

# Reversing Bush Encroachment: The Solution Is in the Soil

By Abbey Kingdon

When massive migrations of large herds crossed the northern South Africa of the past, the 10,000 acres of the Knight family's cattle farm, near Mokopane, in the Limpopo Province of South Africa, was a savannah. It was a low-humidity environment (referred to as a brittle environment by Holistic Management<sup>1</sup>) of open grasslands with broadly spaced acacia trees. It was, and still is, dependent upon the grazing and hooves of ruminants to maintain healthy ecosystem processes.

Over time, with the impact of human management tools, the grasslands gave way to excessive sickle bush (*Dichrostachys cinerea* ssp. *africana* var. *africana*), umbrella thorn (*Acacia tortillas*), and sweet thorn (*Acacia karroo*). But recently, the Knight family has begun to slowly but steadily reverse bush encroachment in their cattle paddocks, using holistic management methods.

Their approach to the issue of bush encroachment is true to the Knight family values and lifestyle: no quick-fix, bandage remedy, but instead, a creative, logical, carefully planned procedure. Three generations of Knights live on the farm, with well-established family traditions like holidays to Kruger National Park and fishing trips. In the early evening of most days, the family is found sipping tea on the east veranda, listening to



Sickle bush and other bush species growing on the Knights' cattle farm.

birds and other inhabitants of the bush, quizzing each other on the origin of the sounds. Some evenings, they pack up the picnic basket and head out into the farm for refreshments in the bush. Their place in the midst of the dramatic South African ecosystem is a conscious choice. The family understands, appreciates, and enjoys the complexities of nature, with no ambition to place a conquering grip on the land.

Before deciding what tools could reverse bush encroachment, such as poison, fire, rest, or animal impact, the Knights determined the root cause of the problem.

The root cause was found, appropriately, in the soil. Others might not see the complex and powerful role soil life plays in ecosystem health, but the Knights dug beneath the surface.

Following the work of Elaine Ingham, a soil scientist, the Knights learned that all soil has bacteria, fungus, and other

<sup>1</sup>The Holistic Management Brittleness Scale (1–10), with 1 being a jungle and 10 being a true desert, determines land's vulnerability to desertification, the formation of deserts, and how quickly dead vegetation breaks down. The scale is linked to total rainfall but is more determined by the distribution of rainfall and humidity during the year. Savory, A., and Butterfield, J. 1999. *Holistic management: A new framework for decision making*. Washington, DC: Island Press. 616 p.



The Knight family enjoys drinks in the veld of their cattle farm, near Mokopane, South Africa.

microbes. The dominance of either bacteria or fungi will influence what types of plants thrive there, said Wayne Knight, who manages the farm and cattle herd with his father, Tom Knight. Bacterial dominance results from the breakdown of plant material in the warm, moist rumen of ruminants. In brittle environments, bacteria cannot survive without this symbiotic relationship between ruminants and grass; only fungi can, Wayne Knight said.

Bush species tend to grow in fungal-dominated soil and grass species in bacterial-dominated soil. The pH of the soil determines which—fungi or bacteria—will have control. Bacteria-based soil harbors annuals, weeds, and grass species. Such soils select for these species because they require nitrate as the predominant form of nitrogen and require an alkaline pH, said Ingham, who studies compost (especially compost tea), and who founded the Soil Foodweb, Inc.

Fungal-dominated soils, on the other hand, set up conditions to grow bushes, shrubs, and trees. Fungi maintain soil pH in the 5.5 to 7 range, which means ammonium is the predominant form of nitrogen, the form most selective for woody perennial plants, Ingham said.

The Knights concluded that if they could change the soil, they could change what grew in it. “Animal impact, dung, and urine will increase the bacterial-dominated soil,” said Dick Richardson, a South African Holistic Management educator and author who consulted the Knights. Thus, they chose animal impact as the management tool to reverse bush encroachment.

In 1997, the Knight family changed their management practices. Up until that time, they thought rest from grazing was the remedy for bush encroachment on grass-producing ground. But fewer cattle worsened the encroachment.

Low stocking rates simultaneously allow overgrazing and overresting. Together, they create weak root systems that are not able to feed soil microbes, Wayne Knight said. The grazing camps looked devoid of life. Moribund grass tufts stood like scarecrows across the pastures that were otherwise shorn clean of grass.

With a new plan, the family consolidated their cattle into 1 big herd and decreased the size of their grazing camps, carefully planning impact and rest intervals for the farm. The family was able to make this management change without any major new fencing development or other investments. The land responded to the new management with increased productivity above- and below-ground. Planned grazing increased the organic and mineral content in the soil and its water-holding capacity and provided more favorable growing conditions for grasses, Wayne Knight said. After grazing, root systems feed soil microbes with carbohydrates they release as the plant downsizes and redirects nutrients to regrowing aboveground. As the grass is snipped off by grazing cattle, the soil life is fed as the plant reacts. During the rest interval, plant shoots regrow. This cycle accelerates the energy flow above- and below-ground, Wayne Knight said.

Now camps that were quiet and empty buzz with bugs, birds and cattle, half hidden in tall grass.

When the family initially sat down and put their heads together over the issue of bush encroachment, they thought the sickle bush and others were pushing out the grass. Now, they believe understocking the land invited the bush.

“At first we saw the bush encroachment as a problem, but Dick Richardson changed our perspective. Bush is there as a symptom of management decisions, which were to have stocking rates lower than the grassland ecosystem can handle,” Wayne Knight said.

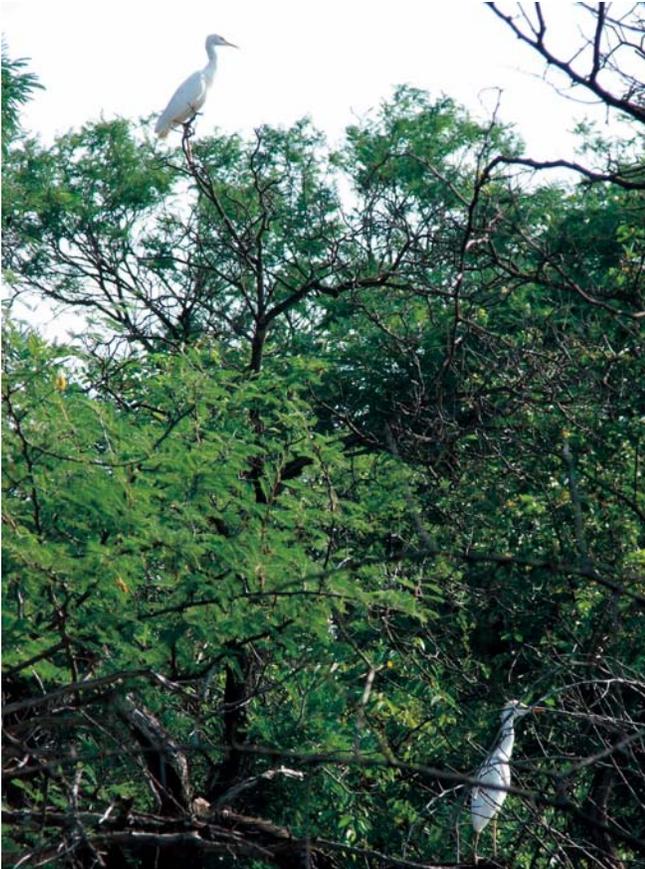
The lively soil created by new management practices encourages higher stocking, which rapidly recycles nutrients back into the soil, introducing even more bacteria through dung.

“The entire ecosystem process has been enhanced by planned grazing,” Wayne Knight said.

Holistic Management identifies 4 ecosystem processes and asks which of them is altered to produce the problem condition in the land. Of water, energy and mineral cycles, and community dynamics, Richardson said community



A cattle camp shortly before the cattle enter. The cattle navigate through the bush to graze.



Tick birds rest for a moment in acacia trees as they move with the cattle through the camp.

dynamics were changed to produce the bush encroachment condition on the Knights' farm. The previous management decision of continual grazing with light animal impact resulted in a decrease in the community dynamics on the farm, and a few bush species were able to dominate.



A cattle camp on the Knights' farm that has responded well to holistic grazing planning (left). The camp on the right was recently grazed.



With animal impact and holistic grazing planning, sickle bush and others are giving way to perennial grasses.

Community dynamics are important because increased diversity of all life forms in the community will lead to greater stability; deeper, more mature soils; and higher energy flows, Richardson said.

Even though hardy, vibrant perennials grow under the gray skeletons of sickle bush in many places on the Knights' farm, there are still camps choked with bush. After crawling through the bush, garnering scratches and hair pulled by thorns, with feet sweating in boots full of thorn punctures, and with a constant awareness that black mambas reside in such places, one has the urge to just torch the whole tangled mess and be done with it. Wayne Knight said the main reason for not using fire is because this tool results in a loss of organic material (a spectrum of ground cover in a given location, with dead leaves and grasses at one end and formed soil at the other end), which takes years to build up in the brittle environment on their farm. The Knights viewed animal impact as the best tool for reversing bush encroachment on their cattle farm.

"If the environment is already degraded, burning it will further set back the grass plants and debilitate soil life, and then the whole cycle slips into a downward spiral," Wayne Knight said.

The Knights didn't have to wait long for feedback from the land on their decisions. Within one grazing season, they saw results. The veld responded with an increase in grass production, a decrease in plant spacing, and varying degrees of bush die-off. In some places, weed and bush germination increased after the initial high-density grazing. But after improved plant spacing and accelerated ecosystem processes, the bush started to die back, Wayne Knight said.

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