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Biodiversity Threats and Conservation Strategies in Amrabad Tiger Reserve

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**Abstract**

The present study is carried out in Amrabad Tiger Reserve (16°21'-16°70'N and 78°48'-79°40'E) of Telangana state in India for a period of two years, from June 2024 to May 2026, to ensure that all the seasons of two consecutive years will be covered. This study aims to assess and document various factors affecting the forest spread and wildlife depletion in Amrabad Tiger Reserve. This article briefly discusses various possible threats or conservation vulnerabilities of biodiversity in Amrabad Tiger Reserve based on field studies carried out intermittently throughout the study area. The present study was conducted using the survey method. Data was collected by direct field surveys, and from the officials of the Forest Department, Chenchu tribes, and local people have also been relied upon and also referred to online databases such as i-Naturalist, the India Biodiversity Portal, the official website of Amrabad Tiger Reserve, Herp Mapper, etc. The significant plant and animal species are observed in their habitat itself and photographed immediately, and confirmed their identities by inquiring from the standard references. The vegetation of Amrabad Tiger Reserve is typically a mix of southern tropical dry deciduous and southern tropical moist deciduous forest types intermingled with scrubs, woodland and grasslands. As a part of the Nallamala Forest tract, Amrabad Tiger Reserve is renowned for being rich in biological diversity with several endemic species of flora and fauna. The present study reveals that the Amrabad Tiger Reserve was once a dense, pristine, and secure forest, but is now under severe threat; deforestation and wildlife depletion are occurring at an accelerated pace and is in an alarming stage. This is detrimental to the biodiversity as well as to the local indigenous tribe, Chenchus, and leading to severe human-wildlife conflict. Predominant threats to biodiversity in the Amrabad tiger reserve include anthropogenic causes, habitat loss, livestock intervention, forest fires, invasive plants, climate change and poaching. The major conservation strategies being implemented are forest fire management, weed and grassland management, water conservation, plastic bans, artificial water supply to the wildlife, surveillance, base camp operations and wildlife projects such as project tiger. From this study, it is observed that Amrabad Tiger Reserve is now under serious threat with some of its areas lost their ecological integrity and most of them are in a critical state. Sustainable practices and integrated approaches of conservation are need of the hour to restore the ecological treasure. Setting up a statutory body for the conservation of natural resources and a protection authority for the effective implementation of conservation measures, making strong guidelines for nature and wildlife protection, carrying out scientific and strategic environmental impact assessments, designing social and environmental plans is essential when taking up any project in the forest or hilly areas. The government has to relocate all the tribal families residing within the core reserve to reduce anthropogenic influence, human-wildlife conflict, improve their socio-economic standards for the sustenance of invaluable biodiversity in the Reserve. If not, the ecological treasure chest would soon be empty.

Keywords: Amrabad Tiger Reserve; Nallamala; Deforestation; Biodiversity; Wildlife depletion**Introduction**

Amrabad Tiger Reserve (ATR) is a part of Nallamala Forest Tract of the Eastern Ghats of India. It is rich in biodiversity and native to several endemic floral and faunal species. Furthermore, this forest tract is home to a large number of Bengal Tigers. It has highly diverse terrain such as hills, valleys, rocky areas, grasslands and even gorges and forms the catchment of the Krishna River.



It is the Abode for several butterflies, frogs, snakes, birds and eutherian mammals. Amrabad Tiger Reserve was once a dense, pristine, and secure forest, but is now under severe threat; deforestation and wildlife depletion are occurring at an accelerated pace and is in an alarming state and need to be conserved imperatively. Hence, an attempt is made to ascertain the factors threatening the biodiversity in the ATR and to suggest the mitigating measures for its conservation and driving a successful rebound in the state's tiger population and protecting the rare, endemic faunal and floral species.

Amrabad Tiger Reserve (16°21'-16°70'N and 78°48'-79°40'E) is situated in Telangana state of India. It is part of the Nallamala forest tract. This sprawling tiger reserve lies roughly 145km south of Hyderabad, the capital of Telangana state. This tiger reserve was a part of Nagarjuna Sagar – Srisailem Tiger Reserve (NSTR) prior to the bifurcation of united Andhra Pradesh. But, when the state was bifurcated as Andhra Pradesh and Telangana in the year 2014, the northern part of the reserve remained with the Telangana State and was Re-designated as Amrabad Tiger Reserve. The southern part was left with Andhra Pradesh and continued as Nagarjuna Sagar – Srisailem Tiger Reserve. It consists of 11 ranges and three divisions.

ATR spans an area of 2611.4 sq.km over Nagarkurnool and Nalgonda districts of Telangana State and is the second-largest tiger reserve in India in 2021 with an estimated 23 tigers next to the Jim Corbett Tiger Reserve, which has the highest tiger numbers with 252 inside the reserve and 266 using the reserve, according to the report released by the Union Environment Department. The National Tiger Conservation Authority (NTCA) report-2022 announced that there are 21 tigers in Telangana, which are mostly in Amrabad Tiger Reserve.

Spanning over 2,611.4 sq km in the Nallamala Hills, part of the Eastern Ghats chain the Amrabad Tiger Reserve in Telangana is one of the largest protected wilderness areas in India. The vegetation of Amrabad Tiger Reserve is typically a mix of southern tropical dry deciduous and southern tropical moist deciduous forest types intermingled with scrubs, woodland and grasslands (Champion & Seth, 1968), with what some ecologists believe is a savannah spread. Dense grass occurs in about 30% of its total area and some other is scattered here and there, which includes about 20% of its area. The climate is generally hot and dry with temperatures ranging from 8°C in winter to 45°C in summer and the average annual rainfall of this reserve is 900 -1000 mm. Amrabad Tiger Reserve as a part of Nallamala Forest tract, is renowned for being rich in biological diversity with several endemic species of flora and fauna (Rao, 1998). It is an Eden for various wild animals (Fig.1). ATR is the home of adorable waterfalls, valleys, gorges, forest canopies, grasslands, rocky terrains etc. (Fig 2 and 3). Amrabad tiger reserve is a part of Nallamala forest, in turn the Eastern Ghats, which are degrading at an unprecedented pace and have become like islands surrounded by dense human populations and thrashed by the forceful waves of changes (GrACE 2019).

The present study was made in different places of the study area such as Hajipur, Chandrasagar Lake, Brahmanpally, Mannanur, Pichakuntla Cheruvu, Amrabad, Padara, Udimilla, Pogilla, Pogilla waterfalls, Yalmalamanda, Bakkalingayapally, Maddimadugu, Bapanapadu, Maredu, Vankeshwaram, Chitlam kunta, Kummaronipally, Madhavanipally, Ambagiri, Farhabad Gate, Farhabad View point, Rampenta Tribal hamlet, Sateshwaram, Yellur, Bhairampally pond, Bhairapur, Billakal, Kamanpenta, Lingamaiahkunta Grassland, Narlapoor, Achampet, Umamaheshwaram, Rangapur, Kondanagula, Pond near Kondanagula, Mylaram, Balmoor, Lingala, Banala, Ananthavaram, Ramagiri, Appaipally, Vatwarlapally, Mallelatheertham waterfalls, Stone Kaman, Domalapenta grass land, Somasila, Loddimalanna Gundam and Water Fall. This study is the first of its kind in this area and carried out with the following objectives.

To know the present conservation status of ATR.

To study the conservation vulnerabilities in ATR

To study the flora and fauna of ATR in brief.

To study the conservation strategies implemented in ATR

To suggest the mitigating measures for its conservation

Research Methodology

The present study is carried out in Amrabad Tiger Reserve (16°21'-16°70'N and 78°48'-79°40'E) of Telangana state in India for a period of two years, from June 2024 to May 2026, to ensure that all seasons of the two consecutive years will be covered. This study aims to assess and document various factors affecting the forest spread and wildlife depletion. The present study was conducted using the survey method Data was collected by direct visits to the study area (field surveys), from the forest department, Tribes and local people. Also referred the online databases such as i-Naturalist, the India Biodiversity Portal, Herp Mapper etc. The significant plant and animal species are observed and photographed immediately, and confirmed their identities by inquiring the standard references such as Daniel JC 2002, Ali 1996, Inskipp et al., 1996, Nameer PO 1998, Manakadan et al., 1998 and Thulsi Rao K et al., 2007. Flora and fauna were recorded by direct field visits and sightings for several times.

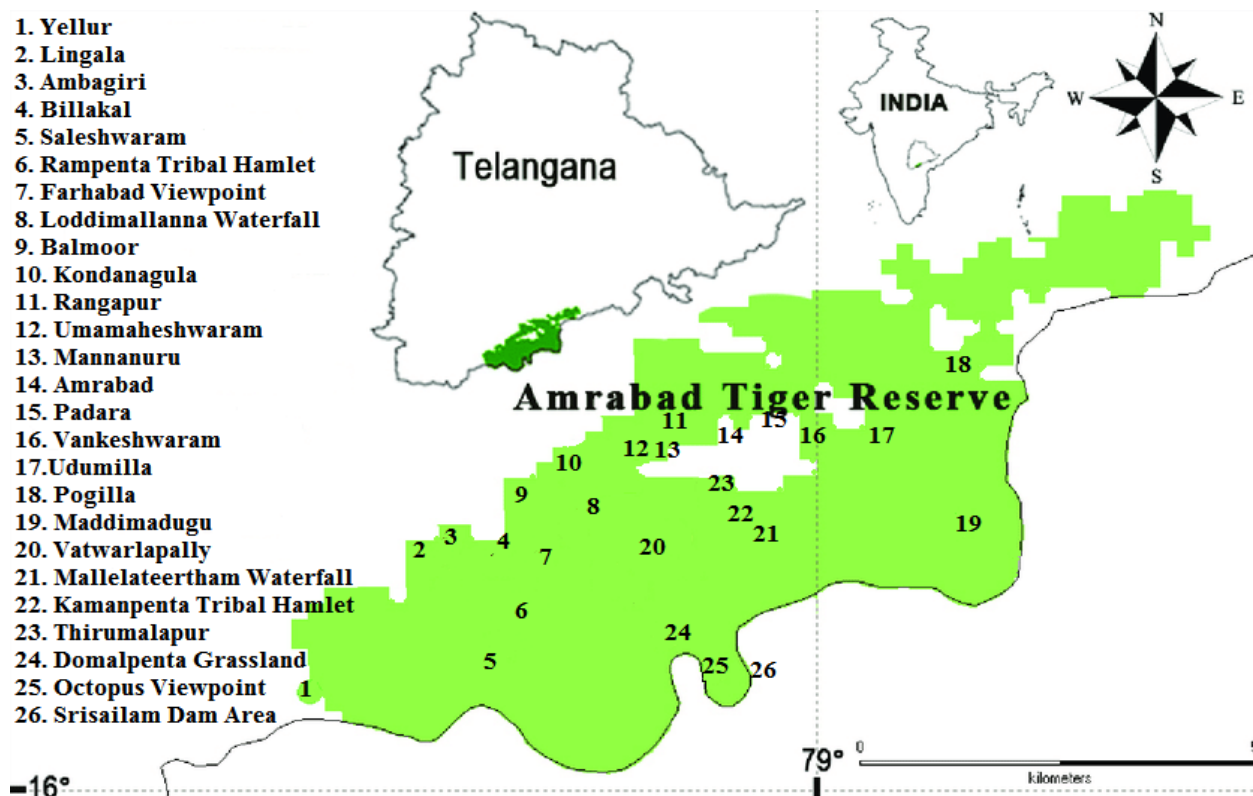


Fig. 1. Map showing the study area with locations of the Amrabad Tiger Reserve, Telangana, India

Results

Amrabad Tiger Reserve is rich in biological diversity with several endemic species of fauna and flora. Some of the common faunal and floral species are listed in Table 1 and 2 respectively.

Table 1. Common faunal Species of Amrabad Tiger Reserve

S.No.	Scientific Name	Common Name	Importance
1	<i>Panthera tigris tigris</i>	Bengal Tiger	Apex predator of the Reserve
2	<i>Panthera pardus fusca</i>	Indian Leopard	Second biggest cat in the Reserve
3	<i>Cuon alpinus</i>	Asiatic Wild Dog	
4	<i>Canis lupus pallipes</i>	Indian Wolf	
5	<i>Vulpes bengalensis</i>	Indian Fox	
6	<i>Felis chaus</i>	Jungle Cat	
7	<i>Prionailurus rubiginosus</i>	Rusty-spotted Cat	
8	<i>Viverricula indica</i>	Small Indian civet	
9	<i>Paradoxurus hermaphroditus</i>	Indian palm civet	
10	<i>Melursus ursinus</i>	Sloth Bear	Common in vajralamadugu , Endemic Sp.
11	<i>Sus scrofa cristatus</i>	Indian Wild Boar	
12	<i>Mellivora capensis</i>	Honey Badger	
13	<i>Axis axis</i>	Spotted Deer	State animal of Telangana
14	<i>Rusa unicolor</i>	Sambar Deer	Largest ungulate of the Reserve
15	<i>Gazella bennettii</i>	Chinkara	
16	<i>Boselaphus tragocamelus</i>	Nilgai	
17	<i>Antelope cervicapra</i>	Black Buck	
18	<i>Tetracerus quadricornis</i>	Four-horned Antelope	Lesser known species of the Reserve.
19	<i>Moschiola indica</i>	Indian Mouse Deer	Being conserved in the Reserve
20	<i>Semnopithecus entellus</i>	Hanuman Langur	
21	<i>Macaca radiate</i>	Bonnet Macaque	
22	<i>Macaca mulatta</i>	Rhesus Macaque	
23	<i>Funambulus palmarum</i>	Indian Palm Squirrel	

24	<i>Ratufa indica</i>	Indian Giant Squirrel	frequently found in Farhabad area
25	<i>Manis crassicaudata</i>	Indian Pangolin	Endangered species of the Reserve
26	<i>Polypedates maculatus</i>	Indian tree Frog	
27	<i>Hoplobatrachus tigerinus</i>	Indian bull Frog	
28	<i>Varanus sp.</i>	Monitor Lizard	Facing severe poaching threat
29	<i>Naja naja</i>	Indian Cobra	Largest venomous Snake of the Reserve
30	<i>Bungarus sp.</i>	Krait	
31	<i>Python molurus</i>	Indian Rock Python	Largest non-venomous snake
32	<i>Ptyas mucosa</i>	Indian Rat Snake	It's drastic fall due to pesticide application
33	<i>Lycodon</i>	Wolf Snake	
34	<i>Pavo cristatus</i>	Indian Peafowl	National bird of India
35	<i>Gallus sonneratii</i>	Grey jungle fowl	Wild bird of the Reserve
36	<i>Coturnix coturnix</i>	Common Quail	
37	<i>Alcedo atthis</i>	Common Kingfisher	
38	<i>Coracias bengalensis</i>	Indian Roller	Most frequently observed bird
39	<i>Spilopelia chinensis</i>	Spotted Dove	
40	<i>Ocyeros birostris</i>	Indian Grey Hornbill	Rarest Bird of the Reserve
41	<i>Bubo bubo</i>	Eurasian Eagle-Owl	
42	<i>Yungipicus nanus</i>	Brown-capped Woodpecker	
43	<i>Cuculus canorus</i>	Common Cuckoo	
44	<i>Aquila fasciata</i>	Bonelli's Eagle	
45	<i>Pelecanus sp.</i>	Pelican	Migratory Bird
46	<i>Phoenicopterus roseus</i>	Greater Flamingo	Migratory Bird
47	<i>Pycnonotus xantholaemus</i>	Yellow-throated Bulbul	Endemic species of the Reserve
48	<i>Monticola solitarius</i>	Blue Rock Thrush	Migratory Bird

Table 2. Common floral Species of Amrabad Tiger Reserve

S.No.	Scientific Name	Common Name	Importance
1	<i>Terminalia sp.</i>	Crocodile bark tree	Predominant tree species of the Reserve
2	<i>Hardwickia binata</i>	Indian black wood	Predominant tree species of the Reserve
3	<i>Madhuca longifolia</i> <i>var. latifolia</i>	Mahua	Predominant tree species of the Reserve
4	<i>Diospyros melanoxylon</i>	Coromandel ebony	Predominant tree species of the Reserve
5	<i>Gardenia latifolia</i>	Indian box wood	Predominant tree species of the Reserve
6	<i>Anogeissus latifolia</i>	Axle wood	Predominant tree species of the Reserve
7	<i>Chloroxylon swietenia</i>	East Indian satinwood	Predominant tree species of the Reserve
8	<i>Pterocarpus marsupium</i>	Indian Kino	Key secondary tree species of the Reserve
9	<i>Boswellia serrata</i>	Indian Frankincense	Key secondary tree species of the Reserve
10	<i>Tectona grandis</i>	Teak	Yields superior quality wood
11	<i>Phyllanthus emblica</i>	Indian gooseberry	Medicinal plant
12	<i>Santalum album</i>	Indian Sandalwood	Yields valuable aromatic timber
13	<i>Acacia sp.</i>	Acacia	Source of fuel wood
14	<i>Ficus bengalensis</i>	Banyan tree	Habitat for wildlife
15	<i>Tamarindus indica</i>	Tamarind	Plant with medicinal properties
16	<i>Embelia ribes</i>	False Black Pepper	Medicinal plant
17	<i>Butea monosperma</i>	Flame of the forest	Ecological Indicator
18	<i>Senna auriculata</i>	Tanner's Cassia	State flower of Telangana, used in tanning
19	<i>Cassia fistula</i>	Indian laburnum	Medicinal plant
20	<i>Phyllodium pulchellum</i>	Showy desmodium	Predominant shrub of the Reserve
21	<i>Phyllodium velutinum</i>	Velvet –Leaf Desmodium	Predominant shrub of the Reserve
22	<i>Erythroxylum monogynum</i>	Red Cedar	Predominant shrub of the Reserve
23	<i>Grewia hirsuta</i>	Nagbala Crossberry	Predominant shrub of the Reserve
24	<i>Grewia flavescens</i>	Sandpaper Raisin	Predominant shrub of the Reserve
25	<i>Grewia rothii</i>	Roth's Grewia	Predominant shrub of the Reserve
26	<i>Helicteres isora</i>	Indian Screw Tree	Predominant shrub of the Reserve
27	<i>Leea asiatica</i>	Asiatic Leea	Predominant shrub of the Reserve
28	<i>Woodfordia fruticosa</i>	Fire Flame Bush	Predominant shrub of the Reserve
29	<i>Agava americana</i>	American Aloe	Predominant shrub of the Reserve

30	<i>Prosopis juliflora</i>	Mesquite	Predominating alien weed plant
31	<i>Guilandina bonduc</i>	Fever nut	
32	<i>Ziziphus jujuba</i>	Jujube or Ber	
33	<i>Ziziphus oenopolia</i>	Wild Jujube	
34	<i>Vitex negundo</i>	Horseshoe Vitex	Shrub with medicinal properties
35	<i>Dodonaea viscosa</i>	Sand olive	
36	<i>Lantana camara</i>	Lantana	Predominating alien weed plant
37	<i>Bambusa vulgaris</i>	Tropical clumping bamboo	
38	<i>Bambusa bambos</i>	Giant thorny bamboo	
39	<i>Dendrocalamus strictus</i>	Solid bamboo	Native to the ATR, Habitat for wildlife
40	<i>Heteropogon contortus</i>	Spear Grass	Predominant grass species of the Reserve
41	<i>Dichanthium annulatum</i>	Marvel Grass	Predominant grass species of the Reserve
42	<i>Tripogon nallamalayanus</i>	Nallamala Five-minute grass	Endemic grass plant of the Reserve
43	<i>Eulalie</i>	Satin top grass	Dominate the grassy undergrowth of forest canopies during the monsoon
44	<i>Paspalum</i>	Dallis Grass	
45	<i>Bothriochloa</i>	Bluestem grass	

Threats to Biodiversity in ATR

The present study reveals that deforestation and wildlife depletion are occurring at a faster rate in Amrabad Tiger Reserve hence is in danger and can be said to be at an alarming state. It is observed that, once, the Amrabad Tiger Reserve was a dense, pristine and secure forest but now is under severe threat due to several factors such as:

Anthropogenic causes

Human intervention is the major threat. It has taking its toll and can be witnessed as barren look of the forest in many areas such as Amrabad plateau, Mannanur, Kondanagula, Balmoor, Lingala, Vatwarlapally etc. Rapid developmental activities such as construction of BT roads, modern agricultural practices such as tube well digging, use of machinery in farming, converting forest land to agricultural land for the purpose of growing cash crops such as chilli, cotton, mango oil palm etc., indiscriminate use of synthetic fertilizers, pesticides and weedicides, brick industry, vehicular disturbances by virtue of their accidents, sounds and toxic emissions etc. are significantly jeopardizing the biotic integrity and sustenance of floral and faunal components in turn the ecological balance of the tiger reserve. The condition is worse in northern and western parts of the reserve, especially the areas falling under the villages such as Amrabad, Kondanagula, Lingala, Rangapur, Mannanur and Vatwarlapally. Vehicular accidents are posing a serious threat to the wildlife, especially to the monkeys on the road that falls between the Mannanur and Vatwarlapally villages. Feeding the unnatural food to the monkeys by the tourists on this road also seems to be a great tragedy, that making these monkeys completely rely on this food for their survival instead of their natural food. The brick industry can also be considered as an emerging threat to the forest spread. Commercial activities such as dome houses and huts constructed near Mannanur for forest hiking are also a kind of modern unexpected threat.

Habitat loss

Habitat loss is one of the major threats in Amrabad Tiger Reserve (Mohanakrishna N 2023). Habitat loss occurred at several places of the ATR, leading to fragmentation. Deforestation is extensive near Maddimadugu, the core area of the forest, due to several factors such as Jhum or podu cultivation by local tribes called Chenchus. In this cultivation, a small patch of forest area is first cleared of trees and vegetation and then burnt. The ash that remains after burning acts as a fertilizer for the grown subsistence crops. This will severely affect the forest spread. Conversion of forest land into agricultural land by the people living in plain areas is also of great concern. As per the records of the forest department, thousands of acres, particularly in border zones such as Rangapur, Mannanur, Lingala, Amrabad and Kolhapur have experienced incursions and were cleared for cultivation. A large amount of forest is destroyed for agricultural purposes. Now they are growing Cotton and Chilli on a large scale. The locals destroying the forest also for their needs, such as making agricultural tools, house construction, firewood etc. Substantial growth of *Prosopis juliflora*, which is locally known as "Sarkar Tumma", and illegal, indiscriminate cattle grazing have also been major causes of concern since they are affecting forest regeneration to a great extent. The forest is becoming barren because of all these unethical activities. *Prosopis* has now invaded an area of nearly 300 acres in Maddimadugu area.

Livestock Intervention

Overgrazing and trampling by heavy livestock such as cattle and sheep, goats or to a limited extent, wildlife such as deer and wild boars, reducing the plant cover, compacting the soil, and limiting natural vegetation regeneration in Amrabad Tiger reserve. Huge livestock herds typically graze all the year long. Shepherds and cattle farmers, especially those migrating from far-off places, including those from Nalgonda, Wanaparthy, Narayanpet,

Jogulamba-Gadwal and Mahabubnagar districts, are venturing deep into the ATR for cattle grazing. Shepherds and cattle farmers from the Kambalapalli area of Nalgonda end are unrestrained. They take their cattle and sheep to Maddimadugu area for grazing. Cattle graze the local flora, leaving *Prosopis Juliflora* trees as it has thorns. Shepherds and cattle herders establish seasonal camps in the region for months at a time. Usually, they enter the forests during monsoon and stay there till Sankranti festival. Thereafter, they head towards their homes for harvesting and return during the monsoon. They spend nearly four months camping on every trip. This practice is severely affecting the local flora and fauna. Maddimadugu is significant as the population of Chinkaras is high in this part of the ATR. Such kinds of cattle and sheep campings can also be witnessed in several sites of the ATR. With cattle grazing the local flora, availability of natural plant species is becoming limited for Chinkaras and other animals. Further, the cattle, sheep and goats, develop foot and mouth Disease (FMD) and such cattle are discarded and left to die. There is every possibility of wild animals getting infected through these cattle. It is risky in terms of tiger and other animal conservation. Strikingly, wealthy cattle farmers from distant towns such as Nalgonda, Narayanpet, and Gadwal hire local shepherds to manage massive herds of 1,500 to 2,000 cows and oxen. Once a calf grows to a sizable height and weight, it is sold in the markets for beef. These apart, they own nearly 1400 to 1600 sheep and goats. They hire local shepherds to take care of these sheep and goats for monthly charges of about Rs.2000 to Rs.3000, besides offering required rice and other provisions. At times, there is political pressure to ask the forest officials to permit shepherds from other areas into the forests. Unregulated grazing by domestic animals puts wildlife's access to food at risk, especially the small antelope species such as four-horned antelope (Fig 4 and 5).

Forest Fires

Being a dry deciduous forest, the ATR is highly susceptible to forest fires. These are annual hazards that occur every year and depleting tens of hectares of forest. Amongst these recurring fire incidents, over 95% are of overwhelmingly human origin and tend to spike during the hot summers. These fires are triggered frequently by cattle grazers, shepherds, poachers, tourists and pilgrims by their camp and cooking fires, motorists, honey gatherers, encroachers or by the locals who collect the Mahua flowers, beedi leaves and other forest products. Deliberate burning by encroachers or grazers to instigate a fresh grass flush is a persistent threat to the ATR and the most common cause of forest fires. This is not only illegal but also unsystematic. These fires are typically bottom fires that burn the leaf litter on the ground, understory and under grown shrubs. Generally they are limited to smaller areas but occasionally may reach up to 60 hectares at a time. These are often being doused and managed by the forest personnel before they reach canopies. Forest fires are not only a threat to biodiversity; there is also evidence that, occasionally, they may reach the interior tribal hamlets causing critical injuries. To combat this recurring threat, forest personnel actively trek to long interior zones to control the blazes.

Invasive Plants

In Amrabad Tiger Reserve, the dominant invasive weeds are *Lantana camara*, *Prosopis juliflora*, *Eupatorium*, *Parthenium* and *Hyptis*. These weeds need to be cleared to restore the grassland. Invasive plants or alien species such as *Lantana camara* and *Prosopis juliflora* are posing a serious threat to the biodiversity in ATR due to resource competition with indigenous species, particularly for their sustenance and habitat. *Lantana camara* is the most dominating and damaging invasive plant in Amrabad Tiger Reserve, which covers roughly one-fourth of it. It is an aggressive shrub that harms the local ecosystems by competing with the native grasses and flora, thus reducing the natural food sources for herbivores and increasing the spread of forest fires. This dense growing plant blocks the sunlight onto the forest floor that hinders the growth of native grasses and flora. This leads to "Green Hunger", the condition where the forest looks lush green, but lacks edible forage for herbivores such as chital and sambar that sustain the reserve's apex predators. Further, its leaves and berries are toxic to them and limit their dietary options, potentially causing malnutrition. Thick, dry Lantana bushes are highly inflammable and act as a "Fuel Ladder" that makes the manageable forest fire highly destructive.

Prosopis juliflora is another predominant and highly problematic invasive weed in Amrabad Tiger Reserve. There is an interesting story behind the invasion of this plant. It is a desert alien plant that grows extensively in barren soils and in areas where the availability of water is scarce. It has an adverse impact on the local habitat as it grows rapidly and colonizes hundreds of acres of core area, especially in and around Maddimadugu. As this weed is unpalatable to wildlife and grazing animals, and also due to its sharp and rigid thorns, livestock prefer to overgraze the local grasses and plants, leaving *juliflora* to thrive and unchecked. Due to its deep root system, it rapidly lowers the water table, makes the surrounding soil dry and outcompetes the native vegetation for moisture. Its dense thorny bushes obstruct the natural movement of wild animals and also injure the soft foot pads of predators such as tigers and leopards. Even if it is burnt, it manages to grow back faster and this results in degradation of local habitat and local flora, thus the forest growth and wildlife. In the 1960's the state government dropped *Prosopis juliflora* seeds from aircraft in Maddimadugu and surrounding areas in order to raise the green cover and to provide firewood for local people. Thus, it derived the name "Sarkar Tumma" locally. During the last three decades, the species covered a large area in the core of ATR.

Climate change

Climate change is severely impacting the ATR by escalating acute water scarcity and temperature extremities, especially in areas located on a rugged, rocky plateau with poor water-retaining capacity. This leads to habitat degradation and forces the native wildlife to migrate closer to human settlements, resulting in human-wildlife conflict. ATR always struggles with endemic drought conditions. Changing climatic patterns have decreased vital monsoon rainfall, particularly in July and drying up of natural waterholes. Extended dry periods and increasing temperatures inhibit the growth of grasses, thus altering the mixed vegetation, in turn affecting the foraging habits of herbivore species such as spotted deer, chinkara, sambar deer and nilgai. Prolonged heat waves and lack of water lead to dehydration and malnutrition, and in turn increased physiological stress. Recent studies indicate that these harsh environmental conditions have caused a massive spike in stress hormones among tigers, threatening their reproductive success and overall health. As water and food sources in the core zone dry out, tigers and their prey, wild boars, monkeys, foxes, wolves, pea fowls etc. are being forced into human habitations, escalating the human-wildlife conflict.

Feral dogs menace

Feral dogs have become a menace to the wildlife, especially in the buffer zone of ATR. They usually tend to pose a major threat to the survival of wildlife, particularly of herbivores and other ungulates. Feral dogs tend to hunt monitor lizards and herbivore species to meet their dietary requirements due to their inadequate feeding. They often harass and hunt the native avian and other mammalian species. Illegal relocation of captured unvaccinated stray dogs from surrounding villages and towns into the ATR also worsens the situation. They also tend to drink water from saucer pits which are actually built for wildlife. This not only reduces the availability of water to wildlife, but can also spread diseases to them. Sometimes they breed with wild dogs, leading to the production of hybrids. They may spread diseases such as rabies and canine distemper virus (CDV) to large carnivores such as tigers and leopards when they are preyed by them. Feral dogs are very dangerous to the offspring of other carnivores. It is observed that poachers are using feral dogs to hunt the wildlife near Achampet division and Lingal range.

Poaching

Poaching is the major threat to the survival of wildlife in the ATR. The wild animals are being poached for their valuable horns, skin, bush meat or small game etc. The meat of some wild animals such as sambar deer, spotted deer, four-horned antelope, wild boar, monitor lizard etc. is believed to be highly rich in protein and being regularly hunted by the poachers. Poachers generally use domestic dogs, country-made rifles, spears, Lead ball shots, arrows, axes explosives for hunting. Some evidence of poaching exists in ATR in recent years. Six poachers were caught in 2022 near Krishna backwater who hunted a sambar deer. In May 2025, four poachers were detained after hunting monitor lizards using hunting dogs in the Lingal Range. In June 2026, four - armed local men trying to enter the reserve illegally were caught with the help of tiger census cameras and booked under the wildlife protection act.

Human and Vehicle Movement

Human and vehicular movement is quite common along the ATR as the Hyderabad to Srisailem Highway (NH765) spans approximately 54–60 km in the reserve. This can disturb the habitat and can make the habitat inadequate for those species such as tigers and four-horned antelopes which tend to live in undisturbed habitats, thus significantly disrupting the fragile ecosystem. The tourist movement is very common in the ATR, the presence of religious places such as Srisailem, Umamaheshwaram, Maddimadugu, Saleshwaram and tourist places like Srisailem Dam, Farhabad view point, Octopus view point, waterfalls etc. are increasing the human footprint inside the tiger reserve. This movement causes high stress levels in wildlife, habitat fragmentation, road kills and wildlife dependency on human food. This is very true particularly in case of monkeys. The plastic thrown by tourists may pose a serious threat to the health of ungulates and other wild animals if they ingest it.

Conservation measures by the Forest Department in ATR

Various conservation and mitigating measures have been initiated by the forest department in the Amrabad Tiger Reserve.

Management of Forest Fire

Forest fire is the biggest threat in ATR. The forest department is engaging many fire team watchers, particularly during the fire season. Immediate action is being taken to mitigate the forest fires, thereby protecting a large area of the Forest and Wildlife. To monitor and tackle the fire locations quickly, the forest department uses satellite maps. Forest personnel trek long distances, even through the night, to douse the flames. Warning boards have also been set up along the Hyderabad-Srisailem highway highlighting the dos and don'ts. Prevention teams have also been deployed to check the illegal cooking fires in the core area. Controlled burning is a common practice in ATR primarily used to create and maintain the fire lines to protect the vast habitat from uncontrollable destructive wildfires. This practice is primarily used to clear the specific strips of forest 10 meters in width and spanning very long distances in the core area of the reserve to break off continuous vegetation and stop wildfires from spreading

to other areas of the reserve. Control burning is also practiced along the roadside, where the chance of a fire accident is very high due to the thoughtless activities by tourists.

Plastic bans

Several strict regulations are being enforced by the Forest Department in ATR to eradicate the usage of plastics. There is a complete ban on single - use plastic, multi-layer plastics and PET plastic water bottles of one liter and below. There is strict enforcement at entry points located at Mannanur and Domalapenta. At these points, Rs.50 is collected, which includes Rs.30 toll for the maintenance of forest that covers anti-littering, eco-maintenance and Rs.20, which is refundable. A jute or cloth bag is provided for the tourists at the entry point to store all the garbage generated during their journey. The Rs.20 will be refunded when the bag with their used items is returned to the exit point. There are heavy penalties up to Rs. 10,000 imposed under the plastic waste management rules for those who litter or dispose of the plastics in the reserve. The forest department is conducting awareness campaigns on the plastic ban in collaboration with the Hyderabad Tiger Conservation Society (HyTiCoS) and WWF India. There is a practice of eco-friendly perks to the tourists of tiger safari at Farhabad a complimentary jute bag and 10 leaf plates per room to promote sustainable practices and supporting the local community livelihoods.

Water Conservation

Several water conservation strategies are being followed by the forest department in ATR. These methods include trench digging, construction of percolation tanks, rock-filled dams and check dams. Total forest area has been divided in to 4 sq.km. grids. Grids with natural water sources are identified and the grids without water sources are provided with artificial water sources. Grids adjoining the human habitations are provided with priority water sources to mitigate the man-animal conflict.

Grassland Management

Grasslands are being productively managed by the forest department in Amrabad Tiger Reserve in order to achieve the improved productivity and maximize the benefits for wildlife. These operations include removal of weed plants and unwanted bushes to ensure the required grass growth. This is usually practiced during the months of June and July. Various grasslands in ATR include, natural waterhole grass lands, artificial waterhole grasslands, view line grasslands and open grasslands. Domalapenta grasslands, Vajralamadugu grasslands and Lingamaiahkunta Grassland are the renowned grasslands in ATR.

Solar-powered Bore wells

Continuous water supply to the wildlife is inevitable, particularly during the hot summers to fulfill their water requirements. Several automated, off-grid solar-powered bore wells are installed in the deeper parts of the reserve, particularly along the animal corridors and near the tribal hamlets, to combat the water scarcity and provide uninterrupted water supply. These bore wells are now active in Farhabad, Mannanur and Maddimadugu ranges which operate automatically based on the availability of sunlight without any human intervention. They rule out manual water supply, reduce organic emissions as they run on clean energy and prevent the wild animals from straying into human habitats and sustain them deep within the reserve, thus helping to mitigate human-wildlife conflicts. Their water is first pumped into overhead tanks then released to artificial saucer pits or water holes. There is a key role of some organizations, such as Virtusa Foundation and Nirmaan Organization, in these activities. Virtusa has installed 10 automated solar-powered bore wells in the heart of the reserve and the Nirmaan is collaborating on Tribal and Wildlife conservation in ATR. It is focusing on integrated water security such as installation of solar-bore wells and rejuvenation of percolation tanks.

Saucer pits

These are artificially engineered, concrete-lined waterholes constructed to support local wildlife by supplying critical hydration during extreme heat waves and seasonal droughts. Each saucer pit can hold about 700–750 liters of water. The Forest Department aims to provide at least one saucer pit or percolation tank for every 9 sq.km to minimize the distance for animals to travel for the water. These saucer pits are regularly refilled using solar bore wells or water tankers. Thus, the saucer pits help to quench the animal's thirst and mitigate animal-human conflict (Fig 6).

Base Camp Operations

23 base camps with 141 base camp watchers have been established so far in ATR to monitor the eco-sensitive areas. These watchers include both uniformed beat subordinates and local tribals. Now these base camps have been strengthened and facilitated with basic amenities such as shelter, fuel and provisions with the financial assistance of Central and State Governments.

Surveillance

Various surveillance methods have been followed by the Telangana State forest department in Amrabad Tiger Reserve for its conservation. Over 300 motion sensitive cameras have been installed across the key animal corridors

to monitor the wildlife and trespassers. 30 centralized CCTV cameras are installed to monitor the forest zones. High-resolution thermal drones also have been deployed to track poachers even in complete darkness. Monitoring System for Tigers: Intensive Protection and Ecological Status (M-S TriPES) is a software – based monitoring system employed by the ground foot-patrolling teams to log snares and signs of illegal grazing. Both ground and river patrolling teams have been deployed in the forest ranges and across the 120km Krishna river stretch for continuous patrol and intercept poachers, illegal fishermen and cross-river smugglers. The AI-Based Surveillance system generates alarms and alerts whenever there is an unusual movement, poaching risk, fire accidents, illegal entry or any wildlife movement is detected. GIS technology is used to map the wildlife and helps to identify the poaching zones and conflict areas. Prevention teams have also been deployed to check the illegal cooking fires and cigarette sparks in the core area of the reserve. Despite the sporadic attempts to bush meat by poachers by virtue of hunting and snares, these strict mitigating measures have been helping in stabilizing the habitat and allowing the tiger population to grow steadily in the Amrabad Tiger Reserve. Periodic tiger census being conducted in the ATR would also help in their conservation.

Project Tiger

This conservation initiative was launched by the Indian government in 1973 to ensure the protection of viable population of the Royal Bengal Tiger in India.

Mouse Deer Project

In collaboration with Center for Cellular and Molecular Biology (CCMB) Hyderabad, the Mouse Deer Project was started in 2017 in the habitats of ATR. Till now, 16 mouse deer batches are released and being monitored.

Biochar preparation

To combat the menace of the invasive plant Lantana in ATR, forest authorities, in collaboration with local Joint Forest Management Committees (JFMCs) and local tribal populations, launched a pilot project that converts uprooted Lantana into a useful product “biochar” by a low-oxygen burning thermo - chemical conversion process. This initiative marks a premier milestone for the region. This strategic approach mitigates the invasive weed, restores native plants, and also creates economic opportunities, provides sustainable income for local tribal communities through value-added carbon products that can be sold or utilized for soil enrichment. Consequently, this approach encourages the permanent removal of the weed while helping to build a local green economy.



Fig. 2. Grassland near Domalapenta Village



Fig. 3. A rocky terrain near Maddimadugu area



Fig. 4. Cattle grazing near buffer zone of ATR at Lingala Village



Fig 5. A massive sheep flock near Maddimadugu area of ATR



Fig. 6. A Saucer pit built for wildlife near Farhabad view point

Discussion

The present study reveals that, Amrabad Tiger Reserve is under severe ecological pressure due to several factors. Mitigating measures are to be implemented strictly. These mitigating measures to be made in to force include, the forest department must strictly ensure checking for illegal entry of smugglers into the reserve. Invasive plants, Prosopis and Lantana need to be uprooted to cut down their growth. Biochar preparation from Lantana is to be continued and implemented in a large scale by encouraging the Chenchu tribes and local people and the uprooted prosopis can be used as firewood. The forest department should offer compensation only to the local cattle farmers in case of any wild animal attack. Compensation should not be offered to the farmers from other areas venturing into the forest. This will reduce the entry of farmers from other areas in to the ATR. To check cattle being brought from far-off places to the ATR for grazing, forest officials should create awareness among the local villagers to prevent those from other areas venturing into the forest. They should issue public notices and direct other departments not to permit the migration of shepherds from far-off places into the forest. Stringent cases to be

booked against shepherds and cattle farmers for venturing into the deep forests. The proposed massive elevated steel corridor of 47.82 km through the reserve is to be completed on a war foot basis, which not only allows uninterrupted vehicular movement, but also reduces harm to the tiger reserve. Re-forestation is need of the hour in the fragmented areas to restore the habitat. Plastic bans, human and vehicular restrictions must be strictly implemented. Strict legislation must be enforced on trespassers and poachers and must be punished under the Wildlife Protection Act, 1972. Timely control of accidental blazes and enforcing the deliberate burning by encroachers and grazers is imperative. Developing green belts in between the forest blocks will stop the further spread of the flames. ATR lacks dedicated in-situ wildlife rescue centers and onsite veterinarians for localized monitoring of stray-wildlife conflicts, this challenge must be addressed properly. Strict implementation of the Indian Wildlife Act 1972 and Indian Forest Conservation Act (Amendment), 2023 or (van sanrakshan evam samvardhan adhiniyam). Community awareness about the conservation of the reserve, erecting more warning boards along the Hyderabad-Srisailem highway and deploying more teams to prevent tourists and pilgrims from cooking inside the forest core area is truly essential. Policies must be made for the protection of mountains, forests and rivers with comprehensive guidelines.

The present study also reveals that the Amrabad Tiger Reserve was once a dense, pristine, and secure forest, but is now under severe threat; deforestation and wildlife depletion are occurring at an accelerated pace and is in an alarming state. Management intervention should ensure the timely implementation of conservation priorities such as minimizing tree felling, illegal entries, livestock pressure, human intervention, forest fires, poaching, vehicular entry, mining, plastic usage and feral species menace etc. for the sustenance of invaluable biodiversity and Chenchu tribal population in Amrabad Tiger Reserve. If not, the ecological treasure chest would soon be empty. Therefore, it is of the utmost urgency to mitigate all the conservation vulnerabilities through various conservation strategies and education programmes. Setting up a statutory body for the conservation of natural resources and a protection authority for the effective implementation of conservation measures, making strong guidelines for nature and wildlife protection. Carrying out scientific and strategic environmental impact assessments, designing social and environmental plans is inevitable when taking up any project in the forest or hilly areas. The government has to relocate all the tribal families residing within the core reserve to reduce human-wildlife conflict, improve their socio-economic standards.

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