

## **SAVANNA PLANT ECOLOGY**

*by Greg Sharam, University of Vancouver*

### **Characteristics of Savanna plants:**

Serengeti National Park can be described as being in a "Fire Climax" state. This means that fire controls what plants live in the Serengeti savanna. There are two types of common plants in a Fire Climax state; the plants that encourage fires and the ones that can endure fire.

The plants that encourage fires are grasses. A huge variety of grasses grow in Serengeti, and all of them have the same traits that encourage and protect them from fire during the dry season. Grasses encourage fire by having easily drying, vertically standing stalks, providing abundant fuel for the fires and making it easy for them to burn. Grasses are protected from fire in three ways.

First, when grasses dry, they remove much of their nutrients to the roots, so when a fire does burn the plant, very little important material is lost. Second, grasses have large supplies of extra nutrients stored underground, so that they can easily re-grow lost leaves after burning. Finally, all plants have what is called an apical-meristem, a part of the plant which controls upward growth. In most plants, the apical-meristem is located at the top of the highest branch. If you have ever tried a gardener's trick and cut the top branch off of a plant, you will have noticed that it stops growing vertically and instead get wider and thicker. In grasses, this apical-meristem is located below the green growing part of the plant, and hidden below the ground. Thus, grasses are pushed up from the ground and not growing up from their tops. When a fire burns grass or an animal eats grass, they are not damaging the important apical-meristem, only eating the leaves.

The second type of savanna plants are those that can endure fire. These plants are trees, and some herbs. The majority of trees in African Savannas are Acacias, Commiphoras, or Terminalias. All of these trees have the same characteristics that protect them from fire; an insulating layer of bark. Most savanna trees are susceptible to fire when they are young, but as they grow larger, they become resistant to fire, and thus reach what is called a "size escape" from fire. Once trees have become large enough, only frequent and hot fires can kill them.

There are a variety of small plants which are fire-resistant, though most of them are very small herbaceous plants that avoid being burned by remaining low to the ground and below the level of grass fires. There are more of these herbaceous plants on the short grass plains than anywhere else in Serengeti, because anywhere in tall grass there is not enough light reaching the ground level to support them.

In a "fire climax" savanna, most plants cannot survive the rigors of repeated burning. It is for this reason that areas that don't burn, such as Kopjes and Riverine Forests are so important for the diversity of Serengeti.

## **Ecology of Savanna Plants: (Multiple Stable States)**

The Ecology of Savannas can be described as "Multiple Stable States". Years ago, farmers and ranchers noticed that savannas tend to grow as either an open grassland with almost no trees or as a dense woodland with many trees and less grass. They also noticed that transitions between these states were rapid and that it was difficult to maintain a mixture of the two states.

Description of the Multiple Stable States:

Scientists describe savanna Ecology as "Multiple Stable States", where there are two or more "States" that an area can live as. Each of those states supports and maintains itself and is thus "Stable". To be exact:

When a savanna has no trees (Grassland State), it grows massive amounts of grass which produces hot burns during the dry season. These fires kill vulnerable tree seedlings and effectively exclude trees, thus maintaining the grassland as a grassland.

When a savanna has many trees (Woodland State), the trees use much of the water and sunlight before they can get to the grass. This reduces the amount of grass that can grow. The less grass there is, the fewer fires that can burn. Thus, the adult trees are safe and many small trees can grow, maintaining the woodland as a woodland.

What causes savannas to switch between States:

The old answer to the question of what caused savannas to switch from a woodland to a grassland state was "Elephants!". Research in the Masai Mara Reserve in Kenya has shown that the two most important factors for Acacia woodlands are Fire and Elephants. Fire, at sufficient frequency and temperature can remove trees from a woodland and push a savanna into a grassland state. Fire can then keep the grassland locked in a grassland state. Elephants can also keep a grassland locked as a grassland by eating any new tree seedlings that might grow. Elephants cannot, however, kill a large enough number of trees to push a woodland state into a grassland state.

### **How Savanna ecology is different from Forest Ecology:**

The Multiple Stable State Ecology of Savannas is unlike the ecology of forests. Most forests change through time after being cut or disturbed; with grasses growing in, then bushes, and then a chain of different trees until a dominant tree species finishes the sequence and becomes the "climax" species. This process is called "succession" and is common to most of us if we have ever seen an old field or disused lot growing back to become forest. Savannas generally do not undergo succession, but will switch back and forth between their multiple stable states without any intermediate stage.

### **Swamps:**

There are several small wetlands in Serengeti National Park. The largest by far is in the extreme west of the park near Lake Victoria. It is growing on a silt soil that was deposited when Lake Victoria covered part of Serengeti.

This swamp is filled seasonally by the rains and the Grumeti River. The major vegetation is Papyrus reeds, the same plant used by Ancient Egyptians to make paper.

Specialized animals such as the Marsh Mongoose and a group of frog and lizard species inhabit the wetlands. Several species of birds including Spoonbills make their homes here, as do a wide variety of migratory birds.

### **Special Stories:**

#### Hotspots:

Within Serengeti, there are two general groups of animals; those that migrate and those that are resident in one place all year. These resident animals tend to congregate in special places which scientists call "hotspots". At these places, many species gather together and graze the grass intensively, so that the grass forms a

"grazing lawn" of highly productive, short vegetation (similar to the short grass plains during the rainy season). Hotspots tend to occur at the boundaries of carnivore ranges, where carnivores are less likely to go so that they don't meet their neighbors. Oddly enough, hotspot grass is much more productive than nearby ungrazed grass. Scientists are interested to see if the grazers themselves create the hotspots by fertilizing the area with their dung as they feed. This is some of the work of Dr. S.J. McNaughton which also includes studies of nutrient cycling on the plains and interactions between the wildebeest and the plants they consume.

