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## Perspectives

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## Mexico's Environmental Revolutions<sup>1</sup>

Mexico's social revolution of 1910 had far-reaching consequences for the nation's natural environment. Among the most important was its creation of a major agrarian reform that delivered nearly half of all agricultural land—and 60% of forestlands—to rural communities whose residents used the landscape in a very different way from the large estates (*haciendas*) that preceded them. Yet the revolution of 1910 was not the only one to transform the environment between 1850 and the present day: in addition, we must consider the liberal political revolution that erupted in 1854 and the Green Revolution that began in 1943. Each of these revolutions left ecological and political footprints that influenced the subsequent one. Nineteenth-century liberalism cemented the hegemony of private property, opened new investment opportunities, and in the long run promoted the commodification of natural resources. It culminated with the 1876–1911 administration of Porfirio Díaz, which promoted a regime of neo-colonial extractivism characterized by making minerals, water resources, forests, and petroleum available for the virtually unbridled use of foreign investors and corporations. The social revolution of 1910 was, in part, a reaction to this situation. It reorganized land tenure and created the possibility for new social uses of the nation's territory, although revolutionaries never contemplated the elimination of private property or an alternative to the intensive use of natural resources. The Green Revolution ushered in a new phase of intensive use of natural resources, yet it never lived up to the goal of enhancing the productivity of peasant agriculture. In the end, it favored commercial production and the unsustainable use of natural resources.

Mexico's vast expanse of ocean and great geographic diversity contribute to making it one of only 17 countries worldwide classified as ecologically “megadiverse.” Its biocultural mosaic is made all the more complex by two parallel mountain ranges that extend from the arid north to the humid south: the Sierra Madre Oriental and Occidental are home to nearly seven million indigenous people, many of whom retain their ancestral language, dress, worldview, and attitudes toward nature. Most of the nation's population resides in the central region, and particularly in the transverse volcanic mountain chain that courses from Veracruz in the east to Colima to the west, passing through Mexico City (the nation's capital since colonial times). Two large peninsulas extend from each end of the country: the Yucatan to the southeast and Baja California in the northwest, as shown on the map.

1 English translation by Shawn Van Ausdal.

**Figure 1:** Major Biomes of Mexico. Source: Simplified map based on Anthony Challenger, *Utilización y conservación de los ecosistemas terrestres de México. Pasado, presente y futuro.* México: UNAM/CNCUB, 1998. Figure 6.2 (p. 278) and 63. (p. 280). Cartography by Paola Luna.



The liberal revolution that Benito Juárez and Ignacio Comonfort, among others, unleashed in 1854 culminated with the so-called “Reform” of 1855 to 1857. The liberals intended to put an end to forty years of political instability, military misadventures, economic decline, and social unrest that had undermined the nation’s economy. Yet post-independence turmoil also created a respite from the intensive use of natural resources that characterized the final decades of the colonial era, particularly in the mining sector. The liberal political revolution of the 1850s was consolidated with the Diaz administration of 1876–1910, a period known as the *Porfiriato*. This prolonged period of authoritarian stability set the stage for rapid economic development based on foreign investment (especially American) in mining, manufacturing, agriculture, railways, and other infrastructure, as well as finance. Thousands of rural communities lost their land to haciendas and other private property owners as a result of laws that ordered the privatization of communal property. Commercial agriculture expanded dramatically, as did forestry, mining, and petroleum. In sum, Porfirian liberalism set the stage for the exploitation of nature on an unprecedented scale, and was very much at odds with the peasant production practices that struggled to survive in the new, unfavorable context (see Figure 2).

Railways constituted the backbone of Porfirian development. They expanded at an impressive rate between 1875, when the nation had 650 kilometers of track, and 1910, when they had extended to 25,000 kilometers. Half of these rail lines belonged to American companies, and fully 80 percent of all investment in Mexican railways were derived from US stockholders. The railroads were primarily built to transport minerals to North American industries. The pace of railroad construction threatened indigenous lands, as speculators snapped up property wherever they thought the lines might travel. Immense quantities of wood were needed for railroad ties, fuel for steam engines, and for construction. Commercial logging on this scale commodified the forests throughout the country, particularly in the north. Mining in northern Mexico boomed thanks to this transportation revolution. Dozens of mines were established in the copper borderlands. New settlements appeared in the sparsely populated north, along with a growing demand for electricity in the cities and mines.



**Figure 2:** Sumner W. Matteson, "Corn Patches Fringed with Maquey [sic]," Toluca, 1907. Note the use of maguey plants to mark the boundaries of peasant cornfields (milpas) and to minimize the potential for erosion. The city of Toluca can be seen in the background. Courtesy of Milwaukee Public Museum, Sumner W. Matteson Collection, Catalog No. SWM1-D179.

Commercial agriculture likewise expanded during the Porfiriato, bringing with it an increased demand for water. In the state of Morelos, for example, sugar plantations received water concessions to the Higuera River that, if exercised, would have accounted for over 100 percent of its flow! Some haciendas in central Mexico became proto-agribusinesses that invested in pumps and irrigation works that in some instances drained marshes upon which indigenous people depended for their livelihoods. Almost everywhere, age-old arrangements about the division of water between haciendas and villages broke down, accentuating the social tensions that exploded during the revolution of 1910. The compulsion to control water was even felt in Mexico City, where

a decade-long project to build an elaborate drainage canal to the Valley of Mezquital eventually succeeded in draining Lake Texcoco. This triumph of nineteenth-century engineering nevertheless failed in its primary goal of putting an end to seasonal flooding in the nation's capital; instead, it aggravated water shortages and encouraged so much pumping from the aquifer that some of the city's most iconic structures began to subside in the twentieth century (Vitz 2012).

Mexican intellectuals recognized the threats posed by the dispossession and privatization of natural resources. Biologists, engineers, and agronomists formed scientific societies to discuss their ecological effects. Perhaps the most distinguished was Miguel Ángel de Quevedo, a hydraulic engineer known as the "Apostle of the Tree" for his opposition to deforestation and its impact on urban public health. The alarm sounded by these scientific communities led to the creation of a national forest service, a forestry school, and conservationist legislation that prefigured the rise of twentieth-century ecological thought. The over-intensive use of resources also worried some entrepreneurs who recognized that their own livelihoods would suffer from environmental degradation. In the Gulf of California, for example, one far-sighted businessman invented a technique to artificially culture pearls and pearl nacre; it became the world's first experiment in sustainable pearl aquaculture (Cariño y Monteforte 1999).

The effects of the liberal revolution, particularly the commodification of nature and privatization of indigenous commons, had severe social consequences that contributed to the outbreak of the 1910 revolution. A decade of warfare and displacement reduced the population by 6.6 percent, or one million people. Post-revolutionary regimes strove to fulfill the "revolutionary promises" embodied in the 1917 constitution, including land reform, the management of natural resources by experts, and the nationalization of sub-soil reserves of oil and minerals. The redistribution of land began as early as 1915, but it rapidly expanded during the presidency of Lázaro Cárdenas (1934–40), whose administration granted 18 million hectares to rural communities. Cárdenas pushed through conservationist legislation and established institutions dedicated to resource management. He nationalized strategic industries such as petroleum extraction, which had been controlled by North American and British corporations since the first decades of the twentieth century. The industry at that point was centered in the Huasteca region of Veracruz, where foreign corporations built small industrial encampments for their workers adjacent to the oil fields. While North American managers lived in relative se-

curity, Mexican workers received the most dangerous, poorly paid, and unhealthy jobs (Santiago 2006). The petroleum companies refused to address these issues even after a major strike in the mid-1930s. In response to this intransigence, Cárdenas expropriated the petroleum industry on 18 March 1936. Henceforth, Mexican bureaucrats and union leaders governed the extraction of oil.

Post-revolutionary land reform also changed the way land was used in Mexico. In the states of Morelos, Yucatán, and Durango, for example, the commercial and oftentimes intensive use of the land ceded to small-scale peasant agriculture. Land reform also included territory that indigenous people had lost in forests, deserts, and jungles, some of which now became biocultural reserves. Some experts objected to redistributing delicate ecosystems to the rural poor, however. These concerns helped to inspire the 1926 Forest Code, which required all logging in land-reform communities (*ejidos*) be carried out by producers' cooperatives, subject to oversight by the national forest service. These rules were ignored until the Cárdenas administration, which created an independent cabinet-level Department of Forestry headed by Quevedo. Prior to 1935, there were only six cooperatives in the entire nation; in the following five years, 860 more were created, accounting for nearly two-thirds of woodland *ejidos*. The cooperatives encountered a number of difficulties but nevertheless represented one of the world's first experiments in community forestry.

Cárdenas was the first president to emphasize natural resource conservation. His administration established the majority of the nation's national parks and undertook scientific research in Lake Pátzcuaro and the Pacific Ocean with the objective of making fisheries more sustainable. His administration launched an impressive number of infrastructure projects (including roads, electric lines, and water projects), most of which targeted the countryside. In essence, the administration sought to organize society and the landscape mutually, in a way that made each dependent on the other (Boyer and Wakild 2012). Unfortunately, this holistic vision of development confronted a third revolution soon after its appearance: the so-called Green revolution that applied cutting-edge technology to peasant agriculture but ended up favoring commercial and increasingly industrial use of the land.

The modernization of the Mexican countryside in the second half of the twentieth century led to the permanent conversion of forests to an increasingly industrialized form

of agriculture. Mechanized farming and irrigation grew rapidly in the river valleys of the northeast, including the Yaqui Valley of Sonora. This ancestral land of indigenous people and (more recently) a US land colonization company was home to the Green Revolution in 1943 and soon became one of the nation's richest agricultural zones. New varieties of corn and, later, wheat were explored; some grew rapidly thanks to irrigation and the application of synthetic fertilizers and pesticides. In the 1950s, these productive technologies were exported to India and the rest of the world. Other experiments in resource-intensive development soon followed, most importantly the so-called River Commissions established in the Papaloapan, Balsas, Fuerte, Grijalva, Pánunco, and Lerma/Chapala Watersheds that built dams, irrigation districts, and transportation networks. The commissions also funded public health and educational services. Despite their populist aura, they put water and land at the disposition of private corporations that ignored the needs of peasant producers. The spirit of "developmentalism" encouraged the federal government to make concessions of forestlands and other natural resources to private interests as well.

The state-owned petroleum company, PEMEX, also grew rapidly in the mid-twentieth century. Although it looked after the economic wellbeing of its workers (and administrators), it took much less heed of the environment. Inept management and inadequate investment in technology are to blame for an abysmal environmental record that includes the Ixtoc I oil spill in the Gulf of Mexico, which harmed human and nonhuman habitats.

The Green Revolution's model of economic development was transformed, beginning in 1980, by neoliberal policies. Mexican producers were exposed virtually overnight to the global economy, with devastating environmental and social consequences. Neoliberalism ignited an intense competition between domestic interests and international corporations over the use of natural resources such as minerals, beaches, and sources of hydro-electricity. Mexico's strategic location directly south of the United States has facilitated economic linkages via ports and railroads, but also illegal activities such as narco-trafficking. Thousands of acres of forests and former croplands are now used for marijuana and opium poppy production, at great cost to the environment and to rural people's personal security.

None of Mexico's revolutions—whether political, social, or agricultural—completely effaced its predecessors. Indeed, they often set the stage for a subsequent revolution. The advocates of the Green Revolution confronted a social panorama that included land-reform beneficiaries, rural workers, and indigenous people who benefited from the social revolution of 1910, for example. Today, these same groups form the leading edge of a far-flung environmental movement that harks back to indigenous communal traditions. The consequences of generations' worth of social struggle over natural resources are manifested today in federal environmental legislation, scientific traditions, and the expansion of civil society. Many Mexicans today seek to renew the bond with their landscape and biocultural heritage (Toledo 2003). Perhaps a new environmental revolution is beginning to take form.

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