

# A LOOK AT SPRINGS IN MEXICAN BORDER DESERT AS A POSSIBLE SITE FOR HIKING

Una mirada al desierto en la frontera norte  
de México como posible sitio de senderismo

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Fecha de recepción: 25 de agosto del 2014.  
Fecha de aceptación: 27 de noviembre del 2014

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## Resumen

*El senderismo es una actividad al aire libre que además de ser una práctica saludable demanda el cuidado del ambiente e incrementa la atracción turística por medio del aprovechamiento de los recursos naturales. Una planeada organización para su implementación traería un desarrollo económico a comunidades desfavorecidas. Tal es el caso de la comunidad de Samalayuca, ubicada en la región norte de México. El objetivo de este estudio es presentar una descripción de la zona de Samalayuca para un posible proyecto de senderismo tomando como referencia tres ojos de agua. El texto menciona el análisis requerido para llevar a cabo el plan. Como parte de los lineamientos, se propone un manual para el trazo de rutas para proteger al turista y el ambiente. También se recomienda la creación de un jardín botánico en el área. De la misma manera se presentan ideas de literatura consultada para implementar diferentes actividades para hacer de lugar un sitio más atractivo y dinámico.*

**Palabras claves:** senderismo, turismo fronterizo, ojos de agua, turismo en el desierto.

## Abstract

*Hiking is an outdoor activity that besides being a healthy practice that demands care for the environment, it increases the tourist attraction. A well-planned organization for its implementation would bring economic development to underprivileged communities. This is the case of the northern Mexican region in this study, Samalayuca. The objective of this paper is to present a description of the Samalayuca zone for a possible hiking project taking as reference three springs. It mentions the analysis required to carry out the plan and probable components. As part of the outline, a manual for the laying down of trails is proposed in order to protect the tourist and the surrounding environment. This work also recommends the creation of a botanical garden. It also presents ideas from previous literature to implement different activities in order to make it a more interactive and dynamic place.*

**Key words:** hiking, border tourism, springs, desert tourism.

# The context

## a) Samalayuca and its surroundings

The Municipality of Juarez is located in the Central Mesa with its coordinates being 31° 44” 22’ north latitude and 106° 26” 29’ longitude (it occupies 1.96% of the state’s area). It is located 1,116 meters above sea level and has frontiers with the United States of America on the north and the Ascension, Guadalupe, and Villa Ahumada municipalities. The municipality is comprised of three sections: Samalayuca, Senecu, and Zaragoza (Folleto Anexo Plan Municipal de Desarrollo 2010-2013, 2011).

The previously mentioned territory is mostly flat with various ridges from nearby mountain ranges, the main ones being: Sierra de Juarez, Sierra el Presidio, Cerro el Mesudo, Cerro la Morita y la Sierra de Samalayuca.

The Samalayuca region is characterized for being predominantly dry, meaning that evaporation exceeds precipitation. Little humidity is a result of the lack of precipitation, temperature, the soil, and the vegetation layer (Ecosistemas y Medio Ambiente Sierra Madre S.C., 2009:20). The weather in the Samalayuca region, much like in the rest of the municipality, reaches extremes. Table 1 presents the temperatures in the area in order to gain a more precise perspective of the project at hand.

Table 1. Weather in Cd. Juarez

Annual Median °C	17
Maximum Median °C	25
Minimum Median °C	9
Maximum Extreme °C	46
Minimum Extreme °C	-22
Frost (days/year)	65
Median Annual Precipitation	224
Rain day average	48
Snow day average	2

Source: Folleto Anexo Plan Municipal de Desarrollo 2010-2013 del Municipio de Juárez, Chih.

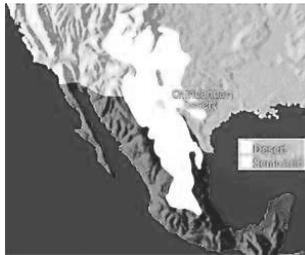
The Samalayuca region, located a 45 min. drive from Ciudad Juarez, is part of the Chihuahuan Desert (DCH) and the Unidad de Manejo Forestal (UMAFOR) code 08-12 located in the northernmost area of the state of Chihuahua (see figures 1 and 2). In the DCH, the 08-12 zone completely or partially covers the Ascension, Ahumada, Buenaventura, Casas Grandes, Galeana, Guadalupe D. Bravos, Janos, Nuevo Casas Grandes, Praxedis G. Guerrero and Juarez municipalities. The territory covers an area of 4,845,697 hectares, has a northern frontier with the United States, a western frontier with the state of Sonora, and a southeastern and Eastern frontier with the state of Chihuahua (Ecosistemas y Medio Ambiente Sierra Madre S.C., 2009:17).

The Samalayuca region has seven main aquifers. According to the UMAFOR 08-12, the subterranean

hydrology in Samalayuca is underexploited, which is where springs or “ojos de agua” are located. This territory can be found between two protected natural areas: Los Médanos de Samalayuca and the Reserva Biósfera in Janos.

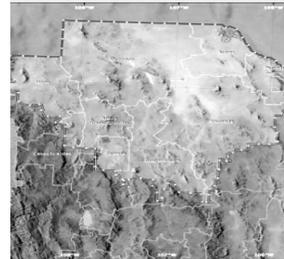
The sand dunes are characterized for their white and fine silicon sand bank. They earned their name from their proximity to Samalayuca town. The view is composed of mountain ranges, hills, and high plains home to a great diversity of flora and fauna.

Figure 1. Chihuahuan Desert



Source: NMSU.  
<http://ddl.nmsu.edu/chihuahua.html>

Figure 2. UMAFOR in the state



Source: Unidad de Manejo Forestal Centro Norte A.C

The sand dunes' main area is 32 km. long and 13 km. wide (Santiago, p. 4). The Samalayuca sand dunes are not only the largest and most famous in northeastern Chihuahua, but they are also rich in materials and exploited by the cement company, the landowners, and the thermoelectric plant belonging to the Electric Company or “Comision Federal the Electricidad” (Santiago, p. 3). Facing this threat, president Felipe Calderon Hinojosa declared the Medanos de Samalayuca area a protected natural area in a ruling that would impact the preservation of this unique ecosystem. He did this June 5, 2009. The ruling is exposed in the Plan the Desarrollo 2007-2012 in the Basic Premise 4 (Diario Oficial de la Federación [DOF] 2009: 59). This section refers to environmental sustainability, which has as one of its main objectives the conservation of ecosystems belonging to the flora and fauna of the country through the implementation of effective mechanisms. The laws cover the establishment of protected natural areas and sustainable driving schemes that allow for the coming together of natural richness and social well-being. (DOF, 2009:59).

In the document, article 4 lists allowed activities:

- Non-invasive use of wildlife
- Invasive use of wildlife
- Sustainable tourism
- Control of detrimental wildlife
- Agriculture and livestock
- Mineral exploration and exploitation

## b) Flora

Due to the extreme temperatures in the desert, Samalayuca flora faces adverse climatic conditions for blooming of vegetation and fauna, which functions as both a platform for the development of a peculiar ecosystem and attraction for locals and tourists. Plain sight reveals an inhospitable place whose landscape contains mostly sand and little vegetation. However, there is great flora diversity here. One hundred and thirty two different plant species from thirty six botanical families can be found in the area (Enríquez & Olivas, 1999:35). Because of its vital role in the ecosystem, a description of characteristic regional plants from the sand dunes and adjoining areas is presented.

The dominant shrub in the area is known as “la gobernadora”. It is known for not allowing other plants to develop under its branches; its roots provide support to the naturally unstable floor (p. 33). Enriquez and Olivas report that “la gobernadora” has medicinal properties. It is used in treating liver and skin disease, stomach aches, and wounds (as cited in Aguilar, Camacho, Chino, Sánchez y López, 1994:33).

Another representative plant is the mezquite, which stores great amounts of water that allow it to be the first plant blooming in the spring. It also stabilizes the soil that the wind so easily moves around. (Enríquez & Olivas, 1999:34). Chamizo, or desert fodder, also grows in the area, along with grass, which appears during rain season and feeds livestock and other local animals (p. 34). The cactus is yet another representative plant of unique beauty. It serves as a decorative plant with its thorns and flowers. The biznaga, also known as *Echinocactus parryi*, is another cactus local to the region (p. 34).

In addition to the aforementioned vegetation diversity, the area is also home to a great variety of medicinal plant such as the calabacita loca used as laxative and treatment for inflammation. The popotillo is used in treatment for cough, colds, headache, fever, and other maladies. The ocotillo is consumed for liver conditions and the elimination of parasites. The trompillo is used to treat muscular pain. Dandelion is abundant in the area and is used to treat inflammation and liver and kidney conditions and to aid in the lowering of blood pressure. The tronado is used to treat diabetes all around the country (p. 36).

The benefits of the local flora are not limited to the properties described above. Plants such as nopal, yuca, cola de caballo, sotol, escobilla, and palmilla also serve as a cushion of sorts between the scrubs and the pastures of the Presidio mountain range, home animal wildlife. It is necessary to point out that the Presidio mountain range is of paramount importance in the process that creates the dunes. The mountain acts as a natural barrier against the winds that deposit the weathered material, favoring the formation of dunes (Santiago: 4).

The Samalayuca mountain range ends at the sand dunes and the soil changes to the characteristics of the DCH where the springs or “ojos de agua” are located. It is noteworthy that these springs draw large numbers of animals seeking water.

The town of Samalayuca is an emblematic reference point in the region since the 19th century and was considered the capital of the DCH as it is located almost exactly in the middle of it. The community can be found in the Juarez municipality 40 km. south of Ciudad Juárez (Santiago: 1), frontier community with the largest population in the state neighboring El Paso, Texas.

The town of Samalayuca originated from the livestock farms built there due to the proximity of the “ojos de agua” in a predominantly desert region. The town was formally established once the Mexico-Ciudad Juárez railroad arrived and construction of a fuel and water station was completed (Santiago:1). Samalayu-

ca was also a stop in the Federal 45 highway, also known as Panamericana. However, the town was left out of the route followed by the new highway construction where most traffic began to go through.

### c) Economy

The town has not experienced the desired development and prosperity even if it is located near two very relevant economic engines. One of them is the cement factory “Cementos de Chihuahua” which stands out thanks to its sheer size in the middle of the desert. The company was considered at the time of foundation the most modern plant of its kind and was inaugurated by then president Ernesto Zedillo in 1996 (Perez, 1996:1A<sup>2</sup>). The second economic activity is the thermoelectric plant that powers the entire northern region of Chihuahua. These installations were built in 1979 by the Comisión Federal de Electricidad. In 1995 a second plant was built in order to meet the increasing demand from increasing population (Holguín, 1995:9A). It is noteworthy that the same year work was started on the new Cementos de Chihuahua factory in Samalayuca, which would go on to produce 2500 tons daily, of which twenty percent would be sold to the municipality and eighty percent to the United States (Aragón, 1995:4A).

The efforts at increasing the prosperity of the area by locals and visitors have grown steadily. An example is the touristic event “Aventura en Dunas Samalayuca” carried out partially by sports organizations. The Autonomous University of Ciudad Juárez, the state, and municipal governments have also participated in this task (Cerda, 2008:55).

The sports activities taking place in the area have attracted visitors from all across the country, the United States, Europe, and Central and South America. The event lasts for 2 days. Due to the success achieved, the sporting event is part of the Festival Internacional de Turismo de Aventura de Chihuahua (p. 56). The touristic development measures taken have focused on the dunes, but this work proposes the development of another part of the area that will benefit the population. On the other hand, due to its unique desert landscapes, the sand dunes area and its surrounding has served as scenario for cinematographic production such as *Conan the Destroyer* (1984) and *Dune* that same year. Other activities developed by the locals in an attempt to reactivate the economy was the “Primer Samalayuca Fest”. At the event, a racecar showing took place, a demonstration of ethnic groups and their traditions, and the inauguration of a rodeo school in the area (Cota, 2006). This festival continues to present itself with similar activities. The most recent edition was on June 15-16 2013, attracting a considerable number of inhabitants from Cd. Juárez and demonstrating once again the touristic potential of the area (Villegas, 2013).

### d) Population

The Unidad de Manejo Forestal Semidesierto Norte, where the region of Samalayuca is located, is known for being a predominantly inhospitable area. However, it holds densely populated communities with Ciudad Juárez (1,332,131 inhabitants) as an example. This represents 39% of the population of Chihuahua. Nuevo Casas Grandes is home to 59,337 inhabitants and Ascension with 23,975 inhabitants (INEGI, 2011). Thirteen more communities are also present with less than 10,000 inhabitants (Ecosistemas y Medio Ambiente Sierra Madre S.C., 2009, p. xx).

With respect to the communities located in American territory within a distance taking two hours or less to travel to the Samalayucan region, one can find El Paso, Texas with 800,647 inhabitants (U.S. Census Bureau, 2012). The city neighbors Ciudad Juárez and is geographically separated from the

same by the Rio Grande. Both cities form a metropolitan area of 2,132,778 inhabitants located a little over 30 minutes from the Samalayuca region. The American city that holds second place in population near Ciudad Juarez is Las Cruces, New Mexico with 97,618 inhabitants. The other two cities with significant populations in the region in American territory are Socorro and Horizon with 32,013 and 16,735 inhabitants respectively (US Census Bureau, 2012).

## Theoretical framework

Tourism is a human activity which leads to sociological, economic, political, ecological, legal and psychological impacts, among others (Osorio, 2000); therefore, its theoretical referents are diverse and according to the nature with which it is addressed. Muñoz (2011) states that the first approaches labeled the study of tourism as exotic and bizarre. Research on tourist activity emerged and has developed from empiric and pragmatic basis, which is one of its aspects to consider. Molina (2011) proposes creative tourism, which implies recognition of singularity and sustainable use. The framework in which creative tourism lies is the post-rationalism whose epistemological base is the constructivism. From this perspective, actors build their own reality (p. 25). The present study assumes this aspect as its own, presenting a proposal in which the state and community are participants in the project.

Contrary to this point of view, the author makes reference to the tourism industry whose basic foundation is the scientific rationalism in which “reality is perceived as objective, structured and it is the same for all people, societies and cultures” (p. 23). Reality is built by an external agent that will not result in economic or social development (p. 25).

Nowadays research in tourism has been formalized. There are several organizations such as the United Nations World Tourism Organization (UNWTO) whose main goal is the promotion of sustainable, responsible and accessible tourism based on empiric and scientific approaches. Due to the exponential development of means of communication, telecommunications, and population growth, research on tourism can be addressed from the complexity theory and transdisciplinarity (Cuevas-Contreras & Zizaldrá-Hernández, 2009).

The present study is of empiric nature and it relies on a spatial approach because it makes reference to a geographic place. Its purpose is to describe the characteristics of a part of the Samalayuca region in order to propose a hiking route for the development of the tourist potential of this site. Similarly, the project intends to suggest public policy on hiking requirements and regulations.

## Hiking

The regional conditions described above provide a propitious scenario for the development of this type of physical activity. In order to have a better understanding of the guidelines presented in this work it is necessary to give a precise concept of the practice. Hiking is performed outdoors consisting of walking in natural settings. These walks can be done in any place and are geared towards improving physical and mental conditions of the person. Hiking also seeks to preserve landscapes for the benefit of the hikers (Comité de Senderos de la Federación Española de Deportes de Montaña y Escalada). The activity is considered a noncompetitive sport performed in well-defined and signaled paths. It is a sport accessible to the great number of enthusiasts

regardless of age, contributing to the overall health of a population; it is an affordable way to spend leisure time during the weekend and vacation (Comité de Senderos de la Federación Española de Deportes de Montaña y Escalada).

Hiking seeks to bring people together with nature, encourage knowledge of the region through direct contact with the environment, local population, and cultural and historical heritage. It can also recover old tracks of communication (Comité de Senderos de la Federación Española de Deportes de Montaña y Escalada) for the revival of historical heritage as is the old train station in Samalayuca.

One of the attractions to develop a hiking zone are the springs located in Samalayuca. The springs are in almost parallel with the Samalayuca mountain range and have served as a small oasis. These aqueous spaces are three in number: the “Ojo de la Casa”, the “Ojo Medio” and the “Ojo Extremo”, which compose an underexploited aquifer. The “Ojo de la Casa”, the best known, is in good condition. The “Ojo Medio” is neglected but has clean water as small fish can be seen in it. The “Ojo Medio” is very close and in plain sight of the Samalayuca mountain range where one can see ancient markings made by the first inhabitants before the Spanish arrived. In the “Ojo Extremo”, water is currently used by a small farm.

One of the characteristics of hiking is that walking is carried out on trails. A trail is an itinerary which has been designed on a geographic space where signals have been placed to guide the hiker while providing a series of supporting services such as restrooms, emergency stations, and information kiosks for the hiker. Flat trails, without much change in elevations, can be classified according to distance travelled. This holds from those that require little effort and can be completed within two hours (10 km) to physically demanding ones which take even more than eight hours to complete (Comité de Senderos de la Federación Española de Deportes de Montaña y Escalada). In this activity 5 km. intervals are being considered. This takes one hour to hike provided that the terrain is level as is the Samalayuca region. Another trail to be considered runs for about 10 km, starting at the town's exit and ending at the “Ojo Extremo” or “Ojo de la Punta”. This would be the entire trail, but as it was mentioned before, there could be shorter alternatives with less kilometers. An example of this would be a trail starting at the “Ojo de la Casa” and ending at the “Ojo Extremo” or “Ojo de la Punta”. This would mean this trail would be significantly less kilometers long. Figure 3 portrays the location of two springs or “ojos de agua”

Figure 3. Ojos de Agua Locations



Source: Javier Melendez en www.ipernity.com560 x 459 | 129.1 KB

A combination by the “Ojo Medio” is proposed in this paper. “Ojo Medio” is located at the outskirts of the mountain range and a trail containing a short climb would provide a spectacular view from the Samalayuca hill.

The trails can be classified according to the effort taken to complete the route. For instance, there are those that require minimal effort and others that are characterized for being very tiring. The latter depends on the on the type of path, existing changed in elevation, and the effort required to complete the trail (Comité de Senderos de la Federación Española de Deportes de Montaña y Escalada).

It is also necessary to consider the time of year and present climatic conditions. Extreme temperatures increase the effort needed and call for special equipment. In Table 1, weather conditions that must be taken into account are presented in order to let the hikers know of these through the use of pamphlets that will also suggest dress and equipment required for the completion of the activity depending on season. In the summer, temperatures can rise to above 40 degrees Celsius and in the winter they can drop to below freezing. This presents a more difficult challenge for hikers. In the case of hiking in Samalayuca, spring and autumn bring beautiful scenery and weather needed to enjoy the blossoming of cacti as well as the splendor of the flora after rain.

Even though hiking can be an activity for the entire population, the effort demanded by the condition of the trail may require certain unusual abilities, physical condition, and equipment such as rappel. Cold temperatures and decrease in available oxygen due to elevation are environmental conditions to be considered. In this specific case, the elevation of Samalayuca does not play a role in oxygen concentration.

## Proposal

Firstly, to aid in the development of this hiking project, the creation of a Manual for the Establishment, Design, Maintenance, and Control of trails in Northern Chihuahua is recommended. The proposed manual would serve as a guide to the construction of all trails in the state. This manual would address the following, minimally required points:

- Necessary cartography for deciding on the location of the trails. The Instituto Nacional de Estadística, Geografía e Informática (INEGI) and Google can be considered reliable sources for this task.
- Area topographic requirements
- Regional climatic conditions
- Types of trails
- Legal use of the areas under landowners' permissions, agreements, and compromises
- Determining maintenance responsibilities and hiker care
- Conventions in the design of signaling on the trail that would determine the distance between signals, height of signal, and recommended materials.
- The information in the roads and natural and cultural surroundings should be bilingual as Americans visit the region regularly for its extreme sports.
- Determining additional information for the benefit of hikers such as description of routes, maps, description of available services or other historical, cultural, and natu-

ral information such as flora, fauna, and geological formations. Necessary equipment and climatic information would also be included.

- Determining of a rescue system.
- Establishment of an ethics code that addresses the following aspects: proper and safe extinguishing of fires, garbage disposal, respecting signals, respecting the population, pet handling if allowed, respecting flora and fauna (not taking any plant or animal from the region), avoiding to cause noise, camping in allowed areas, and parking.
- Everything aforementioned must be established in conjunction with the local population in order to sensitize and commit them to the touristic development so that they may support visitors and maintain an interest in giving the place required maintenance.

For the development of the project of a trail in the three Samalayuca springs the following actions are proposed besides those ones suggested in outline form in the previous section:

- Gathering and design of information that will be provided to the hiker: historic and cultural information, flora and fauna information, and recommended views. It is recommended to create a smaller project within this one that gathers biologists, geologists, anthropologists, and historians to design informational pamphlets and posters.
- Other alternatives. In addition to the trail for hikers, a mountain biking trail running completely or partially parallel to the hiking trail could be made. In order to do this, it is important to determine whether some sort of special bike is needed or not, with the possibility of renting them whichever it may be. The possibility of allowing all-terrain vehicles use could also be considered, even if this would require significant investment and skilled personnel in the maintenance of such vehicles.
- Another possibility is the development of a study on the quantity of water and deciding whether it is cost effective to offer services such as massage and spring water baths in a pre Hispanic cultural setting by utilizing regional herbs. The latter would be accomplished using alternative sources of energy with adequate handling of the water.
- Requiring the proper organizations to provide efficient cell phone communication for the rapid response of the emergency and rescue services should they be needed.
- Defining strategic transport stations going towards the springs and sand dunes at established days and times. It might be necessary to increase bus laps in the least extreme temperature seasons such as spring and autumn. Some of such stations would have to be located near international bridges.
- The proposal presented in this document is thought to be implemented in the Mexican side border. However, it is pertinent to consider the counterpart desert zone which is home to dunes located in the American side as a possible example to develop a recreational site for hiking.

## White Sands National Monument

As can be seen in Map 1, the great Chihuahua Desert occupies Mexican and American territory. The American territory is home to White Sands, located in New Mexico 53 miles (1.5 hour driving distance) north of El Paso, Tx, Ciudad Juarez's neighboring city. The area is similar to the Samalayuca Dune region in Mexico. Even though both areas have been utilized as tourist zones, the Samalayuca Dunes have not undergone the development present in its American counterpart. Firstly, White Sands is labeled as a National Monument. According to the Merriam-Webster's dictionary, a National Monument is defined as a "place of historic, scenic or scientific interest set aside for preservation usually by presidential proclamation". This implies that the federal government provides funding for its maintenance and enforces regulations that protect the area in order to preserve the ecosystem from alteration.

Culturally speaking, it can be stated that there is special interest on the part of society to conserve and highlight the environments with particularly attractive traits. This issue of national concern originates from the different participants of society. As aforementioned, there is a commitment from the government as it provides funding for its maintenance and regulation of the national monuments. Private companies also play an important role. For instance, the marketing of the place can be seen the moment in which hotels closest to White Sands such as El Paso, Tx. promote the attraction through pamphlets. In addition to this kind of support, community is involved in the preservation of this type of attractions through different programs launched by the sites of interest. Undoubtedly, the national monument -in this case White Sands personnel- has made an enormous effort to provide an attractive area for leisure activities. For example, in terms of promotion, the place counts with an attractive website. It allows the user to navigate all necessary information in a friendly manner. The site includes historical and cultural information regarding the place, activities, easy-to-follow directions to the place, etc.

As far as hiking is concerned, the park provides two programs. One of them is the Full Moon Hike offered and ranger-guided once a month from May to October. The second one consists of five trails of varying difficulty and scenery. In this activity, the visitor makes use of a brochure with pertinent information and a description of the five different trails. Besides these options for hiking, White Sands counts with a program called Hike Smart which teaches adults and children safe exploration of the area. Visitors can take classes one Saturday every month from May to October and are one hour long.

Even though the Samalayuca Dunes do not have the same level of development as White Sands, it must be mentioned that it does possess the necessary natural elements to transform it into an attractive zone. The springs would serve as a stop of interest in a trail dedicated to hiking. This development, however, needs government, private, and community support, just like it occurred at White Sands. It is especially important to include the community under precarious conditions. As Sergio Molina states: "exclusion and poverty cannot be used as an argument to drive away the groups under these conditions" (2011:26). It is necessary to avoid falling into the mindset of many tourist centers in Mexico where attractive areas filled with hotels and high-end stores for wealthy visitors, but surrounded by poverty from every side.

## A Botanical garden as an additional attraction

Botanical gardens have served as tourist attraction since centuries past. In its conception, the availability of these spaces in biodiversity was limited to a park with labeled plants with the objective of bringing people closer to nature (Powledge, 2011:743). Later on, as the traffic of seeds and fruits increased due to exploration of previously unknown and remote places, botanical gardens evolved to become an important factor in commerce (p.743).

Throughout evolution, one of the objectives of many botanical gardens was, as Kew's historians remark, to incorporate every plant known to man to their collections. This ambitious aim has been strived for since mid-eighteenth century: the well-renowned Royal Botanic Gardens at Kew in London came into existence from this idea (p.743).

However, nowadays the benefits of the botanical gardens are experiencing changes. It is noteworthy that due to the fact that they require money for their maintenance, these places have turned into recreational spaces where weddings, musical events, and ethnic festivals take place (p. 743).

In addition to the increase on activity diversity, other circumstances have led to the perception of these Gardens as sanctuaries dedicated to plants, the vital element of the ecosystem. The extinction or loss of biological diversity due to development, climatic changes, and commerce -among other factors- has brought reflection and decision-making on the importance of conserving species in these places (p. 745). Presently, the purpose of botanical gardens is to provide a space where plant biodiversity may be rescued with the development of in-depth research, education provided to people concerning plants, teaching programs geared toward professionals devoted to botany, and sustenance of storage centers for long-term preservation (p. 743). A botanical garden in Samalayuca must hold such commitments as the foremost example of its functions, the objective being the preservation of biodiversity.

Another aspect that must be considered is the connection between botanical gardens and society. According to a report commissioned by the Botanic Gardens Conservation International (BGCI), another characteristic of botanical gardens is that they are conceived as "exclusive and elitist institutions" (as cited in Powledge p. 747) The challenge is to establish a connection between the interests and needs of the population in a community with nature presented in this type of spaces (p.747). There are different recreational activities carried out in these spaces. An example is the presentation of Broadway's performers in the New York botanical garden for the launch of several events (p. 747). Another practice is the organization of different social events for entertainment purposes, such as wedding contests (p. 747).

As one may notice, Powledge portrays the gradual changes botanical gardens have undergone through their history. She also displays the distinct activities offered based on the places' necessities and the conditions of the regions. These are just some ideas and guidelines to be considered for a future botanical garden in Samalayuca. It is very probable, in terms of visualization, that new ideas will emerge taking into consideration characteristics of the region and communities as well as the availability of resources.

It is important to emphasize that Samalayuca should be taken into account for the creation of a botanical garden because of the absence of this type of recreational places in the Mexican side frontier. The closest botanical gardens are in the border city of El Paso, Texas. The Chihuahuan Desert Gardens, El Paso Municipal Rose Garden and the Keystone Heritage Park are three of the five places that display de flora of the region. The existence of a botanical garden in the Samalayucan area gathers importance because of

the fact that part of the community does not cross the border to El Paso, Tx., even if there is a continuous flow of people across the bridges. Undoubtedly, besides hiking, the construction of a botanical garden would stimulate the Samalayucan economic development for the benefit of its residents. Other of the advantages of the construction of such space is that this might be helpful for visitors as they would have knowledge of the plants' curative properties that have been described in this work.

## Conclusions

Throughout the present work the tourist potential coming from the location of the Samalayuca region has been uncovered. The location is important as it is less than an hour's drive away from the frontier and is near the two-million inhabitant international community. The project presented proposes the creation of a *Manual de Senderos* for all of Chihuahua. This manual would be an attempt to establish and maintain the trails in optimal conditions to offer visitors a safe hike and encourage the appreciation and contact with biological richness and surrounding culture. The creation of a botanical garden as part of the project would have as objective the preservation of local flora, the promotion of knowledge on local flora, and the recognition of medicinal plants. The garden space could also have other recreational roles for the economic development of the area. This proposal does not try to minimize the importance or compete with the touristic development efforts from the Medanos de Samalayuca, but the cooperation with the area of the Ojos de Agua to join forces for the best possible development of the area. It is important to point out that it is not too late to prevent abuse of this aquifer.

For the development of the project is necessary to create a multidisciplinary research group that will work in conjunction with the locals and whose actions come together as part of a larger project that will include the two Samalayuca areas. A mixed path could also be designed with Medanos de Samalayuca and Ojos de Agua being a part of it. The exposed courses of actions will result in the benefit and economic development of Samalayuca through the implementation of economic mechanisms to compensate, support, or stimulate the owners of natural resources for the generation of environmental services and products, always considering these as public property.

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