The world cycad flora of approximately 297 species and subspecies represents a small fraction of the earth's plant diversity (Donaldson, 2003). Yet, despite their small numbers, cycads are a group of global conservation significance. The 1997 IUCN Red List of Threatened Plants listed 12.5% of the world's vascular plants in one of the threatened categories (Walter and Gillett 1998). Even though the revised listings presented in this action plans are lower than previous estimates (52%), there is clearly a major extinction crisis facing the cycads, a group of plants that are recognized by scientists as the oldest seed plants still in existence with origins dating back to the late Carboniferous period 300 million years ago.

More than 50% of all cycad species occur in just three countries (Australia, Mexico and South Africa) and the ten countries with the highest diversity contain 89% of all cycad species. As a consequence, most range States have low cycad diversity and there are 18 countries that have only one species.

In the current red list (IUCN, 2007) there are now 41,415 species and 16,306 of them are threatened with extinction, up from 16,118 of 2006 list. By comparison, a staggering 82% of the world's cycad species were listed as threatened. At least 52% of the known cycad species are listed as threatened (Critically Endangered, Endangered, or Vulnerable) in the IUCN/ SSC Cycad Action Plan (Donaldson, 2003). The IUCN Cycad Action Plan lists to species as Critically Endangered, five as Vulnerable, and three as Near Threatened (Hill, Chen and Loc 2003).

The main threats to cycads are habitat destruction and the harvesting of plants from the wild (Donaldson, 2003). These threats vary between different regions. Cycads...
in Oceania are less threatened than elsewhere and the threats include habitat
destruction and over collecting (Hill, 2003), where habitat destruction is the primary
threat, over collecting can be a threat. The rapid decline in cycad populations led to a
series of listings on the CITES. Donaldson (2003) indicate that over collecting from wild
populations has decreased since *C. beddomei* were listed in the CITES Appendices.

**Indian Cycads**

Plant species in the families Cycadaceae, Stangeriaceae and Zamiaceae are
commonly known as cycads. *Cycas* is the only genus which occurs in the wild in India.
*Cycas*, was described by Linnaeus (1753) on the basis of illustrations of "Todda Panna
or Mouta Panna" of Van Rheede's *Hortus Malabaricus* (1682). Five species of cycads
occur wild in the Northeast (Orissa, Bihar, Nepal, Sikkim, Bhutan, Assam) and in
southern states (Andhra Pradesh, Tamil Nadu, Kerala, Karnataka) of India (Pant, 1973,
2002; Raizada & Sahni, 1960). *C. annaikalensis* was identified recently from Kozhikode
and Palghat areas of the Western Ghats (Rita Singh and Radha, 2006). In the Eastern
Ghats region, 3 *Cycas* species, namely, *C. beddomei*, *C. circinalis* and *C. sphaerica*
have been documented (Solomon Raju, 2006). These four occur only in India. The other
two species *C. pectinata* and *C. rumphi* are found in India and other adjacent Southeast
Asian countries (Munippan, 2006) and elsewhere grown as ornamentals.

Since then all plants of *Cycas* in the Western Ghats have been considered to be
*Cycas circinalis* L. (Hill, 1994, Pant, 1973), due to the lack of studies and availability of
sufficient data on the extent of geographical distribution of different species. It is evident
that the exact diversity in terms of species, subspecies, or varieties in the region has not
been fully understood. Chronologically, the next species to be described from the region
was *Cycas rumphi* which was described by Miquel, 1839 from islands of the Indian
Ocean. In 1823, Hamilton described another species as *Epicycas pectinata* from
northeast India, which was subsequently recognized by Thiselton Dyer (1890) as a valid
species, *Cycas pectinata* (Hamilt.) Dyer.

*Cycas beddomei* (Dyer, 1883) was the fourth species identified, and is endemic
to the Cuddapah hills of Andhra Pradesh. In 1922, a variety of *C. circinalis* was
recognized by Haines as *C. circinalis var. orixensis* from coastal hilly regions (Mals of
Puff) of Orissa. *Cycas siamensis* also grows in areas overlapping the habitats of *C.
pectinata* towards the east in Manipur, Bangladesh, Myanmar and further to the south
and east in adjoining countries (Pant et al., 1994).
Cycas beddomei is a critically endangered species and known only from the Cuddapah and Seshachalam Hills in Andhra Pradesh. It is listed in Appendix-1 of CITES (Inskipp & Gillett, 2005). Cycas beddomei's endemic status combined with the fact that it is listed as 'Data Deficient' on the IUCN Red List (Hill, 2003), but listed as 'Critically Endangered' by the Foundation for the Revitalization of Local Health Traditions (FRLHT) (Jadhav et al., 2001). The latest IUCN red list (IUCN, 2007) listed it under critically endangered species.

**Use value of Cycads**

Historical accounts (Thunberg, 1793), together with several recent reviews (Donaldson, 2003; Gilbert, 1984; Jones, 1993; Norstog and Nicholls, 1997; Sacks, 1996; Whiting, 1963) show that cycads have probably been used by people since prehistoric times and they have been traded for many different purposes. The most common uses have been for food (seeds and stems), starch (stems), ceremonies and decoration (leaves), basket work (leaves) and medicine or magic (stems, roots, bark). The use of cycads as a food source has been recorded mostly in times of famine (Jones, 1993; Whiting, 1963), medicine and magic has been recorded in various ranges States, but the impact on wild populations.

Cycads also have a long history of use as ornamental plants in Asia and they have recently become popular garden and collector plants in other parts of the world. At the same time, a market also developed for cycads as collectables. Wild populations were heavily exploited to satisfy the demand, especially in South Africa and Mexico. In some cases, tens of thousands of plants were removed from the wild (Whitelock, 2002) leading to widespread decline in many cycad populations (Donaldson and Bosenberg, 1999; Giddy, 1993; Whitelock, 1995).

**Studies on Population demography**

Floristic inventories and studies of forest dynamics usually rely on sampling plots (Dallmeier, 1992). The effects of plot size (Kilburon, 1966; Greig-Smith, 1983) and the influence of plot shape (Condit et al., 1996). On the estimates of plant diversity and density have been assessed. Most studies have followed the plot method, including to long belt transects (e.g.10m x 1000m) (Boom, 1986). Modified after (Shivaraj et al., 2000) a total of over 32 grids of 6.25x 6.25Km have been stratified using remote sensing data. One belt transect of 5m x 1000m will be laid in each of the 6.25x6.25 Km grid. This amounts to approximately the 0.01% of sampling intensity, which is a standard requirement for such enumeration. The rationale is to provide sufficiently precise
estimates of diversity, density dispersion pattern, growth and net rates of change in structure and population. (Hall et al., 1998).

Plant populations exhibit three patterns of spatial distribution—regular, clumped and random. Clumped populations are those where there is a tendency for individuals of the species to occur in clumps and regular populations the plants are more evenly spaced than they were distributed according to chance (Pielou, 1960). Clumped distribution is very common in nature because the seeds may fall at random over an area but if the habit is not homogenous, the proportion of germinating and thriving will vary from site to site so that density is high in some sites are low in others (Feller, 1943).

Poore (1968) mapped trees ≥90 cm dbh in a 26 ha (620 m x 420 m) plot of Malaysian forest and found most of them were clumped. Clumped patterns were predominant in all tropical forest (75 to 100%) (Kadavul and Parthasarathi, 1999). Austin et al. (1972) indicated that in the absence of major disturbance, soil and water conditions play a major role in controlling species distribution.

According to Hubbell (1979), if a population is composed largely or exclusively of adults then either the population is declining or else reproduction in the species is episodic in nature. Sukumar et al., (1992) found that the deciduous forest of Mudumalai had a more or less expanding population structure with a deficiency of individuals in the smallest size class. Some species had few or no individuals in the smallest size class (<5 cm dbh) compared to the largest area. Geldenhuys and Murray (1993) analyzed the population structure selected dominant species. The population structure of most canopy species exhibits a negative exponential or inverse J-shaped curve for a mixed evergreen forest in South Africa.

Vegetation mapping and monitoring is a primary requirement for mapping various management and planning activities at the local, modeling species distribution using environmental surrogates of known locations planning, when primary information is lacking (Anderson and Meyer, 2004). Association of a particular species with specific environmental conditions has long been documented (Colding and Folke, 1997; Hubbell, 2005), but quantitative analysis have been possible only recently (Cullen et al., 2001) with advent of new tools, as well as availability of continuous spatial data on various environmental parameters. (Keer and Ostrovsky, 2003).

Fine scale resolution of environmental data is always desirable to develop accurate species distribution pattern to address ecological limiting factors (Giriraj et al., 2008). Geographical information system (GIS) has been widely used as a tool to aid
design, management and monitoring of national parks and other protected areas (Willson, 1992). The creation of a database of medicinally important species at 1:50,000 scale with respect to mapping of *Ephedra gerardiana* using Remote Sensing and GIS (Porwar et al., 2003).

**Threats to tropical forest biodiversity**

Tropical deforestation is a major concern on several fronts. It is significant to global warming and regional climate change (Houghton et al., 2000); and threats to ecosystems services and variable functions (Daily et al., 2000; Kremen et al., 2000). Salwasser (1990) enumerated the major factors affecting biological diversity that include, pollution, fragmentation of habitats, overuse of resources conservation of wild areas to agriculture and industry other human uses. The increase in disturbance intensity indicated that local anthropogenic pressure is responsible for the depletion (Sagar and Singh, 2003).

Anthropogenic fires date back to 50,000 years ago when hunter-gatherers first colonized India (Gadgil and Meher Homji, 1985). Since then the accidental fires occur in the dry season because of human use of the forests, and intentional fires are set for shifting cultivation, to enhance both fodder production and the collection of non-timber forest produce (Sonali Saha, 2002). The current anthropogenic fires in deciduous forests is of interest because its spatial distribution and intensity influence recruitment of trees, forest stature, tree growth and soil properties (Sukumar et al., 1998). The natural resource of the Eastern Ghats continue to be threatened as a result of increasing demands by local and temporary settlers both inside and outside the protected areas (Gopal, 1997). In Seshachalam hill range of Eastern Ghats as opined by Williams-Linera, (2002) for tropical forests, it is must to understand and minimize the ecological impact of humans on forest ecosystems.

Beaton (1982) has highlighted the aspects of management forest-fire to save the Cycads in Australia. Grove et al. (1980) has reported the effect of fire on growth, nutrient and rate of nitrogen fixation of Cycads.