



Urban Wilderness in and Around Kolhapur Municipal Corporation Limits

KEYWORDS

Urban wilderness, Biodiversity, Green city

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ABSTRACT

The very identity of many of the world's better known towns and cities is based on their natural wilderness which includes forests, woodlands, grasslands, wetlands, coast, hills etc. In any urban environs these Urban Wilderness (UW) habitats, however small and fragmented they may appear, play a critical role in maintaining local ecological balance, life support systems, minimizing impact of pollution, and recycling organic substances to keep the urban environment clean, green and healthy by maintaining local biodiversity. However, today particularly in the context of developing countries, the UW areas and the biodiversity in and around the growing towns and cities are the most neglected and threatened assets without any regard to their ecological, social, cultural, aesthetic value. Therefore it is imperative to protect and conserve these priceless natural possessions, thus there is an urgent need to assess the UW potential of every urban area for 'green city' management, before it is too late.

There is a mosaic of wilderness habitats, such as streams, river, marshland, tanks, grasslands, woodlands, hills, and gardens, in and around Kolhapur city and its suburban areas with rich biodiversity potential. Though, these are being seriously threatened due to ongoing ill planned developmental activities. The present study was carried out in and around the proposed Kolhapur Municipal Corporation (KMC) limits using Google Earth Satellite images, ground truthing, and field observations of indicator biodiversity taxa in 5 major urban wilderness habitats such as wetlands, grasslands, hills, woodlands and gardens by covering a total of 77 representative field sites in 191.09 Km² area. The study revealed a comprehensive picture of the present status, threats and conservation potential of these urban wilderness habitats.

Introduction

In this era of rapid growth, urbanization of rural places has become inevitable. The process of urbanization is characterized by increased human population density and development of commercial and industrial infrastructure and has diverse effects on the local environment. In 1900, only 9% of the world's human population lived in "urban environments". This figure had increased to 40% by 1980, and 50% by 2000, (World Bank, 1984). And now it is expected to increase over 66% by 2025 (UNEP, 2012) with the towns becoming 'growth' centres, rather than healthy 'development'. Thus the ever increasing population, particularly in developing countries like India, is creating stress on the basic physical services of the growing cities. The impacts of urbanisation frequently include: (1) natural habitats destruction and fragmentation and creation of manmade ones; (2) alteration of natural resource flows, including reductions in net primary production, increases in regional temperature, and degradation of water quality; (3) alteration of disturbance regimes, with habitats experiencing more frequent and extreme disturbances; and (4) changes in local species composition and reductions in richness of most taxonomic groups, and (5) areas of intense urbanization with introduction of large number of exotic species. As a consequence both, the large human populations in urban areas and cultural factors that shape the environs in which people prefer to live, are drastically changing. However to some extent few gardens in residential areas contribute to urban green spaces.

Usually every village, town, city is known for its own unique type of environmental settings. Very identity of many of the world's famous towns and cities is based on their natural wilderness areas like rivers, lakes, hills, grasslands, coasts etc. With different climatic and geographical conditions, soil, biodiversity, strata contributing to the var-

ied types of ecosystems. 'Urban Wilderness' (UW) is recognised world over as an important part of local natural heritage.

In recent years 'urban wilderness, green spaces, green corridors, and open spaces, particularly in and around city, town and urban limits have gained considerable significance in the urban landscape. In early 2000s, apart from the classical 'greening concepts', the concepts of 'urban wilderness areas', 'green city', and 'liveable city' come forward with great prominence (Rink, 2009). According to Meyer, (2009) wilderness areas are "the places where biotic diversity is recognized and valued by society and are defined using arbitrary thresholds of remoteness, naturalness and total area". Urban Wilderness (UB) is further defined as, "a large area of unmodified or slightly modified land, and / or wetland, retaining its natural character and influence without permanent or significant habitation, which is protected and managed so as to preserve its natural conditions." (World Protected Area, 1992). These urban wilderness areas include habitats such as forests, hills, woodlands, grasslands, fields, plantations, wetlands, ponds, lakes, reservoirs, springs, rivers, and coasts and all these wilderness areas provide vital habitat for diverse local and migratory biota. Wilderness areas provide not only space but also food to diverse wildlife in close company of man. (Grimm et al. 2000; Pickett et al. 2002; Alberti et al. 2003).

In the urban and semi urban settings these wilderness habitats play a vital role as ecologically crucial micro-ecosystems and are thus dependable regulating mechanism for the micro climatic regime of town or city surroundings. In the mosaics of urban and semi urban areas, with the wilderness areas in between, play a versatile role as they act as buffers for the negative urban growth. The wilder-

ness areas provide natural resources, minimise the ever-increasing impacts of pollutants to some extent, by acting as pollutant sinkers like carbon sequesters and help in recycling of organic substances. Besides, the biodiversity of the wilderness areas is known to help in keeping urban environment clean as well as green by naturally propagating vegetation. All these precious benefits that are gained from urban wilderness are free of cost and help in directly or indirectly maintaining the health of the urban area. Unfortunately today such wilderness areas in and around the growing towns and cities are the most neglected and threatened and are regarded as wasteland or non-productive areas. Hence UW areas are destroyed without any regard to their ecological, social, cultural and aesthetic value and reclaimed to accommodate haphazard unhealthy growth of the urban sprawl.

The pressure of ever increasing populations for space, resources and infrastructure, demands of industries, real estate development, dumping of untreated sewage and solid waste, propagation of exotic species, over exploitation of natural resources are some of the factors creating unbearable pressure on UW. Thus the current wave of urban sprawl and ill-planned 'growth', not 'developmental', activities degrade the existing contiguous wilderness around the urban and semiurban areas into relatively small, fragmented and isolated non-viable patches in urban environments. The impervious surfaces created through such development degrade the last patches of habitat by drastically altering their natural conditions. Hence fragmentation due to these human activities is the main cause of urban biodiversity loss. According to Miller and Klemens (2002) although careful planning can mitigate some of the adverse impacts of such development, most planning occurs on a site-specific scale, and does not consider the much larger landscape-scale picture, which is essential for long term perspective urban planning. Therefore it is imperative to follow the concept of Sustainable Development (SD) i.e. "Improving the quality of human life while living within the carrying capacity of supporting ecosystems", (WCED, 1987).

It has therefore become essential to conserve the pre-urban natural remnants and create urban green spaces, which is the most important task in any effort to mitigate the potential impacts of urbanization (Nobukazu Nakagoshi, 2007). According to Loram et. al (2008) the coverage, composition, and management of 'green spaces' in urban areas (e.g., private gardens, public parks, sports grounds, derelict land, road and railway verges, waterway banks, and areas of semi-natural habitat encompassed by development) play an important role in determining the extent and intensity of many of the effects of urbanisation. To promote biodiversity in urban areas, research is needed to develop landscape planning and management methods (White, 1994). The study of urban wildlife is a relatively recent approach. With the expansion of urban areas and continuing urban sprawl, however, small patches of high quality urban wilderness habitat may become more important. (Nelson and Nelson, 2001)

Material and Methods

Study Area

The focus of this benchmark study was on the existing urban wilderness habitats in Kolhapur Municipal Corporation (KMC) boundary limit and its proposed expansion in the fringe villages. Kolhapur a typical growing city in Maharashtra is situated at 16° 70' N latitude and 74° 23' E longitudes, at 546 MSL near eastern spurs of the West-

ern Ghats on undulating terrain, on bank of Panchganga River. The region is known for its moderate climate, picturesque natural surroundings and fertile irrigated soils supporting a rich quality of semi urban life. This developing municipal corporation, a historical city, is spread over 66.82 Km² area with population of around 5 lakh (Census, 2011). The proposed expansion of KMC boundary, after inclusion of 17 fringe villages with diverse wilderness habitats, will increase up to 191.09 Km² and would support population over 10 lakh, including migrant and floating population. Considering this expansion, the field study sites were selected within existing as well as expansion city boundary limits in 20 Km periphery around Kolhapur city. Thus a total of 77 field sites, 36 within KMC limits and 41 outside KMC limits, from the 17 villages to be included in the proposed expansion, were selected. The sites were categorised on their wilderness potential into five separate habitat types namely wetlands, grassland, hilly area, woodlands and gardens. Table No.1 shows distribution of the study sites in the five wilderness habitat categories. Map of the study area, indicating location of the wilderness habitat within 20km radius area on fringe of Kolhapur Municipal Corporation (KMC) limits, is given in Figure No. 1.

Table no 1 Number of study sites in the five types of wilderness habitats within and outside Kolhapur Municipal Corporation (KMC) limits

Sr. No.	Habitat Type	Study Sites Within KMC limits	Study Sites Outside KMC limits	Total No. of Study Sites
1	Wetlands			
a	Irrigation tanks	08	11	19
b	Streams	02	02	04
c	Marshlands	03	01	04
d	River	01	00	01
		14	14	28
2	Grasslands	06	08	14
3	Hills	02	07	09
4	Woodlands	07	12	19
5	Gardens	07	00	07
Total sites		36	41	77

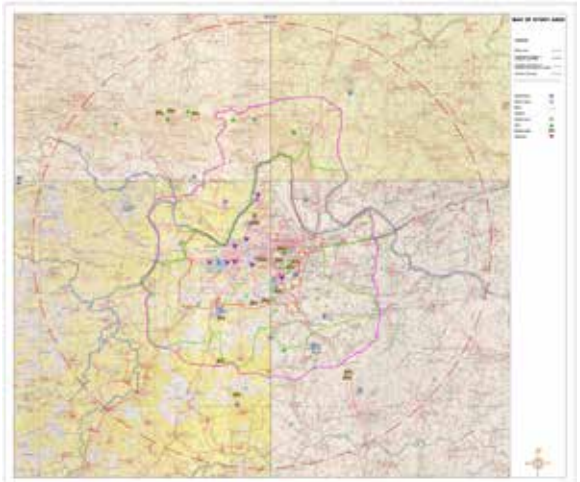


Fig. no.1 Map of the study area indicating wilderness habitat from within and in fringe area (20 km radius) of Kolhapur Municipal Corporation (KMC) limits

Methodology

The field study included personal observations, interaction with locals and on site photo documentation to evaluate present status and threats to the habitats from human activities. Health and wellbeing of any habitat being judged by the diversity of biota it supports, the focus of the investigations was on biodiversity of the wilderness habitats. The study area was categorised in five main wilderness habitats such as wetlands, grasslands, hills, woodlands and gardens.

This being benchmark study on documentation of biodiversity of the wilderness habitats around Kolhapur city, the study was restricted only to the identified microhabitats. The biodiversity study was indicative as to determine the ecological quality of the habitats and not a detailed systematic study of flora and fauna. As the study habitats were under constant pressure of alterations and study time constrains, presence of only vertebrate i.e. Reptile, bird and mammal species were considered as indicators of the wilderness status. Threats to the habitats were also documented to investigate the impacts of growing urbanisation on the urban wilderness area (Desai, 2014). The local people are direct stake holders in urban development, and also responsible for degradation or protection of local ecology and wilderness habitats. Earlier study by Desai and Samant (2016) on the perception of the local population on conservation of their urban wilderness habitats has revealed possibility of still protecting and conserving many such habitats.

Field investigation was carried out in study area in 20 km radius, at all major 42 field sites comprising of 77 micro habitats, as many field sites had more than one type of micro habitat. Google Earth images from ten year period 2004 to 2014 (i.e. year 2004, 2006, 2008, 2011, 2013 and 2014) were compared to learn about the change in landuse practice which was further confirmed by ground truthing. Google Earth Satellite image study, ground truthing and field observations revealed the present status, multiple uses and threats to the five study habitats, namely wetlands, grasslands, hills, woodlands and gardens. Percentages of the threats to each of the five habitats were calculated, and a comprehensive picture of the UW potential of the sites was drawn for each habitat type.

Results and Discussion

The urban wilderness habitats in the study area support a variety of organisms. However, the study being indicative was restricted to select representative microhabitats. Assessment of biodiversity is investigative and to indicate present status of habitats and thus is not a detail systematic study of flora and fauna. Most of the study sites are under constant landuse pressure and alterations in the habitats due to diverse human activities The details of the biodiversity observed during the study is summarised in following table no 2.

Table no 2. Biodiversity recorded at wildernesses habitat sites in the study area

Sr. No.	Biodiversity	No of Orders	No of Families	No. of Species
1	Butterflies	01	08	35
2	Fish	04	08	30
3	Reptiles	02	12	22
4	Birds	21	69	125

5	Mammals	08	12	27
6	Trees & shrubs	25	50	144
	Total	61	159	383

Tree and shrubs in flora and Butterflies, fishes, reptiles, birds, and mammals in faunal taxa were chosen as indicators of wilderness status of study sites. A total of 383 species from 61 orders and 159 families were found to be associated with the five habitats namely wetlands, grasslands, hills, woodlands and gardens. Table no. 3 gives habitat wise details of species diversity.

Table no. 3 Number of species associated with the five habitats in the study area

Type of Habitat	No of species						Total
	Butterflies	Fish	Reptiles	Birds	Mammals	Tree& shrub	
Wetland	28	30	19	107	25	89	298
Grassland	35	00	20	110	23	87	275
Hill	26	00	15	94	20	92	247
Woodland	29	00	18	89	24	25	185
Garden	35	00	17	105	17	105	279

In earlier study (Desai, 2014) it was revealed that many sites were comprised of more than one micro habitat. It is observed that mosaic of micro habitats sustains more number of species as compared to a single habitat. It is seen from Table No.3 that all the five habitats had good representation of biodiversity taxa, where as expected wetlands represented the highest species diversity (78%), compared to other habitats, i.e. garden (73%), grassland (72 %), Hills (65 %), and woodland (48%) respectively. The higher biodiversity percentage from wetland habitats is due to exclusively aquatic as well as associated littoral and ecotonal biota, representing aquatic as well as terrestrial affinity. Whereas the garden habitat had highest number of tree and shrub species, many being ornamental and exotics. Comparatively the grasslands and hilly habitats represented relatively taxa good diversity, with grasslands having better species representation in all taxa except trees and shrubs diversity, which was more in hilly habitat. Contrary to the expectations woodlands were represented with list floral biodiversity among the studied five habitats. This could be attributed to their degraded status as a result of continuous tree felling for firewood purpose and developmental activities as compared to the other habitats.

Some of the common species found in the five study habitats are given below with their common English and scientific nomenclature as follows:

Wetland Habitat and peripheral area:

Plant species – Little hogweed- (*Portulaca oleracea*), Lesser Indian reed mace (*Typha angustata*), Lotus (*Nelumbo nucifera*), Water thyme (*Hydrilla verticillata*), Water morning glory (*Ipomoea aquatica*), Water hyacinth (*Eichhornia crassipes*), Arjun (*Terminalia arjuna*), Indian willow (*Salix tetrasperma*) etc. **Fishes**- Rohu (*Labeo rohita*), Catla (*Catla catla*), Kolshi (*Puntius kolus*), Murrel (*Channa leucopunctatus*), Dokrya (*Channa gachua*), Dandai (*Rasbora daniconius*) etc. **Butterflies**- Common crow (*Euploea core core*), Common emigrant (*Catopsilia pomona*), Common bush-

brown (*Mycalesis perseus blasius*), Blue pansy (*Junonia orithiya*), Painted lady (*Vanessa cardui*). **Reptiles**- Indian flapshell turtle (*Lissemys punctate*), Checkered keelback (*Xenochorphis piscator*), Common skink (*Mabuya carinata*). **Birds**- Indian cormorant (*Phalacrocorax fuscicollis*), Purple heron (*Ardea purpurea*), Pond heron (*Ardea grayii*), Purple moorhen (*Porphyno porphyno*), Coot (*Fulica atra*), Pheasant tailed jacana (*Hydrophasianus chirurgus*), Little egret (*Egretta garzetta*), Red wattled Lapwing (*Vanellus indicus*), Marsh harrier (*Circus aeruginosus*), Brahmany kite (*Haliastur indus*) etc. **Mammals**- Common Langur (*Preshytis entellus*), Fulvous fruit bat (*Rousettus tescenaulti*), Smooth Indian otter (*Lutra perspicillata*)etc.

Grassland Habitats:

Tree and shrub species – Silk cotton tree (*Bombax ceiba*), Acacia (*Accasia nilotica*), Indian lantana (*Lantana Camara*), Oleander (*Thevetia peruviana*), Pongam (*Pongamia pinnata*), Australian acacia (*Acacia ariculifermis*), Common Sesban (*Sesbania sesban*), etc. **Butterflies**– Spotless grass yellow (*Eurema laeta sikkima*), Grass yellow (*Eurema hecabe contubernalis*), Common Crow (*Euploea core core*), etc. **Reptiles** - Fan-throated Lizard (*Sitana ponticeriana*), Garden lizard (*Calotes versicolor*), Russell's viper (*Daboia russeli*), Indian Cobra (*Naja naja*), Green Keelback (*Microstodon plumbicolor*), **Birds**– Black winged kite (*Elanus caeruleus*), Indian shikra (*Accipiter badius*), Harrier (*Circus aeruginosus*), Common Quail (*Coturnix coturnix*), Common Peafowl (*Pave cristatus*), Skylark (*Alauda arvensis*), Pipit (*Anthus pratensis*) etc. **Mammals** - Common Mongoose (*Herpestes edwardsi*), Indian pangolin (*Manis crassicaudata*), Indian fox (*Vulpes bengalensis*), Black naped hare (*Lepus nigricollis*), etc.

Hilly Habitats:

Tree and shrub species – Indian soapnut (*Sapindus laurifolius*), Madras thorn (*Pithocollobium dulce*), Australian acacia (*Acacia ariculifermis*), African tulip tree (*Spathodea campanulata*), Flame of forest (*Butea monosperma*), Siamese senna (*Cassia siamea*), Indian jujube (*Ziziphus mauritiana*), Bidi leaf tree (*Bauhinia racemosa*), etc **Butterflies**– Grass yellow (*Eurema hecabe contubernalis*), Painted lady (*Vanessa cardui*), Lime butterfly (*Papilio demoleus*), Crimson rose (*Pachliopta hector*) etc **Reptiles** – Monitor lizard (*Varanus indicus*), Rat snake (*Ptyas mucosus*), Common krait (*Bungarus caruleus*), Skink (*Mabuya carinata*), etc. **Birds**– Spotted Dove (*Streptopelia chinensis*), Laughing dove (*Spilopelia senegalensis*), Barn owl (*Fyto alba*), Wiretailed, Swallow (*Hirundo smithii*), Jungle babbler (*Turdoides striata*), Indian Shikra (*Accipiter badius*) etc. **Mammals**- Blacknaped hare (*Lepus nigricollis*), Barking deer (*Muntiacus muntjak*), Wild boar (*Susscrofa cristatus*), Indian fox (*Vulpes bengalensis*), Common langur (*Preshytis entellus*), etc..

Woodland Habitat:

Tree and shrub species – Neem (*Azadirachta indica*), Australian acacia (*Acacia ariculifermis*), Mango (*Mangifera indica*), Acacia (*Accasia nilotica*), Crape Jasmine (*Tabernaemontana divaricate*), Kashid (*Cassia siameia*), Peacock flower (*Caesalpinia pulcherrima*), etc. **Butterflies**– Blue mormon (*Papilio polymnestor*), Common tiger (*Danaus genutia*), Common cerulean (*Jamides celeno*), Common emigrant (*Catopsilia pomona*), etc. **Reptiles**- Common whipsnake (*Ahaetulla nasustus*), Sawscaled viper (*Echis carinata*), Common ratsnake (*Ptyas mucosus*), Cobra (*Naja naja*), etc **Birds**– Gery hornbill (*Tockus birostris*), Golden backed woodpecker (*Dinopium benghalenso*), Jungle myna (*Acridotheres fuscus*), Jungle babbler (*Tur-*

doides striata), Indian cuckoo (*Cuculus microptirus*), Coucal (*Centropus sinensis*) etc. **Mammals**- Common mongoose (*Herpestes edwardsi*), Blacknaped hare (*Lepus nigricollis*), Barking deer (*Muntiacus muntjak*), wild boar (*Susscrofa cristatus*) etc.

Garden Habitat:

Tree species - Bidi leaf tree (*Bauhinia racemosa*), Rubber (*Ficus elastic*), Queen crape myrtle (*Lagerstroemia speciosa*), Palm (*Palm Phoenix*), Cape jasmine (*Gardenia jasminoides*), Rain tree (*Albizia saman*), Gulmohur / Flame tree (*Delonix regia*), Pangara/ Lenten tree (*Erythrina indica*) etc. **Butterflies**– Lime (*Papilio demoleus*),Crimson rose (*Atrophaneura hector*), Twany coster (*Acraea violae*), King Crow(*Euploea klugii*), etc. **Reptiles** - Garden lizard (*Calotes versicolor*), Earth boa (*Eryx johnii*), Cat snake (*Boiga trigonate*), Rat snake (*Ptyas mucosus*), etc. **Birds** – Crimson breasted barbet (*Megalima haemacephala*), Red vented bulbul (*Pycnonotus café*), Purple rumped sunbird (*Leptocoma zeylonica*), Dayal (*Copsychus saularis*), Indian robin (*Saxicoloides fulicatus*), Brahminy myna (*Sturnia pagodarum*), Common crow (*Corvus splendens*), etc. **Mammals**- Common mongoose (*Herpestes edwardsi*), Indian flying fox (*Pteropus giganteus*), Common langur (*Preshytis entellus*), Three striped squirrel (*Funambulus palmarum*) etc.

Presence of a mosaic of fragmented micro habitats such as streams, river, marshland, tanks, grassland, woodland, hills, and gardens make Kolhapur city and its surroundings rich in biodiversity, which is an asset to the city as it keeps urban environment healthy and clean. However, in the last decade the increased developmental pressures, mainly through changed land use and pollution, have already seriously altered many of these habitats. Now it is posing a serious and immediate physical threat to ecology and biodiversity of the remaining intact habitats.

Threats to the Urban Biodiversity –

Growing population and ongoing developmental activities in the city are exerting pressure on the urban wilderness in the region. These activities not only continuously and exponentially increase pressures on the local natural resources, such as wilderness habitats, but are degrading them qualitatively as well as quantitatively. Many of the earlier well known wilderness areas in the region have now been damaged beyond regeneration level. The comprehensive picture of the threats to habitats and biodiversity studied are expressed in Figures No. 2, 3, 4, 5, and 6.

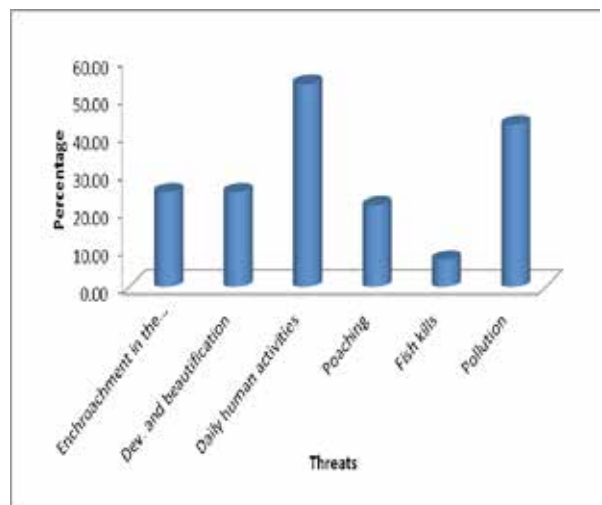


Fig no. 2 Major threats to wetland habitats

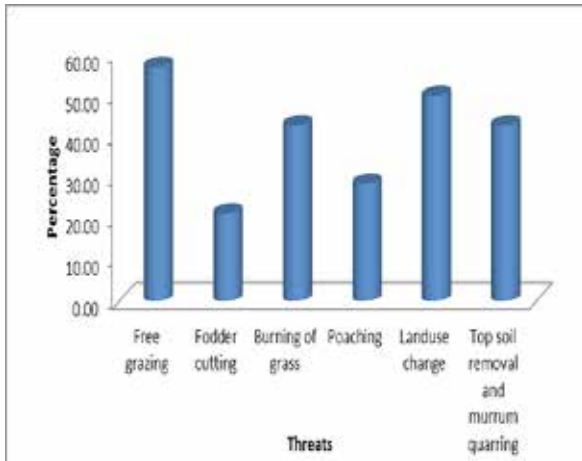


Fig no. 3 Major Threats to Grassland in the study area

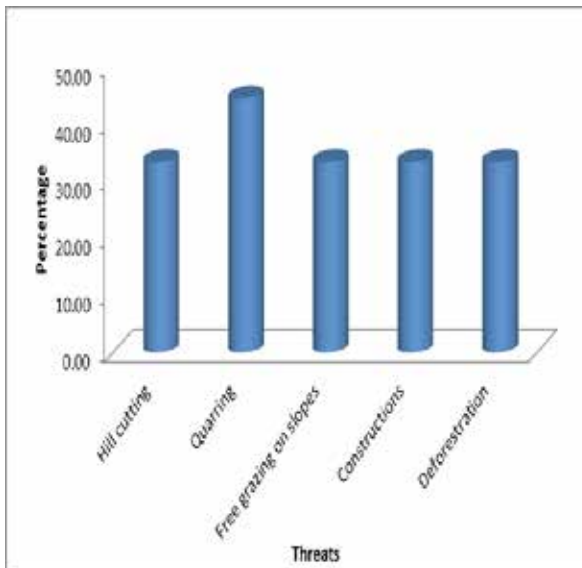


Fig no. 4 Major threats to hilly habitats in the study area

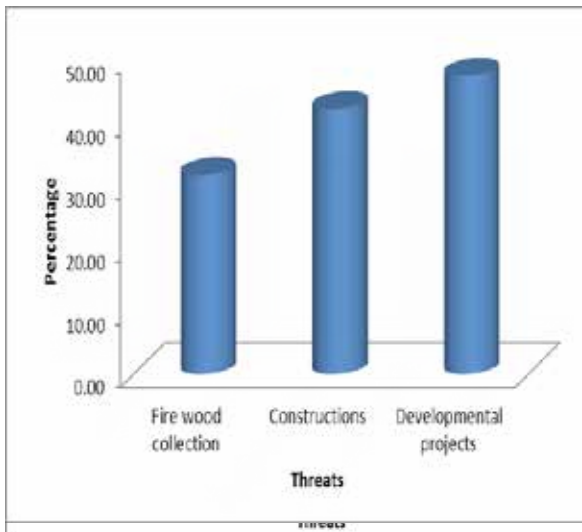


Fig no. 5 Major threats to woodland habitats in the

study area

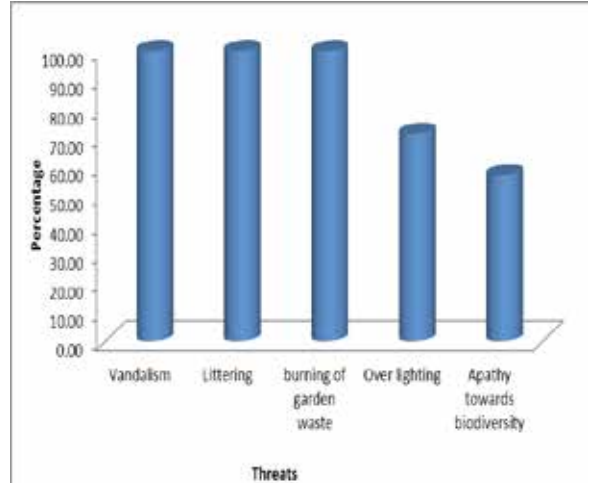


Fig no. 6 Major threats to garden habitats in the study area

The wilderness study revealed that in general the status of study wetlands was more or less degraded and the process continued. Fig No. 2 shows human encroachment in the marginal areas of wetlands had altered (25%) the natural habitats. e.g. Kotitirth tank, under pretext of 'Development and beautification' of wetlands, serious negative impacts on (25%) wetlands. e.g. Rankala tank, Padmala marshland were noticed. Conservation of biodiversity in the habitats was neglected component. Growing pollution was adversely affecting biodiversity (43%) of some lotic water bodies e.g. Panchaganga River, Dudhali and Jayanti nallas. Frequently occurring fish kills were indicators of sever pollution levels in some of them (11%), namely Rankala tank and Panchaganga River.

Traditionally many areas in and around the city and villages were kept as community common grazing lands (pastures) locally called village 'Gairan', and some of the uncultivated places referred as 'Malran' (fallows). These habitats were used for free grazing of cattle (57%) and fodder collection by grass cutting to (29%) e.g. university campus. However, annual rampant cutting and burning of grassland (43%) destroys diverse fauna of the grassland habitats. e.g. vast campuses of Shivaji and MF agricultural universities. Over grazing, converting grassland into wasteland and hunting of birds and animals amounted to (22%). But the most important was negative land-use change (51%), followed by removal of topsoil and murum quarrying (43%) reported as major threats to the habitat. Most of the grasslands from outskirts of the city were privately owned and thus caused rapid alterations in landuse due to urban development and haphazard growth activities.

Most of the hilly sites were situated on the periphery of Kolhapur city with 600 MSL and above elevation. The northern hilly range of Kolhapur city (up to 700 MSL) provides habitat for variety of typical wild fauna including leopard and associated prey species. Hill slope cutting (34%) and murum, stone quarrying and soil excavation (44%) are the common threats to the habitats at Top, Jyotiba, Rakshi, and Chambukhadi. Free cattle grazing (34%) was also common on the hill plateaus and slopes. Giroli hill is a typical example where thick wooded habitat was completely removed for construction of roads and farm-houses. Same scenarios exist in all hills in the study area.

Majority of the woodlands either were degraded natural forest or manmade plantations of exotics tree species. These fragmented woodland pockets in and around the city play an important role in sustaining ecological balance of the city and nurture diverse biota. However, many of these habitats represented comparatively fewer species as they were mostly social forestry plantation. The ongoing developmental activities in the hilly region were damaging (43%) the existing vegetation cover. However some of them such as Kalama tank catchment development, TA battalion and Shahu mill woodland can be protected as part of landscape improvement without much altering in their character. Many patchy and fragmented groves and woodlands on government, village panchayat or community lands needs to be protected on top priority for local ecological purpose.

Gardens are considered essential part of any urban landscape. Although the present stress on ornamental gardens, exclusively for leisure and entertainment use, does not serve any meaningful ecological purpose. The Town Hall, one of the oldest botanical garden in the city, has preserved a variety of rare tree flora and associated fauna, particularly large roost of Indian flying fox (*Pteropus giganteus*). Hutatma Park and Mahavir gardens situated along Jayanti nala support several microhabitats. Rapid growth, legal or illegal in and around the city, without any green spaces is exerting pressure on the existing limited garden habitats. There is thrust by the administration on creation and maintenance of conventional gardens with lawns, ornamental bushes and shrubs and non-usable fountains, when there is dire need of creating thick groves and block plantations of local species of large evergreen trees for ecological functions of pollution control, carbon sequestration, habitats for fauna and oxygen generation to function as lungs of the city, besides recreation.

Conclusion

Biodiversity study carried out was indicative of present habitat quality of the five major semiurban habitats and microhabitats. Mosaic of these habitats have enriched Kolhapur city for years and given a character for which it is known. The naturally rich assortment of diverse habitats in limited area is a unique feature of the city, which supports wealth of biodiversity and as an asset to urban wilderness conservation. These areas have good potential to maintain the city green, healthy and Liveable. Hence, the dwindling urban biodiversity, along with its wilderness habitats needs to be protected and conserved at any cost to keep the city prosperous by all means. According to Blair, (2001), it is essential to use remnant 'natural' habitats in urbanised areas as tools for biodiversity conservation rather than to focus on unrealistic restorations and development of cities. The possibility of restoration of urban greens is limited, and plans for biodiversity conservation are constrained by public policy and the configuration of towns. However, urban biodiversity is of particular importance for the recreation of town dwellers and to sensitise citizens to the conservation of biodiversity (Ormerod, 2003).

Considering the environmental and social needs of growing population and expanding city limits of Kolhapur, in long-term perspective planning wilderness areas and green spaces ought to be increased in their number and size and preserved and carefully monitored, especially in neighboring villages and new settlements. In most developing cities like Kolhapur, there are wilderness patches in semi urban areas or on fringe villages which are inseparable part of the growing towns with great potential of sustainable urban development which is truly eco-friendly and Liveable.

References: –

- Alberti, M. J., J. Marzluff, E. Shulenberg, G. Bradley, C. Ryan, and C. Zumbunnen. (2003) Integrating humans into ecology: opportunities and challenges for studying urban ecosystems. *BioScience* 53(12):1169-1179.
- Ali, Saleem H. (2008) 'Green Cities: Urban Growth and the Environment', *Journal of the American Planning Association*, 74:1, 143
- Anonymous (1975) Regional Plan for Kolhapur -Ichalkaraji region. (1971-91)
- Anonymous (2011) Census of India, Government of India (GOI)
- Blair, R.B. (2001). Birds and Butterflies Along Urban Gradients in Two Ecoregions of the United States: Is Urbanization Creating a Homogeneous Fauna. In: Lockwood, J.L., McKinney, M.L. (Eds.), *Biotic Homogenization*. Kluwer Academic/Plenum Publishers, New York, pp. 33–56.
- Collins, Michael P. (1991) 'Green Cities: Ecologically Sound Approaches to Urban Space', *Urban Studies*, 28:3, 495 — 497
- Davies Richard G. & Barbosa Olga & Fuller Richard A. & Tratalos Jamie & Burke Nicholas & Lewis Daniel & Warren Philip H. & Gaston Kevin J. (2008), City-wide relationships between green spaces, urban land use and topography *Urban Ecosystem* 11:269–287
- Desai Nilisha (2014) Study on conservation of urban wilderness: a case study of Kolhapur city, Ph.D. thesis, Shivaji University, Kolhapur
- Desai Nilisha and Samant Jay (2016), Perception of Local People on Urban Wilderness habitats in Kolhapur City, *International Journal of Scientific Research*, Vol.5, Issue 2: 272 – 275
- District Social and Economic Review Report- Kolhapur district. (2012). Govt. of Maharashtra.
- Grimm, N. B., Grove, J. M., Pickett, S. C., Redman, L. (2000). Integrated Approaches to Long-Term Studies of Urban Ecological Systems. *Bio-Science*, 50, 571-584.
- Kumagai, Yoichi and Yamada, Yoriyuki. (2008) 'Green space relations with residential values in downtown Tokyo - implications for urban biodiversity conservation', *Local Environment*, 13:2, 141 — 157
- Loram Alison, Warren Philip H., Gaston Kevin J. (2008), *Urban Domestic Gardens (XIV): The Characteristics of Gardens in Five Cities*, *Environmental Management*
- Miller, N. A. and M. W. Klemens (2002), *Eastern Westchester Biotic Corridor*, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York, MCA Technical Paper No. 4
- Myere Amenda (2009) *The Nature of and Need for Urban Parks* (Private circulation Paper)
- Nakagoshi Nobukazu (2007), Analysing urban green space pattern and eco-network in Hanoi, Vietnam Pham Duc Uy, *Landscape and Ecological Engineering*, 3:143–157
- Nelson G. S., Nelson S. M., (2001), Bird and butterfly communities associated with two types of urban riparian areas, *Urban Ecosystems*, Vol 5: pp 95-108
- Ormerod S. J. (2003). *Restoration in Applied Ecology: editor's introduction*. *J Appl Ecol*, 40:44–50
- Palmer (2003), Colonization, urbanization, and animals', *Philosophy & Geography*, 6:1, 47 — 58
- Pickett, S. T. A., and M. L. Cadenasso (2002), The ecosystem as a multi-dimensional concept: meaning, model, and metaphor. *Ecosystems*, 5:1-10
- Rink Dieter. (2009). Wilderness: The Nature of Urban Shrinkage? The Debate on Urban Restructuring and Restoration in Eastern Germany. *Nature and Culture*, 4(3): 275–292
- Selman, P. H. (1984) 'Planning for green cities: some emerging principles', *Journal of Environmental Planning and Management*, 27:2, 54 — 59
- United Nations. (1993). *World Urbanisation Prospects- The 1992 Revision* United Nations. New World
- United Nations. (2012). *World Urbanization Prospects: The 2012 Revision*, UN Department of Economic and Social Affairs, Population Division, esa.un.org/unpd/wup/index.htm
- White, R. R. (1994). *Urban Environmental Management: Environmental Change and Urban Design*. John Wiley, Chichester
- Wolch, Jennifer (2007) 'Green Urban Worlds', *Annals of the Association of American Geographers*, 97:2, 373 — 384
- World Commission on Environment and Development (WCED) (1987), *Our Common Future*, Oxford University Press, Delhi, 383p.