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## Deluges of Grandeur: Water, Territory, and Power on Northwest Mexico's Río Mayo, 1880-1910

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**ABSTRACT:** Northwest Mexico's irrigation landscape, known today as *El Distrito de Riego 038*, or *El Valle del Mayo*, issues from historical struggles to build an official order out of a diverse world of signs, symbols, processes, places, and peoples. It is the ancestral home of the Yoreme (Mayo), an indigenous group for whom colonisation and agricultural development have meant the loss of autonomy and of the seasonal mobility required to subsist in an arid land. It is also the birthplace of President Álvaro Obregón, a one-time chickpea farmer who transformed late-19th century irrigation praxis into the laws and institutions of 20th century water management. Reshaping territory for the ends of centralising ('federalising') water resources has always proved exceedingly difficult in the Mayo. But this was particularly so in the beginning of the federalisation process, a time of aggressive modernisation under the direction of President Porfirio Díaz (1876-1910). Research on Mexican hydraulic politics and policy, with some important exceptions, has tended to focus on the scale and scope of centralisation. Scholars have paid less attention to the moments and places where water escapes officials' otherwise ironclad grasp. This paper explores water governance (and state formation more broadly) in the late 19th century, on the eve of Mexico's 1910 Revolution, as an ongoing, ever-inchoate series of territorial claims and projects. Understanding the weaknesses and incompleteness of such projects offers critical insight into post-revolutionary and/or contemporary hydraulic politics.

**KEYWORDS:** Water governance, territoriality, political geography, state formation, Porfiriato, landscape, power, Mexico

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*In landscape, representation and reality fuse when a tree, path, or gate is invested with larger significance.*

Ann Spirn (1998)

### INTRODUCTION

Northwest Mexico's irrigation landscape known today as *El Distrito de Riego 038*, or *El Valle del Mayo*, issues from historical struggles to build an official order out of a diverse world of signs, symbols, processes, places, and peoples. The lower Río Mayo basin lies in the southwest corner of Sonora state, about an hour north of the Sinaloa border by car. Where forests of organ pipe cactus and coastal desert thorn scrub once stood in superabundance, now lies a fragmented geography of canals, parcels, pueblos, and roads. Only a few, disconnected patches of thorn scrub remain. This is the ancestral home of the Yoreme (Mayo), an indigenous group for whom colonisation and agricultural development have meant the loss of autonomy and of the seasonal mobility required to subsist in an arid land. Entwined with this process was the federalisation of the Mayo river and basin – a surface area of about 11,000 square kilometres. Here, I explore early moments in the ongoing bid to conjure and control a federal hydraulic territory. The paper opens in the 1880s, with military efforts to survey, distribute, and settle land, and closes around 1910, when widespread disenchantment with the regime of President Porfirio

Díaz had many Mexicans, including Yoremes, contemplating revolt. The Mayo valley is a singularly important point at which to trace the roots of contemporary hydraulic governance. There, in the earliest articulations between export crop production and programmes to represent and recreate national territory, many of the bases for a modern, irrigated Mexico were worked out. It is the birthplace of President Álvaro Obregón, a one-time chickpea farmer who, along with his successor, Plutarco Elías Calles, strove to turn pre-revolutionary irrigation praxis into the laws and institutions of post-revolutionary water management (Aboites, 1998). The following, then, is part 'thick description' (Geertz, 1973) of those pre-revolutionary modalities of water control, hydraulic politics and development, and part 'thin description' (Marcus, 1998) of their extensive articulations and tensions with resource centralisation more broadly. I end the paper with a comment on continuities between the past and the present context of neo-liberal reforms to decentralise water resources management.

Reshaping territory for the ends of centralising water-resources has always proved exceedingly difficult in the Mayo, but this was particularly so in the beginning of the federalisation process. For Yoremes, the rhythms of daily life had their own well-worn patterns, revolving around cycles of flood and drought constantly affecting the region. Southern Sonora is a bull's-eye for Pacific coast cyclones that make their way north, from central and southern Mexico during late fall and winter (Blake, 1935). The articulation of extreme climatic variability, historical subsistence practices, and modern waterworks often chafed against efforts to create a durable federal hegemony. My analysis focuses on the implications of this tension for state formation in the early modern period, and is loosely informed by two theoretical trends. Pierre Bourdieu's work on 'symbolic capital' informs the first. Symbolic capital refers to certain properties (physical, social, cultural, etc) that 'social agents' reflexively recognise, value, and/or identify with. Recognition depends upon particular 'categories of perception', which, in turn, are based on binary notions of difference or opposition – e.g. developed/undeveloped, cultured/uncultured, modern/backward, etc. Modern statecraft, argues Bourdieu (1998), operates in part as a force for inculcating these so-called "durable principles of vision and division". The grand cartographic and land-distribution schemes of 19th century Mexico constituted the beginning of a federal apparatus for crafting and diffusing such principles and practices of vision. Through them, the irrigation landscape would take on certain elements of the Cartesian geometric rigidity seen in mapmakers' renderings. Similarly, the modern subject-categories authorising official intervention in lives and landscapes produced lasting, if complicated, effects. Contemporary water policy is at once a means for engaging with and burying these effects. Today's 'water-user', for example, masks uneven access and inequality just as yesterday's 'smallholder-farmer' cloaked power relations that sustained land and water monopoly. The rigidity of the modern categories and principles of division also stood in contrast to the territorial practices that had come before, practices based on constant adjustment to changing river dynamics. And here Bourdieu's lens loses focus. How are we to grasp the relationship between those modern principles of vision, the actual functioning of emerging hydraulic bureaucracy, and the defiant plasticity of human social relations?

For this second axis of inquiry I turn to Gilles Deleuze and Félix Guattari (1987), who argue for a spatial analytic of statecraft sensitive to *both* the forces and flows it contains and what escapes it. As a set of values, visions, and territorial practices, 'modernity' required distance from the primitive world that preceded it. Yet, modern agricultural production would never have survived during those early years were it not for the *genius loci* of those who came from that less-than modern world. Water governance was (arguably, has always been) characterised as much by what escaped the experts' grasp as by what the experts could capture. Loyalties and alliances were in constant flux, as floods – and, to some degree, droughts – consistently sped up the pace of social and political change. Being a good state subject might at one moment articulate quite seamlessly with expectations of landowners and/or shareholders of the new irrigation companies forming on the Río Mayo. In the next, these two positions could be completely at odds. I approach 'the state' here as an effect of ongoing and often rather routine human-territorial projects and practices (Mitchell, 1999; Painter, 2006). The result is an accounting of

Porfirian<sup>1</sup> state formation as a set of frequently unstable national-territorial projects to recalibrate political loyalties towards a central point, towards Mexico City and an emergent hydraulic bureaucracy. Paradoxically, the fullest expression of this project, of the creation of willing 'hydraulic subjects', would not be achieved until some years after the Mexican Revolution (Almada, 1993; Banister, 2010).

### NEW 'PRINCIPLES OF VISION': VIOLENCE, CARTOGRAPHY, AND LAND REFORM

The Río Mayo ranges 350 kilometres from its headwaters in Chihuahua state to the gently sloping coastal plain of southern Sonora. As it wends its way from the Sierra Madre to the sea the river cuts through diverse ecotones ranging from cool pine/oak woodlands and drought-deciduous forests, to desert coastal thorn scrub of columnar cacti and mesquite *bosques*. It finally drains into mangrove-lined estuaries on the Sea of Cortéz, now heavily laden with agrochemicals and untreated waste.<sup>2</sup> Annual rainfall averages of 1,000 mm in the Sierra Madre plummet to a mere 277 mm on the Sonoran coast. Most of this precipitation comes during summer, but fall and winter cyclones may also bring soaking rains known regionally as *equipatas*, which can produce severe flooding. Since impoundment in the mid-1950s, median annual river-flow is calculated at around 875 million m<sup>3</sup> (Mm<sup>3</sup>), at times reaching well over 2000 Mm<sup>3</sup> (especially during heavy winter rains), or dropping below 500 Mm<sup>3</sup>. The district's 95,000 or so irrigable hectares bring together around 11,000 water users. Agrarian-reform *ejidos*, most created following the 1910 Revolution, today control roughly 70% of this irrigated landmass, at least on paper. Private-holders own and/or rent the remaining 30%. Of these 11,000 registered water users only about 3500 actually produce in a given year. Interviews with district officials, large landowners, and *ejidatarios*, along with data from harvest permits and water rights, suggest that producers controlling more than 100 ha and, in some cases, well in excess of 1000, largely dominate the politics of water rights in the valley. Given the Mayo's extreme variability, hydraulic politics often involves crises and chaos.<sup>3</sup> Most critical to the discussion here, many of these contemporary agricultural interests are part of the original family dynasties that benefitted from the 19th century enclosure and privatisation of lands.<sup>4</sup>

The roots of current disparity thus cut deeply into the region's historical firmament (Almada, 1993; Hewitt, 1988; Sanderson, 1981). The *centrally* coordinated push to enclose land and colonise Sonora's southern valleys (the much larger Yaqui Valley lies just to the north) began largely in the 1880s. At the direction of President Díaz, the Mexican government had ratcheted up the previously laggard pace of

<sup>1</sup> The term 'Porfirian' refers to a kind of modern cultural and political zeitgeist that took hold of Mexico the three or so decades (1876-1911) that General Porfirio Díaz, either directly or indirectly (through political puppetry and other devices), controlled the presidency. The period is commonly referred to as the 'Porfiriato'

<sup>2</sup> There is almost no wastewater treatment for the three *municipios* in the Mayo Valley. This is, arguably, the most pressing environmental challenge facing the region, and Mexico more broadly (field notes, 2007).

<sup>3</sup> It has always been difficult to gather hard data on land tenure in the valley because, since the Revolution and restrictions on irrigated landholdings (limited to 100 hectares), landowners either illegally rented from *ejidos* (see note 3), or used the names of family members to disguise large holdings (see Hewitt, 1988; Sanderson, 1981). Renting is no longer illegal but often involves a verbal contract or other informal arrangement. We can thus only approximate the distribution based on data and interviews. According to the Sociedad de Responsabilidad Limitada del Río Mayo (SRLRM), and calculations made by Caballero (2007: 43-45), the water-user 'Society' that now controls the irrigation network, by 2007 on average around 30% (about 3500) of registered water users farmed their land. The remaining 70%, comprising about 43,000 hectares, come largely from the *ejido*-minifundio sector, hold fifteen hectares or less, and generally do not have the means to produce. They thus rent out their parcels and water rights. Caballero (2007) triangulated harvest permits from the Ministry of Agriculture and data on water rights from the National Water Commission, finding that producers with holdings larger than 100 hectares in 2006 controlled around 38,000 hectares. The politics of distribution largely moves along the lines of interpersonal relations, with conflict occasionally flaring up in larger, more public ways, often depending upon the Río Mayo's flow (see Banister, 2010).

<sup>4</sup> *Ejidos* are agrarian-reform communities created after the Revolution. Most valley *ejidos* were formed during the Presidency of Lázaro Cárdenas del Río (1934-1940), and were carved from large landholdings created during the late nineteenth century. Data on water flow are from the SRLRM (2007). Interviews were conducted in 2007, and supported by observations I made four years living and working in southern Sonora. During these years, I got to know several *ejidatarios* and agrarian activists who had experienced a second wave of agrarian reform in the mid-to-late 1970s.

exploration and settlement (internal colonisation) across the nation, and in particular in the coastal northwest. As in Chiapas state (southern Mexico), in Sonora "Liberal rule and the local logics of landed production" (Bobrow-Strain, 2007) began to articulate in ways that would lay the bases for 20th century development and resource politics. One must keep in mind, however, that while some elements of Porfirian "principles of vision and division" would prove durable – e.g. the privatisation and hyper-fragmentation of land – they have never been expressed in obvious or straightforward ways.

By 1887, troops, military cartographers, and landowners began pouring into the valley under the auspices of a campaign to parcelize and grant title to Indian lands. Colonel Agustín Díaz, Head of Mexico's Geographical-Exploratory Commission (CGE) and its offshoot, the Sonoran Scientific Commission (CCS), believed that "true geography could be realised only when [a national] cartography had been concluded".<sup>5</sup> It was a revealing assertion, for military maps were integral to transforming rather than merely interpreting or representing national territory (Craib, 2004). In southern Sonora, cartographers worked to create a simulacrum of land titles and private ownership in a region where boundaries had been marked by fluid practices: walking and gathering, planting and hunting, and in song (Radding, 1997). The new vision, by contrast, would have this kinetic form of territoriality papered over with fixed small plots and rigid grid-work of fields and canals. Together, Yaquis and Mayos fiercely resisted, waging guerrilla warfare for over a decade. But federal troops' superior firepower and numbers ultimately won out and, at least in the Mayo Valley, by 1890 the bonfire of Indian resistance had been reduced to but a few scatterings of embers (Almada, 1993; O'Connor, 1989; Spicer, 1992).

Surveyors and private landowners could now begin terraforming a modern irrigation space. In a few areas, what were otherwise loose agglomerations of Yoreme dwellings, on federal maps now became new agricultural colonies: Etchojoa, Cohuirimpo, San Pedro, and Santa Cruz de Huatabampo (see map below).<sup>6</sup> These *colonias* comprised large polygons of 7,597 ha, subdivided into 'zones' of 303 ha (25 per colonia). Each zone contained 100 plots of just over 3 ha. The CCS required Indian 'heads of family' to register in order to receive a small plot.<sup>7</sup> In other words, the valley's historical inhabitants had become 'colonists' in their own land. Jesuits had attempted a similar reconstruction of people and territory less than two centuries before. By contrast, non-Indian colonists received lands purportedly for "the benefits they produce... the services they provide, [and] the industries they establish".<sup>8</sup> The latter tended to be connected in one way or another to the regional silver-mining elite also dating to the colonial period (Almada, 1993; Ruíz, 1988). Maps published in 1888 thus contain several large *sociedades agrícolas* (agricultural societies) bearing the names of regional elites; they are islands in a sea of tiny subsistence-plot squares.

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<sup>5</sup> [www.inegi.gob.mx/prod\\_serv/contenidos/espanol/bvinegi/productos/integracion/especiales/infogeo/geo1w.pdf](http://www.inegi.gob.mx/prod_serv/contenidos/espanol/bvinegi/productos/integracion/especiales/infogeo/geo1w.pdf) (pp. 6-7)

<sup>6</sup> These population centres were derived from some of the original Jesuit mission towns. They form the basis of what are now the Valley's three municipal seats, Huatabampo, Etchojoa, and Navojoa, with a total population of around 300,000 (INEGI, 2005).

<sup>7</sup> Memoria que el Secretario de Estado y del Despacho de Guerra y Marina Presenta al Congreso de la Unión y Comprende de 1o de Julio de 1886 a 30 de Junio de 1890. Documento número 9. Informe Rendido por el Ingeniero Agustín Díaz, el 30 de Septiembre de 1887, pp. 61 and 71. Hereafter, Doc. 9.

<sup>8</sup> Doc. 9, p.65.

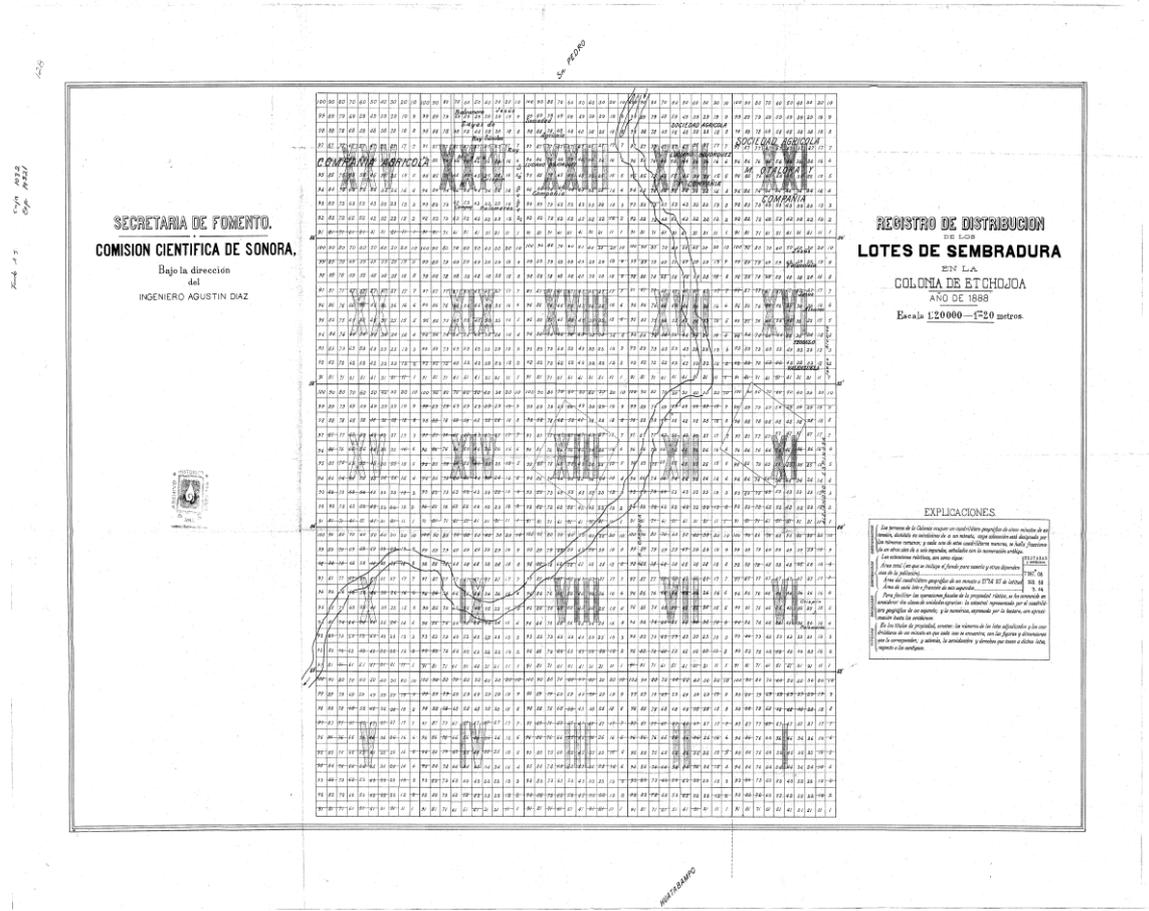
Figure 1. The Lower Río Mayo in the late 19th and early 20th centuries. (Cartography by Paul Mirocha).



Porfirian cartography constituted an aggressive effort to erase historical and geographical memory, supplanting it with a modern, panoptical view of landscape. In practice, this meant substituting an older lexicon of place with an alien toponymy of boundaries, borders, and barriers. In the town of Tórim – the area in Yaqui territory where the Commission had established its headquarters – Colonel Díaz urged his surveyors to "immediately designate the names... of settlements so that they appear in plats, registers, deeds, [and] boundary-markers [without sparking] memory of past events". Destroying or changing the position of these new boundary-markers (*mojoneras*) could bring severe punishment. Indians' pacification and assimilation, then, was seen as a function of both 'legitimate possession' (owning an individual small plot), and the severing of old spatial imaginaries from a landscape densely layered with meaning, and etched by human-territorial practice (see figure 2). But privatised plots hardly made sense where water constantly reshaped land in chaotic cycles. Thus, for those still unmoved by the much-lauded prospects of commercial farming, 'civilising development' also required "military points [of control]... to ensure the tranquillity of those tribes and impede the savages from continuing their raids in those zones".<sup>9</sup>

<sup>9</sup> Doc. 9.

Figure 2. 1888 map showing the division of Etchojoa into small plots and private holdings.



Note: At this point, most of the small parcels had been assigned numbers but no names (i.e. they had not been officially distributed). Several large squares, by contrast, had already been cordoned off for private holdings and new agricultural companies in formation. As the plan shows, the latter were subdivided into small plots, ostensibly for sale. Over time, however, most of these were simply folded into large agricultural enterprises, and/or rented out. Note the proliferation of numbered squares improbably nestled within the riverbed. (Reproduced with permission, Archivo Histórico del Agua, Fondo: A.S.; Caja: 1032; Exp.: 14521).

Old spatial imaginaries proved rather difficult to erase.<sup>10</sup> It was one thing to describe a one-dimensional human-agricultural landscape on paper. It was an entirely different matter to survey and redistribute land already occupied, to reduce a history of heterogeneous, fluid practices to fixed-plot cultivation on the edge of a fast-changing river. The visions of geometric rigidity and predictability that accompanied Porfirian land distribution thus quickly produced its detractors. Except now, with the pall of military violence hanging over the region, outright resistance more and more seemed futile. Instead, many Indians began to both contest and seek advantage in the parcelization process itself, sometimes simultaneously. These two tactics could at times work in tandem, with Yoremes claiming lands they had resided on and worked since 'time immemorial', as historian Gustavo Lorenzana Durán (2001) has argued. Yet here one also perceives a slow shift in relations between the Mexican state and its would-be subjects, as struggles over the floodplain began to take expression within an "idiom of government" (Bobrow-Strain, 2007).

<sup>10</sup> See Evers and Molina, 1992 on Yaqui territoriality in the contemporary context.

Those Yoremes who attempted to confront authorities directly claimed that they had in their possession '*primordiales*' and/or '*testimonios*' – oral and written proof of their holdings. In his earliest official reports, Commission head Agustín Díaz asserted that Indians had approached him regularly, attempting to reaffirm their historical claims to a fixed piece of land, even though boundaries were in flux just about everywhere on the river plain. The claims, he countered, referred only to areas falling outside of the targeted development zone. Díaz also felt that the 'primordial' titles would still support the government's division of land into the four agricultural colonies.<sup>11</sup> To paraphrase Deleuze and Guattari (1987), here were two opposing approaches to territory, one of linearity, compartments and containers, and another of circularity, connection, and flow. When Indians did follow proper procedure, received some sort of formal document and, even, had their names registered on the plats, their longstanding use-claims to land and water features still went unaddressed or were easily pre-empted by the claims of the more privileged.

Despite many contretemps, the Commissions left a critical legacy. First and most crucially, by virtue of a frequently violent territorial project they created the necessary conditions for launching capitalist agro-export production. Over time, large landowning families would dominate ever-larger portions of the floodplain. They did so through the development of irrigation works and the subsequent control of the region's most important means of production, water (this process is the focus of the following sections). Second, the Commissions laid the groundwork for inculcating and mediating, à la Bourdieu, a centralised, statist vision of water governance. Federal officials would from now on claim for themselves the ability to create categories describing how that vision would be negotiated. There were the many maps, drawings and plans that irrigators now had to possess to justify their claims. However, the Mayo's volatility also meant that regulating water and mediating struggles over its use were exceedingly difficult. And still, conflict, as Bobrow-Strain (2007) found in Chiapas, was "increasingly articulated through the idiom of government". Third, several of the assorted *técnicos* and military men who moved through the CGE/CCS ranks, or who in one way or another were involved in Porfirian land distribution, also went on to play critical roles in the establishment of the agriculture and irrigation companies that dominated the valley's resources even into the early 1930s (Aguilar Camín, 1977; Almada, 1993). Fourth, Porfirian land distribution literally laid the groundwork for what later became a central axis in the production of socio-spatial difference, of ethnic and class conflict: the bifurcation of landed and water relations between *latifundios* and *minifundios*. Following the Revolution, the former enjoyed access to private credit and were free to form buyer cooperatives, which vastly reduced input costs and created economies of scale. This, in turn, positioned them to make the most of state-led irrigation expansion following the Revolution. The minifundio-ejido sector, meanwhile, remained dependent upon official sources for credit, inputs, and was tied to official agrarian leagues and the ruling political party. The ejido system remains in place, but has been all but emasculated by agricultural policy and larger economic forces, particularly since the 1970s (Hewitt, 1988; McGuire, 1986; Sanderson, 1981). Over time, though, the two sectors became both increasingly antagonistic and mutually constitutive.

The Commissions, therefore, introduced the most aggressive efforts yet to racialise and reorder the landscape, both on paper and on the ground. In doing so they set down a loose conceptual and material framework upon which the post-revolutionary governance of water and land would rest. Rather than simply pouring a level foundation for later development, Porfirian *reparto* initiated the assemblage of radically disparate things, processes, people, and places that constitute today's federal Irrigation District 038. With its uneven patchwork of plots, a dendritic network of old and new canals, and its mix of small ejidos and large farms, it hardly resembles the 'legible' (Scott, 1998) grid-work idealised in fin de siècle cartography. A student of the region's history, Gustavo Lorenzana Durán, suggested to me that in contrast to the Yaqui Valley district, the overarching federal plan for southern Sonora simply never fully materialised in the Río Mayo. In a similar vein, despite the efforts of several government

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<sup>11</sup> Doc. 9.

engineers, centralised water regulation remained a distant dream.<sup>12</sup> Nonetheless, elements of that modern "grid epistemology" (Dixon and Jones, 1998) remain.

### IRRIGATION COMPANIES AND THE REMAKING OF FLOODPLAIN SPACE

Falling on the heels of reparto, the Porfirian regime created a novel legal structure to encourage construction of hydraulic works and to stimulate private agricultural development. This, in turn, sparked a new set of struggles between emergent landed interests. The capital driving the transformation came largely from the colonial silver mine town of Alamos, in the foothills of the Sierra Madre, about 50 km east of the valley. New "distance-demolishing" technologies (Scott, 2009), meanwhile, were also in place to connect the centre of the nation-state with its periphery, in development. By 1907, the *Sud-Pacífico* railroad connected Navojoa, the Mayo's dusty agricultural hub, to the US border at Nogales. Telegraph lines also linked the region with the national capital. Equally important, federal troops had hobbled Indian resistance (Zamorano, 1985).<sup>13</sup> Regional elites would now claim that, "Mayo Indians are docile and hard-working; they are [now] convinced that their uprisings against the government are useless and many now cultivate the lands given to them by the Nation as *colonos*" (García y Alva, 1907).

Expansion of the international market for agricultural commodities – in this case, chickpeas or garbanzo beans – was also rapid. To satisfy this demand, between 1902 and 1910, nearly 20 irrigation companies came into existence, each with its own primary and lateral canal system. The first large-scale transformation of the floodplain thus came rather swiftly, bringing with it a 'hardening' of the hydraulic landscape and of hydraulic social relations. Irrigation and flood defence works soon carved the most accessible lands into shard-like slices, while berms and swails were formed to hold water and protect fields. By 1910, garbanzo production in the municipalities of Huatabampo and Etchojoa had reached a total of 10,500 tons, valued at close to one million pesos (Lorenzana Durán, n.d.). Moreover, each year from 1902 to 1916 garbanzo covered an average surface area of 20,000 ha, or about 60% of the total irrigable hectares at the time (Mange, 1934). Garbanzo was now king, and the pursuit of its profitability "gave birth to [an] agro-industrial complex of planters, bankers, shippers, and... an army of [Indian] wage workers" (Ruíz, 1988).

Establishing a zone of modern agriculture in Sonora's southern valleys had evolved as the spatial corollary of a longstanding ideal. Mexico's Liberal thinkers and politicians since independence (1821) had encouraged the formation of a smallholder citizenry (Córdova, 1973; Kroeber, 1994). The local articulation of this vision with capitalist production relations diverged significantly from the original ideal. Yoremes, each of whom gained title to a 3- or 4-ha plot found it increasingly difficult to compete with the growing number of companies and their canals for irrigation water. The well-heeled shareholders of these companies were all too eager to meet their need for water, but of course for a fee. In other words, these modern agricultural associations were both intensive plantations and, private resource utilities. The idea for intensive grain farming and milling operations had, in fact, taken hold in the valley as early as the 1830s, a time when municipal governments still largely controlled the allocation of surface water (Lorenzana Durán, n.d.).<sup>14</sup> This changed rather dramatically with the *Ley de 5 de junio de 1888* (Law of June 5), which empowered federal government to regulate the use of "general communication routes" such as "floatable and navigable rivers", estuaries, and lakes that connected states or served as federal territorial limits (Aboites, 1998). Regional elites like Sonora's governor, Rafael Izabal, viewed the law as a usurpation of local authority. However, the 1894 *Ley de 6 de junio*

<sup>12</sup> Pers. comm.; June 28, 2007.

<sup>13</sup> The Porfirian military captured, 'deported', and enslaved several hundred 'rebellious' Yaquis, and a handful of Mayos, to work on Henequen plantations in the Yucatán Peninsula and in Oaxaca's Valle Nacional (Spicer, 1992).

<sup>14</sup> Agricultural companies were not the extensive hacienda that typified landholding in central and southern Mexico. Instead, these would become intensive agricultural enterprises with irrigation works, machinery, and waged labour (Aboites 1998; Kroeber 1994; Lorenzana, 2001, 2006, n.d.).

(Law of June 6), authorising federal government to grant and regulate water concessions, made clear the Río Mayo's federal status (Lorenzana Durán, n.d.). Rather than municipal councils, the federal Ministry of Development (*Fomento*) would now approve surface-water concessions, mostly to well-capitalised irrigation companies. After a few years and countless formal procedures, these concessions could become privately tradable assets. Irrigation companies emerged, then, as a way to re-articulate historical practices of resource allocation and, thereby, relationships between landowners, Indian labourers, and nascent federal organisations. They were rarely, if ever, a simple means for making the 'elements of wealth' available to repentant *indígenas*. Such a paternalistic discourse – the promise of a better life through agricultural development – indeed tended to authorise exactly the opposite.

The largest and most influential of these enterprises was the Río Mayo Agricultural Company (*Compañía Agrícola del Río Mayo*, or CARM). The CARM's founder, Ángel Almada, personified the movement of capital from Sierra to the sea and from mining to agriculture that bankrolled export production more broadly. He came from a prominent Alamos family, one with wide-ranging interests, from mining and banking to mercantile trade.<sup>15</sup> Almada and his contemporaries distinguished between docile and rebellious Indians, breathing new life into a narrative of regional development put in place by Jesuit missionaries (Almada, 1993; Spicer, 1992). The latter were clearly 'obstacles to progress', and the role of irrigation companies was to show them what they could accomplish through hard 'work'.<sup>16</sup> Having 'acquired' most of Pueblo San Pedro's best floodplain fields from their 'old owners' (*antiguos poseedores*), therefore, Almada's Mexico City attorneys presented the company to anxious authorities as an example for Indians to follow. Transforming a purportedly natural object (the floodplain) was tantamount to rendering an underdeveloped world into a lush Utopia, its people into docile producers. The re-territorialisation of floodplain space, in other words, came as much with a didactic as an explicitly developmental purpose. Here one glimpses a hegemonic worldview long in the making, as boosters portrayed southern Sonora as a 'region' of unachieved potential. Creating a new way, a new prosperity, meant the aggressive pursuit of the valley's natural bounty, and of masculine labour and hard work.<sup>17</sup> That the floodplain was already in part a reflection of human labour was simply outside the realm of possibility. Like the CARM, most subsequent petitions for water came couched within expressions of concern for Indians' welfare, echoing the larger official discourse rationalising military mapping and land redistribution. Most importantly, it masked official anxieties.

In 1902, Almada landed a concession for water at 10 m<sup>3</sup>/s to irrigate around 2000 ha. As with all concessions and in an ode to the rule of law that now, in theory, prevailed, he and his lawyers were asked to produce title to irrigable lands granted by the cartographic commissions. Investigations after the Revolution revealed that few such documents were ever produced.<sup>18</sup> Moreover, Fomento's Water Division imposed no set time frame and made no reference to seasonal shifts in flow. Rather than a use right, then, this constituted de facto private ownership of water and, thereby, control over land.<sup>19</sup> With

<sup>15</sup> Almadás were (and remain) an influential Sonoran family, with interests ranging from banking, mining and agriculture, to government and clergy.

<sup>16</sup> Elízaga and Fernández to Sr. Secretario de Estado y del Despacho de Fomento, March 2, 1901, AHA, c. 4589, exp. 61094, f. 2.

<sup>17</sup> See Aguilar Camín, 1977 on the "strong spirit and masculine force" that motivated Sonora's business and agricultural entrepreneurs. Sonoran elites have long portrayed their state as a place where hard work has levelled social difference – or, rather, difference was a category reserved for those who spurned development, labour, and modernity (Almada, 2001).

<sup>18</sup> Unless otherwise noted, most of what follows is based on different *expedientes* from the Archivo Histórico del Agua (AHA), *Fondo Aprovechamientos Superficiales*. For brevity's sake, hereafter I cite documents from this fondo, providing only the date and numbers, e.g. *caja* (c), *expediente* (exp.), and *foja* (f). For the CARM's land claims, see Aha, c. 280, e. 6783.

<sup>19</sup> Contrato celebrado entre el C. Leandro Fernández, Secretario de Estado y del Despacho de Fomento, en representación del Ejecutivo de la Unión y el Lic. Ernesto Peláez en la del Angel Almada para aprovechamiento como riego de las aguas del río Mayo del Estado de Sonora, April 3, 1902, Archivo Histórico del Agua, Caja.4589; Expediente 61094, Fojas 57-8 (hereafter cited as Contrato-CARM). The original contract granted the concession to Almada personally. It would then be turned over to the Río Mayo Agricultural Company's shareholders. According to Carol Rose (1994), length of time is a critical factor separating usufruct from property. As long as the CARM continued to use Almada's (and, later, the Compañía's) concession, Fomento imposed no date of expiration.

the CARM and other projects, then, canal-works of stone, burnt brick, and lime mortar began to striate the floodplain, going in every direction, overtaking or intertwining with the more evanescent landscapes of wooden dykes, brush weirs, and shallow basins marking an earlier, hardier, 'indigenous' territoriality.

Federal intervention during this time makes little sense when viewed outside of the realm of political connection and patronage, as a simple matter of documents and laws. By 1910, Fomento had doled out water to nearly 80 m<sup>3</sup>/s to nearly 20 different companies. This was from 65 to 75% of maximum flow during the summer rainy season as it was calculated during that period.<sup>20</sup> Contrary to Lorenzana Durán (2001), I believe this constituted a mass dispossession of water, even if the federal government remained the ultimate arbiter of rights.<sup>21</sup> Porfirian water contracts reveal an obsession with getting private initiative off the ground and little concern with the nuts-and-bolts issues of allocation. Most make no mention of water volume as a function of time. Moreover, despite constant reference to water quantity, Fomento officials had little instrumentation for accurate measurement. This was the case elsewhere in Mexico, too (Kroeber, 1994). From the colonial period, a royal *merced* (grant) of water had always been a critical lever for securing surface flow. There were, nonetheless, very few of these prior claims in the Mayo region (Lorenzana Durán, 2001). Porfirian water law also contained caveats against damaging 'third party' (i.e. downstream) interests. Yet, local and state courts tended to protect such interests in proportion to the political and economic power they wielded (Aboites, 1998; Banister, 2010). In most cases, Indians' largely undocumented assertions of historical practice meant little. This remained the case until well after the 1917 Constitution, whereby pueblos and indigenous *comunidades* could petition for water rights (Aboites, 1998).

Deleuze and Guattari (1987) argue that, "power centers are defined much more by what escapes them or by their impotence than by their zone of power". By this same metric, the modern irrigation company, as an assemblage for simultaneously increasing central government's spatial reach and facilitating private resource appropriation was rarely easy to control. These two objectives frequently came to loggerheads, as waterworks and concessions tethered together unholy alliances between differently positioned interests: bankers, merchants, and farmers (sometimes one and the same thing); irrigation-company shareholders; and Yoreme smallholders and labourers. Here were two worlds increasingly intertwined. In gross terms, one might be described as an 'indigenous' approach to water, landscape, and territory. In that world, water and matter could flow in "a movement that simultaneously affects all... points in a given space" (Deleuze and Guattari, 1987). By contrast, the other view, modern and expert-managerial, sought to boldly structure space for the purpose of capturing, containing, and/or holding matter for its distribution in a centrally controlled, orderly manner.

Neither of these views was completely viable within the new context of agricultural development, and Porfirian water politics reflected and refracted this tension. The Mayo's unpredictability stymied authorities, particularly those stationed in Mexico City and whose formative years had likely been spent in the temperate or tropical climes of the centre and south of the republic. They might take cues from Europe and the United States, where irrigation increasingly meant bold infrastructural projects run by technocrats (Reisner, 1993; Worster, 1985). And they tended to lack basic hydrological data on which to ground their lofty ideals (Aboites, 1998; Kroeber, 1983). Their notions of hydrology were, typically, developed in and for wetter environments and, thereby, incorporated the biases of distinctive physiographic and cultural regions. As Jamie Linton (2008) argues, models of the hydrologic cycle have,

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<sup>20</sup> These figures are calculated from an array of sources, including Montañón y Gaxiola, 1933; Moreno, n.d.; and Bond, 1928.

<sup>21</sup> Lorenzana Durán argues that in most cases water in Mexico has been historically considered a public rather than a private good. Thus, the establishment of private irrigation should not be viewed simply as an example of private dispossession. While I do believe there is a case to be made for viewing water as a historically public good in Mexico, scholarship must also look more carefully at the very distinction between 'public' and 'private'. As a claim to truth, what types of behaviour or interventions do the distinction authorise. Moreover, Meyer (1996) suggests that Spanish colonial water law and jurisprudence played out along both public and private axes, depending upon the interests in question (Indian versus non-Indian, mining versus agriculture, etc).

over time, internalised a "blue-water bias", a set of assumptions built around experiences with water as something stored up in lakes, rolling along in perennial rivers and streams, or at least as some kind of reliable surface flow. Mexican government maps constituted mere snapshots of particular places at specific moments in time. With each new ditch and canal, however, the Mayo's floodplain more and more resembled a gigantic pinball machine, water ricocheting wildly like a destructive steel ball. Topography changed quickly, as it does throughout the arid northwest. During the rainy months, arroyos and rivers might undergo a drastic makeover, changing from one day or week to the next. Worse still, along with the lack of reliable data, civilian government (as opposed to military) had only the most skeletal presence in the region; the decentralised web of personnel and offices normally sustaining resource centralisation would not come until after revolution. Officials depended heavily upon local authorities for information, and those officials were usually far removed from the Porfirian ideal type of the dispassionate, professional administrator (Tenorio-Trillo, 1996). Communication between centre and periphery also tended to occur in incomplete utterances, broken sentences, and misspellings characteristic of modern telegraphy.

To illustrate, in a rather typical case Fomento had asked Ángel Almada and his lawyers to prove that their company had initiated surveys for irrigation works. Federal concession stipulated that irrigation works be operable within a ten-year period. With no federal witnesses available – aside from a few stamp officers and postal workers – they solicited the aid of police commissar (*comisariado de policía*) Francisco Yocupicio, to verify their survey claims. In a document bearing his 'legal' signature, Yocupicio testified that he had been present when the CARM's administrative council had gathered together with a squad of labourers at a spot on the river named Calvario. They had reconnoitred several sites for construction of a primary canal, identified one, and declared its suitability in front of the official witnesses. Soon they would proceed with construction.<sup>22</sup> While such tableaux of banal – yet momentous – formalities were becoming commonplace, nothing suggests that Fomento's Mexico City officers ever went to the site. They thus could not, in good conscience, have completely written off the possibility of the project's potential harm to downstream, or third-party interests. And yet they did just that, helping make CARM's canal one among many future sites of intense social conflict.

Charged with regulating and allocating, authorities in Fomento's Water Directorate strove to accommodate and encode the growing complexity in hydraulic/power relations. As projects like the CARM grew in number and scale, officials remained several steps behind changing seasonal and social circumstance. Moreover, their interventions at times amplified rather than mitigated the dramatic consequences of negative environmental feedback. These, in turn, required further adjustments, and so on it went, in an endless looping chain of events linking together or pulling apart ecological, political, and human social dynamics. Between 1904 and 1907, for instance, widespread flooding produced several 'upheavals' in the Mayo's flow regime. According to Almada, storms had changed the river's course directly in front of his company's primary intake canal, "leaving a dead river full of sand, and shifting its waters a great distance away...". During that time, CARM labourers constantly struggled to situate and build primary siphons as floods continued to alter riverbed topography.<sup>23</sup> Paradoxically, because the company lacked the financial means to construct a large-scale impoundment system, I argue that it and others remained dependent upon the flexibility of approaches that rather closely resembled ancient river-control strategies – or, rather, on the Yoremes who still understood them. Put differently, the capitalist agrarian revolution could not fully achieve distancing from 'primitive' practice that modernity required.

Almada, meanwhile, pushed for a more open-ended regulatory process to allow for trial and error. Original plans for an intake canal placed it in an area known as Paredón Colorado (near Calvario). In light of the river's changing direction, however, that site had been an apparent miscalculation. Instead,

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<sup>22</sup> Testimonio de Francisco Yocupicio, Comisariado de Policía, del Departamento de Álamos, October 2, 1902, AHA, c. 4589, exp. 61094, f. 114; Ángel Almada to Sección 5a, Ministry of Fomento, AHA, c. 4589, exp. 61094, f.113.

<sup>23</sup> Ángel Almada to the Minister of Fomento, October 27, 1908, AHA, c.4589, exp. 61094, f.182.

water might be more accessible from an undisclosed point located as far as 5 km upriver.<sup>24</sup> Almada then argued that officials' calculations for the concession's volume should have been based on the Mayo's obvious tendencies. It might "go completely dry for an entire season". Almada's lawyers complained that the originally allotted quantity had been calculated based on "rivers with constant water flow".<sup>25</sup> The Ministry's formulae for volume were, in other words, inappropriate for the river's erratic dynamics, based more on the perennial rivers' characteristic of southern and central Mexico.

### **PORFIRIAN LEGERDEMAIN AND THE ETHNIC POLITICS OF WATER AND LAND**

The scientific commission's efforts to parcelize and redistribute also created fertile ground for fraud, and this partly explains how companies came to control the river and the floodplain. A particularly revealing case of this, and of the ethnic tensions within resource politics more broadly, took place in an area known as Tiriscohuasa, located between the towns of Etchojoa and Huatabampo (see map). From the very beginning, agricultural elites had situated the social displacements of land fragmentation and waterworks development within a discursive framework that simultaneously racialised people and territory. Framing things thus became a way to assert the ability to transform and manage the new landscape in the name of a vaguely defined greater good (e.g. improving Indians' lives). The shareholder-latifundistas of the Tiriscohuasa Irrigation Company purported to represent the interests of several Mayos to whom, years earlier, the CCS had granted several small plots. CCS maps refer to them as '*Los pobres de Etchojoa*' (the poor ones of Echojoa). Crucially, the concession also included a small section of the riverbank at which *Los pobres* could construct a workable *toma*, a canal inlet from the riverbed. Such places were somewhat rare given the riverbank topography. In 1906 Tiriscohuasa's primary shareholders filed a complaint with Fomento's Water Directorate charging that powerful neighbouring irrigators, Crispín J. Palomares and Trinidad B. Rosas, had blocked Tiriscohuasa's main canal with their poorly planned and executed Canal *Independencia*.<sup>26</sup> Acting through their Mexico City attorney, Palomares and Rosas countered that Tiriscohuasa had at one time belonged to a group of "*indios* who have completely disappeared and in reality those who today make up... '*Tiriscohuasa*' and who present themselves as champions of the Indians who were permitted to open a canal by the chief of the Scientific Commission are [among others] Clemente Ibarra, a wealthy mine-owner...".<sup>27</sup> In other words, they had accused Tiriscohuasa's shareholders of appropriating the '*Los Pobres*' label in order to create a veil of concern for Indians' welfare. Palomares viewed the ruse as a direct threat to his own company and continued to alert Fomento officials.<sup>28</sup> The land and waterworks in question, he believed, still belonged to the Indian town of Etchojoa, to a people who "in truth... are indeed poor and worthy of consideration". What we have here, he continued, 'is a type of game' for which Yoremes were pawns.<sup>29</sup>

It is impossible to say with any certainty how widespread this 'game' had become. In both cases, landowners' paternalism was intended to leaven a favourable official decision. It ratified their racial privilege and control over the most critical means of production. But matters were more complicated still. Maintaining the privileges of race meant creating and maintaining loyal labouring subjects, while at the same time rationalising dominion over the productive resources that those subjects needed for survival. And it was growing ever more difficult to access those resources, as the more the spaces and places fell within the emerging federal zone and/or the domain of irrigation companies, the better the odds that conflict would draw official attention and, thereby, set in motion bureaucratic procedure.

<sup>24</sup> *La Constitución de Hermosillo*, August 13, 1901, No. 67, AHA, c.4589, exp. 61094, ff. 25-6.

<sup>25</sup> Ernesto Peláez to the Minister of Fomento, January 14, 1902, AHA, c.4589, exp. 61094, ff. 50-1.

<sup>26</sup> Letter to the Sub-Minister of Fomento, July 3, 1906, AHA, exp.15484, c.1108, f.4.

<sup>27</sup> Letter to the Minister of Fomento, from Juan R. Orci, attorney representing Crispín J. Palomares and Trinidad B. Rosas, October 3, 1906, AHA, exp.15484, c.1108, f.17.

<sup>28</sup> Juan R. Orci to Minister of Fomento, October 3, 1906, AHA, exp.15484, c.1108, f.17.

<sup>29</sup> Hand-written letter to the Minister of Fomento from Crispín J. Palomares, August 30, 1906, AHA, exp.15484, c.1108, ff. 25-26.

The Tiriscohuasa Company continued to wrangle with Palomares and Rosas over the manner in which the two canals would cross over one another, even well after President Díaz's ouster at the hands of revolutionaries.<sup>30</sup> Ministry officials consistently sent out ambiguous signals. On the one hand, they remained steadfast in requiring proof of valid land titles, and also withheld all concession contracts until agreement could be reached between the parties in dispute over the intersection of canals. On the other, internal company memoranda illustrate officials' desire for the 4m<sup>3</sup>/s concession to simply move forward, despite procedural problems and lapses in titling. Zurburán and company had sent Fomento paperwork signed and stamped by a Huatabampo town notary who testified to having 'seen' valid, signed titles to the 3357 ha in question. The titles' signatures, wrote a Fomento investigator, had not been 'legalised' and thus failed to meet the Ministry's standard of proof.<sup>31</sup> This standard is unclear in the documents, but Tiriscohuasa's lawyers quickly returned with another set of signatures, including that of Sonora's governor. Federal authorities thus swiftly validated the titles in question, allowing the concession to move forward.<sup>32</sup>

Like many other irrigation companies in the valley, a part of Tiriscohuasa's *raison d'être* was the sale of water to other farmers rather than just maintaining ownership and cultivation of land, as such. Ample proof of this can be found in the documentation on land and water claims following the Revolution. For example, the CARM and other agricultural companies were charged with charging producers with 'usurious' rates for water, often as much as 15% of the harvest. Companies were also accused of having acquired water for lands that they never possessed title to, while Mayos had waited years for official recognition of their small plots. In such cases, then, the effect of Porfirian reparto was to contain Indians within the three main urban zones (Etchojoa, mostly).<sup>33</sup> Men like Zurburán and Rosas, in a limited sense, thus likely did represent the interests of the so-called Pobres de Etchojoa, as the latter would have held little if any of the capital needed to construct waterworks. Los Pobres, moreover, would have found it increasingly difficult to farm the floodplain in customary fashion. Now one needed federal sanction, at least in theory. Lawyers for the company, moreover, consistently argued that its shareholders, mostly Indians, had insufficient economic resources to pay federal concession fees.<sup>34</sup> The material effects of such machinations, writ large, are glimpsed in CCS maps of the district, which, by 1909, already show how the reparto had bifurcated space. Old indigenous communities like Etchojoa and San Pedro are portrayed as completely subdivided, while large blank squares mark the unencumbered space of irrigation and agricultural companies (see figure 3).<sup>35</sup>

<sup>30</sup> See Willems-Braun, 1998 on the idea of 'buried epistemologies'. Juan R. Orci to the Minister of Fomento, November 10, 1906, AHA, exp.15484, c.1108, f.31; A. Aldasoro, Minister of Fomento, to Pedro Zurburán, February 3, 1911, AHA, exp.15484, c.1108.

<sup>31</sup> Internal memorandum to the Minister of Fomento, April 30, 1907, exp.15484, c.1108, f.43.

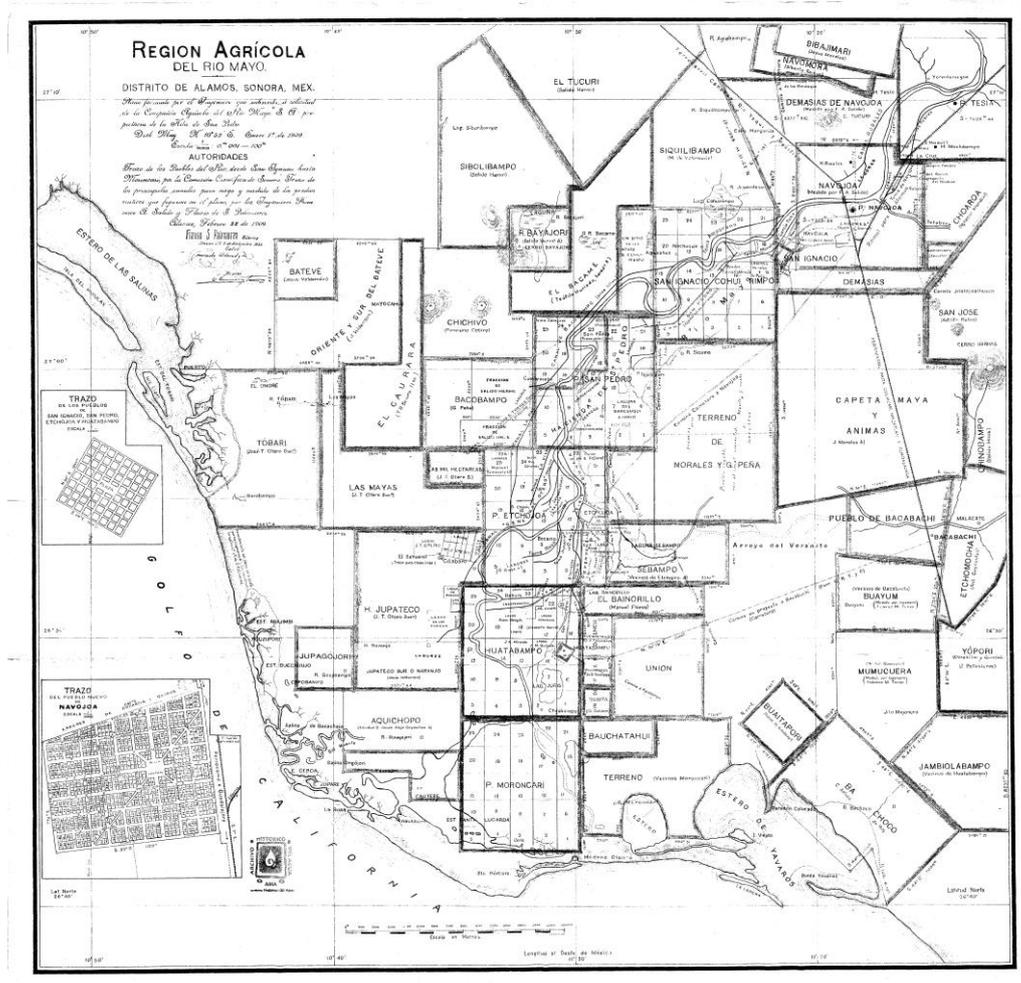
<sup>32</sup> Memorandum to the Minister of Fomento from Sección 5a, July 3, 1907, AHA, exp.15484, c.1108, f.46.

<sup>33</sup> For the CARM case following the Revolution, see AHA, c. 280, exp 6783. Of course, some of the charges are likely ramped up, reflecting the post-revolutionary zeitgeist and the particular interests, agrarian and otherwise, pursuing them. Still, such charges are widespread in the AHA's historical record.

<sup>34</sup> Julián Morineau, Tiriscohuasa's representative in the Distrito Federal, to the Minister of Fomento, July 16, 1907, AHA, exp.15484, c.1108, f.48. Officials nevertheless continued to push for the payment until 1911 (following the outbreak of revolution), when Fomento abruptly reversed course, waiving the 325-peso charge for irrigation-works inspection (Sr. Molina, Fomento official, to Julián Morineau, July 18, 1907, AHA, exp.15484, c.1108, f.49; J. Díaz Lombardo to the Minister of Fomento, August 5, 1911, AHA, exp.15484, c.1108, f.17.

<sup>35</sup> What is interesting here is that the rules of Porfirian reparto seemed to apply mostly to Mayos who participated in the programme and received a small plot. Elites, by contrast, were granted large sections in an ad hoc or idiosyncratic manner, and apparently based on the sole criterion of their potential for establishing commercial agriculture and 'improving' the region. When it came time for landing water concessions, as I note in the narrative, Porfirian policy required some proof of title. But as the CARM and Tiriscohuasa cases suggest, landowners quickly learned that merely kicking the regulatory ball down the field, keeping the paperwork in motion, was a way to continue harvesting on lands with questionable ownership records. This dynamic only accelerated after the Revolution and with the further bureaucratization of hydraulic relations.

Figure 3. Mayo District in 1909.



Note: Indigenous areas of the valley are characterised by hyper fragmentation, while non-Indian areas are now mostly large agglomerations. (Reproduced with permission, Archivo Histórico del Agua, fondo: aprovechamientos superficiales, caja: 2765; expediente: 38687).

The process of legitimising private land possession thus brought together bureaucratic performance, juridical sleight-of-hand, and dispossession, creating "multiple pressures to comply" (Held, 1989) with the demands of the new, modern social order. Nonetheless, as the Tiriscohuasa case illustrates, those demands were often confusing and at cross-purposes, with loyalties split: being a good state subject and a landowner, for example, could be seamless or untenable, depending upon one's position vis-à-vis federal regulation, means of production, and/or other landowners. The momentous, yet mundane world of events, acts and utterances – the modern customs and beliefs that could render powerful the claims of paperwork, titles, and regulations – helped efface the injustices of resource appropriation. In doing so, it worked to reconstitute the national territory, one document at a time. The paperwork thus formed part of a modern spatial practice. On the contested floodplain, however, this new form of territoriality also meant creating defensible spaces with *immobile* objects (as opposed to the traditional practice of moving objects in response to seasonal shifts in flow and river trajectory).<sup>36</sup> The new

<sup>36</sup> This is perhaps overstated, for certainly even traditional floodplain farming required some defence works as well (likely used in combination with more mobile technologies).

irrigators clung stubbornly to the modern vision of a tameable river, while circumstance favoured a more flexible approach. Mayos and non-Indians of the valley's small pueblos, meanwhile, found themselves caught in the middle: as labourers for the newly formed irrigation companies; as subsistence farmers and small-parcel landowners indebted to agricultural companies for water and other inputs; and as the valley's earliest farmers, as people with indispensable knowledge and skills. While such knowledge brought with it the stigma of backwardness, landowning elites also relied heavily upon 'pre-modern' practices.<sup>37</sup> Such tension meant that each new canal created another focal point at which ethnic, class, and other markers of difference collided and/or articulated.

### HYDRAULIC BUREAUCRACY AND FRUSTRATIONS OF REGULATION

Differentiating the modern irrigators from their Indian predecessors, among other things, was a zeal for business and development, a unique Porfirian-Liberal worldview (Knight, 1990). Sustaining this zeal, of course, were official and extra-official violence, financial capital and, thereby, access to labour, materials, and technologies. With growing frequency, landowners looked to government regulation as a political weapon in the war for land and water. Some years before the Porfiriato, the Salido family's hacienda Tres Hermanos had become something of a regional benchmark for success in terms of agricultural development. It was located upriver, in an area now just a few kilometres west of the Mocúzari reservoir. Water there was plentiful and, unlike the rock-studded and hilly topography just to the east, the land there becomes relatively level and arable. The Salidos (or, rather, their Mayo labourers) farmed around 200 ha, mostly in wheat. Their hacienda also boasted one of the few hydro-powered mills in the region, as well as a system of primary and lateral canals and laterals (González Huerta, 1999; García y Alva, 1907).<sup>38</sup>

Almost directly across from Tres Hermanos but separated from it by a narrow islet, lay the Goycolea family's equally impressive hacienda Santa Bárbara, another of the valley's earliest and most profitable projects. Antonio Goycolea, family patriarch, had filed a complaint with Fomento against the Salidos for erecting river defence works and siphons that had significantly narrowed the channel and, therefore, dangerously increased the velocity of flow. This had altered the Mayo riverbed. The Salidos, he went on, lacked the necessary approval from the Ministry of Communications and Public Works, which was required "of any waterworks, as this is a *federal waterway*".<sup>39</sup> The Ministry sent in its engineer, Abel Nava, to investigate. After interviews with landowners, local officials, and workers, Nava blamed irrigators' adoption of the ancient practice of *asceción*, or the use of sticks, tree-trunks, rocks, and sand to create diversion weirs (*estacadas*) for channelling runoff and trapping nutrient-rich sediment. The *estacadas* – placed upriver near the jutting tip of the islet splitting the river into parallel channels – had narrowed the 350-meter wide riverbed by at least 100 m, creating a dangerous hydraulic ricochet during periods of heavy runoff. This would bring catastrophe, Nava warned, if and when another cyclone hit the region. The engineer called for destroying the *estacadas* on both sides of the river and excavating canals on the right bank to handle overflow. Tres Hermanos, rather than Santa Bárbara, he insisted, was in the most precarious position (González Huerta, 1999).<sup>40</sup>

<sup>37</sup> Aboites (2001) critiques this distinction, suggesting that we should, instead, seek to understand how past practices and objects are reworked into seemingly new modalities of water relations.

<sup>38</sup> The Salidos established Tres Hermanos in the 1860s on a site not far from the present-day Mocúzari reservoir.

<sup>39</sup> Cited in González Huerta, 1999 (my emphasis).

<sup>40</sup> AHA, c.4599, exp.61228, f.8. Nabhan and Sheridan (1977) have studied the cultural practice of living fencerows in significant detail on the Río Sonora and the Río San Miguel, respectively, arguing in favour of the social and environmental benefits they produce. Doolittle (2003), by contrast, has recently suggested that such practices, despite the claims of researchers, environmentalists, and farmers, often produce problems for downstream water-users. They increase river velocity and, thereby, exacerbate the effects of flooding, causing erosion. This, I believe, was also true for the Río Mayo, even before the advent of waterworks during the mid-to-late 19th century.

Together with Nava's report, Goycolea's complaint illustrates once again the frustrating truth at the heart of development: being a successful modern irrigator required a rapprochement with tradition. Very few of these men of enterprise had any experience at all in floodplain agriculture. Nor were they privy to "indigenous oral tradition", which might have helped "them understand just how capricious the river could be" (González Huerta, 1999).<sup>41</sup> Seasonal runoff also brought with it nutrients from the foothills and the Sierra Madre range. As González Huerta (1999) asserts, "he who could best manipulate the course of the river would also have the most extensive lands". Capturing runoff, of course, allowed for irrigating fields. But doing so also recharged plots with nutrient-rich, water-retaining soils from higher up in the basin and the Sierra Madre range. Waterworks like those of Tres Hermanos and Santa Bárbara were designed to capture relatively high-volume runoff, introducing some of the earliest masonry and *mampostería* – rock and lime plaster (Aboites, 1998; González Huerta, 1999). In doing so, however, they had sharply increased the scale of water diversion, as well as shifting the scope of practice from flexibility toward rigidity.

Acting on Nava's recommendations, Fomento authorities asked the Sonoran Scientific Commission to destroy the diversion works. The CCS's engineer, Gonzalo Isunza, garnered the hacendados' support to do so, which included a loan of labourers for the task. Goycolea, meanwhile, unimpressed with the work, complained that Isunza's reconstructed riverbed reflected an official bias in the Salidos' favour. In re-examining the case, Fomento agreed, changing its tack and siding with Goycolea. They argued that Isunza had indeed played favourites, and recommended digging even more trenches (*zanjas*), further upstream, to counter the prejudicial effects that the existing trenches would have on Santa Bárbara. Such work required yet another engineer who, in his turn, failed to win the hacendados' agreement on placement of the new trenches. He then proceeded to dig them in a spot that, in his view, safeguarded *all* property-owners' interests. The Goycoleas and the Salidos, in other words, were left to hash out an agreement on their own, as Fomento's agents finally just recused themselves from the case altogether, arguing that such matters remained outside of their official remit (González Huerta, 1999). Reaching an equitable solution in the context of fluvial uncertainty was just too complicated.

As González Huerta (1999) correctly points out, politically centralised (or effectively nationalised) 'water management' and regulation were still a long way off. Nonetheless, it is still quite revealing that Goycolea turned to federal irrigation authorities at all. This would not have been the case just a few years before. It also underscores just how conflict-ridden subjects' relationships to both hydraulic bureaucracy and each other had become, and in a relatively short span of time. One intervention in the landscape seemed always to necessitate another, more aggressive than the one before, and so on down the line, with each telegram to Mexico City and each tardy response creating a kind of echo-chamber effect between centre and periphery, indeed, between landowning subjects and state subjects. Irrigators often did what they felt they had to, asking for an official rationale *ex post facto* (little has changed). By the early 1900s, what from the outside might have seemed like utter chaos had started to become a rather permanent feature of water relations.

## CONCLUSION

Such was the nature of Porfirian hydraulic bureaucracy, or as Wester (2008) has dubbed it, 'hydrocracy'. Confusion, spotty information, favouritism, inexperience, floods, all of these combined to create the unruly network of hydraulic politics linking Mexico City to the Mayo Valley. Porfirian historiography, at least until recently, has tended to find order in such chaos and complexity (Garner, 2001). The Mayo case, by contrast, exposes the weaknesses of an instrumentalist approach to understanding hydraulic

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<sup>41</sup> This is perhaps too facile a distinction, as matters were surely more complicated in practice. The Salidos and Goycoleas were the earliest to commercially farm in the valley, and by this time had between them several years of cultivation experience. Yet, regardless of background, workers with knowledge of hydrology were far more critical (indispensable, really) to the survival of capitalist irrigation companies than records indicate, and the Goycoleas and Salidos would have got nowhere without the labour of Mayo workers and their intimate knowledge of place.

politics. For Mexican resource governance, in its infancy during the Porfiriato, approaching water as a lever to control people proved exceedingly difficult. But disorder was (and is) an integral dimension of statecraft, part of the cultural lens that development officials used to understand their mission.<sup>42</sup> And here, I believe, Deleuze and Guattari (1987) provide a critical insight. Capturing or 'overcoding' social relations in the name of hierarchy and centralisation is a two-way process: for every thing, person, or place falling within the reach of federal bureaucracy, something else might get away. River federalisation could become a weapon in an internecine, elite war of position. At the same time, each new deluge seemed to propel a kind of social fission whereby alliances and loyalties were tossed once again into the Mayo's roiling waters. Faced with the intransigence of this social and material world (White, 1985), and frustrated by their inability to regulate water relations, federal agents oftentimes found themselves running just to stay in place.

Nonetheless, irrigation also propelled a social fusion, as capitalist agriculture and federal authority slowly began to nourish each other. Therefore, despite constant setbacks, by 1910, on the eve of Mexico's Revolution, garbanzo production accounted for 60% of the valley's cultivable surface area of 20,000 ha (García y Alva, 1907). Furthermore, out of 20 or so companies, perhaps ten dominated the export agriculture trade. In the brief span of two decades, a handful of men like Ángel Almada, Trinidad Rosas, the Salido brothers, and the Oteros, among other emergent latifundistas, had flexed their financial muscle and spun networks of patronage and kinship to appropriate large portions of the valley's land and hydraulic base. As a set of rigid "principles of vision" (Bourdieu, 1998) involving the privatisation of land and water-resources, modern irrigation development indeed took root on the banks of the Río Mayo, albeit in fragmentary form. The Porfirian state had catalysed a radical reorganisation of ecology and society in the name of capitalist agriculture. What has proved most durable, then, is the late-19th century articulation of "Liberal rule and the local logics of landed [and irrigated] production" (Bobrow-Strain, 2007).

Meanwhile, the organisational structures sustaining this articulation by necessity changed over time. As Painter (2006) suggests, 'the state' is an ongoing, ever incomplete series of territorial claims and projects. Mexico's hydraulic-resource bureaucracies have long shown a chameleon-like capacity to adapt to shifting circumstances (Warner et al., 2008). The neo-liberal policy turn of the 1990s reinforces this argument. With it came the devolution of irrigation-network control to local water users organised in user 'modules'. These latest reductionist categories for representing people and space ('water user', 'water module', etc.) pave over the asymmetries of political power and resource access that plagued Mexico's countryside well before the 1990s shift. As with yesterday's 'smallholder', today's water-user is perhaps just as apt to be a bureaucrat, banker, or businessmen as an ejidatario or middle-class farmer whose sole income is from farming. This is why, when exploring the effects of the reforms in Sonora, Wilder and Romero-Lankao (2006) found little evidence supporting officials' claims of efficiency, sustainability and, in particular, equity. In many ways, neo-liberalism reproduces the ongoing enclosure of resources begun during the Porfiriato. Nevertheless, its categories of intervention are consistently destabilised by the social-ecological diversity they are meant to contain. Here, I believe, is where we must seek possibilities for lasting social change, for a just alternative to the technocratic fixes so often prescribed in water policy analysis.

## REFERENCES

- Aboites, L.A. 1998. *El agua de la nación: Un historia política de México (1888-1946)*. México, DF: Centro de Investigaciones y Estudios Superiores en Antropología.
- Aboites, L.A. 1988. *La irrigación revolucionaria. Historia del sistema nacional de riego del río Conchos, Chihuahua (1927-1938)*. México: Secretaría de Educación Pública-CIESAS.

<sup>42</sup> In both field interviews and archival documents I could not help noticing how often officials describe their efforts in terms one might use to describe a military campaign.

- Aboites, L.A. 2001. Labores nuevas, labores viejas: Historias de ríos y los usos del agua en el norte de México. *Relaciones* 22(87): 49-78.
- Aguilar Camín, H. 1977. *La frontera nómada: Sonora y la revolución Mexicana*. México: Siglo Veintiuno Editores.
- Almada Bay, I.L. 1993. La Conexión Yocupicio: Soberanía estatal, tradición cívico-liberal y resistencia al reemplazo de las lealtades en Sonora, 1913-1939. PhD thesis. El Colegio de México.
- Almada Bay, I.L. 2001. *Breve historia de Sonora*. México, DF: Fondo Económico de Cultura.
- Almada, F. 1990. *Diccionario de historia, geografía y biografía sonorenses*. Hermosillo: Instituto Sonorense de Cultura.
- Banister, J.M. 2010. Irrigation and the politics of chaos in Sonora's Mayo valley. PhD thesis. University of Arizona.
- Blake, D. 1935. Mexican west coast cyclones. *Monthly Weather Review*, December.
- Bobrow-Strain, A. 2007. *Intimate enemies: Landowners, power, and violence in Chiapas*. Durham: Duke University Press.
- Bond, J.B. 1928. *Informe acerca del proyecto del Río Mayo, Sonora*. México: Comisión Nacional de Irrigación.
- Bourdieu, P. 1998. *Practical reason: On the theory of action*. Stanford: Stanford University Press.
- Caballero, O. 2007. Participación de los usuarios agrícolas en la conservación y modernización de la infraestructura del distrito de riego 038, Río Mayo, Sonora. Tesina, El Colegio de Sonora.
- Córdova, A. 1973. *Ideología de la revolución Mexicana: La formulación del nuevo régimen*. México, DF: Editores Era.
- Craig, R.B. 2004. *Cartographic Mexico: A history of state fixations and fugitive landscapes*. Durham: Duke University Press.
- Deleuze, G. and Guattari, F. 1987. *A thousand plateaus*. Brian Massumi (trans). Minneapolis: University of Minnesota Press.
- Dixon, D.P. and Jones III, J.P. 1998. My dinner with Derrida, or spatial analysis and poststructuralism do lunch. *Environment and Planning A* 30(2): 247-260.
- Doolittle, W.E. 2003. Channel changes and living fencerows in eastern Sonora, Mexico: Myopia in traditional resource management? *Geografiska Annaler* 85A(3-4): 247-261.
- Evers, L. and Molina, F. 1992. Hiakim: The Yaqui homeland. *Journal of the Southwest* 34(1): 225-317.
- García y Alva, F. 1907. *México y su progreso: Album-directorio del Estado de Sonora*. Hermosillo.
- Garner, P. 2001. *Porfirio Díaz: Profiles in power*. Harlow: Pearson Education Ltd.
- Geertz, C. 1973. Thick description: Toward an interpretive theory of culture. In Geertz, C. (Ed), *The interpretation of cultures: Selected essays*, pp. 3-30. New York: Basic Books.
- González Huerta, R. 1999. Los conflictos por el agua entre las haciendas del municipio de Camoa, Sonora. *Boletín del Archivo Histórico del Agua* (16): 20-25.
- Held, D. 1989. *Political theory and the modern state*. Cambridge: Polity.
- Hewitt de Alcántara, C. 1988. *Modernización de la agricultura mexicana, 1940-1970*. México, DF: Siglo XXI Editores.
- INEGI (Instituto Nacional de Estadística y Geografía). 2005. *II conteo de población y vivienda*. México: Instituto Nacional de Estadística y Geografía
- Knight, A. 1990. *The Mexican revolution, Vols. 1 & 2*. Lincoln: University of Nebraska Press.
- Kroeber, C.B. 1994. *El hombre, la tierra, y el agua. Las políticas en torno a la irrigación en la agricultura de México, 1885-1911*. México: IMTA-CIESAS.
- Linton, J. 2008. Is the hydrologic cycle sustainable? A historical-geographical critique of a modern concept. *Annals of Association of American Geographers* 98(3): 630-649.
- Lorenzana Durán, G. n.d. Un garbanzo de a libra: Agricultura comercial en el valle del Mayo, 1884-1910. Unpublished manuscript.
- Lorenzana Durán, G. 2001. Tierra, agua y mercado en el distrito de Álamos, Sonora, 1769-1915. PhD thesis. Jalapa: Universidad Veracruzana.
- Lorenzana Durán, G. 2006. Tierra y agua: Una historia de los valles del Mayo y del Yaqui (1934-1940). *El Tejabán* 6: 9-127.
- Mange, J.A. 1934. Historia del negocio del garbanzo. In *Album del Mayo y del Yaqui. Directorio Comercial 1933*. Navojoa: Imprenta Montaña.
- Marcus, G.E. 1998. *Ethnography through thick and thin*. Princeton: Princeton University Press.
- Meyer, M.C. 1996. *Water in the Hispanic southwest: A social and legal history, 155-1850*. Tucson: University of Arizona Press.
- Montaña, R.E. and Gaxiola, P. 1933. *Album del Mayo y del Yaqui: Directorio comercial, 1933*. Navojoa: Montaña.

- McGuire, T.R. 1986. *Potam revisited: Politics and ethnicity on the río Yaqui*. Tucson: University of Arizona Press.
- Mitchell, T. 1999. Society, economy, and the state effect. In Steinmetz, G. (Ed), *State/Culture: State-formation after the cultural turn*, pp. 76-97. Ithaca: Cornell University Press.
- Moreno, J.M. n.d. Historia ambiental de la región del río Mayo. Unpublished manuscript. Hermosillo: El Colegio de Sonora.
- Nabhan, G.P and Sheridan, T.E. 1977. Living fencerows of the Rio San Miguel. Sonora, Mexico: Traditional technology for floodplain management. *Human Ecology* 5(2): 97-111.
- O'Connor, M.I. 1989. *Descendants of totoligoqui: Ethnicity and economics in the Mayo valley*. Berkeley: University of California Press.
- Painter, J. 2006. Prosaic geographies of stateness. *Political Geography* 25(7): 752-774.
- Radding, C. 1997. *Wandering peoples: Colonialism, ethnic spaces, and ecological frontiers in northwestern Mexico, 1700-1850*. Durham: Duke University Press.
- Reisner, M. 1993. *Cadillac desert: The American West and its disappearing water*. New York: Penguin.
- Rose, C.M. 1994. *Property and persuasion: Essays on the history, theory, and rhetoric of ownership*. Boulder: Westview.
- Ruíz, R. 1988. *The people of Sonora and yanqui capitalists*. Tucson: University of Arizona Press.
- Sanderson, S.E. 1981. *Agrarian populism and the Mexican state: The struggle for land in Sonora*. Berkeley: University of California Press.
- Scott, J.C. 1998. *Seeing like a state: How certain schemes to improve the human condition have failed*. New Haven: Yale University Press.
- Scott, J.C. 2009. *The art of not being governed: An anarchist history of upland Southeast Asia*. Newhaven: Yale University Press.
- Spicer, E.H. 1992. *Cycles of conquest: The impact of Spain, Mexico, and the United States on the Indians of the southwest, 1533-1960*. Tucson: University of Arizona Press.
- Spirn, A.W. 1998. *The language of landscape*. New Haven: Yale University Press.
- Tenorio-Trillo, M. 1996. *Mexico at the world's fairs: Crafting a modern nation*. Berkeley: University of California Press.
- Warner, J.; Wester, P. and Bolding, A. 2008. Going with the flow: River basins as natural units for water management. *Water Policy* 10(2): 121-138.
- Wester, P. 2008. Shedding the waters: Institutional change and water control in the Lerma-Chapala basin, Mexico. PhD thesis, Wageningen University, Netherlands.
- White, R. 1985. Are you an environmentalist or do you work for a living? Work and nature. In Cronon, W. (Ed), *Uncommon ground: Rethinking the human place in nature*, pp. 171-185. New York: WW Norton.
- Wilder, M. and Romero-Lankao, P. 2006. Paradoxes of decentralization: Water reform and social implications in Mexico. *World Development* 34(11): 1977-1995.
- Willems-Braun, B. 1998. Buried epistemologies: The politics of nature in (post)colonial British Columbia. *Annals of the Association of American Geographers* 87(1): 3-31.
- Worster, D. 1985. *Rivers of empire: Water aridity, and the growth of the American West*. Oxford: Oxford University Press.
- Zamorano Ramos, E. 1985. Datos sobre la construcción del ferrocarril de Guaymas al sur. *Historia General de Sonora, IV, Sonora Moderno: 1892-1910*. Hermosillo: Gobierno del Estado de Sonora.