

DIVERSITY AND DISTRIBUTION OF FLORA, FAUNA & AVIFAUNA AND ASSESSMENT OF ITS STATUS WITH RESPECT TO LAND USE PATTERN IN AND AROUND BANNERGHATTA, BANGALORE, INDIA.

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Abstract : This investigation was carried out using the point centered quadrant method. About ten transects were laid down and each one measured 1-2 km in length. At every 200m point interval of each transect, four nearest trees were enumerated for species name, distance of the tree from the transect line, Girth at breast height (GBH), canopy cover and ground cover. Birds on the trees were also assessed, The data thus collected was analyzed for species accumulation, abundance, species richness, diversity index, evenness and size class distribution. The survey results suggest that the region is of high faunal diversity with 34 species and rich in bird diversity with a minimum of 156 birds identified during the survey period.

IndexTerms – Quadrant method, Species abundance, species richness, Diversity index, avifaunal diversity, faunal diversity, floral diversity.

I. INTRODUCTION

Bannerghatta National Park also known as BNP is located at a distance of around 21 km from the Bangalore city, India. Located in the midst of pleasant environs, the national park is very much prestigious for its lion and tiger safari. Alternate attractions of Bannerghatta National Park incorporate its crocodile and snake ranch. Bannerghatta National Park was established in the year 1971 and spreads over a region of 104 sq. km. Ten reserve forests of Anekal Range of the Bangalore Forest Division falls under this national park.

One of the well-known cookout spots close Bangalore, Bannerghatta National Park houses buffaloes, lions, elephants, panthers, and so on. A pet's corner just as a historical center is likewise located inside this national park. Lion safaris are organized out on demand. Bannerghatta National Park brags of a rich flora, involving the zizyphus, jalari, neem, tamarind, chujjullu, sandal, and so forth. This park was started with the primary objectives of bio-conservation and also to provide bio-recreation to the visiting tourists with nature-education facilities to students and researchers. The park was originally founded in 1970 for the purposes of providing a recreation center for citizens. In 1972 a mini zoo was created within the park. BNP was declared as a national park in 1974. A portion of Bannerghatta National Park was declared as biological reserve in 2002. Bannerghatta's landscape comprises of hilly terrain, scrubland, deciduous forests, valleys, the Suvarnamukhi stream, and thus provides a home to a variety of species of animals and plant life, a few of which are endangered. The park's landscape is enclosed with high density of human settlements including agricultural lands situated within the park (Singh 2008).

Invasion of exotic species is among the most important global scale problems experienced by natural ecosystems and Bannerghatta National Park is not an exception to it. Today, invasion of alien species is second only to habitat loss as a cause of species endangerment and extinction (Schei 1996). Forest and shrub lands are often invaded by the short invasive species (Wiser.S.K., et al. 1998).

Growing human population and improved extensive transportation have increased the degree of movement of non-indigenous organisms and the current enhanced rate of invasion constitutes one of the most important effects that humans have had on the earth (Sharma et al. 2005). In the present study an attempt was made to understand the status of the floral, faunal and avian diversity in and around Bannerghatta.

II. RESEARCH METHODOLOGY

Study Area:

Bannerghatta National Park is a 65,127.5 acre park which is located in the hills of Bangalore's Anekal range. It is one of the smallest National Parks in the country measuring about 103 km² (Singh 2008) in area. The park is highly undulating in shape and measures a maximum of 26 km in length from North to South and from East to West varies between 0.3 and 5 km width. The park lies between 12° 34' and 12° 50' N latitudes and 77° 31' and 77° 38' E longitudes (Rajeev 2002). Though a small National Park, it is the largest remaining scrub forest of the country. The terrain of the park is highly uneven with a mean altitude of 865m and ranges between 700 and 1035m above mean sea level. The park gets an average annual rainfall of 937mm ranging between

728mm and 1352mm. 1-2 km buffer area from the park boundary was marked out a topographic map and a total of 50 villages around the area was considered for investigation.

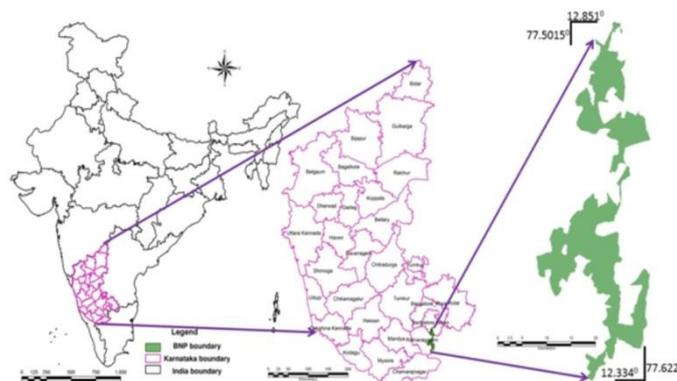


Fig. 1: Bannerghatta National Park (BNP)

a) Field survey and sampling:

The field surveys were conducted during Jan-Dec visiting all the 50 villages by vehicle. The gathered data was entered into a special data collection form which was designed to collect information such as crops grown, type of soil, livestock, type of soil, type of fauna and flora with special consideration to avifauna.

c) Assessment of floral diversity:

The study was carried out using the point centered quadrant method. A total of about ten transects each one measuring about 1-2 km(depending upon the terrain) were laid evenly covering almost all the villages except the urbanized parts. At every 200m point interval of each transect, four nearest trees were considered for sampling and the data such as species name, distance of the tree to transect line, canopy cover, ground cover and Girth at breast height (GBH) were entered to field data sheet. The data thus collected was analyzed for species accumulation, abundance, species richness, diversity index, evenness and size class distribution.

IV. RESULTS AND DISCUSSION

Geo morphology:

The results show that about 43% of the villages are located on undulating terrain followed by about 33% on slopes and 5% in villages. Only 19% of the villages in the region were situated on plateau lands. This clearly suggests that the lands of these are highly undulating and less suitable for human habitations.

Soil type:

Red soil (50%) is the major soil type in the region followed by Clay (31%), Sandy soil (24%), Loamy soil (19%), Gravelly soil (19%), Alluvial soil (14%) and black soil (10%). (Fig.2).

Land Use Pattern:

According to the present study findings, agriculture consumed most of the land in the selected area which was about 62%, followed by urban development (22%), industrial development (8%) and stone quarry (4%) and sand mining (4%) (Fig.4).

Crops:

The crop Ragi (*Eleusine coracana*) is found to be the major crop (90%) cultivated followed by mango (*Mangifera indica*) (71%), Paddy (*Oryza sativa*)(67%), Jack fruit (*Artocarpus heterophylla*) (62%),Banana(*Musa paradisiaca*) (57%), Sapota grooves (*Achras sapota*)(38%) and Maize(*Zea mays*) (19%) among the villages in the study area(Fig. 3). The agriculture in the region is both rain and ground water dependent (76%). About 47% of the villages also utilizes surface water stored in open tanks and 14% of the villagers uses open wells.

Livestock:

The results show that majority of villages in the study area have domesticated cow (*Bos indicus*) and chicken (*Gallus gallus*) (95%) which was followed by Goat (*Capra aegagrus hircus*) (86%), Sheep (*Ovis aries*) (81%), Buffalo (*Bubalus Arnee*) (76%) Bullock (*Bos indicus*) (62%) pig (24%) and Horse (*Equus caballus*) (5%) depicting a good diversity of livestock in the region (Fig. 4).

Floral diversity:

The survey shows that the villages have good tree diversity around it. The major trees around the villages are enlisted in the table below (Table. 1).

Table 1: Major tree diversity of the villages in the region

Sl.No.	Regional Name	Scientific Name	Percentage prevalence in the villages
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1	Tenginamara	<i>Cocos nucifera</i>	95.24
2	Bevina mara	<i>Azadiracta indica</i>	85.71
3	Hunase mara	<i>Tamarindus indica</i>	85.71
4	Silver	<i>Grevillea robusta</i>	80.95
5	Halasina mara	<i>Artocarpus heterophylla</i>	80.95
6	Mavina mara	<i>Mangifera indica</i>	80.95
7	Arali mara	<i>Ficus religiosa</i>	80.95
8	Biduru	<i>Dendrocalamus strictus</i>	76.19
9	Alada mara	<i>Ficus bengalensis</i>	71.43
10	Nilagiri mara	<i>Eucalyptus spp</i>	71.43
11	Honge mara	<i>Pongamia pinnata</i>	71.43
12	Hebbevu	<i>Melia dubia</i>	71.43
13	Tegada mara	<i>Melia azedarach</i>	71.43
14	Hatti mara	<i>Ficus recemosa</i>	66.67
15	Mothugada mara	<i>Butea monosperma</i>	61.90
16	nerale mara	<i>Syzygium cumini</i>	61.90
17	gasagase mara	<i>Muntingia calabura</i>	61.90
18	Adike mara	<i>Areaca catechu</i>	61.90
19	Sapota mara	<i>Achras sapota</i>	57.14
20	Belada mara	<i>Limonia acidissima</i>	57.14
21	Dasavalada gida	<i>Hibiscus rosa-sinensis</i>	52.38
22	Elachi mara	<i>Zyzipus jujumbe</i>	47.62
23	Shrigandada mara	<i>Santalum album</i>	42.86
24	karijali	<i>Acacia nilotica</i>	42.86
25	godambi	<i>Anacardium spp</i>	33.33
26	Geru mara	<i>Semecarpus anacardium</i>	33.33
27	Hone mara	<i>Pterocarpus marsupium roxb</i>	23.81
28	Cassia mara	<i>Cassia spp</i>	19.05
29	bougainvillea	<i>Bougainvillea spectabilis</i>	14.29

Faunal diversity:

The survey results suggest that the region has considerable faunal diversity (Table 2). The region is also an abode for a minimum of 7 IUCN listed threatened species such as Sloth bear (*Melursus ursinus*), Wild dog (*Cuban alpinus*), Pangolin (*Manis crassicaudata*), Sambar deer (*Cervus unicolor*), Slendor loris (*Loris tardigradus*) and Hyaena (*Hyaena hyaena*) including the endangered Asian Elephant (*Elephant maximus*).

Table.2.Major faunal diversity of the villages in the region

Sl.No.	Common Name	Scientific Name	% Prevalence in the villages	Conservation status
1	Elephant	<i>Elephas maximus</i>	100.0	Endangered
2	Spectacled Cobra	<i>Naja naja</i>	85.71	Vulnerable
3	Mungusi	<i>Herpestes edwardsi</i>	80.95	Least Concerned
4	Bandicoot	<i>Bandicota bengalensis</i>	80.95	Least Concerned
5	Rat Snake	<i>Ptyas mucosus</i>	80.95	Least Concerned

6	Common Garden Lizard	<i>Calotes versicolor</i>	80.95	Least Concerned
7	Chameleon	<i>Chamaeleo zeylanicus</i>	76.19	Least Concerned
8	Green whip snake	<i>Ahaetulla nasutus</i>	76.19	Least Concerned
9	Bonnet macaque	<i>Macaca radiata</i>	71.43	Least Concerned
10	Rat	<i>Rattus rattus</i>	71.43	Least Concerned
11	Skink	<i>Sphenomorphus indicus</i>	71.43	Least Concerned
12	Kaadu bekku	<i>Felis chaus</i>	66.67	Least Concerned
13	Jackel	<i>Canis aureus</i>	66.67	Least Concerned
14	Wild Boar	<i>Sus scrofa</i>	66.67	Least Concerned
15	Chekered keelback	<i>Xenochrophis piscator</i>	66.67	Least Concerned
16	Sloth deer	<i>Melursus ursinus</i>	61.90	Vulnerable
17	Wolf Snake	<i>Lycodon aulicus</i>	61.90	Least Concerned
18	Indian rock python	<i>Python molurus</i>	52.38	Least Concerned
19	Stripe necked Mongoose	<i>Herpestes Vitticollis</i>	47.62	Least Concerned
20	Mandalada haavu	<i>Vipera russelli</i>	47.62	Least Concerned
21	Rock Agama	<i>Psammophilus dorsalis</i>	47.62	Least Concerned
22	Leopard	<i>Leopard spp</i>	47.61	Least Concerned
23	Indian Porcupine	<i>Hystrix indica</i>	42.86	Least Concerned
24	Small Indian civet	<i>Viverricula indica</i>	38.10	Least Concerned
25	Wild dog	<i>Cuon alpinus</i>	33.33	Endangered
26	Pangolin	<i>Manis crassicaudata</i>	23.81	Nearly threatened
27	Samber	<i>Cervus unicolor</i>	19.05	Vulnerable
28	Chital	<i>Axis axis</i>	19.05	Least Concerned
29	Barking deer	<i>Mantiacus muntjac</i>	14.29	Least Concerned
30	Bronze Back Snake	<i>Dendrelaphis pictus</i>	9.52	Least Concerned
31	Kaadu paapa /Slendor loris	<i>Loris Tardigradus</i>	4.76	Endangered
32	Kathe kiruba	<i>Hyaena hyaena</i>	4.76	Nearly threatened
33	Mouse deer	<i>Moschiola indica</i>	4.76	Least Concerned
34	Banded Kukri snake	<i>Oligodon signatus</i>	4.76	Least Concerned

(Source: IUCN, 2009)

Avian diversity:

The present study depicts the abundant avifaunal diversity (Table 4). A total of 156 species was documented using binocular during the survey. The area provides a habitat for most of the threatened and IUCN red listed species such as White-bellied Heron (*Ardea insignis*), Indian White backed vulture (*Gyps bengalensis*), Egyptian vulture (*Neophron percnopterus*), Red headed vulture (*Sarcogyps calvus*), Oriental turtle dove (*Streptopelia orientalis*) and Forest Owlet (*Heteroglaux blewitti*).

Table. 3. Avifaunal diversity of the study area

Sl.No.	Name of the bird	Scientific Name	% Prevalence in the Villages of Study area	Conservation Status
1.	House crow	<i>Corvus splenens</i>	96.48	Least Concerned
2.	Grey Jungle Fowl	<i>Gallus sonnerati</i>	90.55	Least Concerned

3.	Large billed crow	<i>Corvus macrorhynchos</i>	90.22	Least Concerned
4.	Common myna	<i>Acridotheres tristis</i>	76.19	Least Concerned
5.	House sparrow	<i>Passer domesticus</i>	75.10	Least Concerned
6.	Brahminy Kite	<i>Haliastur indus</i>	71.43	Least Concerned
7.	Black Winged Kite	<i>Elanus caeruleus</i>	67.55	Least Concerned
8.	Blue Rock pigeon	<i>Columba livia gmelin</i>	65.67	Least Concerned
9.	Ashy Prinia	<i>Prinia socialis</i>	54.58	Least Concerned
10.	Black-naped monarch	<i>Hypothymis azurea</i>	22.33	Least Concerned
11.	Large billed crow	<i>Corvus macrorhynchos</i>	42.38	Least Concerned
12.	Common koel	<i>Eudynamis scolopacea</i>	37.52	Least Concerned
13.	Red vented bulbul	<i>Pycnonotus cafer</i>	33.62	Least Concerned
14.	Western marsh harrier	<i>Circus aeruginosus</i>	41.20	Least Concerned
15.	Rose ringed parakeet	<i>Psittacula krameri</i>	40.20	Least Concerned
16.	Oriental honey buzzard	<i>Pernis ptilorhynchuse</i>	41.05	Least Concerned
17.	Black kite	<i>Milvus migrans</i>	43.86	Least Concerned
18.	Indian robin	<i>Saxicoloides fulicantus</i>	42.86	Least Concerned
19.	Greater coucal	<i>Centropus sinensis</i>	30.75	Least Concerned
20.	Lesser coucal	<i>Centropus bengalensis</i>	29.05	Least Concerned
21.	Jungle myna	<i>Acridotheres fuscus</i>	32.26	Least Concerned
22.	Oriental magpie robin	<i>Copsychus saularis</i>	32.46	Least Concerned
23.	Red whiskered bulbul	<i>Pycnonotus jocosus</i>	32.56	Least Concerned
24.	Laughing dove	<i>Spilopelia senegalensis</i>	30.05	Least Concerned
25.	Spotted-necked dove	<i>Stigmatopelia chinensis</i>	30.05	Least Concerned
26.	Ashy Drongo	<i>Dicrurus leucophaeus</i>	58.30	Least Concerned
27.	Barn Owl	<i>Tyto alba</i>	28.74	Least Concerned
28.	Baya weaver	<i>Ploceus philippinus</i>	19.17	Least Concerned
29.	Common quail	<i>Coturnix coturnix</i>	39.50	Least Concerned
30.	Blue winged parakeet	<i>Psittacula columboides</i>	23.21	Least Concerned
31.	Indian silverbill	<i>Euodice malabarica</i>	32.20	Least Concerned
32.	Common button quail	<i>Turnus suscitator</i>	28.95	Least Concerned
33.	Coppersmith barbet	<i>Megalaima haemacephala</i>	24.65	Least Concerned
34.	Common kingfisher	<i>Alcedo atthis</i>	85.12	Least Concerned
35.	Gold-fronted leaf bird	<i>Chloropsis aurifrons</i>	20.55	Least Concerned
36.	Red collared dove	<i>Streptopelia tranquebarica</i>	35.33	Least Concerned
37.	Red wattled lapwing	<i>Vanellus indicus</i>	29.58	Least Concerned
38.	Green bee eater	<i>Merops orientlis</i>	28.47	Least Concerned
39.	White checked barbet	<i>Megalaima viridis</i>	27.45	Least Concerned
40.	Black drongo	<i>Dicrurus macrocercus</i>	25.57	Least Concerned
41.	Black eagle	<i>Ictinaetus malayensis</i>	24.67	Least Concerned
42.	Indian roller	<i>Coracias benghalensis</i>	25.67	Least Concerned
43.	Purple-rumped sunbird	<i>Dicaeum erythrorhynchos</i>	19.58	Least Concerned
44.	White bellied drongo	<i>Dicrurus caerulescens</i>	22.57	Least Concerned

45.	Forest Owlet	<i>Heteroglaus blewini</i>	13.41	Endangered
46.	Oriental turtle dove	<i>Streptopelia orientalis</i>	13.11	Critically endangered
47.	Small sun bird	<i>Nectarinia minima</i>	22.51	Least Concerned
48.	Pale-billed flower pecker	<i>Dicaeum erythrorhynchos</i>	13.81	Least Concerned
49.	White throated fantail flycatcher	<i>Rhipidura albicollis</i>	21.81	Least Concerned
50.	Black Shouldered kite	<i>Elanus axillaris</i>	17.20	Least Concerned
51.	Common cuckoo	<i>cuculus canorus</i>	17.22	Least Concerned
52.	Rufous Wood pecker	<i>Celeus brachyurus</i>	17.25	Least Concerned
53.	Eurasian collared dove	<i>Streptopelia decaocto</i>	18.05	Least Concerned
54.	Marshel's iora	<i>Aegithina nigrolutea</i>	4.16	Least Concerned
55.	Northern shoveller	<i>Anas clypeata</i>	4.76	Least Concerned
56.	Scaly-breasted munia	<i>Lanctura punctulata</i>	5.76	Least Concerned
57.	Brown headed barbet	<i>Psilopogon zeylancius</i>	3.52	Least Concerned
58.	White-rumped munia	<i>Lonchura striata</i>	17.25	Least Concerned
59.	Orphean warbler	<i>Sylvia hortensis</i>	3.25	Least Concerned
60.	Brown shrike	<i>Lanius cristatus</i>	1.35	Least Concerned
61.	Red-breasted flycatcher	<i>Ficedula parva</i>	2.20	Least Concerned
62.	Forest wagtail	<i>Dendronanthus indicus</i>	2.26	Least Concerned
63.	Paddy field pipit	<i>Anthus rufulus</i>	3.76	Least Concerned
64.	Purple rumped sun bird	<i>Neectarinia zeylonica</i>	5.76	Least Concerned
65.	White-browed wagtail	<i>Motacilla madera</i>	4.56	Least Concerned
66.	Brown-capped woodpecker	<i>Dendrocopos moluccensis</i>	19.27	Least Concerned
67.	Red rumped swallow	<i>Hirundo daurica</i>	5.75	Least Concerned
68.	Tickell's blue fly catcher	<i>Cyornis tickelliae</i>	5.55	Least Concerned
69.	Indian golden Oriole	<i>Oriolus kundoo</i>	5.75	Least Concerned
70.	White bellied treepie	<i>Dendrocitta leucogastra</i>	6.76	Least Concerned
71.	Rufous treepie	<i>Dendrocitta vagabunda</i>	7.46	Least Concerned
72.	White bellied minivet	<i>Pericrocotus erythropygius</i>	5.78	Least Concerned
73.	Indian grey hornbill	<i>Ocyrceros birostris</i>	15.26	Least Concerned
74.	White browed fantail flycatcher	<i>Rhipidura aureola</i>	6.86	Least Concerned
75.	White throated munia	<i>Lonchura malabarica</i>	6.26	Least Concerned
76.	Greater coucal	<i>Centropus sinensis</i>	5.55	Least Concerned
77.	Common hoopoe	<i>Upupa epops</i>	15.36	Least Concerned
78.	Lesser coucal	<i>Centropus bengalensis</i>	23.25	Least Concerned
79.	Purple sunbird	<i>Nectarinia asiatica</i>	13.05	Least Concerned
80.	White wagtail	<i>Motacilla alba</i>	18.05	Least Concerned
81.	Blue checked bee eater	<i>Merops persicus</i>	15.29	Least Concerned
82.	Black-hooded oriole	<i>Oriolus xanthornus</i>	16.55	Least Concerned

83.	Common babbler	<i>Turdoides caudata</i>	15.29	Least Concerned
84.	Egyptian vulture	<i>Neophron percnopterus</i>	15.29	Endangered
85.	Large cuckooshrike	<i>Coracina javensis</i>	14.23	Least Concerned
86.	Greater coucal	<i>Centropus sinensis</i>	15.27	Least Concerned
87.	Brown-breasted flycatcher	<i>Muscicapa muttui</i>	13.45	Least Concerned
88.	Loten's sunbird	<i>Nectarinia lotenia</i>	15.45	Least Concerned
89.	Asian brown fly catcher	<i>Muscicapa dauurica</i>	1045	Least Concerned
90.	Indian paradise flycatcher	<i>Terpsiphone paradi</i>	11.52	Least Concerned
91.	Black headed cuckooshrike	<i>Lalage melanoptera</i>	8.98	Least Concerned
92.	Gold fronted chloropsis	<i>Chloropsis aurifrons</i>	11.52	Least Concerned
93.	Greenish leaf warbler	<i>Phylloscopus trochiloides</i>	12.52	Least Concerned
94.	Indian cuckoo	<i>Cuculus micropterus</i>	8.52	Least Concerned
95.	Small minivet	<i>Pericrocotus cinnamomeus</i>	12.45	Least Concerned
96.	Large grey babbler	<i>Turdoides malcolm</i>	13.33	Least Concerned
97.	Common rosefinch	<i>Erythrira erythrina</i>	10.15	Least Concerned
98.	Pied bush chat	<i>Saxicola caprata</i>	9.15	Least Concerned
99.	Red munia	<i>Amandava amandava</i>	8.42	Least Concerned
100.	Rosy minivet	<i>Pericrocotus roseus</i>	9.45	Least Concerned
101.	Shikra	<i>Accipiter badius</i>	9.78	Least Concerned
102.	Spotted owlet	<i>Athene brama</i>	10.12	Least Concerned
103.	White browed bulbul	<i>Pycnonotus luteolus</i>	12.25	Least Concerned
104.	Common Tailor bird	<i>Orthomus sutorius</i>	13.45	Least Concerned
105.	Bay backed shrike	<i>Lanius vittatus</i>	4.76	Least Concerned
106.	Black headed munia	<i>Lonchura malacca</i>	5.25	Least Concerned
107.	Black napped Oriole	<i>Oriolus chinensis</i>	7.89	Least Concerned
108.	Black shouldered wood pecker	<i>Chrysocolaptes festivus</i>	5.26	Least Concerned
109.	Brown shrinke	<i>Lanius cristatus</i>	6.45	Least Concerned
110.	Blyth's reed warbler	<i>Acrocephalus dumetorum</i>	7.89	Least Concerned
111.	Common Iora	<i>Aegithina tiphia</i>	5.79	Least Concerned
112.	Cattle Egret	<i>Bubulcus ibis</i>	62.38	Least Concerned
113.	Crested serpent eagle	<i>Spilornis cheela</i>	8.53	Least Concerned
114.	Grey francolin	<i>Francolinus pondicerianus</i>	3.33	Least Concerned
115.	Indian great reed warbler	<i>Acrocephalus stentoreus</i>	3.33	Least Concerned
116.	Cinereous tit	<i>Parus cineris</i>	6.23	Least Concerned
117.	Indian white backed vulture	<i>Gyps bengalensis</i>	5.23	Critically endangered
118.	Jerdon's baza	<i>Aviceda jerdoni</i>	8.89	Least Concerned
119.	Barn swallow	<i>Hirundo rustica</i>	9.26	Least Concerned

120.	Jerdon's bush lark	<i>Mirafrja affinis</i>	2.23	Least Concerned
121.	Plum headed parakeet	<i>Psittacula cyanocephala</i>	5.56	Least Concerned
122.	Oriental white-eye	<i>Zosterops palpebrosus</i>	10.23	Least Concerned
123.	Jerdon's Chloropsis	<i>Chloropsis jerdoni</i>	3.76	Least Concerned
124.	Grey-breasted prinia	<i>Prinia hodgsonii</i>	6.36	Least Concerned
125.	Large pied wagtail	<i>Motacillam deraspatensis</i>	3.76	Least Concerned
126.	Intermediate egret	<i>Mesophoys intermedia</i>	27.18	Least Concerned
127.	Little brown dove	<i>Streptopelia senegalnsis</i>	5.45	Least Concerned
128.	Eurasian crag martin	<i>Ptyonoprogne rupestris</i>	5.23	Least Concerned
129.	Pied kingfisher	<i>Ceryle rudis</i>	32.86	Least Concerned
130.	White breasted water hen	<i>Amaurornis Phoenicurus</i>	10.52	Least Concerned
131.	Indian Pond heron	<i>Ardeola grayii</i>	52.86	Least Concerned
132.	Striated heron	<i>Butorides striata</i>	42.35	Least Concerned
133.	Black crowned night heron	<i>Nycticorax nycticorax</i>	32.35	Least Concerned
134.	Small blue kingfisher	<i>Alcedo coerulescens</i>	52.86	Least Concerned
135.	Yellow-eyed babbler	<i>Chrysomma sinense</i>	33.36	Least Concerned
136.	Common moorhen	<i>Gallinula chloropus</i>	31.22	Least Concerned
137.	Little egret	<i>Egretta garzetta</i>	32.45	Least Concerned
138.	Common coot	<i>Fulica atra</i>	28.15	Least Concerned
139.	Indian scimitar babbler	<i>Pomatorhinus horsfieldii</i>	22.12	Least Concerned
140.	Purple moorhen	<i>Porphyrio porphyrio</i>	28.15	Least Concerned
141.	Alpine swift	<i>Tachymarptis melba</i>	20.08	Least Concerned
142.	Grey Heron	<i>Ardea cinerea</i>	21.20	Least Concerned
143.	White throated king fisher	<i>Halcyon smyrnensis</i>	22.03	Least Concerned
144.	Common swallow	<i>Hirundo rustica</i>	9.56	Least Concerned
145.	Little cormorant	<i>Phalacrocorax niger</i>	11.10	Least Concerned
146.	Tawny-bellied Babbler	<i>Dumentia hyperythra</i>	12.23	Least Concerned
147.	Wire tailed swallow	<i>Hirundo smithii</i>	14.52	Least Concerned
148.	Black Ibis	<i>Pseudibis papillosa</i>	9.45	Least Concerned
149.	Common river tern	<i>Sterna aurantia</i>	7.89	Least Concerned
150.	Glossy ibis	<i>Plegadis falcinellus</i>	6.65	Least Concerned
151.	Little grebe	<i>Tachybaptus ruficollis</i>	9.56	Least Concerned
152.	Purple heron	<i>Ardea purpurea</i>	5.68	Least Concerned
153.	White bellied heron	<i>Ardea insignis</i>	7.89	Critically endangered
154.	Puff-throated babbler	<i>Pellorneum ruficeps</i>	2.23	Least Concerned
155.	Great cormorant	<i>Phalacrocorax carb</i>	50.25	Least Concerned
156.	Yellow-billed babbler	<i>Turdoides affinis</i>	9.85	Least Concerned

Endangered, Critically Endangered, (IUCN, 2009 and Ali, 2002).

Assessment of floristic diversity in and around Bannerghatta National park:**Species number and abundance:**

The seven transect lines surveyed consisting of 63 quadrat points in a distance of 14 km showed a total of 175 individual trees belonging to 38 taxa. The species *Eucalyptus* is found to be dominant with 38 individuals followed by *Pongamia pinnata* with 15 individuals and *Acacia chundra* and *Azadirachata indica* with 12 individuals each of the total floristic assemblage, these four species together accounts to 44% of the total abundance in the region. Further, 26 species showed a poor abundance varying between 1 and 4 individuals (Table 6). Of the total 38 species identified 20 species were represented by less than 2 individuals. This suggests that the vegetation in the region is highly altered.

Table: 4. Summary of the floristic composition:

Sl.No	Scientific Name	Abundance (No. of individuals)	Relative Abundance	Cumulative Abundance
1	<i>Eucalyptus</i> sps	38	21.71	21.71
2	<i>Pongamia pinnata</i>	15	8.57	30.29
3	<i>Accacia chundra</i>	12	6.86	37.14
4	<i>Azadiracta indica</i>	12	6.86	44.00
5	<i>Cocos nucifera</i>	9	5.14	49.14
6	<i>Tectona grandis</i>	8	4.57	53.71
7	<i>Ulve mara</i>	8	4.57	58.29
8	<i>Artocarpus heterophylla</i>	7	4.0	62.29
9	<i>Dendrocalamus strictus</i>	7	4.0	66.29
10	<i>Annona squamosa</i>	6	3.43	69.71
11	<i>Melia dubia</i>	6	3.43	73.14
12	<i>Acacia nilotica</i>	4	2.29	75.43
13	<i>Diaspyros melanoxylon</i>	4	2.29	77.71
14	<i>Albizia lebbeck</i>	3	1.71	79.43
15	<i>Ficus bengalensis</i>	3	1.71	81.14
16	<i>Tamarindus indica</i>	3	1.71	82.86
17	<i>Terminalia arjuna</i>	3	1.71	84.57
18	<i>Beppale mara</i>	2	1.14	85.71
19	<i>Cassia fistula</i>	2	1.14	86.86
20	<i>Cassia</i> sps	2	1.14	88.00
21	<i>Diasporase montane</i>	2	1.14	89.14
22	<i>Mangifera indica</i>	2	1.14	90.29
23	<i>Tapasi mara</i>	2	1.14	91.43
24	<i>Accacia aurculiformis</i>	1	0.57	92.00
25	<i>Albzia amara</i>	1	0.57	92.57
26	<i>Areca catechu</i>	1	0.57	93.14
27	<i>Basari mara</i>	1	0.57	93.71
28	<i>Beete mara</i>	1	0.57	94.29
29	<i>Butea monosperma</i>	1	0.57	94.86
30	<i>Casurina equisetifolia</i>	1	0.57	95.43
31	<i>Dalbergia panniculata</i>	1	0.57	96.00
32	<i>Delonixregia</i>	1	0.57	96.57

33	Phoenix doctylifera	1	0.57	97.14
34	Polyalthia ceresoides	1	0.57	97.71
35	Premna tomentosa	1	0.57	98.29
36	Semecarpus anacardium	1	0.57	98.86
37	Terminalia chebula	1	0.57	99.43
38	Thaati mara	1	0.57	100.0
	Total	175	100.00	

Species diversity:

The species composition among the seven different sites studied varied between 7 and 14 species with the mean of 11 ± 2.70 species per site. The number of individuals ranged from 13 to 36 with the mean value of 25 ± 7.4 individuals per site of length 2km.

The Shannon-Wiener's index of species diversity calculated using the formula

$$H' = -\sum p_i \ln(p_i)$$

Where, P_i is the proportion of total number of species made up of the i^{th} species.

The mean value of the diversity (Shannon-Wiener's index) for the study area is found to be 2.11 ± 0.26 (range between 1.69 and 2.46, $N=7$). The diversity appears to be same as that of vegetation in Kalrayan hills of Eastern Ghats (Mr. Gopalakrishna S.P., *et al*) which ranges between 0.736 and 2.379 ($N=30$). The tree species identified for the study area were more evenly distributed with a mean evenness value of 0.89 ± 0.03 per site and ranged from 0.93 ($N=7$). The table 7 given below shows the diversity pattern for the study area.

Table.5. Diversity patterns

Site No.	Taxa [Species richness(S)]	Individuals	Dominance ($D = \sum P_i^2$)	Shannon index ($H' = -\sum p_i \ln(p_i)$)	Simpon index ($1-D$)	Evenness/Equitability ($E = H' / \ln S$)
1	14	31	0.10	2.46	0.90	0.93
2	14	25	0.12	2.38	0.88	0.90
3	8	13	0.17	1.93	0.83	0.93
4	7	23	0.22	1.69	0.78	0.87
5	11	36	0.16	2.08	0.84	0.87
6	12	27	0.14	2.19	0.86	0.88
7	11	20	0.18	2.06	0.83	0.86

Species accumulation:

The accumulation of species along the sites is drawn on X-Y axis. The predicted species area curve thus obtained shows a steady increase in species accumulation with every 2Km distance surveyed. The study shows no uniform pattern of accumulation.

Size class distribution:

Majority (32%) of the individuals of the tree species enumerated in the region were in the size class ranging from 0-5 in diameter at breast height followed by 5-10cm (15%) and 10-20cm (22%). Further, about 8% of the tree individuals were in the size class of 30-40cm and about 2% were in the size class of 60-80cm. The juvenile tree species (0-10cm dbh) constitutes about 47% of the total tree species enumerated. This suggests that the tree population is stable and the vegetation is growing.

Canopy cover and ground cover:

This forest vegetation has a poor over story with an average canopy cover of 21.88% (SE-1.88, $n=63$) and ranges from fully opened canopy to a closed canopy in some sites. The results of the understory suggests that the region has a poor ground cover with a mean value of 18.52% (SE=2.11, $n=63$) and varies from no ground cover to full ground cover in some sites. The canopy cover of the vegetation appears to be not in congruence with the ground cover which may be largely due to the human influence (Agricultural activities) and reveal that the vegetation is of open forest type.

CONCLUSION

Bannerghatta has more undulating terrain which is a characteristic of forest land. The region also falls under the catchment area of the Arkavathi River, a tributary of Cauvery. The region is moderately developed in terms of connectivity. Agricultural farming is mostly seasonal but it is intensive. The economy of the region is agriculture based with a recent addition of stone quarrying and illegal sand mining. The study area appears to be a region of high floral and faunal diversity including avian diversity and has a high conservation value. The vegetation in the region appears to have a greater species diversity and high species rarity. The fauna is more stable with more number of juveniles present in it.

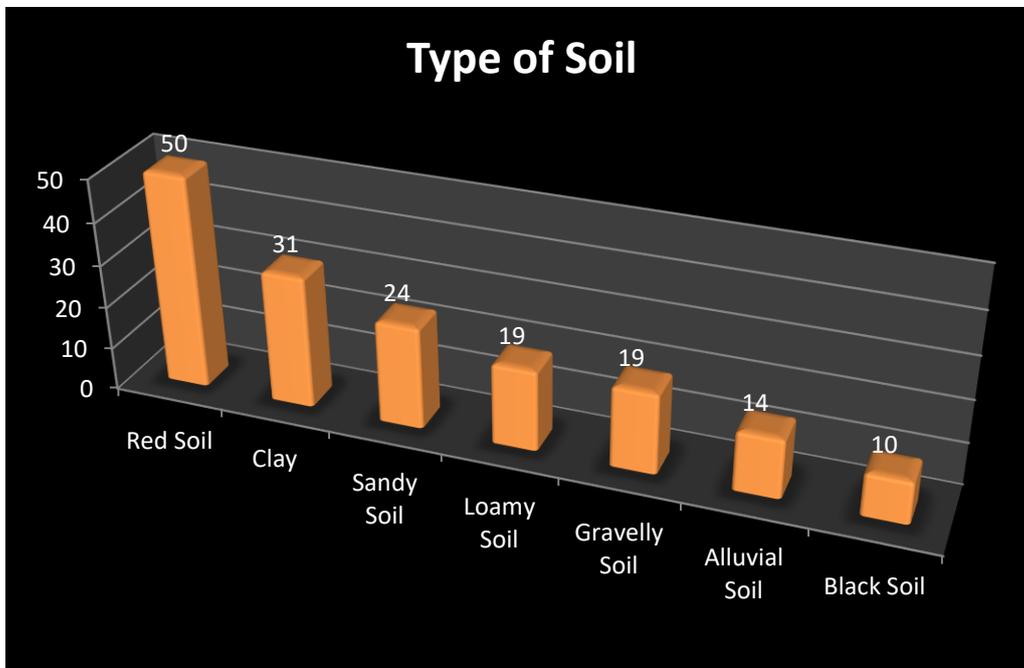


Fig.2. Proportion of soil types in the study area

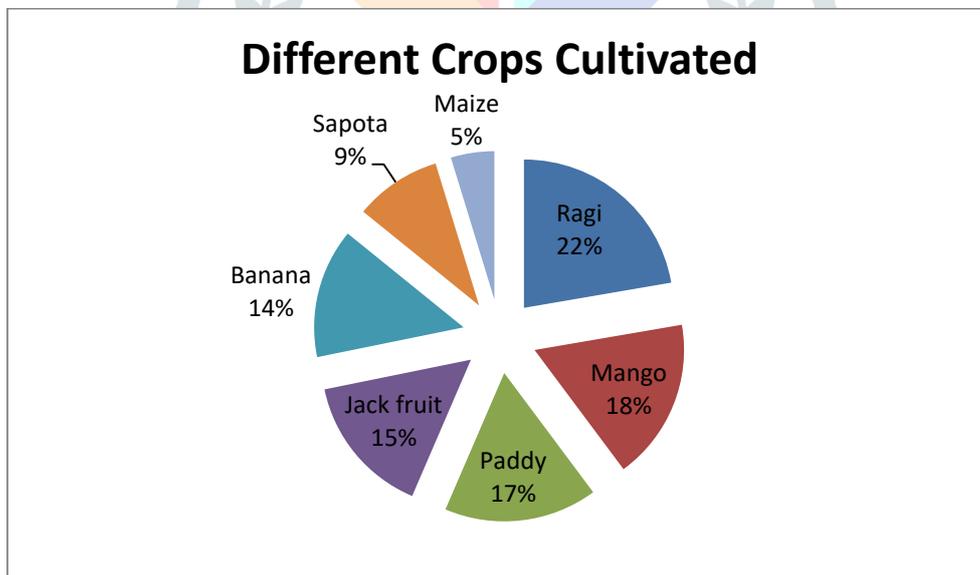


Fig. 3.Crops cultivated in the study area

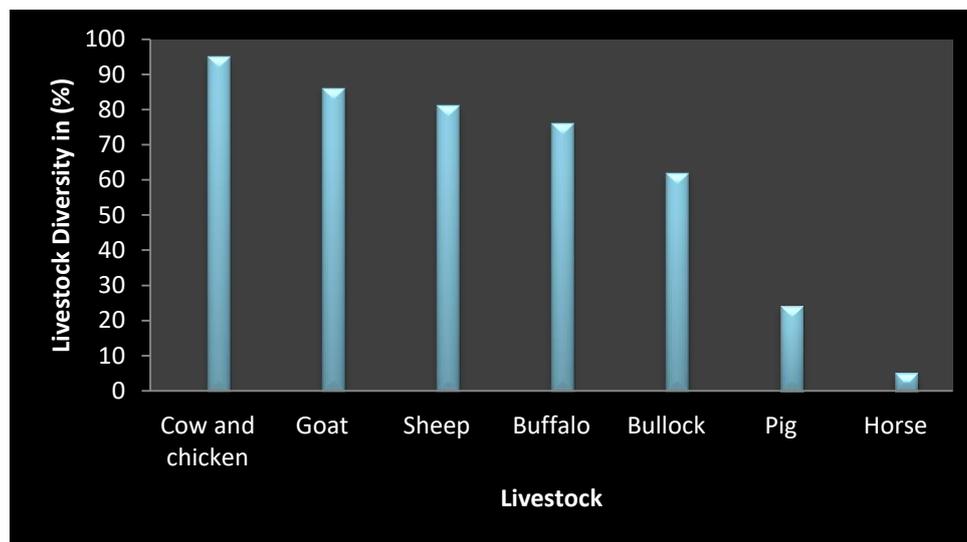


Fig.4.Diversity of Livestock in the study area

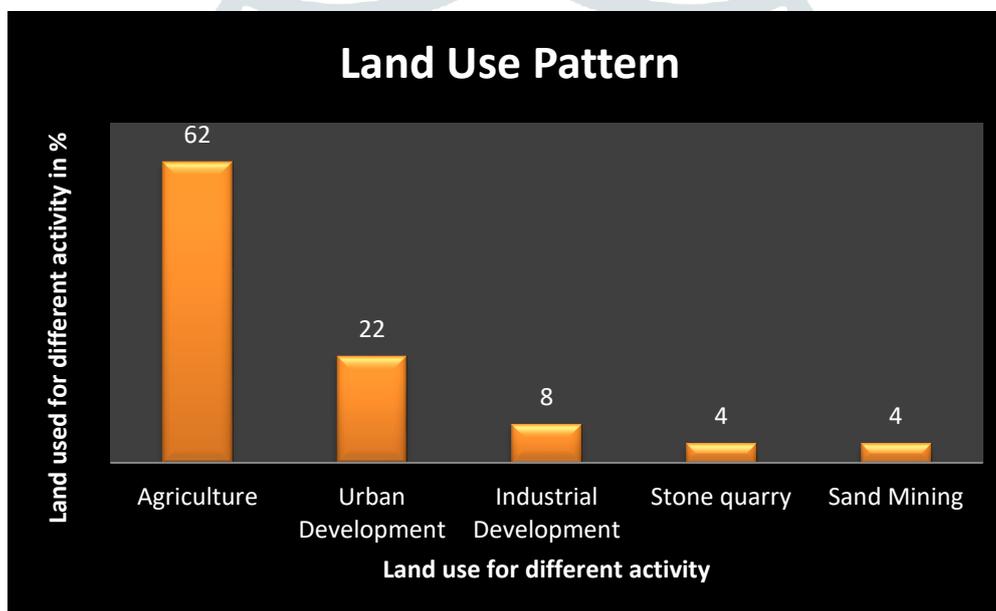


Fig.5. Land Use for different activity

REFERENCES

- [1] The Indian Wild life (Protection) Act, 1972..
- [2] Mr. Gopalakrishna S.P., Surendra Varma *et al.*, (2011): Ecology, Conservation and Management of the Asian Elephant in Bannerghatta National Park, southern India. A Rocha India/ANCF: Asian Elephant Ecology and Conservation Reference Series No.1 pp 14.
- [3] Bhatti, U. and Hanif. M. 2010. Validity of Capital Assets Pricing Model.Evidence from KSE-Pakistan.European Journal of Economics, Finance and Administrative Science, 3 (20).
- [4] Singh, V.V., (2008): wildlife management plan for Bannerghatta National park, 2008-2009 to2012-2013.Government of Karnataka, 2008, pp158.
- [5] Schei, P.J. (1996) Conclusions and recommendations from the UN/ Norway conference on alien species. Science International, 63: 32-36.
- [6] Wiser S. K., *et al.* (1998): Community structure and forest invasion by an exotic herb over 23 years. Ecol. 79, 2071–81.
- [7] Sharma, J. S. Singh (2005): Plant invasions: Emerging trends and future implications Department of Botany, Banaras Hindu University, and Varanasi, India Review articles current science, vol. 88, PP-729
- [8] Rajeev, B. M.T., (2002): Wildlife management plan for Bannerghatta National park, 2003-2004 to 2007-08. Government of Karnataka, India, pp-175.
- [9] IUCN listed threatened species 2009.
- [10] IUCN (2010): Bird Life International. The IUCN Red List of Threatened Species, Version (3).
- [11] IUCN, 2009 and Ali, 2002.
- [12] The wild life protection act 1972 (central act 53of 1972).
- [13] Karnataka Gazette dated 9-1-1975.