Integración del paisaje como propuesta de regionalización. cuenca río mololoa

Integration of landscape as a proposal of regionalization. Mololoa River basin

Armando Avalos Jimenez
Universidad Autónoma de Nayarit, México
armand18_a@hotmail.com

Fernando Flores Vilchez
Universidad Autónoma de Nayarit, México
vilchez@hotmail.com

Susana Marceleño Flores
Universidad Autónoma de Nayarit, México
smlmarcel@hotmail.com

Resumen

La cuenca del río Mololoa constituye un sistema complejo de suma importancia, ha proveído de bienes y servicios a 36 localidades asentadas en ella; actualmente se reportan tasas de deforestación de bosques del 0.1 % y selvas del 0.36 %, por lo que surge la necesidad de establecer un manejo sustentable de los recursos. Con base en el enfoque paisajístico, metodologías de análisis multivariado y encadenamiento, se obtuvo la integración de los factores del paisaje y una propuesta de regionalización, dando lugar a la conformación de 8 regiones caracterizadas por la homogeneidad entre los siguientes factores: tipo de clima, geomorfología, edafología, tipo y uso de suelo, vegetación, acceso a educación, salud, servicios básicos de agua potable, drenaje, energía eléctrica, vivienda y potencial económico, que en su conjunto muestran las características que han moldeado la estructura, función y composición de la cuenca del río Mololoa, como base para la formulación de instrumentos de planeación.

Palabras clave: enfoque paisajístico, sistemas de información geográfica, análisis multivariado.

Abstract

The basin of the river Mololoa is a complex system of utmost importance, it has provided goods and services to 36 locations in it; They are currently reported rates of deforestation of forests of 0.1% and jungles of the 0.36%, by what there is a need to establish a sustainable management of resources. Based on the landscape approach, methodologies for multivariate analysis and chaining, was the integration of factors of the landscape and a proposal of regionalization, giving rise to the formation of 8 regions characterized by homogeneity among the following factors: type of climate, geomorphology, soil science, type and use of soil, vegetation, access to education, health and basic services of drinking water, drainage, electricity, housing and economic potential, showing the characteristics that have shaped the structure, function and composition of the basin of the Mololoa River, as a basis for the formulation of planning instruments.

Keywords: landscape approach, geographic information system or geographical information system (GIS), multivariate analysis

Fecha recepción: Noviembre 2014 **Fecha aceptación:** Mayo 2015

Introduction

Regionalization involves the division of a territory in areas with common characteristics and represents a basic methodological tool in environmental planning, as it allows the knowledge of resources for its proper management (CONABIO, 2008). Also, is an exercise in classification of identification of taxonomies and representations of the elements that is interesting to highlight based on the definition of a classification system, giving rise to the regional integrations are

carried out from different perspectives and apply methodologies depending on the needs of who proposes them (Giménez, 1994).

The importance of regionalization is that it allows to represent the natural, social, economic and political processes in the space, including all heterogeneity prevailing within a given geographical space, and by criteria of homogeneity, functionality and systemic analysis, allows to realize processes of differentiation, spatial Association and functional relationships between different elements.

Currently in the basin of the river Mololoa in Nayarit, Mexico, there have been estimated rates of loss of natural vegetation of 41.67 has / year with rates of deforestation of forests and jungles of the 0.1 and 0.36%, respectively, as well as an increase in the area urbanized in 74.86 ha/year (Nájera, Bojorquez and Cifuentes, 2010).

This situation arises the need to establish a sustainable management of resources through the application of correct policies and environmental planning based on knowledge of these resources. In this sense, the study of nature and biodiversity must be supported in the analysis of three relatively independent systems and, at the same time, interconnected among themselves (physical-biological-social), which requires a holistic view of each of them (range Chiappy-Jhones, Le Moig, and Ramirez, 2001).

The landscape approach with a holistic and systemic approach seeks to integrate landscape forming factors in a spatial perspective that facilitates the understanding of the inherent properties of the system as a whole (Cotler and Priego, 2004). The objective of this work was to integrate landscape factors and regionalize Mololoa river basin, based on the landscape approach (holistic and systemic), with support of multivariate analysis and linkage analysis, integrating heterogeneous components of the landscape and representing it in homogeneous units that show the physical, biological and social characteristics that have shaped the current conditions of the river basin Mololoa.

The study area (Figure 1) is located in the central part of the state of Nayarit, between the geographical coordinates 21 ° 43 '26 "North Latitude, 104 ° 56' 46" west longitude and 21 ° 16 '12 "North Latitude , 104 ° 43 '06 "West Longitude (INEGI, 2000). It has an area of 56.937 ha, and is considered a type areic basin bounded by five elevations volcanic: volcano San Juan, Coatepec, Tepetiltic, Sangangüey and boiler Tepic, which together form the center Matatipac Valley.

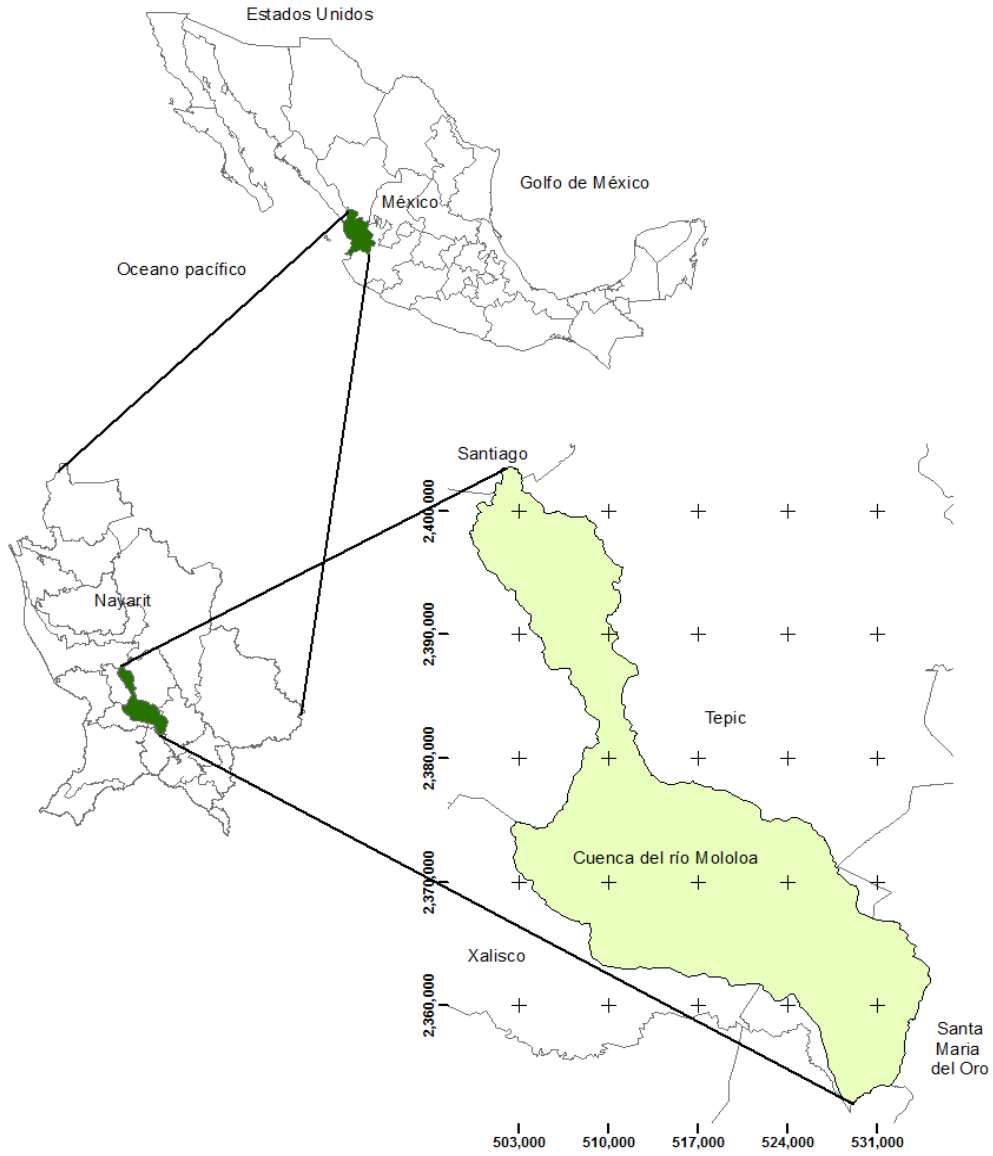

Figure 1. Study area. Mololoa River Basin.

Font. Prepared by the author.

For its geomorphology and natural resources is a complex system of utmost importance for the population of the 36 villages in it are based, particularly Tepic (state capital) and Xalisco with a population of more than 371.154 inhabitants. This portion of the state holds a large variety of natural resources such as forests, jungles, grasslands, water and climate that provides goods and services to the people who sit on it (Najera et al, 2010).

MATERIALS AND METHODS

The methodology was developed with a landscape approach to identifying sources of information for the physical, biological and social factors.

the methodology of multivariate analysis, the analysis process chain for the formation of regions was used on the basis of the concepts of correlation of variables through the Pearson r coefficient applied to the analysis of spatial units for the integration of landscape factors, and according to the methodology of Buzai (2003).

69 variables (see Table 1) obtained for each of the localities in the study area were used; 50 were for environmental factors characterized by geomorfoedafología taken Bojorquez et al, (2005) and the coverage and use of soil taken from Najera et al, (2010); socioeconomic variables and 19 measures for each of the towns settled in the study area from the General Census of Population and Housing (INEGI, 2010).

With the support of Geographic Information Systems (GIS) geographic locations are represented, the ejido grants (National Agrarian Registry, RAN, 2010), and the boundaries of the river basin Mololoa to integrate spatial analysis.

The original data matrix (MDO) was formed, with the physical, biological and social factors, with 69 variables were set in the axis of the columns and the rows axis 36 suburbs. Spatial analysis for the transposed matrix was established in order to have the axis of the columns to the suburbs and the rows axis to each of the variables. From this matrix the standardization of variables and comparison was made, using the standard score, calculated from the average and standard deviation for each of the individual measurements.

With the transformed data standardized data matrix (MDZ) is constructed from multivariate analysis which was applied by the correlation coefficient "r Pearson", in order to measure the intensity of the joint variation of the calculated values each of the suburbs, so that the correlation matrix of spatial units (mCUE) was obtained.

Then the chaining analysis procedure for formation of the landscape units used by Buzai (2003) was applied in socio-spatial oriented applications regionalization in urban areas.

The procedure was performed linkage analysis from the correlation matrix of spatial units (mCUE); List of the top boundary for each geographical correlation was obtained; then neighboring links are identified through the correlation coefficient r; the relationship between spatial units where the highest correlations occur on a bi-directional (reciprocal pairs) were determined finally joined the residual pairs according to their contiguity, and overlaid the results obtained using GIS tools.

RESULTS AND DISCUSSION

, Formed by August 8 units (Figure 2): a geographical regionalization model (20,000 approximate scale 1) was obtained. Each unit was characterized by ecological and social conditions that share a similar trend in relation to the climate, geomorphology, soil, vegetation, soil type, land use, access to education, access to health, basic services, housing , economic and productive potential, which together show the conditions that maintain the structure, function and composition of the river basin Mololoa.

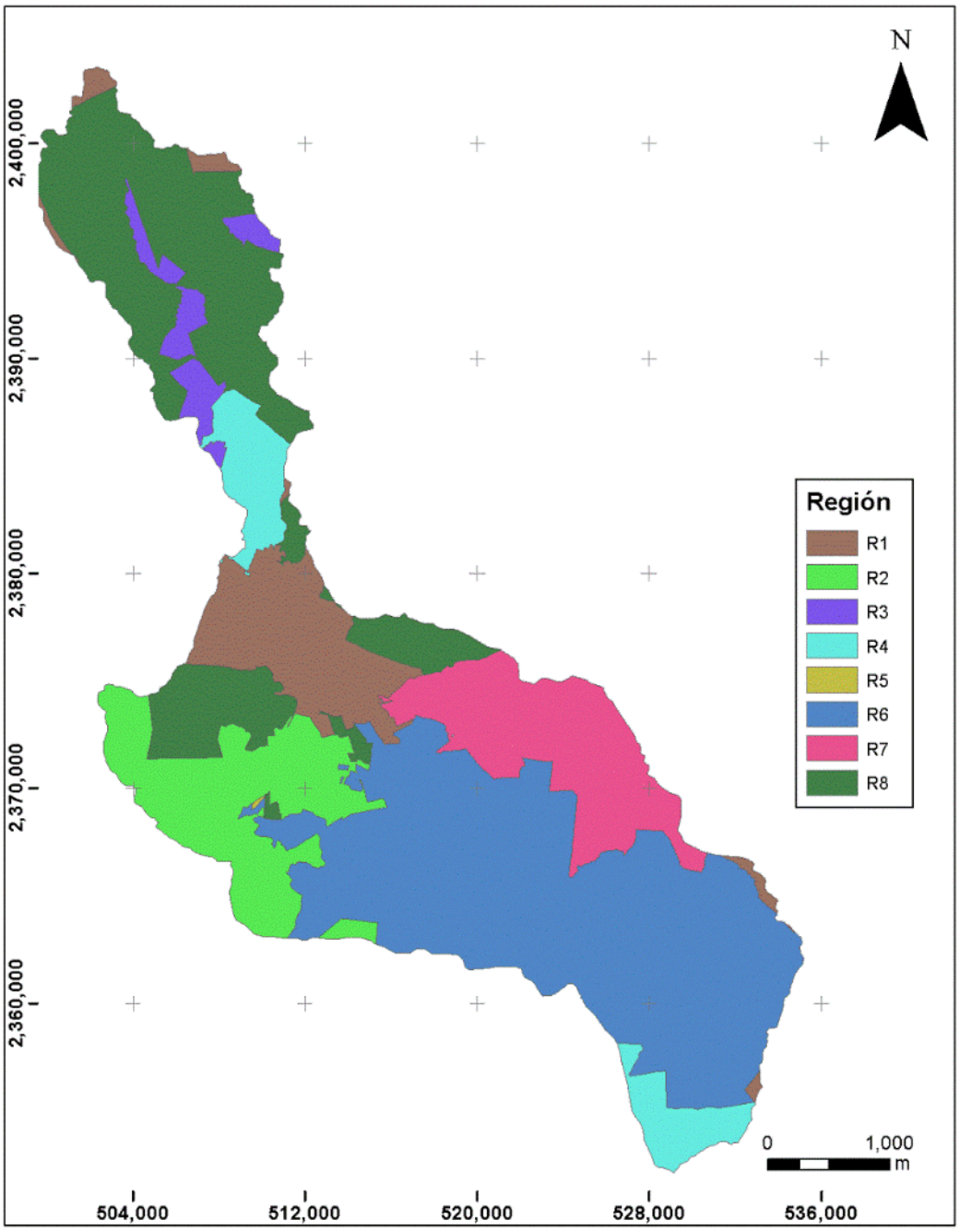

Figure 2. Geographic regionalization model.

Source: Prepared by the author.

The description of the units set forth below:

Region 1 (R1). It includes the municipalities of San Jose de Costilla, Emiliano Zapata, Xalisco, Testerazo and Carrizal, who share 64% of the variables, with 16 physical, biological and 19 September socioeconomic.

The reciprocal pair was made up of the towns of San José de Costilla-Emiliano Zapata (Majadas) with 99% correlation. The variables that were established in the region mainly by the type of variables warm climate Denudativo Depositional Environment and reliefs Pre-grouped to San Juan, Matatipac Valley Plains, hills associated with the San Juan volcano, volcanic centers associated with the San Juan, Acrisol humic soil types, humus and humic Cambisol Andosol, and the biological part of the variable land use of perennial crops, the social part characterized the region with a trend of 60%.

Region 2 (R2). It was formed by the towns of Bellavista, El Limon, El Limón 2 Tepic, Vado del Cora, Zapotanito and La Galinda, sharing 80% of all variables, physical variables 27 9 19 biological and socioeconomic. The reciprocal pair was made up of the towns of Bellavista-Zapotanito with 98% correlation.

Variables marked tendency to the formation of the region were mainly by the type of variables Denudativo Environment, climate type Semicálido, soil types Acrisol orthic and éutrico Regosol as well as the biological part of the variable type Scrub coverage by the social part characterize the region with a trend of 75%, although variable population attending school population of 15-17 and 18-24 years was reduced to 63% by the town El Limon.

In this region the town of Tepic has the largest population and the largest number of households with access to services, education and health, being five standard deviations above the average; however, the locations were in the region are similar to 0.2 deviations below the average trend.

Region 3 (R3). It was formed by the towns of The Hermit, Lo and The Pigeon Lamedo share 46% of the variables, with 12 physical variables, 6 biological and socioeconomic 19.

Variables marked tendency to the formation of the region, 3 were particularly Semicálido climate variables, the Denudativo Environment, geomorphological complexes associated variable San Juan and soil type Cambisol chromic per share coverage was characterized by oak forest, perennial crops, scrub and grassland, the social part characterize the region with a trend of 67% in this group the El Hermit has no indigenous population so that the variable Population Native characterized with 63%.

This region was characterized by mutual pair formed by the suburbs of El Rodeo and Lo Lamedo with 91% correlation.

Region 4 (R4). It was formed by the towns of Cerro Tigers Cefereso and Salvador Allende, these towns share 51% of the variables, physical variables 11 5 19 biological and socioeconomic.

Variables marked tendency to the formation of the region were particularly type Warm, warm climate these locations Denudativo the Environment, geomorphological structure of volcanic Sierras lomeríos Valles, soil types Acrisol orthic, the biological part share 3 types of coverage oak forest, grassland and tropical forest, the social part characterize the region 3 with a trend of 75%.

Region 5 (R5). It was established by the homogeneity given by the towns of La Escondida, batteries, Salazares, La Herradura, San Andrés and the Sabines, these locations share 54% of all variables, with 12 physical variables, 6 biological and 19 socioeconomic.

The variables of this region were the types of Warm, warm climate, the Denudativo Environment, volcanic ridges, valleys with low hills; Acrisol soil types orthic, háplico Feozem, chromic Luvisol and éutrico Regosol; in the biological part with variables oak forest, perennial crops, grassland and Rural. On the social side characterize the region with a tendency 100% for

all variables. The 5 it was characterized by the formation of mutual few localities batteries and Salazares to have a similarity of 74%.

Region 6 (R6). Is determined from the homogeneity between the towns of Aquiles Serdan, Pantanal, Green, brakes, Col. bricked, La Corregidora, El Refugio, La Curva, La Labor, San Leonel and Trigomil, these towns share 70% variable, with 21 physical variables, 8 biological and socioeconomic 19.

In this region the variables were the type of climate Semicálido, the Environment and Depositional Denudativo, Matatipac Valley Plains, hills associated with pyroclastic Sangangüey, hills covered with high average acid tuff Plains Labor Valley, with soil types humic Acrisol, Acrisol orthic, humic Cambisol and Gleysol vértico, the biological part shared variables coverage forest of oak and pine forest, perennial crops, shrubland, grassland and rural areas, the social part was characterized by 100% by ejidos.

This region was characterized by having resemblance between the towns of Aquiles Serdan and Pantanal with a correlation of 0.6752.

Region 7 (R7). It was determined from the homogeneity between the towns of La Cantera and fortune, sharing 83% of the variables, with 29 individuals, nine biological and socioeconomic 19.

The variables of this region were the kind of warm climate and the Denudativo Depositional Environment, Foothills boiler explosion of Tepic, Matatipac Valley Plains with humic soil types and Cambisol Acrisol humic part shared by biological variables Forest coverage oak, perennial crops, grassland and scrub, on the social side was characterized by 40% through the towns of La Cantera and The Fortuna who formed the region with a similarity of 56%.

Region 8 (R8). It was determined from the homogeneity between the towns of La Cantera and La Fortuna sharing 58% of the variables, with 12 individuals, nine biological and socioeconomic 19.

In this region the variables were the type of warm climate the Denudativo Depositional Environment and with geomorphological structures Matatipac Valley Plains and Mountain Ranges Sangangüey associated with pyroclastic volcanic Sangangüey Building, Piedmont; Acrisol soil humic Acrisol orthic, humic Cambisol, háplico Feozem and Litosol; the biological part localities share variables Oak forest coverage, perennial crops, scrub, Rural and secondary vegetation, grassland, Selva Baja, and bare floors, the social part was marked at 100%.

Region 8 It was characterized by mutual pair formed by the homogeneity in the distribution of variables Camichín the towns of San Cayetano and Jauja with a similarity of 37%.

Several studies conducted with regionalization landscape approach, as in the case of works Chiappy, Gama, Soto, Geissert and Chavez (2002) in Veracruz; Landscape regionalization of five municipalities of the Huasteca Veracruzana high by Gama et al. (2001), the characterization of landscapes in the Yucatan Peninsula also Chiappy, Gama, Giddings, Rico-Gray, and Velázquez (2000) and the work of Gonzalez, Bojorquez, Najera Garcia, Maduro, and Flores (2009) in Nayarit, and Bocco, Velázquez, Mendoza, Torres y Torres in Michoacan (1996).
In this work an opening to the landscape analysis is established, however, its implementation does not take into account social factors, leaving short the study of interactions with these elements, which reveals that although they have a theoretical basis that provides a holistic and systemic vision of the landscape, there are no clear the scope and limitations of the application of the approach (Urquijo and Bocco 2011). In this paper, the social aspect was treated with an equal to the other (physical and biological) factors assessment, obtaining a comprehensive analysis of the relationships and interactions of all components of the landscape.

Studies regionalization conducted by the landscape approach come to the results of formation of regions based on geomorphology and soil types, from these landscape units so that it fails to understand the unity in the geomorfoedafológico sense defined, unlike the present study where the regions were formed from the homogeneity of the 69 variables, it was established that the components that structure each unit.
In this sense, each unit was defined by the ratio of its components and relationships with adjacent regions, so although some localities counted on variables in greater proportion as the largest

populations, increased access to basic services, education and housing or greater coverage or soil type, this alone did not guarantee the formation of the region.

An example of this is the case of the RP-7 defined by sharing the largest number of variables with 87%; however, these variables did not share homogeneity, according to correlation analysis, which put her in seventh place. Furthermore, the RP-1 shared only 64% of the variables, but their homogeneity was 99%, which characterized it in unity with greater similarity between their localities. The region with the lowest number of shared variables was the RP-4 (35 variables) whose homogeneity was in 51%.

CONCLUSIONS

The heterogeneity of the river basin Mololoa was reflected in 8 units established by the similarity of the 69 variables that characterized the landscape; each unit was defined by the ratio of its components and relationships with adjacent regions, so although some localities counted on measured variables in greater proportion, these alone will not ensure the formation of each region.

The application of multivariate analysis methodology in combination with integrated chain analysis groups variables characterizing each of the physical, biological and social components of the landscape of the river basin Mololoa with this use of personal criteria are avoided by providing an assessment equitable to all components, eliminating bias to obtain regions with a holistic view that lets you see the structure, function and composition of natural and social resources in an organized manner.

The information obtained can be used to identify regions of environmental importance and further development of social welfare, as bases for the construction of environmental management instruments such as eco-regional planning and environmental management programs.

Bibliography

Buzai G. D. (2003). Mapas Sociales Urbanos. Lugar Editorial. Buenos Aires.

Bocco, G., Velázquez A., Mendoza M. E., Torres M. A. y Torres A. (1996). Regionalización ecológica del Estado de Michoacán. Proyecto de Actualización del Ordenamiento Ecológico General del Territorio del País. Informe final, Subproyecto Regionalización Ecológica. (INE-SEMARNAP), México, p. 95.

Chiappy, C., Gama, L., Giddings, L., Rico, V., y Velázquez, A. (2000). Caracterización de los paisajes terrestres actuales de la península de Yucatán. *Investigaciones Geográficas (Mx),* (42) 28-39. Recuperado de http://www.redalyc.org/articulo.oa?id=56904203

Chiappy-Jhones, C. J., Chávez, J., Soto Esparza, M., Gama, L., y Geissert, D. (2002). Regionalización paisajística del estado de Veracruz, México. *Universidad y Ciencia,* 36(18) 87-113. Recuperado de http://www.redalyc.org/articulo.oa?id=15403602

Cotler H., Priego A. (2007). El análisis del paisaje como base para el manejo integrado de cuencas: el caso de la cuenca Lerma-Chapala. Secretaría de Medio Ambiente y Recursos Naturales, Instituto Nacional de Ecología.

Gama, L., Chiappy Jhones, C., Le Moig, A. M., y Ramírez Martínez, E. (2001). Regionalización paisajística de cinco municipios de la huasteca alta veracruzana y la percepción etnopaisajística de sus habitantes. Foresta Veracruzana, 3(1) Recuperado de http://www.redalyc.org/articulo.oa?id=49730101

González García A. S., Bojórquez Serrano J. I., Nájera González O., García Paredes J. D., Madueño Molina A., y Flores Vilchez F. (2009). Regionalización ecológica de la llanura costera norte de Nayarit, México, Investigaciones Geográficas, (69), pp. 21-32. DOI: http://dx.doi.org/10.14350/rig.18002

Giménez, G. (1994). Apuntes para una teoría de la región y de la identidad regional. Estudios sobre las culturas contemporáneas. Universidad de Colima. Colima, México. (018) pp. 165-173.

INEGI (2010). Censo general de población y vivienda. México.

Mendoza, M. y G. Bocco (1998). La regionalización geomorfológica como base geográfica para el ordenamiento del territorio: Una revisión bibliográfica. Serie Varia, núm. 17, Instituto de Geografía, UNAM, México, pp. 25- 55.

Nájera, O., Bojórquez, J. I., Cifuentes, L. (2010). Cambio de cobertura y uso del suelo en la cuenca del río Mololoa, Nayarit. Biociencias, No. 1, pp. 19–29.

Urquijo P. S., y Bocco G. (2011). Los estudios de paisaje y su importancia en México, 1970-2010. Journal of Latin American Geography, 10 (2) pp. 37-63. DOI: http://dx.doi.org/10.1353/lag.2011.0025