

# Importance of dune vegetation

## Function, characteristics and zonation of dune vegetation

### Function and characteristics

Vegetation plays an important part in the formation and stabilisation of coastal sand dunes. Pioneer plants trap and hold windblown sand in the foredune and help create conditions which encourage the establishment and growth of other plant communities such as woodland, scrub, heath and forest. All plants, whether they are herbs, shrubs or trees, growing either singly or in groups, have a role in the development of vegetative cover and together they bring about dune stabilisation.

Windblown sand trapped in the foredune by vegetation serves as a reservoir of sand for the beach

during periods of wave erosion. In the absence of sand-trapping dune vegetation, windblown sand from the beach moves inland and is lost to the beach/dune system. Wind erosion of the beach and unvegetated foredunes results in coastline recession.

The above-ground parts of dune plants act as obstructions, increase surface roughness and reduce the surface speed of sand-carrying wind. The reduction in wind movement results in the deposition of sand on and around the plant. Sand spinifex grass (*Spinifex sericeus*) is the most successful sand-trapping plant colonising dunes along most of the Queensland coastline. It has the ability to grow

### *Dune vegetation can*

- prevent wind erosion by decreasing wind speed at ground level
- build up sand dunes and thus reduce the extent of recession produced by a storm
- reduce wave erosion caused by overwash where dense vegetation exists
- regenerate naturally after storm damage, where dune management allows
- tolerate a hostile environment of high winds, salt spray, sandblast, covering by sand, sandy soil and little water
- accept massive movements of the dunes, both vertically and horizontally
- function as a self-supporting community where plants are mutually dependent for protection and nutrient supply

### *Dune vegetation cannot*

- prevent direct wave erosion – dune sand is not strongly bound by roots under wave attack
- survive direct wave attack – much of the seaward vegetation will be destroyed in a storm
- tolerate excessive physical damage caused by people, stock or vehicles
- tolerate mismanagement such as mowing, which destroys some species and juveniles of others, and topsoiling, which prevents free drainage and is unsuitable for growth of many natural dune species
- tolerate overfertilising, which can be toxic to some species
- tolerate introduction of unsuitable plant species – some undesirable plants displace natural vegetation; others, such as palm trees, do not reduce wind erosion and accelerate wave erosion when they fall

through accumulations of windblown sand. Cycles of sand deposition and plant growth result in dune formation and build-up.

The development of vegetative cover on newly formed dunes, if undisturbed, will create conditions which suit the colonisation and growth of a wider range of plant species. The shade produced by plants keeps surface temperatures lower than on bare sand and, together with reduced wind movement, helps to lower the evaporation rate from the sand surface. Increasing vegetative cover further reduces wind movement, which results in a lower rate of water loss from plant leaves. Dead plants and leaf litter add humus to the sand and act as a mulch.

The accumulation of humus results in improved moisture and nutrient-holding capacity of developing dune soils. With lower surface temperatures and increased moisture and nutrient content, the sand can support a greater variety of plants. Thus, the vegetative cover on the dune increases and movement of sand by wind is further decreased.

Pioneer plants make up the initial dune vegetation. They are found on the dune nearest the sea, where their survival depends on their ability to establish, grow and reproduce. They must also tolerate salt spray, strong winds, sandblast and occasional

inundation by sea water. Plants with these characteristics are ideally suited as agents for initial stabilisation of dunes.

Plant communities such as woodland, scrub, coastal heath or forest occur on dunes landward of the pioneer zone. They are usually in zones roughly parallel to the coastline and the type of zonation present is described below.

## Zonation

The aggregation of plants on coastal sand dunes forms, in general, three zones of vegetative cover:

1. a pioneer zone with primary stabilising plants consisting mainly of herbaceous species
2. a woodland (or scrub) zone with secondary stabilising plants consisting of shrubs, vines, stunted trees and a few associated herbs and grasses
3. a forest (or coastal heath zone with tertiary stabilising plants composed of low shrubs and stunted trees)

Variation in vegetation zonation landward across coastal sand dunes is associated with decreases in the degree of exposure to salt spray, strong winds and sandblast, and with improvement in the nutrient status and moisture content of developing dune soils.



On this section of accreting coastline, the herbaceous pioneer vegetation is building new foredunes. Behind the pioneer zone lies an open woodland dominated by horsetail she-oak which provides protection for a more dense woodland of hind-dune species. Young she-oaks are colonising the herbaceous area behind the new foredune as the coastline and the dunal plant communities move seawards.