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10

The Younger Dryas in Arid Northeast Asia

Joshua Wright and Lisa Janz

Introduction

In this chapter, we will concentrate on the arid Northeast Asian steppe region east of the Altai mountains, between the forested steppe of Siberia to the north and the loess highlands of eastern Asia to the south. The three primary regions that we will consider are the Khangai mountains in Central Mongolia, the Gobi Desert, and the Ikh Nurruud basin, or Basin of Great Lakes, in western Mongolia (Figure 10.1). The last provides an extensive record of climate proxies from the lakes. Archaeological data, however, comes primarily from the Gobi Desert region.

Why This Region?

The larger issue in the archaeology of this region, and the sites discussed here, is adaptation to climatic fluctuation. Paleoclimatic data show that arid, Northeast Asia has long been a tough environment, and the adaptation to the Younger Dryas by resident hunter-gatherers raises the question of how exceptional the impact of that colder and dryer period might have been on a population already adapted to subsistence on a marginal landscape.

Hunter-Gatherer Behavior: Human Response during The Younger Dryas, edited by Metin I. Eren, 231–248.

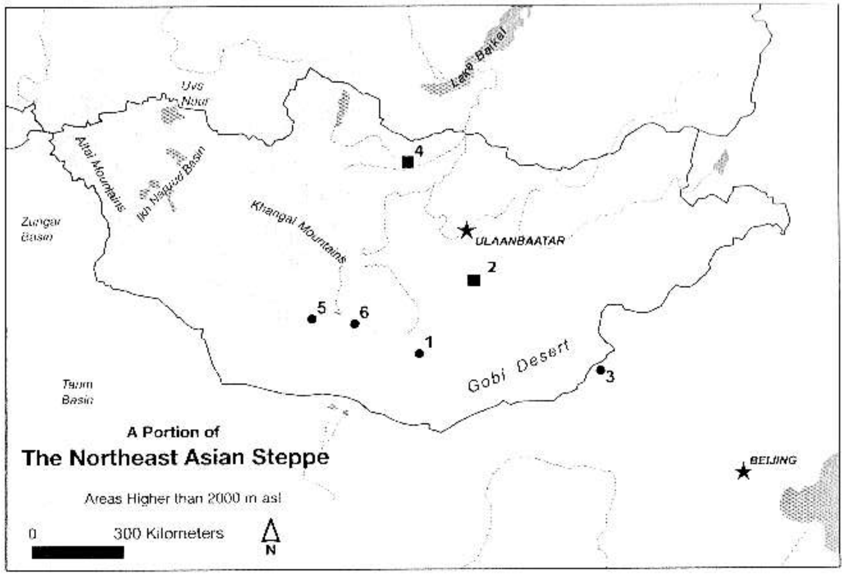

Figure 10.1 The arid steppe regions of Northeast Asia. Sites mentioned in text are 1) Shabarak-Usu/Bayan Zak; 2) Baga Gazaryn Chuluu; 3) Baron Shabaka Well; 4) Egiin Gol; 5) Chikhen Agui; and 6) Tsagaan Agui.

As part of the larger East Asian region, the Northeast Asian steppe was a critical frontier of human activity during the Pleistocene and Holocene periods. It is tied to greater East Asia by its common chipped-stone traditions throughout the late Pleistocene and early Holocene, and by its central role in discussions of the dynamics of human habitation and technological development in Northeast Asia following the last glaciation (Elston and Brantingham 2002; Goebel 2002). During the late Pleistocene, there is a noted division between the blade industries of the western and northern steppe regions of central and Northeast Asia and the flake and chopper industries associated with the southern and eastern river drainages and coastal regions of East Asia. During the terminal Pleistocene, probably beginning around the time of the Last Glacial Maximum (~21,000 cal BP), a common microblade technology appeared in much of Northeast Asia, including the north coastal regions and areas previously dominated by flake and chopper, tool traditions. Since the late Holocene, the steppes and deserts of Northeast Asia have formed a distinct environmental frontier within East Asia between mobile pastoralists and sedentary agriculturalists.

At the northern extent of the arid reaches of Northeast Asia, the Khangai mountains (maximum elevation 4,000 m asl) feed rivers that

mostly drain northward as part the Lake Baikal watershed. The western portion of this region is dominated by the eastern edge of the Altai range (maximum elevation 4,200 m asl) and includes many dry, high altitude intermountain plains and a line of shallow lake basins along their northern flanks, which constitutes the Valley of the Gobi Lakes. This valley, extending across the plains that divide the Khangai and Altai ranges, meets the larger Ikh Narruud lake basin (Valley Basin of the Great Lakes, ca. 1,100 m asl) in the west. The lakes across this region are typified by a series of extensive basins that capture drainage from the surrounding highlands. The Gobi Desert, in the south, is the largest Asian desert and the only major, arid region in Northeast Asia. In its eastern reach, the Gobi is characterized by open steppe, while basins and smaller mountain ranges dominate the central and western areas. This latter region forms the central arena for discussion in this chapter because it contains the most well documented archaeological sites.

Climate History

Overall the climate of arid Northeast Asia is dominated by the relationship between the Asian monsoons that bring rain and wet conditions to coastal and southern Asia, and the countervailing westerlies that bring dry conditions to Central Asia. The boundary between these two weather systems shifted back and forth across the Northeast Asian steppe belt throughout the late Pleistocene and Holocene.

The backdrop for the Younger Dryas in arid Northeast Asia is the Last Glacial Maximum of the Sartan glaciation (25,000 cal BP), which brought the snow line down to 2,000–1,800 m asl in this region. By 20,000–18,000 cal BP, higher elevations were deglaciating and warming began throughout the region under discussion (Grunert, Lehmkuhl, and Walther 2000; Horiuchi et al. 2000). Released from periglacial conditions, the warmer succeeding period was one of hyper-aridity in the western basins of Mongolia. Dune fields crossed many of the low-lying basins and loess deposition occurred over wide areas (Lehmkuhl and Lang 2001; Yang et al. 2004). With the warming trend of the Bølling-Ållerød (14,700–13,000 cal BP) (Goldberg et al. 2001; Prokopenko et al. 1999), deciduous forests grew in the northern Khangai and the Selenga river drainage (Feng 2001; Horiuchi et al. 2000).

Typical climatic shifts associated with the cool, dry Younger Dryas have been documented in ice and lake cores recovered in Inner Asia, from the Qinghai plateau (Madsen et al. 1998) and Lake Baikal (Prokopenko et al. 1999). Climate dynamics typical of the late Pleistocene regained some dominance during this interval. During the Younger Dryas, the Northeast Asian steppe and Gobi Desert were outside the reach of the Asian monsoons, as they are today (Feng 2001; Herzschuh 2006; Ilyashuk and Ilyashuk 2007; Zhou et al. 2001). In arid Northeast Asia, this climatic shift toward an exceptionally cool, dry climate was most evident between 12,900 and 11,600 cal BP (see also Herzschuh 2006). Although the snowline had risen to approximately 3,500 m asl (Lehmkuhl and Lang 2001), extreme aridity and very low lake levels characterized basin and steppe environments (Herzschuh 2006; Huang et al. 2007; Rhodes et al. 1996; Yang et al. 2004). This was not universally the case, and the Uvs Nuur basin in western Mongolia reached its minimum level at 12,200 cal BP. (Yang et al. 2004). Other lake basins all along the eastern face of the Altai began to recover between 12,000 and 10,000 cal BP (Rhodes et al. 1996; Yang et al. 2004). Though some large, arid regions, such as Lake Bosten, in the Zungar basin, did not undergo lake formation until the early Holocene (8000–7000 cal BP) (Huang et al. 2007). Despite this general drying trend, some ambiguities exist in the paleoenvironmental record of the region. Permafrost layers of Gobi Desert soils degraded between 13,000–10,000 cal BP as temperatures consistently warmed (Yang et al. 2004), and some regions saw a rise in lake levels. Around the northwestern edges of the Khangai and the northern area of the Ikh Nurruud basin, lake stands not only increased, but reached their highest recorded levels (Yang et al. 2004). At 11,230 ± 60 cal BP, Uvs Nuur stood forty meters higher than its present level (Grunert, Lehmkuhl, and Walther 2000). Similarly, lake basins all along the eastern face of the Altai began to recover from late glacial aridity between 12,000 and 10,000 cal BP (Rhodes et al. 1996; Yang et al. 2004). These widespread increases in lake levels resulted in huge inflows of water, driving the formation of large alluvial fans at the mountain edges above lakes (Grunert, Lehmkuhl, and Walther 2000). The Lake Baikal drainage, including the northern Khangai mountains, also experienced some increases in aridity and cooling between 13,100 and 12,100 BP (Ilyashuk and Ilyashuk 2007; Prokopenko et al. 1999), but forest cover remained.

In spite of temporary returns to cooler conditions during the Younger Dryas, postglacial, warming trends and deglaciation continued and appear to have moderated the effect of Younger Dryas conditions. Lake levels throughout the Altai region were mostly influenced by long-term warming and deglaciation. In contrast, regions most reliant on precipitation would have been more directly affected by conditions of the arid Younger Dryas. In short, although the Younger Dryas in the Northeast Asian steppe was a continuation of late Pleistocene patterns of widespread aridity, its effect was tempered by high-elevation warming and a concomitant hydrologic dynamism in many lake basins.

Just as the Younger Dryas provides records of tumultuous geomorphological and hydrologic changes, shifting vegetation dynamic provides an important record of early Holocene climatic trends. During the early Holocene, overall conditions remained dry (Chen et al. 2008), but there is a general increase in indicators of wetter conditions (Herzschuh 2006). Lake levels in the Ikh Naruud Basin dropped in the early Holocene, but the shoreline still stood 12–8 meters above modern levels. The dynamics of the streams that fed these lakes changed and they began to down-cut into the large fluvial fans that formed during the Pleistocene and Younger Dryas (Grunert, Lehmkuhl, and Walther 2000; Lehmkuhl and Lang 2001).

Evidence of *Artemisia*-dominated steppe appears throughout the Northeast Asian steppe from the North China Plain (10,000–8000 BP) (Liu, Cui, and Huang 2001) to the Zungar Basin (10,000–6000 cal BP) (Huang et al. 2007; Rhodes et al. 1996). In the Great Lakes region of western Mongolia, and the northern slopes of the Khangai steppe, this *Artemisia*-dominated steppe alternated with periods when forest dominated the ecosystem during the early Holocene (Grunert, Lehmkuhl, and Walther 2000; Lehmkuhl and Lang 2001). In the highlands to the north of the lakes region and the Khangai, an abrupt warming and increase in moisture is indicated by changes in the Chironomid (midge) populations during the early Holocene (Ilyashuk and Ilyashuk 2007). In the Gobi Desert region, low rainfall, desert conditions remained predominant along with unstable lacustrian environments in desert basins (Chen et al. 2008; Herzschuh et al. 2004; Yang et al. 2004); although, by 8000 cal BP there was a widespread high in lake levels throughout the Gobi-Altai region (Harrison, Yu, and Tarasov 1996; Komatsu et al. 2001; Lehmkuhl and Lang 2001). To the south, a monsoon driven wet climate dominated the loess plateau (Chen et al. 2008).

The early Holocene was a climatically rich time in Northeast Asia, vegetation communities rebounded from the arid late Pleistocene, and the environment was characterized by closed woodlands of much more dense vegetation, a situation not typical during the Pleistocene. Despite the potential of the Khangai mountains and Ikh Naruud Basin to support Holocene occupation, thus far the best known archaeological remains from all the periods discussed here come from the less forgiving regions of the Gobi Desert and far eastern spurs of the Altai mountains (Derevyanko and Dorj 1992; Gábori 1963; Okladnikov 1986; Tsybiktarov 2002; Wright 2006; Wright et al. 2007).

Cultural Periods

The discussion of cultural chronology spanning the Younger Dryas is mainly a discussion of chipped-stone tool traditions. Wedge-shaped, microblade cores, small bifaces, and small endscrapers characterize the widespread Northeast Asian microlithic tradition. Microblades were often broken into segments and inserted into hafts, sometimes being retouched along one edge. Intensively retouched microliths are less common in Northeast Asian assemblages, but backed microblades and elaborately retouched small pieces, such as awls, drills, and points produced by pressure flaking do occur (Bettinger, Elston, and Madsen 1994; Bleed 2002; Chen and Wang 1989; Elston and Brantingham 2002; Hayashi 1968; Maringer 1950; Nelson 1926; Tang and Gai 1986; Zheng 2000). Developed microlithic assemblages have been dated as early as the late Pleistocene at sites such as Xueguan, Xiachuan, and Hutouliang on the southern borders of the Gobi Desert (Chen and Wang 1989; Lu 1998) and Verkolenskaya Gora, Ust-Kyakta and Studenoye 1 in South Siberia (Kuzmin and Orlova 2000). Dates for the northern sites reach well into the Younger Dryas. Although the chronology of pottery in Northeast Asia is not well understood (but see Cohen 2003), over much of temperate and coastal, Northeast Asia the use of pottery develops in the late Pleistocene as early as 16,500 cal BP in the Russian Far East (cf. Frink and Harry 2008; Kuzmin and Orlova 2000; Kuzmin and Shewkomud 2003; Wu and Zhao 2003). New dates from the Gobi Desert indicate the use of pottery by at least 9600 cal BP (Janz 2012).

That being said, there is little well-documented evidence for human activity in the Northeast Asian steppes during the Younger Dryas. This is not a dearth of evidence; there are widespread traces of the people using microlithic tools throughout the region (Bettinger, Elston, and Madsen 1994; Derev'anko 1998; Derevyanko and Dorj 1992; Fairservis 1993; Wright et al. 2007), but there is a lack of dates for those sites. Though microlithic technology continued to be used throughout much of the Holocene, the relationship of many of these sites to late Pleistocene geomorphology suggests that they could date to the Younger Dryas. In addition, the few dated sites do support the presence of people during the late Younger Dryas and early Holocene (Table 10.1).

Sites of *Younger Dryas* and Early Holocene

Although, there are currently no archaeological sites securely dated to the Younger Dryas alone, much of the terminal Pleistocene appears to have been characterized by ephemeral traces of hunter-gatherer occupation. Toolkits uniformly composed of microlithic cores and blades made primarily of colorful jaspers, chalcedonies, and silicified sandstone typify Gobi Desert archaeological sites assigned to the earliest postglacial periods. While there is variation in core types, many were wedge-shaped or heavily reduced on all sides to produce a conical or bullet shape. Various types of expedient, tabular, and intermediate

Table 10.1 Dated late Pleistocene and Holocene sites from the Northeast Asian steppe region.

Site	Conventional ^{14}C age	Calibrated age (2σ range)*	Location latitude longitude	Reference	Climate conditions
Tsagaan Agui	33497 ± 600 33840 ± 640	NA	44.42N 101.10E	(Derevianko et al. 2000)	Last Interstadial
Dörölj (Egiin Gol)	21820 ± 190 31880 ± 800	NA	49.26N 103.34E	(Jaubert et al. 2004)	Last Interstadial
EGS 082 (Egiin Gol)	27000 ± 390	NA	49.44 N 103.64 E	Wright 2006	Last Interstadial
Baron Shabaka Well	12450 ± 74 12509 ± 59	14.9–14.2 15.1–14.2 KBP	42.51 N 111.06 E	(Janz, Elston, and Burr 2009)	Terminal Pleistocene
Baga Gazaryn Chuluu (BGC 1451)	12,203 ± 73	14.3–13.8 KBP	46.18 N 106.04 E	(Janz, Elston, and Burr 2009)	Terminal Pleistocene
Chikhen Agui	5630 ± 220 11545 ± 75	11.5–5.5 KBP	44.46 N 99.04 E	Derevienko et al. 2003 (Janz, Elston, and Burr 2009)	Younger Dryas/Early to Mid-Holocene
Shabarakh-Usu (Bayan-Dzak)	7969 ± 37 8439 ± 60	9.5–9.3 KBP 9–8.7 KBP	44.10 N 103.42 E	(Janz, Elston, and Burr 2009)	Early Holocene

*Calibrations performed using Oxcal 4.0 online tool with IntCal 04 calibration curves.

types are also represented in these collections as well as large cylindrical bladelet cores. The majority of cores produced pointed microblades that were occasionally retouched and hafted either broken into segments or whole (Chard 1974; Derev'anko 1998; Lu 1998).

The occurrence of technology such as pottery, grinding stones, and polished stone tools has been used to identify a "Neolithic" culture (Chard 1974; Kuzmin and Shewkomud 2003; Okladnikov 1990) in the early Holocene or late Pleistocene that is not associated with any of the aspects of sedentism, agriculture, animal domestication, or social differentiation widely understood to be associated with Neolithic people of western Eurasia (for more information see Derevianko et al. 2003; Lu 1998; Weber 1995). Dates from Shabarakh-Usu and sites in the southern Gobi Desert (Elston et al. 1997; Janz et al. 2009) suggest that these technologies were established by the early Holocene as part of an Epipaleolithic or Mesolithic type of economy in which pottery and grinding tools were used as part of foraging activities.

Baron Shabaka Well

Baron Shabaka Well is a terminal Pleistocene site with an assemblage deposited during a time of highly contrasting hyper-aridity and increased fluvial flow-out of deglaciating highlands. The Baron Shabaka Well site (also known as [American Museum of Natural History] AMNH Site 19), discovered in 1928 in eastern Inner Mongolia, is one of numerous postglacial habitation sites discovered by the AMNH's Central Asiatic Expeditions. Artifacts were recovered from several discreet clusters within a sand-dune, covered valley (Fairservis 1993). Clusters of artifacts surrounding hearths typified these localities. Lithic materials included both developed microblade assemblages and coarsely chipped implements, along with bifaces, grinding stones, and polished stone (Fairservis 1993). Some site clusters contained coarse, thick ceramic sherds. The site was recently dated using ostrich eggshell fragments, but it is not clear exactly which occupation assemblages the shells were associated with. Overall, the assemblages suggest the site was periodically occupied by mobile hunter-gatherers, some of whom appear to have been processing grass seeds or other such resources within the dune fields.

Chikhen Agui

Chikhen Agui is a cave site located in a small limestone ridge in the eastern Gobi-Altai. The cave is situated near a narrow canyon and

adjacent to a spring-fed stream. This site records hunter-gatherer activity in an arid rocky desert region at end of the Younger Dryas, and early to mid-Holocene. Radiocarbon dates (Table 10.1) on charcoal from several hearth features returned dates ranging from the late Pleistocene (Horizon 4) and the Younger Dryas to the mid-Holocene (Horizons 1–3) (Derevianko et al. 2000; Derevianko et al. 2003). Although the earliest AMS date was 13,400 cal BP (11,545 + 75 BP (uncalibrated), the majority of the dates were from ~9000 cal BP. Ostrich eggshell from Horizon 1 date to 11,500 cal BP (10,060 ± 50 BP)) (Kurochkin et al. 2009).

The lithic assemblage is comprised of microblade cores and tools, as well as endscrapers, retouched flake points, and other retouched flakes. Tools were made from reddish- and yellowish-brown jasper or chalcedony, as well as dark siliceous sandstone. Chikhen Agui contained numerous hearths and concentrations of grass, interpreted as the remains of bedding (Derevianko et al. 2003). There is no evidence for pottery, grinding stones, bifaces, or similar technologies at Chikhen Agui (see Janz 2006). The locale would have been an ideal place for hunting large and medium-sized ungulates (Derevianko et al. 2003) and may have been a seasonal hunting camp reoccupied throughout the Pleistocene and Holocene.

Shabarakh-Usu (Bayan-Dzak)

The Shabarakh-Usu, or Bayan-Dzak as it is called today, is a complex of sites in the central Gobi Desert in southern Mongolia that is mainly the remains of a post-Younger Dryas, early Holocene adaptation to increased effective moisture in Pleistocene dune formations and lake or playa environments (Janz 2006, 2012). A series of sites were discovered at this locale by both Soviet (Gábori 1962; Okladnikov 1962) and American (Berkey and Nelson 1926; Maringer 1963) archaeologists. These sites were found amidst extensive dune accumulations that were associated with a small playa in an internally drained basin. Numerous dates on ostrich eggshell fragments and beads from the two sampled sites were closely clustered around 9000 cal KBP (8439 ± 60 to 7969 ± 37 BP) (Janz et al. 2009).

This locale is considered of primary importance, because it produced remains from stratified sites during several sets of excavations in the early twentieth century. While Nelson and Gábori believed there to be both an aceramic Mesolithic as well as a Neolithic (see above) component, Okladnikov found chronologically divergent types of pottery throughout all levels. The recent ostrich eggshell dates were taken from two of Nelson's differing stratigraphic levels but returned dates that were not significantly different (Janz et al. 2009) suggesting relative contemporaneity between aceramic and ceramic locales.

The ubiquity of food processing tools such as pottery, large retouched tools, and grinding stones around the playas, stream edges, and dune fields of Bayan-Dzak suggests that those artifacts are the remains of various activities at task specific locales related to those particularly productive environments. Similar data from Pigeon Spring, in the southern Gobi Desert, suggests that dune regions around springs and playas may have been occupied regularly following the Younger Dryas and before the early Holocene period of increased humidity (Bettinger et al. 2007; Elston et al. 1997). This would support that notion that conditions of the Younger Dryas may have tied foragers to areas where water was more readily available.

Baga Gazaryn Chuluu

Baga Gazaryn Chuluu is a range of rocky hills in the northern Gobi Desert (between 1,400–1,700 m asl). The area has been intensively surveyed, and a pattern of artifact scatters was recorded. These scatters include microblade debris, ceramics, and grinding stones. Occupants made use of the typical cryptocrystalline raw materials of the Gobi Desert for their microblade industries. Based on their geomorphological and archaeological contexts, these chipped-stone artifacts appear to range in time from the end of the late Pleistocene until the early Bronze Age (approximately 3000 cal BP). In general the activity patterns are focused on better watered areas within the hills and the surrounding dry steppes. The position of some sites along dry channels and around dry playa basins suggests an adaptive system that, for some of its history, was developed in wetter than current conditions (Wright et al. 2007).

The dated assemblage reported here is from BGC 1451, and it consists of a scatter of microblade debris, ceramics, and ostrich eggshell that was found on the outwash fan of a small erosion channel. The site had been sealed by colluvium and cut into by the active erosion channel. Stratigraphically, the artifacts are from the first soil formation above the fine-grained loess that underlies much of the soil and surface sediment in the region. In other places at BGC 1451, this loess, and sometimes the first soil, show signs of solifluction suggesting cold conditions after its formation. The chipped-stone assemblage is a typical Gobi Desert, microblade assemblage, with a few retouched bladelets and scrapers. Excavation recovered several dozen, small bladelets and fragments from one small area. In total, this assemblage contains 157 items; the great majority (95.8%) is lithic debitage.

Discussion

The climate in Northeast Asia is mainly determined by the interplay between the northernmost edge of the humid East Asian monsoon regime and the dry air of western Central Asia. The manifestation of the Younger Dryas in the Inner Asian Steppe, Eastern Altai, and the north Gobi Desert is an expression of this relationship following the last glacial. The late Pleistocene to the initial Holocene was a period in which aridity dominated the local climate despite progressive climatic amelioration. As post-glacial increases in precipitation and average temperatures began to transform many highly arid environments into more habitable steppe and desert-steppe, the Younger Dryas temporarily slowed, was interrupted or, in some cases, caused the regression of this process. By the early Holocene, however, much of the arid Northeast Asia had been transformed; steppe and desert-steppe environments were increasingly appealing for hunter-gatherer occupation as Pleistocene dune-fields and small playas or lakes were filled and grasslands expanded. By the end of the early Holocene mosaic steppe vegetation in the southern and northernmost reaches of the region had been transformed into woodlands.

The handful of known, dated, sites in arid, Northeast Asia suggest an adaptive continuity of material culture across the Gobi Desert and surrounding highlands throughout the terminal Pleistocene, Younger Dryas, and early Holocene. However, not enough is known about any one site or area to discuss specific local dynamics. In order to develop a more detailed understanding of subsistence and social organization in the Gobi, Eastern Altai, and Inner Asian steppe, additional sites must be dated, and ancient landscapes must be recovered and documented. The central question that remains to be addressed is how the dynamics of environmental change and dramatic fluctuations in the climate of this region were related to changes in technology, subsistence, and culture throughout the late Pleistocene and early to middle Holocene.

The evidence that we have today suggests a very limited technological impact from the Younger Dryas. It was simply one of several climatic reorientations to which people adapted their existing technologies—microlithic toolkits, ceramics, and ground stone. Furthermore, in as much as the few sites recorded here demonstrate—setting aside the lacunae in the data—regional site distribution, the nature of the landscape and the human ecology of the region during this time suggest that, in an echo of subsistence adaptations that emerged by the end of the Holocene, population mobility would provide a major means of adaptation to shifting environmental conditions.

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