New Views of the Tibetan Plateau and Himalaya for Conserving Biodiversity

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Astronaut photograph of Qinghai Lake in the region of Amdo in northeast Tibet. Photo: NASA.

From a global environmental perspective, few other places in the world are as important as the Tibetan Plateau and Himalaya is now. Concerns about global warming, climate change, receding glaciers, food insecurity and loss of biodiversity all point to the significance of this Asian mountain region in addressing these global challenges. Tackling these issues require greatly increased scientific research, improved understanding of current land use practices, especially of livestock grazing and greater participation by the local people in the entire conservation and development process. Critical examination of existing environmental conservation and economic development policies and programs is required. New perspectives and fresh thinking on how we view the Tibetan Plateau and Himalayan landscape is also needed if the unique biodiversity of the region is to be conserved.

A number of globally important biodiversity "hotspots" are located on the Tibetan Plateau and Himalaya. With their highly distinctive species, ecological processes and evolutionary phenomena, these areas are some of the most important places on earth for conserving biodiversity. The Tibetan Plateau is one of the most ecologically diverse landscapes on earth. It includes the most intact example of mountain rangelands in Asia with a relatively intact vertebrate fauna and is one of the largest remaining terrestrial wilderness regions left in the world. The area is home to numerous rare and endangered wildlife species such as the wild yak, Tibetan wild ass, or *kiang*, the migratory Tibetan antelope, or *chiru*, Tibetan argali and snow leopard (Harris 2008). Conserving these animals and their habitat is an important priority for the global conservation community.

The chiru, perhaps more than any other animal, embodies the expanse of the northern Tibetan steppe, or changtang, ecosystem. The *chiru* is a migratory animal and needs a vast landscape in which to roam between winter and summer ranges. They cover distances of up to 400 kilometres on their seasonal migrations. Observing herds of hundreds of female *chiru* with their female young of the previous year traveling on ancient paths as they have for thousands of years, is to bear witness to one of the earth's outstanding ecological spectacles. Understanding *chiru* migratory movements could provide valuable insight into the structure and function of the Chang Tang ecosystem and assist in efforts to protect biodiversity (Bolger et al. 2007).

If antelope embodies the expanse, the wild yak characterises the elemental wild nature of the Chang Tang. No other animal so evokes the raw energy and wild beauty of the Chang Tang. Standing almost two metres high at the shoulders and weighing up to a ton and with horns a metre long, wild yaks are magnificent creatures. The wild yak is an indicator species; its presence reveals a special place. With wild yaks roaming the landscape, an ecosystem is still intact. If the land can provide habitat for wild yaks, many of the other species of Tibetan wildlife will be there as well.

Photographs of the earth taken by astronauts provide an out-of-the-ordinary observation of the Tibetan Plateau. Taken at heights of 200 to 400 kilometres above the earth, these photos provide a fascinating point of view; an outlook that captures not only the magnificent splendour of the Himalaya mountains and other ranges, but also the immense expanse of the Tibetan Plateau. The photographs from space enable you to envisage the lay of the land from a broad, regional context (Robinson, et al 2002). The oblique angle images that show the earth's horizon provide a remarkable view of an entire landscape. Unhindered by the clutter of political boundaries one begins to define the land by watersheds, by mountain ranges and large lakes; the natural demarcations of an environment. One needs to keep in mind that on these astronaut photographs north is not always at the top of the image!

These views from space provide a new look of the Tibetan Plateau and Himalaya. They provide a perspective that enables you to see the landscape in its entirety. Conservation strategies for the Tibetan Plateau need to encompass a broad scale and implement programmes at the level at which natural systems operate. This landscape level of attention ensures persistence of populations and ecological processes and has to work across political boundaries. Artificial, man-made politically drawn lines on a map do not stop a river from

Astronaut photograph of Mount Everest region. View from the northeast looking southwest. Photo: NASA.

Astronaut picture of southern Tibet looking south to Upper Mustang, Nepal. Photo: NASA.

flowing downhill nor do they prevent black-necked cranes from migrating or Tibetan argali and Tibetan wild ass from crossing international borders in search of forage to graze on. Birds and animals do not need passports and visas, and we now need to adopt a similar style in how we perceive landscapes.

The American poet, Gary Snyder (1995:73), got it right when he wrote, "Now, with insights from the ecological sciences, we know that we must think on a scale of a whole watershed, a natural system. A habitat. To save the life of a single parrot or monkey is truly admirable. But unless the forest is saved, they will all die." Saving the Tibetan Plateau requires a new way of thinking; an approach that recognises watersheds instead of political frontiers to define plans of action for conservation and development. It also requires acceptance of the complex nature of the Tibetan landscape, not only in the ways that physical forces shape it, but also in ways that socio-economic and institutional forces interact and impact the nomads and farmers who use the natural resources.

George Schaller, who has spent decades working to conserve the wildlife of the Tibetan Plateau and adjoining Himalayan regions, when writing of the vast rangelands of the northern Tibetan landscape noted, "The beauty of these steppes and peaks will persist, but without wildlife they will be empty and the Tibetans will have lost part of their natural and cultural heritage. My vision for tomorrow is the past when humans, livestock, and wild animals lived in the vast steppes of the Chang Tang in ecological harmony" (1998:323). "To bequeath the Chang Tang far into the next millennium will require a never-ending moral vigilance, a passion to understand the ecology, and a deep commitment to a harmonious coexistence between the nomads with their livestock and the wildlife. Without such dedication there will ultimately be a desert where only howling winds break a deadly silence." (1998:332). Schaller's exhortation for heightened devotion to conserving the Tibetan ecosystem should be taken as a wake-up call for everyone interested in biodiversity in the region.

Conservation of wildlife depends on better protection of the species, improved understanding of their ecology and better insights into the dynamics of the Tibetan Plateau ecosystem, especially the rangelands. It also requires innovative approaches to conservation and pastoral development that adopt participatory, integrated ecosystem management models that work at the landscape level with the local people actually using the natural resources. As a first step, by looking at images from space, we can try to better understand the geography and ecology of the Tibetan Plateau. We also need to acknowledge the hallowed nature of the Tibetan landscape and start to treat it with a little more reverence and respect.

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Astronaut picture of western Tibet and the Himalaya looking west (space shuttle visible at the top). Photo: NASA.

(Images are available for viewing and downloading from the NASA website: *http://eol.jsc.nasa.gov/sseop/*).

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Vegetation Types of the Endangered Eastern Ghats Mountain Ecosystem in Southern Andhra Pradesh and Tamil Nadu, India.

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Vegetation and land cover information have been generally recognised as the basis for planning and management and for detailed habitat inventories. The design and execution of these comprehensive inventories of natural resources, coupled with scientific assessments using Remote Sensing and GIS tools, have often led to a clear definition of management priorities. Vegetation management depends upon several factors including classification of habitats and the regular monitoring of these habitats permits the detection of change in vegetation components and immediate surroundings. The present study was conceived with a view to studying the land use/land cover of the southern parts of the Eastern Ghats in Andhra Pradesh and Tamil Nadu using Remote Sensing and Geographic Information Systems.

The primary objectives of this study was to prepare thematic maps and mapping of the existing vegetation of the region with a focus on land use and land cover and to study land use patterns in and around the natural forest patches.

The Eastern Ghats constitute an important biogeographic region in the Indian region and has been identified as a major centre of plant diversity with a unique floral diversity. Ranging from Orissa, Andhra Pradesh to Karnataka and Tamil Nadu the Eastern Ghats are spread over an area of about 75,000 square kilometres through a chain of fragmented and disjunct hill ranges. The scope of this project encompassed southern parts of the eastern ghats, particularly the Seshachalam-Chittoor hill ranges, in the Chittoor district and covering the Palamaner forest division in Andhra Pradesh. In Tamil Nadu, the study area primarily covered the Tiruvannamalai, Vellore, Villupuram, Salem (Yercaud) hill ranges and to some extent also the Dharmapuri and Nilgiris district where the Eastern Ghats converge with the Western Ghats evergreen ecosystems. The fragmented nature of the Eastern Ghats mountain ecosystem limited the extent of area that was included in the study and only some of the major hill ranges were covered for satellite interpretation. The Ghats have a rich assemblage of floral, faunal wealth including many endangered and endemic species. An estimated 3,000 species of flowering plants constitute the entire flora of the Eastern Ghats out of which at least 100 species are known to be endemic to the region. The overall vegetation structure of these hill ranges comprises several forest vegetation types including tropical dry deciduous, mixed dry deciduous, dry evergreen forests, scrub or thorn forests, riverine forests and small patches of evergreen forests.

The methodology for the present study was carried out through a combination of different field techniques which included field surveys, satellite data processing and GIS data analysis.

The land use and land cover information of the Eastern Ghats within the study area covered an area of 153,934 square kilometres. The data analysis included assessment of the forest cover and land use distribution pattern across 17 different thematic elements, relevant to the landscape of the region. Dry deciduous forests, thorn forests and scrub vegetation constituted 38 percent of the forest cover. Dry deciduous forest constituted a substantial part covering an area of 14,967 square kilometres (10 percent). In the Chittoor district of Andhra Pradesh these forests occupied 1,518 square kilometres mainly in the Seshachalam hills and the Palamaner forest ranges apart from reserve forests. Including other deciduous forest types and scrub, these constitute over 6,600 square kilometres in the district. These hills also harbour endemic floristic elements like *Shorea tumbuggaia, Boswellia ovalifolia, Pterocarpus santalinus, Terminalia pallida, Pimpinella tirupatensis, Cycas beddomi* and faunal assemblages like *Golden Gecko, Slender Loris Loris tardigradus.* In Tamil Nadu, as per the surveyed area dry deciduous forests were largely recorded in Vellore, Villupuram, Tiruvannamalai, Salem (Yercaud), Dharmapuri and Nilgiris districts

Mixed dry deciduous forests accounted for 18,514 square kilometres (12 percent) according to the satellite data. These non teak-bearing forest patches occur in the Seshachalam ranges in the Chittoor districts, Andhra Pradesh and in Vellore. Only 2,482 square kilometres (1.6 percent) of dry evergreen forests were recorded through our analysis. The presence of these forests is characterised by low and dense forest thickets, at times impenetrable, with distinct thorny elements. The vegetation has typical elements like *Manilkara hexandra, Memecylon umbellatum, Syzygium cumini, Albizia amara, Albizia lebbeck, Strychnos nux-vomica,* Increased economic activities along coastal regions have led to exploitation of these unique forest ecosystems for fuelwood and fodder purposes.