Korea on April 12, 2002. South Korea, he said, was engulfed by so much dust from China that people in Seoul were literally gasping for breath. Schools were closed, airline flights were cancelled, and clinics were overrun with patients having difficulty breathing. Retail sales fell. Koreans have come to dread the arrival of what they call “the fifth season”—the dust storms of late winter and early spring. 4

And the situation continues to deteriorate. The KMA reports that Seoul has “suffered dust events on 23 days during the 1970s, 41 days in the 1980s, 70 days in the 1990s, and 96 days so far this decade.” 5

While people living in China and South Korea are all too familiar with dust storms, the rest of the world typically learns about this fast-growing ecological catastrophe when the massive soil-laden storms leave the region. On April 18, 2001, for instance, the western United States—from the Arizona border north to Canada—was blanketed with dust. It came from a huge dust storm that originated in northwestern China and Mongolia on April 5th. 6

Nine years later, in April 2010, a National Aeronautics and Space Administration (NASA) satellite tracked a dust storm from China as it journeyed to the east coast of the United States. Originating in the Taklimakan and Gobi Deserts, it ultimately covered an area stretching from North Carolina to Pennsylvania. Each of these huge dust storms carried millions of tons of China’s topsoil, a resource that will take centuries to replace. 7

The thin layer of topsoil that covers much of the earth’s land surface and is typically measured in inches is the foundation of civilization. Geomorphologist David Montgomery, in Dirt: The Erosion of Civilizations, describes soil as “the skin of the earth—the frontier between geology and biology.” After the earth was created, soil formed slowly over geological time from the
weathering of rocks. It was this soil that supported early
plant life on land. As plant life spread, the plants pro-
tected the soil from wind and water erosion, permitting it
to accumulate and to support even more vegetation. This
relationship facilitated an accumulation of topsoil that
could support a rich diversity of plant and animal life.8

As long as soil erosion on cropland does not exceed
new soil formation, all is well. But once it does, it leads
to falling soil fertility and eventually to land abandon-
ment. Sadly, soil formed on a geological time scale is
being removed on a human time scale.

Journalist Stephen Leahy writes in *Earth Island Jour-
nal* that soil erosion is “the silent global crisis.” He notes
that “it is akin to tire wear on your car—a gradual, unob-
served process that has potentially catastrophic conse-
quences if ignored for too long.”9

Losing productive topsoil means losing both organic
matter in the soil and vegetation on the land, thus releas-
ing carbon into the atmosphere. Rattan Lal, a soil sci-
entist at Ohio State University, notes that the 2,500 billion
tons of carbon stored in soils dwarfs the 760 billion tons
in the atmosphere. The bottom line is that land degra-
dation is helping drive climate change.10

Soil erosion is not new. It is as old as the earth itself.
What is new is that it has gradually accelerated ever since
agriculture began. At some point, probably during the
nineteenth century, the loss of topsoil from erosion
surpassed the new soil that is formed through natural
processes.

Today, roughly a third of the world’s cropland is los-
ing topsoil at an excessive rate, thereby reducing the
land’s inherent productivity. An analysis of several stud-
ies on soil erosion’s effect on U.S. crop yields concluded
that for each inch of topsoil lost, wheat and corn yields
decreased by close to 6 percent.11

In August 2010, the United Nations announced that
desertification now affects 25 percent of the earth’s land
area. And it threatens the livelihoods of more than
1 billion people—the families of farmers and herders in
roughly 100 countries.12

Dust storms provide highly visible evidence of soil
erosion and desertification. Once vegetation is removed
either by overgrazing or overplowing, the wind begins to
blow the small soil particles away. Because the particles
are small, they can remain airborne over great distances.
Once they are largely gone, leaving only larger particles,
sand storms begin. These are local phenomena, often
resulting in dune formation and the abandonment of
both farming and grazing. Sand storms are the final
phase in the desertification process.

In some situations, the threat to topsoil comes prima-
arily from overplowing, as in the U.S. Dust Bowl, but in
other situations, such as in northern China, the cause is
primarily overgrazing. In either case, permanent vegeta-
tion is destroyed and soils become vulnerable to both
wind and water erosion.

Giant dust bowls are historically new, confined to the
last century or so. During the late nineteenth century, mil-
lions of Americans pushed westward, homesteading on
the Great Plains, plowing vast areas of grassland to pro-
duce wheat. Much of this land—highly erodible when
plowed—should have remained in grass. Exacerbated by a
prolonged drought, this overexpansion culminated in the
1930s Dust Bowl, a traumatic period chronicled in John
Steinbeck’s novel *The Grapes of Wrath*. In a crash pro-
gram to save its soils, the United States returned large areas of
eroded cropland to grass, adopted strip-cropping, and
planted thousands of miles of tree shelterbelts.13

Three decades later, history repeated itself in the Sovi-
et Union. In an all-out effort to expand grain production
in the late 1950s, the Soviets plowed an area of grassland
roughly equal to the wheat area of Australia and Canada
combined. The result, as Soviet agronomists had predicted, was an ecological disaster—another Dust Bowl. 14

Kazakhstan, which was at the center of this Soviet Virgin Lands Project, saw its grainland area peak at just over 25 million hectares in the mid-1980s. (One hectare equals 2.47 acres.) It then shrank to less than 11 million hectares in 1999. It is now slowly expanding, and grainland area is back up to 17 million hectares. Even on the remaining land, however, the average wheat yield is scarcely 1 ton per hectare, a far cry from the 7 tons per hectare that farmers get in France, Western Europe’s leading wheat producer. 15

Today, two giant dust bowls are forming. One is in the Asian heartland in northern and western China, western Mongolia, and central Asia. The other is in central Africa in the Sahel—the savannah-like ecosystem that stretches across Africa, separating the Sahara Desert from the tropical rainforests to the south. Both are massive in scale, dwarving anything the world has seen before. They are caused, in varying degrees, by overgrazing, overplowing, and deforestation.

China may face the biggest challenge of all. After the economic reforms in 1978 that shifted the responsibility for farming from large state-organized production teams to individual farm families, China’s cattle, sheep, and goat populations spiraled upward. The United States, a country with comparable grazing capacity, has 94 million cattle, a slightly larger herd than China’s 92 million. But when it comes to sheep and goats, the United States has a combined population of only 9 million, whereas China has 281 million. Concentrated in China’s western and northern provinces, these animals are stripping the land of its protective vegetation. The wind then does the rest, removing the soil and converting rangeland into desert. 16

Wang Tao, one of the world’s leading desert scholars, reports that from 1950 to 1975 an average of 600 square miles of land turned to desert each year. Between 1975 and 1987, this climbed to 810 square miles a year. From then until the century’s end, it jumped to 1,390 square miles of land going to desert annually. 17

China is now at war. It is not invading armies that are claiming its territory, but expanding deserts. Old deserts are advancing and new ones are forming like guerrilla forces striking unexpectedly, forcing Beijing to fight on several fronts.

A U.S. Embassy report entitled “Desert Mergers and Acquisitions” describes satellite images showing two deserts in north-central China expanding and merging to form a single, larger desert overlapping Inner Mongolia and Gansu Provinces. To the west in Xinjiang Province, two even larger deserts—the Taklimakan and Kumtag—are also heading for a merger. Highways running through the shrinking region between them are regularly inundated by sand dunes. 18

While major dust storms make the news when they affect cities, the heavy damage is in the area of origin. These regions are affected by storms of dust and sand combined. A scientific paper describes in vivid detail a 1993 sandstorm in Gansu Province in China’s northwest. This intense sand and dust storm reduced visibility to zero, and the daytime sky was described as “dark as a winter night.” It destroyed 430,000 acres of standing crops, damaged 40,000 trees, killed 67,000 cattle and sheep, blew away 67,000 acres of plastic greenhouses, injured 278 people, and killed 49 individuals. Forty-two passenger and freight trains were either cancelled, delayed, or simply parked to wait until the storm passed and the tracks were cleared of sand dunes. 19

While China is battling its expanding deserts, India, with scarcely 2 percent of the world’s land area, is struggling to support 17 percent of the world’s people and 18 percent of its cattle. According to a team of scientists at
the Indian Space Research Organization, 24 percent of India’s land area is slowly turning into desert. It thus comes as no surprise that many of India’s cattle are emaciated and over 40 percent of its children are chronically hungry and underweight.20

Africa, too, is suffering heavily from unsustainable demands on its croplands and grasslands. Rattan Lal made the first estimate of continental yield losses due to soil erosion. He concluded that soil erosion and other forms of land degradation have cost Africa 8 million tons of grain per year, or roughly 8 percent of its annual harvest. Lal expects the loss to climb to 16 million tons by 2020 if soil erosion continues unabated.21

On the northern fringe of the Sahara, countries such as Algeria and Morocco are attempting to halt the desertification that is threatening their fertile croplands. Algerian president Abdelaziz Bouteflika says that Algeria is losing 100,000 acres of its most fertile lands to desertification each year. For a country that has only 7 million acres of grainland, this is not a trivial loss. Among other measures, Algeria is planting its southernmost cropland in perennials, such as fruit orchards, olive orchards, and vineyards—crops that can help keep the soil in place.22

Mounting population pressures are evident everywhere on this continent where the growth in livestock numbers closely tracks that in human numbers. In 1950, Africa was home to 227 million people and about 300 million livestock. By 2009, there were 1 billion people and 862 million livestock. With livestock demands now often exceeding grassland carrying capacity by half or more, grassland is turning into desert. In addition to overgrazing, parts of the Sahel are suffering from an extended drought, one that scientists link to climate change.23

There is no need to visit soil-devastated countries in order to see the evidence of severe erosion in Africa. Dust storms originating in the new dust bowls are now faithfully recorded in satellite images. On January 9, 2005, NASA released images of a vast dust storm moving westward out of central Africa. This huge cloud of tan-colored dust extended over 3,300 miles—enough to stretch across the United States from coast to coast.24

Andrew Goudie, professor of geography at Oxford University, reports that the incidence of Saharan dust storms—one rare—has increased 10-fold during the last half-century. Among the African countries most affected by soil loss from wind erosion are Niger, Chad, Mauritania, northern Nigeria, and Burkina Faso. In Mauritania, in Africa’s far west, the number of dust storms jumped from 2 a year in the early 1960s to 80 a year recently.25

The Bodélé Depression in Chad is the source of an estimated 1.3 billion tons of wind-borne soil a year, up 10-fold since measurements began in 1947. The nearly 3 billion tons of fine soil particles that leave Africa each year in dust storms are slowly draining the continent of its fertility and biological productivity. In addition, dust storms leaving Africa travel westward across the Atlantic, depositing so much dust in the Caribbean that they cloud the water and damage coral reefs.26

Nigeria, Africa’s most populous country, reports losing 867,000 acres of rangeland and cropland to desertification each year. While Nigeria’s human population was growing from 37 million in 1950 to 151 million in 2008, a fourfold expansion, its livestock population grew from 6 million to 104 million, a 17-fold jump. With the forage needs of Nigeria’s 16 million cattle and 88 million sheep and goats exceeding the sustainable yield of grasslands, the northern part of the country is slowly turning to desert. If Nigeria’s population keeps growing as projected, the associated land degradation will eventually undermine herding and farming.27

In East Africa, Kenya is being squeezed by spreading deserts. Desertification affects up to a fourth of the coun-
Chroniclly plagued by overgrazing and overplowing, Iraq is now losing irrigation water to its upstream riparian neighbors—Turkey, Syria, and Iran. The reduced river flow—combined with the drying up of marshlands, the deterioration of irrigation infrastructure, and the shrinking irrigated area—is drying out Iraq. The Fertile Crescent, the cradle of civilization, may be turning into a dust bowl.  

Dust storms are occurring with increasing frequency in Iraq. In July 2009 a dust storm raged for several days in what was described as the worst such storm in Iraq’s history. As it traveled eastward into Iran, the authorities in Tehran closed government offices, private offices, schools, and factories. Although this new dustbowl is small compared with those centered in northwest China and central Africa, it is nonetheless an unsettling new development in this region.  

One indicator that helps us assess grassland health is changes in the goat population relative to those of sheep and cattle. As grasslands deteriorate, grass is typically replaced by desert shrubs. In such a degraded environment, cattle and sheep do not fare well, but goats—being particularly hardy ruminants—forage on the shrubs. Between 1970 and 2009, the world cattle population increased by 28 percent and the sheep population stayed relatively static, but the goat population more than doubled. 

In some developing countries, the growth in the goat population is dramatic. While Pakistan’s cattle population doubled between 1961 and 2009, and the sheep population nearly tripled, the goat population grew more than sixfold and is now equal to that of the cattle and sheep populations combined.

As countries lose their topsoil, they eventually lose the capacity to feed themselves. Among those facing this problem are Lesotho, Haiti, Mongolia, and North Korea. Lesotho, one of Africa’s smallest countries, with only
2 million people, is paying a heavy price for its soil losses. A U.N. team visited in 2002 to assess its food prospect. Their finding was straightforward: “Agriculture in Lesotho faces a catastrophic future; crop production is declining and could cease altogether over large tracts of country if steps are not taken to reverse soil erosion, degradation, and the decline in soil fertility.”

Michael Grunwald reported in the Washington Post that nearly half of the children under five in Lesotho are stunted physically. “Many,” he wrote, “are too weak to walk to school.” During the last 10 years, Lesotho’s grain harvest dropped by half as its soil fertility fell. Its collapsing agriculture has left the country heavily dependent on food imports.

In the western hemisphere, Haiti—one of the early failing states—was largely self-sufficient in grain 40 years ago. Since then it has lost nearly all its forests and much of its topsoil, forcing it to import over half of its grain. Lesotho and Haiti are both dependent on U.N. World Food Programme lifelines.

A similar situation exists in Mongolia, where over the last 20 years nearly three fourths of the wheatland has been abandoned and wheat yields have started to fall, shrinking the harvest by four fifths. Mongolia now imports nearly 70 percent of its wheat.

North Korea, largely deforested and suffering from flood-induced soil erosion and land degradation, has watched its yearly grain harvest fall from a peak of 5 million tons during the 1980s to scarcely 3.5 million tons during the first decade of this century.

Soil erosion is taking a human toll. Whether the degraded land is in Haiti, Lesotho, Mongolia, North Korea, or any of the many other countries losing their soil, the health of the people cannot be separated from the health of the land itself.