STREET TREE INVENTORY IN MEXICO CITY

by Alicia Chacalo, Alejandro Aldama and Jaime Grabinsky

Abstract. A representative sample of 1261 sidewalk trees in 240 city blocks was measured and evaluated to describe the condition of trees in Mexico City. The data obtained were species, height, diameter, number of stems, site characteristics, health condition and required treatments. Nine species represent more than 72% of the trees. There are problems due to the planting in inappropriate locations, in the choice of species and in the lack of adequate and sufficient maintenance and planning.

Great efforts have been made to plant trees in Mexico City but planning, selection, subsequent care and maintenance have lagged seriously. The use of trees as elements that can absorb and tolerate some atmospheric pollutants is of interest because air pollution is a prominent problem for the city.

Some neighborhoods have few street trees; a high number of trees do not survive long, and trees lack "adequate" site conditions and care(1). We measured the extent of these problems and attempt to define which factors account for the problems. The main objective of our studies is to understand the urban forest's condition, the practices that are involved and factors that influence the tree's future. The goal is to achieve a healthy, diverse and well distributed urban forest.

Mexico City is one of the most polluted as well as one of the most populated in the world. There are about 15 million people living in the urban area. Located in the middle of a valley surrounded by high mountains and with an altitude of 2400 meters above sea level, its climatic conditions favor a great diversity of trees including species of both temperate and tropical regions.

The urban areas are very heterogeneous according to the income level, but have in common poor planning and a very small quantity of green space.

There has been a decrease of green areas of 3.7% annually during the years 1950 and 1980 in the city (Lavin cited in Ezcurra). This rate of decrease is higher in the east of the city due to low income settling (6% annual) and smaller in the center of the city (1%). In the poor areas, the open spaces disappear rapidly and are occupied by houses. Also the green area per inhabitant is less than in the other parts of the city.

Specifically in relation to parks and public spaces the rate of decrease (1.5%) is due to the increasing demand of vehicular traffic in the city that expands the pavemented area (2). This situation makes clear the importance of the remaining trees along streets for the people in the city (Fig. 1).

Methodology

The study was a representative sampling of trees in the delegaciones (sections of Mexico City). Each sample tree was analyzed and the information entered in the Tree Health Condition Evaluation Form, containing the following data: location and site evaluation, tree characteristics, health condition, recommended treatments and socioeconomic level of the block where the tree was located.

Seventeen undergraduate students in the Environmental Engineering curriculum in Universidad Autónoma Metropolitana-Azcapotzalco participated in the study while taking a course in Urban Tree Management. The field work was done in February and March of 1993.

The trees were distributed throughout Mexico City in 16 Delegaciones. A total of 240 blocks were studied. From the planned 1440 trees, information was obtained from only 1261.The sampled trees were those between the sidewalk and the curb, not those in parks, medians or forests.

When measuring soil compaction, metallic rods were used: if they could be easily pushed into the ground more than 8 centimeters, a 1 was assigned, meaning light compaction; a 2 if pushed only between 2 to 8 cm, meaning moderate compac-

Fig. 1. Trees in a sidewalk in Mexico City that were measured and evaluated.

tion; a 3 if pushed less than 2 cm.,severe; and a 4 if it was impossible to measure the compaction due to cement or mechanical obstruction.

For each item (interferences, compaction, diseases, insects, wounds,and tree structure) a 1, 2 or 3 were assigned.Three for severe problems whose possible consequences are coming soon, indicating that treatment should be given within one year; 2 for moderate problems whose possible consequences may take longer to appear; 1 for light problems whose treatment can be postponed for 3 or more years.

Site was graded as follows: 1 very good, 2 good, 3 regular, 4 bad and 5 poor .For general tree health, the procedure used was similar, but the factors included species, wounds, insects, diseases and structure. The information on the forms was coded, placed in a PC computer, and processed with the SAS package. In this paper the results are only of single characteristics, we did not seek to find correlations.

Some Initial Results

Site evaluation. Among the variables considered as tree interferences, electric and telephone lines and pavement were the most frequent (Fig.2). Utility lines were in 48% of the trees and were 24%of all the interferences. Pavement accounted for 19% of the interferences but affected 37% of the trees. Many trees had two or more interferences that required immediate attention.

The soil compaction around 13% of the trees could not be measured using the iron rod technique (Fig.3), and for another 34% it was severe. In all, 47% of the individuals were affected strongly by this problem. From all site measurements and observations, approximately 20% of the trees live

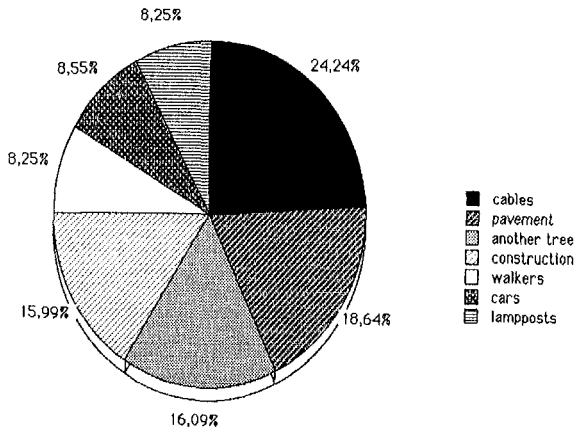

Fig. 2. Distribution of tree interferences.

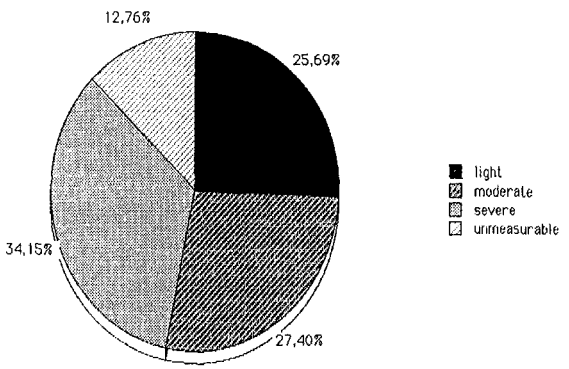

Fig. 3. Soil compaction.

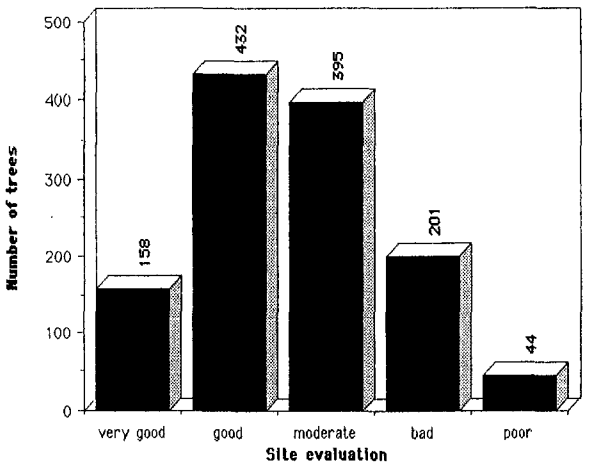

Fig. 4. Distribution of the number of trees with respect to site evaluation.

in bad to poor sites (Fig. 4).

Tree Characteristics

Table 1 lists the species of the trees considered; nine of them represent 72% of the total. A majority of the identified species are introduced, not native.

The dendrometric characteristics considered were the diameter, the height and the number of trunks. Eighty eight trees measured less than a meter in height (Fig. 5) and 702 trees had a diameter of less than 15 centimeters (Fig.6). This shows a young population of trees in this city, a big planting effort by the government and by citizens in the recent past, but also a low survivability

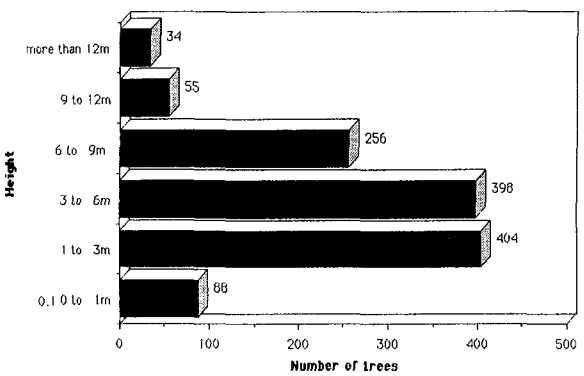

Fig. 5. Distribution of the number of trees with respect to height.

Table 1. Tree species found in Mexico City streets in 1993.

Latin name	Common name	Frequency
Fraxinus uhdei (Wenzing) Lingelsheim	Fresno	225
Ligustrum lucidum Ait.	Troeno	165
Cupressus lindleyi Klotsch. &	Cedro blanco	
Cupressus sempervirens Linn.	Cedro italiano	128
Jacaranda mimosifolia D. Don	Jacaranda	100
Erythrina coralloides D.C.	Colorín	74
Eucaliptus globulus Labiell. &	Eucalipto	
Eucaliptus camaldulensis Dehnh.	Eucalipto	74
Ulmus parvifolia Jacq.	Olmo	70
Ficus retusa Linn	Laurel de india	36
Liquidambar styraciflua Linn	Liquidambar	35
Ficus elastica Roxb.	Hule	30
Ficus benjamina	*Ficus*	25
Yucca elphantipes Regens	Yuca	24
Schinus molle Linn.	Piru-Pirul	18
Pinus sp.	Pino	18
Acacia retinoides Schecht.	Acacia	16
Salix babylonica Linn.&	Sauce llorón	
Salix bomplandiana H.B.K.	Huejote	16
*Eriobotrya japonica Lindl.	Níspero	10
Cassia tomentosa Linn	Retama	7
*Citrus limon (L.) Burm.	Limón	7
*Persea gratissima Gaertn.	Aguacate	6
Quercus rugosa Nec.	Encino	6
*Ficus carica Linn.	Higo	6

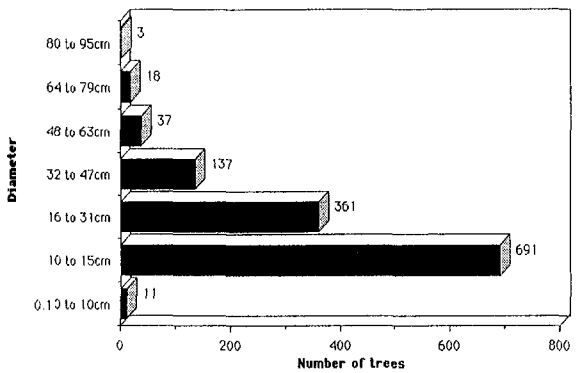

Fig. 6. Distribution of the number of trees with respect to diameter of the trunk.

potential.

Diseases affected more than half (644) of the trees sampled (Fig.7) which is about the same number of trees presenting injuries due to insects (Fig.8). Severe injuries and diseases, were found on approximately 10% of the trees. More wounds were found (1827)than the total number of trees

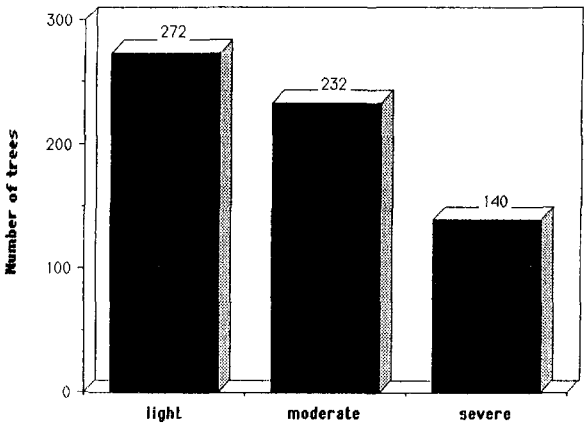

Fig. 7. Distribution of tree disease intensity.

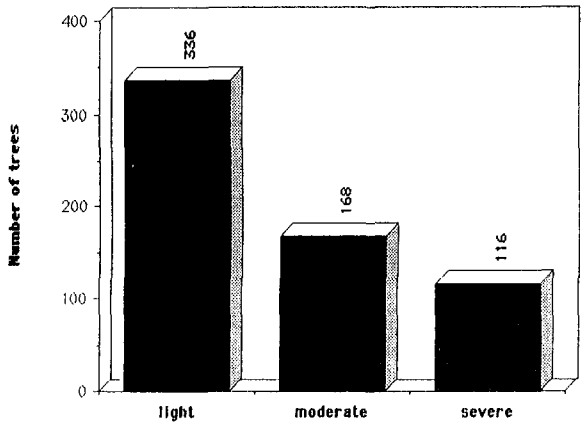

Fig. 8. Distribution of the number of injuries due to insects.

(1261) and the predominant category was severe.

Required Treatments

Pruning was required in almost all the trees and in more than half it should be done within the coming year at the most (Fig.9). There were several other required treatments; the total number per tree was over four in average (Fig.10).

Conclusions

This inventory shows clearly the need to introduce into Mexico City a better system to maintain street trees, specifically the need for better planning and planting and a more precise knowledge of tree management.Evaluations of the trees show some severe problems, demonstrating that some arboricultural practices have not achieved a professional status although the amount of work devoted has been considerable.

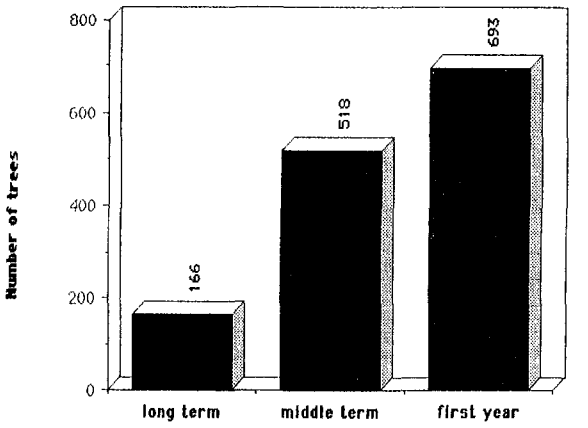

Fig. 9. Recommended pruning.

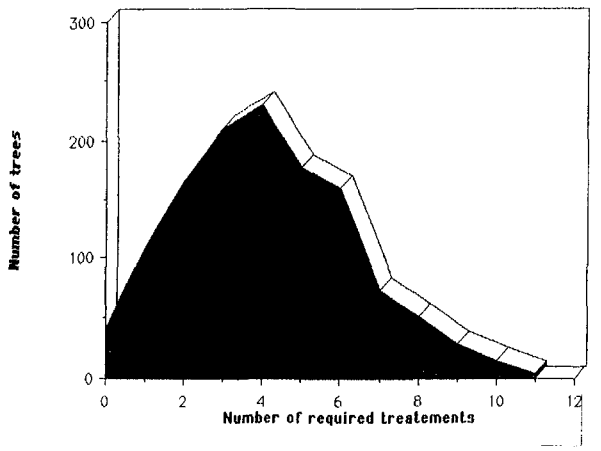

Fig. 10. Distribution of the number of trees with respect to number of required treatments.

The sites used present problems that might have been prevented with a better selection of species or more environmentally sensitive urban planning. Although the number of species present is high, many of them are under represented, so this should be taken in consideration when planning a planting campaign.

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Résumé. Un échantillon représentatif (1 260 individus) d'arbres en trottoir était inventorié pour décrire le portrait des arbres de Mexico. Les données recueillies étaient les suivantes: espèce, site, état de santé et traitements requis. Les résultats montrent qu'il y a des problèmes dus à la plantation dans des endroits inappropriés, au choix des espèces et au manque entretien adéquat et suffisant.
Chacalo

Zusammenfassung. Eine repräsentative Probe (1.260 Bäume) von Strassenbäumen wurde registriert, um die Situation der Bäume in Mexico City zu beschreiben. Die erhobenen Daten behandein Art. Standort, Gesundheitssituation und erforderliche Behandlung. Die Resultate zeigen, daß Probleme entstanden sind durch Pflanzung an nicht angemessenen Standorten, durch Artenwahl und durch Mangel an adäquater und ausreichender Pflege.