

Endemic and Threatened Plants of Lambapur-Peddagattu - Proposed Uranium Mining Area, Nalgonda, Telangana, India

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Abstract

Uranium ore mining and processing is one of the important mandate of the Uranium Corporation of India Limited (UCIL) for producing alternate energy on large scale at Lambapur-Peddagattu areas of Nalgonda District, Telangana which is endowed with huge deposits of uranium. Documentation and exploration of Biodiversity play a very important role in identifying the endemic and threatened species of importance and helps in developing suitable management plans for sustainability. Out of the 548 species reported, 28 species belonging to 27 genera and 14 families are reported under various threatened and endemic categories. The present study area is having 5.10 % of threatened and endemic species representation. Two species namely *Cleome viscosa* var. *nagarjunakondensis* and *Crotalaria paniculata* var. *nagarjunakondensis* are endemic to the study area of Nagarjunkonda Island. Post monitoring studies and establishment of a conservation cell is required to monitor the status of such species which are prone to become threatened and possible making visual changing impact during mining activity.

Keywords: Uranium, Endemic, Threatened Plants, Restoration, Adaptive management approach.

Introduction

During last five decades, consumption of energy in agriculture, industry and household sector has increased tremendously which led to lookout for alternative energy; in this regard the Atomic Energy Programme of our country has gained considerable momentum¹. Accordingly to meet the required power, the Department of Atomic Energy has developed a comprehensive action plan to produce 20,000 MWe of nuclear power by 2020 AD from the available Uranium deposits in India². In India, first unconformity deposit was established in the intra-cratonic Proterozoic Cuddapah basin at Lambapur-Peddagattu, Nalgonda district, Telangana, India³. To expand the utilization of uranium ore on large scale, UCIL has implementing its operations in mining and processing at Lambapur-Peddagattu areas, were endowed with huge uranium deposits⁴.

To initiate the operation of mining activity, it is essential and prime requisite to generate baseline floristic data which can be compared to both past and future data to identify changes that may result due to mining operations. Taxonomic studies and exploration of Biodiversity play a significant role in documenting the threatened status of species and based on generated data, location specific recommendations to be formulated for long term sustainability of the environment of the region. The studies aim to help in developing integrated database on different components of biodiversity and to suggest

proper measures for restoration of the species and their habitats on a sustainable way⁵.

Methodology

All prominent places such as higher elevations, different habitat types, distribution of vegetation structure and other vantage points were identified and noted on the map. After being fully acquainted with the area and distribution pattern of vegetation, the main study areas was divided into 3 zones namely Core zone (0 -5 Km), Buffer zone-I (5-15 Km) and Buffer zone-II (15 -30 Km). For the present investigation, the Core zone was selected for 100% survey, while at Buffer zone I and Buffer zone II, the area coverage was 10 % and 5% respectively to record the biodiversity. On a regular basis, field trips were undertaken to record floral components during the Pre and Post monsoon seasons to get the maximum list of species in each habitat during the period 2009 to 2014. Specimen collections were made from different types of habitats and relevant field data of the species regarding habit, habitat, altitude and phenology were recorded. The entire study area was divided into 1 x 1km grid and selected maximum of 5 quadrates in each grid. Care was taken to have adequate sampling in all directions and all habitats of the study area. Each quadrate will have 3subgroups consisting of 10m x 10m for trees, 5m x 5m for shrubs and climbers 1m x 1m for herbs and grasses. All the plants were identified from the key vegetative and reproductive features by using the field guide of the regional floras viz; Flora of

presidency of Madras⁶, The Flora of the Presidency of Bombay⁷, Flora of Andhra Pradesh⁸, Flora of Nalgonda District⁹ and Flora of Guntur District¹⁰. In the present study, when the species were subjected to analysis of their endemic and threats category will be categorized based on the available published data and also from the personal field level observations.

Study area: The study area is lying between 16° 25' to 17° 50' and 78° 40' to 78° 60' covering an area of 30 km radius (2826 km²) Figure-1. The forest area forms an area of 36 % (15% deciduous forest and 21% scrub forest) of the total geographical area. The study area is bounded on the north by Nalgonda district where as the south by Guntur and parts of Mahaboobnagar district on the east by Nalgonda, Guntur, and on the west by Nalgonda district. The study area forms a fragmented stretch between Amarabad Tiger Reserve and Krishna River associated forests. The study area is located about 136 km from the Hyderabad. Physiographically study area consists of flat topped to undulating hills, medium to coarse-grained granite composed of proterozoic sediments. As it is in close proximity to Nagarjunasagar canal system, majority of the area is under cultivation, however the rocky outcrops exposures at the bottom of the hills generally composed of granitic rocks Figure-2. The main range of hills runs through the Peddavura mandal of Peddagattu and Chitriyal whereas the low range of hills starts in the South West of the study area at Devarakonda and extends from the vicinity in a Northeastern direction near

Parvedula Figure-3. River Krishna is the most important river formed by number of interconnecting channels, tributaries and waterfalls Figure-4 which resulted reservoirs, lakes and tanks along the stretch. The general drainage pattern is dendritic to sub-dendritic followed by trellis type indicating heterogeneous nature of formation. The general elevation of the area is around 300m and the ground level is at 215 m. The soils are almost red or black cotton soil comprising of clays. The area enjoys a semiarid type of climate. It is characterized by a hot summer and low degree of humidity except during the south west monsoons. In February and early parts of March, the weather becomes moderately warm. In the later part of March, the hot season commences. Hot winds prevail throughout the summer. The average daily maximum and minimum temperature recorded was 45.4 and 13.8°. The number of average rainy days is 46 days. The average relative humidity generally varies from 31% to 77% at 8:30 hrs. Forest type such as Southern Dry Mixed Deciduous forest and Hill top vegetation like *Ziziphus-Acacia-Mundulea-Mimosa* association is a common feature in thorny scrub vegetation in Nagarjunasagar. *Diospyros-Dalbergia-Wrightia* association is generally predominant in Kambalpally areas while *Mundulea sericea*, *Chloroxylon swietenia* and *Diospyros chloroxylon* have been observed in the reserve forests of Lambapur, Chitriyal and Peddagattu areas. Dominant shrubs in these forests are *Maytenus emarginata*, *Dodonea viscosa*, *Carissa spinarum*, *Ziziphus xylophyrus*, *Grewia flavescens* and *G.hirsuta* etc.

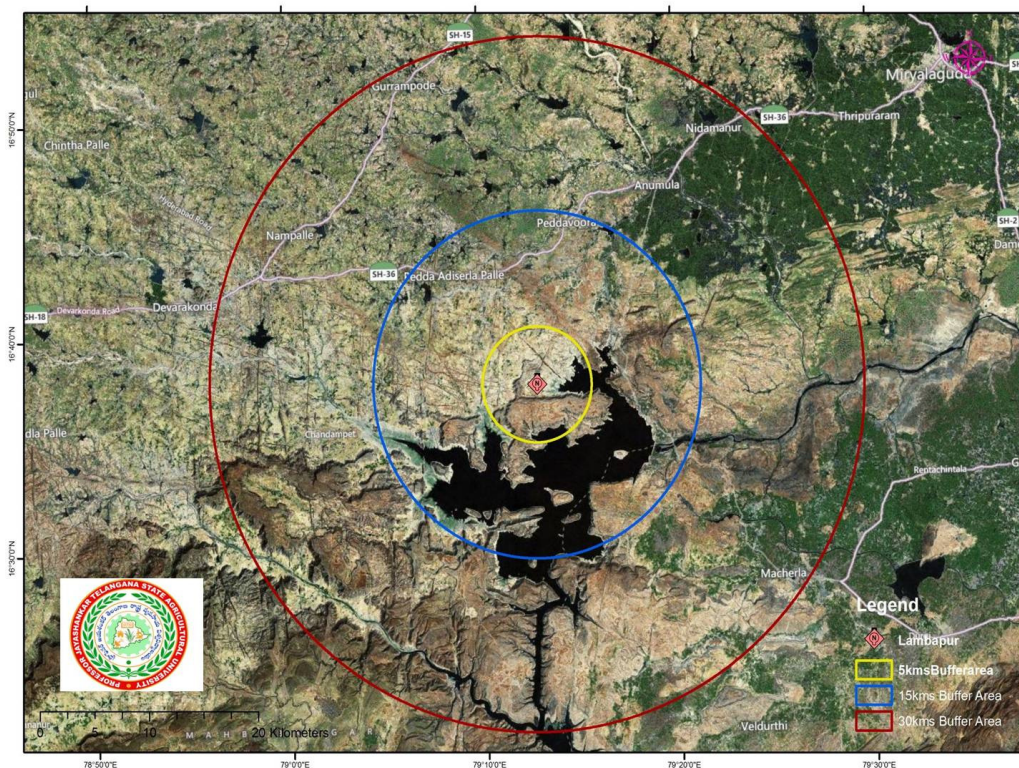


Figure-1
 Study area with 5, 15, 30 km radius buffers



Figure-2
Typical rocky outcrops at Lambapur and Peddagattu village

Results and Discussion

In the present study, intensive surveys were conducted in all the habitats available at Core zone (CZ), Buffer Zone-I (BZ-I) and Buffer Zone-II (BZ-II) from 2010-2014 and documented the floral diversity of the region. A total of 548 species belonging to 96 families and 368 genera were recorded. Of these, 108 species were trees, 93 species of shrubs, 284 species of herbs, 49 species climbers and 14 species hydrophytes. The important families recorded with species richness were Leguminosae (79 species), Poaceae (68 species), Malvaceae (34 species), Apocynaceae (24 species), Compositae (23 species), Acanthaceae (20 species), Euphorbiaceae (18 species), Cyperaceae, Lamiaceae represented with 17 species each and Convolvulaceae (16 species). While with respect to genera, Poaceae represented by 46 genera followed by Leguminosae (39 genera), Compositae (22 genera), Apocynaceae (20 genera), Malvaceae (19 genera), Acanthaceae (12 genera) and Lamiaceae (10 genera).

Out of the 548 species collected, 28 species belonging to 27 genera and 14 families are coming under different threat categories. The present study area is having 5.10 % of threatened and endemic species representation. As per the IUCN Red List Categories 2 species namely *Santalum album* and *Saraca asoca* are listed under Vulnerable (VU) category and 1 species namely *Decalepis hamiltonii* is listed under Endangered (EN) category and the remaining 25 species are in Not Evaluated (NE) category Figure-5. Among these endemics, 24 species are endemic to Peninsular India, 2 species such as *Alysicarpus mahabubnagarensis* and *Urginea nagarjunae* are endemic to Nalgonda and Mahaboobnagar districts and the

remaining 2 species namely *Cleome viscosa* var. *nagarjunakondensis* and *Crotalaria paniculata* var. *nagarjunakondensis* are endemic to the study area of Nagarjunkonda Island Figure-6. The families such as Acanthaceae (4 species), Cleomaceae (3 species) and Poaceae (3 species) are showed highest number of endemic species, while other families showed one species each Table-1. In the present study prepared herbarium specimen for *Cleome viscosa* var. *nagarjunakondensis* which was not available in any herbaria¹¹, and now added in the collection of herbarium list (Voucher No.BRNS-PG-005056) of Botanical survey of India, Deccan circle Figure-7. In the study area large scale stress from driving demands like collecting fire wood, grazing livestock and expansion of agricultural area's lead to drastic changes in the environment. The core zone is having 5 villages namely Lambapur, Vutlapally, Parvedula, Pulicherla and very little part of Vaddipatla village containing 9 hamlets. Majority of the households in the core zone are predominantly (89%) depends on wood as a fuel for cooking and 55 % of live stock was depended on forest for grazing. Economically important trees are being cut regularly in all the forest ranges of the study area. Tree species such as *Diospyros chloroxylon*, *Wrightia tinctoria*, *Terminalia arjuna*, *Terminalia bellerica*, *Diospyros melanoxylon*, *Acacia chundra*, *Chloroxylons wietenia*, *Acacia nilotica* and *Albizia amara* were indiscriminately culled at different girth intervals for their own consumption and also for commercial purposes. Habitat destruction/alternation, pressure of livestock, and human population are taking their toll. Therefore, stringent measures are to be taken up in the above areas to minimize these activities.

Table-1
Different Endemic and Threatened category plants of the study area

S. No	Species name	Family name	Reference
Endemic plants of Peninsular India occurring in the study area			
1	<i>Santalum album</i> L.	Santalaceae	Rawat, G.S. (2008) ¹² .
2	<i>Cadaba fruticosa</i> (L.) Druce.	Cleomaceae	Rawat, G.S. (2008) ¹² .
3	<i>Cleome felina</i> L.f	Cleomaceae	Rawat, G.S. (2008) ¹² .
4	<i>Dolichandrone falcata</i> (Wall. ex DC.) Seem.	Bignoniaceae	Rawat, G.S. (2008) ¹² .
5	<i>Lepidagathis cristata</i> Willd.	Acanthaceae	Rawat, G.S. (2008) ¹² .
6	<i>Justicia glauca</i> Rottler	Acanthaceae	Rawat, G.S. (2008) ¹² .
7	<i>Sansevieria roxburghiana</i> Schult. and Schult.f	Liliaceae	Rawat, G.S. (2008) ¹² .
8	<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Rawat, G.S. (2008) ¹² .
9	<i>Decalepis hamiltonii</i> Wight and Arn.	Apocynaceae	Ved, D., (2015) ¹³ .
10	<i>Saraca asoca</i> (Roxb.) Willd.	Leguminosae	CAMP (1988) ¹⁴ .
11	<i>Barleria longiflora</i> L.f	Acanthaceae	Ahmedullah, M. and Nayar M.P. (1986) ¹⁵ .
12	<i>Digitaria tomentosa</i> (J.Koenig ex Rottler) Henrard	Poaceae	Ahmedullah, M. and Nayar M.P. (1986) ¹⁵ .
13	<i>Eragrostiella brachyphylla</i> (Stapf) Bor.	Poaceae	Ahmedullah, M. and Nayar M.P. (1986) ¹⁵ .
14	<i>Leucas lamiifolia</i> Desf.	Lamiaceae	Ahmedullah, M. and M.P. Nayar M.P. (1986) ¹⁵ .
15	<i>Maerua apetala</i> (Spreng.) M. Jacobs	Cleomaceae	Ahmedullah, M. and Nayar (1986) ¹⁵ .
16	<i>Mimosa prainiana</i> Gamble	Mimosaceae	Ahmedullah, M. and Nayar M.P. ((1986) ¹⁵ .
17	<i>Polygala wightiana</i> Wahl.	Polygalaceae	Ahmedullah, M. and Nayar M.P. (1986) ¹⁵ .
18	<i>Tragus roxburghii</i> Panigrahi.	Poaceae	Karthikeyan, S. (1981) ¹⁶ .
19	<i>Caralluma adscendens</i> (Roxb.) Haw. var. <i>attenuata</i> (Wight) Grav. and Mayur.	Apocynaceae	Kumar, K.M.P. (2014) ¹⁷ .
20	<i>Gloriosa superba</i> L.	Liliaceae	Darmendra.S (2013) ¹⁸ .
21	<i>Andrographis paniculata</i> (Burm.f.) Nees	Acanthaceae	Ravi Kumar and Ved,D.K. (2000) ¹⁹ .
22	<i>Limonia acidissima</i> Groff	Rutaceae	Ravi Kumar and Ved,D.K (2000) ¹⁹ .
23	<i>Strychnos nux-vomica</i> L.	Loganiaceae	Ravi Kumar and Ved,D.K (2000) ¹⁹ .
24	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight and Arn.	Combretaceae	Ravi Kumar and Ved,D.K (2000) ¹⁹ .
Endemic plants occur only in the Nalgonda and Mahbubnagar District			
25	<i>Alysicarpus mahabubnagarensis</i> Ragh.Rao and al.	Leguminosae	Sampath et al (2007) ²⁰ .
26	<i>Urginea nagarjunae</i> Hemadri and Swahari.	Apocynaceae	Prasad, M.N.V et al (2007) ²¹ .
Endemic plants occur only in the study area			
27	<i>Cleome viscosa</i> var. <i>nagarjunakondensis</i> Sundararagh.	Cleomaceae	Sudhakar Reddy,C.H. (2003) ¹¹ .
28	<i>Crotalaria paniculata</i> Willd. var. <i>nagarjunakondensis</i> Thoth.	Leguminosae	Thothathri,K. (1964) ²² .



Figure-3
View of the Habitat Feature at Lambapur and Peddagattu village



Figure-4
Perrinial water falls of chandravanka river, a tributary of river krishna

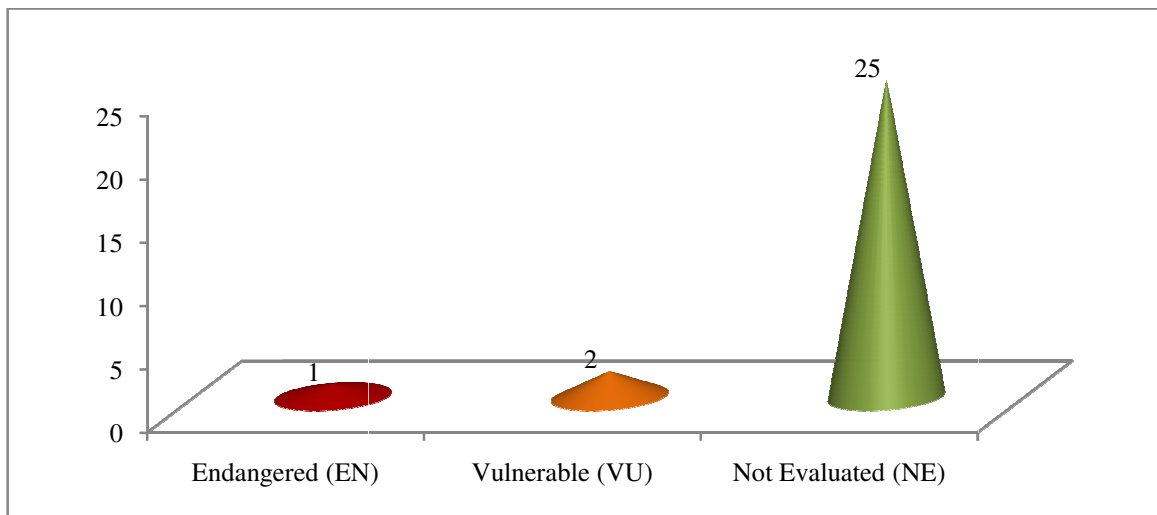


Figure-5
IUCN Red listed species recorded in the study area

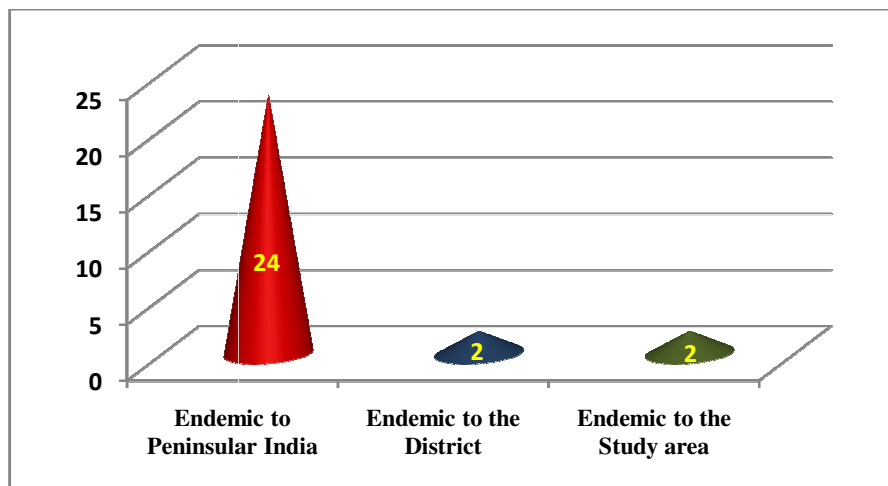


Figure-6
Endemic species recorded in the study area



Figure-7

Cleome viscosa var. nagarjunakondensis (*italic*) - An endemic species to the study area (it should be in normal font)

Conclusion

The threatened taxa documented in the present study indicate that, these areas are serving with number of unique species to the region. The authorities should take proper protection measures on threatened species that are most at risk from fragmentation under mining activity. Establishment of a conservation cell is required for effective ecological evaluation of the region during Pre and Post implementation of the project activity with critical Protected Area Management Planning, Land-Use Polices, Environment Management Plan (EMP) and its funding mechanism for long term sustainability of the region.

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