Development of relative thermal stress index (RTSI) for Monitoring and Management of Dry Deciduous Ecosystem

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Gir wildlife sanctuary, located between 20˚ 57' to 21˚ 20' N and 70˚ 28 to 71˚ 13' E , is the last home of Asiatic lions. Its biodiversity comprises of 450 recorded flowering plant species, 32 species of mammals, 26 species of reptiles, about 300 species of birds and more than 2000 species of insects. As per 1995 census it has 304 lions and 268 leopards. The movement of wildlife to thermally comfortable zones to reduce stress conditions forces the changes in management plan with reference to change in localized water demand. This necessitates the use of space based thermal data (available from AVHRR, MODIS etc.) to monitor temperature of Gir-ecosystem for meso-scale level operational utility.

As the time scale of the variability of NDVI parameter is much higher than that for lower boundary temperature (LBT), the dense patch in riverine forest having highest NDVI value would not experience change in its vigour with the change in the season. NDVI value of such patch would be near invariant over the year and temperature of this pixel could serve as reference temperature for developing the concept of relative thermal stress index (RTSI) which is defined as RTSI= [(T_p-T_r)/(T_{max}-T_r)] wherein T_r, $T_{max}$and T_p refer to LBT over the maximum NDVI reference point, maximum LBT observed in the Gir ecosystem and the temperature of the pixel in the image, respectively.

RTSI images were computed from AVHRR images for post-monsoon , leaf-shedded and summer seasons. Scatter plot between RTSI and NDVI for summer seasons clearly showed hierarchical demarcation of four segments (RTSI $<$ 0.18, 0.18-0.45, 0.45-0.77 and $>$ 0.77) which could be extrapolated backward to leaf-shedded season. Thus, spatial location of patches having RTSI $\geq$ 0.45 could be identified in leaf- shedded image which are expected to experience stress during summer season. Man-made water points could be arranged at theses patches to meet the needs of wildlife and lions. Further, the unsupervised ISODATA classification of 1100 m spatial resolution RTSI images of post-monsoon, leaf-shedded and summer seasons could bring out the broad classification of Gir ecosystem in dense, mixed , open deciduous forests and scrub.