

 **FACULTY OF NATURAL SCUIENCE**

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Introduction

1.1 Importance of South Africa's Ecosystem

South Africa is renowned for its flora, which has an exceptionally high level of endemism and is considered one of the world's six floral kingdoms. The Cape Floristic Region (CFR), one of the most diverse and threatened ecosystems globally, is the primary focus of this project. The CFR is home to in excess of 9000 different plant species, most of which are found nowhere else on earth. The vast majority of these species are fynbos, a hard-leaved sclerophyllous shrubland and/or heathland vegetation which forms a large part of the CFR.

 Fynbos and other South African heathlands are amongst the most fire-prone worldwide, and because of this, the plants have adapted both physically and reproductively to the presence of fire. The South African ecosystem is unique and valuable and may be threatened when conservation issues are not considered in fire management.

1.2 The Role of Fire in Ecosystems

Fire has always played a significant role in the development of South Africa's indigenous flora. Although harmful uncontrolled fires have caused untold damage to the flora and fauna of South Africa, ecological research has revealed the intricate evolutionary adaptations of fynbos and savanna plants to fire. Fire, as a destructive force, can do great damage to the natural environment, particularly in grasslands, forests, and shrublands, which are areas that characterize much of the more moist regions of South Africa.

 These fires destroy the organic soil surface because the heat does not penetrate into the soil and lead to the runoff of water, soil erosion, invasion by alien plants, and loss of plant species and reduction in plant cover. This type of ecosystem degradation can, in turn, lead to a fire regime where fires occur too frequently because of the build-up of a grassy or other fine fuel state that does not allow for safe burn and is hot and damaging to the soil seedbank.

This is also a typical situation in the high rainfall grasslands and Afromontane regions of South Africa. Fires can be started by lightning or humans. If uncontrolled fires are hot and damaging to the soil seedbank, plant species and loss of plant species and reduction in plant cover. This type of ecosystem degradation can, in turn, lead to a fire regime where fires occur too frequently because of the build-up of a grassy or other fine fuel state that does not allow for safe burn and is hot and damaging to the soil seedbank. This is also a typical situation in the high rainfall grasslands and Afromontane regions of South Africa.

2. Fire Adaptation in South African Plants (Fire-Resistant Plant Species and Fire-Dependent Plant Species)

Importance of Fire-Resistant Plant Species

Fire-resistant plant species are invaluable in maintaining the health and biodiversity of ecosystems, especially those where fire is a frequent and dominant ecological factor. These plants have a variety of characteristics that enable them to survive, resist, or tolerate fire. In areas prone to frequent fires, these plants can act as a buffer and help protect properties, both public and private, surrounded by fire-prone vegetation. By using fire-resistant plants, communities can still have attractive and diverse vegetation but with a greater chance of withstanding an oncoming fire. Fire-resistant plants which are able to re-sprout after a fire, or which have seeds that only germinate after a fire, can help speed the recovery of an area that has been burnt. The longer a vegetation type takes to recover after fire, the more vulnerable it is to invasion by weeds and exotic plant species. Therefore, the use of fire-resistant native plants can be an important tool in the prevention of weed invasion and the spread of exotic plant species. Finally, planting fire-resistant species can help to reduce the risk of uncontrollable fire developing in the first place. This is due to the fact that fire-resistant plants generally do not carry fire well and are therefore less likely to sustain an intense fire or to transfer fire to the canopies of trees.

1.

Benefits of Using Fire-Resistant Plants

Fire has been a part of the Australian landscape for tens of thousands of years, and many of our plants have come to depend on low-intensity fires for their regeneration. These plants have developed a variety of mechanisms allowing them to survive fire and to regenerate afterwards. The loss of fire-prone native plants and their replacement by exotics or vigorous natives can lead to more intense fires and the loss of biodiversity. The use of fire-resistant plants may be the only way some communities can retain certain native plants and the values and services these plants bring to the environment.

Plants that are more resistant to burning will most likely survive a bushfire and therefore can retain their many protective and environmental values. Trees and plants can act very effectively as windbreaks and can assist in changing the direction and increasing humidity of oncoming fires. This, in turn, will slow down the progress of a fire or even stop it in its tracks. Fire-resistant plants that survive a fire can act as a focal point for natural regeneration.

The use of fire-resistant plants as a way of controlling bushfire damage is a recent trend that is becoming more and more popular. There are many benefits of using these plants, which are the key to this newfound trend, and are the only way that communities can truly live with and adapt to bushfire as a necessary and natural part of the Australian environment. Fire-resistant plants can assist in reducing radiant heat and the speed of fire, which are two factors that lead to most destruction of property. They can do this by maintaining a higher level of moisture in their leaves and twigs and are generally more resistant to burning and therefore will not add to the fuel of the fire.

2. Characteristics of Fire-Resistant Plant Species

2.3 Fire-Prone Ecosystems in South Africa

3. Ecological Benefits of Fire in South Africa

3.1 Biodiversity Enhancement

3.2 Nutrient Cycling and Soil Fertility

3.3 Regeneration and Succession

3.4 Fire as a Management Tool

4. Fire Management and Conservation Strategies

4.1 Controlled Burns and Firebreaks

4.2 Monitoring and Research

4.3 Community Engagement and Education

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