

C i t y a t t h e

BY JAMES MAYEUX

MONTERREY IS AN energetic city with a proud, self-made spirit. It attracts young people seeking work in the industries whose major market, the United States, lies only 130 miles to the north. With four million inhabitants, Monterrey already ranks as the third-largest city in Mexico, and its fast-growing population is predicted to double in the next ten to 15 years. New pipelines, electric towers, highways, subdivisions, industrial parks, and feed lots thrust themselves into the surrounding landscape.

The city is set in an arid valley at the foot of the Sierra Madre Oriental, a stunning range of folded and tipped limestone mountains that lies within one of the 25 most biologically diverse and endangered areas on the planet. Monterrey, hungry for land, the land it needs for housing and industry, threatens to alter the mountain ecosystems more in the next ten years than it has in the 400 years since the city's founding. The rural and wilderness areas of the Sierra Madre, though nominally protected by federal and state environmental laws, are undergoing major changes, some of which are reducing or outright destroying the habitats of indigenous plants and animals, leading to their extinction.

Scientists are only beginning to study the effects of the expanding city's adjacency to the large, fragile habitat area. Historically, the city has behaved toward the Sierra Madre with benign neglect at best and unchecked plunder at worst. The inaccessibility and poverty that once protected the Sierra Madre no longer deter the city's inhabitants, who are eager to flee the wrack and strain of urban life for the cool folds of Sierra's skirts.

ABOVE THE CITY

It has been estimated that climbing 1,000 feet is the climatic equivalent of moving 400 miles north. At the elevation of Monterrey, 1,800 feet above sea level, the landscape is desert scrub and grasses — the Coastal Plain, *matorral* in Spanish. The mountains surrounding the city, however, rise abruptly to over 6,000 feet, the climatic equivalent of moving northward nearly 2,000 miles. The vegetation responds accordingly, changing from Coastal Plain to Piedmont Scrub, then Oak Forest, Mixed Pine-Oak Forest, and finally Pine Forest at the summits. At the summits are deeply folded plates of upended limestone and shale strata, each fold rising higher than the last until the highest peaks in northern Mexico at just over 12,000 feet. West of the folds, the land dries out becoming the Altiplano, Mexico's high central plateau.

The Coastal Plain vegetation is recent, the result of overgrazing since Spanish colonial times. Early explorers found the Coastal Plain a rolling prairie with wooded stream beds and an occasional mesquite tree or group of live oaks. The Coastal Plain runs from the base of the Sierra Madre east to the Gulf of Mexico, northwest to the Balcones Escarpment, and fades out on a line between Corpus Christi and San Antonio.

In 1836, Mexican ranchers retreated to safety south of the Rio Grande after Texas independence. The cattle they abandoned thrived and multiplied in the clumps of mesquite, huizache, retama, and prickly pear, and formed the herds first worked by Anglos in the Spanish style, on horseback. The cowboy culture quickly spread up the Great Plains to Canada, but its birthplace was in the

matorral of the Coastal Plain.

The Piedmont Scrub chaparral at the base of the Sierra, around 2,000 to 2,500 feet above sea level, is made up of shrubs and small trees from 12 to 20 feet high, including anacahuita (the state flower of Nuevo León), yucca, chapote, char-rasquillo, colorín, verbena, and sage. The tough plants are able to endure extended dry spells, but in a good spring display remarkable colors and give off delicate perfumes.

The Oak Forest *bosque de encino*, from 2,000 to 4,000 feet above sea level, marks the line of greater rainfall, anywhere from 30 to 40 inches per year. (Monterrey receives only 20 inches per year.) The trees of the Oak Forest tend to legginess. Competing with each other for light, they grow without much horizontal branching, merging into a solid canopy of deep green over a hypostyle hall of black trunks. The spatial effect is haunting at any time of day, but after dusk in the early summer of certain years, fireflies emerge by the millions to create a floating carpet of light pulsing in rhythmic waves — as gentle and awe-inspiring a natural phenomenon as I have ever witnessed.

Looking more closely within the Oak Forest one begins to notice vegetation not expected in northern Mexico: dogwood, redbud, yew, ferns — vegetation familiar in the northeast United States. Moving south along the Sierra, into the state of Tamaulipas, rainfall amounts are greater — as much as six to eight feet per year — and one finds even more: magnolia, hornbeam, sweetgum, maple, and other species not seen again for many hundreds of miles, beginning in the pine forests of East Texas. These relict colonies survived in the cooler, wetter parts of the Sierra

E d g e o f t h e C l o u d s

Will Monterrey destroy the mountain wilderness that surrounds it?

The trouble with our times is that the future is not what it used to be.

— Paul Valéry



James Maynard

after the last Ice Age ended, and now are landlocked into high-altitude “islands,” microclimates created by altitude, rainfall, and indirect sunlight. They are comparable, ecologically, to the pools and puddles left behind as a lake dries out.

The Oak-Pine Forest *bosque de encino-pino* begins at around 4,000 feet, where cooler temperatures make the growth of pines possible. With greater altitude one finds more pines, until at the tallest peaks in northern Mexico, 12,000 feet above sea level, nothing remains but alpine meadows and needle-leaf trees — pine, fir, spruce — that is, vegetation you would find today in the far northern United States and southern Canada. The dwarf pine *Pinus culminicola* survives on only the three highest peaks in northeastern Mexico: La Viga, El Potosí, and La Marta. Its total habitat measures mere acres.

AN ANCIENT FOREST

The region is no stranger to massive change. In the cooler times 25 to 15 million years ago, all of Mexico, down to the Isthmus of Panama, was part of a northern temperate forest that circled the northern hemisphere below the line of glaciation. Fossil remains of *Liquidambar*, the genus that includes sweetgum, have been found in Alaska, Maryland, the Norway-Greenland sea bed, Japan, China, and central Asia. Their genetic heirs are still found in North America, Turkey, and eastern Asia. But the North American temperate forest has never been

able to leap the tropical heat of the Isthmus of Panama, and stopped abruptly there. The vegetation of the two Americas is genetically quite different.

The glaciers’ retreat repeatedly separated the temperate forests of Mexico and Central America from those of North America, with results still visible in the gene pool. Northern temperate vegetation in the U.S. shows low genetic divergence, even among far-flung plant populations, indicating that the genes have flowed freely. Some 18 to 20 glacial events during the Pleistocene epoch determined the ranges of the U.S. populations; the current range reflects a re-colonization that occurred about 10,000 years ago, as the last glaciers retreated.

The Mexican populations, and presumably the Central American populations, show greater genetic divergence, which probably reflects different climatic forces. The Mexican and Central American populations would not have been as affected by the cooler temperatures of the glacial periods, and their populations are likely to be much older. The greater divergence among them reflects gradual adaptations to unique local conditions over longer times — and isolation. The isolation that made them genetically divergent and unique also makes their numbers small, and makes their species easily disturbed or extinguished.

SCIENCE IN THE SIERRA

The first large-scale satellite-image study of the Sierra Madre was carried out last



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year at the Centro de Calidad Ambiental of the Monterrey TEC (Instituto Tecnológico y de Estudios Superiores de Monterrey). Called the *Ordenamiento Ecológico de la Sierra Madre Oriental*, the study compares satellite images from the years 1975 and 1995 for an area of about 250,000 hectares in the Sierra Madre south of Monterrey. The *Ordenamiento* shows that during those two decades, approximately 40 percent of the land area suffered changes: 57 percent by forest fire; 19 percent by forestry; 13 percent by urbanization; 6 percent in vegetation cover; 4 percent from deterioration by insect pests; and 1 percent from erosion.

That is to say, forest fire has either partially or totally destroyed nearly one quarter of the study area. Though fire caused by lightning is a natural event in the Sierra Madre, the majority of the fires are man-made. Whether willful or accidental, they are the result of greater numbers of people camping, touring, and vacationing there.

Loss of tree cover due to logging represents another 8 percent of the study area. Because rainfall is variable, slopes steep, soils thin, and regeneration slow, legal forestry cannot be considered an important, sustainable industry for the region. Illegal forestry — the theft and sale of a few hasty truckloads of timber — reflects rural poverty and the difficulties of monitoring human activity in remote places. The TEC study points dramatically to a problem central to the fate of the Sierra: how to replace a legitimate but ecologically

undesirable industry with a viable one.

Another 5 percent of the land-use change comes from urbanization and agricultural development. Urbanization includes new road cuts and buildings, often on steep, wooded sites where land values are lowest and views are best. Weekend farmers commonly clear the native vegetation on steeper slopes to replace it with orchards — and are dismayed to see their soil rush downhill in the first torrential rain. Ironically, the technical difficulties of urbanizing remote sites often destroy the very qualities that attracted homebuilders in the first place.

The *Ordenamiento* recommends protective measures for ecological and agricultural resources. New development should take place only:

- within 500 meters of existing paved roads, and 200 meters of existing unpaved roads
- on slopes of 20 percent grade or less
- outside prime agricultural land
- outside a 20-meter buffer on either side of waterways, including dry washes
- outside habitats of endangered plant and animal species, or of species unique to a area
- at least 500 meters from natural springs and bat- and parrot-roosting sites.

Within the study area, approximately 24,000 hectares (60,000 acres) meet those conditions — about 1 percent of the total study area. Densities of resort residential developments in the area range

from 0.2 houses per hectare to three houses per hectare. Though the *Ordenamiento* does not recommend densities, if only those lands it identifies as ecologically safe are developed, 25,000 to 50,000 new houses could be built in coming years. The environmental impact of that many new dwellings has not been modeled, but would include new road and utilities infrastructure, construction activities, and almost certainly human activity extending beyond the bounds of the approved housing sites.

A comprehensive plan for the Sierra Madre would seek to balance ecologic, economic, and social forces for the entire region — both the city and Sierra. The human flight to the city for opportunity and the flight away from it for relief are linked and should be studied together. The TEC study and others by the Universidad Autónoma de Nuevo León mark the first steps in that direction: We are beginning to know the Sierra scientifically.

The *Ordenamiento* is an invaluable basis for further planning for the Sierra — planning that would include community participation, economic modeling, and consideration of visual resources, such as views. Such plans would require the long-term support of state and local governments, academia, and extra-national environmental groups. One fact emerges clearly from the TEC study: Though in the imagination of most city dwellers the Sierra Madre is a largely unspoiled “wild” area, untouched by the city of Monterrey, the reality is that as the city

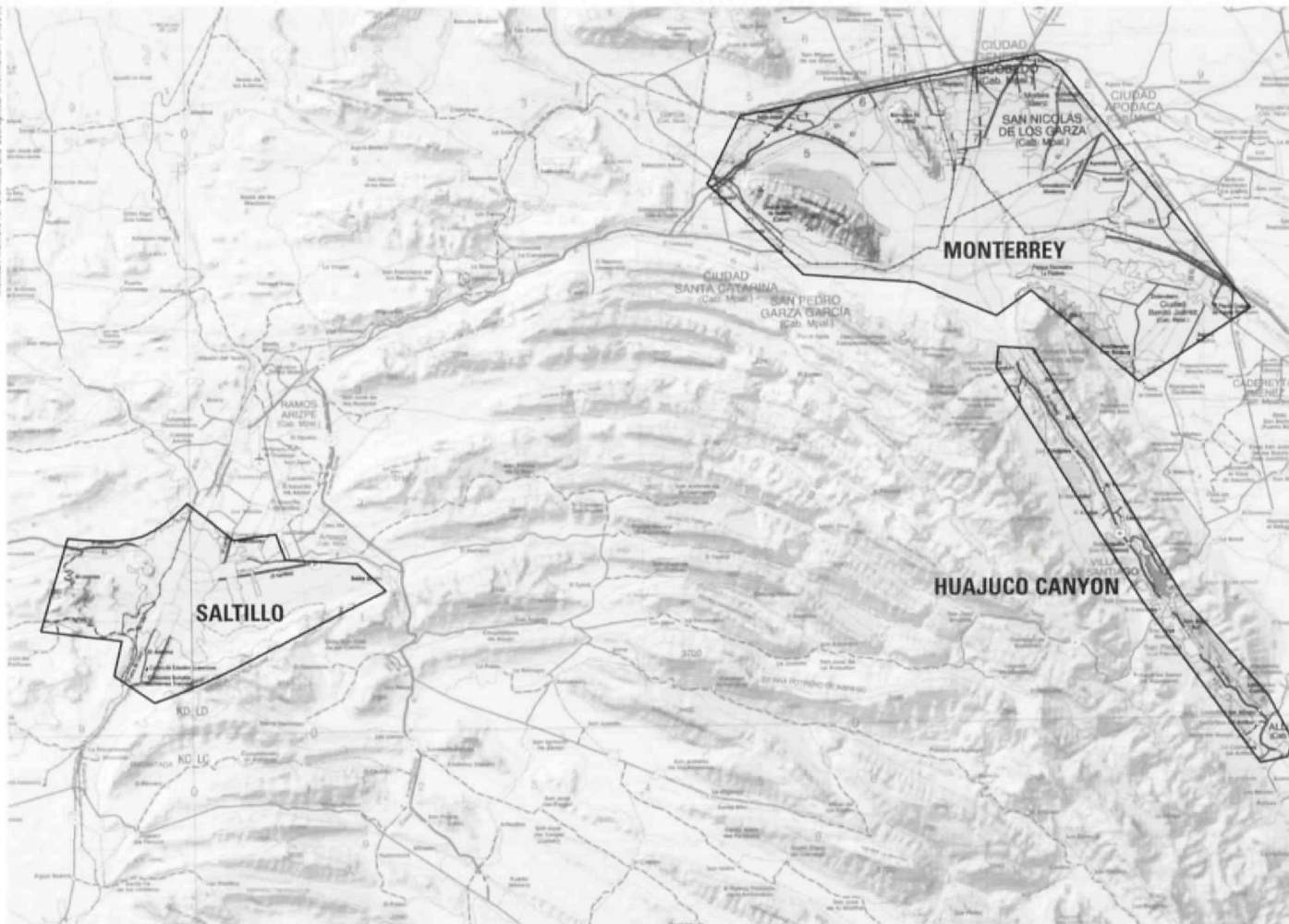
has become a difficult place for people to live, it has changed the Sierra, mostly in unstudied, accidental, undesirable ways.

WHICH NATURE?

Ann Whiston Spirn, in her essay “The Authority of Nature: Conflict and Confusion in Landscape,” writes that since classical times we have conceived of “first” and “second” nature.

First represents a nature unaltered by human labor. Cicero defined second nature thus: “We sow corn, we plant trees, we fertilize the soil by irrigation, we confine the rivers and straighten or divert their courses. In short, by means of our hands we try to create as it were a second nature within the natural world.” John Dixon Hunt has written that gardens have been called a “third nature,” a self-conscious re-presentation of first and second natures, and artful interpretation “of a specific place... for specific people.”

By that definition, Man-the-Builder is forever condemned to work in second or third nature, forever banished from the original garden. The making of gardens, then, which symbolize paradise and consciously represent the first lost nature and the second man-made nature in its most delightful, personal, and expressive forms, seems a logical art form. It is a way of regaining some of the harmony with nature we lost when Adam bit the apple. As Joachim Wolschke-Bulmahn tells us, “Nature is ideology... is a (more-or-less) systematic scheme of ideas, held by particular social, political, cultural,



Cities and mountains: Topographic map showing Monterrey and Saltillo.

and other groups. Without human beings on earth, the idea of nature would not exist at all." For us, as for Adam, the apple is knowledge. We now know what we do.

The biologists who see the deterioration of the Sierra Madre and decry its impending development tend to be passionate and open with their low regard for human activity. They invoke science and ecology with the weight of religious dogma. Since they are generally frustrated and angered by what they see happening, and often do not express themselves in terms that most people can understand, they do not provide the kind of charismatic public leadership that would best serve their ends.

Developers, on the other hand, offer a simple deal: "For a reasonable amount of money, you can own all the peace and quiet and beauty the mountains can offer." They aim to please, but ironically, since few of them are either trained environmental professionals or acute observers of life in the mountains, they tend to destroy the very qualities they sell in the act of making them accessible to their clients. The destruction occurs in several ways. Part of the rural land's appeal was its lack of man-made structures, including roads. But development, of course, creates those structures.

The developers who build Swiss chalets in the Sierra plant an unfortunate idea: that the place's value lies in its resemblance to the Alps. Lacking knowledge of the unique biological value of the

Sierra, they make the strangeness of it familiar by reference to other known places — Switzerland or Colorado — missing the opportunity to cultivate a unique *genius loci* in the public mind.

Last, because the mountains are developed in the same way as the city (with lots, car spaces, and yards), owners soon plant grass, mow lawns, and drive just as they do in the city. This behavior reflects a fundamental rift in people's idea of "man-made" and "natural": "man-made" is to live in, and "natural" is to look at. Since "natural" is mute and of indeterminate economic value, "man-made" usually wins when one must choose between them.

A GARDEN

It seems to me that what distinguishes third nature from the first two is the degree of consciousness we bring to it. Our ideas are tools with which we fashion the tools to change our world. If nature is a human intellectual construct, then the more conscious we are of it, the more powerful it grows as a construct, and the more powerful will be the tools it creates. The questions Ann Spirn raises — "whether humans are outside or inside nature, whether human impact is inevitably destructive or potentially beneficial, whether one can know an objective nature apart from human values" — are questions that we must begin to address. It's difficult even to define the word "nature." Spirn notes, "A.O. Lovejoy identified 66 different senses of the words

nature and natural as used in literature and philosophy from the ancient Greeks to the 18th century.... At first the abstraction of the word nature conceals differences. Then when arguments inevitably ensue, it befuddles and confounds."

Spirn ends her essay with an optimistic observation: Gardens provide hope. She writes: "Gardens have been a medium for working out fresh ideas and forms of human habitation, and they are particularly fertile ground for exploring relationships between the human and nonhuman. In the garden there is a recognition of constructedness and an attitude of beneficial management, as well as an acknowledgement that certain nonhuman phenomena are beyond human control. Gardens are never entirely predictable; one cultivates a garden with an acknowledgement of unforeseen circumstances. Nature may be constructed, but it is not only a construct.... Any approach to landscape design based on the notion that nature is singular or its meaning universal or eternal is sure to founder. The emphasis should be on a spirit of inquiry and exploration rather than close-minded certainty. Emotional rhetoric and doctrinaire positions will not advance this agenda, but rather a more reasoned, self-critical, inclusive approach which acknowledges the plurality of human values and motives embedded in ideas of nature and authority."

Having bitten the apple of knowledge, we change the way we see nature in the Sierra — and in the city. We cannot

reasonably continue to see the Sierra as "the other," the wild, unspoiled nature apart from the city. That first nature exists now only in the imagination. We must question the wisdom of seeing the Sierra as second nature, a region of manageable engineering projects, for we run the risk of losing the strangeness and complexity of the place by defining problems too simply, and are no closer to bringing that "other" into our city lives. Perhaps the idea of third nature, where we consciously explore the idea of the Sierra as a wild garden, can guide us. By seeing the city and the Sierra as one — our home and our wild garden, each one better for the other — maybe we can learn to manage our household while properly valuing what is unpredictable and complex beyond our control. ■

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The data relating to changes in the landscape were taken from the Ordenamiento Ecológico de la Sierra Madre Oriental, produced by the Instituto Tecnológico y de Estudios Superiores de Monterrey in March 2000.