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Review article

Análisis histórico-dendrológico de la cubierta arbórea del Bosque de Chapultepec (1ª sección): 1ª parte

Historical-dendrological analysis of the tree cover of Bosque de Chapultepec (1st section): Part I

Héctor Mario Benavides Meza^{1*}

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¹Centro Nacional de Investigación Disciplinaria en Conservación Y Mejoramiento de Ecosistemas Forestales, INIFAP. México.

*Autor para correspondencia; correo-e: benavides.hector@inifap.gob.mx

*Corresponding autor; e-mail: benavides.hector@inifap.gob.mx

Abstract

Bosque de Chapultepec is the main component of the urban forest of Mexico City and its importance goes back for more than seven centuries. In the beginning, the forest provided potable water to the pre-Hispanic city of *Mexico-Tenochtitlan*, and was the resting and recreational place for the *tlatoanis* (emperors) of the *Mexica* Empire. After the Spanish Conquest, *Chapultepec* continued as water provider to the capital of the viceroyalty of New Spain and also served as resting and recreational site for the viceroys; however, the place was declared property of the city in 1530 and opened for the citizens of Mexico City in 1550. Nowadays the value of this green urban space is remarkable, considering its location in a metropolitan area of 7 866 km² and 22 million inhabitants, because of the social and ecosystemic services that provide. Notwithstanding the importance of *Chapultepec* to the city along the centuries, the information about the characteristics and conditions of the tree cover is limited and any analytical compilation effort of the scarce information was never done before. This attempt tries to explain the changes of the tree cover of *Chapultepec* over the centuries, in response to the environmental changes of the site but also the basin of the Valley of Mexico. The 1st part of this paper considers the pre-Hispanic period and continues chronologically to the XIX century, reporting as possible the tree species that were established and the conditions of the forest and the basin.

Key words: Urban green areas, Mexico City, urban tree species, history of arboriculture in Mexico, New Spain, *Taxodium mucronatum* Ten.

Resumen

El Bosque de Chapultepec es el componente principal del bosque urbano de la Ciudad de México y ha sido de gran trascendencia para la misma por más de siete siglos, ya que suministró agua potable a los habitantes de la ciudad desde la época prehispánica, y sirvió como sitio de recreación y descanso para los *tlatoanis* mexicas. Después de la Conquista Española, el bosque fue declarado, en 1530, propiedad de la Ciudad de México y abierto a sus habitantes para su recreación en 1550; lo cual continuó en el México independiente. En la actualidad, al estar el bosque ubicado en el área metropolitana más extensa y poblada del país (7 866 km² de superficie y 22 millones de personas), su valor ambiental y social se acrecienta debido a los variados servicios ecosistémicos que genera para sus residentes. Es paradójico que no obstante la trascendencia del bosque durante tantos siglos, sea escasa la documentación sobre las características de su arbolado, particularmente en las etapas iniciales, y que nunca se había realizado una recopilación y revisión analítica del mismo, con el fin de

entender los cambios que se dieron en función de la variación de las condiciones ambientales que se presentaron en Chapultepec y en la cuenca del Valle de México. Esta contribución recopila la información consignada desde la época Prehispánica, y de manera cronológica se llega hasta el fin del siglo XIX; se comentan las especies que se establecieron y las condiciones del bosque y de la cuenca.

Palabras clave: Áreas verdes urbanas, Ciudad de México, especies arbóreas urbanas, historia de la arboricultura en México, Nueva España, *Taxodium mucronatum* Ten.

Introduction

Bosque de Chapultepec (*Chapultepec* Forest) is the main component of the urban forest of Mexico City and its significance and value dates back more than seven centuries. Its importance increases today, considering that it is located in a metropolitan area made up of 16 municipalities of Mexico City, 50 municipalities of the State of Mexico and one municipality of the state of *Hidalgo*, with an area of 7 866 km² and a population greater than 22 million inhabitants (Sedatu, 2018; Inegi, 2020).

Urban green areas (UGAs) have become greatly relevant in the global and national context, considering the expansion of the urban surface and the population that lives in those places. According to Salbitano *et al.* (2017) and Borelli *et al.* (2018), the expansion of the urban surface is particularly significant in cities located in developing countries, because the accelerated urbanization processes have brought, consequently, an unplanned expansion that inhibits the sustainability of urban centers. UGAs are fundamental sites to improve the urban environment and the quality of life of the inhabitants, benefits that were referred since the 80's of the 20th century (Benavides, 1989).

It is paradoxical that *Bosque de Chapultepec*, the most significant UGA of Mexico City for more than seven centuries (particularly the nowadays 1st Section), was never completely diagnosed and inventoried the tree cover and lacked of a whole tree inventory, which is the basis for the management of any urban forest (Benavides, 2015).

The aforementioned study was recently completed at the 1st Section of *Bosque de Chapultepec*, however it was considered pertinent that before the exposure of the results, it was necessary to refer in first place, the extensive history about the tree cover, and the environmental and urban changes that prevailed at the site and in the Valley of Mexico basin.

The objective of the present contribution is to provide a compilation about the characteristics and conditions of the tree cover of 1st Section of *Bosque de Chapultepec* along this period, and analyze the variation of the tree cover, considering the changing conditions that influenced the place and the basin of the Valley of Mexico. It is important to note that such aspects must be considered to propose management alternatives for the future, considering the current conditions that induce climate change, global warming and the increase in the urban heat island, circumstances that *Bosque de Chapultepec* trees are facing.

It is pertinent to clarify that the extent of the topic and the space available in this type of journals, compelled to divide the publication into two parts. In addition, it is important to recognize the lack of arboricultural information about the historical UGAs of Mexico. The data is scarce and frequently it is dispersed in documents elaborated by historians, archaeologists or architects, and frequently, in those documents the tree information is usually complementary or anecdotal; situation that must be amended by urban forestry and arboriculture specialists.

Conformation of *Bosque de Chapultepec*

Bosque de Chapultepec was limited for many centuries to what is currently known as the 1st Section. This is the place where historical sites are located, such as the *Chapultepec* Castle, museums (the Anthropology and History Museum for example), monuments, fountains, lakes, the Alfonso Herrera Zoo and the Lake House of the *Universidad Nacional Autónoma de México* (National Autonomous University of Mexico) (UNAM). *Chapultepec* also has an extensive surface of green spaces and tree cover that generate several ecosystem services that improve the environment of the city and consequently, the quality of life and well-being of the inhabitants of Mexico City and its metropolitan area.

In the 60's of the last century and derived from the urban development of the city, a peripheral freeway named *Boulevard Adolfo López Mateos* was constructed (Díaz, 2018), and caused the separation of the western part of the original *Bosque de Chapultepec* and a reduction of its surface. As a result, the old and historic forested area began to be called Old *Chapultepec* and later 1st Section, while the space that was separated began to be called New *Chapultepec* and later 2nd Section. In the last one, recreational, cultural and artistic elements were built, among which the Natural History Museum and the old and famous Roller Coaster, now gone, stand out.

Later, a 3rd Section was added further to the west, at the *Barranca de Dolores* area, inaugurated on September 13th, 1974 (GDF, 2006). This area was somewhat distant from the historic place, and recreational and cultural infrastructure were built also (Figure 1).



Source: Prepared by the author based on an image from
<https://www.google.com/intl/es-419/earth/>.

Figure 1. *Bosque de Chapultepec* with its three original sections and surroundings in Mexico City.

The three sections of *Bosque de Chapultepec* have an area of just over 686.01 ha (PUEC-UNAM, 2002; GDF, 2003), which makes the place as the largest UGA in Mexico City, its metropolitan area and the country. The place as a whole has an extensive recreational and cultural infrastructure, which makes it the most visited urban park in Mexico and among the most frequented in the world (GDF, 2003).

Recently and within the framework of the city government program called *Chapultepec: Nature and Culture*, the forest was expanded and a new 4th Section was added. It is located to the southwest of the 3rd, separated by *Constituyentes* avenue, within the facilities of the Military Base 1-F, near the old town of *Santa Fe*,

at the *Álvaro Obregón* District. The expansion is in a consolidation process, and thus it is not commented on this paper.

1st Section of *Bosque de Chapultepec*

It is located to the west of the city, in the transitional zone between the volcanic foothills of the *Sierra de Las Cruces* and the lake area of the Valley of Mexico. The extreme parallels of this section are 19°24'46" and 19°25'45" north latitude and the extreme meridians are 99°10'35" and 99°11'32" west longitude. The area of this section is 274.0864 ha and the altitude is very homogeneous (2 245 m), except for the *Chapultepec* hill, which reaches a height of 2 325 m (Dirección General de Bosques Urbanos y Educación Ambiental, 2006).

The 1st Section is delimited to the northwest by *Campos Elíseos* avenue and *Andrés Bello* street, to the north by *Rubén Darío* avenue, to the northeast by General *Mariano Escobedo* avenue, to the southeast by part of the *Bicentenario* Circuit, to the south by the *Chapultepec* and *Constituyentes* avenues, to the southwest and west with the *Los Pinos* Cultural Complex (former presidential residence) and the Peripheral Freeway (Figure 2).



Source: Prepared by the author based on an image from <https://www.google.com.mx/>.

Figure 2. 1st Section of *Bosque de Chapultepec*.

Even though the 1st Section is located at the *Miguel Hidalgo* District, the UGA does not depend administratively of such administration, because it was cataloged since 2003 as an area of environmental value (AVA, for its acronym in Spanish), under the responsibility of the Secretary of the Environment of Mexico City (GDF, 2006). It is currently administered by the office of the Executive Director of Bosque de Chapultepec, under the office of the General Director of the System of Protected Natural Areas and Areas of Environmental Value.

Historical aspects

The multiple historic events related to *Bosque de Chapultepec* are associated with the so-called 1st Section. There are references about early human occupation by indigenous ethnic groups such as *Teotihuacan*, *Tolteca* and *Tepaneca*, until the final dominion of the *Mexica* group (Campos, 1919; Matos, 2003; Rivas, 2005). The importance and significance of this place is largely explained by its springs, which even led to consider *Chapultepec* as a sacred site by these cultures (Campos, 1919; Matos, 2003). The name of the place by which it is currently known has a *Náhuatl* origin, whose roots are *chapolli* (*chapulín* or cricket) and *tepetl* (hill or mountain), which means "hill of the *chapulín*" (León-Portilla, 1970; Matos, 2003).

When the capital of the *Mexica* empire (Mexico-*Tenochtitlan*) was founded on an islet in the brackish Lake of *Texcoco* in 1325, the springs of *Chapultepec* became a strategic site because it supplied the potable water needed by the city. It was carried in the beginning by containers on canoes, and later, transported by an aqueduct constructed in the reign of *Chimalpopoca* (1418). The aqueduct cross over part of the lake, and later was improved during the reign of *Moctezuma I* (1466), with the technical advice of *Nezahualcóyotl*, king of *Texcoco* (Campos, 1919; Armijo, 2005; Moreno, 2005; Rivas, 2005).

During the *Mexica* empire the forest was considered as a sacred place and purification space for the *tlatoani* or *Mexica* emperors, and a site for rest and recreation. A temple (*teocalli*), which served as an astronomical observatory was constructed on the top of the hill, and were built for the royalty and nobility water pools, country residences, a botanical garden and it was used also as a hunting preserve (Campos, 1919; León-Portilla, 1970; Solís, 2002; Matos, 2003; Moreno, 2005; Rivas, 2005). According to Moreno (2005), the enclosure as a whole was protected by a fence and was called the "Garden of the *Tlatoani*", a term that

evidenced the recreational and resting vocation that *Chapultepec* had since pre-Hispanic times, although in this case, it was exclusive to the *Mexica* nobility.

After the Spanish Conquest (1521), *Bosque de Chapultepec* became a property of Hernán Cortés for few years after the Spanish Crown granted the place to him. Notwithstanding this situation and because the springs of Chapultepec continued to supply drinking water to Mexico City (even until the 19th century), the members of the City Council asked to the king Charles I of Spain (and V of Germany), that the forest would be removed from Cortés's possessions and would belong to the city. The king agreed to this request and on June 25th, 1530, he decreed that such place, with an approximate area of what would now be 330 ha, be excluded from any private property and be delivered in perpetuity to Mexico City (Campos, 1919; Armijo, 2005; Zapata, 2007). It should be noted that this decree marked a worldwide milestone in urban forestry. In accordance to the current concept of a peri-urban forest (forest sites located on the periphery of a city, that provide one or more environmental services to the city and could be property of the city), Chapultepec could be one of the first peri-urban forests in the world (Mexico City was still located about 7 km away), if not the first.

In 1550 another transcendental event was recorded at *Bosque de Chapultepec* and in the history of the urban forestry and urban arboriculture of Mexico (and probably in the world again), when viceroy Luis de Velasco y Ruiz de Alarcón allowed the access of the city's inhabitants to the place for recreational purposes (Campos, 1919; Armijo, 2005; Moreno, 2005). The only place that was restricted to the visitors was the area of the springs that supplied water to the city, but visitors could enjoy in the proximity of a "wider than deeper reservoir called "pool of the swimmers", privately owned but open to the public" (Campos, 1919; Arciniega, 2005).

It is important to highlight that *Bosque de Chapultepec*, with this second provision, strengthens its position as a peri-urban forest, providing drinking water to Mexico City and facilitating recreational activities.

Background of the tree cover

Pre-Hispanic and viceroyalty era

The beautiful gardens and the recreational constructions that the *Mexica tlatoanis* had at the site (Garden of the *Tlatoani*), were referred by conquerors, chroniclers, friars, viceroys and visitors during the first years of the viceroyalty (Alcocer, 1886; Campos, 1919; Nuttall, 1923; Morales, 2004; Moreno, 2005; Rivas, 2005; Lascurain, 2010). The chronicles always emphasized the greatness of the *Taxodium mucronatum* Ten. trees (*ahuehuete* or *sabino*), the importance and beauty of the place and the springs, which must have been magnificent without a doubt.

The stories from that time probably gave rise to the myth that king *Nezahualcóyotl* had created the forest with specimens of *T. mucronatum*, an idea that several centuries later Campos (1919) and Martínez (2002) continued to repeat. Not intending to diminish the great contributions that the king of *Texcoco* made in the Valley of Mexico basin, widely documented and there is evidence of them, the creation of a forest of *ahuehuetes* in *Chapultepec* is surely exaggerated. These kind

of trees were established naturally thousands or millions of years before, when the conditions of the site (presence of springs and a lake area) were favorable for them. This species is native to the Valley, very common in other parts of the basin and even in the country (Calderón de Rzedowski and Rzedowski, 2001).

What it is very likely that king *Nezahualcóyotl* carried out in *Chapultepec* (because he was an expert of the characteristics of the basin), was the planting of trees of this species in strategic or specific places to protect the banks of the springs, define paths, as well as the improvement of the forest. It is important to remark that king *Nezahualcóyotl* lived in *Chapultepec* and was conscious of the mythical importance that both the tree species and the place had for the *Náhuatl* nobility and the recreational importance of the place for the *tlatoanis* (Campos, 1919).

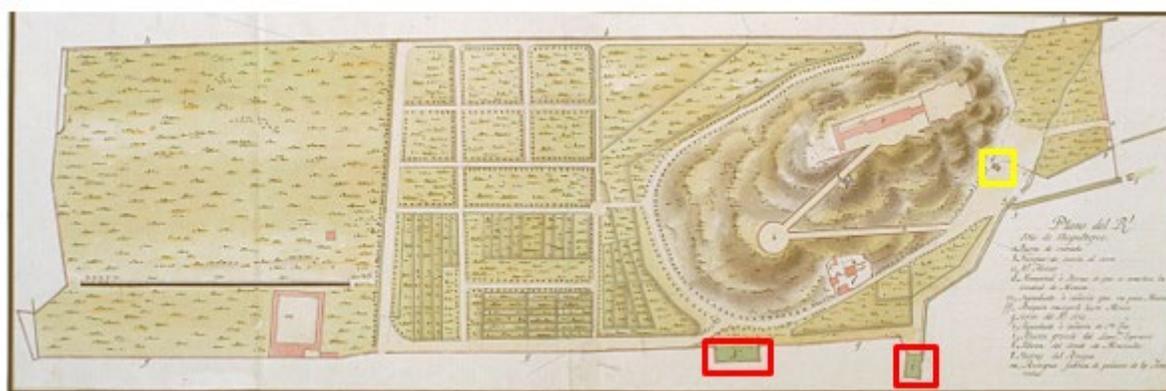
It should be noted that in addition to the previous species, there were probably also specimens of other hydrophilic native species on the banks of the springs and surroundings, such as *Salix bonplandiana* Kunth (*ahuejote*), *Salix mexicana* Seemen (Mexican willow), *Fraxinus uhdei* (Wenz.) Lingelsh. (ash) and *Alnus* spp. (aile), in addition to the marshes composed mainly of *Typha latifolia* L. (cattail), characteristic of this type of sites (Calderón de Rzedowski y Rzedowski, 2001).

After the conquest, the magnificence of the Garden of the *Tlatoani* induced the first viceroy of New Spain, Antonio de Mendoza Pacheco, to consider that it was an ideal site to establish a resting place. According to a document consulted by Moreno (2006) at the Historical Archive of Mexico City, the viceroy mentioned to king Charles I of Spain in 1537, that "near this (Mexico City), there is a small forest called *Chapultepec*", in which "the construction of a wooden fence was carried out to protect the historical and recreational garden, made up of springs, flora and fauna of a great variety of species and a rock formation (the *Chapulín* hill) and (the construction) of the royal houses".

There is evidence that viceroys occupied the Royal Houses during the 16th and 17th centuries and it is possible to consult official documents at the *Archivo General de Indias* dated in *Chapultepec*, such as a letter from viceroy Gaspar de Zúñiga on May 20th, 1601, addressed to the king of Spain (Archivo General de Indias, 1601).

After the report of the place by viceroy Antonio de Mendoza, it was not possible to find information regarding the trees and *Bosque de Chapultepec* conditions. The events that allow certain continuity to what happened in the forest are the constructions that were carried out, such as the establishment of a gunpowder factory and a cannon foundry by viceroy Gaspar de Zúñiga (Archivo General de Indias, 1599), factory that later exploded (Campos, 1919), a proposal in 1787 for the renovation of what had been the palace of the viceroys at the foot of the hill (Archivo General de Indias, 1787a), and the construction of a royal palace in the fortress (at the top of the hill) (Archivo General de Indias, 1787b).

From the arboricultural standpoint, an important issue was the establishment of the Royal Botanical Garden in a vast surface of *Chapultepec* (Figure 3), that was active from 1793 to 1820 according to the information that appears in the notes of the architectural drawing (Archivo General de Indias, 1792).



Source: Archivo General de Indias (1792)

(<http://pares.mcu.es/ParesBusquedas20/catalogo/description/21357>). This plan was drawn up in 1792 for the establishment of a botanical garden and in which the springs that supplied drinking water to Mexico City (yellow), as well as those intended for the recreation of visitors to private property (red) are located.

Figure 3. Image of the architectural drawing of the Royal Site of *Chapultepec*.

In such drawing are shown three pools (springs), which implies that three centuries after its designation as provider of environmental services to Mexico City, the forest continued to fulfill its function as a peri-urban forest, providing drinking water and recreation places for its inhabitants (Figure 3). In addition, a very large wooded space is observed on the left side (west) of the drawing, as well as fragmented square and rectangular spaces. The *Real Alcázar* or royal palace already built on the top of the hill is possible to observe, and some constructions in the lower part of it, among which the old square-shaped gunpowder factory stands out on the lower left side (Figure 3).

Towards the end of the viceroyalty, the forest continued to be called the "Garden of the Royal Palace of *Chapultepec*" (Moreno, 2006). During such time, one of the few specialized contributions about the trees was reported by Alexander von Humboldt, in his essay on New Spain published in 1822, that was derived from his famous trip in 1803 (von Humboldt, 2014). The naturalist said that *Chapultepec* "... is covered with the most lush vegetation ..." and observed that "... the trunks of the *ahuehetes*, more than 15 or 16 m in circumference, raise their crowns above the *Schinus* (undoubtedly referring to *Schinus molle* L. (*pirúl*), which he previously knew in Peru during that same trip), which in their appearance or look (refers to the

ahuehuetes) resembles the weeping willows of the east ..." (most likely *Salix babylonica* L.).

No pictorial works or drawings of *Bosque de Chapultepec* were found that showed the tree appearance during the viceroyalty era, however, an example close in time was elaborated by the German painter J. M. Rugendas in 1833, in which the magnificent *ahuehuetes* and a group of people on horseback visiting the place can be seen (Figure 4).



Source: <https://mnh.inah.gob.mx/historia>.

Figure 4. *Bosque de Chapultepec* by J. M. Rugendas (1833).

XIX century

As the centuries passed, an environmental deterioration was registered in the upper part of the basin and in the Valley of Mexico. This process was observed and reported also by von Humboldt during his visit to Mexico City. He noted that "... since the 16th century, trees have been cut down recklessly, both on the plain on which the capital is located and in the mountains that surround it" (von Humboldt, 2014). These actions undoubtedly caused a severe impact on the hydrological regime of the basin, and during the 19th century the flow of the *Chapultepec* springs started to reduce and at the end of the same century, they dried (Cabrera *et al.*, 2005). Associated to this situation was the decrease of the water table level, which marked the beginning of the decay that has been damaging the *T. mucronatum* trees for a long time.

The lack of dendrological information prevails in the years that followed von Humboldt's visit and the forest was surely deteriorated after the battles of *Molino del Rey* and *Chapultepec* during the war of intervention by the army of the United States of America in September 1847, which, however, could not be verified in any document.

Blasio (1903) mentions that after the U.S. Invasion, the Castle of *Chapultepec* was used as a presidential house and in the brief empire of Maximilian (1864-1867), the emperor chose it as his residence (*Miravalle*). An important rehabilitation work took place on both, the palace and its gardens, which gave rise to information on the tree cover.

According to documents from such time consulted by Gómez (2012), the original surface of the forest was increased, as Maximiliano ordered the purchase of surrounding land from *La Hormiga* ranch (towards the west) and others areas close to this place, paying more than one hundred thousand pesos. Another tracks were

bought to build the *Paseo del Emperador* (now *Paseo de la Reforma*), in order to connect the palace and forest with the city in a more direct way (Blasio, 1903).

The emperor was accompanied from Europe by his gardener Wilhem Knechtel (who should be considered rather as a professional horticulturist and a proto-landscape architect of the time), and because of the publication of his memoirs at the end of the 19th century, published few years ago in Mexico (Knechtel, 2012), it is possible to know a specialized description of *Chapultepec*. He described the site as a beautiful park and highlighted the garden construction activities that he carried out at the palace. He also mentioned the magnificence of the *T. mucronatum* trees, which he referred as *T. distichum* (*T. distichum* (L.) Rich. var. *mexicanum* (Carrière) Gordon), which he commented that they were "... testimony of the sanctity of a place consecrated to the gods in the times of the indigenous empire ..." and pointed out that "... a tree was so large that it took nine men with their arms outstretched to surround its trunk". However, he did not provide information about other tree species or their condition, which suggests the greatness that the *ahuehuete* cover must have had for him (Knechtel, 2012).

The significance of the *ahuehuete* cover at that time was also discussed by other visitors, as was the case of the plenipotentiary minister of the king of Portugal on a visit to emperor Maximilian and who, according to the document that Gómez (2012) consulted, the minister reported that "... *Chapultepec* stood out with its tall and black-green *ahuehuetes*, its ash trees and weeping willows and gardens ...", a reference that, together with that of von Humboldt, provides data on other species in the forest.

The springs of *Chapultepec* during this period were also referenced. Blasio (1903) commented that in the privately owned pool called "*Alberca de Chapultepec*" "...was used by emperor Maximilian after paying his fee", "... swimming fifteen to twenty

minutes", and was "... so abundant that overflowing on both sides, it fed a pond for unexperienced swimmers and on the other a series of small ponds for ladies".

After the Second Mexican Empire, there is no information regarding the trees at *Bosque de Chapultepec*, although the castle (which looked more like a palace) continued to be used as a presidential residence since 1872 by President Sebastián Lerdo de Tejada (Moreno, 2005; Moreno 2006).

Towards the end of the 19th century (1895), during the government of General Porfirio Díaz, works were carried out to restore and improve the forest. A commission formed by Eduardo González Gutiérrez, Eduardo Cañas and José Yves Limantour were designated, with the aim to enlarge and improve the park's infrastructure for the recreation of the population (Tovar and Alcántara, 2002). These authors referred that a large part of the current design of the 1st Section is derived from the 1895 renovation project, adapted and modernized by Engineer Miguel Ángel de Quevedo y Zubieta between 1903 and 1906, based on a governing plan similar to that one used in the *Forest of Boulogne* of Paris. The renovated 1st section was inaugurated in 1907 (Tovar and Alcántara, 2002), information that will be addressed in the second part of this work.

Final comments

The magnificence and beauty of *Bosque de Chapultepec* since *Mexica* times transcended and endured throughout the centuries. Stories and chronicles always referred the *ahuehuetes* or *sabinos*, however, there are few comments about the

rest of the species in the literature from such time. It is feasible to deduce from the environmental conditions of the place, the kind of species that coexisted in *Chapultepec*, except for those exotic introduced during the viceroyalty era, such as *S. molle* that von Humboldt mentioned in his essay.

Unfortunately, this naturalist also commented on the deterioration that was already noticeable in the basin, and consequently, the reduction of the springs and the initial depletion of the water table that followed in the last part of the XIX century. This situation affected the development, survival, beauty and size in the long term of the *ahuehuetes* and other tree species, subjects that will be commented on in the 2nd part of this work.

Conclusions

The presence of springs, high level of the water table and lacustrine conditions favored the establishment of a hydrophilic and riparian woody vegetation, in which individuals of *T. mucronatum* most likely prevailed.

Derived from the use of the site as a place for rest and recreation of the Mexican nobility and aristocracy, viceregal hierarchs, palace of an ephemeral emperor and presidential house, *Bosque de Chapultepec* was anthropogenic intervened for more than seven centuries, as archaeological and historical remains and reports evidenced such condition.

The arboricultural information of the initial stage of *Bosque de Chapultepec* is limited, because the chronicles and reports that were elaborated since the

vicerealty up to the 19th century, were generally done by specialists not related to the subjects of botany, dendrology, arboriculture or gardening. In addition, the academics and researchers who have consulted original sources, generally came from the social areas of knowledge, and it is therefore possible that they do not give importance to the arboreal topic.

It is pertinent that specialists in urban forestry and arboriculture, botany and dendrology, consult bibliographic collections in both Spain and Mexico, in order to have more information from the past, that will be useful for the management of the site in the future.

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Conflict of interests

The author states that there is no conflict of interest with a company or institution related to this work.

Contribution by author

The author is responsible for all components of this work.

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