

Shifting sands. Dunes encroaching on village oasis (left) and road (right) in Egypt's Western Desert.

Kuwait's Unjust Deserts: Damage to its Desert

Among the less heralded consequences of the Gulf war could be a massive movement of sand engulfing roads and towns

THE GULF WAR HAS CREATED STAGGERING environmental problems—pollution from hundreds of oil fires that may continue to burn for years; toxic chemicals from weapons and bombed Iraqi factories; and devastating effects on marine life and beaches from the oil spills now circulating in the Persian Gulf. And these are not the only wartime environmental disasters that will have long-term repercussions.

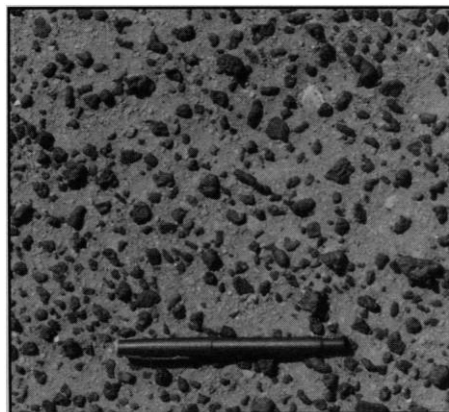
There will also be "major effects on the geology of the area," says Egyptian-born geologist Farouk El-Baz, head of Boston University's Center for Remote Sensing. The disruption of the desert in Kuwait, northeast Saudi Arabia, and southern Iraq will lead to a huge increase in sand and dust storms, and to the formation of new, moving fields of sand dunes that could threaten to engulf airports, agricultural settlements—and even whole cities, claims El-Baz.

El-Baz explains that over thousands of years the terrain has developed its own kind of "desert shield": a stabilizing layer of large pebbles, ranging from the size of a pea to that of a walnut, which are too heavy for the strongest desert winds to pick up. This "desert pavement" helps to make Kuwait and the surrounding regions habitable by holding down sand and dust particles, thereby creating a stable terrain.

Desert pavements. Size of pebbles are indicated by pen. Disruption exposes finer particles to wind.

Now, says El-Baz, vehicular movements and hundreds of miles of military fortifications have created extensive areas where the desert's natural shield has been breached. The phenomenon is clearly apparent if you look at animal tracks in the desert, El-Baz says. When animals walk across an undisturbed sand sheet their footprints are "almost imperceptible." But if an animal walks on a vehicle track, its feet will make deep impressions. A single vehicle, he says, will disturb the desert's "natural packing," making the sand less hard and compact.

That change can be seen in satellite photographs studied by his center before the war, he says. Any rock that has sat on the desert for a long time develops a shiny "desert varnish" of light-absorbing magnesium and iron oxides. When the stones are moved, they reflect more light, so the ve-



hicle tracks now crisscrossing the desert are clearly visible from satellites.

The destruction of the desert pavement may well cause a "new generation of sand dunes—like those in southern Saudi Arabia—to begin marching southward" through Kuwait, along the west side of the Persian Gulf, over the peninsula of Qatar, the United Arab Emirates, and eastern Saudi Arabia. Sand can build up with enormous rapidity, says El-Baz: "A whole airport could be covered in dunes in no time at all."

What's more, he says, dust storms from fine particles previously held down by the desert pavement are likely to increase. El-Baz says he has seen this kind of thing before in both war and peace. The entire Gulf region experienced severe dust storms after the Iraqis began extensive agricultural tilling of areas in their western desert. And after the Iran-Iraq war of the '80s, pilots and airport officials say, the incidence of dust storms doubled—often leading to airport closings. Now, El-Baz expects the prevalence of dust storms to double again.

Even a much shorter war—the 1973 Yom Kippur war between Egypt, Syria, and Israel—wrought severe changes in the configuration of sand in the Sinai Peninsula. To stop the enemy, the Israelis bulldozed a 40-foot-high sand wall (the "Bar Lev Line") on the east side of the Suez Canal. The wall turned out to be ineffective—the Egyptians breached it with high-power hoses—but the effects were lasting. When El-Baz returned to Egypt in 1974 to an area he had not seen since 1958, "The thing that struck me instantaneously was that all the dunes in the North Sinai had taken on a new coat."

To prevent these effects from creating a disaster, El-Baz says windbreaks will have to be constructed and new methods for funneling sand out of the way must be developed. Otherwise, he says, there will be massive disruption of roads, airports, agricultural settlements, and towns. Ironically, he says, much of his previous study of sand movement by wind and the encroachment of sand on human settlements was carried out with Kuwaitis. "The best work we did on that was with the Kuwait Institute for Scientific Research."

That institute now lies in ruins. El-Baz says colleagues there tell him that Iraqi troops vandalized it and made off with the contents, including computers and field measurement instruments. "The research materials are all gone," El-Baz says, making it that much tougher to stop the encroaching sand.

■ CONSTANCE HOLDEN