No Land Use 6000 BP

Revision of 3.18.16 by Andrew Sluyter.

By 6000 BP people occupied and used, to one degree or another, all parts of Middle America except some Caribbean islands and glaciated areas on the mainland.

The Lesser Antilles other than Trinidad and Tobago as well as some small islands far off the coast of northern South America and Caribbean Central America were not occupied in 6000 BP. By 8000 BP, people had occupied islands such as Trinidad, Margarita, and Tobago that lay just offshore of the South American mainland (Wilson 2007, 39). The earliest evidence of occupation of the Greater Antilles comes from Hispaniola and dates to between 4510 BCE and 4350 BCE, a few centuries prior to the target date of 6000 BP (Wilson 2007, 27). The earliest evidence of occupation of the Lesser Antilles, in contrast, dates to approximately 3000 BCE, about a millennium after the target date (Wilson 2007, 45). Similarly, the archipelago of tiny islands about 100 km off the coast of northern South America—La Blanquilla, La Orchila, and Los Roques—are assumed to have gone unoccupied until the same period as the Lesser Antilles. The three Cayman Islands went unoccupied until after Christopher Columbus encountered them in 1503, during his fourth voyage (Stokes and Keegan 1996). San Andrés and Providencia, about 200 km off the Caribbean coast of Central America, are also assumed to have been uninhabited until after Christopher Columbus encountered them in 1502.

I copied the MiddleAmericaRegion base map polygons for the archipelago of tiny islands off the coast of northern South America (La Blanquilla, La Orchila, and Los Roques), San Andrés and Providencia, the Cayman Islands, and the Lesser Antilles north of Tobago but south and east of Puerto Rico and pasted them into the No land use 6000 BP layer. I made no adjustments for Holocene sea-level rise even though it remained 5-6 m below current mean sea level in the Middle American region, having begun to slow its rise by 6000 BP but not stop (Toscano and Macintyre 2003). Neither, therefore, did I make adjustments for the complexities of localized subsidence and emergence due to tectonic, erosional, and depositional processes.

There are currently no glaciated areas in Middle America except for three volcanic peaks in Central Mexico that rise to over 5,000 m: Citlaltépetl (Pico de Orizaba), Popocatépetl, and Iztaccíhuatl. As measured in the mid-twentieth century, each peak had a small area covered by glaciers (ice and firn fields): Citlaltépetl, 950 ha; Popocatépetl, 72 ha; Iztaccíhuatl, 122 ha (White 2002). The total glaciated area was therefore 1,144 ha, or 11.44 km^2. White (2002) provides large-scale maps of the extent of that mid-twentieth-century glaciation for each of the three peaks. The maps show that the termini of the glaciers reached down to approximately 4,700 m at that time. Since the mid-twentieth century, those glaciers have been melting, retreating upslope, and decreasing in area (Ramirez Necoechea, Valenzuela Meraz, Hernandez Ramirez 2013). They might disappear entirely within a few decades.

The areas glaciated in 6000 BP are not easily derived from the published studies. Vázquez-Selem and Heine (2004) determined, on the basis of relict moraines and other features, that the mean altitude of glacier termini for Iztaccíhuatl during what they term the Ayoloco advance, which dates to the Little Ice Age (1300-1850 CE), was approximately 4,500 m, roughly 200 m lower than in the mid-twentieth

century. During the warmer Holocene Climate Optimum (9,000-5,000 BP) and the Medieval Climate Optimum (950-1250 CE), the glaciers were likely much smaller, similar to the mid-twentieth century, with the termini at a mean elevation of about 4,700 m, or even smaller, as at present in the early twenty-first century. In addition, during the Little Ice Age as well as during the Neoglacial (5,000-1,000 BP) that occurred between the Holocene Climate Optimum and the Medieval Climate Optimum, small glaciers might have formed on lower peaks, in the 4,000-5,000 m range, such as La Malinche, Cerro Ajusco, and Nevado de Toluca (Vázquez-Selem and Heine 2004; White 2002). And many more peaks, of course, display evidence of glaciation during the ice ages of the Pleistocene epoch that preceded the Holocene epoch during the Quaternary period.

For the 6000 BP map, therefore, which falls during the Holocene Climate Optimum, the extent of glaciation is based on current conditions (early twenty-first century) as an analog for that earlier warm period. Polygons of visible glaciers were digitized from the OCM Landscape base map for Citlaltépetl and Iztaccíhuatl. The areas of the polygons are 229 ha for Citlaltépetl and 90 ha for Iztaccíhuatl. Both are less than White's estimates of 950 ha for Citlaltépetl and 122 ha for Iztaccíhuatl in the mid-twentieth century, as expected given retreat over the past several decades. A polygon for Popocatépetl could not be digitized because ash from periodic eruptions since the 1990s has so obscured any remaining ice and firn fields that they are not shown on the OCM Landscape base map; nor are they visible on the Google Satellite base map. Nonetheless, given the reduced area over the past half century for the Citlaltépetl and Iztaccíhuatl glaciers, those of Popocatépetl certainly have decreased from White's estimate of 72 ha for the mid-twentieth century, due to volcanic activity as well as climate change. None of the polygons, therefore, reach the threshold of 500 ha and consequently were not mapped as areas of no land use in 6000 BP. An area of 500 ha is approximately 8% the size of the grid cells of 8,000 m by 8,000 m (64 km^2/6,400 ha) used to judge the level of generalization appropriate for the project. So even an area of 500 ha, which, if a square, would have sides about 2.25 km (2,250 m) long and is not particularly significant. An area of 500 ha therefore serves as an absolute lower threshold for mapping glaciated areas. Note that in terrain with steep slopes, such as volcanic peaks, the area measurements based on the OCM Landscape base map necessarily underestimate the actual area; nonetheless, the areas are so much smaller (229 ha, 90 ha, and <72 ha) than the threshold of 500 ha that corrections for slope were unnecessary in order to make a determination. Therefore, the No land use 6000 BP layer was not modified by removing glaciated areas.

Table 1. Glaciated areas during the Holocene Climate Optimum (9,000-5,000 BP).

Volcanic Peak	Period	Glaciated Area (ha)	Area ≥500 ha?	Source
Citlaltépetl	Early 21st Century	229	No	OCM Landscape
	Mid-20th Century	950	Yes	White 2002
	Holocene Climate Optimum	229	No	OCM Landscape
Popocatépetl	Early 21st Century	<72	No	OCM Landscape
	Mid-20th Century	72	No	White 2002
	Holocene Climate Optimum	<72	No	OCM Landscape
Iztaccíhuatl	Early 21st Century	90	No	OCM Landscape
	Mid-20th Century	122	No	White 2002
	Holocene Climate Optimum	90	No	OCM Landscape

References

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