

Exploring the pearls of Paarl

The diversity and potential of Paarl Mountain Nature Reserve

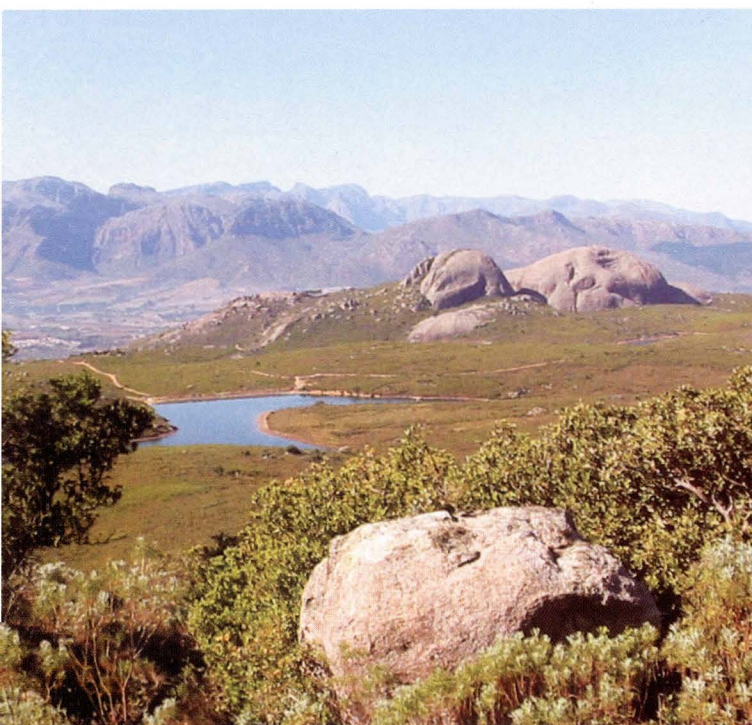
by **Sue Milton**, Conservation Ecology, University of Stellenbosch, **Richard Dean**, FitzPatrick Institute, University of Cape Town and **Myke Scott**, freelance plant collector

'Peerleberg' (Pearl Mountain) was the name given to the spectacular granite mountain in 1657 by Dutch settler Abraham Grabbema who was sent to find what resources the Cape interior had to offer to Van Riebeeck's newly established supply station near Cape Town. The mountain has been known by this name ever since. Thirty years later, in 1687, a settlement was founded at the foot of the mountain by Simon van der Stel who allocated farms to Free Burghers and in the following year to French Huguenots. Van der Stel named the area Drakenstein – not as we had long believed for the spectacular boulders (dragon stones) but after Hendrik Adriaan van Rheede tot Drakenstein, Commissioner of the Dutch East India Company. The commissioner stayed in Cape Town in 1685 and made notes on ostrich, lion and wild dogs that he saw there, but never visited Paarl Mountain. Had he done so he would doubtless have been fascinated, because he was a botanist and co-author of *Hortus Malabaricus* (the garden of Malabar) that describes all the therapeutic properties of the plants of Malabar. While in Cape Town he inspired Van der Stel and others to study the Cape plants.

Little is known of Khoikhoen use of the Paarl area, but they had doubtless visited the mountain over tens of thousands of years to graze their animals. The Seventeenth Century French Huguenot and Dutch farmers used the mountain for

grazing and for watering their livestock. In 1838 the land was granted to the magistrate's office as a commonage for inhabitants of Paarl and the military base of Agter Paarl. The mountain was included in the Municipal boundaries of Paarl in 1840 and dams and roads were built between 1881 and 1914. During this period the Perolds and other families camped on the mountain during their Christmas holidays. Their signatures are engraved in the rocks at Krismas Kamp, an attractive grove of wild olives on the plateau with a magnificent view over Bretagne Rock.

Nature reserve status for the mountain was proposed in the 1950s but was opposed by farmers and others who made use of the mountain for camping, grazing and collection of firewood, wildflowers, honeybush tea, thatching reeds and other natural resources. In 1963 Paarl Mountain was declared a National Monument, but it was not until 1970 that the whole mountain commonage (2900 ha) was granted to the Paarl Municipality by an act of Parliament for use as a nature reserve. Of this area, 890 ha were leased to neighbouring farm owners for fifty years (1970-2020) and 100 ha were transferred to the State for the Afrikaans Language Monument. The remaining 1910 ha form the present Paarl Mountain Nature Reserve. The first management plan for the reserve was drawn up by Brian van Wilgen in 1974 when he was a student at the University of Stellenbosch.



ABOVE LEFT: Looking across the plateau of Paarl Mountain Nature Reserve. Photo: Sue Milton. RIGHT: The explorer William Burchell visited Paarl in 1811 and, while walking to the foot of the mountain behind Paarl village, he noted the rooibos trees *Cunonia capensis* growing along the river. Photo: Myke Scott.



ABOVE LEFT: Grassy patches support a rich diversity of plants. RIGHT: Who planted the silver tree woodland on the southern slopes of Paarl mountain? We would love to hear from any reader who has information on the history and origins of this woodland. Photos: Sue Milton.

Explorers and collectors

Paarl Mountain has long attracted the attentions of natural historians, yet there are few published studies of its vegetation and fauna. We know from travel accounts by Van der Stel in 1685 that there were black rhinoceros, elephant, lion and eland in the area in 1685. A century later when Thunberg, Sparrmann, Masson and Gordon were exploring and collecting from 1770 to 1785, there were still zebra, antelope and lion, but elephant and hippo had been virtually shot out. On 24 January 1874, the English bird taxonomist Captain G.E. Shelley, collected a variety of birds during a hot walk up the mountain. His bag included Cape and scrub robins, boubou shrike, Cape canary and stone chat. On top of the plateau in fynbos he collected grass-birds and a white necked raven that had come to examine his specimens. On his way down the mountain, he cooled off in a stream pool in the company of pied kingfishers.

The vegetation of the Paarl area is described in only the vaguest terms in the eighteenth century as shrubby and grassy, but in 1801 John Barrow climbed the mountain and commented on the huge wild olives, the elegant heaths (ericas), and the abundance of sugarbush *Protea repens*. In his own words 'The mountain of Paarl furnishes a fine field for the botanist. The plants are varied and wonderfully luxuriant'. William Burchell visited Paarl in 1811 en route from Tulbagh to Stellenbosch. While walking to the foot of the mountain behind Paarl village he noted rooiers *Cunonia capensis* along the river, *Erica pubescens*, *Cassine capensis* and the parasitic stokkiestee, *Viscum capense*, agurkie *Cucumis prophetarum*, bloublomsalie *Salvia africana* and bokbietou *Diosma capitata*. Drege's 1830 collections of legumes, daisies, pelargoniums, grasses and

buchus are the earliest herbarium records from Paarl Mountain. T.R. Sim and S. Garside made a large collection of mosses and liverworts between 1917 and 1919. Since then, knowledge of the Paarl Mountain flora has grown slowly with the help of at least 110 people, including such well-known botanists as Rudolf Marloth, General Jannie Smuts, Pole-Evans, Harry Bolus, R.H.Compton, Elsie Esterhuisen, John Hutchinson, John Acocks and Chris Burgers, who deposited Paarl Mountain specimens in the national herbaria. Our plant checklist for Paarl Mountain Nature Reserve (710 species) is based on 1657 records.

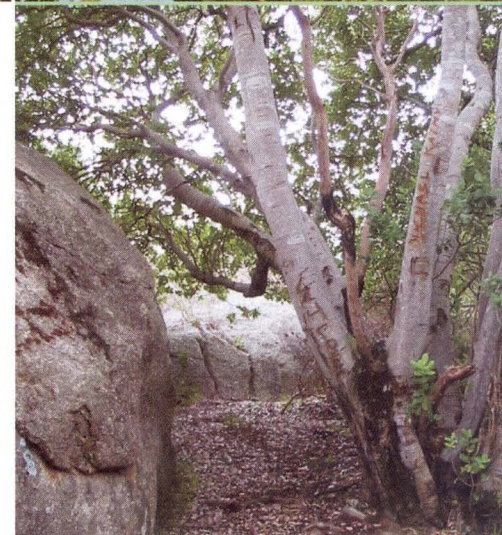
The 1960s saw the start of a field herbarium in Paarl Mountain Nature Reserve. Major additions to the herbarium were made by volunteer Joan Isham between 1990 and 1998, by Barrie Low in 1999 and by our team in 2002. The herbarium, which is arranged in systematic order, now contains 554 mounted plant specimens of 394 species. The collection is far from complete as it represents only 55% of the plant species known to occur in Paarl Mountain Nature Reserve! And there are undoubtedly many more plant species on the mountain for which no record yet exists.

Four biomes in one

Paarl Mountain Nature Reserve has something for everyone. Apart from the botanical garden, picnic sites, walks, fishing, bird watching, rock-climbs and spectacular views of the Western Cape in all directions, you can see four of the region's biomes, Karoo, Fynbos, Forest and Renosterveld Biomes, within a kilometre of one another.

Each of these major vegetation types can be further divided into sub-types, depending on soil depth, moisture, slope and aspect.

The thin soils over granite boulders



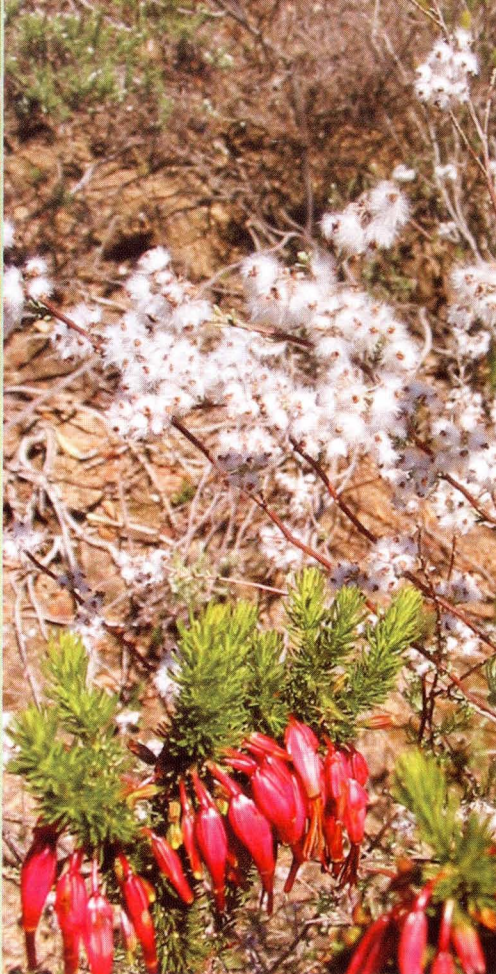
FROM TOP: The deep granite soils support dense, tall and impenetrable protea fynbos, strongly dominated by a white-flowered form of the sugarbush *Protea repens*. Photo: Myke Scott.

A FOREST patch in the shade of the mighty granite boulders. Photo: Sue Milton.

THE LOWER slopes, where soils are clayey and conditions drier, support renosterveld shrubland, very rich in grasses. It is on these lower slopes that the botanical pearls of Paarl are found, because the lower slopes of most hillsides in the western Cape have been converted into vineyards at the expense of the rich flora. Photo: Sue Milton.

BELOW: Tolbos *Leucadendron rubrum* also grows on the deep granite soils. Photo: Sue Milton.





One may well ask why the various species flower at different times of the year, and perhaps it is because they need to please particular pollinators, or to have seeds available at the time of the year when seed dispersal will be most effective.

ABOVE LEFT: The rare fireworks pincushion *Leucospermum grandiflorum* can be seen in flower from August to October. RIGHT: The fluffy white seeds of kapokbos *Erioccephalus* and the shiny red flowers of *Erica* can be seen together in September. Both are used by sunbirds - the kapok for lining nests and *Erica* flowers as a nectar source. Photos: Sue Milton.

have a vegetation similar to that of the Succulent Karoo. The succulents that flourish in boulder cracks and on shallow soils at the edges of the great granite domes and boulders that emerge from the mountain plateau include aloes, crassulas, euphorbias, many vygies and succulent species of daisies and pelargoniums.

The deep granite soils of the flat plateau support remarkably dense, tall and impenetrable protea fynbos, strongly dominated by a white-flowered form of sugarbush *Protea repens* and by tolbos *Leucadendron rubrum*. These shrubs grow so close together as to exclude most other plants. Were it not for the granite boulders and domes that emerge here and there, occasional fires that knock back the proteas, and the termites and rodents that maintain open patches for yellow daisies and pea flowers, pink suurings (*Oxalis*), red ericas, blue aristecas and orange watsonias, the plateau vegetation would be rather dull. On screes and boulder-strewn areas waboom *Protea nitida* is dominant, and on the southern slopes along the stream leading to Victoria Dam there is a woodland of tall silver trees *Leucadendron argenteum*.

Before the Bethel, Nantes and Victoria dams were built a century ago to improve the town water supply,

there would have been marshes on the mountain plateau. Remnants of these can still be seen just above the dams, where dense stands of golden-leaved sonskynbos *Leucadendron salignum* and white-flowered koffiebos *Brunia* and *Berzelia* and tall bracken thrive in the boggy soil.

Various types of forests and woodlands grow in the shade of mighty boulders and follow the courses of streams coming off the mountain. There are patches of wild olive *Olea europaea* subsp. *africana*, kliphout *Heeria argentea* and taaibos *Rhus* associated with all the big boulders on the mountain. Along the larger streams there are ribbons of tall forest similar to those you will see in similar habitats at Jonkershoek and on Table Mountain. At the waterfall just above the Jan Phillips road near the offices you can see maidenhair and filmy ferns - real damp, dark forest specialists.

The steep lower slopes, where soils are clayey and conditions drier, support fine-leaved renosterveld shrubland, very rich in grasses, bulb plants (orchids, irises, *Aristea*, *Ixia*) and flowering shrubs such as yellow *Athanasia* and *Aspalathus*, purple *Polygala*, pink *Podalyria*, blue *Felicia* and *Lobostemon*, white kapokbos *Erioccephalus* and buchu. It is on these lower slopes that

the botanical pearls of Paarl are found, because the lower slopes of most hill-sides in the western Cape have been converted into vineyards at the expense of the rich flora.

The lower slopes of Table Mountain, Tygerberg Hills and Paarl Mountain are unfortunately also recipients of invasive alien plants from gardens and farms. Recently the Drakenstein Municipality embarked on a major alien invasive plant clearing programme to save the rare plants of the lower slopes of Paarl Mountain Nature Reserve from inundation by wattle, pine and lantana.

Where to wander?

There is a network of roads and a few paths on the mountain plateau. Driving or walking these routes will allow you to see all the habitats on the mountain. As you enter the reserve you drive through the rarest and most species-rich habitat - the renosterveld. Then the road winds up onto the plateau through the wetland habitats around the two dams, and through dense tolbos and sugarbush fynbos, through patches of waboom amongst boulders. If you are walking you could take the steep and rather slippery road through the silver tree woodland and into the olive forest on the south-east-



ABOVE LEFT: Carpenter bee on *Polygala virgata*. RIGHT: The perfumed flowers of *Cyphia volubilis* attract moth pollinators at night. Photos: Sue Milton.

ern side of the mountain. You can walk up the Paarl rock for an outstanding view of the Cape lowlands or picnic in the shade of ancient wild olives at historical Krismis Kamp.

Flowers for all seasons

The top ten plant families in Paarl Mountain Nature Reserve as far as species richness goes are Asteraceae (daisies) with 105 species, Iridaceae with fifty-eight, Fabaceae (legumes) with fifty, Poaceae (grasses) with forty-four, Proteaceae with twenty-nine, Scrophulariaceae (snapdragons) with twenty-two, Restionaceae and Ericaceae with eighteen each and the Oxalidaceae (surings) with seventeen. There are different plants flowering in Paarl Mountain Nature Reserve every month, but spring (August-October) is definitely the best time to visit the reserve to see the greatest variety of flowers. One may well ask why the various species flower at different times of the year, and perhaps it is because they need to please particular pollinators, or to have seeds available at the time of the year when seed dispersal will be most effective.

The birds and the bees

In September, temperatures are warming up, insects emerge from their pupae and birds begin to breed. Many plants time their flowering for spring because this is the time of the year when insect pollinators (such as flies, bees, wasps and butterflies) are most abundant. Yellow, white and purple flowers are known to be attractive to insects and so it is not surprising that these colours are prevalent on the mountain in spring and summer. In early summer (September to November) pink *Podalyria*, purple *Polygala* and yellow *Aspalathus* flowers attract large

black carpenter bees that jostle one another for possession of bushes with the most flowers. The brilliantly blue flowers of *Aristea africana* and the purple-blue *Lobostemon* flowers are offset by the white flowers of *Agathosma* and *Adenandra* (buchu) that are very conspicuous in the renosterveld just above the Jan Phillips drive in spring.

Bright colour is not essential for successful pollination. There are many white flowers in the flora of Paarl Mountain Nature reserve like *Asparagus*, *Berzelia* and *Spiloxene*. Some may attract their pollinators by reflecting ultraviolet light, others, such as the sweet scented flowers of the creeper *Cyphia volubilis*, use perfume that guides moths to their flowers even on dark nights. The two small stemless proteas (*P. acaulis* and *P. scabra*) on Paarl Mountain bear inconspicuous brownish-green flowers on the soil surface. These emit a nutty smell that attracts small mammals like mice and possibly shrews, which pollinate the flowers while sipping the nutty nectar.

One rare plant well worth seeing in spring in the Paarl Mountain Nature Reserve is the fireworks pincushion *Leucospermum grandiflorum*. This grows in wet habitats near the dams and the best time to see the golden flowers is from August to October. No-one knows what pollinates its impressive golden flower but, as John Manning has shown (in *Veld & Flora* March 2004) for other pincushions, it may well be a long-tongued horsefly!

Autumn is the time to see *Oxalis* species; the 'suurings' or sorrel. Paarl Mountain has many of these starry white, yellow, orange, pink and cerise-flowered plants the bulbs of which are popular food items for Cape golden moles and Cape francolins. They flower in profusion, especially along the road

edges, in the cool months. As the temperatures rise, the rosettes of heart-shaped leaves shrivel, and the plants retreat below ground.

Red flowers and flowers that produce large volumes of nectar are attractive to birds, particularly during cold weather when insects are hard to find. The white-flowered form of the sugarbush *Protea repens*, that occurs in profusion on the mountain plateau, produces masses of flowers in May and June. Although many birds will drink nectar when they can get it, the Cape sugar bird and orange-breasted and malachite sunbirds are real specialists, and common in Paarl Mountain Nature Reserve. The pinks and reds of many proteas, the oranges and reds of watsonias, tubular ericas, aloes and wild dagga *Leonotis* certainly attract these birds which they depend upon for pollination. The fluffy white seeds of kapokbos and the shiny red flowers of *Erica* can be seen together in September. Both are used by sunbirds - the kapok for lining nests and *Erica* flowers as a nectar source.

Mystery of the silver trees

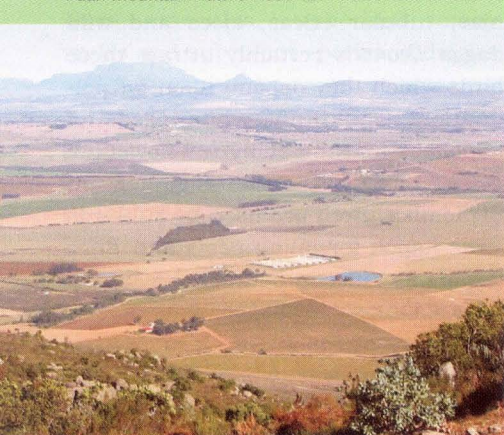
The silver tree woodland on the southern slopes of Paarl Mountain may not be natural. Paarl Mountain is one of only four localities (worldwide) where the silver tree *Leucadendron argentum* grows, the other three being Table Mountain, Tygerberg Hills and the Helderberg Nature Reserve. In the 1995 Protea Atlas, Tony Rebelo suggests that the tree may have been planted in all the non-Peninsula sites. However, in their botany textbook Edmonds & Marloth (1897, p. 169) note that the silver tree occurs 'on the Cape Peninsula, (and) near Paarl and Stellenbosch', so if planted, the planting took place in the 1800s, and may



TOP: Material gathered by termites - part of the process that maintains diversity.

ABOVE: Fire is an essential part of the fynbos.

BELOW: The sea of agricultural land around the Paarl Mountain Nature Reserve. Photos: Sue Milton.



Control of invasive alien plants has become an essential part of management in protected areas all over the world because the plants we move around for horticulture and agriculture are moved further by wind, water, ants, birds and cars.

have been motivated by the value of the wood. This is possible since Burchell reported that in 1811 there were 'plantations' of silver trees near Wynberg at Wittebome, and that this farmstead was named for the silver tree. It is curious that no Paarl specimens of this species are represented in South African herbaria. The authors would love to hear from any reader who has information on the history and origins of Paarl's silver tree woodland.

Management challenges

Management of Paarl Mountain Nature Reserve faces all the usual challenges of nature reserve management (such as balancing the budget), and others that have to do with the reserve being a small island of natural habitat in a sea of vineyards, crops and housing developments.

Plants did not evolve in a vacuum but with rhinos, antelope, birds, diseases, wildfires and hunter-gatherers. If completely protected from all disturbance it is likely that many of the smaller plant species would be overshadowed by larger ones and eventually disappear. However, because Paarl Mountain Nature Reserve is now a small island rather than part of a fynbos and renosterveld 'mainland' it is not feasible to return rhinos or herds of antelope to the mountain. And since human populations have grown greatly over the past 300 years, uncontrolled gathering of plant resources is now unthinkable.

Some of the processes that maintain diversity are being perpetuated. These include the activities of small animals such as rodents and termites. Termites feed on dead leaves which they drag into their under ground nests. Harvester termites digest the dead leaves themselves with gut flora similar to those in the stomachs of cattle. Other kinds of termites grow fungi on leaf compost, and then feed on these 'mushrooms' instead of the plant litter. Both types of termites are important in returning the minerals and organic matter from the vegetation to the soil and their activities cause patchiness in the vegetation that enables plants of different kinds to co-exist. Rodents, including rodent-moles, cut plants, making openings in taller vegetation. Their activities are similar to farming in that they 'cultivate' their preferred food plants, bulbs and grasses, in these open patches.

The use of fire is essential for con-

serving the bulb plants and smaller shrubs in fynbos. If fynbos on fertile soils is protected from fire for fifteen years or more, the bird-dispersed forest shrubs start to take over, and the attractive herbaceous plants are lost. However it is not desirable to burn the whole mountain at one time because the birds and other animals in the vegetation would have no refuge. Burning should take place at the natural fire season - the end of the dry summer - but unfortunately this is when fires are hardest to control. Fire at regular intervals of ten to fifteen years is better than no fire, but ideally burning should vary in frequency to give all the plant species an opportunity to flourish somewhere at some time. Burning is a process that needs careful planning, well-trained personnel and adequate equipment to manage. Wide firebreaks must be maintained all around the reserve to prevent controlled fires from spreading onto the surrounding farms. This is necessary even though adjacent farms with natural vegetation will need to develop a burning programme in conjunction with Paarl Mountain so that they too can preserve their valuable renosterveld.

Invading species and genes

Control of invasive alien plants has become an essential part of management in protected areas all over the world because the plants we move around for horticulture and agriculture are moved further by wind, water, ants, birds and cars. We recorded forty-five species of alien plants in Paarl Mountain Nature Reserve - including hakea, wattle, pine, bugweed, lantana and *Hypericum*. Most of these are under control, but the reserve will never be free of these invasive species because they keep moving in.

In addition to invasive alien plants, the proteas of Paarl Mountain seem to be under threat from indigenous invaders in the form of genes of proteas introduced from other parts of the country. Four species of *Protea* (*P. aurea*, *P. canaliculata*, *P. mundii*, *P. neriifolia*) from the southern Cape were planted near the Afrikaans Language Monument, around the staff houses in the nature reserve and on the walls of Bethel and Nantes dams and these have begun to spread and to hybridize with locally-indigenous *Protea* species, particularly with *P. laurifolia*. There are now many hybrid plants near the entrance of the reserve. Hybridization

may eventually lead to local extinction of the original species on the mountain.

Releasing untapped potential

Paarl Mountain Nature Reserve offers much for the nature-lover, angler, hiker and picnicker, but has potential to contribute even more to recreation, tourism, conservation and education in the Boland. To achieve long-term conservation and the continued evolution of the fauna and flora that it protects, Paarl Mountain Nature Reserve needs to develop corridors between Paarl Mountain, across the lowlands to other protected hills and mountains. Such corridors might include green belts along rivers, hiking routes, and certain types of farming enterprises such as game farms. Extension of the reserve and co-management that includes restoration of the lower slopes of Paarl Mountain to conserve the species rich renosterveld vegetation is a goal to aim for in future planning.

The recreational potential of Paarl

Mountain Nature Reserve is only partly developed. There is scope for developing new hiking routes and picnic or camping sites. However, making recreation compatible with conservation requires planning. Good access roads, paths and other facilities are essential if the reserve is to be available for people to enjoy walking, birding, fishing and picnicking there. Certain sensitive habitats such as wetlands, riverbanks and lichen-covered granite domes need to be protected from trampling and erosion, whereas with careful planning, other sites can be developed for picnic areas or bridges and paths.

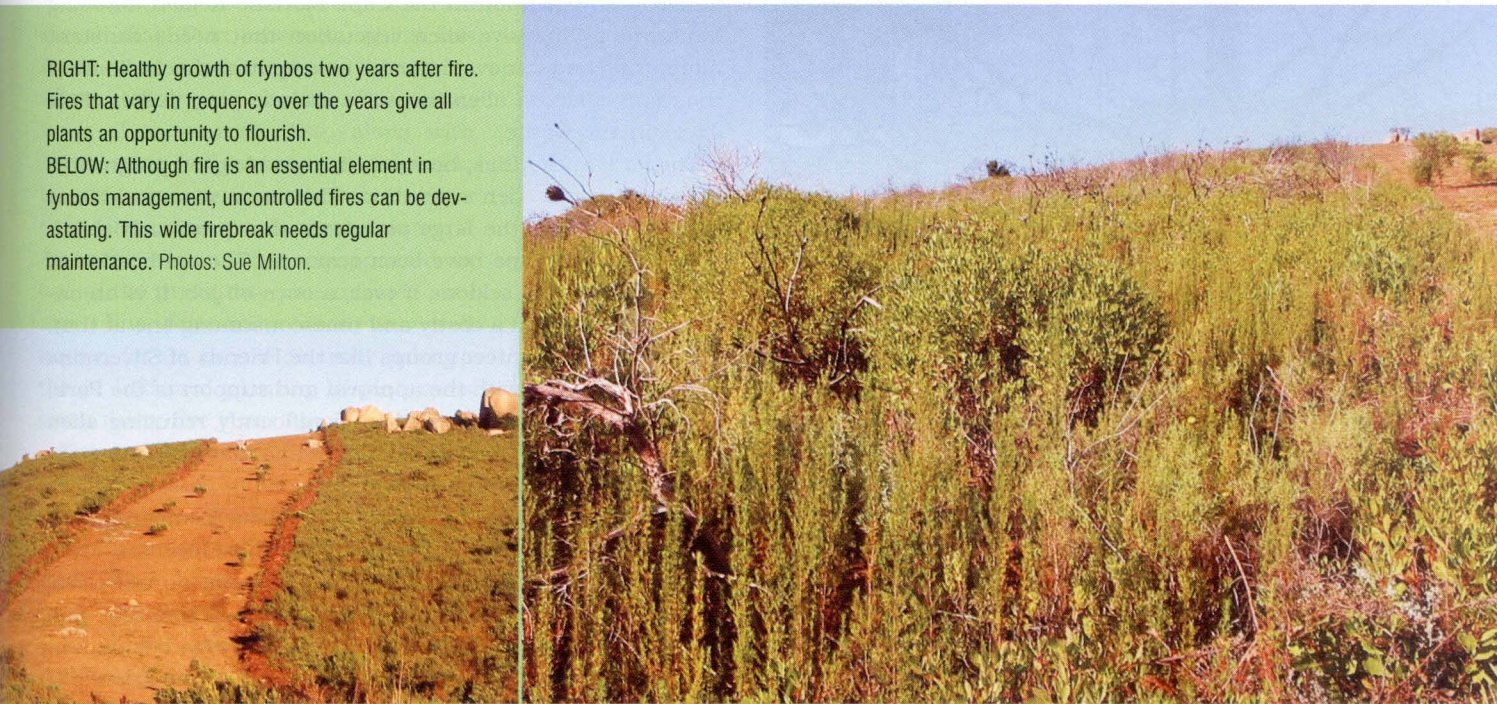
Paarl Mountain Nature Reserve has potential to be a prime outdoor classroom. There are opportunities to learn about geology, weather patterns, hydrology, and to use instruments to measure changes in altitude, temperature, slope and aspect. The marshes and streams offer opportunities to do water audits that assess water quality and quantity. Historical artifacts

including old camping sites, graffiti and the dams provide a focus for discussion of issues such as the European colonization of the Western Cape, conflicts with indigenous people, and changes in farming practices. The herbarium and an associated environmental education centre could inspire a new generation of taxonomists, naturalists and resource managers.

All conservation management decisions are based on knowledge and understanding of how natural systems work. Questions include whether it may be feasible to harvest wildflowers or teas from the reserve, how roads are influencing streams, whether populations of rare plants are benefiting from current burning management, how fast hybrid proteas are spreading in the reserve and whether they are fertile. All these questions, and more, need to be researched and answered to make rational decisions that will ensure that Paarl Mountain Nature Reserve is viewed as a Pearl by future generations.

RIGHT: Healthy growth of fynbos two years after fire. Fires that vary in frequency over the years give all plants an opportunity to flourish.

BELOW: Although fire is an essential element in fynbos management, uncontrolled fires can be devastating. This wide firebreak needs regular maintenance. Photos: Sue Milton.



Further reading

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