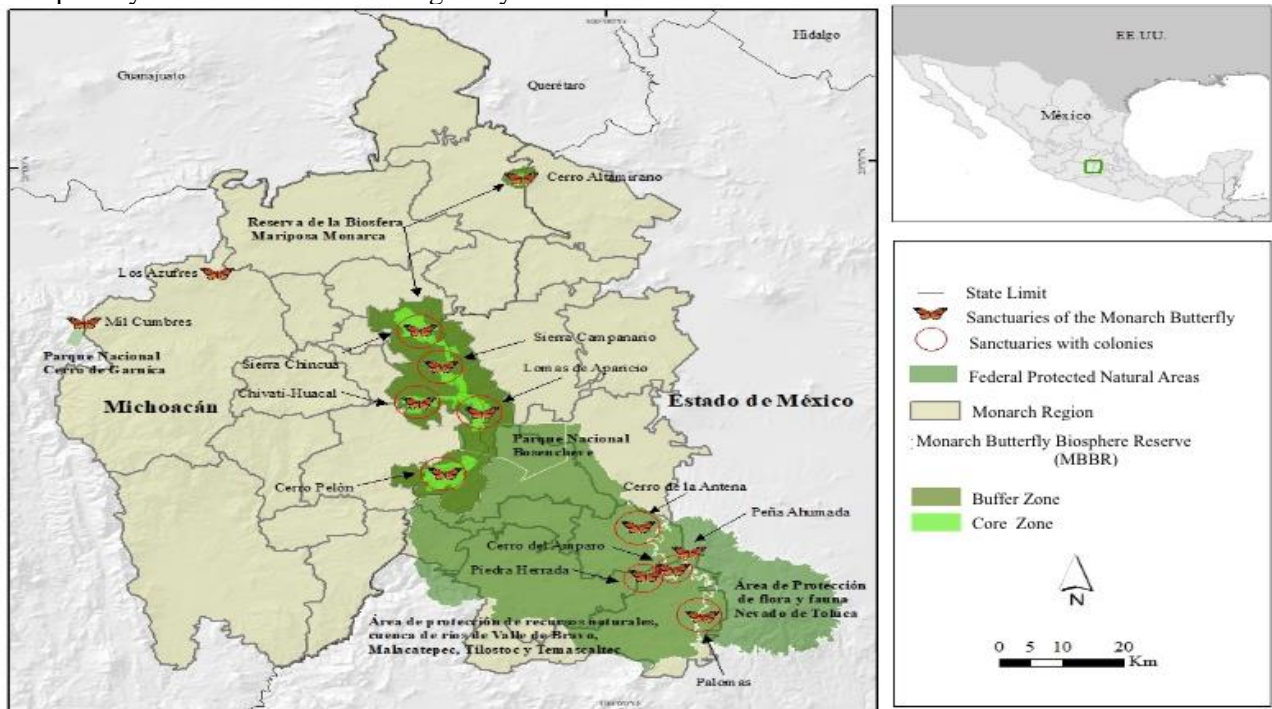


Figure 1. Six overwintering sanctuaries are located in the MBBR located in Michoacan and the State of Mexico, an additional seven overwintering sanctuaries are located outside of the MBBR in the Monarch Region.



Methodology

As of December 2021, each of the 13 overwintering sanctuaries located in the “Monarch Region” was visited twice a month. When a colony was located, the location was established using a Garmin® Geo positioning device in UTM projection, with the WGS 84 datum. The perimeter of the forest occupied by the butterflies was determined from the tree that was found on the highest point of the slope, to do this we recorded the direction and distance of the consecutive and peripheral trees of the colony. The data from the polygonal perimeter was processed with the ArcView 3.3 geographic information system (GIS) to establish the area occupied by the colony (Vidal y Rendon-Salinas, 2014). We visited the Atlautla Sanctuary, whose area is not counted in the historical graph as it is located outside of the Monarch Region.

Results

In the second half of December 2021, ten colonies of monarch butterflies were registered -five in Michoacan and five in the State of Mexico-, which occupied a total area of 2.835 *ha* of forest. Six colonies (2.174 *ha*) were located within the MBBR, while four (0.661 *ha*) were located outside of the reserve. This area represents an increase of 35% compared to the area occupied in 2020, which was 2.10 *ha* (Fig. 2). In the Monarch Region, the largest colony (1.187 *ha*) was recorded in el Ejido El Rosario in Sierra Campanario Sanctuary, and the smallest colony (0.003 *ha*) was located in el Ejido Crescencio Morales in Lomas de Aparicio Sanctuary, this colony has been reported after it was found in 2003-2004 (Table 1). We visited Atlautla, adjacent to the Iztaccihutl-Popocatepetl National Park, where monarch butterflies were present, however, a colony was not established.

Table 1. Forest area occupied by monarch butterflies colonies throughout the second half of December 2021.

Location	State	Sanctuary	Colonies (agrarian properties)	Area (ha)
Inside the Monarch Butterfly Biosphere Reserve (MBBR)	State of Mexico	Cerro Pelón	E. El Capulín	*
			E. Mesas Altas de Xoconusco	*
			C.I. San Juan Xoconusco	*
			B.C. San Pablo Malacatepec	0.016
		Sierra Campanario	E. San Joaquín Lamillas	*
			E. La Mesa	*
	Michoacan	Cerro Altamirano	E. Contepec	*
		Cerro Pelón	E. Nicolás Romero	0.556
		Chivatí-Huacal	C.I. Carpinteros	*
			C.I. Donaciano Ojeda	0.080
		Sierra Campanario	E. El Rosario	1.187
			Propiedad Estatal	0.332
		Sierra Chincua	Propiedad Federal	*
			E. Cerro Prieto	*
E. El Calabozo Fracción 1	*			
Lomas de Aparicio	E. Crescencio Morales	0.003		
<i>Area occupied inside the Reserve</i>				2.174
Outside the MBBR	State of Mexico	Cerro del Amparo	E. San Francisco Oxtotilpan	0.011
		Palomas	E. San Antonio Albarranes	0.267
		Piedra Herrada	E. San Mateo Almomoloa	0.378
		Peña Ahumada	E. Ojo de Agua	*
		Cerro de la Antena	E. El Potrero	0.005
	Michoacan	Los Azufres	P.P. San Andrés	*
		Mil Cumbres	E. Río de Parras	*
<i>Area occupied outside the Reserve</i>				0.661
<i>Total area occupied</i>				2.835

E= Ejido , C. I.=Indigenous Community, P. P.= Small Property, B. C.= Communal Property, * No colony present. Note: except for Small Property, all other are agrarian properties that exist in Mexico.

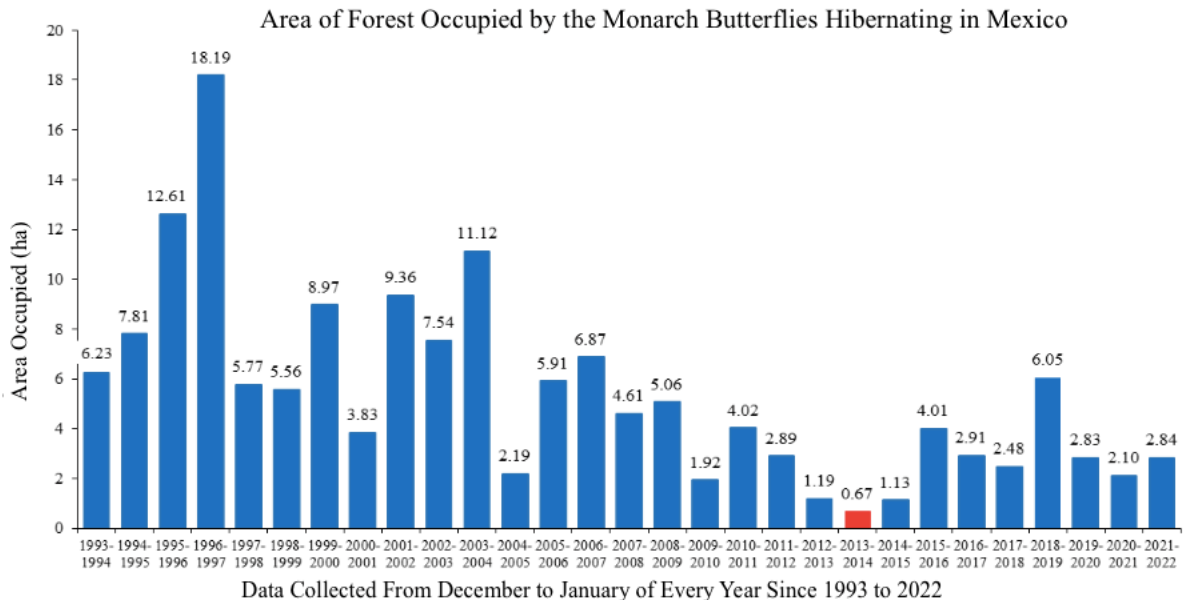


Figure 2. Area of forest occupied by monarch butterfly colonies in Mexico from 1993-1994 to 2021-2022.

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