

ENVIRONMENT

Plants and extreme ecosystems

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LAST week's article was dedicated to looking at how bushfires can be both beneficial and detrimental to our environment. I also touched on some adaptations that organisms that live in ecosystems prone to bushfires have that help them survive or at least let them stand a greater chance of survival. This week staying on the same theme, I would like to look at how plants in particular survive in ecosystems that have continuously harsh conditions like tropical savannas and deserts.

Tropical savannas can be of two types, climatic or seasonal savannas or edaphic or non-seasonal savannas. The former relies on bushfires while the latter on soil conditions for its continued existence. In tropical savannas the vegetation comprises of low and herbaceous plants, for example, sedges and grasses. However, there are patches of trees present, such as, a water course or in depressions where water can accumulate. Generally, the plants found in this ecosystem have adapted to it physically by having leathery leaves, thick bark in the case of trees, sub-surface perennating organs and annual regeneration life strategies. Before going further I would like to briefly explain the last two physical adaptations. Sub-surface perennating organs are modified parts of the plant like leaves, stems, roots or whole shoots usually develop underground and are modified to store food. So when conditions are unfavourable the part of the plant that is above ground dies and when conditions are suitable again the plant grows back using the food stored in these organs. Annual regeneration strategies are used by plants to avoid dry conditions completely. Some plants do this by shedding



their leaves and seeds when conditions are unfavourable. When it rains these seeds germinate and take in nutrients, grow and shed more seeds. This strategy does not strictly take place on an annual basis as seeds can survive up to three to five years between rainfalls.

A savanna or grassland like a pasture can be considered to be one of the first stages in ecological succession. This means that when an area is disturbed, one of the first plant species to colonise the area is grasses. This vegetation provides energy for animals and as they die and decay, for larger forms of vegetation like shrubs and eventually trees to be established in the area, therefore in this form the vegetation

can also referred to as biomass. In savannas this biomass can be removed periodically by bushfires. It can also be kept at a low level by poor soil conditions so that large vegetation like trees cannot get enough nutrients to survive. Savannas can also get help in maintaining a low biomass from other organisms, such as fire ants or by grazing animals. Therefore this ecosystem is maintained.

In savannas, primary productivity is kept very low and is synchronized with periods of rainfall. So for most of the year the plant is in stasis and when water is available, the stomata on the leaves open and photosynthesis will occur at an accelerated rate. Nutrients will also be released

from the soil during rainfall as it dilutes them and makes them into a form suitable for uptake by plants.

Besides high temperatures and dry conditions, tropical savannas have to deal with water logging when the rains come. Some of these adaptations include root aeration structures, and using water to disperse reproductive structures.

However, in tropical deserts, yes there are such ecosystems; the conditions are not harsh but extreme compared to savannas. Tropical deserts are found at around 30° North and South of the Equator, but are usually centred about 23°.

The vegetation characteristic of this ecosystem is widely spaced clumps of grasses or shrubs. In tropical deserts some plants adapt by sending down large tap roots to underground sources of water. Therefore they are able to photosynthesise and stay green throughout the year, for example, date palms. This does not mean however, that they do not have xeromorphic adaptations, for instance, include the presence of leathery or thick leaves or reduction of leaves to sometimes none at all, photosynthetic stems, or a high root to shoot ratio. They have to as it takes a long time to draw up water from the ground to their leaves. So if they had thin leaves the water would evaporate from them before the water from the underground source reached it.

Therefore it can be seen that plants that live the two driest tropical ecosystems have specific physical adaptations and strategies to help them survive in these extreme conditions. Some plants withstand the hot and dry conditions while others enter a period of dormancy and wait out the unfavourable conditions, growing back only when there is sufficient rainfall.

However, in the case of tropical savannas, plants that live in this ecosystem also have to deal with water-logging when the rains come.