Traditional knowledge in the Defence of the Cultural Landscape of Tlajomulco, Mexico

Marìa de la Luz Ayala, Edith R. Jiménez Huerta

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Like other people who live in the older settlements around the city of Guadalajara, the inhabitants of Tlajomulco have a comprehensive vision of their villages and surroundings. They have been living on the land and off the land for centuries. At the end of the 20th century, the cultural landscape of Tlajomulco began its latest transformation. The formerly fertile flatlands gave way to large-scale sterile real estate developments. In the rainy season the waters of the water basin, once used to irrigate crop fields, now flood the houses and roads created by this new urbanization. As the city expands, the forests that supplied timber, charcoal and wood, as well as other goods obtained by hunting and gathering, are diminishing and their biodiversity is threatened. At the dawn of the 21st century, the cultural and environmental diversity that has characterized these villages for centuries is thus in danger of being lost to unplanned urban sprawl. The aim of this paper is to encourage conservation and prevent further deterioration by making more widely known the rich cultural landscape of the traditional villages of Tlajomulco and the know-how of the inhabitants that has contributed to its conservation.

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From the twentieth century to the present day, the metropolitan area of Guadalajara has been expanding at a dizzying pace onto the lands of neighbouring villages. The city is incorporating not just the human settlements on its fringes but also the bodies of water, woodlands, grazing lands, pastures, croplands, quarries, gulleys and hills it finds on its way. The metropolitan area has started to encroach on farmland that used to be very productive until the 1970s. As in other

places in the world, no limits seem to have been set to the urban expansion of the city beyond its periphery. There are two aspects to the growth pattern of the metropolitan area of Guadalajara: the gradual expansion of the city itself, and the growth of nearby villages. This has resulted in a rather compact metropolitan fabric. However, since the first years of the twenty-first century a radical change in this growth pattern can be observed: the new urbanizations are no longer integrated into the urban fabric of either the city or the villages. The new estates do not even adjoin one another; they are dispersed, scattered over the downs and plains and on village land. Rapid urbanization threatens to destroy the great cultural and environmental diversity of these villages as it gobbles them up and invades their land. This situation bears witness to the unequal relationship existing between the city of Guadalajara and the surrounding villages.

Our study of Tlajomulco, one of the municipalities over which the metropolitan area of Guadalajara is expanding, will serve to illustrate the influence that the city is having on the destiny of its neighbouring villages. Tlajomulco is just 30 kilometres south of Guadalajara, the second largest city in the country (see Figure 1).[1] Over the centuries the needs of Guadalajara for food, fuel and housing, as well as the needs of the inhabitants of the surrounding countryside, shaped the local landscape. In the 1990s, however, the city began to expand southward at an extraordinary rate, over agricultural lands, woods and the villages themselves. This reconfiguration of the peri-urban municipalities is an example of a global problem in a local context.[2]

In this work we wish to illustrate two points: first, that the advance of the metropolitan area of Guadalajara over the lands of Tlajomulco is bringing with it changes in land occupation, and the loss of both cultural and environmental diversity; second, that there is a

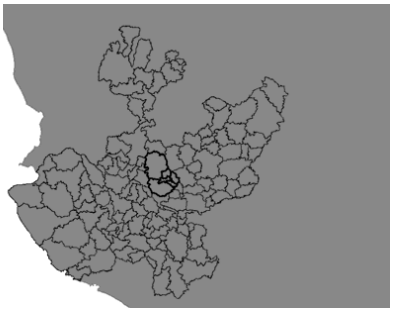
[1] Tlajomulco, 1575 metres above sea level (5169 feet), occupies an area of 70,397.15 hectares (173,951 acres, equivalent to 272 square miles).

[2] G. Estany, A. Badia, I. Otero, M. Boada, "Socio-Ecological Transformation from Rural into a Residential Landscape in the Matadepera Village (Barcelona Metropolitan Region), 1985-2008", in *Global Environment,* 5, 2010, pp. 8-37.

Figure 1. Location of Tlajomulco, Jalisco, Mexico

Mexico in the World

Jalisco in Mexico



Metropolitan area
of Guadalajara in Jalisco

Tlajomulco in the metropolitan
area of Guadalajara

Source: Mexico in the World and Jalisco in Mexico: Maps of the programme Arc View ESRI 3.2 a.; Municipalities of Jalisco: INEGI, 2005a; Metropolitan Area of Guadalajara: INEGI, 2005b and Multispectral Satellite Image SPOT, 25 January 2009.l

historical memory to be rescued, that of the area's old villages, which had a remarkable degree of integration with their environment. An integration that is being undermined, even to the point of almost disappearing. Knowledge of the environmental wealth and diversity of these villages, and their interaction with the city over the years, is hence vital if we wish to conserve them. To address these two aspects,

we have divided this study in two parts. We start by illustrating the expansion of the city of Guadalajara over the surrounding municipalities between 1970 and 2009 and, in particular, changes in land occupation the accelerated urbanization of the last decade brought about in the municipality of Tlajomulco. The flatlands of the area, and even the wooded hills, are being transformed into gated real estate developments for all social groups, and theme parks for the enjoyment of many urban dwellers. The new inhabitants of these housing estates, weekend visitors and public officials do not share the original inhabitants' comprehensive perception of the local environment. In particular, real estate developers, with the complacency of the authorities, are putting enough pressure on the land to raise worries that a critical threshold may have been reached, "leading to landscape degradation".[3] Secondly, we show that the promotion of historical and cultural values can be of crucial importance as a means to counteract the problems derived from this accelerated urbanization. One of the aims of this paper is indeed to contribute to rescuing the historical memory of the traditional villages of Tlajomulco. Memory is the most important resource that traditional cultures have for the conservation of their culture and environment. Historical records bear witness to the composite character of the traditional occupation of the area, resulting in a cultural landscape[4] constituting a diversified mosaic. Nowadays, villages and communities still play a major role in conservation "not only because they inhabit places that are strategic from the point of view of conservation, but

[3] J. Marull, J. Pino, E. Tello, *The loss of Landscape* cit., p. 123.

[4] Several authors have pointed out the relevance of the cultural landscape model for achieving sustainable land-use management. See: A. Farina, "The Cultural Landscape as a Model for the Integration of Ecology and Economics", in *BioScience*, 50, 4, 2000, pp. 313-320, available on the web at: http://uniurb.academia.edu/AlmoFarina/Papers/279151/The_Cultural_Landscape_As_a_Model_for_the_Integration_of_Ecology_and_Economics. M. Agnoletti (ed.), *The Conservation of Cultural Landscapes*, CABI, Wallingford/Cambridge MA 2006. J. Parrota, M. Agnoletti, E. Johann (eds), *Cultural Heritage and Sustainable Forest Management: The Role of Traditional Knowledge*, 2 Vols., Ministerial Conference for the Protection of Forest in Europe/IUFRO, Warsaw 2006.

also because they still stick to ways of using natural resources […] that induce and propitiate a richness of flora and fauna". Traditional villages have "a very long history of use of resources and have generated cognitive systems for their surrounding natural resources which are transmitted from generation to generation".[5] We conclude by explaining how the accelerated urbanization of Guadalajara in the twenty-first century, combined with the unequal relationship between the city and the places it absorbs as it expands, is threatening the great cultural and environmental diversity that the villages of the area have had over the years.

Metropolitan expansion, changes in land occupation, and planning[6]

For the first time in history since cities first came into existence thousands of years ago, more people in the world live in cities than in

[5] V.M. Toledo, E. Boege, "La biodiversidad, las culturas y los pueblos indígenas", in V.M. Toledo (ed.), *La biodiversidad de México. Inventarios, manejos, usos, informática, conservación e importancia cultural,* FCE/Conaculta, Mexico 2010, pp. 160-192. Authors' translation.

[6] Our analysis of the growth of the city, and of the villages and other settlements in the municipality of Tlajomulco, is based on relief maps at a scale of 1:50,000 produced by INEGI using aerial photographs taken in 1971-1972; aerial photographs at a scale of 1:75,000 taken in 1985; aerial photographs at a scale of 1:10,000 from1993; a multispectral image taken by the Landsat satellite in 2000; the digital urban cartography of the census (INEGI, *II Conteo de Población y Vivienda 2005*); and a multispectral image from the SPOT satellite, taken in 2009. Our analysis of changes in land occupation in the municipality of Tlajomulco is based on digital images from the Landsat and SPOT satellites (2000 and 2009, respectively), images from Google Earth, and vectorial data about the urban outline of the municipal capital and of some of the places in the census (INEGI, *II Conteo de Población y Vivienda 2005*). We overlaid a digital elevation model, created from vectorial information in the topographic map of INEGI, 1993, on the images and maps of the area. We also went on a field outing to verify elements that were not clear in the images and maps.

[7] C. Hume, "Countries Die. City is Eternal", in *Urban Issues, Architecture,* 22 March 2008, available on the web at: http://www.thestar.com/News/Ideas/article/349541 (accessed 25 February 2012). According to the United Nations, today more than half the population of the earth live in cities (UN-Habitat, *State*

rural areas. The worldwide increase of urban areas is not the result of a corresponding increase in population size, but of a trend towards building low-density suburban housing that began in the United States of America in the mid-twentieth century. This trend has now spread across all the regions of the world,[8] and Latin American cities are no exception. It is expected that in the coming years most of the population growth will take place in the peri-urban areas of large and medium cities.[9]

Metropolitan expansion

The city of Guadalajara is regarded as a paradigm of urban sprawl in Latin America. From 1970 to 2000, its urban area grew 1.5 times faster than its population.[10] Its urban limits rapidly extended into three immediately adjoining municipalities and, from the end of the 1990s, into two more, one of which is Tlajomulco. As we noted above, in the first decade of the twenty-first century the up to then more or less compact growth pattern of the metropolis changed radically. Today, new urbanizations are no longer woven into the metropolitan fabric. New housing estates, large and small, no longer adjoin each other. The trend is to locate them further and further away both from the city and from any other urban settlement, such

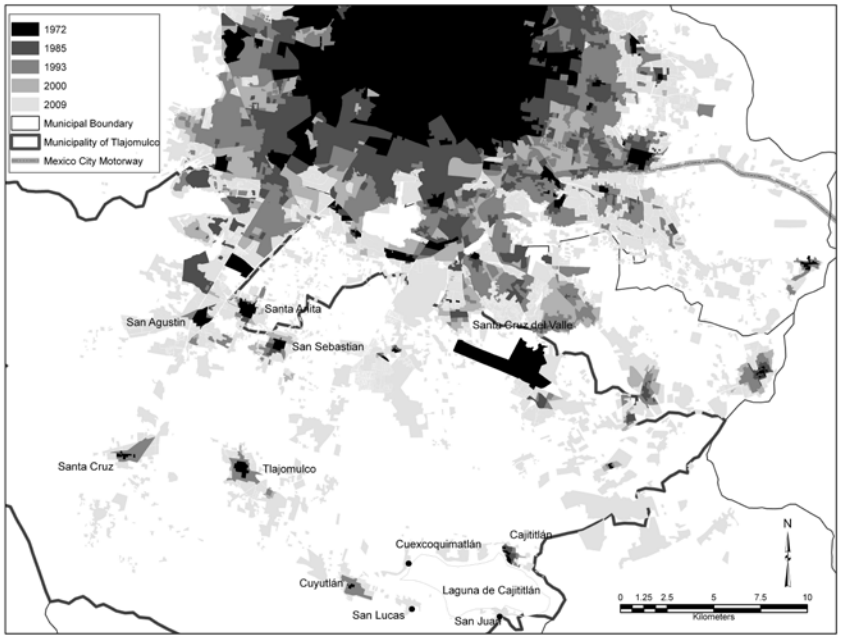
of the World's Cities, 2010/2011. Bridging the Urban Divide, Earthscan, London/ Washington DC 2008).

[8] Ibid. Hansen et al. 2005, cit. in M.L. McKinney, "Urban Futures", in *Urban Ecology,* K.J. Gaston (ed.), Cambridge University Press, Cambridge 2010, pp. 287-308.

[9] H. da Gama Torres, *Social and Environmental Aspects of Peri-urban Growth in Latin American Megacities,* United Nations expert group meeting on population distribution, urbanization, internal migration and development, New York 21-23 January 2008.

[10] UN-Human Settlements Program, "Urban trends: Urban Sprawl Now a Global Problem", in *State of the World's Cities* cit. Urban sprawl is a common feature of Mexican Cities at least since 2000 to 2012. A. Rébora Togno, "Reflexiones para replantear el paradigma urbano vigente. De la planeación de los asentamientos humanos a una gestión urbana eficaz centrada en las obligaciones del aprovechamiento de la propiedad inmobiliaria", in *Impacto de la vivienda en el desarrollo urbano. Una mirada a la política habitacional en México*, A. Iracheta Cenecorta, E. Soto (eds), El Colegio Mexiquense, A. C., Mexico 2010, pp. 127-149.

Figure 2. Southward expansion of the metropolitan area of Guadalajara, 1972-2009



as the municipal capitals and smaller towns (see Figure 2).

In just a decade, the population of the municipality of Tlajomulco increased substantially: in fact, it trebled (from 123,619 inhabitants in 2000 to 416,626). The transition from rural to urban was accomplished at a speed and with an intensity never seen before. The percentage of the population classified as urban grew from 66 to 90.[11] There was also a change in population distribution. For a long time the population had been concentrated in the oldest parts of the municipality, viz., the municipal capital and the nine traditional villages that have existed since the sixteenth century, as well as

[11] INEGI, *XII Censo General de Población y Vivienda 2001* and *XIII Censo General de Población y Vivienda 2010*, Instituto Nacional de Estadística y Geografía, Mexico 2011.

Figure 3. High-income real estate development in La Primavera forest

ranches and old haciendas dating centuries back. As the twentieth century drew to a close, with the expansion of the metropolitan area of Guadalajara there was a large migration of outsiders into the new estates built in Tlajomulco, which is where the majority of the inhabitants of the municipality now live. While the rate of population

Figure 4. Middle and low-income real estate developments on cropland

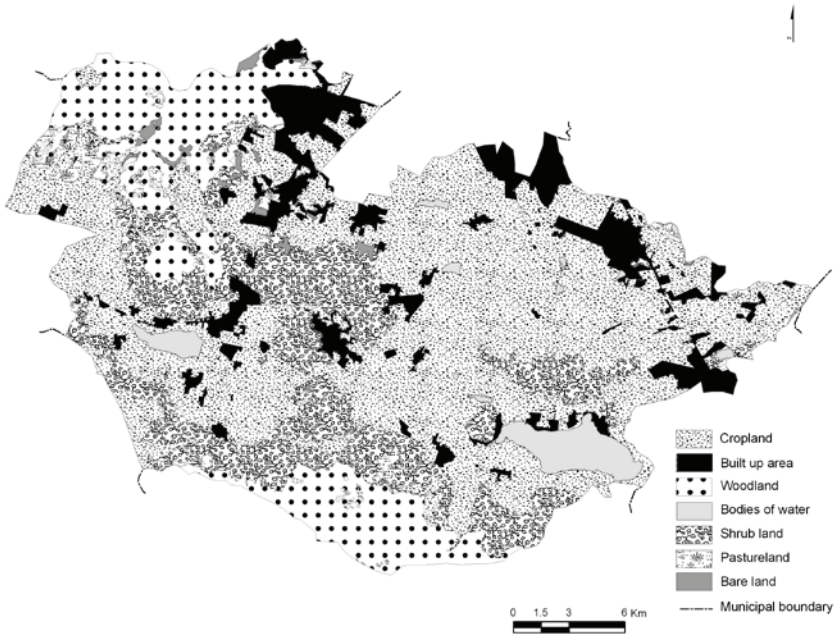
growth in the state of Jalisco was 1.5 per cent between 2000 and 2010, in Tlajomulco the rate was 12.5,[12] the highest in the state of Jalisco. Urbanization drastically changed the cultural landscape of the municipality. Never had change been so great and so fast. In just a few years, a large amount of the land of Tlajomulco and of the villages under its jurisdiction was transformed from rural to urban. The residential estates for the urban poor – social housing and informal settlements – and middle income groups were established on the fertile agricultural fields, whilst high-income housing was developed mainly on woodlands closer to Guadalajara (see Figures 3 and 4).

Changes in land occupation

A naked-eye comparison of Figures 5 and 6 is sufficient to understand the principal land-cover changes that took place in Tlajomulco between 2000 and 2009. As we just pointed out, cropland and, to a lesser extent, woodland gave way to new urbanizations. While cropland was lost to urbanization, at the same time some was

[12] INEGI, *XIII Censo General de Población y Vivienda 2010 cit.*

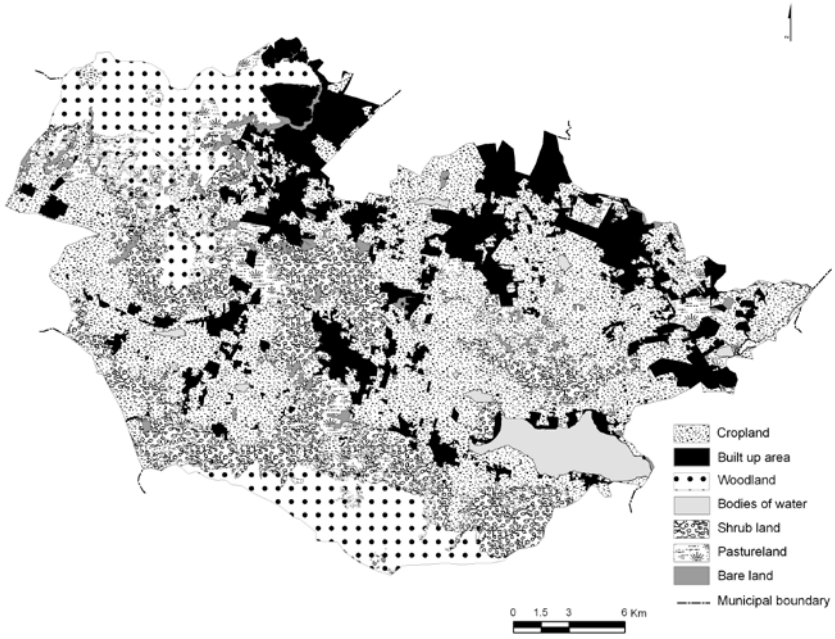
Figure 5. Changes of land cover in the municipality of Tlajomulco, 2000



gained through the reduction of pasture and shrub land, mainly on hillsides. The last change to be noted here, which is quantitatively small but qualitatively significant, concerns the wooded areas. These are also being urbanized. Fires are being lit to clear the grounds for urbanization, and trees are being felled to clear new ground for crops and pastures. Particularly evident is the major deforestation in La Primavera forest, west of the municipality.[13] Unlike La Primavera, the Madroño mountain range, located to the south of the municipality and much further away from the city, has maintained its tree cover, which, however, is beginning to show signs of deterioration.

[13] On March 6, 1980, La Primavera was declared a protected forest area. It occupies an area of 30,500 hectares extending over the municipalities of Tala, Zapopan and Tlajomulco. It has four kinds of woodland: oak (*encino*), oak-and-pine,

Figure 6. Changes of land cover in the municipality of Tlajomulco, 2009



In general terms, in the municipality of Tlajomulco, cropland, shrub land and woodland have been lost, and there has been a concomitant increase in residential areas, pasturelands, bare lands and bodies of water. In order to explain these land cover changes, we think it is important to emphasize two characteristics of this jurisdiction. Firstly, we are dealing with a very large municipality, as it extends over 70,897.15 hectares, nearly a third of the total area occupied by the six municipalities of the Metropolitan Area of Guadalajara. Secondly, flat lands, traditionally used for crops and recently

pine, and tropical deciduous forest; three classes of plants: riperian or riverbank, rupiculous (growing on rocks) and ruderal (growing on uncultivated land); and 135 species of birds and 29 of mammals. Secretaría del Medio Ambiente y Recursos Naturales (SEMARNAT) *Programa de manejo del área,* pp. 10 and 21.

Table 1. Changes of land cover in the municipality of Tlajomulco, 2000-2009

Categories	Area in 2000		Area in 2009		Difference in Area between 2000 and 2009	
	Hectares	%	Hectares	%	Hectares	%
Cropland	35,248.65	50.1	28,975.03	41.2	-6,273.62	-8.9
Built up area	7,553.55	10.7	12,060.66	17.1	4,507.11	6.4
Woodland	10,522.41	14.9	10,216.72	14.5	-305.69	-0.4
Bodies of water	2,100.08	3.0	2,299.48	3.3	199.4	0.3
Shrub land	12,917.60	18.3	11,393.56	16.2	-1,524.04	-2.2
Pastureland	1,568.55	2.2	3,991.51	5.7	2,422.96	3.4
Bare land	486.31	0.7	1,460.19	2.1	973.88	1.4
Total land accounted	**70,397.15**	**100.0**	**70,397.15**	**100.0**	**0**	**0**

Source: Original elaboration based on digital images from the Landsat (2000) and SPOT (2009) satellites; images from Google Earth and vectorial information on the urban outline of the municipal capital and of some towns in the INEGI, *II Conteo de Población*, 2005.

singled out as suitable for housing, though in fact they are not, account for a significant amount of the municipal territory (62%).[14] For instance, there has been a six per cent increase in built-up land cover in Tlajomulco between 2000 and 2009, which might not seem much, but actually comprises an area approximately equivalent to 40% of the urban growth of the whole metropolitan area per decade between 1970 and 2000, when the city was expanding in a more compact fashion.

This increase of the built-up cover by 4507.11 hectares was the largest single increase in Tlajomulco (from 10.7% to 17.1%). Another significant increase, by 3.4%, was that of pastureland (2422.04 hectares). There was also a smaller increase (973.88 hectares) in bare land, from 0.7 to 2.1%. In the same period, cropland was reduced considerably, by 6273.62 hectares (from 50.1 to 41.2% of the overall

[14] H. Ayuntamiento de Tlajomulco de Zúñiga, http://www.tlajomulco.gob.mx/index.php?pag=infomediofisico (accessed March 2012).

area of the municipality), mainly lost to urban development. Shrubland and woodland were reduced by 2.2% and 0.4%, respectively (6273 and 306 hectares). The loss of woodland was relatively small, but of great significance in terms of reduction of local biodiversity. As to the small decrease noted in the area occupied by bodies of water, it is a datum that should be taken with caution, since the changes may depend on the time of the year when the satellite pictures were taken (see Table 1).

We have shown that the cultural landscape of Tlajomulco has drastically changed in the last decade, with the urban threatening to become the dominant component of the traditional agrarian landscape mosaic that has characterized the area over time. There can be no doubt that the most significant changes are the loss of agricultural land for crops and an increase in the number of human settlements. The principal changes that have occurred in land occupation have taken place on relatively flat lands, principally those used for crops, but one also observes a tendency for both the sides and tops of hills to be invaded, as well as places having great landscape and environmental value. Such is the case for the most recent extensions of housing estates and the building of a new golf course on some of the hilltops of the forest of La Primavera.[15] The data we examined indicate a trend towards even greater urbanization. As we have seen, urban sprawl has impacted wooded areas as well as cropland. Even when the losses are apparently not significant in percentage terms (only 0.4%), they actually threaten to undermine land-cover diversity. Firstly, there is the gradual disappearance of buffer zones between the woodlands and "pressure points" such as settlements and industries. Secondly, new housing estates and urban facilities constitute barriers that increase the fragmentation of woodlands. Their continuity is thus disrupted, leaving isolated patches interspersed by

[15] One of the most recent examples in La Primavera forest of residential and recreational urbanization (covering 50 hectares) is a Country Club extension, El Cielo, of the upmarket housing estate El Palomar onto the wooded hilltop the estate adjoins. There are other older estates that have done the same thing, such as Bugambilias, etc.

bare ground, shrubs and new housing developments, without regard to the vocation of the land. These sites are considered of great environmental value, as they provide a habitat for numerous species of wild flora and fauna. Some steps at the national and local level have been taken to deal with this issue.

Planning

In order to protect forests and woodlands, the forest of La Primavera was decreed a Natural Protected Area in 1980. Recently the Madroño mountain range was also placed under legal protection, though only at the municipal level.[16] However, neither of these attempts at landscape protection was altogether effective, as they still allowed important land-use changes, such as low-density "ecological" developments around the protected areas. Recent local planning documents have identified three major problems in the jurisdiction: accelerated urbanization, the integration of Tlajomulco into the metropolitan economy of Guadalajara, and pollution and environmental degradation.[17] While the planners' diagnosis is correct, and agrees with what we affirmed in the previous section, we find the strategies they propose inadequate, as some are based on faulty information, others would make impossible the very effects they wish to achieve, and a crucial element is missing, viz., taking into adequate consideration the local people and their traditional methods of sustainable land management.

The municipal planning documents, whose objective is to control and restrict the accelerated urbanization of the municipality, start with a fundamental mistake, which is to considerably underestimate the size of the population the municipality will be lodging in the future. The National Population Council estimates that the number of inhabit-

[16] Área de protección de flora y fauna La Primavera (30,500 has.), *Diario Oficial de la Federación*, 22 May 2001, p. 15.

[17] H. Ayuntamiento de Tlajomulco de Zúñiga, *Plan Municipal de Desarrollo de Tlajomulco* 2007-2009 and *Programa municipal de desarrollo urbano de Tlajomulco*, 2009.

ants of Tlajomulco will increase from 288,697 in 2009 to 688,046 in 2030.[18] Based on this information, meeting their housing needs will require the building of another 95,997 dwellings on 5728 hectares. Unfortunately, though, these figures fall far short of those we find in the massive urban and housing projects the municipality is planning to approve. Outstanding among these is the project of a "Satellite City", whose construction is planned over the next twenty years (estimated completion by 2030). The Municipal Collaboration Committee has submitted to the town council a proposal to build this "ecological" city, comprising 250,000 dwellings, on a 9000-hectare area of high environmental value, to lodge a million people. If this project is carried out, in twenty years the new city will have doubled the growth projected in earlier estimates. If municipal planning continues to ignore the big housing projects that will determine the extent of future land occupation, it will be unable to curb accelerated urbanization and prevent further environmental deterioration in the municipality.[19]

The strategy of the plans for integrating Tlajomulco into the economy of the metropolitan area of Guadalajara is twofold. One objective is to connect the villages of the municipality to each other and the municipality as a whole to Guadalajara by various roadways, including link roads, motorways and a new mega-clearway (*macro libramiento*). The plan is for a stretch of the 108.7-kilometre clearway to pass through the forest of La Primavera, although not through its protected area. The clearway would connect to another road, that of San Juan de los Arcos, on the other side of the forest. This would have the effect of isolating a section of the forest and putting it under intense pressure to urbanize and making it much more vulnerable to forest fires, tree felling, bulldozing and other environmental alterations. The fragmentation of the forest will affect the "natural flows of fauna" by interfering with the trails the animals use for repose, hunting and migration. The second objective is to stimulate the municipality's potential for tour-

[18] H. Ayuntamiento de Tlajomulco de Zúñiga, *Programa municipal* cit., p. 65.

[19] This suburban expansion pattern of urbanization is a characteristic not only of Tlajomulco, but of many metropolitan areas around the world. UN-Habitat, *State of the World's Cities* cit., pp. 10-11.

ism. The government's vision for doing this is limited to improving the urban image of the towns and villages that happen to have "some degree of deterioration", drawing up projects to rescue and restore the Franciscan Way,[20] and promoting the use of the forest for "sustainable ecological tourism". The programme argues that by rescuing "the historical and cultural heritage of the municipality", Tlajomulco will be able to take advantage of its cultural wealth and strengthen the "identity" of its population.[21] The programme also advocates the promotion of "productive ecological activities and eco-tourist routes". But the trouble with these municipal projects for the integration of Tlajomulco into the metropolitan economy is that they are designed to attract inhabitants of the city to enjoy the rural pleasures of Tlajomulco, its churches, waters and woods, and this centralist view from the metropolis outward towards the municipality, intended to "invigorate the local economy", takes no account of the needs of the local population. Neither does it consider the impact that the imposed ecological tourism will have on the integrated land management carried out by the local inhabitants through the centuries.

We do not see a promising future for either Tlajomulco or the conservation of its woodlands, because over the last ten years we have witnessed a reduction of its natural areas serving as buffer zones around woods, especially in the forest of La Primavera and the principal hills of the municipality, which are closer to the metropolis. In planning documents, the stated goal is to "completely respect the protected area of La Primavera and to designate the Totoltepec hill, the Madroño mountain range and the system of lakes" as protected areas. Ironically, as we have seen in the case of La Primavera forest, to construct "ecological" settlements with golf courses it is first necessary to destroy part of the forest. There are plans to extend the urbanization of the municipality onto areas of great ecological value.[22]

[20] The "Franciscan Way" is a tour of the chapels and churches built by the Franciscan friars between the 17th and 18th centuries in each of the old villages of the area. It is a good example of the religious architecture of the colonial period.

[21] H. Ayuntamiento de Tlajomulco de Zúñiga, *Programa municipal* cit., p. 29.

[22] The disarticulated urbanization of Tlajomulco is the result not only of bad

The policies for the integration of Tlajomulco into the metropolis and the protection of its environment completely ignore the needs and contribution of the traditional communities who have been living there for nearly five hundred years. Current planning sets forth the objective of preserving the local heritage, "the forest" and "picturesque" villages, as if they were something frozen in a photograph. In fact, if the planning of Tlajomulco overlooks the fundamental role of local people in the conservation of the cultural landscape, its only achievement will be to turn what is left into museums for the entertainment of tourists.

In order to encourage the conservation of the agrarian practices that "are the basis for effective conservation of cultural landscapes",[23] we would like to make the rich cultural landscape and know-how of the inhabitants of the traditional villages of Tlajomulco more widely known. This is the subject of the following section.

Rescuing historical memory as a means of conserving the cultural landscape

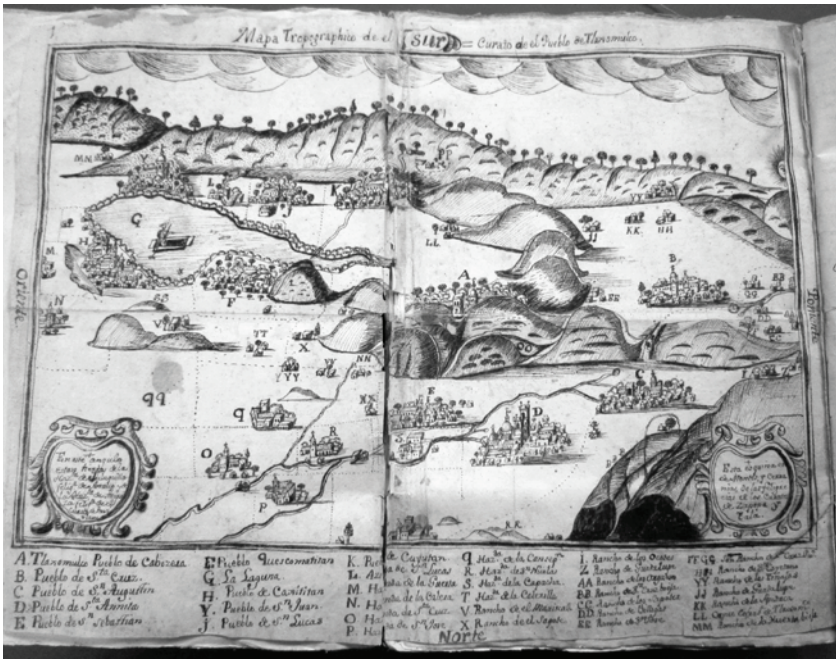
Over the years, traditional agrarian practices and know-how have shaped the cultural landscape of Tlajomulco, which is characterized by remarkable cultural and biological richness. Our starting point to show the diversity of the landscape mosaic of Tlajomulco are a geographical report *(Relación)* and a map of 1778 by the Franciscan friar Fray José Alejandro Patiño.[24] The map includes only two dominant

planning but also of just over ten years of government corruption. Officials have pocketed money to grant permits for changing land use in order to facilitate urbanization where it was forbidden, and planning limits have not been respected. According to the president of the Consejo de Colaboración Municipal, developers pay approximately $30,000 MXN for each permit: *Mural*, 9 November 2007.

[23] M. Agnoletti, "Introduction", in Parrota, Agnoletti, Johann, *Cultural Heritage* cit., p. 13.

[24] *Mapa Topográfico de el Curato de el Pueblo de Tlaxomulco. Y sucinta historial relación, hecha con arreglam[ien]to a la instrució[n] Real, de su Mag[esta]d (que Dios guarde)*, Biblioteca Pública del Estado de Jalisco (BPEJ), Fondos especiales, ms. 50, III, 1778, 10 fs., [fs. 272 - 281]. Of the five "Relaciones topográficas" of

Figure 7. Map of Tlajomulco, 1778



components of the landscape: settlements – ten villages, nine haciendas and twenty-two ranches – and natural features – lands, lake, rivers, forests, woodlands, hills and mountain ranges (Figure 7).

Villages, products and trades

The fact that some agrarian features, such as cultivated land, are not shown on the map, far from implying their nonexistence, reflects the artist's aesthetics. In fact, cultivated land areas are mentioned in the *Relación*, which does not merely list them, but goes into further detail, allowing us to appreciate the degree of integration of land-use management and diverseness of land occupation of the time, which had given rise to a cultural landscape, a diversified mosaic of gardens, orchards, horticultural patches, cultivated lands, forest,

Table 2. Villages, products and trades in Tlajomulco, 1778

	Pueblos	Products cultivated and manufactured	Trades
A	**Tlajomulco** (Original meaning: in the big corner)	Bedspreads, ponchos, ribbons, blankets, cotton and woollen fabrics, leather briefs. Oak firewood, and others. Maize, beans and courgettes. Cattle and smaller livestock, horses, donkeys, chiken and turkeys.	Textile workers, loggers, field labourers and livestock keepers.
B	**Santa Cruz** (Previously located in El Rancho)	Wheat, maize and beans. Cattle raising.	Farm hands.
C	**San Agustín de las Cuevas** (Near some caves or tunnels in the hillside)	Oak (two types) and pine firewood and charcoal that comes from the Hacienda of San Isidro, Tala, "because what with the consumption of this produce for so long they have no wood remaining in their own lands". Just a little maize and beans. Cattle raising.	Loggers and charcoal burners.
D	**Santa Anita** (Formerly located on rough ground by a spring of white water)	Firewood and charcoal from the woods rented in Tala. Just a little maize and beans. Cattle raising.	Loggers and charcoal burners.
E	**San Sebastián el Grande** (Previously established at the foot of the hill)	Firewood and charcoal from the woods that they rent in Tala. Just a little maize and beans. Cattle raising.	Loggers and charcoal burners.
F	**Cuexcomatitlán** (Cuescomal, original meaning: place of maize store)	Cantaloupe (honeydew) melons, watermelons and chilli, from three to four types of fish, just a little maize and beans.	Orchard gardeners, fishermen.
H	**Cajititlán** (The tiny arch)	Quarried stone. Fish and other lake produce. Maize and beans. Cattle raising.	Stone masons, fishermen.
Y	**San Juan** (Commonly called Xuchitán, flowery)	Grinding stones for maize and millstones for wheat. Fish and other produce from the lake. Hard woods, mesquite crates for moving earthenware. Maize and beans.	Stone masons, fishermen, loggers.
J	**San Lucas** (Originally the settlement of the village (pueblo) of Cuyutlán)	Grinding stones for maize and millstones for grinding wheat. Fish and other lake produce. Hard wood, mesquite crates for moving earthenware. Maize and beans.	Stone masons, fishermen, loggers.
K	**San Miguel de Cuyutlán** (Previously located on the mountain range)	Fruits, wheat, maize and beans. Hard and useful woods that are sold in Guadalajara. Raising of domestic and useful animals.	Orchard gardeners, farm hands and loggers.

Source: *Mapa Topográfico de el Curato de el Pueblo de Tlaxomulco. Y sucinta historial relación, hecha con arreglam[ien]to a la instrució[n] Real, de su Mag[esta]d (que Dios guarde)*, Biblioteca Pública del Estado de Jalisco (BPEJ), Fondos especiales, ms. 50, III, 1778, 10 fs., [fs. 272-281].

woodlands, and a lagoon. We have used the map and the *Relación* to reconstruct part of the cultural and environmental history of the villages of Tlajomulco. Here we first provide an overview of the trades and products of the area, and of the special uses the inhabitants of Tlajomulco made of local produce. We then illustrate the wide diversity of plants and animals of the cultural landscape of the municipality. Table 2 lists the principal products of the ten villages of Tlajomulco, and the trades practised by their inhabitants.

The mosaic of products and trades found in Tlajomulco at the time is suggestive of a community providing for its needs by meeting those of the city. A variety of food and manufactured goods was produced in Tlajomulco. Among other things, the inhabitants grew maize, beans and wheat, raised various species of animals for their meat, grew fruit, vegetables and garden produce, and produced cotton and wool cloth. To a large extent, the fruit, garden produce, wheat and meat consumed in the city of Guadalajara were produced on the lands of the villages, haciendas and ranches of Tlajomulco. As shown in Table 2, each of the villages had its own speciality. There is no doubt that the location of each village is what determined the principal activity of its inhabitants. In the capital town, the main products were cotton and woollen fabrics, and agricultural produce. The villages situated near the Madroño mountain range (San Juan, San Lucas and Cuyutlán) exploited "hard and useful woods", which were sold in Guadalajara. The villages close to the lake (San Juan, San Lucas, Cajititlán and Cuexcomatitlán) extracted from it fish and other items, such as stone for ashlars dressed by the villagers of Cajititlán, which were then brought to Guadalajara to be used as facing for houses and other buildings.[25] In the Northeast of the municipal-

Nueva Galicia, compiled between 1777 and 1778 after Antonio de Ulloa's *Instruction*, only that of Tlajomulco is accompanied by a map; see P. Gerhard, *La frontera norte de la Nueva España*, UNAM, Mexico 1996, p. 73.

[25] J.B. Iguíniz, *Guadalajara a través de los tiempos. Relatos y descripciones de viajeros y escritores desde el siglo XVI hasta nuestros días,* I, 1586-1867, Ayuntamiento de Guadalajara, Guadalajara 1989, p. 75. M. Mota Padilla, *Historia de la conquista del reino de la Nueva Galicia*, Talleres gráficos Gallardo y Álvarez del Castillo, Guadalajara 1920.

ity, next to La Primavera forest, were four villages whose main activity was producing firewood and charcoal (Tlajomulco, San Agustín, Santa Anita and San Sebastián). On the edge of the lake, fruits and vegetables were grown; for example, the inhabitants of Cuexcomatitlán cultivated melons, watermelons and chilli "on the side of the lake" and those who lived in San Miguel de Cuyutlán lived off "many orchards of fruit trees". Other products made from raw material available on the Madroño mountain range, which supplied the local and regional markets, included portable crates (*guacales*) of mesquite wood used to transport pottery, as well as rectangular mortars (*metates*) for grinding maize and millstones for grinding wheat, all made by the villagers of San Juan and San Lucas.[26] The mortars and millstones were made of basalt, a volcanic stone described by Friar Patiño as "a blue stone, which though hard is easy to work, and lies in veins on the mountain range".

Plant and animal diversity

The *Relación* records a large variety of plants and animals in the lands of the municipality, in particular those that were more widely used and appreciated. As regards fruit trees, some were native to the area and mostly did not require cultivation, such as avocados, cherimoyas, guavas, sapota trees (*zapotes)* and prickly pears or Indian figs; then there were the fruit trees "from Castile", that is, imported species, including apricots, peaches, figs, quinces, grapes, and various kinds of citruses. The fruits of citruses ripened at different times of the year; some, like oranges, limes, green lemons, and *sidras,*[27] bore fruit all year round, while others were seasonal (see Table 3).

The trees described as "hardwood" were abundant in Tlajomulco "and most abundant" on the Madroño mountain range, which "was

[26] It is most likely that *guacales* were made for the the adjoining village of Tonalá, which specialized in the manufacture of earthenware that was distributed not only locally and regionally, but also beyond the borders both of the Intendancy of Guadalajara and of New Spain itself.

[27] These are citruses that look like grapefruits.

Table 3. Fruit trees in Tlajomulco

Fruit trees (plants) of the soil, i.e. native	Time of the year when they ripen	Fruit trees of Castile	Time of the year when they ripen
Avocados	May	Apricots	May
Cherimoyas	January	Peaches	June
Lent guavas Seasonal guavas	February August	Figs	May
Prickly pears or Indian figs (*tunas*)	August	Quinces	July
Sapota trees (*zapotes*)	May	Oranges	All the year round
Watermelons	June	Sweet limes (*limas*)	´´ ´´
Cantaloupe melons (honeydew)	June	Green limes (*limones*)	´´ ´´
Aubergines	"Ripen in the summer"	*Sidras*	´´ ´´
		Grapefruits	´´ ´´
		Grapes	June

Source: *Mapa Topográfico de el Curato de el Pueblo de Tlaxomulco. Y sucinta historial relación, hecha con arreglam[ien]to a la instrució[n] Real, de su Mag[esta]d (que Dios guarde),* Biblioteca Pública del Estado de Jalisco (BPEJ), Fondos especiales, ms. 50, III, 1778, 10 fs., [fs. 272-281].

clothed in woods of every kind". The document does not list all the different species but only those of "greatest usefulness and value", such as *palo dulce*, *tepeguaje* (a type of acacia), red and white cedar, and oaks (two main varieties). It also mentions that there was pine, but that it "is not much appreciated". The *Relación* devotes more space to the mesquite, a resinous tree "of hard wood, found not only covering the woods but even within the villages, the ranches and the haciendas". Apart from having wood that is very useful because of its hardness, it is a leguminous tree producing a fruit with edible pods "for the Indians and for children, rather than for the Spaniards and other people, which is used to fatten hogs and asses"; while "the tender shoots of this tree are good for infirmities of the eyes".

Other edible or marketable produce obtained from the woods included the roots and fruits of certain plants, such as the *jícama*, described as a "round root" (turnip shaped) that when eaten "refreshes those who have been walking in the sun" and "ripens in the

dry season". From the honeycombs and apiaries "of tame bees" the inhabitants took honey and wax for candles used for home illumination and church services. From the maguey they extracted syrup, which was fermented to make *pulque,* one of the commonest alcoholic drinks in Mexico before beer became popular.

The *Relación* also lists animals that lived on the Madroño mountain range and on other hills in Tlajomulco, including both those harmful to cattle and other livestock, such as pigs and chickens, and useful ones. The first group includes "leopards",[28] mountain cats, foxes, boars and wolves, which came down "to eat the young of the larger cattle and of the horses, even though they might be big, and sheep", coyotes, which also came down from the woods "to eat, deploying a thousand cunning tricks, the tender offspring of sheep, pigs and hens". Deer were in an intermediate position between the "harmful" animals and the "useful" ones. The *Relación* says they had a predilection for "bean fields", but because of their "utility", "the hunters" had "made them scarce". Of rabbits and hares it is said that, though regarded as food elsewhere, in Tlajomulco "they were only eaten with some reluctance". The list of animals living on the mountain range concludes with squirrels, badgers, opossums *(tlacuaches)* and skunks, which are not recognized as being of any usefulness to humans.

As regards birds, the author of the document mentions their beauty and other pleasing qualities. Tlajomulco had "wild birds of many species", but these being so well known the author restricts himself to naming those "of pleasing and gentle song" such as the ringdove, sparrow, calendar lark, blackbird, mulatto bird, cardinal, *cuitlacoche,*[29] mockingbird[30] and linnet *(jilguero)*. Birds of prey included owls, night owls, small eagles, falcons and small hawks, "which threaten the chicks of hens and turkeys". Finally the author lists the edible birds: the "turkey of the Indies" (*guajolote*), said to be "not as beautiful as

[28] Actually jaguars.

[29] The scientific name is *Toxostoma curvirostre.*

[30] Its Nahuatl name is *cenzontle* which can be translated as "four hundred voices".

the Spanish kind and not having such brightly coloured plumage", but "very tasty in stews" and more palatable than chicken, capon, cockerel, pigeon, or quail, which were "abundant in the valleys", or cranes, which were numerous in the months of December and January and were hunted "for food by all classes of people".

The author's account of the flowers, like that of the birds, concentrates on those most appreciated for their beauty, colour and perfume.[31] Among these are the *cacalosuchil*[32] and the oak orchid (*lirio de encino*).[33] Others on the list include *coquito*, *fraile*, *palo bobo*, *coralillo*, *catarina*, *floripondio* and *maravill*a, which are woodland flowers. The list of wild flowers continues with those that grow in the plains, which are also "very beautiful and having a strong scent", like those of San Juan and San Nicolás. The "most appreciated" were three: one, said to be like myrtle, which was used to dye paper blue to produce "hand-made paper flowers", which were then sold; another was a big white flower like jasmine, whose root was purchased by pharmacists and eaten by "the Indians and children", and also fed to pigs to fatten them; the third, which at the time was grown for its "usefulness", was the *azafrán rumi*, later known as "edible saffron", used to dye material "flesh-coloured". The *Relación* also mentions flowers sown in the "little gardens", all of them "of agreeable smell and beauty", such as white lily, carnation, iris and poppy.

The number of medicinal plants listed in the *Relación* is very high, bearing witness to how important they were in the lives of the villagers. Some were cultivated in the "little gardens", like chamomile, mugwort *(estafiate),* peppermint *(hierbabuena),* parsley, thyme, rosemary, dill, fennel and basil. "The most special" were *nahuapatle*, which they said was "good for curing sores of the private parts and

[31] Due to the difficulty of identifying the scientific and English names, especially of plants and flowers, largely because the same name is often used for different plants, in many cases we decided to keep the Spanish or Nahuatl name as it appears in the *Relación*.

[32] Also known as *Jacalusúchil*, it is a native plant from Mesoamerica (*Plumeria rubra L.*).

[33] Nowadays 59 species of orchids can be found in the forest of La Primavera, according to SEMARNAT, *Programa de manejo del área,* p. 12.

buboes" and *coanenepile*, "useful for measles". Other medicinal herbs included *tabardillo*, effective in curing fevers; the cancer herb, "most useful for preventing the corrosion of those infested by the contagion", royal sage, "useful for fainting fits and the vapours", *rosilla* and *inmortal,* both of which "help those who are very hot in the head to sneeze", *ciruelillo*, used "to fix teeth and molars", *acocote,* "good for a sore throat, swellings and toothache", elder, and others the author "omit[s] for lack of space".

Other plants, classified as poisonous, were gathered principally in the woodlands. They were used to purge, "to animate fantasy", or "to deprive one of one's senses", but could make people go mad or even kill them if administered without proper knowledge. For example, the *Relación* mentions the *pipizaguat,* used as a purgative by the natives, cautioning the reader that if anyone drank "more than the usual amount they would irremediably die of diarrhoea in less than twelve hours", and the *rosamaría,* whose seed, "if given in small quantities to drink cooked, animates fantasy and deprives one of one's senses, but if given to drink in much larger quantities will drive those who take it mad and kill them". Another deadly herb was *jumete,* which would cause to die of *miserere*[34] those who, "as a hoax", were given food with some of the herb spread on it – unless, of course, they were cured in time with cold maize flour custard.

The *Relación* thus illustrates the great variety of resources available in the area. The local population evidently relied on these resources to complement their diet and earn their livelihood. Some of the items were traded in the city and the neighbouring villages. The *Relación* also shows us the different uses local people made of these products. Many were edible, while others were used for healing, building, heating and cooking, and others again for colouring and dyeing paper and cloth. There were also some used for "entertainment, pleasure, jesting and malice", a testimony to the fact that traditional cultures are not necessarily restricted to living off

[34] Ileus, a painful obstruction of the intestine.

[35] C. Price, "Cultural Forest Landscapes and Ecological Imperialism", in Parrota, Agnoletti, Johann, *Cultural Heritage* cit., p. 145.

Table 4. Edible woodland produce used nowadays

Common name	Scientific name
Maguey	Agave sp.
Hillside sweet potato	Dioscórea remotiflora
Pitaya	Stenocereus queretaroensis
Nopal	Opuntia spp.
Wild bean	Phaseolus vulgaris var. Mexicanus
Guamuchil	Pithecellobium dulce
Mesquite	Prosopis levigada
Guaje	Leucaena esculenta
Talayot	Gonolobus uniflorus
Camichín	Ficus padifolia
Ahuilote	Vitex mollis
Zapote blanco	Casimiroa edulis
Jaltomate	Solanum licopersicum

Source: J.A. Machuca Núñez, "La flora y la fauna del municipio de Jocotepec, Jalisco", http://www.cyberjoco.com/wp-content/gallery/FlorayfaunadeJocotepecyalgomas.pdf (accessed March 2012).

the land at the subsistence level, but can also be sophisticated.[35] Finally, this historical record allows us to appreciate the local people's differentiated occupation of the land and their wide ranging knowledge and great skill in the management of their environment. This integrated land use management "resulted in high diversity in the forest as well as in handicraft and culture".[36] Nowadays traditional forest and agrarian knowledge still allow high levels of plant and animal diversity. A recent study carried out on the Madroño Mountain Range, but on the side of the municipality of Jocotepec, shows that

[36] E. Johann, "Traditional Forest Management Under the Influence of Science and Industry: The Story of the Alpine Cultural Landscapes", in Parrota, Agnoletti, Johann, *Cultural Heritage* cit., p. 51.

traditional agrarian practices and integrated land-use management are still widespread there.[37] Trees are used for timber, fences, posts, firewood and charcoal. Other woodland resources are exactly the same as those described in Patiño's *Relación* and are still used in the villages of Tlajomulco today. It is noteworthy that in times of scarcity or economic downturns, edible woodland produce once again becomes an important part of people's daily diet (Table 4).

This produce, besides being consumed by the locals, is a source of seasonal employment for low-income people. It includes the hillside sweet potato *(camote del cerro),* gathered from October to February, *pitayas* and *guamuchiles*, which ripen between May and June, and nopals, which are available and sold almost all the year round.

In the case of the municipality of Tlajomulco, the farther from the city people live, the more likely they are to maintain their cultural and environmental heritage. For instance, in the village of San Lucas, located at the foot of the hill, many houses still have their gardens and draw from the forest foodstuffs that are part of their daily diet, such as nopal, seasonal jicama or hillside sweet potato. While some crafts have disappeared, like weaving, which played a very important role in the economy of Tlajomulco until the 1840s, others, like the manufacture of blue-basalt mortars recorded in the *Relación*, still live on. The villagers have also not yet lost the tradition of using the woods as a place for leisure. One of our key informants, Doña Emilia, who lives in San Lucas, is in her nineties and still climbs the mountain in search of peace and quiet. She also keeps a well-supplied garden that is a living inventory of the items described in the *Relación*, including fruit trees, medicinal plants, cooking herbs, birds and flowers. One of her sons still produces basalt mortars, while another is a construction worker. Both have deep inherited traditional knowledge; for example, they can recognize birds by their song and tell when and where orchids will bloom (Figure 8).

Conclusions

Tlajomulco is situated at the heart of a rich agricultural area and is surrounded by other areas that are also rich in biodiversity. The

Figure 8. Garden in San Lucas, Tlajomulco, 2010

expansion of Metropolitan Guadalajara is cutting into productive land and encroaching upon important ecosystems. Urban sprawl in Tlajomulco is following a global trend that "threatens the very culture" of cities and the countryside.[38] Although there have been great changes in land occupation and the landscape mosaic, Tlajomulco has not yet reached the point of no return. There are still people in traditional villages who continue to practise an integrated management of their lands. They should be able carry on doing so, as long as they are not ignored by land planners.

People rooted in the area have been interacting with and looking after their environment since time immemorial, and their environ-

[37] J.A. Machuca Núñez, "La flora y la fauna del municipio de Jocotepec, Jalisco", available on the web at: http://www.cyberjoco.com/wp-content/gallery/FlorayfaunadeJocotepecyalgomas.pdf (accessed March 2012).

ment has been providing them with fruits for their nourishment, materials for their crafts, and places for their recreation. Current policies are overriding cultural values and overlooking the complementary nature of the relationship between the environment and the people who inhabit it.

We believe it is important to rescue the memory of these ancient villages as a first step towards the conservation of this environment. If a key principle of the theory of conservation and its applications is that biological and cultural diversity "are dependent on one another and occupy the same geographical area",[39] it follows that the very survival of the villages is intimately linked to the conservation of the biological and cultural diversity of the area. We are not suggesting a return to some pre-modern rural idyll of happy peasants. However, it is important to emphasize that many of the inhabitants of these small villages still live off subsistence agriculture supplemented with hunting and gathering in the woodlands. This traditional lifestyle and culture has been coexisting, in many cases, with modern economies; so far, however, it has been disregarded.

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[38] European Environmental Agency (EEA), *Urban Sprawl in Europe. The Ignored Challenge. EEA Report* 10, 2006, http://www.eea.europa.eu/publications/eea_report_2006_10 (accessed March 2012).

[39] This bio-cultural axiom defined by B. Nietschmann is quoted in Toledo, Boege *La biodiversidad, las culturas* cit., p. 168. Authors' translation.

ing up the land-cover maps of Tlajomulco, 2000-2009, which they did at the Laboratory of New Technologies, Department of Geography and Territorial Organization, University of Guadalajara. And, finally, thanks to Nicholas Barrett for his invaluable support in the translation of this article.