The Yellow River: A Natural and Unnatural History. By Ruth Mostern. Maps and Infographics with the Assistance of Ryan M. Horne. New Haven, CT: Yale University Press, 2021. Pp. xiii + 326. $35.00 hardcover.

Over the past decade, environmental historians of China have written a veritable flood (yes, I said it) of books about the Yellow River (Huanghe 黃河).[1] *The Yellow River: A Natural and Unnatural History* by Ruth Mostern departs from previous river histories in two fundamental ways. First, in terms of temporal scope, Mostern's book traces the life of the river over nearly the entire span of human habitation, from the Neolithic to the mid-nineteenth century. Second, in terms of spatial scale, Mostern adopts a "whole-basin and sediment-centered" perspective (p. 6). That is, in examining the entire Yellow River watershed, the book draws attention to the upstream sources of the river's infamous sediment burden (heavier than any other major river in the world), which it picks up from Northwest China's ecologically fragile and erosion-prone Loess Plateau (Huangtu gaoyuan 黃土高原). Mostern effectively illustrates how events upstream altered the river's alluvial floodplain, where its flow slows down and its sediment accumulates. The book's wide temporal and spatial lens makes it possible to "historicize the processes of sediment transport and floodplain transformation and to make their long-term consequences visible" (p. 6).

Mostern's quantitative, geographically aware, *longue durée* approach generates interpretations that highlight the relative degree of environmental change that has occurred in different places and at different times, thereby avoiding easy generalizations. Specifically, the book seeks to identify "exactly when it was that the [Yellow River's] lower course turned unruly and what happened, both upstream and downstream, that led it to be that way" (p. 9). To answer these questions, as explained in the book's appendix, Mostern and her research team have constructed a database of 3,754 spatially and temporally referenced "events" related to the Yellow River. An event is defined here as any instance of river management activity or disaster

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[1] David A. Pietz, *The Yellow River: The Problem of Water in Modern China* (Cambridge, MA: Harvard University Press, 2015); Ling Zhang, *The River, the Plain, and the State: An Environmental Drama in Northern Song China, 1048–1128* (Cambridge: Cambridge University Press, 2016). Although framed as an environmental history of warfare, another work that fits into this trend is Micah S. Muscolino, *The Ecology of War in China: Henan Province, the Yellow River, and Beyond,1938–1950* (Cambridge: Cambridge University Press, 2015).

listed in the ten published sources that serve as the corpus for the database.[2] Another component of the database contains geospatial information about settlements on the Loess Plateau, which serves as an indicator of changing human activities upstream.[3]

In addition to the book's groundbreaking use of geospatial analysis and other digital research methods, Mostern's extensive engagement with literature from the natural sciences published in English and Chinese sets this study apart from previous histories of the river. The book draws its data on human contributions to erosion rates on the plateau from the findings of Xu Jiongxin 許炯心; information on Yellow River sediment levels comes from research by Shi Changxing 師長興 and his collaborators.[4]

Mostern situates insights drawn from these data within a narrative based on a synthesis of relevant secondary scholarship in English and Chinese, though the book does not consult the extensive historiography of Yellow River water control

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[2] Shen Yi 沈怡, Zhao Shixian 趙世暹, and Zheng Daolong 鄭道隆, *Huanghe nianbiao* 黃河年表 (Nanjing: Junshi weiyuanhui ziyuan weiyuanhui, 1935); Huanghe shuili weiyuanhui Huanghe zhi zong bianji shi 黃河水利委員會黃河志總編輯室, ed., *Huanghe zhi*, vol 1: *Huanghe dashi ji* 黃河志・卷一：黃河大事記, 2nd ed. (Zhengzhou: Henan renmin chubanshe, 2017); Huanghe fanghong zhi bianzuan weiyuanhui and Huanghe zhi zong bianji shi 黃河防洪志編纂委員會、黃河志總編輯室, eds., *Huanghe zhi*, vol. 7: *Huanghe fanghong zhi* 黃河志・卷七：黃河防洪志 (Zhengzhou: Henan renmin chubanshe, 1991); Huanghe shuili weiyuanhui Huanghe zhi zong bianji shi 黃河水利委員會黃河志總編輯室, ed., *Huanghe zhi*, vol. 2: *Huanghe liuyu zongshu* 黃河志・卷二：黃河流域綜述, 2nd ed. (Zhengzhou: Henan renmin chubanshe, 2017); Tan Qixiang 譚其驤, ed., *Huanghe shi luncong* 黃河史論叢 (Shanghai: Fudan daxue chubanshe, 1986); Huanghe shuilishi shuyao bianxiezu 黃河水利史述要編寫組, *Huanghe shuilishi shuyao* 黃河水利史述要 (Zhengzhou: Huanghe shuili chubanshe, 2003); Yao Hanyuan 姚漢源, *Huanghe shuilishi yanjiu* 黃河水利史研究 (Zhengzhou: Huanghe shuili chubanshe, 2003); Song Zhenghai 宋正海, ed., *Zhongguo gudai zhongda ziran zaihai he yichang nianbiao zongji* 中國古代重大自然災害和異常年表總集 (Guangzhou: Guangdong jiaoyu chubanshe, 1992); Yuan Zuliang 袁祖亮 et al., *Zhongguo zaihai tongshi* 中國災害通史 (Zhengzhou: Zhengzhou daxue chubanshe, 2009).

[3] Based on Tan Qixiang, ed., *Zhongguo lishi ditu ji* 中國歷史地圖集 (Beijing: Zhongguo ditu chubanshe, 1982–1987).

[4] Xu Jiongxin, "A Study of the Accumulation Rate of the Yellow River in the Past 10,000 Years," in L. J. Olive, R. J. Loughran, and J. A. Kesby, eds., *Variability in Stream Erosion and Sediment Transport: Proceeding of an International Symposium Held at Canberra, Australia, 12–16 December 1994* (Wallingford: International Association of Hydrological Sciences, 1994), pp. 421–30; Shi Changxing, Zhang Dian, and You Lianyuan, "Changes in Sediment Yield of the Yellow River Basin of China during the Holocene," *Geomorphology* 46.3–4 (2002): 267–83.

in Japanese.[5] Following a long and detailed chapter describing the geography and environment of the Yellow River and its watershed, Mostern structures each of the core sections of the book around "a turning point in the world-making processes along the Yellow River" when "the links between the middle course and the lower course were transformed" (p. 9). Chapters 2–4 each focus on one of the river's "lifespans." (More on these chapters below.)

Mostern further points to three periods when human-induced erosion upstream and reduced resilience to flooding on the alluvial plain combined to change the propensities of the river: the third century before the Common Era and the eleventh and the eighteenth century of the Common Era. At each of these inflection points, human settlement on the Loess Plateau increased, erosion accelerated, and the sediment accumulation rate on the floodplain doubled. "Generally speaking," Mostern writes, "whenever the Loess Plateau population became denser and settlements became more numerous, erosion increased; and whenever erosion on the Loess Plateau rose, so too did catastrophe on the floodplain" (pp. 11–12). The book's argument thus follows the eminent historical geographer Tan Qixiang 譚其驤 in linking population growth and upstream erosion with the rate of flooding downstream.[6]

The first "lifespan" of the Yellow River, covered in chapter 2, lasted from around 7,500 years ago to 750 C.E. Beginning in the mid-Holocene (7,500–5,000 B.P.), farming and other human activities had localized impacts on tributary watersheds; by the late Neolithic and early Bronze Age (5,000–3,500 B.P.), humans had extended their footprint across the entire Yellow River basin. During the late Bronze Age and into the Iron Age (c. 3,500 B.P.), larger populations equipped with better technologies altered the environment to an even greater extent. Although erosion and sediment transport began 5,000 years ago, progressive agricultural intensification dramatically increased erosion between 2,000 and 3,000 years ago, when centralized states compelled growing populations armed with iron tools to expand the amount of land under cultivation at the expense of the ecologically fragile grasslands of the Loess Plateau. By the turn of the Common Era, human activities on the Loess Plateau were

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[5] For an introduction to the Japanese historiography see Mark Elvin et al., *Japanese Studies on the History of Water Control in China: A Selected Bibliography* (Canberra: The Institute of Advanced Studies, Australian National University, 1994).

[6] Tan Qixiang, "Heyi Huanghe zai Dong Han yihou hui chuxian yige changqi anliu de jumian—Cong lishi shang lunzheng Huanghe zhongyou de tudi heli liyong shi xiaomi xiayou shuihai de juedingxing yinsu" 何以黃河在東漢以後會出現一個長期安流的局面——從歷史上論證黃河中游的土地合理利用是消弭下游水害的決定性因素, *Xueshu yuekan* 學術月刊 2 (Feb. 1962): 23–35.

having an effect downstream. Populations had become large enough and technologies impactful enough that "erosion had begun to affect the entire alluvial plain" (p. 99). Sedimentation increased, making the Yellow River relatively unstable.

The floodplain's populace built levees starting 2,900–2,700 years ago to confine the unstable river to a preferred channel, making it possible to settle closer to the river to access water and cultivate alluvial soils. They increased the risk of flooding in the process. Political and military powerholders in North China expanded waterworks construction during the three centuries prior to the Common Era, making that period "the beginning of the high-disaster and high-management era in Yellow River history: intensive levee construction and interventionist flood management" (p. 101). Confined within embankments, sediment accumulated until it caused the riverbed to rise above the surrounding banks. When the river inevitably broke through the dikes, it flooded land below and caused catastrophe for residents of the North China Plain. As a result, the riverbed periodically shifted north or south of the Shandong Peninsula over the following centuries, taking a new route to the sea across its 700 km wide floodplain.

Historical sources on the Yellow River record only sporadic disasters between 750 B.C.E. and 750 C.E., but Mostern's data reveal two disaster-prone intervals. Fortifications and colonial agriculture in the Ordos region (directly to the north of the Loess Plateau) intended to resist incursions by the Xiongnu 匈奴, beginning under the Qin and continuing under the Han, accelerated erosion and increased sedimentation, resulting in the first wave of disasters around the turn of the Common Era. Previous historians have chronicled the Yellow River's change of course in 11 C.E., as well as the Han imperial court's responses.[7] Mostern fully recognizes the significance of these developments, but characterizes the instability as an "anomaly that was followed by a long stable period" (p. 66). The second disaster-prone era did not occur until after the founding of the Tang in 618 C.E.

Mostern takes pains to emphasize that the gradual increase in the rate of erosion during this "lifespan" paled in comparison to later times. Except for high erosion and sediment deposition during the last two centuries before the Common Era, the river remained stable throughout this long period, never undergoing sudden changes in course. Hydraulic engineering work had not yet affected much of the plain and flood events had a limited, localized impact. Mostern agrees with the findings of T. R. Kidder, Arlene Rosen, and their co-authors, who contend that the landscape transformations between late Neolithic and early dynastic times, especially on the Loess Plateau, increased Yellow River sedimentation and, as a consequence, investment

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[7] For instance, Pietz, *The Yellow River*, pp. 45–46.

in flood control measures.[8] Yet Mostern prefers to see these changes in relation to what came afterward instead of what existed before, noting that, "Neolithic and Iron Age erosion pales in comparison with that of the middle and later imperial periods" (p. 67). The Loess Plateau still had reasonably intact forest and vegetation cover, as the limited population had not converted much of it to farmland. After the collapse of a centralized agrarian empire in the third century C.E., agricultural colonization retreated, grasslands returned, erosion diminished, and floods abated. Mostern's data contain few records of flooding between the first century and the eighth century (pp. 112–13). Yet the most significant changes in the river were still to come.

A truly disaster-prone Yellow River emerged during the 900s and 1000s in tandem with the ecological degradation that resulted from changing patterns of land use on the Loess Plateau. Prior to the tenth century, loess soil with ample vegetation cover absorbed rainfall and limited runoff; thereafter, deforestation and destruction of grasslands led to "a phase of severe and rapid erosion" (p. 121). Large-scale destruction of natural vegetation and intensified erosion "caused the primordial gentle and flat ground of the Loess Plateau to begin its transformation into the deep-gullied and steep-highland landscape characteristic of the contemporary Loess Plateau" (p. 134). The region's current landscape, which is dissected by gullies and hills, Mostern notes, has only existed for between 1,000 and 1,500 years.

In chapter 3, the book's most impressive section, Mostern highlights what she terms the "middle period tipping point" between 750 and 1350. The Tang-Song transition, in particular, "marked the turning point that caused the Yellow River to convert from its low-disaster early period of slow environmental transformation to a frequently calamitous final imperial millennium of high-velocity ecological change" (p. 123). Sedimentation increased by an order of magnitude compared to the highest prior rates, initiating frequent flooding followed by the creation of hydraulic infrastructure that sought to tame the river.

This transformative era, in Mostern's compelling account, "pivots, again and again, on warfare" (p. 176). Beginning in the mid-700s, and for the next three centuries, "the military geography of the Loess Plateau was a profound driver of ecological degradation" (p. 131). Following the An Lushan Rebellion (An-Shi zhi luan 安史之亂 , 755–763), the Tang regime vied with ethnically diverse claimants from the

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[8] Tristam R. Kidder and Yijie Zhuang, "Anthropocene Archaeology of the Yellow River, China, 5000–2000BP," *Holocene* 25.10 (2015): 1627–39; Arlene M. Rosen, Jinok Lee, Min Li, Joshua Wright, Henry T. Wright, and Hui Fang, "The Anthropocene and the Landscape of Confucius: A Historical Ecology of Landscape Changes in Northern and Eastern China during the Middle to Late-Holocene," *Holocene* 25.10 (2015): 1640–50.

steppes and Tibet for geopolitical power in the Ordos. As garrisons and agricultural colonies impinged upon fragile grasslands and forested hillsides, they destroyed natural vegetation and accelerated erosion. Runoff washed greater amounts of silt into the river, threatening intricate canal systems used for irrigation and transport. By the ninth century, writers regularly referred to the river as "Yellow" due to the loess sediment that coloured its waters. Yet Mostern's data indicate that the Tang regime paid little attention to river management even as the frequency of reported disasters began to rise.

Along with rapid commercialization and population growth, military hostilities during the Song period intensified forest and grassland destruction, erosion, and sediment deposition. The conflict between the Song and the rival Tangut people, who founded the Xi Xia 西夏 regime in the Ordos region, wreaked havoc on the forests and grasslands of that ecologically fragile region. Mostern brilliantly employs historical GIS maps of the deployment of Song garrisons to illustrate how the Song fortified the frontier with the Xi Xia and settled military agricultural colonists to displace pastoral peoples. Soldier-farmers and their families felled trees to clear land for farming, for building materials, and for fuel, resulting in severe erosion.

Deposition of the Yellow River's sediment on the plain ushered in an unprecedented era of flooding, which peaked in the late tenth century and the second half of the eleventh century. Mostern's data show a "remarkable correlation" after 950 or so between disasters and precipitation (p. 124). Before the tenth century, when vegetation cover on the Loess Plateau could absorb moisture, increased rainfall did not necessarily lead to flooding. After that time, deforestation and loss of ground cover meant that runoff from rainstorms washed soil into the Yellow River and its tributaries, making disasters more likely in rainy years.

Hydraulic management interventions undertaken by the Song court in its confrontation with the Khitan Liao 遼, as explored by Ling Zhang, led the silt-laden river to change its course in 1048 for the first time in eight hundred years.[9] Frequent disasters and management efforts followed. Based on records of river-related events, Mostern outlines a broad periodization of gradually evolving state responses to the river's growing instability. Between 920 and 1029, a period of abnormally high rainfall, river management officials reacted to unexpected catastrophes by making emergency repairs to levees and canals. Yet bureaucratic incentives encouraged Song officials to undertake local responses rather than a more broadly coordinated strategy. From 1029 to 1090, they debated how to manage the newly silt-filled river. Finally, from 1090 to 1165, they prioritized repair and maintenance of the existing hydraulic infrastructure.

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[9] Zhang, *The River, the Plain, and the State*.

The Song military's intentional breach of the Yellow River's southern dikes in 1128 to slow the invading Jurchen Jin 金 cavalry caused the river's waters to flow into the Huai River (Huaihe 淮河) basin, which became a frequent theater of war for the next two decades.[10] The southward diversion of the Yellow River marked the beginning of the "most unstable era in all of recorded floodplain history" (p. 170). As it meandered across the Huai basin, the river changed course frequently, flooded annually, and followed multiple paths to the sea. However, because the official system for documenting disasters and management events collapsed along with the collapse of hydraulic infrastructure, only a small number of these appear in the historical record. Paucity of documentation, as Mostern acknowledges, renders the database of river-related events on which the book is based "least reflective of the reality of river history" for this period (p. 172).

During the late twelfth century, the Jin regime's military-style river management system rejected levee construction in favour of a multi-course river network, and this led to the Yellow River shifting between multiple courses for nearly three centuries. After the Mongols conquered the Jin—a war that included more intentional levee breaches—and founded the Yuan dynasty in 1279, the river continued to have multiple courses. But Yuan rulers also restored the long-neglected Grand Canal (Dayunhe 大運河) to transport resources north from the productive Yangtze Delta, the economic heartland of the empire, to the capital of Dadu 大都 (later known as Beijing) and re-engineered the floodplain to ensure the canal's functioning.

During the final "lifespan" of the Yellow River, from the mid-fourteenth century until the mid-nineteenth century, erosion on the Loess Plateau accelerated by another order of magnitude. In the late fourteenth and fifteenth century, Ming recolonization of territory captured by the Mongols, culminating in the construction of a network of long walls (a.k.a. the Great Wall) in the 1470s, coincided with another era of military fortification, garrison agriculture, population growth, and an upsurge in erosion-causing activity. After the late seventeenth century, civilian agricultural migrants, encouraged by tax incentives from the Qing government, planted New World crops like maize and sweet potatoes in marginal upland areas, removing virtually all the native groundcover that had absorbed rainfall and held the soil in place.

Downstream, as erosion intensified and silt clogged waterways, sedimentation gave rise to floods that spurred the creation of an elaborate hydraulic infrastructure.

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[10] Christian Lamouroux, "From the Yellow River to the Huai: New Representations of a River Network and the Hydraulic Crisis of 1128," in Mark Elvin and Liu Ts'ui-jung, eds., *Sediments of Time: Environment and Society in Chinese History* (Cambridge: Cambridge University Press, 1998), pp. 545–84.

Throughout this "lifespan" of the Yellow River, the floodplain waterworks system focused on the Grand Canal, whose grain-carrying convoys crossed the river not far upstream from its mouth. Deposition of sediment washed downstream from the Loess Plateau destabilized the Yellow River-Grand Canal complex, so that maintaining it demanded constant investments of labour and materials. As Mark Elvin has written:

> The Canal was the lifeline that made it possible to maintain supplies to Beijing—the principal capital after 1420 under the Ming. What was intuited as politically and militarily necessary to block non-Han invasions of the central Chinese plain from the north led to a war with water instead.[11]

The imperial state had entered a protracted struggle against the silt-filled river that it could never truly win.

During the Yuan and Ming, Mostern's data indicate bursts of policy initiatives that alternated with periods of less active management. Advocates of aggressive hydraulic engineering that sought to lock the river into a single course prevailed in court debates during the mid-fourteenth century and again in the late sixteenth century. After 1400, due to this trend toward more aggressive floodplain management, there ceased to be a correlation between rainfall levels and the rate of flood disasters. Like previous historians, Mostern pays much attention to Pan Jixun's 潘季馴 celebrated overhaul of the floodplain infrastructure in the 1570s, which confined the previously multi-course river to a single channel between fixed levees and released water from Hongze Lake (Hongzehu 洪澤湖) via sluice gates to scour the riverbed and wash sediment past the river's confluence with the Grand Canal.[12]

This hydraulic engineering system, which the Qing regime extended, reached its apex during the eighteenth century with "a level of interventionist engineering that was entirely unprecedented in Yellow River history" (p. 182). Waves of intensive construction in the early eighteenth and early nineteenth century marked an era of "remarkably successful intensive floodplain management" (pp. 228–29). From the mid-sixteenth until the mid-nineteenth century, and especially during the eighteenth century, official interventions kept the Yellow River relatively stable. The river loomed above the plain as its bed rose and Qing officials oversaw the building of ever-higher levees; the river flooded frequently, but not catastrophically, and it did not change its course to the sea.

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[11] Mark Elvin, *The Retreat of the Elephants: An Environmental History of China* (New Haven, CT: Yale University Press, 2004), p. 130.

[12] Elvin, *The Retreat of the Elephants*, pp. 129–30, 137–38; Pietz, *The Yellow River*, pp. 49–52.

Mostern's assessment of river management during the high Qing (c. 1683–1799) is not entirely positive. Even at the height of its effectiveness during the eighteenth century, she writes, floodplain engineering "did not effectively support the livelihoods of most floodplain denizens, but it did serve the needs of state and elite power structures and prosperous urban life along the Grand Canal and in the capital at Beijing" (p. 231). However, the book puts forth no concrete evidence to support the claim that Qing water policy did not benefit North China's populace.[13] Kenneth Pomeranz's characterization of the maintenance of the Grand Canal during the 1700s as a central component of the Qing Empire's "reproductive statecraft," which required prosperous regions like the Lower Yangtze to subsidize the well-being of ecologically marginal areas of the empire, such as the North China Plain, runs counter to Mostern's assessment. When Qing reproductive statecraft fell apart under the pressure of demographic, economic, and ecological developments caused in part by its successes, the denizens of North China suffered as a result.[14]

It is true that Qing hydraulic management efforts never addressed the problem of upstream erosion. As Mostern points out, "the late-imperial floodplain infrastructure system had no solution to the accelerating quantity of sediment flowing from the Loess Plateau onto the floodplain: it simply moved it away from the Grand Canal confluence and into other locations that were of less strategic value to the imperial regime" (p. 225). Disasters grew more frequent by the 1840s, and in 1855 the Yellow River returned to a course north of the Shandong Peninsula. That course change, Mostern explains, "reflected neither dynastic decline nor an irresistible natural cycle so much as the technological, economic, administrative, and most of all ecological limits of a complex system conceived and engineered during an era of vertiginously rising sedimentation rates" (p. 237). There was simply too much silt. Ever-increasing deposition of sediment from the eroded Loess Plateau, not failures of engineering or administration, doomed the late-imperial floodplain system to collapse.

One of the advantages of tracing the Yellow River's history over such a long duration is that it enables Mostern to characterize severe ecological degradation on the North China Plain—with the river, entirely locked behind levees, causing frequent

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[13] To support this statement, Mostern (p. 231, n. 132) cites, but does not discuss, Jinghao Sun, "City, State, and the Grand Canal: Jining's Identity and Transformation, 1289–1937," (Ph.D. dissertation, University of Toronto), 2005.

[14] Kenneth Pomeranz, "The Transformation of China's Environment, 1500–2000," in Edmund Burke III and Kenneth Pomeranz, eds., *The Environment and World History* (Berkeley and Los Angeles, CA: University of California Press, 2009), pp. 123–27. Pomeranz's argument is echoed in Pietz, T*he Yellow River*, pp. 63–64, 68.

flood disasters—as a relatively recent phenomenon: "When Chinese and global commentators refer to the Yellow River by the moniker of 'China's Sorrow,' they are unwittingly evoking only the river's final imperial life span, especially the nineteenth-century collapse and its aftermath" (p. 10). In historicizing environmental decline and the frequency of ecological disasters, Mostern's book stands alongside Lillian Li's study of famine relief in North China, which similarly demonstrates that it was not until the late nineteenth century that China became a "land of famine."[15]

Although the ecological crisis of the late nineteenth century—precipitated by population growth, frontier expansion, and intensified hydraulic engineering efforts—may have reached an unprecedented level of severity, the essential dynamics of the cycle had not changed. Again and again, erosion on the Loess Plateau accelerated and Yellow River sedimentation increased, giving rise to catastrophe on the floodplain. As early as 4 C.E., Han commander in chief Zhang Rong 張戎 connected agricultural settlement on the Loess Plateau with erosion, sedimentation, and flooding. For centuries thereafter, other observers expressed an acute awareness of that relationship as well. What prevented anyone from acting on it?

The answer, according to Mostern, is a geographic one. Around 1000 C.E., imperial China's concentrations of wealth and revenue, the locations of its northern borderlands, and the zones of its waterworks diverged. The imperial capital moved east, away from the Loess Plateau, and China's economic core shifted to the southeast. From that time onward, "it ceased to be conceptually possible for the Chinese imperial state to 'see' the politically and spatially distinct regions of the river basin as a single ecological system." The middle course, a militarized frontier, and the lower course, an ecologically precarious centre, "signified different things in the imperial imagination, and they had different roles in the realm" (pp. 12–13). Imperial regimes managed the Yellow River's middle course and lower course separately, with unintended but disastrous results for people and nature alike. By the eighteenth century, I would add, when China's population boomed but the size of the imperial bureaucracy remained basically unchanged, although some Qing officials perceived the threat, the state did

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[15] Lillian M. Li, *Fighting Famine in North China: State, Market, and Environmental Decline, 1690s–1990s* (Stanford, CA: Stanford University Press, 2007). Although Mostern provides a reliable account of the environmental degradation that emerged in North China by the end of the eighteenth century, her claim that the total amount of arable land in the region fell between 1740 and 1930 (p. 232) does not withstand scrutiny. Evidence for the statement is derived from Pomeranz, who reports that total arable land declined over that period not in North China as a whole, but in Wugong 五公, Hebei Province. Pomeranz, "China's Environment," p. 133.

not have the capacity to change the agricultural and land-use practices of millions of people for the sake of slowing erosion or preventing floods. A policy approach that managed the Yellow River as a single, coherent hydrological system was outside the realm of political possibility.

In its sheer comprehensiveness, Mostern's history of the Yellow River from prehistoric to late imperial times surpasses any existing account. Even a lengthy review such as this one cannot do justice to the amount of empirical information and interpretive insight that it offers. Only the epilogue, "The Yellow River in the Anthropocene," when compared to the rest of the book, proves a bit of a disappointment.[16] (Interested readers may turn to David Pietz's modern history of the Yellow River, which picks up where Mostern's book leaves off.[17])

Given Mostern's focus on the river as a "sediment sorting machine" that transports organic and mineral material downhill to its floodplain or estuary (pp. 2–3), she could have taken a chance to reflect in the epilogue upon a particularly pertinent dimension of the ongoing relationship between the Yellow River and the Chinese people in the Anthropocene. Since the 1950s, the PRC's construction of dam and reservoir megaprojects, along with soil and water conservation programmes undertaken on the Loess Plateau, has dramatically reduced the volume of sediment that the Yellow River transports into the sea. Sedimentation has returned to the levels of the middle Holocene, when human influence was negligible. The alluvial fan at the river's mouth has thus taken on a distinctive shape that some scientists consider a geophysical marker of the Anthropocene. The delta, which previously advanced toward the sea with the accumulation of waterborne sediment, is now receding.[18] The Yellow River has entered yet another "lifespan," and Mostern's book is an ideal starting point for anyone seeking to understand its historical significance.

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[16] American advisers from the Tennessee Valley Authority (TVA) could not have assisted the Guomindang 國民黨 regime in founding the Yellow River Conservancy Commission (*Huanghe shuili weiyuanhui* 黃河水利委員會) in 1929, for instance, since the TVA did not come into existence until 1933 (p. 240).

[17] Pietz, *The Yellow River*.

[18] Houjie Wang et al., "Stepwise Decreases of the Huanghe (Yellow River) Sediment Load (1950–2005): Impacts of Climate Change and Human Activities," *Global and Planetary Change* 57.3–4 (2007): 331–54; James P. M. Syvitski and Albert Kettner, "Sediment Flux and the Anthropocene," *Philosophical Transactions of the Royal Society A* 369 (2011): 957–75.