

AN ATLAS OF GAZA IN SAND

**Visualizing State
Violence through
Sand, Soil, and
Land Cover in
Gaza, Palestine**

1920-present

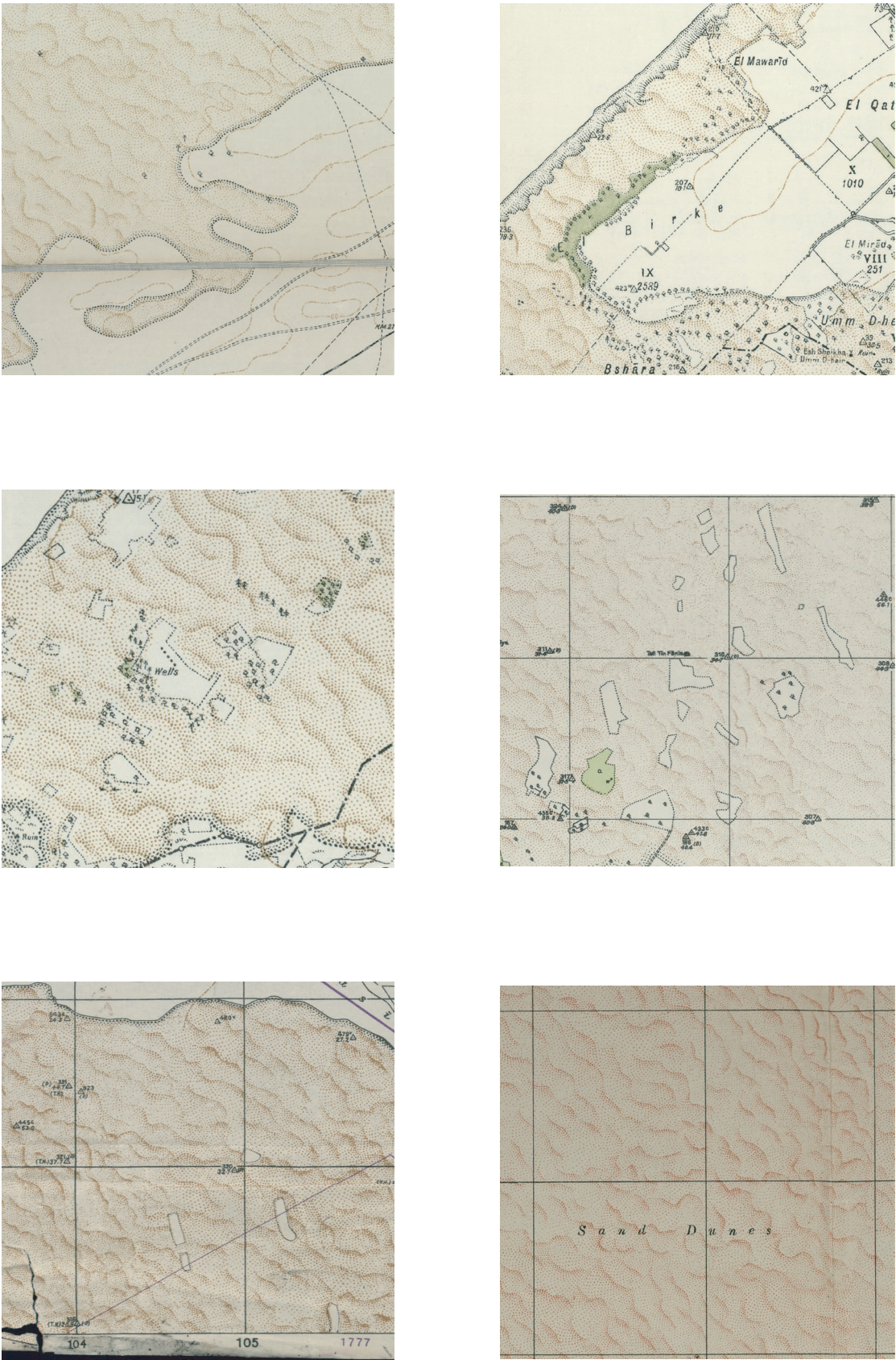
**by Mika
Yassur**

In January, 2009, Israeli forces bombed houses and a United Nations school in Beit Lahya, Gaza. At least two children and six elderly people were killed in the attack and another dozen wounded by white phosphorus bombs. Forensic Architecture investigated these incidents, mapping “tentacles” of white clouds drifting towards the earth, burning everything they came into contact with. While Israel maintained it had used white phosphorus as a “smoke screen” “in compliance with international law,” FA determined that, based on the height of shelling, Israel had in fact used it to terrorize civilians and clear out these neighborhoods.

In May, 2009 three researchers from Al Azhar University, Gaza, investigated the occurrence of phosphorus in the soil, collecting 23 samples. The researchers categorized three soil types: loam, sandy loam, and sand, noting that phosphorus preferentially binds to finer materials, like clay and silt, staying in suspension longer in these cases in contrast to coarser sand—which will also have a lower phosphorus content. Many of the sites tested, however, contained dangerously high phosphorus concentrations—destroying the natural ecosystem in agricultural sites and posing health risks in urban areas.

The particle size and soil content have a direct impact on levels of toxicity suspended in the land in Gaza—a densely populated strip of land inundated with chemical violence by Israel through herbicide spraying, chemical warfare, and infrastructural violence—releasing sewage, asbestos, and tons of rubble into the earth.

Sand dunes in Gaza are a site of ongoing political geo-reformation and contestation. As I plot throughout this atlas, soil distribution throughout the strip is both a site of violence on a granular level and is manipulated through state mechanisms of environmental management and spatial control.



Sand dune details from Mandate maps

The British Mandate (1920-1948) carried out extensive mapping projects through the Survey of Palestine department, establishing the Palestinian Grid Cassini Soldner projection. The World Zionist Organisation put pressure on British authorities to conduct a cadastral survey, hoping to plot lands open for Jewish settlement. The Mandate government decreed all land de facto under its jurisdiction unless residents could provide proof of ownership—despite the fact that ownership was often recongized through long-standing custom agreements, not physical documentation. Recognizing these efforts to expropriate their lands, Palestinians resisted the British systems and mapping efforts—at times chasing away surveyors or destroying their equipment.

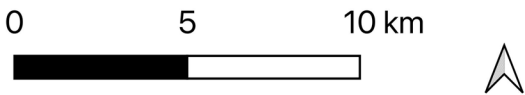
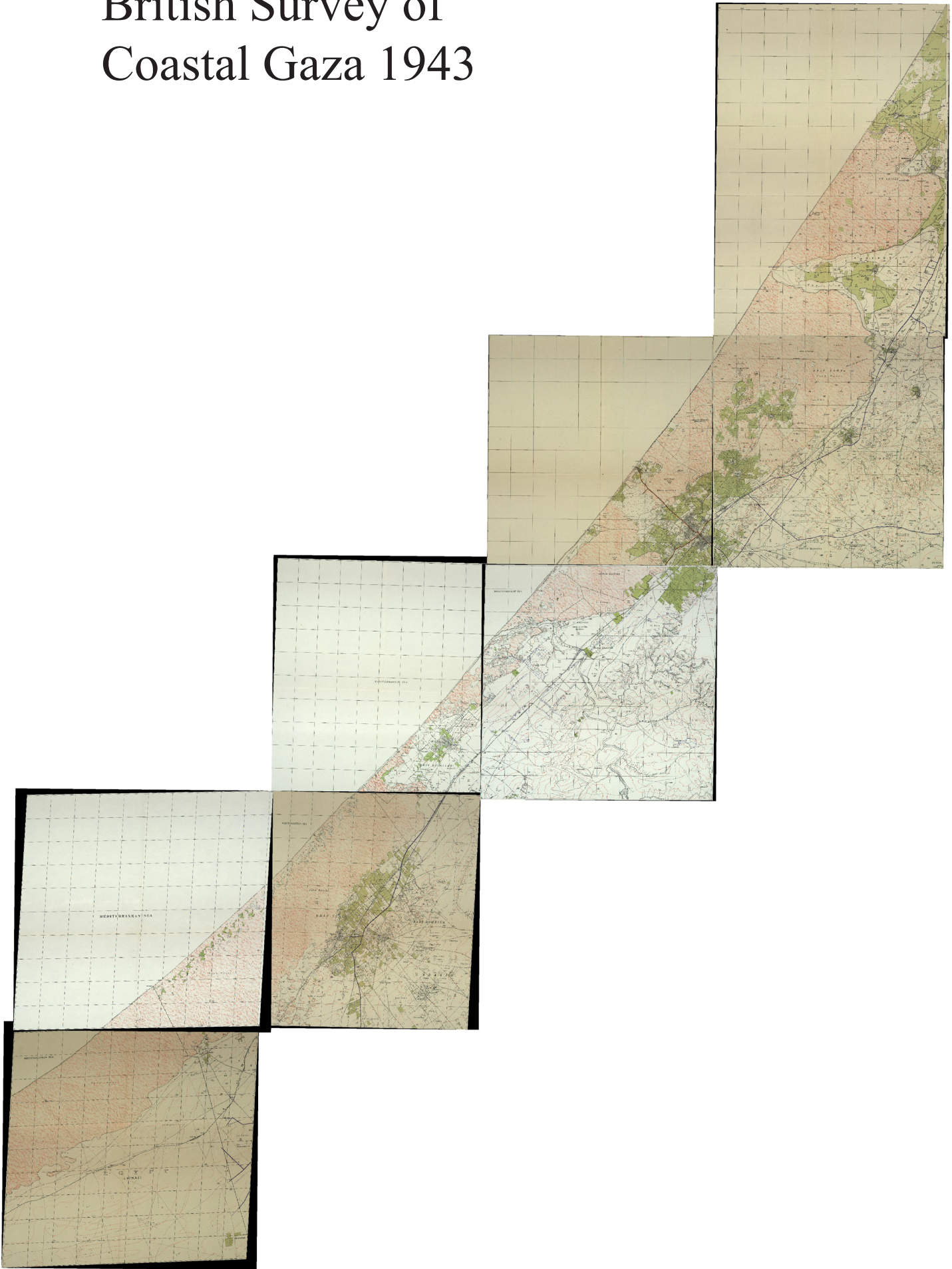
British Survey of Coastal Gaza 1931



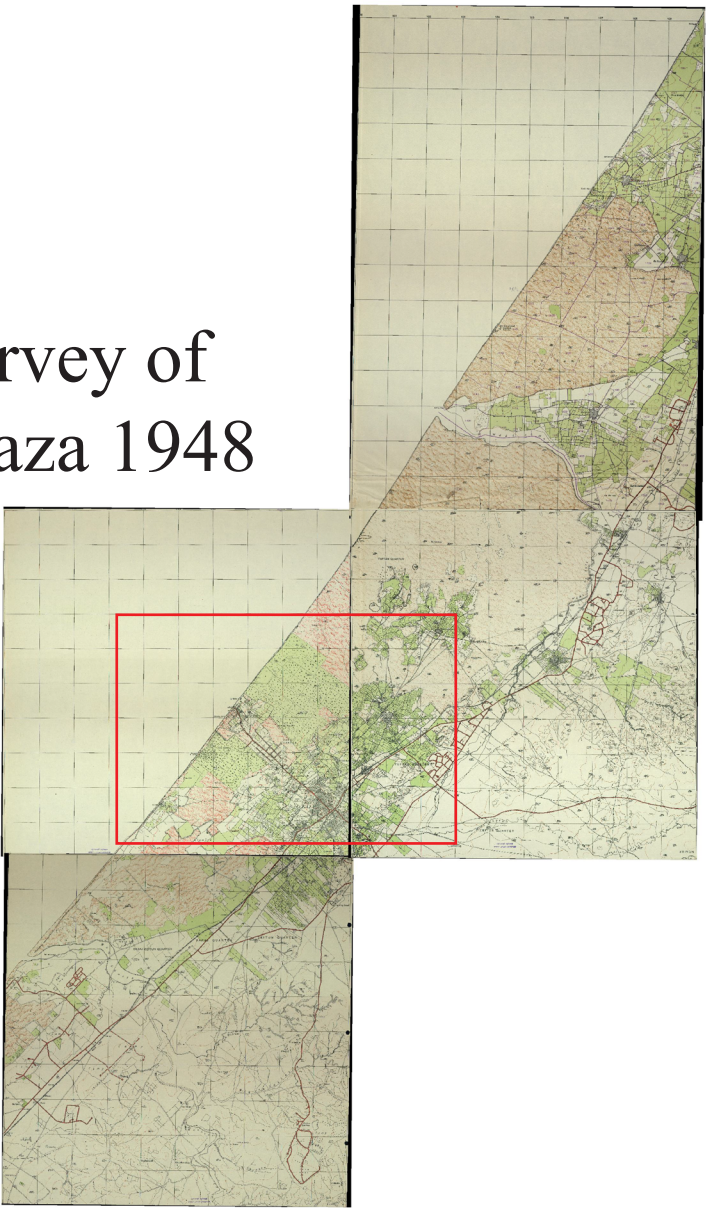
0 5 10 km



British Survey of Coastal Gaza 1943



British Survey of
Coastal Gaza 1948

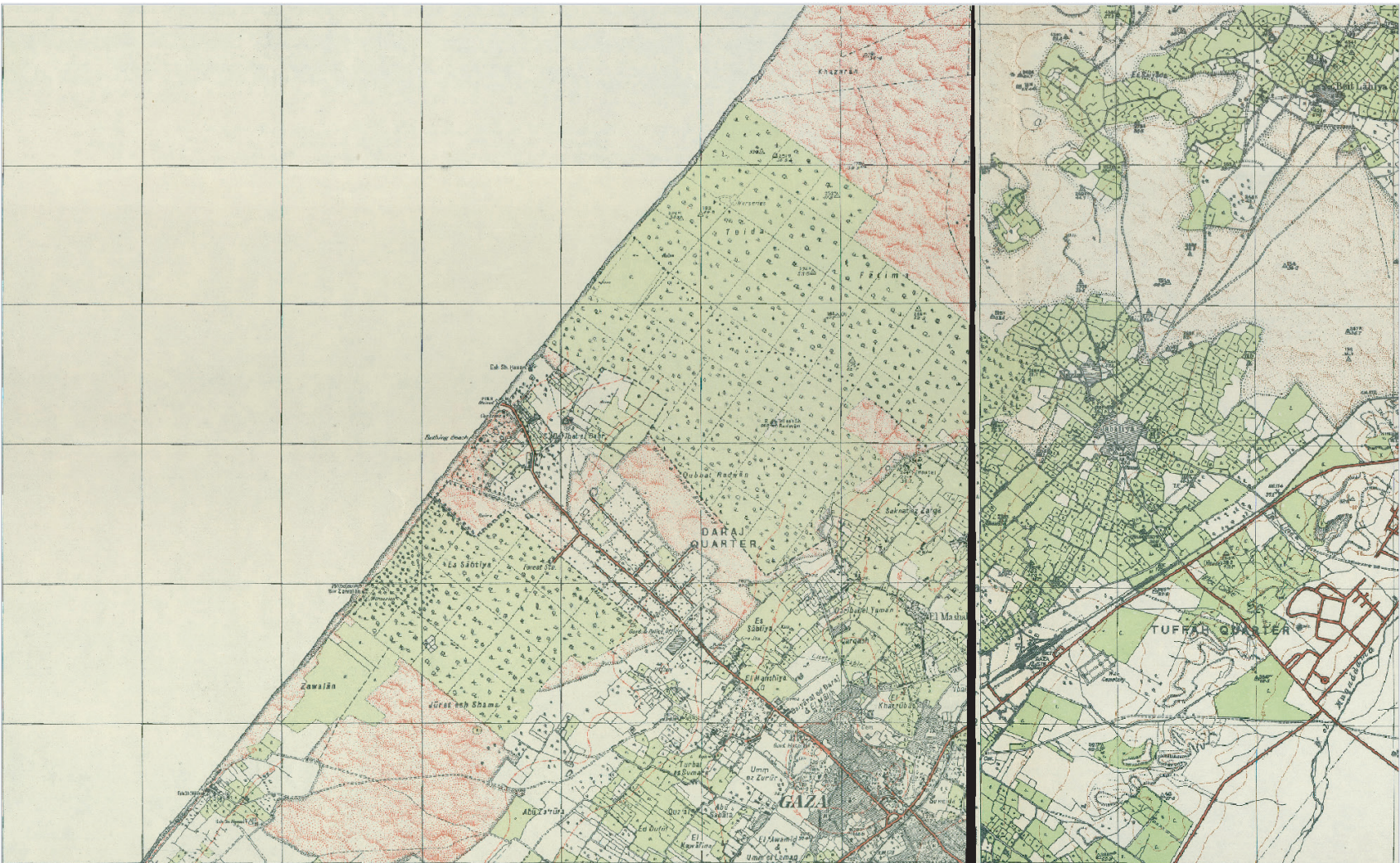


0 5 10 km





Enlargement near Gaza city—1931

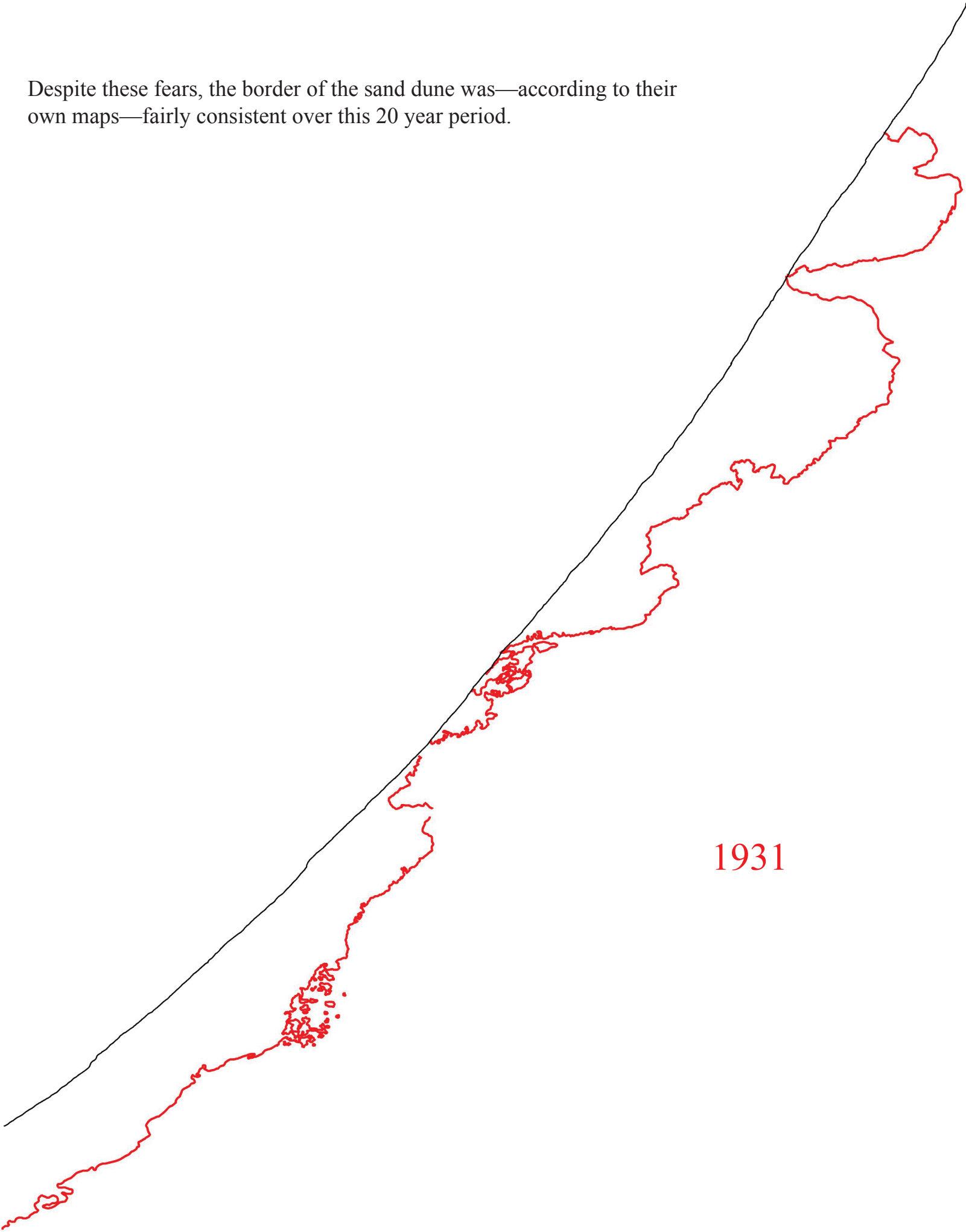


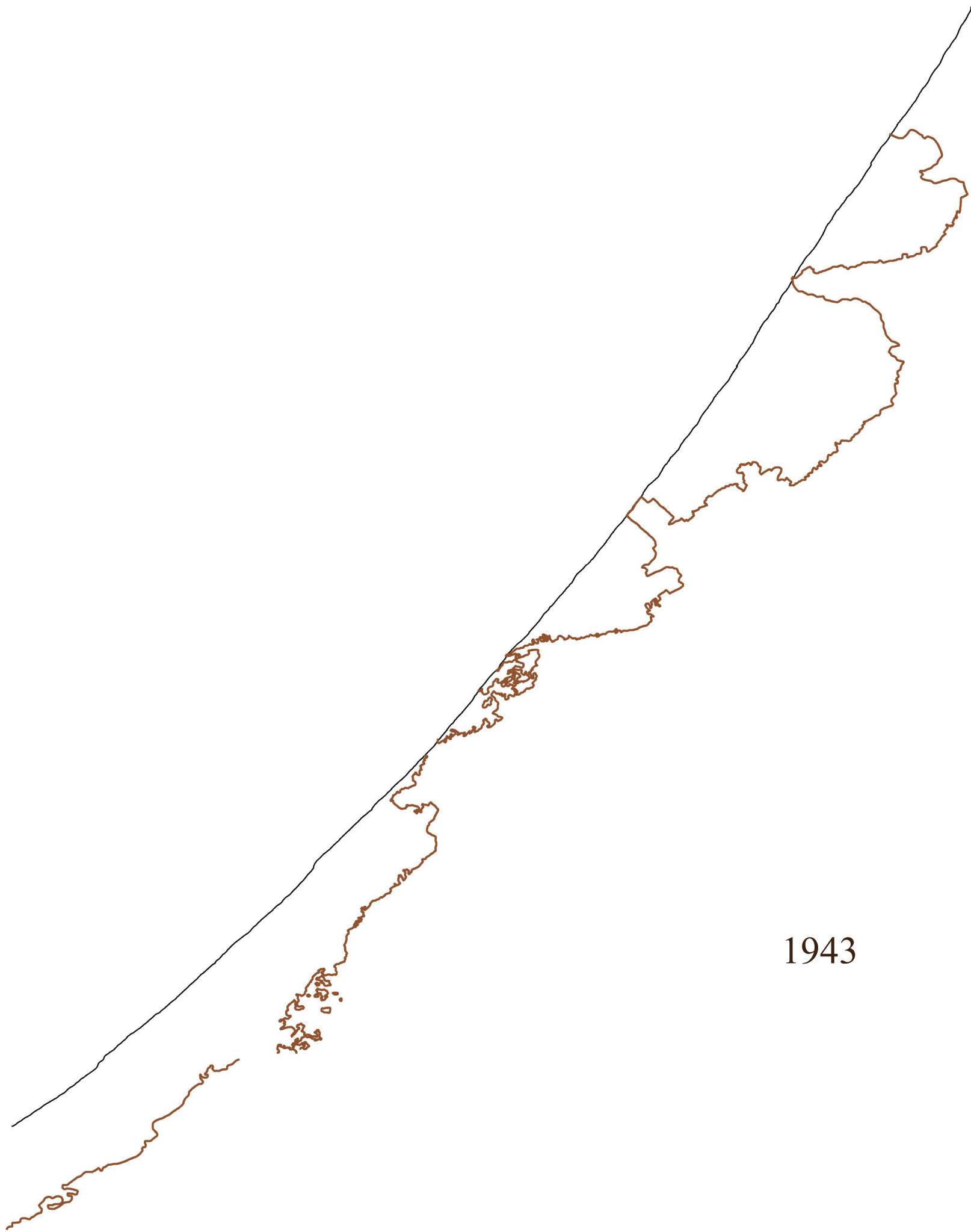
Enlargement near Gaza city—1948

The British Mandate became concerned with the encroachment of sand dunes in Gaza, claiming thousands of dunams around Gaza city under its jurisdiction as a “closed forest reserve,” attempting to fix the sand in place through afforestation.

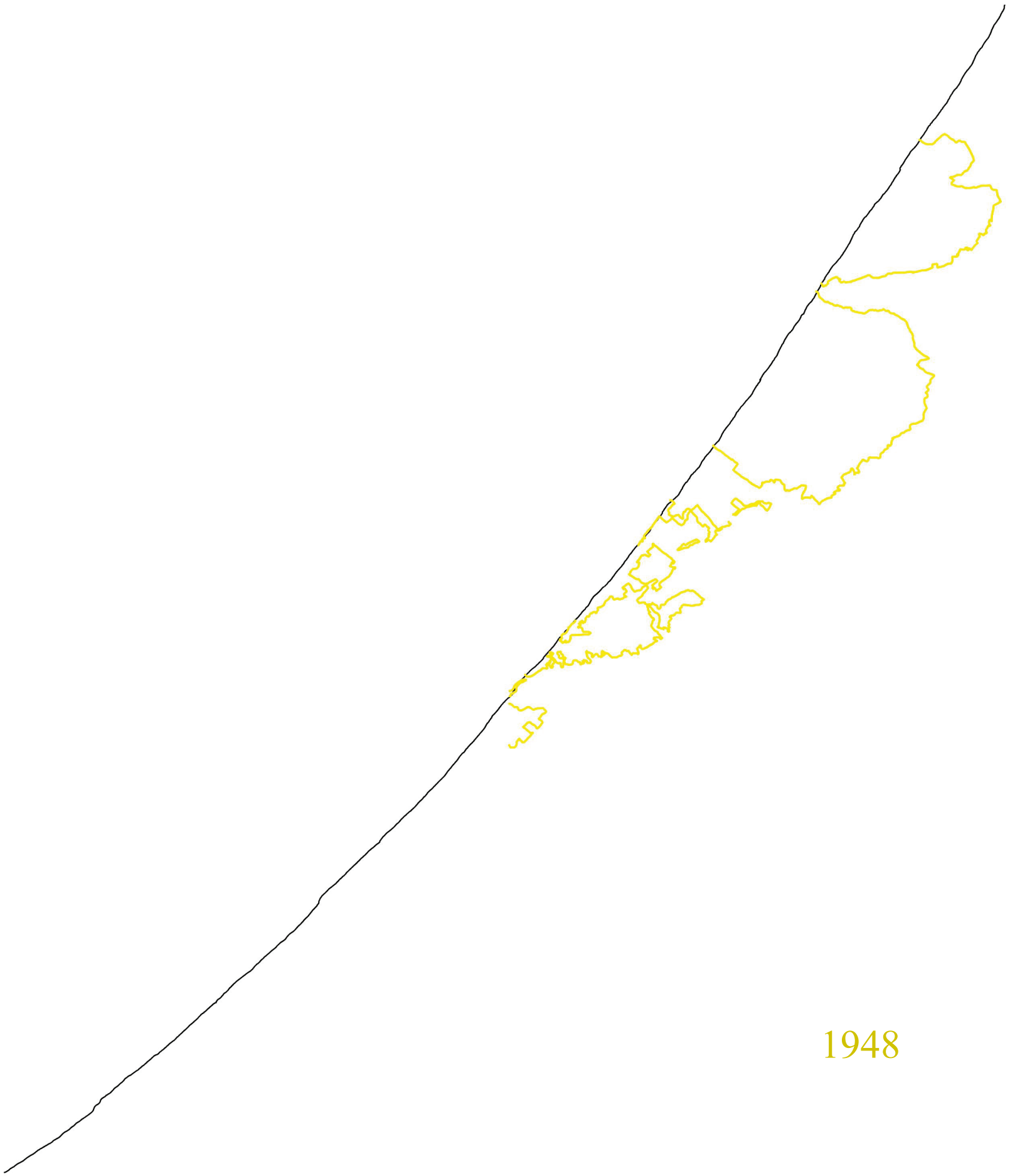
By 1925 this project extended north around Jabalia, Nazla, and Beit Lahia under the “Sand Drift Ordinance”, regulating the role of Palestinians in laboring—free of pay—for a few days each year to assist in planting. This ordinance made sand dunes specifically vulnerable to seizure by the state—deemed as “wastelands,” that could not be revived and which first had to be “reclaimed”—despite local, communal cultivation and ownership of the dunes.

Despite these fears, the border of the sand dune was—according to their own maps—fairly consistent over this 20 year period.



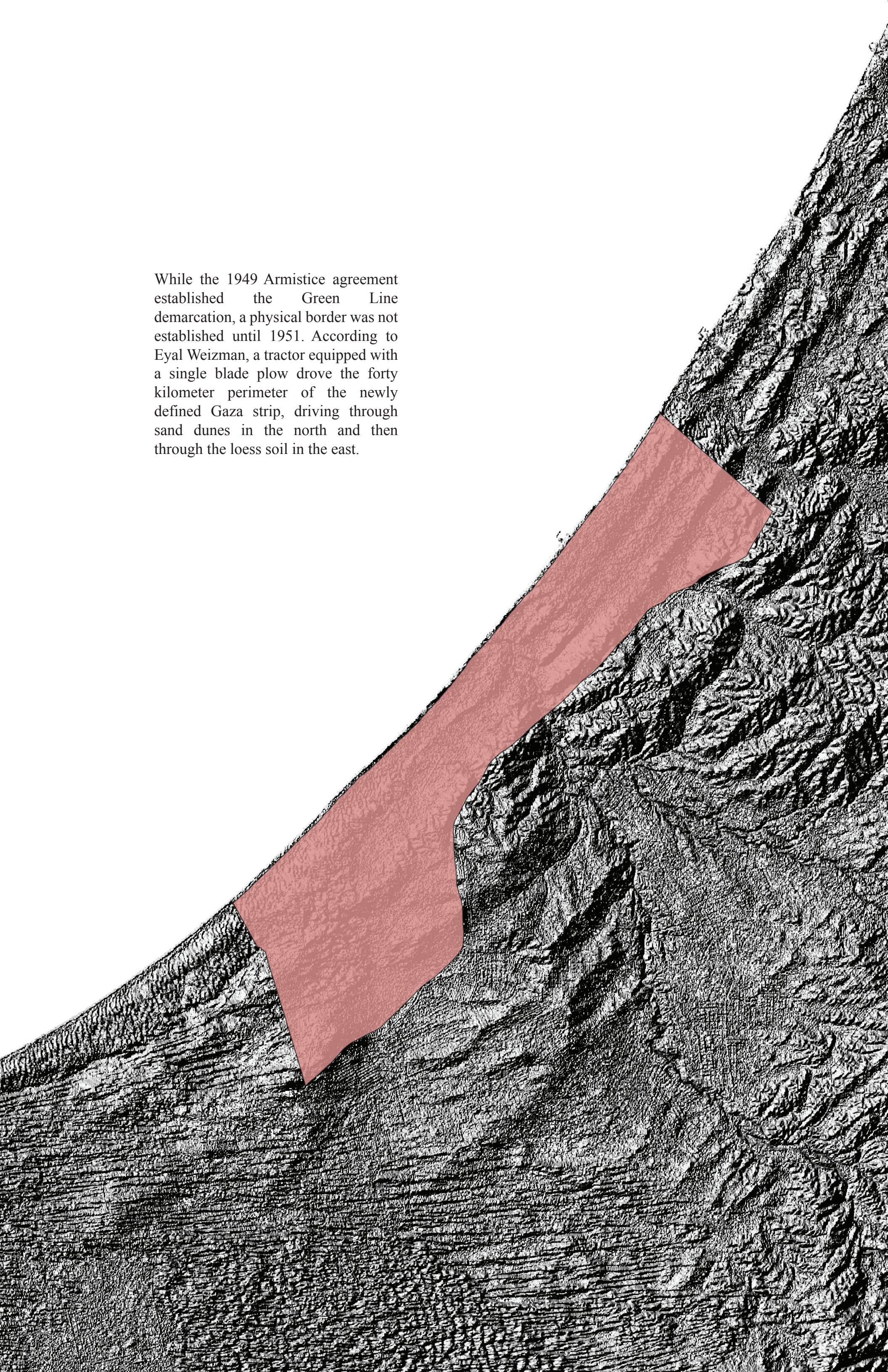


1943



1948

While the 1949 Armistice agreement established the Green Line demarcation, a physical border was not established until 1951. According to Eyal Weizman, a tractor equipped with a single blade plow drove the forty kilometer perimeter of the newly defined Gaza strip, driving through sand dunes in the north and then through the loess soil in the east.



Over the next seventy years, land use in Gaza became both extremely concentrated and dictated by soil distribution, with the majority of agricultural lands located towards the east.

1973 NDVI

No reflective bands available from this time period

Gaza strip border

Normalized Difference Vegetaion Index 1973

high values=dense, healthy vegetation

middle values=barren land or sand

lowest values= water

0.652174

-0.75



Israeli Settlement Footprints 1985

Beginning in 1973, Israel began to construct twenty one settlements throughout Gaza—many of them on the sites of the sand dunes. Far from being empty, these dunes were sites of communal agricultural lands and Bedouin homes; the year prior, the IDF drove out around 5,000 Bedouin Palestinians from the southern dune areas, bulldozing their houses, tents, and almond, peach, olive, castor-oil trees and patches of wheat.



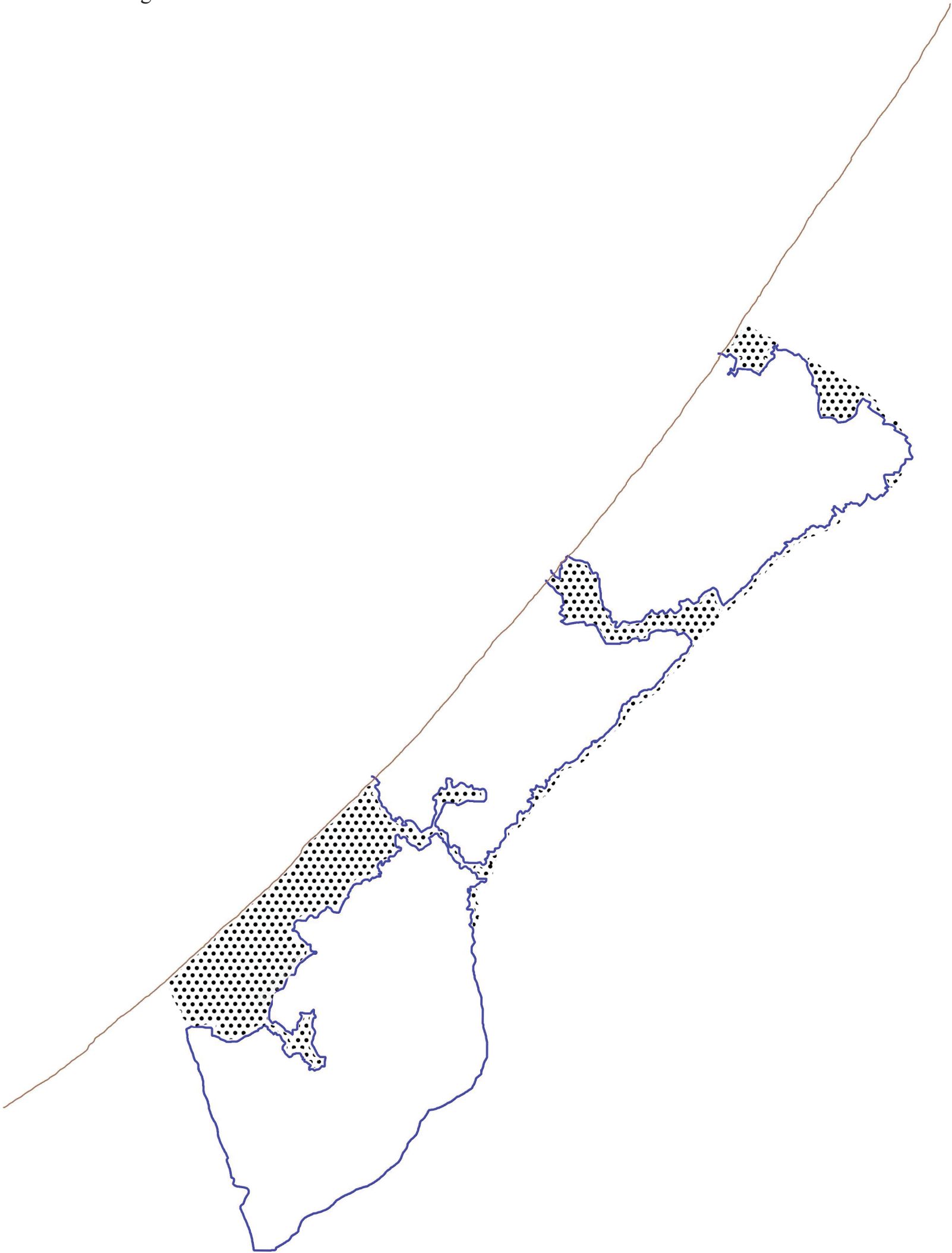


1985 True Color Landsat Imagery
1943 dune border

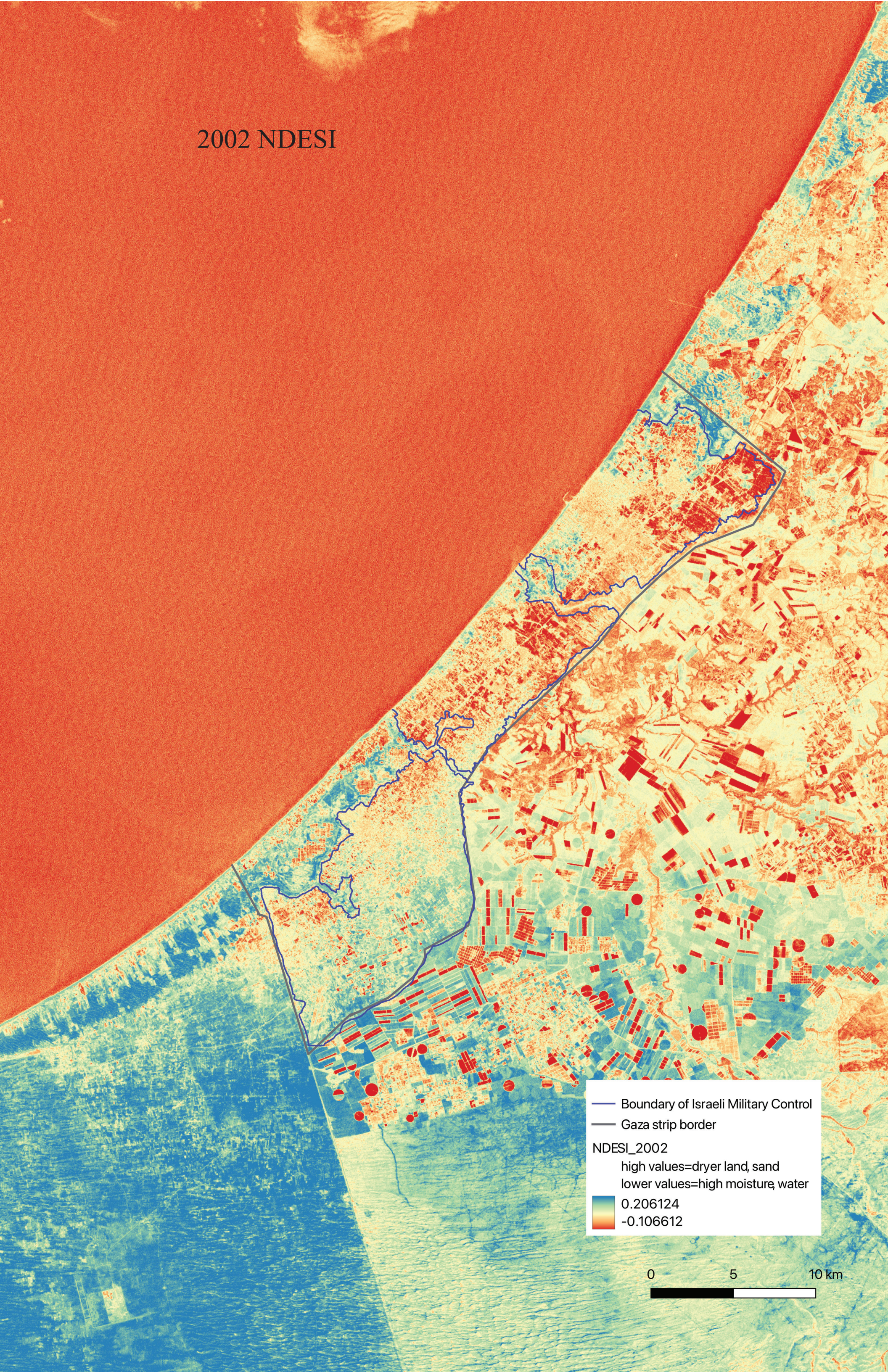
Even as the Israeli settlements expanded and Gazan localities became more densely populated, the distribution of sand dunes and soil has remained relatively consistent. This map depicts the dunes (in blue / light green) using a Normalized Difference Sand Dune Index (NDESI), where the lowest and highest values represent sand dunes and high levels of moisture, respectively.



By 2002, Israeli military control zones had expanded, covering much of the dune area.



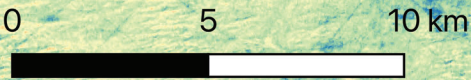
2002 NDESI



— Boundary of Israeli Military Control
— Gaza strip border

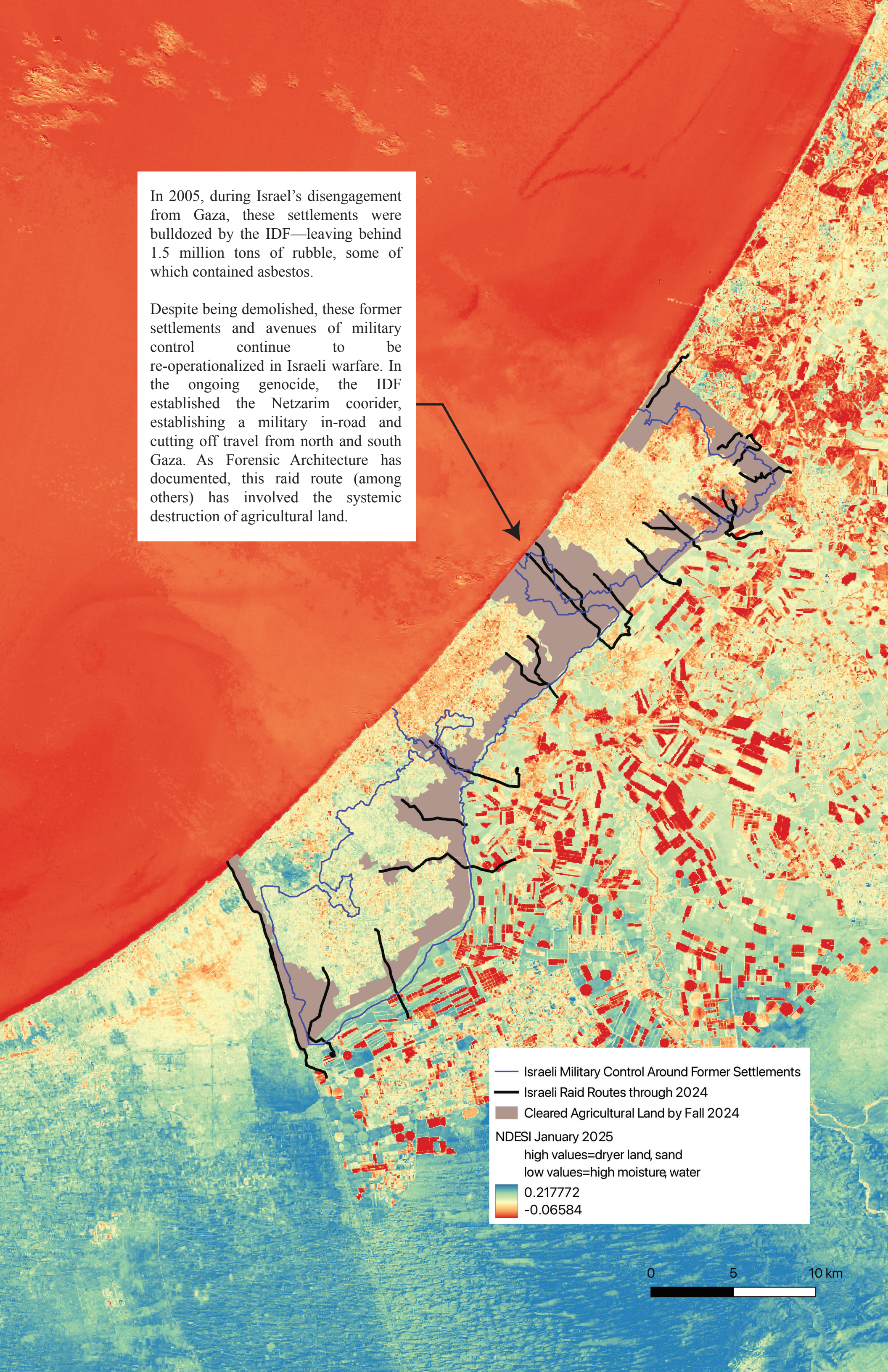
NDESI_2002
high values=dryer land, sand
lower values=high moisture, water

0.206124
-0.106612



In 2005, during Israel’s disengagement from Gaza, these settlements were bulldozed by the IDF—leaving behind 1.5 million tons of rubble, some of which contained asbestos.

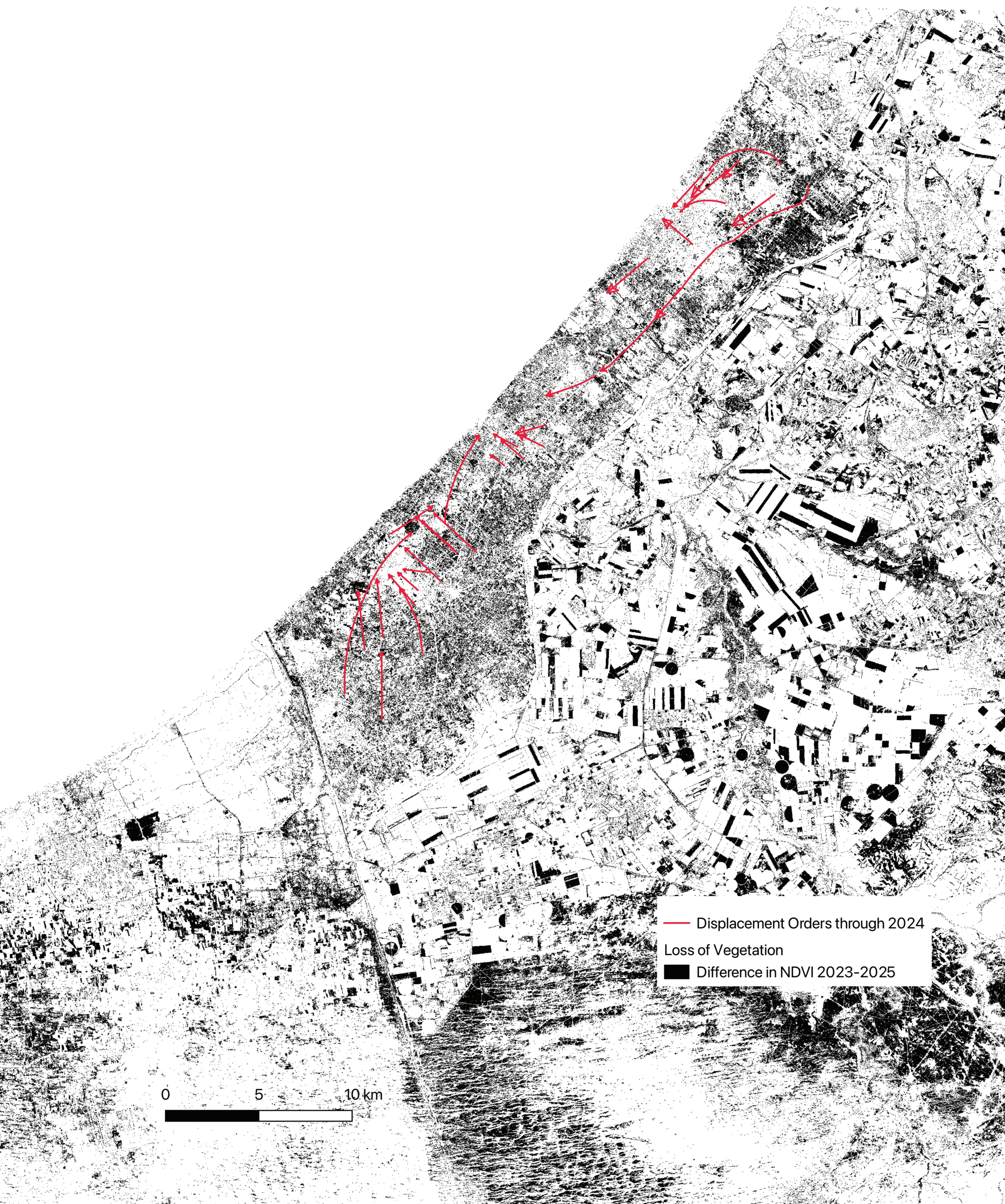
Despite being demolished, these former settlements and avenues of military control continue to be re-operationalized in Israeli warfare. In the ongoing genocide, the IDF established the Netzarim coorider, establishing a military in-road and cutting off travel from north and south Gaza. As Forensic Architecture has documented, this raid route (among others) has involved the systemic destruction of agricultural land.



— Israeli Military Control Around Former Settlements
— Israeli Raid Routes through 2024
■ Cleared Agricultural Land by Fall 2024
NDVI January 2025
high values=dryer land, sand
low values=high moisture, water
0.21772
-0.06584

0 5 10 km

Military displacement orders, annotated as arrows, have forcibly relocated Gazans into sandier areas while the IDF razes agricultural lands.



NDESI October 2025



NDESI October 2025
higher values=dryer land, sand
lower values=high moisture, water
0.214411
-0.065081

0 5 10 km

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Data Sources

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Landsat Data from USGS Earth Explorer