

Vegetation of Río Eslava basin: southwest of Mexico City.

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ABSTRACT

It is studied the vegetation of the Rio Eslava Basin, Delegation Magdalena Contreras, Federal District, Mexico, in the context of " The Main Plan of Integral Managing and Sustainable Utilization of the Rio Eslava Basin", as part of the diagnosis for the conservation of the area. The field samplings were realized during the 2008, from which the species were registered and described the plant communities. The map of vegetation and use of soil were made with base in the visual interpretation of compositions to color (RGB) of an image Quick-Bird (2005) and white and black aerial photography (2004). The results describe five vegetable primary communities (Forest of *Abies religiosa*, Forest of *Pinus teocote* - *P. montezumae*, Forest of *Pinus harthwegii*, Forest of *Pinus* and *Quercus* and Forest of *Quercus rugosa* - *Q. laurina*), a secondary community (Induced pastureland) and three classes of use of the soil (Agriculture, urban Zone and Disclosed soil). The zone is characterized for sheltering an important number of species and vegetable representative communities of the basin of the Valley of Mexico and of the south zone of mountain of the Federal District.

Key words Eslava river basin, Plant communities, Cartography of the vegetation, Mexico Distrito Federal.

INTRODUCCIÓN

Mexico City considered among the metropolitan zones most over populated of the planet, is not strange to a series of supply of goods and services. Critical aspects the air pollution, the change of land use in zones of conservation, the

supply of drinkable water and the lack of green areas for the citizens, others. Associated these problems, it has thought that the number of inhabitants for the year 2020 in the City will be 9.3 million, with the consistent occupation of the spaces not nowadays in the political delegations of the periphery of the Federal District (Government of Distrito Federal 2006). Essentially, the projections of population for the year 2030 according to the CONAPO (2005) are presented in south and west delegations (Cuajimalpa de Morelos, Álvaro Obregón, La Magdalena Contreras, Tlalpan, Xochimilco, Milpa Alta and Tláhuac) of the capital, political entities with the most important forest surfaces of the conservation area, striking this way, very probably to the biodiversity that regulates and allows the continuity of the ecological systems that generate key and strategic benefits for the maintenance of the city (PAOT and CentroGeo 2010).

In this respect, a primary component of the ecosystems is the vegetation, which structures the habitat of the species of flora and fauna and takes part in the ecological cycles that originate the services ecosystem used by the society of indirect form. Particularly, the plant communities that are located in the soil of conservation of the Capital take part of important form in the infiltration of the water to the subsoil and, wherefrom is extracted 70% of the water that the inhabitants of Mexico City use. Of equal form, they are a part of the "Lungs of the Capital", as well as areas with a

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current and potential use for recreation and, that simultaneously, they intervene in the regulation of the climate and mitigation of air pollution (PAOT and CentroGeo 2010).

This context shows the importance of the areas of conservation that still contain vegetable coverage in a megalopolis as Mexico City, for the study of these is fundamental to generate and to establish the programs necessary for his conservation and / or utilization. In this respect, it was carried out "The Main Plan of Integral Managing and Sustainable Utilization of the Río Eslava Basin" (UAM and GDF 2008) of which the present study of vegetation formed a part and, to agree this way, the biophysics diagnostic of the basin. Particularly, the study was busy with establishing the composition, structure and distribution of the vegetable communities of the Río Eslava Basin.

Studies of diverse authors have mentioned aspects related to the vegetable present communities in the zone. Among are Miranda and Hernández (1963) with his work "Los Tipos de Vegetación de México y su Clasificación " who define for the central part of Mexico some types of vegetation like Forest of pine, Forest of oaks, Zacatonales and Forest of oyamel. For its part, Rzedowski (2006) recognizes the presence Forest of

Quercus and Forest of coniferous, between the above mentioned, Forest of Pine in which it dominates *Pinus montezumae* and Forest of *Abies religiosa*. Works developed at regional level of all or part of the Basin of the Valley of Mexico are the work of Velázquez (1994), who deals with the description of the vegetable associations and relations multivariate with some abiotic factors in the zone of the volcanoes Tlaloc and Pelado and the work of Silva *et al.* (1999) who brings near to the description of the vegetation in the region of mountain of the south of the Basin of the Valley of Mexico. For his part, Sanchez - Gonzalez *et al.* (2005), publish the text " Semejanza florística entre los bosques de *Abies religiosa* de la Faja Volcánica Transversal", considering the composition of species of the type of forest mentioned in sites located in the zone of study and others in the Basin of the Valley of Mexico and out of this one. Finally, Rzedowski and Rzedowski (2001) elaborate the work " La Flora Fanerogámica del Valle de Mexico ", in which they consider the flora to be a principal topic and describe the principal vegetable communities of the area. To local scale the works developed by Avila-Akerberg (2004), Nava (2003) and Avila-Akerberg (2002), who deal with the flora, description and genuineness of the vegetation of the high part of the Rio Magdalena. Specifically for the work zone, a previous decade, one finds the work developed by nongovernmental organizations (Balam, SC.) and investigators of the UAM - Xochimilco, which was used for the establishment of the Park San Nicolás Totolapan's Ejidal, located in the zone of study and, in that they consider studies of the flora and vegetation of the zone.

Study area

The Río Eslava Basin is located in the southwest of Distrito Federal, between the 19° 15 ' 10" and 19° 17' 30" of north latitude and the 99° 15' 18" and 99° 16 ' 40.6" of length west, with a surface of 2302 ha (Fig. 1). Politically 85 % of his area is located at the delegation Magdalena Contreras and the rest (15%) at the delegation Tlalpan.

From the physiographic point of view, it belongs to the Sierra del Ajusco, characterized by a wavy relief and materials of volcanic origin. In the

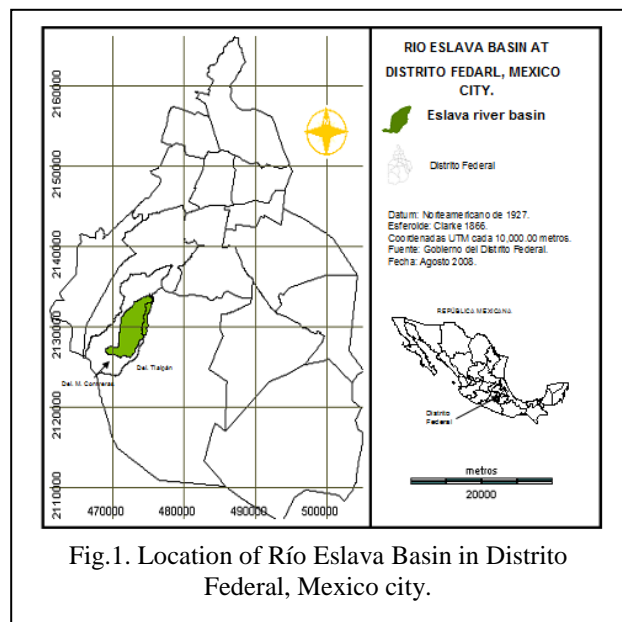


Fig.1. Location of Río Eslava Basin in Distrito Federal, Mexico city.

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low parts from 2600 to 3200 altitude there are some small valleys dedicated to agricultural activities and from 2900 to 3700 altitude there is situated the mountainous area, which a series of glens forms with direction southwest - Northeast. The climate is moderated subhumid by rains in summer, by a gradient of annual rainfall that goes of 700 mm in the low zone to 1174 mm in the discharges. The annual average temperature is of 11.4° C, with maxims in April and May with values between 13.1° and 13.5° C and minims in December and January, 11.2° and 9.1°, respectively (Gobierno Del Distrito Federal 2004).

The soils of the zone are of volcanic origin, developed from igneous rocks as Andesites, Dacites and Tuffs. This lithological composition and age of the materials they have developed a soil of low adhesiveness and cohesiveness and high place contained of organic matter, characteristics that make them susceptible to erosive processes. They content bring soil Andosol, Phaeozem and Leptosol (Vela *et al.* 2008).

MATERIAL AND METHODS

For the development of the objectives visits were realized to the zone during February, March and April, 2008 season that corresponds to the dry spells in the zone. The structural information, floristic and the general conditions of the vegetation were obtained in 41 sites of sampling, selected of preferential form by base in the present tonalities in a color composition (RGB) of the satellite Quick-Bird of October, 2005 and thematic cartography.

The unit of sampling was a circle of 10 meters of radius, in which there was, registered the composition of species, the abundance (coverage) and structural characteristics of the vegetation and of the site (Kent and Coker 1998, Mueller-Dombois and ElleMBERG 1974). The specimens were determined with base in Rzedowski and Rzedowski (2001) and were verified with botanical specimens of the region of study deposited in the National Herbarium of the Institute of Biology of the National Autonomous University of Mexico (UNAM). For the taxonomic changes of genera and/or species were taken as a base the labels of

correction or ratification signed by taxonomic authorities in the group of plants and for the consultation of the website of the Missouri Botanical Garden (Tropicos.org 2008).

The description of the types of vegetation and communities was realized by base in Rzedowski (2006), Rzedowski and Rzedowski (2001) and Silva *et al.* (1999).

In the production of the cartography mentioned Quick-Bird (2005) was used, with spatial resolution of two meters. Of this one different transformation were obtained (Analysis of Principal Components and NDVI) and together with the original bands, color compositions (RGB) were generated (RGB) to realize a visual interpretation (Chuvieco 2005). Also, we used white and black aerial photograph (2004) with spatial resolution of 25 cm, which supported the previous interpretation. For the recognition of the vegetable communities 180 points were located along diverse distances in the Basin.

RESULTS

Nine classes of vegetation and land use were defined, between them five vegetable primary communities (Forest of *Abies religiosa*, Forest of *Pinus teocote* - *P. montezumae*, Forest of *Pinus hartwegii*, Forest of *Pinus* - *Quercus*, Forest of *Quercus rugosa* - *Q. laurina*), secondary another one (Induced pastureland) and three coverages of the soil - Agriculture, Urban Zone and Disclosed Soil - (Fig. 2). The taxonomic wealth considering the vegetable present communities was 165 species, in 102 genera and 47 families. The Forest of *Abies religiosa* is the vegetable community that occupies the major surface (44.6 %) with 1071 ha. It is distributed in the average and south part, in boundary by *Quercus* forest and mixed forest (Forest of *Pinus* - *Quercus*) between the 2600 and 2700 altitude and, in his limit altitudinal top (3650altitude) with the Forest of *Pinus hartwegii* and in minor measure with induced pastureland. It is possible to observe in flat slopes (3°) and straightened (45°), with an average inclination of 20°. Is a forest semiclosed with coverages of the arboreal stratum between 40% and 75%,

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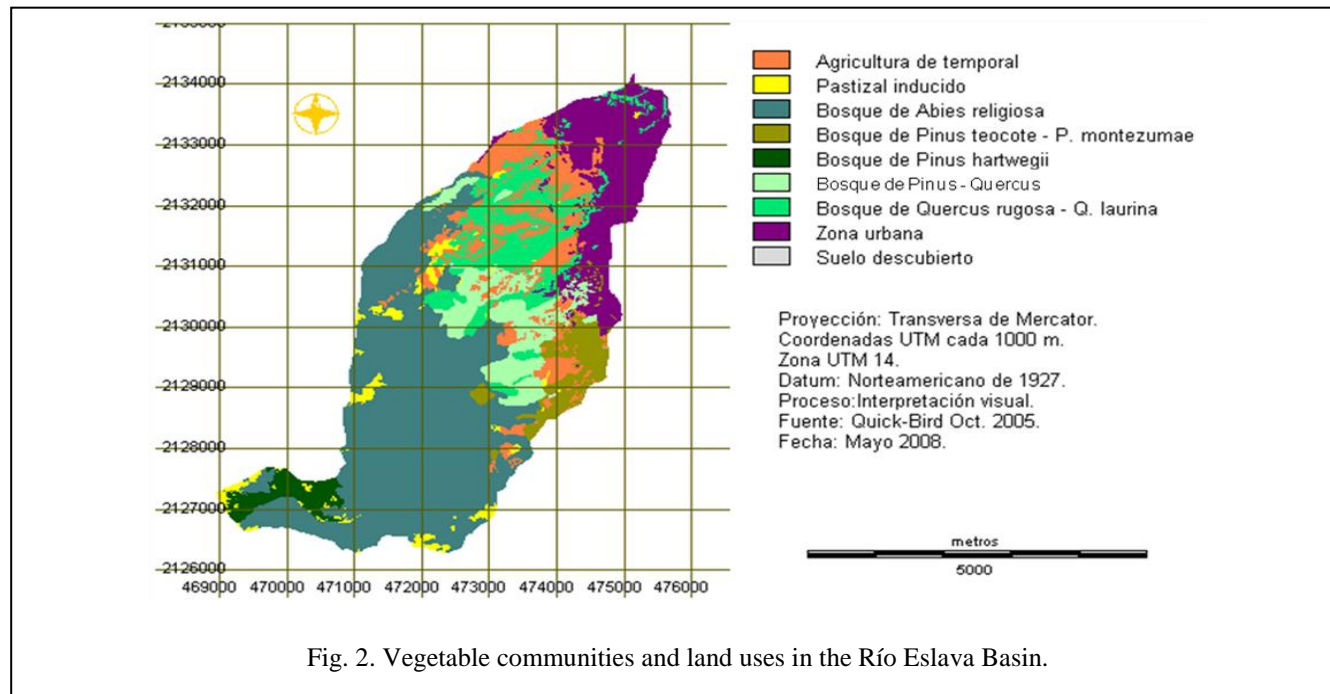


Fig. 2. Vegetable communities and land uses in the Río Eslava Basin.

nevertheless, in the disturbed areas they present with coverage from 15 to 30 %. This stratum goes from 25 to 35 meters of height and occasionally it can come to 40 meters. The stratum with shrubs frequently is abundant with coverage from 40 to 80 % and minor (10 to 25 %) in better preserved areas. The same trend, to be abundant (40 - 70%), is observed in the stratum of grasses in the disturbed areas and the opposite (5 - 20 % of coverage) in zones of minor disturbance. The disclosed soil and the presence of exposed rock show a low coverage of 10 - 35 % and 10 %, respectively. The coverage of rubbish in the soil ranges between 25 and 70 %. The wealth of taxonomic entities registered in this community ascends to 65 species, in 52 genera and 28 families. The families with the major number of species are Asteraceae (14), Lamiaceae (5), Poaceae and Rosaceae (4), and Ericaceae, Pinaceae, Scrophulariaceae and Solanaceae with 3 species each one, which in total corresponds to 60 % of the species in 8 families. For this community three vegetable associations were identified. The first one constituted by religious *Abies religiosa* - *Quercus laurina* - *Salvia mexicana* that is distributed in the low zones about 2800 to 3000 altitude, in boundary with Forest of *Quercus* and Forest of *Pinus* -

Quercus. It presents an arboreal stratum high place dominated by *Abies religiosa* and *Pinus montezumae* and, lower other one (15 to 20 m), in that *Quercus laurina*, *Sambucus nigra* var. *canadensis* and *Alnus jorullensis* are present. Other abundant species are *Roldana barba-johannis*, *Roldana angulifolia*, *Cestrum thyrsoideum*, *Solanum cervantesii* and *Cupressus lusitanica*. The latter as result of the reforestation practiced in the zone. The second association is *Abies religiosa* - *Ageratina glabrata* located about the 3100 altitude and limits with Forest of *Pinus* - *Quercus* and pastureland. Present species of important coverage are *Festuca amplissima*, *Senecio toluccanus*, *Ageratina rivalis*, *Acaena elongata*, *Solanum cervantesii* and *Sambucus nigra*. Finally, the association of *Abies religiosa* - *Roldana barba-johannis* distributed in the zones of major altitude in vicinity with the forest of *Pinus hartwegii*. It can present two arboreal strata, the high one (35 m) dominated by *Abies religiosa* and other one under from 6 to 15 meters where are present *Sambucus nigra* and *Salix paradoxa*. Abundant species in this association are *Roldana angulifolia*, *Ageratina mairietiana*, *Acaena elongata*, *Ageratina glabrata*, *Festuca amplissima*, and *Brachypodium*

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mexicanum.

For its part, the Forest of *Pinus teocote* - *P. montezumae* occupies 4.7% (113 it has) of the surface of the area. This North-East of the Basin is distributed in the zone of washes of lava proceeding from the volcano Xitle and in small hills, between 2700 and 2900 altitude in boundary with the Forest of *Quercus rugosa* - *Q. laurina* and Forest of *Abies religiosa*. It prospers in hillsides with inclination between 3° and 15°, but it can be in more pronounced areas of 30°. The coverage of disclosed soil is low (5%), the present rubbish covers 20% of the area and the exposed rock is variable with values of 40% to 70%. For this community there were registered 25 species, 18 genera and 10 families. The families better represented as for the number of species are Poaceae (6 sp.), Asteraceae (5 sp.) Pinaceae and Fagaceae with three species each one, which as a whole corresponds to 68 % of the total. The genera with the major number of species are *Pinus* and *Quercus* with 3 species, respectively. It is a community semiopened with an arboreal stratum dominated by *Pinus teocote* and *P. montezumae* from 10 to 17 meters of height and other one that in occasions is present from 6 to 10 meters in which some individuals of *Quercus laurina*, *Q. glaucoides* and *Buddleja cordata* are observed principally. The coverage of the shrubby stratum is between 15 and 20% and height of 2 meters dominated by *Ageratina glabrata* and *Senecio salignus*. The herbaceous stratum commonly is abundant with coverage from 40 to 60 % and average height of 0.5 meters, dominated for grasses as *Piptochaetium virescens*, *Aegopogon cenchroides* and *Stipa ichu*. Other important species in this association are *Pinus leiophylla*, *Castilleja scorzonerifolia* and *Muhlenbergia robusta*.

The forest of *Pinus hartwegii* occupies 70 ha. (2.9%) of the Basin and is to the south of the area between the 3400 and 3600 altitude, being adjacent to the Forest of *Abies religiosa* and some induced pastureland. It is a community opened that can reach 30 % of coverage in the only arboreal stratum that it contains, height from 8 to 20 meters in which dominates *Pinus hartwegii* in the majority of the sites and individuals of *Abies religiosa* in minor number. The shrub stratum is scanty (8 -

15%) of approximately a meter of height, with presence of *Eryngium proteiflorum* and *Baccharis conferta*. In the opposite direction, the stratum with grasses is in the habit of being abundant with coverage from 50 to 80 % and 0.6 meters of height, in which are present grasses like *Muhlenbergia macroura*, *Piptochaetium virescens* and *Stipa ichu*. It registered a total of 23 species, in 22 genera and 10 families. The families with the major number of species are Asteraceae (6), Poaceae and Scrophulareaceae with four each one and, Apiaceae and Pinaceae with two, respectively.

The community *Quercus rugosa* - *Q. laurina* is included in the forests of hardwoods. They occupy the central zone - west of the Basin, with a surface of 265 ha (11%). It includes, besides the forests in which dominates exclusively the genus *Quercus*, those forests in which there are present some individuals of the genus *Pinus* in minor proportion. The altitudinal range was found from 2470 to 3000 meter above sea level, in boundary with the Forest of *Pinus* - *Quercus* and the Forest of *Pinus teocote* - *P. montezumae* in the zones of minor altitude and with *Abies religiosa* Forest in the high part. Commonly presents an alone stratum with coverage of average to semi-closed (50 to 80 %) and trees from 8 to 16 meters, in occasions with individuals of 18 meters of height of the genera *Pinus* and *Abies*. The stratum with shrubs presents a height from 1.5 to 2.5 meters most of them and coverages from 40 to 60 %, on the other hand, the stratum with grasses frequently is less abundant with values from 5 to 15 % of coverage (dominated in occasions for grasses) and height of 0.5 meters. The coverage of litter in the soil is considerable (60 – 85% of coverage) in the majority of the sites with this vegetation and the rock and soil exposed generally do not exceed 15% of coverage. Physiognomically were registered two variants, one of type deciduous located essentially to the north of Chichicapa's Valley in compact woodlands and, other one of type evergreen, located in the center - northwest of the Basin. The obtained information shows that the composition of species is similar at least to level of vegetable community. 68 species were registered in 49 genera and 26 families. The families with the major number of

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Table 1. Number and proportion of taxa recorded in the study area and its relationship to other geographic units.

	Cuenca del Río Eslava			Región de Montaña del Sur de la Cuenca de México. (Silva <i>et al.</i> 1999)		Cuenca del Valle de México. (Rzedowski y Rzedowski 2001)		México. (Rzedowski y Rzedowski 2001)	
	#	#	%	#	%	#	%	#	%
Families	47	56	83.9	106	44.3	126	37.3	220	21.3
Species	165	195	85.1	862	19.2	2,305	7.2	22,000	0.7
Area (km ²)	24	60	40	1,000	2.4	7,500	0.32	2,000,000	0.0012

#. Number of entities identified taxonomic level or spatial unit area of the headline.

%. Percentage of surface occupied by the Río Eslava Basin with regard to the spatial unit of the headline.

species are Asteraceae (20), Rosaceae (6), Poaceae (5), Lamiaceae and Fagaceae with 4, who as a whole 57.3 % of the total of the species. Between the genera, those of major number of species are *Ageratina* (5), *Quercus* (4) and *Salvia* with three species. Between the species of major coverage is, *Ageratina ramireziorum*, *Cestrum thyrsoides*, *Salvia mexicana*, *Muhlenbergia robusta*, *Ageratina areolaris*, *Montanoa frutescens* and *Clethra Mexicana*.

The Forest of *Pinus - Quercus* is located in the group of the types of vegetation of Mixed Forest. The forests in which two or more species are codominant or in occasions with a major proportion of one over the other one. For the zone that occupies us, it is considered to be essentially those forests in which the proportion of pines over oaks is major, nevertheless, the above mentioned they present considerable abundance.

It occupies 194 ha. (8 %) of the surface of the Basin and northwest are located in the part in boundary by *Pinus* Forest and *Quercus* Forest in his limits of low distribution (2600 masl) and by the Forest of *Abies religiosa* in the highest part (3000 masl). It is a semiclosed forest that can reach coverage of 80 %, but frequently is between 50 - 60 %. Presents two arboreal strata, the highest dominated by *Pinus montezumae*, *P. patula* and *P. leiophylla* of approximately 20 - 25 up to 35

meters of height when *Abies religiosa* appears and, another stratum under from 8 to 15 m, dominated by *Quercus laurina*, *Q. rugosa* and *Alnus jorullensis*. The stratum with shrubs is abundant with coverage of 60 %, in which *Ageratina glabrata*, *Roldana barba-johannis* and *Ribes ciliatum* as conspicuous. On the other hand the stratum with grasses presents between 20 - 30 % of coverage and there can be present *Trisetum virletii*, *Penstemon roseus* and the fern *Pleopeltis polylepis*, among others.

Floristically, were registered 44 species in 33 genera and 22 families. The better represented families are Asteraceae (10), Fagaceae (4), Lamiaceae and Pinaceae with three species, each one, value that in his set corresponds to 45.4 % of the total. The genera with the major number of species are *Quercus* with 4 species and *Pinus* with 3 species. Of the total of the species registered for this community 15 of them (36 %) are elements registered for cloud forest. Between the abundant ones are *Quercus laurina*, *Ageratina glabrata*, *Roldana barba-johannis*, *Salvia elegans* and *Alnus acuminata* among others.

The induced pastureland occupies approximately 3 % of the area. It is of human origin, since the natural grasslands, called "zacatonales", are distributed overhead of the altitudinal limits of the Basin. This type of vegetation is present in the

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low zones inserted with agricultural areas and hardwood forests, in that dominate the tussock grasses. Likewise, the tillering grasses, also induced, that are between the forests of coniferous to major altitude in the zone center and south of the Basin. The above mentioned are a product of the felling of the forest of *Pinus hartewii*, the fires and the extensive shepherding. Between the principal grasses are *Muhlenbergia macroura* and *Stipa ichu* and among the shrubs, *Senecio cinerarioides*.

The agriculture in the zone is of temporarily with exception of some areas with fruit trees, plantations of christmas trees and the presence of greenhouses in the main valleys (Rancho Viejo and Chichicarpa) of the Basin. In total, Agricultural areas occupy 11.5% of the zone, between which can be distinguished from field observations three conditions, one is the agriculture located near the panoramic road Picacho-Ajúscó between the 2800 and 3000 altitude mainly with oats, another located in the valleys in which are observed fruit trees, culture of flowers, of tomato in greenhouses and fish-ponds of ornamental plants, among others. Finally, agriculture in hilly areas located in the center - north of the areas, which have formed terraces and cultivated potatoes and corn, among others. In these latter areas there is agriculture neglected due to lack of conservation practices and abandonment of terraced land on which secondary vegetation has developed.

The Urban areas occupy 14% (275 ha.) in the zone and are located in what in another time was a forest of hardwood (*Quercus*), mixed forest and in minor proportion forest of coniferous. The urban growth is observed to the north of the basin, in the adjacent zone with agriculture, at the cost of areas of culture and some remnants of forest of oaks. Another zone of important growth to the north - northeast, it appears in the area of volcanic tuffs proceeding from the Xitle Volcano and Chichicarpa Valley, in which have dealt areas of mixed forest and hardwood.

DISCUSSION

Rzedowski (1998) mentions that the forests of pine and oaks are those who in absolute terms

contain the major wealth of species, over the tropical forests and xerophilous bushes, due essentially to the confluence of elements Nearctic and Neotropical. In this respect, the wealth of taxonomic entities for the working zone was 47 families, 102 genera and 165 species, in an approximate surface of 24 km².

If it is considered the information obtained with regard to the brought ones by other authors, that the species registered in the Basin correspond to 85.1 % of the brought ones for Avila-Akerberg et al. (2002) for the soil of conservation Contrerense in a surface of 40 % of the first, to 19.2 % with base in the information published by Silva et al. (1999) for the Region of Mountain of the South of the Basin of Mexico and to 7.2 % of the species of Basin of the Valley of Mexico (Rzedowski and Rzedowski 2001). As for families and genera the taxonomic entities registered in the zone are equivalent to 44% and 30% of the registered ones in the Region of Mountain of the South of the Basin of Mexico and to 37% and 15.7% of the Basin of the Valley of Mexico, respectively (Table 1).

This taxonomic wealth is considerable, nevertheless, due to that the field samplings were realized in one season of the year, the number of species brought (165) is minor to the existing one in the basin. Now then, if the method proposed by Rzedowski (1991) for estimating the floristic wealth of the country and apply to know the number of species estimated for the Rio Eslava Basin, the value is obtained e/g of 2.27 (for the Basin of the Valley of Mexico the value number of species/number of genera - e/g - of Asteraceae is of 3.6), with what the probable number of species for the basin would be 231 entities. This information realizes of the important wealth of species of the Río Eslava Basin in a proportionally minor surface to the spatial units before mentioned.

On the other hand, the representation of the number of species of both principal families (Asteraceae - 41 and Poaceae -12), agrees with the brought for Rzedowski (2006) for forest of coniferous and *Quercus* forest distributed in the country, as well as with the results of works developed in the Axis Neovolcanic like those of Chávez and Trigo (1996) in the National Park Iztaccíhuatl-Popocatepetl and

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Cornejo et al. (2003) for the reservation of the biosphere Butterfly Monarch in Michoacán. Locally also there are coincidences with exposed by Silva et al. (1999) and Avila-Akerberg (2002), in the mountain of the south zone of the basin of the Valley of Mexico and in the zone of conservation of the delegation Magdalena Contreras, respectively.

Rzedowski and Rzedowski (2001) describe nine vegetable communities for the Basin of the Valley of Mexico, of which Forest of *Abies religiosa*, *Pinus* and *Quercus* they include from general form to those who are present in the Río Eslava Basin. For your part, Silva et al. (1999) for the region of mountain of the south of the Basin of the Valley of Mexico, define with major detail 19 vegetable communities, of them, all the communities in the type of vegetation of Forests of coniferous they are present in the Río Eslava Basin and partially the communities of mixed forests and forests of oak.

These characteristics award to the Río Eslava Basin an important representation as for the forests of coniferous of the zone of mountain to the south of the D.F. and his area of conservation.

CONCLUSIONS

The Río Eslava Basin like hydrographic unit contains important part of the vegetable biodiversity of the southwest of the Federal District, since it shelters approximately 7 % of the species of plants of the basin of the Valley of Mexico and about 20 % of the south zone of mountain of the D.F. Likewise, it contains vegetable communities in good condition of conservation that there offer environmental services that are key for Mexico City, as the purification of air, habitat for species of fauna and flora and her recharges of the aquiferous one.

Nevertheless, the area is subject to anthropogenic pressures considerable, principally for the urban growth in the average lower zones and on the communities of *Quercus rugosa* - *Q. laurina* and *Pinus teocote* - *P. montezumae*. For those vegetable communities away from the urban zone to the south of the Basin, the pressures are caused by the passage of pedestrians, for the fire and shepherding, which into some cases has changed of the typical species, since it is the case of some zones

in the forest of *Abies religiosa*. In this respect, considering the total of the species registered of the communities was observed that approximately 35 % is associated or favored by some type of disturbance.

Other particularities of the basin are that great part of his surface is covered by Forest of *Abies religiosa* and, together with the located ones in the basin of the Río Magdalena, form a part important of the forests of this type in the Federal District. Also, it should be noted that despite the absence of a cloud forest community as such, the area hosts a number of species belonging to it.

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