

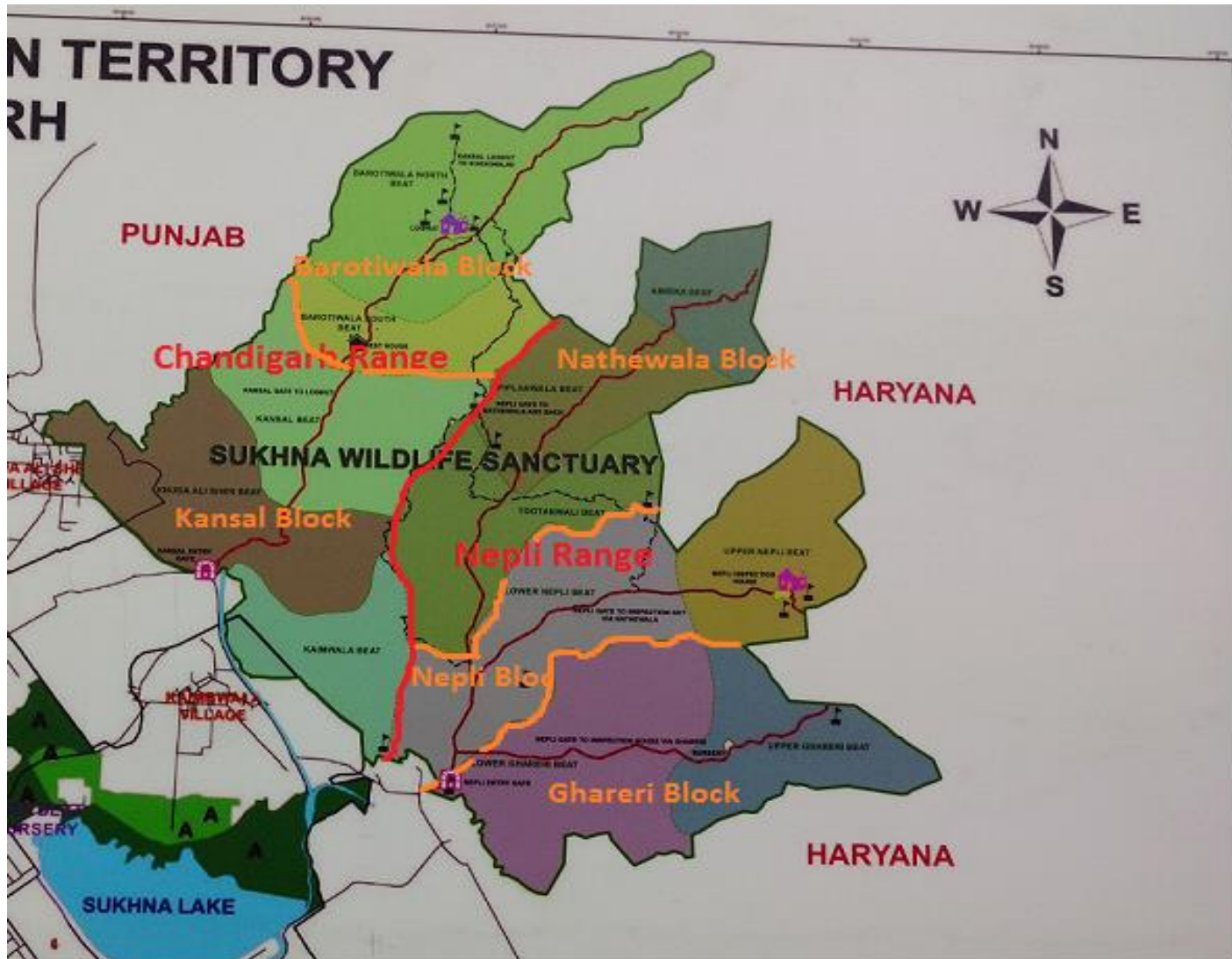
**Management Plan
of
Sukhna Wild Life Sanctuary**

(2018-19 to 2027-28)

Chapters of Management Plan Document

1. Introduction giving details, background, history & why management plan is necessary
2. History of the Management Plan of Sukhna WLS, UT Chandigarh & its present practices
3. Profile of Sukhna WLS UT Chandigarh
4. Issues & Challenges
5. Strategies to overcome the challenges
6. Management of Tourism Zone & conservation education
7. Eco-development of areas adjoining the Sukhna WLS Chandigarh
8. Man-animal conflict and resolution
9. Research, monitoring & Training
10. Organisation & administration
11. Schedule of operations and miscellaneous prescriptions

Administrative Map of Sukhna WLS



Extent and constitution of Sukhna WLS

- **Reserve forest area** – 7,548.43 acre notified as R.F. area by Secretary, Forest and Environment, Chandigarh Administration
- - Sukhna Choe : 866.56 acre
 - Lake Area : 260.88 acre
 - Hilly Area : 6420.99 acre
- Total : 7548.43 acre or
- 3054.74 ha or 30.5474 sq km.
- **Sukhna WLS** – 6,420.99 acre from within the above R.F. area, notified as Sanctuary vide Secretary, Environment and Forest, Chandigarh Administration notification No.694-H II(4)-98/4519 dated 6.3.98. (Appendix – II).
 - Hilly Area – 6,420.99 acre or 2598.48 hectare

Compartments

- In a wild life sanctuary, compartments are not prime, for the fact that rotation of crop may not be a priority;
- Nevertheless, compartment is the smallest management unit, which refers to a certain specific area of the forest having defined boundary, natural features & biodiversity;
- In all, 12 Beats having 12 compartments or 24 sub-compartments have been suggested :-

S.No.	Block	Beat	Comptt. / Sub-comptt. Ref No.	Area (in Ha.)
1	Barotiwala	Barotiwala North	1A	216.00
2		Barotiwala North	1B	88.00
3		Barotiwala South	2A	42.94
4		Barotiwala South	2B	97.06
5	Kansal	Kansal	3A	87.86
6		Kansal	3B	127.14
7		Khuda Ali Sher	4A	219.78
8		Khuda Ali Sher	4B	100.22
9		Kaimbwala	5	154.00
10	Nathewala	Ambika	6A	77.97
11		Ambika	6B	52.03
12		Piplanwali	7A	65.97

S.No.	Block	Beat	Comptt. / Sub-comptt. Ref No.	Area (in Ha.)
13		Piplanwali	7B	44.03
14		Tootanwali	8A	137.20
15		Tootanwali	8B	120.80
16	Nepli	Lower Nepli	9A	119.46
17		Lower Nepli	9B	107.03
18		Lower Nepli	9C	53.51
19		Upper Nepli	10A	214.58
20		Upper Nepli	10B	50.40
21	Ghareri	Lower Ghareri	11A	129.20
22		Lower Ghareri	11B	105.80
23		Upper ghareri	12A	64.00
24		Upper ghareri	12B	136.00

(Grid method has been used to segregate areas of Compartments / sub-compartments)

Map showing Compartment / Sub-compartment boundaries



Compartments in Sukhna WLS

Statement of Significance

- Falls under **Champion & Seth's Type 5B/C1** Northern Tropical Dry Mixed Deciduous Forests & **5/DS1** Dry Deciduous Scrub.
- **In geological terms** it hoards immense value as the area was once inhabited by mammoth elephants, gigantic turtles, members of Dinosaur class & extinct gymnospermous tree stems of late Pliocene now calcified;
- Sukhna WLS is situated in Shivalik Hills which comprises ***Naturally Hilly Ecosystem*** and represents a very fragile ecosystem being located on **conglomerates** and thereby very loose soil **devoid of humus** and very high run off rate of soil. It falls in the **Western Himalayas** and **Lower Gangetic Plains bio-geographical zones**; contiguous to the forests of Haryana and Punjab in the region.
- The Sanctuary supports a **significant population** of Sambhar, Nilgai, Jungle Cat, Jackals, stray dogs, , Wild Boar, Porcupine, Mongoose, small Mongoose, Indian Palm Civet, Pangolin, Common Langur, Rhesus Monkey, Peacock, Grey Partridge, Kingfisher, Parrots, Doves, Jacanas besides sizeable population of snakes and butterflies.

Statement of Significance (contd.)

- Sukhna WLS area is the **catchment for 4 major seasonal streams** (Choe) viz. Kansal, Nathewala, Nepli and Ghareri Choe(s). The catchment area supports the continuous water supply regime to Sukhna lake at Chandigarh, which is a major local & tourist attraction.
- Sukhna WLS acts as a '**Green Lung**' to the heavily congested and over populated capital of 2 states of Haryana and Punjab and the seat of U.T. Administration.
- Sukhna WLS provides opportunity for **environmental education** to the young minds and nature interpretation to the nature lovers.
- Sukhna Lake attracts huge flock of **migratory birds** each year; the vicinity of Wildlife Sanctuary provides breeding ground to some.

Faunal & Floristic diversity of Sukhna WLS

- Trees 40, Shrubs 28, Climbers 10, Herbs 28 & Grasses 16. Besides some bamboos & palms also found there.
- Mammals 20
- Reptiles 10
- Birds >120
- Amphibians 3
- Fish 3
- Invertebrates 30
(Insects)

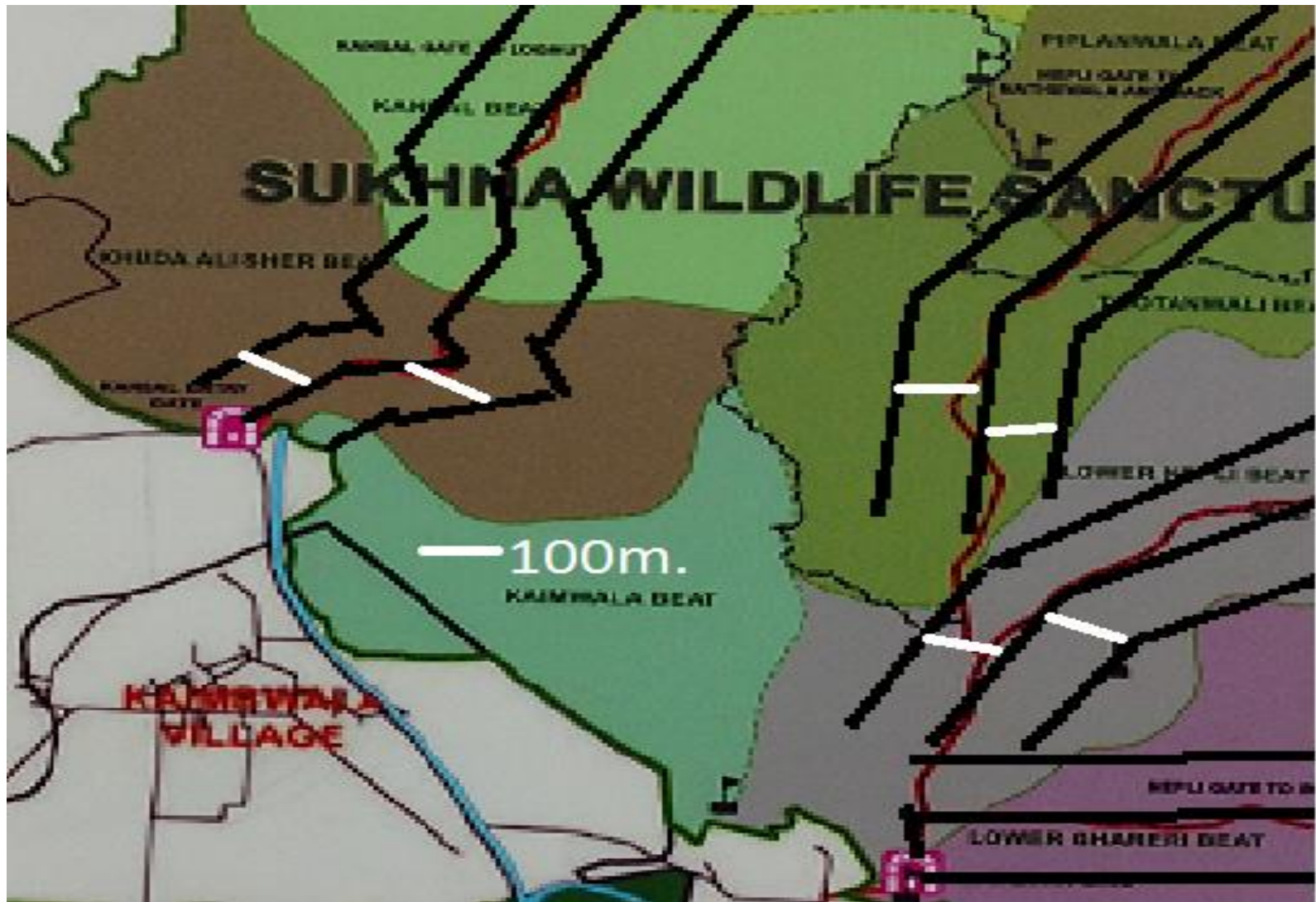
Photos of evidences during transect walk



Spatial Distribution Of Fauna In Sukhna WLS

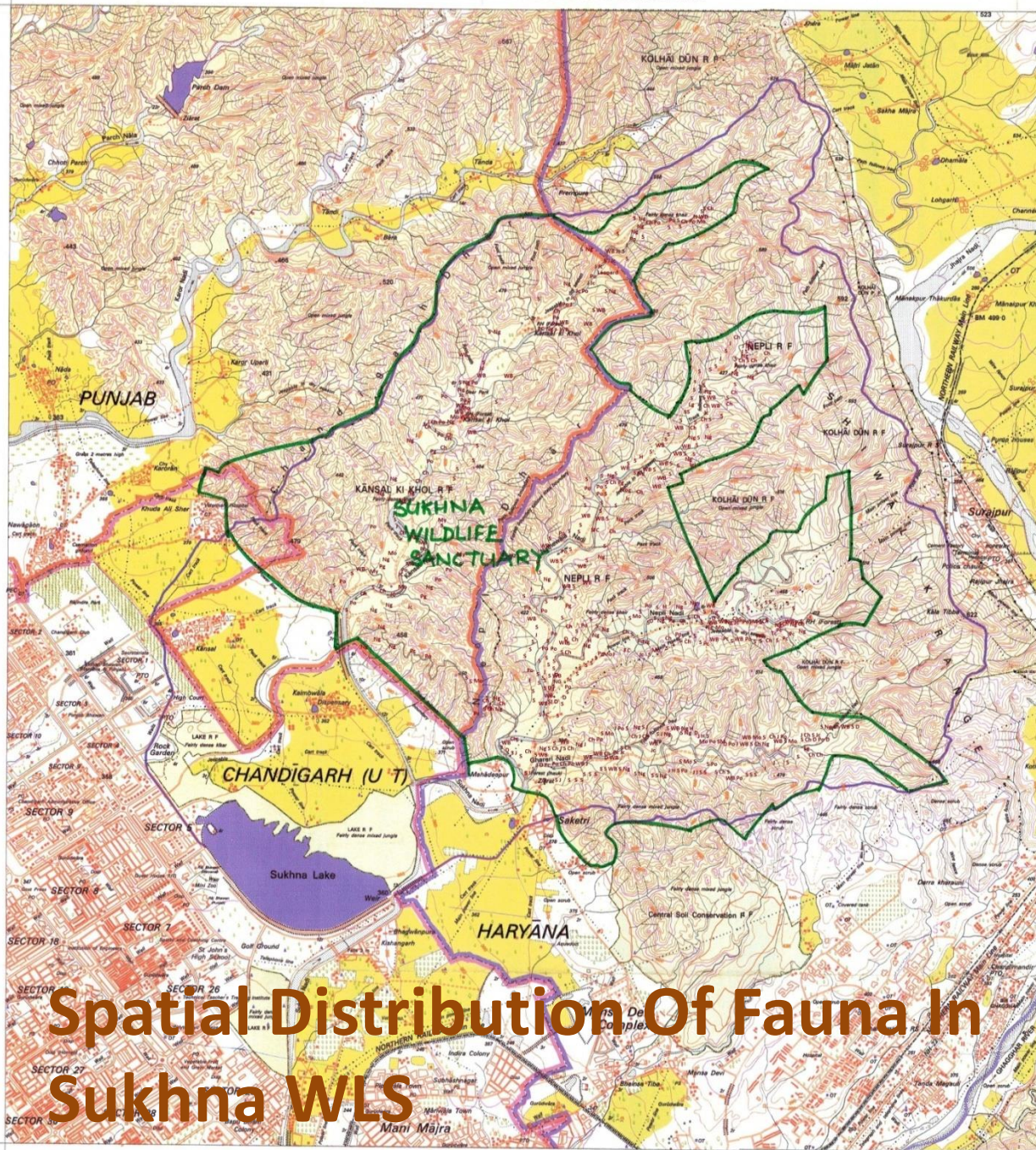
- **Transect method** has been followed to study faunal distribution;
- Being dry deciduous forest, maximum animal movements can be gauged along water courses;
- 4 **water courses** namely; Kansal, Nathewala, Nepli & Ghareri were studied;
- 3 transects 100m apart were laid; mid-stream dry bed, 100m. on either flank in each nallah.
- **Distribution** of animals is based on pug / hoof marks and on droppings (poops, antlers, spines) and carcass to mark zones where different species visit the streams;

Transects Map



Results of Transect Walks

- **Top of trophic level** has Leopard (*Panthera pardus*) at the apex, but the evidences were really scarce. Pug marks only in Kansal and kills in Nathewala;
- **At level-III**, jungle cats, jackals, escaped-to-wild (feral) stray-dog packs, birds of prey are the main carnivores; jungle cat foot prints few, mainly packs of stray dogs (3 to 4 packs of 10-12 dogs), few jackals; their prey base is young ones of chital & sambar and small mammals. Population of these herbivores is severely restricted
- **At trophic level – II**, herbivores are the main prey base for higher trophic levels: grown up neel gai is too big for a leopard, only young ones and sub-adult females are preyed, also Sambar & Chital; population of chital is low and restricted to pockets of Kansal, Nepli, Nathewala & lesser in Ghareri. Wild Boar is available in plenty in all valleys. Among plants, **Wood rot fungus of Khair** in Nepli require special mention & attention.
- **Small mammals** are in a decreasing order: Porcupine> Mongoose> small mongoose> civet cat> Pangolin. Porcupine is found every where. Special attention to be paid to Pangolin.
- **Trophic level-I** are autotrophs i.e. plants and discussed elsewhere.



Spatial Distribution Of Fauna In Sukhna WLS

Issues & challenges

- Sukhna WLS falls in the **bio-geographic zones** of **Western Himalayas** and **Lower Gangetic plains**.
- **Tropical Dry Deciduous forests (5B/C1) & scrub (5B/DS1)** in outer Shivaliks.
- **Locality factors** pose a variety of **issues and challenges given as below:**
 - To **augment the catchment capabilities** of the area by reducing soil erosion and provide clear water to the lake, perennially.
 - To **restore and conserve** the representative **biodiversity** of the area
 - To lay **emphasis on maintaining a viable population** of wild animals.
 - To **enhance capacity building** for effective management.
 - To **promote regulated tourism / eco-tourism** for aesthetics & leisure, conservation education/ Training, building mass support through environmental awareness, opportunities for self employment and **enhance visitor experience**.
 - To **encourage field research**, inventorise to develop an adequate database, networking and develop a monitoring protocol.
 - **Other issues**

1. Augmenting catchment capabilities of the area

- **prime objective** with which this area was set aside in 1950s to provide water to the Sukhna artificial lake in perpetuity;
- However subsequent siltation led to Soil Conservation measures, **enormity** of work extended to 175 Check Dams, silt detention dams and other veg. means for creating green cover
- **Geological formation** – Conglomerate, a challenge
- **Continued de-siltation** till strata stabilizes with veg cover,
- **succession** of better plant species of next seral stages to replace dry deciduous vegetation akin to earlier seral stages of riverine succession

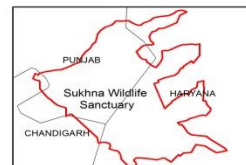
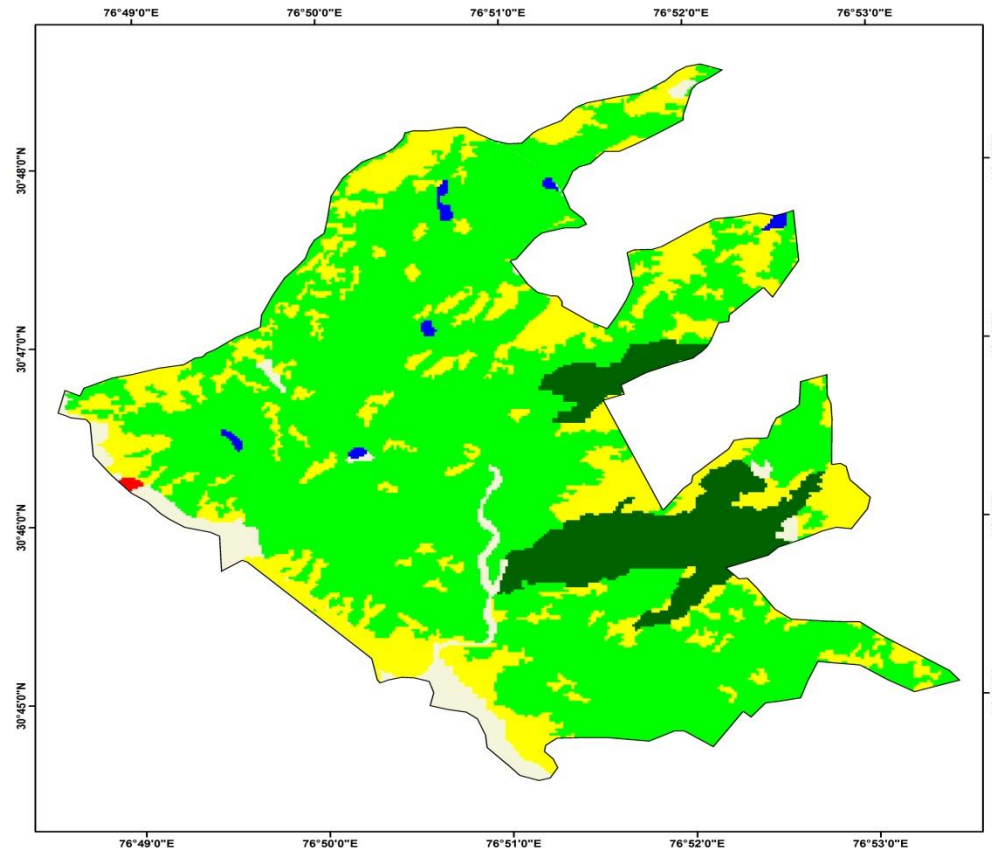
2. Restoring and conserving biodiversity of Bio-geographic zone (BGZ)

- Existing vegetation pattern is shown in vegetation map of the sanctuary, which shows that roughly **66% area** is under **moderately dense canopy**.
- **Pebbly conglomerates greatly heated up** during summers, leaving only **xerophytic, shrubs & trees** with deeper root systems to survive
- Water conservation has **increased moisture** in soil - stage set for **next seral stage** or even **climax vegetation** of BGZ; also palatable grasses in the flood plains for **enhanced fodder** availability
- Slopes require shade providing spp. through intervention, excessive regn. of *Prosopis* & *Leucinia* to be contained, *Adhatoda* & *Murraya* replacing available space after *Lantana* uprooting need **to be curtailed** & planted with **suitable grasses**

Vegetation Map



FOREST SURVEY OF INDIA
Forest Cover Map of Sukhna Wildlife Sanctuary
(as per India State of Forest Report, 2017)



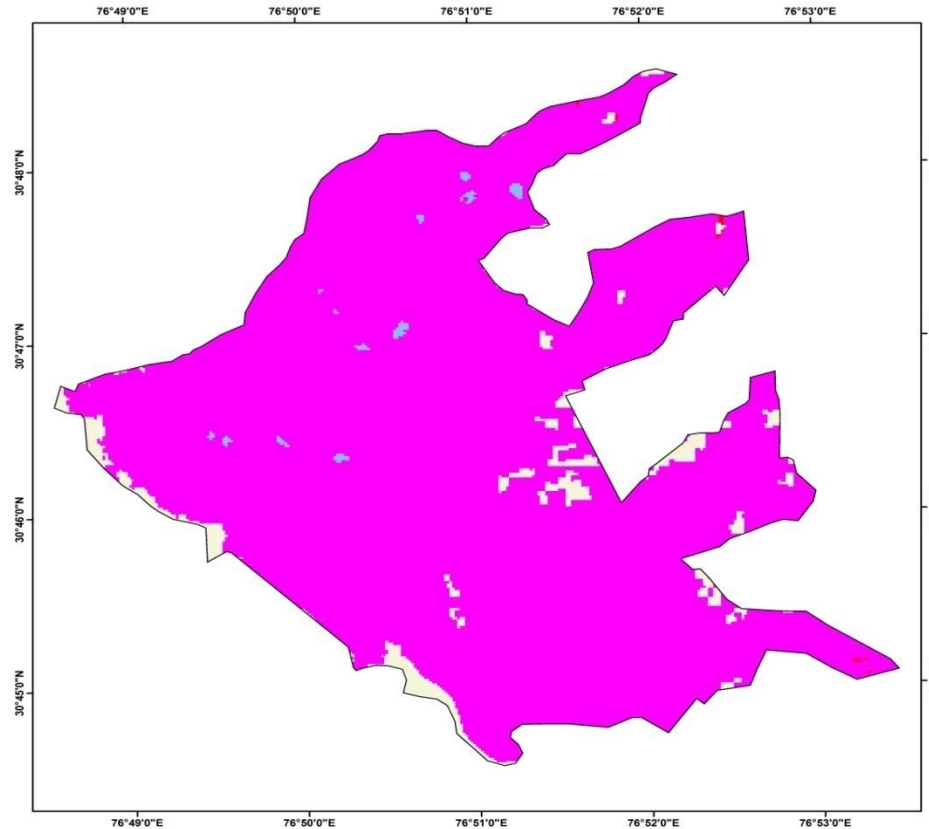
Legend	
	Very Dense Forest
	Moderately Dense Forest
	Open Dense Forest
	Scrub
	Non Forest
	Water

(Based on Digital Interpretation of IRS P6-LISS III IRS-Resourcesat-2 LISS III Data)

Forest Types Map



FOREST SURVEY OF INDIA
Forest Type Map of Sukhna Wildlife Sanctuary
(as per FSI's Forest Types of India, 2011)



(Based on Digital Interpretation of IRS 1D LISS III)

Percent area under different density forests in SWLS

Type	Area (in sq. km.)	%
Very Dense Forests	2.36	9.08
Moderately Dense Forests	17.01	65.47
Open Forests	6.03	23.21
Deciduous scrub	0.02	0.077
Non Forest area	0.56	2.155
Total	25.98	99.99

Fire

S. No	Year	Area Burnt (Ha)	Location of Fire Incidence	Type of Fire	Damage	Remarks
1	2009	93	Upper Nepli-Lower Nepli-Tootawali-Piplawala	Ground	Nil	High Tension wire passing through area. Fire coming from Morni Hills area of Haryana
2	2010	5	Nepli	Ground	Nil	
3	2011	8	Nepli	Ground	Nil	
4	2012	15	Upper & Lower Nepli	Ground	Nil	
5	2013	1	Nepli	Ground	Nil	
6	2014					
7	2015	80	Upper Nepli-Lower Nepli-Tootawali-Piplawala	Ground	Nil	

3. Lay emphasis on maintaining a viable population of wild animals

- **Maintaining wild animal population** is dependent upon the available resources in the protected area. Dry deciduous forests have little to offer during lean seasons;
- **Past interventions** e.g. **uprooting of Lantana** in the area has resulted in somewhat enhanced availability of fodder, water but declined the shelter esp. Small animals as it has removed their shelter or niche;
- **Census:2011** in WLS have shown abundance of Sambar 1031+/- 441 & Pea fowl 926+/-326.
- **Current study** Transect walks in 4 valleys, though does not quantify overall population but close to heuristic views of staff about 40 to 50 neel gai, 200 to 250 sambar, upto 100 chital and 200 to 250 wild boars.

4. Enhancing capacity building for effective management

- Wildlife management has now emerged as an elaborate concept where progress is being made at a fast pace
- Without wildlife management training at appropriate levels for enhancement of skills, capacity building and knowing the progress made in the field, a scientific and effective management will be difficult;
- A **training programme** can be organized in collaboration with the Wildlife Institute of India, Dehradun

5. Promoting regulated tourism / eco-tourism

- **Low Sighting:** A visitor to a protected area expects to see some free ranging wild animals - gets passionate about wildlife conservation;
- **Lack of Grazing Grounds:** High population of herbivores in a WLS needs grazing grounds- prefer open grasslands or escape terrain;
- **Lack of Awareness:** Though **trekking has popularized** this WLS, the stakeholders like villagers of nearby area, students and people of Chandigarh, politicians, development departments, NGOs, are not fully well versed with the biological, ecological, landscape and environmental values of Sukhna WLS.

6. Encouraging field research, inventorise to develop an adequate database, networking and develop a monitoring protocol

- In the past, some research has been undertaken as far as the enhancement of silt retention capacity in the catchment area is concerned;
- However, no research has been taken up in Sukhna WLS keeping the management needs in mind which include the habitat requirements of the faunal species

7. Other issues

- **Discussion with staff - additional issues:**
- **Staff Shortage:** Against Sanctioned posts of 12 Forester; 15 FG (as per the version of staff), 2 Forester (BO) and 2 FG are working and 1 Block Officer.
- **Water Scarcity:** There is shortage of potable water for use by staff and labour in the Sanctuary area **particularly Nepli gate**. Also, plantations/ Nurseries need better irrigation facilities. **Urgent need**
- **Number of visitors** entering and traversing the sanctuary during organized monthly trek are too many, causing disturbance to wildlife. **Tourist zone** passes through **the middle of the sanctuary**.
- There are number of **feral cattle** in the sanctuary which puts **pressure on fodder availability** and are potential carriers of disease.
- **Stray Dogs** increased, have disturbed the ecology, hunt in packs of 6 -10 animals and are threat to populations of Chital and Sāmbar.
- **Vegetation of Leucinia** and **muscat (*Prosopis juliflora*)** increased disproportionately (**like weed**) and needs to be checked.

STRATEGIES TO OVERCOME THE CHALLENGES

- Following broader issues have been classified:
- **Boundary issues** – External, Internal & Ecological.
- **Wilderness Zone issues**
- **Tourism & Eco-tourism Zone issues**

1. Boundaries

- **External Boundaries** : WLS Notification dated 17.2.98 states “ **as demarcated in the field**”. No clear-cut boundary description of the WLS in words although Khasra numbers given. Boundary description through pillars with GPS Coordinates and number and natural features needs to be recorded in Boundary pillar register
- In the nallahs at the boundary of WLS, **special structures** made of steel embedded in cement concrete require to be erected to restrain the animals within bounds
- Without wall along inhabitations, sanctuary area is prone to encroachment and illegal access particularly near Suketri.

Boundaries (contd.)

- **Internal Boundaries** : Though originally demarcated with clear lines and pillars, need to be maintained. Comprise of range, block and beat boundaries and the management unit is being considered as beat. However, the compartment remains the basic management unit & proposed. There boundaries marked on trees.
- The ~2,600 hectare of Sukhna WLS is presently divided into 2 Ranges, 5 Blocks and 12 Beats. Standard practice to be followed (mentioned).

Boundaries (contd.)

- **Ecological Boundaries:** During lean periods, animals venture out from WLS in search of greener pastures incld. Agri. fields or water. Stray cases when animals come in human inhabitations through nullahs i.e. Patiala-ki-Rao, Sukhna nullah etc. Patiala-ki-Rao has its own resident faunal population in the forests along the stream such as near Panjab University & up to vill. Daria along nullah or railways tract on the other side.
- It **extends in adjoining forests** of Pb & Haryana upto ~5 km.
- This is Ecological **Zone of Influence**, where **signages** are required to be put up for public awareness and as to steps to be taken in the conflict situation. Help may also be rendered to these Forest departments in case of man animal conflict adjoining such zones

Wilderness Zone

- Purpose of **wilderness zone** is to keep the area for **holistic biodiversity management** without much outside interference, except management interventions where necessary;
- Highly eroded/ landslide areas of this zone are to be treated by using **vegetative & engineering** measures.

Wilderness Zone (contd.)

- **Objectives**
- 1) To manage the hydrological cycle for providing clear water to the lake in perpetuity.
- 2) To manipulate vegetative cover adapted to changing edaphic and climatic factors
- 3) Allow ecological processes to happen without interference.
- 4) Encourage healthy Prey – Predator ratio through scientific management practices
- 5) Protection of the sanctuary from theft, poaching and fire in perpetuity.
- 6) Relief & Rehabilitation

Management of Hydrological Cycle

- Existing Dams, which were constructed over a longer period of time, some have been constructed some 50 years ago, are **silted up** and have **exhausted their storage capacity**, need to be revitalized either by **desilting or raising height**;
- **Fragile, steeper slopes** need to be treated with suitable vegetative structures. And **by retaining walls** where required.
- Gentle slopes to be **contour trenched**, improving water regime. (Use of grass slips on rims & berms of contour trenches recommended to stabilize them. Trenches should be planted with shade bearing trees).
- Fresh gully formations to be checked **with brushwood dams and gully plugs**.
- Banks of streams/ nallahs to be stabilized with Arundo donax or other similar local grasses/ shrubs.
- Slopes of several water reservoirs/ Dams are too steep to be negotiated by wild animals to use them for drinking purposes; need rectification
- Construction of Breast walls/ retaining wall are required to prevent landslides and flow of debris to the water streams.

Manipulation of Vegetative Cover

- **Along the water streams in the valleys:**
- a) With the improvement of water regime, area around water bodies is supporting mesophytic vegetation. This warrants change in vegetation to next seral stage. Therefore, it is required that vegetation **around water bodies along streams**, following species be brought in:-
- **Map** showing areas which can be brought under **Dense forests** with plantation of **100 trees per hectare** with **tall climax species over a period of 10 years**.
- **Top Canopy**- Selection should be made from following species: *Sterculia alata*; *Pterospermum acerifolium*, ***Shorea robusta***, *Adina cordifolia*, *Bischoffia javanica*, *Alstonia scholaris*.
- **Middle canopy**- ***Cordia myxa***, *Acer oblongum*, ***Saraca asoca***, *Craetiva religiosa*, *Schleichera oleosa*, *Mitragyna parviflora*, ***Holoptelia integrifolia***, ***Schizygium cuminii***, *Mangifera indica*.

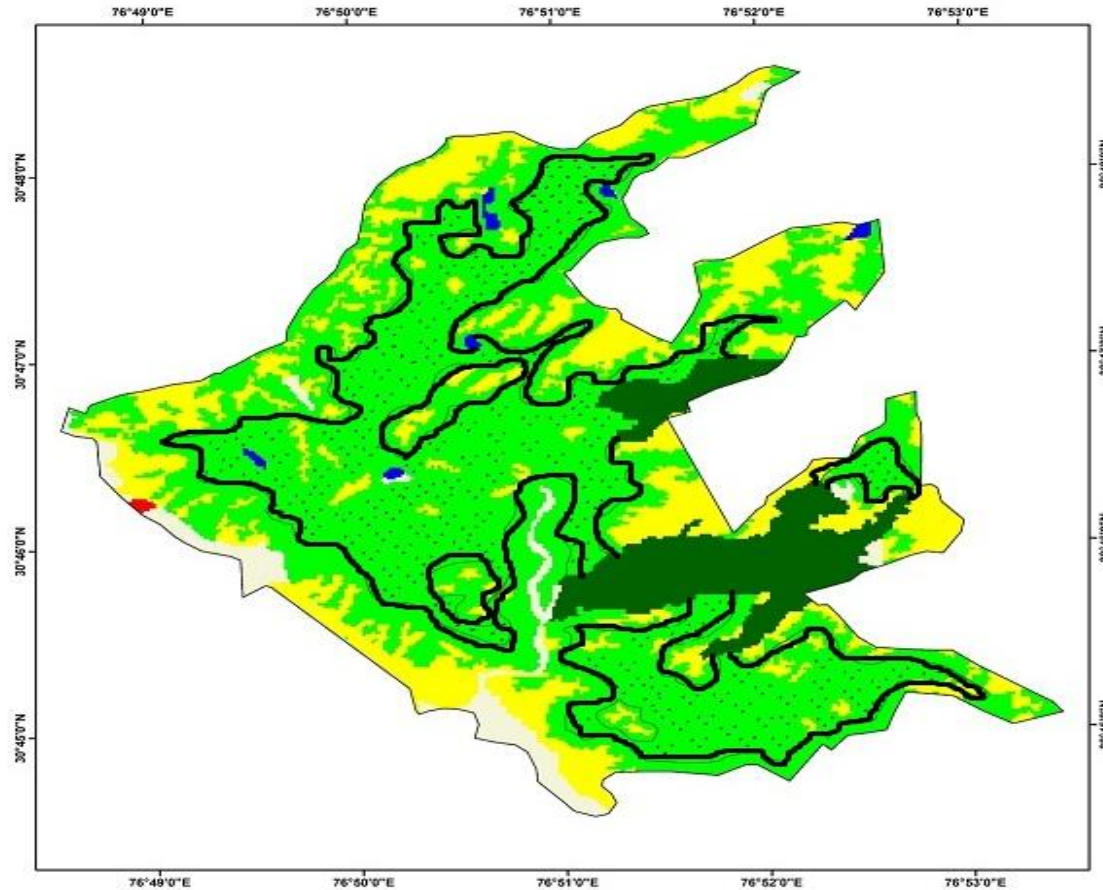
Manipulation of Vegetative Cover


- **Shrubs**- Edible shrubs like, *Indigofera heterantha*, *Sesbania sesban*, *Morus serrata*, *Ulmus villosa*, *Zizyphus jujube*, *Carissa carandas* (Karonda), *Artocarpus heterophyllus* (maintained as hedge), *Grewia oppositifolia*, *Grewia asiatica*.
- **Grasses**- *Arundo donax* along water courses for stabilization; *Setaria glauca*, *Pespellum sp.*, *Oplis manus*, *Ophiopogon*, *Cymbopogon spp*, *Imperata cylendrica*, *Bothriochloa pertusa*, *Vetiveria zizanoides*, Legumes like clover, *Medicago falcata*, *Trifolium alexandrinum*, *Desmodium spp*.
- These grasses are required to be planted in the plain lands along water courses after planting *Arundo donex* on the edges.

Area which can be brought under dense forest



FOREST SURVEY OF INDIA Forest Cover Map of Sukhna Wildlife Sanctuary (as per India State of Forest Report, 2017)



 Area to be brought under dense forest = 11.33 sq km



Legend	
	Very Dense Forest
	Moderately Dense Forest
	Open Dense Forest
	Scrub
	Non Forest
	Water

(Based on Digital Interpretation of IRS P6-LISS III IRS-Resourcesat-2 LISS III Data)

Along the water streams in the valleys (contd.)

- **Plantations of *Eucalyptus* & *Prosopis juliflora* need to be removed, in stages, in small patches at one time rejuvenating the patch with desired species before moving ahead**
- **Eucalyptus needs to be removed** by cutting and lifting the material from the sanctuary area as the timber, leaf litter may bring in allelopathic effect, suppressing growth of other desired species
- the openings in the Eucalyptus has to be essentially smaller without creating bigger openings (which should scattered, over a larger area, **not exceeding 15 stems per Ha**) and replaced by taller sp.

Along the water streams in the valleys (contd.)

- Prosopis juliflora should be removed only from the valley part and not from the southern slopes or Hill tops (ridges). Prosopis removal should not exceed **1 Ha patch** at one place and should be scattered in all valleys (**not exceeding 5 Ha in a year**).
- Leucinia leucocephala (subabul) is not conducive for consumption by animals. This being a wildlife area, leucinia is **required to be removed** and replaced by fodder yielding small trees and bushes
- **Grasslands**- The area ahead of Range office (Nepli gate), at the confluence of nullahs, flood plain is required to be brought under grassland management having a clear visibility (of 800 m or higher and 2Km from Kansal gate), which will be ideal for free ranging herbivore population
- Aim should be to develop approx. 10 % (250 Ha) as Grassland spread over entire sanctuary area;
- The rims, berms and slopes along the watercourses should invariably be planted with Arundo donax for 1-3 ft strip in the above defined plains.

Along the hill slopes

- **Southern slopes: Contour trenching be done** with staggered trenches of 2 to 2.5m x1m x0.75m (lxdxb) filled with mixture of farm yard manure:sand:clay in 1:1:1 ratio with a **thoroughly mixed pyrilite rock or water retaining gel (gelatin gel)** or any other and planted with shade bearing species such as *Dalbergia sissoo*, *Zizyphus jujube*, *Prosopis cineraria*, *Cordia myxa*, *Ficus infectoria*, *Ficus glomerata*, *Alstonia scholaris*, *Butea monosperma*. The pits -soil mulched with grass blades of *Saccharum munja* and wild date palm leaves growing in the vicinity. The berms & brims sown with small grass seeds such as *Dicanthium annulatum*, *Bothriochloa pertusa* and *Cynodon dactylon* etc. Existing *Prosopis juliflora* and *Leucinia leucocephala* needs replacement in small patches
- **Northern slopes:** Northern slopes have **higher moisture levels**. The most common species is *Annogeisus latifolia* (Chhal) which forms large pure patches. The other species are *Diospyros montana* (kendu), *Terminalia tomentosa*, etc. This can be planted with *Lagerstroemia parviflora*, *L. speciosa*, *Milletia ovalifolia*, *Sesbania sesban*, *Sesbania grandiflora*, *Ficus infectoria*, *Ficus glomerata*, *Siris* (*Albizia lebbek*, *A. procera*, *A.stipulata*). *Adina cordifolia* & *Holoptelia integrifolia* can also come up there. Only open patches need to be covered or areas blank left after removal of *Prosopis juliflora* should be taken up

Ridges

- The ridges – form **formidable challenge** to vegetate sufficiently for providing a green cover all round the year.
- Like contour trenches, ridge trenches required to be formed and filled with fym:clay:sand in 1:1:1 ratio mixed with **water retentive gels (hydrogels)** and soil mulched after planting & watering.
- Rims & brims to be covered with *Dicanthium*, *Bothriochloa* and *Cynodon dactylon* grasses.
- Here all xerophytic and advance vegetation is tried to be retained. Tall plants of *Shorea robusta*, *Alstonia scholaris*, *Cordia myxa* should be tried during rains.
- A second canopy if required, should be planted with *Prosopis cineraria*, *Sesbania sesban* & *Dalbergia sissoo*.

Ecological Processes

- a) **Packs of stray dogs**, have established as carnivore species in the PA- required to be eliminated from PA. Requisite procedure under relevant acts viz., **WL PA (1972) & Cruelty to Animals Act (1960)**, and approvals thereof may be sought from the appropriate authority.
- b) **Re-introduction of Ghoral & Kakkar** (Barking Dear) is required to be done. These species are adapted to steeper slopes and will improve not only prey base in the sanctuary but add variety to the fauna and is available at this altitudinal range.
- c) **Weed Eradication:** Weed infestation in Sukhna WLS is a menace which reduces grazing potential for wild herbivores, hinders regeneration and is a fire hazard as well. *Prosopis* & *Subabul* regeneration requires to be checked and Dhak, Amla, Bauhinia, Bamboo. Grasses like *Saccharum*, *Arundo donax* etc. (coming up in open patches) be encouraged. Parthenium, which is found along paths and roads (soil worked areas) should be uprooted manually prior to fruiting, each year.
- d) **Improvement of Bamboo Thickets:** Bamboo (*Dendrocalamus strictus*) is naturally occurring in the area. Bamboo needs better management by way of cleaning of clumps, thinning. Planting more sp. Like *Bambusa* bamboos, *D. hamiltonii*, *D. strictus* along nallahs

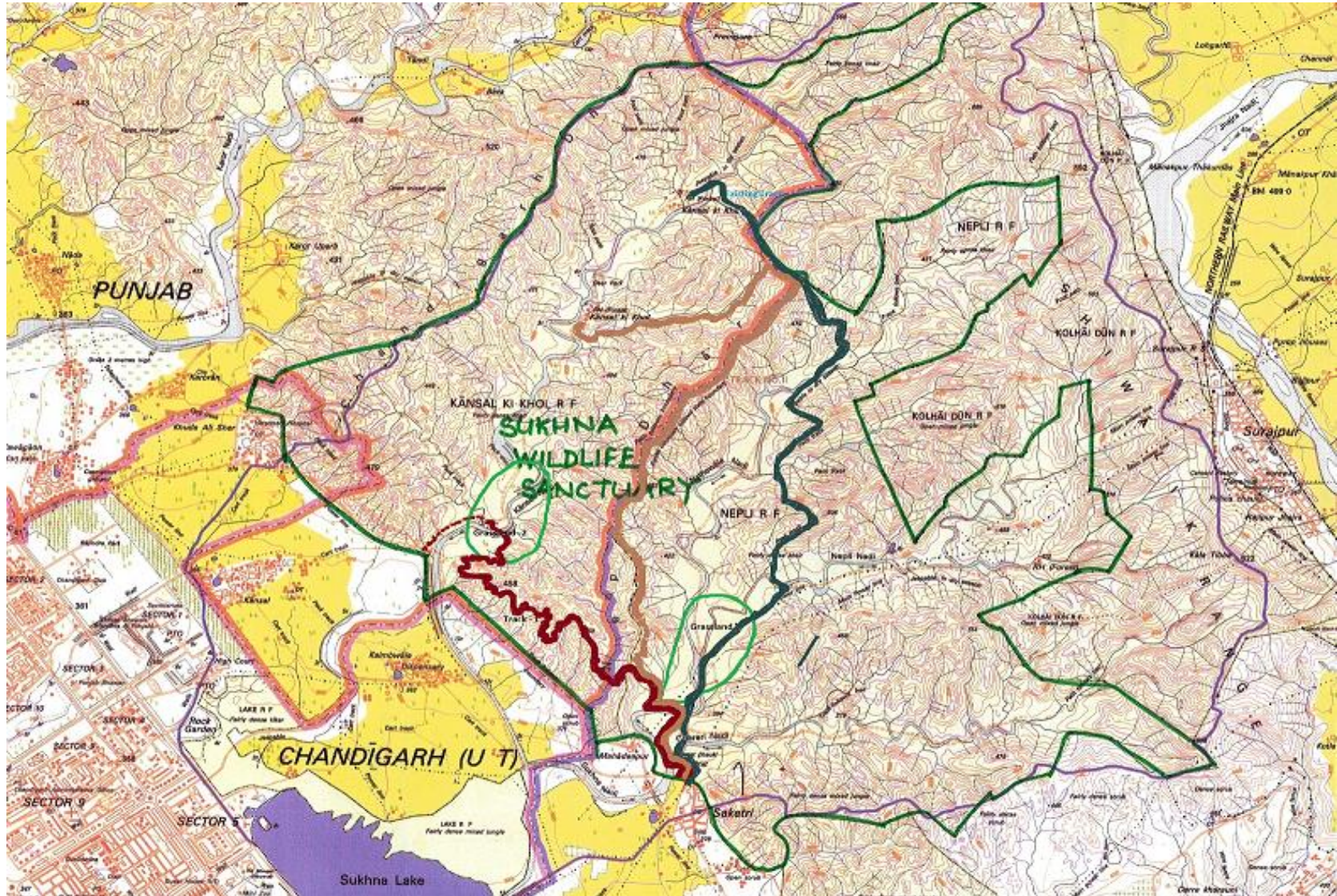
Improve Prey- Predator ratio

- The prey base in the sanctuary is low. As a result, **carnivore is not much sustained** in the sanctuary.
- Prey base at **Trophic Level - II**, has to be herbivores, for becoming part of the food chain at higher levels. These require **vegetation for the year round feeding**. This needs to be provided with grassland formation, canopy manipulation & planting foraging species.
- **Trophic Level- III** can be well developed if competition by **stray dogs** to jackals, foxes, jungle cats is removed.
- **Top of the Trophic Levels** in this part of the country is occupied by Leopard. Therefore, resident population of leopards may not be possible as animals at lower level will also migrate outside the PA in the continued jungles of adjoining states to escape predation until **population is large and fodder availability is not scarce** during lean periods.

Theft, Poaching & Fire Protection

- Minimum equipment or arrangement with FSI or **NRSA for satellite monitoring in case of fire** direct to the concerned staff on their mobiles is required to be attuned.
- Equipment and gangs having duty roaster in different valleys are to be sensitized before the fire season.
- A high tension wire passes through the Nepli valley.
- That the escaped fire coming from adjoining forest area (Morni Hills) or adjoining villages, are effectively checked by keeping fire gangs in readiness and placed in the area during such fire season.
- **Fire lines** in these fire prone areas are required to be cleared well before fire season. Roads and Nallahs in the areas be also treated as fire lines and debris collected and control burnt well in time.
- For **theft and poaching**, an intelligence net work required to be created around the sanctuary area in the villages touching the bounds of PA by the concerned Beat FG.

Tourism & Ecotourism Zone



Tourist Significance of Sukhna WLS

- Chandigarh is an imp. Tourist destination of North India
- Enroute to Hill Stations of Shimla/ Kullu- Manali
- Earliest Planned city of modern India
- Along with Sukhna Lake, Rock Garden, Rose Garden, Vidhan Sabha & Others; Sukhna WLS completes the tourist circuit.
- With large number of Educational Institutions (Youth); Enthusiastic/ Awakened & Nature loving communities, Sukhna WLS is their nearest contact to Nature & Wilderness

Current Status of Eco-Tourism

- **Monthly Treks are held on 1st Sunday of every month** except June, July, August & Sept.
- Approx. 800 – 1000 visitors join these treks every month (Table-)
- These Treks are **unguided (only 3-4 staff join the trek)**, no specific Do's & Don'ts explained. As the number of visitors are high, with lot of talking and noise, sighting is generally scarce
- There is **no clear demarcation of Tourist zone and Wilderness/ Core zone**. Resultantly, current track traverses through the entire sanctuary, covering a distance of approx. 8 Km (Nepli Range office to Kansal Rest House).
- Besides, permits are issued to visit sanctuary area and 3 Inspection Huts / Log Huts at Nepli & Kansal (Record of visitors not available)
- Number of VIPs visit the Sanctuary & Rest Houses, however, **Night stay is not allowed in the Sanctuary/ Rest Houses**.
- **No record available on Number of Vehicles entering & Traversing the Sanctuary**

Year wise Visitations in Sukhna WLS

S. No	Year	Number of Person Visiting Wildlife Sanctuary
1	2005-06	6580
2	2006-07	7649
3	2007-08	10733
4	2008-09	10828
5	2009-10	8154
6	2010-11	8219
7	2011-12	7061
8	2012-13	5755
9	2013-14	5495
10	2014-15	6416
11	2015-16	6127
12	2016-17	6655
13	2017-18	6440

Current Status of Eco-Tourism

- Current Tourist facilities lack
 - Specific Parking Area
 - Canteen facilities
 - Tour/ Nature Guides
 - Rest Rooms/ Toilets except in Rest House/ Inspection Hut
 - Interpretation Centre
- However, Drinking water, Refreshment provided free

Proposed Eco-Tourism Activities

- Clear delineation of Eco-Tourism zone and Wilderness zone
- It is proposed to earmark tourist zone along South-West boundary of the sanctuary.
- It will have 2-3 Tracks laid down (proposed route depicted on Map)
- Tourism zone will cover 15-20 % of the sanctuary area.
- Remaining area will be wilderness zone with limited or no access to tourist

Proposed Eco-Tourism Activities

- **Beautifying those water bodies and paths** which fall *en route* visitations by people by planting shade trees i.e. trees with dense foliage such as *Saraca indica*, *Schleichera oleosa*, *Magnolia grandiflora*, *Pterospermum acerifolium* . Flowering bushes and trees to **enhance visual diversity** of the area such as *Aesculus indica*, *Milletia ovalifolia*, *Sesbania grandiflora*, *Bischoffia javanica*.
- **Construction of trekking routes with stabilized soil** of the cut surfaces on the edges or lined edges to avoid soil erosion.
- Construction of **raised paths on angles** in between to **afford views in jungle** area at vantage points

Proposed Eco-Tourism Activities

- Development of **Parking lots** near the gates.
- Construction of a **canteen cum souvenir shop & public conveniences** in the Parking area near the gates.
- Construction of **hideouts and visits** to watch towers for affording wildlife viewing.
- Involvement of the community of neighbouring villages for **nature guides**, for **cycling tours**, for running facilities such as **ticketing centres**,
- Only **guided/ attended tours** to be allowed with Nature guides (on payment), in groups of 10-15 visitors

Proposed Eco-Tourism Activities

- **Institution of Nature Guides** may be propagated.
- Youth from **adjoining villages** be encouraged, selected and trained as nature guides to augment their income as a self employment opportunity.
- Visitors could be allowed inside PA in groups of 15- 20 **under the supervision** and guidance of one Nature Guide, who could charge a **defined fee** from the visitors which should be prominently displayed at the gates

Proposed Eco-Tourism Activities

- To enrich the experience of visitors and improve their knowledge base, **interpretation centre** be developed providing life-size models of wild animals, method of identification of wild animal signs (pug marks, squat, sounds, others), ecosystem processes, wildlife documentaries etc.
- It is proposed to develop two such centers, **one on each gate**, in a phased manner.
- A **common complex** with canteen facilities, Souvenir shop and Interpretation Hall can be merged into one complex.
- **pamphlets**: Good, informative publicity material and pamphlets can help in publicity and knowledge base of visitors

Proposed Eco-Tourism Activities

- **Liaison: Inter agency co-operation** between forest deptt, tourism deptt. cultural deptt. and NGOs should be developed to promote biodiversity awareness through Eco-tourism in Sukhna WLS.
- **Participation of local communities** can also be ensured by allowing sale of emblemmed local items, T-shirts, caps,(Souvenir shop) etc
- **Nature Education Camps** for school children to be organized during holidays

Research, Monitoring and Training

- Study on behaviour, habitat, feeding habits etc. of wild animals.
- Population ecology and feeding behaviour of ungulates.
- Study on flora and monitoring the temporal changes in floristic composition including vegetation dynamics.
- Study on fauna of Sukhna WLS and monitoring their population.
- Impact of habitat changes on population of wildlife.

Research, Monitoring and Training

- Study and monitoring of endangered species.
- Predation pattern of leopard.
- Habitat suitability study for reintroduction of Barking Deer.
- Study on reproductive behaviour of carnivores and ungulates.
- Carrying capacity of the area with respect to important species.
- Study on wild life diseases including causes of death.

Research, Monitoring and Training

- Anthropogenic pressure on Sukhna WLS.
- Impact of tourism on Biodiversity conservation.
- Study on intraspecific and interspecific competition.
- Resource assessment and valuation studies.
- Socio-economic impacts on fringe communities of the PA.
- Usage and impact of usage of water courses by the fringe inhabitants and its impact on Sukhna lake.(Legal status and ownership of water courses, outside the PA, leading to Sukhna Lake, needs to be ascertained).
-

Research, Monitoring and Training

- **Impact of water conservation practices** on vegetation (short & long term).
- Impact of increased moisture on **pathological agents** in the PA (**wood rot fungi of Khair** in Nathewala).
- Status of introduced species such as *Arundo donax* on riverine flat areas & fodder availability, *Pongamia pinnata* on natural regeneration on flat areas, natural regeneration of *Millettia ovalifolia*, etc.
- Effect of enhanced moisture on **burrowing rodents**.
- Population studies on **reintroduced Chital**.
- **Limiting factors** in population dynamics of herbivores.

Training

- Protection duties including use of firearms, survey and demarcation, fire fighting and intelligence gathering network.
- Tourism management including interpretation and conservation education, conducting nature camps and creating awareness among people.
- Census of wild animals, grassland ecology and management, water source management, animal diseases, habitat improvement works etc.
- Tranquilization, Net Throwing Guns, rescue and veterinary care.
- Application of laws and regulations.
- Post mortem of wild animals and other wildlife health care.

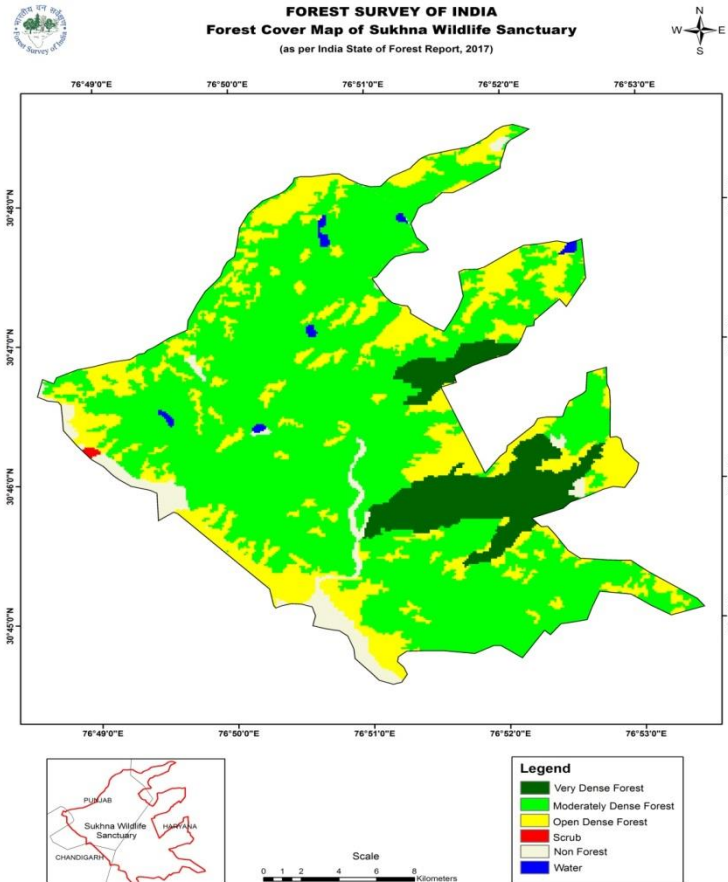
Training

- **Post Graduate Diploma** courses in wildlife management at W.I.I., Dehradun for A.C.F. and D.C.F.
- **Wildlife health, chemical immobilization**, application of power fencing etc. at W.I.I. for Range Officers and Beat Officers.
- **Certificate courses in wildlife management** at W.I.I., Dehradun for Range Officers.
- **Remote sensing training** at Indian Remote Sensing Institute, Dehra Dun for A.C.F. and D.C.F.
- **Short term Sensitization & Refresher** courses for Frontline staff should invariably be held once in six months (in consultation with WII)

Schedule of Activities

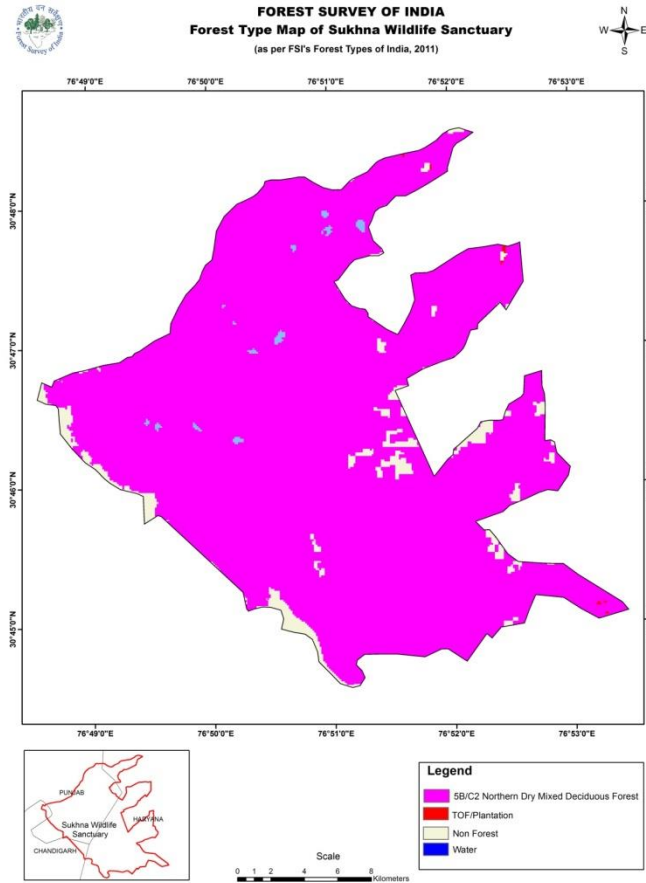
GIS layers

Vegetation Map

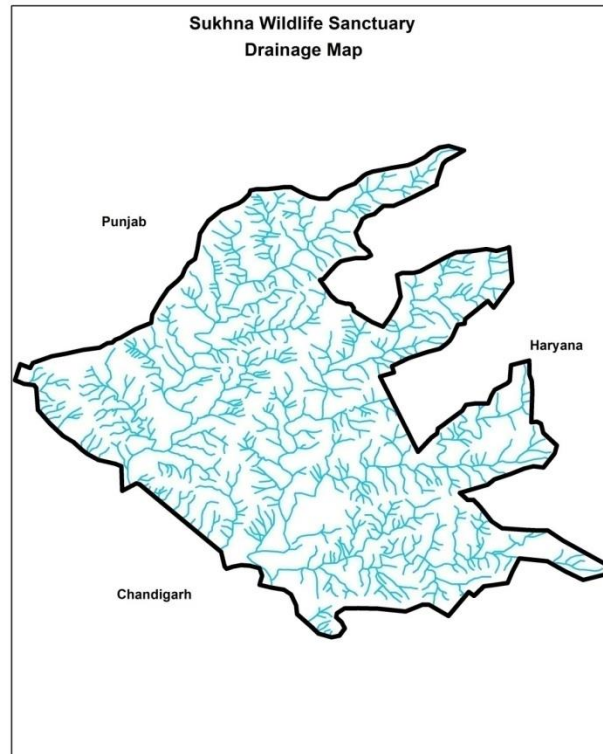


(Based on Digital Interpretation of IRS P6-LISS III IRS-Resourcesat-2 LISS III Data)

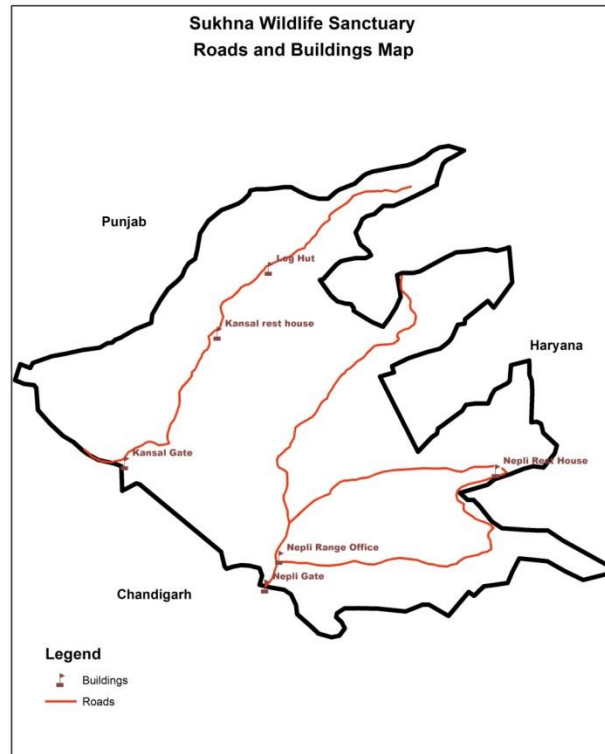
Forest Type



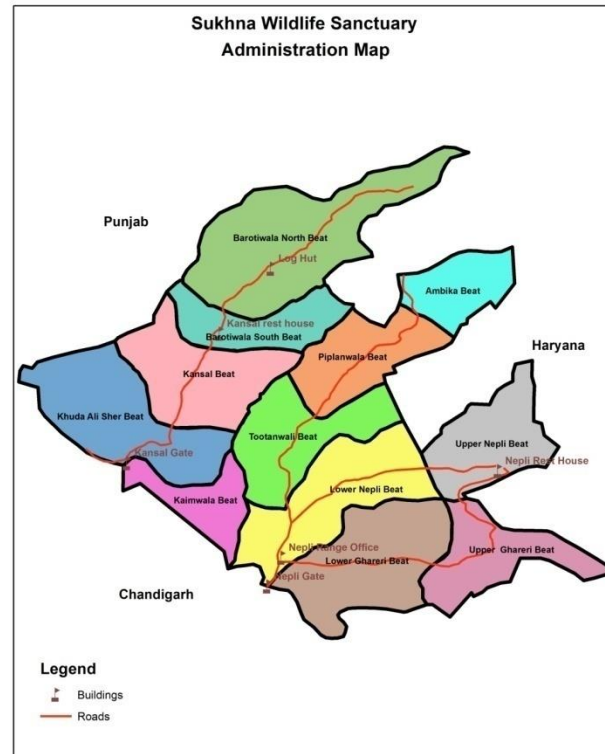
Drainage Map



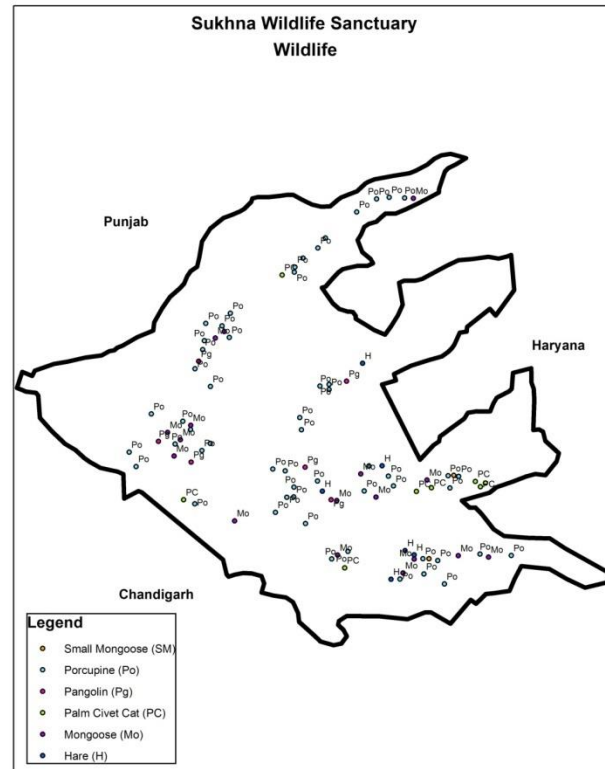
Roads & Buildings Map



Administrative Map



Wildlife - small mammals distribution



Thanks for your patience