CONSERVATION AND MANAGEMENT OF COASTAL SAND DUNE VEGETATION

Kasturi N. Desai

P.E.S. College of Arts and Science, Farmagudi, Ponda, Goa 403401, India

Sand dunes throughout the world have been recognized for their ecological significance. The dune vegetation helps in keeping the coastal land free from erosion and also prevents internal desertification. For effective management of the sand dune ecosystem, basic information of species composition, ecology, extent of land use and human intervention is required. Hence, this study was taken up.

All plants whether herbs, shrubs or trees either growing singly or in groups on coastal sand dunes have a role in the development of vegetation cover and together they bring about stabilization of the dunes and minimize erosion.

Coastal sand dunes were perhaps among the earliest habitats for the primitive man. As land became scarce, dune system was leveled for housing, industries and for many other developmental needs (Ranwell, 1972)

Coastal dune systems act as a buffer to the force of stormy seas. As the dune is attacked by storm waves, eroded material is carried away and deposited offshore where it alters the shore profile. The dune system has the capacity to store the sand and thus protect the shore land. Even lower dunes have a significant effect of resisting storm, and with the increase in the height, the efficiency increases (Clerk, 1977).

Moreover, beautiful stretches of sandy shores and beaches attract large numbers of tourists through out the world. A well planned development of beaches is essential not only for the ecological importance of sand dune vegetation but also for an eco-friendly development of tourism and other industries, which in turn contribute profoundly to the economy of the coastal states.

Human interference by way of devegetating, eroding or lowering the dune results in increasing damage by storms. It is essential to stabilize the frontal sand dunes to protect the shoreline and also for the protection of valuable installation on the coastline (Bhimaya, 1974).

The herbaceous pioneer zone, shrubby midshore zone and backshore zone covered with trees, form a natural sloping triangle in the coastal area which divert the wind flow upward, controlling the erosion (Untawale, 1994).

Plants like *Spinifex littoreus* and *Ipomoea pes-capraea* are the common species occupying the fore dune region. The midshore has mainly shrubs like *Vitex negundo*, *Clerodendron inerme* and few herbs like *Spermacoce stricta* and *Justicia simplex*. The backshore has general mesophytic plants like *Leea sambuciana* and *Crotolaria striata*. Major plantation of *Casuarina equisetifolia*, *Anacardium occidentale* and *Cocos nucifera* are taken up on this region. Very often plantation of these trees is taken up on the fore dunes and on the mid dunes. The roots of these trees remain superficial and proper anchorage is not ensured, resulting in uprooting of trees and cutting of the shores (Desai, 1995).

It is extremely important to note that under no circumstances the fore dune and its natural vegetation be disturbed.

Often the sand dune flora is considered to be weed flora, their conservation is essential as they are the only plants which can withstand adverse conditions of rough wind velocity, shifting sand, salt spray as well as nutrient deficiency in the sandy soil.

Just conserving psammophytes or sand dune plants in isolation will not solve the problem. The plants in their natural ecosystem have to be preserved. Taking into consideration the ever increasing pressure of development, it has become necessary to study and manage the coastal dune ecosystem. Following are the few suggestions which will help in protecting the ecosystem (Clark, 1977; Desai, 1995):

Rceived on 7 March 2000 *Accepted on 13 April 2000*

- Prohibit lowering of dunes and restrict all constructions beyond dune lines.
- If buildings are constructed nearby, care should be taken that the ground water level should not reduce below a critical level, otherwise stabilizing of vegetation will be difficult and the dunes will be subjected to wind erosion and storm damage.
- Local plants that can tolerate adverse conditions of the dunes should be tried for plantation.
- Sand dune plants like *Spinifex*, *Ipomoea*, *Clerodendrona* and *Vitex*, and other trees like *Anacardium* and *Pandanus* that need less care and improve the soil with litter are suggested for plantation.
- The Forest Department and NGOs should maintain nursery of sand binding plants and make them available to those who are desirous of growing them.
- The movement of the sand should be stopped as near the source as possible. If the land is sinking in relation to the sea level erosion will be continuous, so artificial dunes have to be built from time to time.
- Coastal protection needs regular intensive observation of dune system. In order to have proper access to the beach, pathways may be made by rotational use. Air photo monitoring may be required more frequently to detect changes in pathway patterns.

While planning, designing and executing tourist complexes, ecological aspects of slope, stability, erosion control, vegetation and conservation of flora and fauna should be given key importance, so that the likely adverse effects of such construction can be prevented (Desai, 1995).

Government of India has clearly demarcated the Coastal Regulation Zone (CRZ) by its notification dated 20/2/1991, on which no construction can be taken up. It has been declared that the coastal stretches which are influenced by tidal action in the land side up to 500 m. (later amended to 200 m.) from the High Tide Line (HTL) and the land between Low Tide Line (LTL) and High Tide Line (HTL) as the Coastal Regulation Zone (CRZ). The high tide line is defined as the line upto which the highest tide reaches at spring tide. It was only by the amendment dated 11/11/93 that the word 'sand dune' was introduced and no flattening of the dunes is permitted.

In order to conserve and maintain the coastal sand dunes it is essential to enforce strictly the legal provisions of the CRZ regulations through proper publicity and due punishment be given, if the rules are not rightly followed. Importance of the sand dune vegetation should be emphasized through the various mass media to common man. It should be made mandatory and compulsory for the users and owners of land adjoining coastal regulation zone to grow and maintain local species of sand dune plants on the open area between 200-500 m.

Acknowledgement

I thank Dr. Untawale, Assistant Director, National Institution of Oceanography who guided me in working on this topic for my Ph.D. degree. I extend my sincere thanks to Dr. Heblekar, Principal, P.E.S. College for always encouraging me in my research and giving me all the facilities for the same.

References

Bhimaya, C.P. (1974). *A review of sand dune stabilization and afforestation in general with details of the practical method of approach.* International Regional Training Centre on heathland Sand Dune Afforestation FAO/DANIDA of the United Nations, Rome, 239.

Clark, J.R. (1997). *Coastal ecosystem management: A technical manual for the conservation of Coastal Zone Resources.* Wiley International Publication, New York, 928 pp.

Desai, K.N. (1995). *The structure and function of the sand dune vegetation along the Goa Coast*, Ph.D. Thesis, Goa University, 218 pp.

Ranwell, D.S. (1972). *Ecology of salt marshes and sand dunes.* Chapman and Hall, London, 258 pp.

Untawale, A.G. (1994). Coastal sand dune vegetation. In: *Biodiversity in the Western Ghats, an information kit*, WWF-India, IIRR, SIDA, 3-10,2.