Developing Strategies for Conservation of Last Remaining Population of Lesser Florican in Deccan, Bidar District, Karnataka






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Developing Strategies for the Conservation of Last Remaining Population of Lesser Florican in Deccan, Bidar District, Karnataka with additional note on surveys conducted in Yadgiri and Kalaburgi districts, as well as in Eastern Plains of Karnataka

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Contents

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Introduction

Grassland-dependent species, mainly Bustards and Floricans, need immediate attention

The population of the critically endangered Great Indian Bustard (GIB) *Ardeotis nigriceps* and Lesser Florican *Sypheotides indicus* in various states of India is as shown in the map. However, the population of both species has been declining rapidly due to habitat loss, hunting, and other factors. According to the International Union for Conservation of Nature (IUCN), the Great Indian Bustard (GIB) is one of the most endangered bird species in the world, with its current estimation being less than 150 individuals left in the wild. Conservation efforts are underway to protect their remaining habitats and increase their population (BirdLife International, 2023).

In Andhra Pradesh, the Great Indian Bustard (GIB) and Lesser Florican are found in the grasslands of the Rollapadu Wildlife Sanctuary. Overall, the populations of Great Indian Bustard (GIB) and Lesser Florican in the Deccan region are critically low.

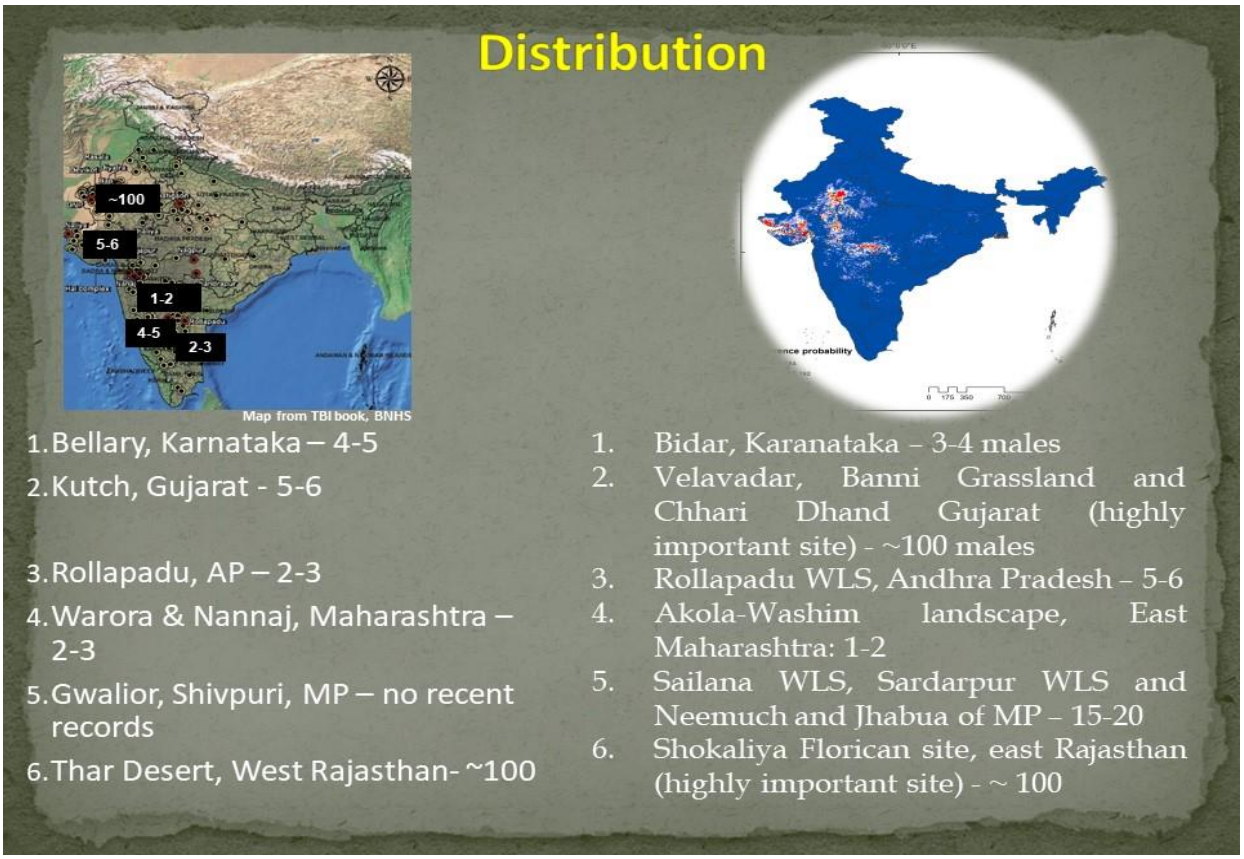


Figure 1 Distribution map of GIB (left) and Lesser Florican (right) in India with estimated population

The Deccan Plateau in India is a region that spans several states, including Maharashtra, Karnataka, and Andhra Pradesh. In the past, this region was one of the strongholds of both the critically endangered Great Indian Bustard (GIB) and Lesser Florican. While the Great Indian Bustard (GIB) is resident in the region, the Lesser Florican presently uses it as non-breeding ground. However, the Lesser Florican occasionally breeds in the Deccan.

GIB in Deccan Plateau – an overview for reference

In Maharashtra, the Great Indian Bustard (GIB) is found in the grasslands of the Nannaj Sanctuary in Solapur, Latur, Ahamadnagar and Osmanabad districts.The population of the Great Indian Bustard (GIB) in the Great Indian Bustard (GIB) Sanctuary was 50–60 in 1980s (Kulkarni 1981; Rahmani and Manakadan 1990; Kumar *et al.* 1997), and 30–40 during 2000–2006 (Rahmani and Kalra 2005). This population declined to 13 in 2010, five birds in 2015, and then a single bird was seen in 2016 in the Sanctuary (366.73 sq. km in the districts of Solapur and Ahamadnagar). During 1980–1990, after its initial success, Bustard conservation failed in many areas because of poor habitat management in protected areas, by the forest department, and the change in land use in non-protected areas (Ali *et al.* 1984; Rahmani 1989; Rahmani *et al.* 2014). Extensive infrastructure developments, such as heavy-duty overhead wires, roads, industries, and canals completely changed the habitat on a landscape level. For example, during our study an adult male Great Indian Bustard (GIB) collided with a power line in the Nannaj area in September 2015 (Bhagwat Mhaske from Great Indian Bustard (GIB) Sanctuary, Nannaj, pers. comm., September 2015).

Around half a century ago, Great Indian Bustards were spotted throughout Karnataka, except for the Western Ghats. But now they are supposed to be restricted to only Ballari, Koppal, Chitradurga, Haveri, Gadag, and Raichur districts. Rahmani and Manakadan (1990) reported the occurrence of Bustard as unconfirmed reports based on personal communication with many researchers in Bijapur, Raichur, Dharwad, Ballari, Chitradurga, Tumkur, Hassan and Mysore, who further stated the presence of Bustard in Dharwad. Rahmani and Manakadan also estimated the Bustard number as 30 to 40 for the state. Neginhal (1997) also reported the Bustard nest and egg from Ranibennur in 1997. Ghorpade (1996) reported the bird from Hagedal in the Gadag district (Bhat *et al.*2005) based on secondary sources compiled for the Bustard status from 1981 to 2005 in Ranibennur Blackbuck Sanctuary, which showed regular sightings of five birds from 1981 to 1997, and the highest of 14 birds in 1990; since 1998 the number of birds has drastically reduced in the Sanctuary; however, one bird was reported in 2003 (Kumara and Raj 2007).

But the last sighting of Bustards at the Ranibennur Blackbuck Sanctuary was in 1998, and ever since, there have been neither reports nor sightings of Great Indian Bustards from elsewhere in Karnataka. However, a group of naturalists from Hospet and Ballari, under the banner of the Society for Wildlife and Nature (SWAN) rediscovered Great Indian Bustards in remote corners of Siruguppa taluk of Ballari district in 2006. Ever since the NGO has been recording and documenting the sightings with little publicity among the local villagers (Samad, Mistnet 2006, WWF Special Issue 2012). In Karnataka it has been reported in the north in Vijapura district, adjacent to the Maharashtra border (Bilal *et al.* 2016).

Image 1(Left) Great Indian Bustard Male in its habitat in Nannaj Sanctuary by Nayan Khanolkar; Image 2 (Right) Great Indian Bustard female in Rajasthan © DhristimanMukharji

Lesser Florican – a species of interest under an ongoing project

The smallest bustard species in the world and amongst the Indian species, Lesser Florican (LF) *Sypheotides indicus* is protected under Schedule-I of the Wildlife (Protection) Act, 1972. It is categorized as 'Critically Endangered species' as per the IUCN (2020) due to its rapid reduction in the number of mature individuals over the past three generations with an apparently accelerating rate (BirdLifeInternational 2021). In addition, the rapidly declining grasslands over its entire distribution range is another factor for its dwindling population.

The species formerly occurred across almost the entire Indian subcontinent extending up to the Terai zone of Nepal, now extinct in Pakistan and the eastern parts of the Indian subcontinent.

Lesser Florican is endemic to the Indian subcontinent and restricted to dry grasslands with scattered bushes and scrublands, mainly in Gujarat, south-east Rajasthan, north-west Maharashtra, some regions of Karnataka, Andhra Pradesh, and western Madhya Pradesh (BirdLife International 2022; Dutta *et al.* 2018; Sankaran 1997). In western India, grasslands are fragmented and patchily distributed and the majority of habitat available to the Lesser Florican is now a mosaic of grassland and cropland (Narwade *et al.* 2020; Sankaran 1997).

Taxonomy

Lesser Florican *Sypheotides indicus* belongs to the family Otididae under the order Otidiformes. The species name *Sypheotides indicus* was designated by Collar and Andrew (1988). Locally known as *Karinavilu* in Karnataka, *Nelanemili* in Telugu states (Telangana and Andhra Pradesh), *Tanmor* in Maharashtra and, *Kharmor* in Hindi.

Morphology

The female is slightly larger than the male, the average size of the male and female are 46 and 52 cm respectively. The breeding male exhibits distinct coloration, characterized by a black head, neck, and underparts, while the wing coverts are notably white. In non-breeding plumage, the male looks similar to the female but has whitish wing coverts and black underwing coverts. Females are rufous buff-sandy colour.

Behaviour

While performing its display, the male folds its legs and shoots vertically upwards attaining a height of about 2-2.5 m, with wings partly open, and flutters rapidly, producing a croak-like sound (Lad 2016). It has been observed that the sound produced by the displaying male is not emitted by the voice box (syrinx) but comes from bits of sounds produced by the rotation of the primary feathers around the carpel joint during the wing beat. The characteristic vertical jump by the males makes them conspicuous during the breeding season. The male jumps to a height of 2-2.5 m at a selected place, going on to make as many as 600 jumps in a day, and the sound can be heard up to a distance of 300 to 400 meters (Lad 2016). The display is to attract the females and serves to repel the rival males. The display spots are easily identifiable from the male's excreta scattered in the grassy patches rendered by the male's repeated trampling. Lesser Florican has a tendency to hide by lying low in grasses, and flies away if a threat is nearby, the bird produces a short whistle when flushed. Its flight is characterized by the rhythmic strokes of the broad wings, outstretched neck, and feet tucked under the body.

Status of Lesser Florican

The estimated population of the species was 4,734 mature individuals in 1982, followingly 3,530 in 1999 and 2,500 in 2009. The recent estimation in 2018, the population was 730 mature individuals, showing an 84 percent decline from 1982 to 2018. In August 2010, a survey was conducted in areas where previous surveys were conducted (Sankaran 2000) and a sharp decline of almost 65% of the population was seen in the areas of Rajasthan, Gujarat, and Madhya Pradesh (Bharadwaj *et al.* 2011). During recent surveys conducted jointly by BNHS, WII, TCF and State governments, the global population is estimated to be around 300 to 600 males (Dutta *et al.* 2018). The current population of Lesser Florican in all over India is 730 mature individuals (BirdLife International, Species factsheet: Lesser Florican 2022).

Breeding range

Intensity of breeding in terms of the number of individuals in floricans varies from region to region. The major breeding grounds where the birds can be seen regularly in abundant numbers are Velavdar National Park in Gujarat and Shokaliya landscape in Rajasthan while species breed in low numbers in western Madhya Pradesh (Dutta *etal.*2018). In the southern part of subcontinent, it is known to breed in Rollapadu, Andhra Pradesh and north-west Maharashtra (Narwade *et al.* 2021). While in Bidar, Karnataka the displaying males and subadults have been recorded (Sivasankar and Vivekanand 2020).

Image 2 (Left): Displaying male Lesser Florican (taken in Sailana WLS, Ratlam, MP); 4 (Right): Evasive Lesser Florican female in its habitat (taken in Shokaliya, Ajmer, Rajasthan) © Dhritiman Mukhrejee

Movement of Lesser Florican

In the erstwhile, Bhavnagar district of Gujarat state, 489 males of Lesser Florican were ringed to study the dispersal patterns and site fidelity (Dharamkumarsinhji 1957). The recent report of long-distance dispersal of the males from Rajasthan to Telangana covered approximately 1,000 km (Dutta 2021 in litt,), another telemetry study showed that the tagged female (RSD-2) utilized nonbreeding habitats in Maharashtra, Karnataka, and Telangana and dispersed as far as 776 km from its breeding grounds (Mohan Ram *et.al.* 2022). Lesser Florican is an indicator of a healthy semi-arid grassland ecosystem and monsoon, where they occur in good numbers in north-west India (Manakadan and Rahmani 1999). Due to agriculture expansion and other developmental activities, grassland habitat underwent rapid degradation. Consequently, Florican population immensely declined and became rare (Shankaran1991,1994 b). Threats to semi-arid grasslands in western India are lack of national policy on grassland, habitat degradation and loss, plantation and spread of invasive species,

use of pesticides, indiscriminate developmental activities, poaching, inadequate protected area coverage (Sivakumar *et al.* 2019).

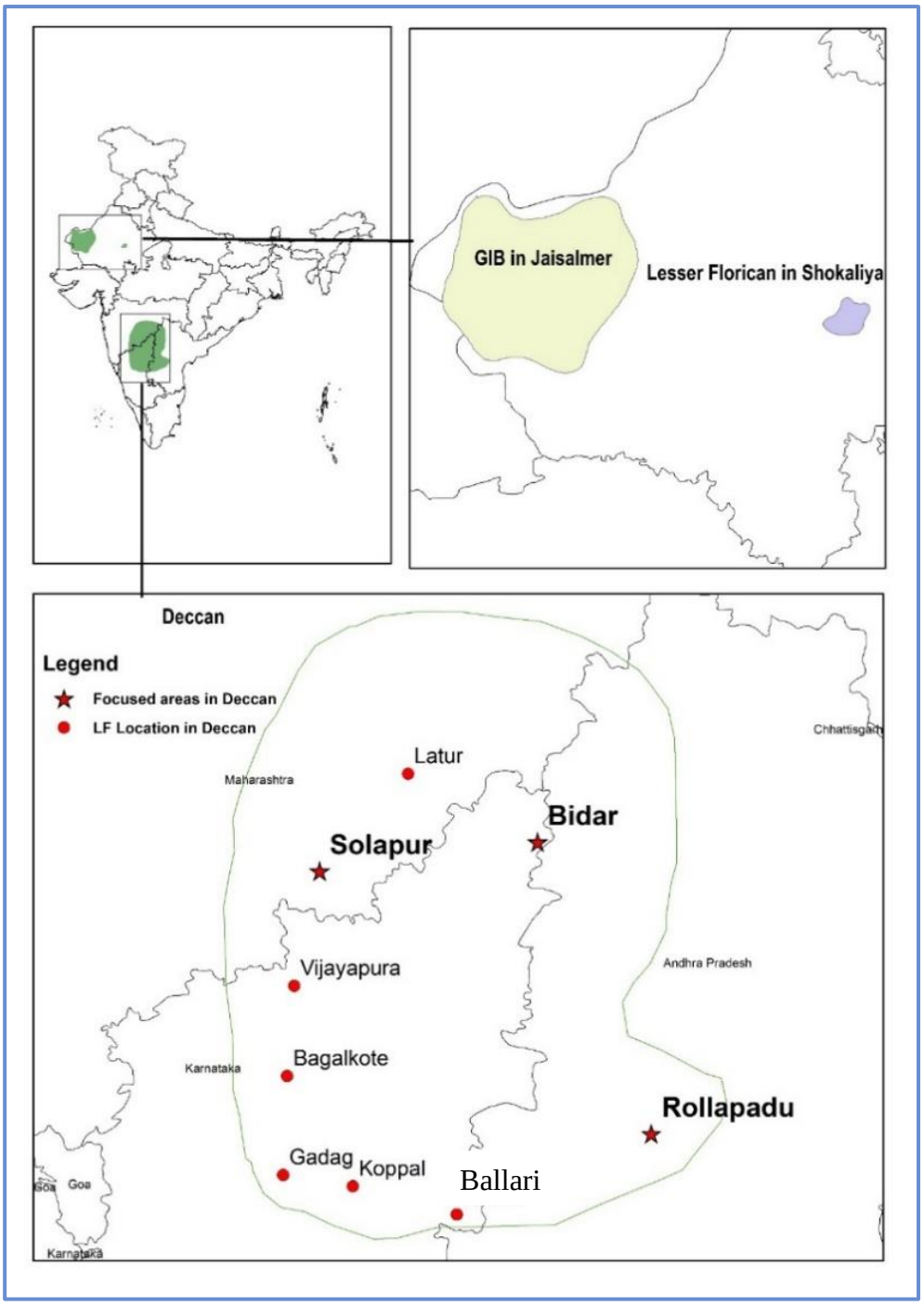


Figure 2 Le sser Florican travels more than 1000 km from North-West part of India in Rajasthan to Deccan Plateau (Karnataka, Maharashtra, Andhra Pradesh). BNHS conducted surveys of Lesser Florican and GIB during 2021-2022 in areas shown above.

Great Indian Bustard (GIB) and Lesser Florican in Karnataka

Based on secondary data collated from published literature as well as personal interactions with concerned people, maps of current and previous distribution of GIB and Lesser Florican in Karnataka were prepared.

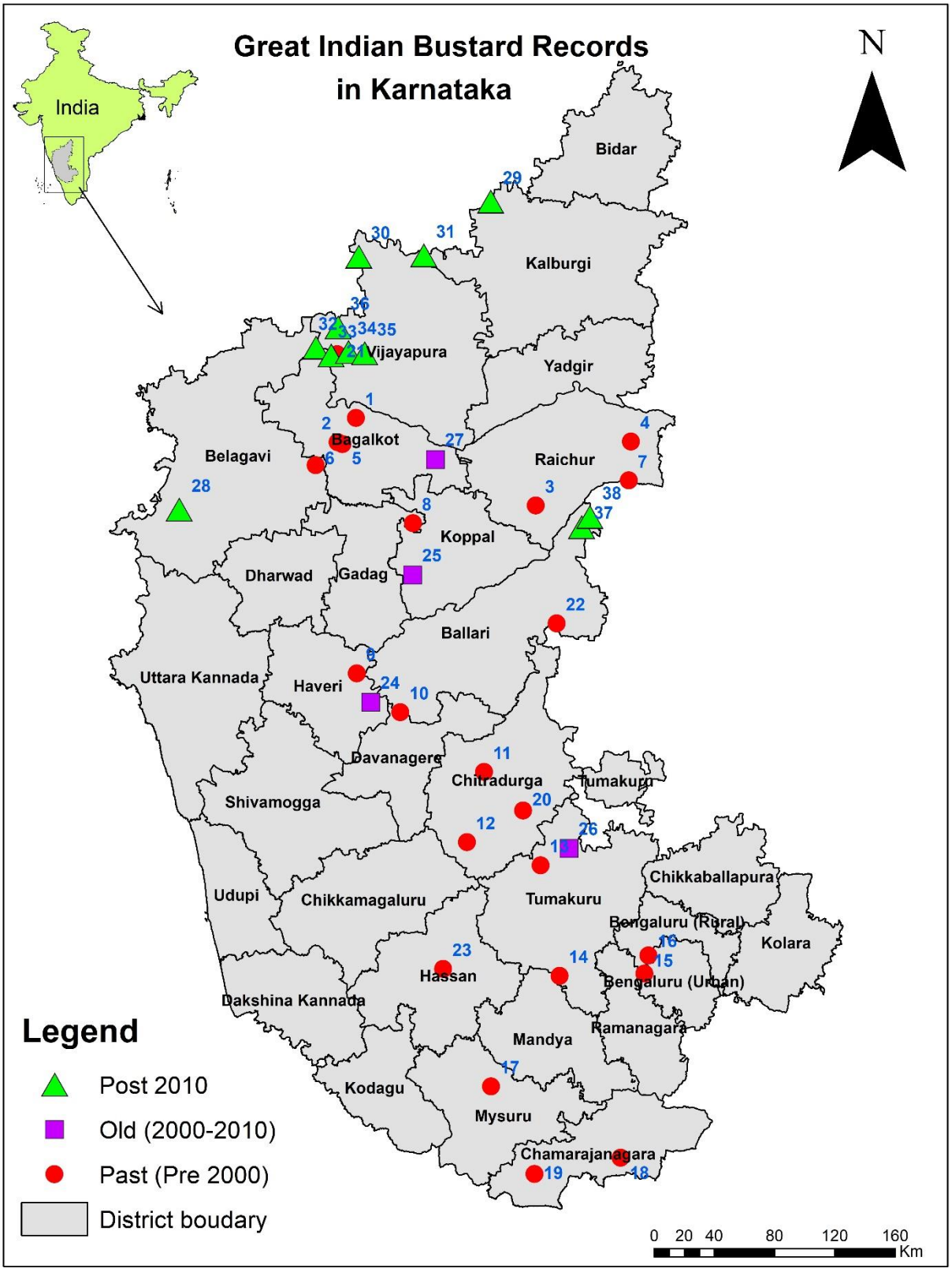


Figure 3 Great Indian Bustard Records in Karnataka

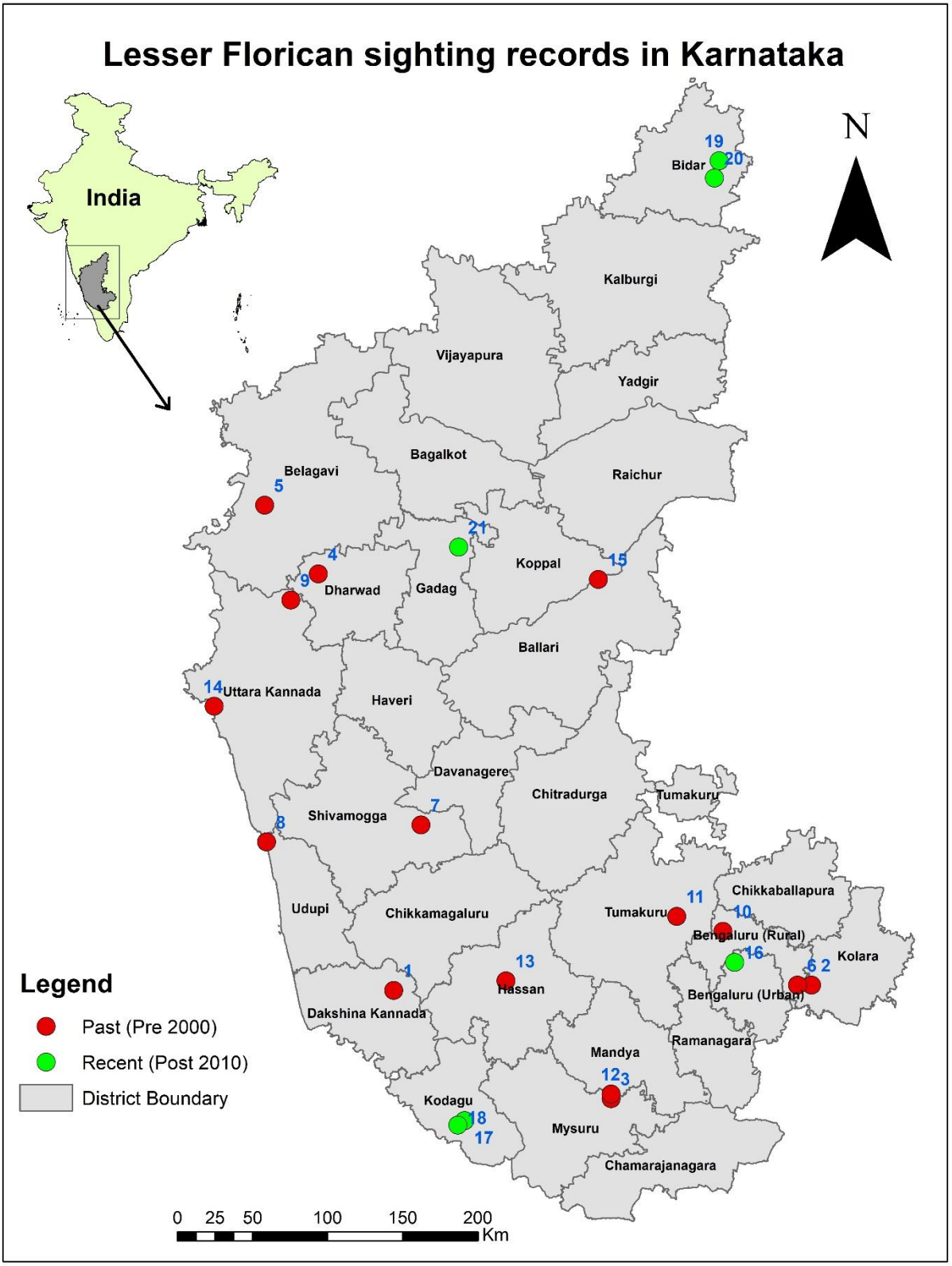


Figure 4 Lesser Florican records in Karnataka

Lesser Florican reported previously in Bidar

The physiognomic features of the Bidar landscape consists of undulating plains, plateaus extensively covered by traditional agriculture and grasslands sparsely covered by *Butea monosperma* and *Semecarpus anacardium*. The mosaic of grasslands and sparse woodlands of Bidar with traditional agriculture provides suitable habitat for Lesser Florican and associated fauna (Divyabhanusinh and Kazmi 2019). The species was first recorded by Mr. Vivekanand in the year 2008. An initial assessment of the status and distribution of Lesser Florican was conducted in systematic manner in 2019-20 by Karnataka State Forest Department (Sivasankar and Vivekanand 2020). From 2011 to 2020 the species has been recorded at Kamthana, Shamshirnagar, Bellur-Zamistanpur, Mamdapur-Chondi, Chouli-Aliyabad, Alur-Belur, Ladha-Chatnal, Mahagaon, Dhanura, Santhpur and Kappikere grasslands by Mr Vivekanand. In 2021, it has been recorded from Mamdapur-Chondi, Aaliyabad, Santhpur, Alur-Belur, Kamthana and Jyanthi-Hungi areas.

Study area – Bidar district and surrounding

Bidar district is the northernmost part of the Karnataka state in India. It is bounded by Kamareddy and Sangareddy districts of Telangana state to the east, Latur and Osmanabad districts of Maharashtra state to the west, Nanded district of Maharashtra state to the north and Kalaburagi district to the south. The district extends (17.35'–18.25'N; 76.42'–77.39'E) to 5,460.12 sq.km of total geographical area, of which 277.07 sq.km is forest, which is 5.07% of the total area of the district. Bidar is constituted of five talukas i.e., Aurad, Basavakalyan, Bhalki, Humnabad, and Bidar (Karnataka State Gazetteer).

Bidar is a semi-arid region dominated by grasslands, and dry-deciduous and scrub vegetation. It experiences a semi-arid climate with extreme summer. The temperature varies between 20° C and 42° C; summer begins from the first week of March and lasts until mid-June. This is followed by southwest monsoon which continues till late September, and winter is from September to the end of January. The average annual precipitation is 847 mm (33.3 in), with most of the rainfall received during the monsoon season. Physiographically, the district can be divided into two regions, the northern low lands and the southern high lands. The southern high lands are popularly known as the Bidar plateau, which is made up of laterite rock. Bidar plateau has an elevation range from 640 to 684 m (2,100 to 2,244 ft) above sea level. The ground surface is flat, gently sloping forming broad valleys and flat-topped hills. The ground altitudes are varying from 420 to 684 m (1,378 to 2,244 ft.) above sea level (Karnataka State Gazetteer).

The two important types of soil in the district are black soil and laterite soil. Major parts of the district are made up of black soils derived from Deccan, these are deep black in colour and their texture varies from loamy to clay. A lateritic soil is confined to the central region of the district. Lateritic soils are pale to bright red in colour and clay to clayey loam in nature. Agriculture is the main occupation in rural parts of the district. The dominant crops are Green gram, Bengal gram, Black gram, Sugarcane, etc. (Karnataka State Gazetteer).

Methods

Surveys

Regular surveys

The field surveys were conducted from August 23, 2021 to March 28, 2023 (N=577 days). Secondary information based on interviews regarding Lesser Florican and associated species, occurrence and perceived threats were collected from local respondents (Herders/ farmers, with age 50< were preferred).

A) Early winter survey: November 2021

Landscape level survey was conducted in November 2021 covering entire Bidar district to assess the status and distribution of Lesser Florican and other grassland associated species. The interviews with locals (N=75) were also conducted to assess the status of Lesser Florican and other associated species. For landscape survey, the 6 km x 6 km grids have been laid over entire district. Of the total 180 grids, 114 grids were identified to conduct landscape level survey based on data gathered from BNHS initial surveys, previous records, and agriculture pattern in area. The 99 grids (87%) have been surveyed during the landscape survey for presence of Lesser Florican, grassland associated species and their habitats. Four survey teams each with 4 observers, composed of a researcher (01), a field assistant (01), a Forest Department staff (01) and a driver (01); sampled the grid along 8 km trail by using systematic vehicle transect survey. The vehicle speed was maintained between 10-30 km/hr. The surveys were conducted during early morning (6:00 hrs to 10:00 hrs) and evening hours (15:30 to 18:30 hrs). Important habitat characteristics such as land cover, topography and human disturbances were recorded at an interval of 2 km. Dominant land-cover type, terrain type, vegetation composition within 100m radius from the point of observation were recorded systematically to assess the habitat quality.

B) Late winter survey: February 2022

Winter survey was carried out from 12-18 February, 2022. All 31 sites, were demarcated from potential grassland habitats identified in Post-monsoon Lesser Florican survey conducted in November 2021. Four survey teams with each team of 4 observers, researcher (01), a field assistant (01), a Forest Department staff (01) and a driver (01) sampled the grid along the 6 km trail by using systematic line transect survey method. Important habitat characteristics such as land cover, topography and human disturbances were recorded at an interval of 1 km. The surveys were conducted in early morning (6:00 hrs to 10:00 hrs) and evening hours (15:30 hrs to 18:30 hrs). Secondary information based on interviews regarding Lesser Florican and associated species, occurrence and perceived threats were collected from potential respondents (Herders/ farmers, with age 50< were preferred).

C) Monsoon survey: July-August 2022

The landscape level survey was conducted in the monsoon from July 20, 2022 to August 03, 2022. A total of 95 grids were surveyed during the landscape survey for the presence of Lesser Florican, and grassland associated species and their habitats. Secondary information based on interviews regarding Lesser Florican and associated species occurrence and perceived threats were collected from local respondents (Herders/farmers, with age 50<were preferred).

D) Winter Survey: September - December 2022

The regular survey was conducted from September 2022 to December 2022 in the Bidar district for the presence of Lesser Florican and grassland-associated species and their habitats. Secondary information based on interviews regarding Lesser Florican and associated species occurrence and perceived threats were collected from local respondents (Herders/farmers, with age 50<were preferred). Decoy experiment and Entomology survey were also carried out during the period.

E) Summer survey: January - March 2023

The summer survey was conducted from January 2023 to March 2023 to determine the presence of Lesser Florican and other grassland-associated species. The regular survey was carried out at 11 sites, which were identified as potential sites. Continuous observations were made at these sites. The point count and line transect methods are used for conducting field surveys.

Survey planning

Five to six teams were deployed to carry out the survey, comprising a minimum of four persons, one biologist/scientist/birdwatcher who is experienced to identify the species on the spot, one photographer, one data collector and one volunteer. Survey teams conducted the ground survey in the grids following the vehicle transects and point count methods, in the early morning hours 6:00 hrs to 10:00 hrs and late evening hours 15:30 hrs to 18.30 hrs, depending on the availability of the light. Thus, each team was assigned to survey one grid in the morning and one grid in the evening every day. The survey teams covered nearly 105 girds of the selected study area in 12 days from July 20, 2022 to August 03, 2022.

Survey protocol

During the course of data collection, a mix of point count and line transect data was collected. In each grid, a length of 10-12 km vehicle transects were laid. The vehicle speed was maintained between 10-30 km/hr. From the start point to the end point, at an interval of 2 km, 10 minutes of point count was conducted. Animal/bird sighting was recorded between the point counts locations as part of the line transect. The survey was targeted to document the information regarding the presence of grassland obligatory species like Lesser Florican *Sypheotides indicus*, Indian Grey Wolf *Canis lupus pallipes*, Blackbuck *Antilope cervicapra*, Chinkara *Gazella bennettii*, Great Indian Bustard (GIB) *Ardeotis nigriceps*, Montagu's Harrier *Circus pygargus*, Pallid Harrier *Circus macrourus*, Marsh Harrier *Circus aeruginosus*, Hen Harrier *Circus cyaneus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, Painted Sandgrouse *Pterocles indicus*, Nilgai *Boselaphus tragocamelus*, Wild Boar *Sus scrofacristatus*, Indian Small Fox *Vulpes bengalensis*, Jungle Cat *Felis chaus*, and free-ranging dogs.

Equipments used

Each team was equipped with a GPS to record the tracks, a Binocular to observe and identify the species, a Range finder to measure the distance of the animal from the observer, and a Camera to record the species sighting through photographs.

Important habitat characteristics observed

Land cover, topography and human disturbances were recorded at an interval of 2 km. Dominant land-cover type, terrain type, and vegetation composition within

a 100 m radius from the point of observation were recorded systematically to assess the habitat quality.

Experiment with Decoy

Animals use various cues and signals to search potential resources like habitat, mate, breeding site, roosting and foraging areas etc. The habitat, hetero specific and conspecific cues are few among them that are mostly preferred. Surveying for a species with low population over a large landscape is not an easy task. In most cases the species presence may get undetected because of low density and cryptic nature of the species. To overcome this situation, we use the audio-visual cues to detect the species.

In the Lesser Florican decoy experiment we used the audio-visual cues at grasslands where the species was previously recorded. A 2D life size decoy made of thermocol foam was used to provide visual cues. The Bluetooth speaker (Rocker R-SP-312) was used for playback of fluttering sound produced by the male during display leap. The Bluetooth speaker was kept within a meter of decoy, hanging on branches of *Butea monosperma* tree at a height of 1-1.5 meters. The previously recorded sounds were played for two hours in morning and evening. Each decoy and Bluetooth speaker setup were equipped with two camera traps to detect any possible movement near decoy. The decoy experiment was employed 3 hours in morning and evening respectively. The maximum number of decoys used in the experiment was two. The observers were also employed in morning and evening hours during playback period to detect any possible movement.

Entomological study

To study the insect diversity, surveys were conducted from October 16–20, 2022 during 08:00 to 11:30 hrs in the morning and 16:30 to 18:30 hrs in the latter half of the day considering the weather conditions and taxa activity. The study was conducted by combination of methods using randomly placed 10 x10m quadrants and opportunistic observations. Total eleven quadrants were studied. Two quadrants each at Kamthana, Alur, and Chetnal were studied by active visual encounter method where, ground vegetation was sparse while sweep net method was used in two quadrants at Nirna and one each at Aliyabad, Chondi, and Kamthana where vegetation was suitable for the use of net.

These methods were used considering the limitations on the extent of different survey methods for different insect groups and in order to include maximum insect orders. Insects were actively searched in their microhabitats like on the vegetation, in the dung, under the rocks and along the waterbodies. Different life stages, sex and activity of the insects were noted. Unidentified insects were either hand-picked or caught with a net for photographs of their morphological characters and released back. Pit-fall trap method was also carried out at one location, i.e. Chondi grassland. Six transparent plastic cups, approximately 10cm deep, were installed in the soil with a separating distance of 20m between the two installations. Two cups were filled with water, whereas four were without any solvent.

Data Collection

- All the observations were entered in the Data Collection App designed specifically for landscape surveys by BNHS, and The Bustard Program. All the parameters such as GPS location, date & time, weather, terrain, vegetation cover, insect count, animal name, and vegetation details like name and specification of grasses, trees, shrubs and invasive species were fed in the app.
- The sighting of an individual animal or a group of individuals among any of the species mentioned in survey protocol has been considered as one sighting.
- For each sighting, the number of individuals, sex (if possible), sighting angle, and sighting distance from the vehicle transect line have been recorded along with Latitude and Longitude coordinates during the vehicle line transect.
- At every point count, species sightings, and habitat parameters like terrain type (flat, slope, and undulating) and vegetation type (grassland, agriculture land, and forest/plantation) corresponding to each animal sighting within a 100 m radius have been recorded.
- Important habitat characteristics such as land cover, topography, and human disturbances have been recorded at an interval of 2 km.
- Dominant land-cover type within a 100 m radius of the point shall be recorded as fallow, agriculture, grassland, scrubland, and plantation.
- Vegetation composition within a 100 m radius of the point was recorded as the percentage of area covered by short, medium, and tall grasses; the grasses were identified using various references. The percentage of shrub cover and tree cover along with the species name was recorded.

Tracks covered

The tracks were saved using GPS device. The habitat data along with anthropogenic disturbances were recorded at an interval of 2 km. If two or more trails are laid in one grid, then they were recorded separately with separate track IDs. The distribution data of grassland indicator species such as Lesser Florican *Sypheotides indicus*, Indian Grey Wolf *Canis lupus pallipes*, Chinkara *Gazella bennettii*, Blackbuck *Antilope cervicapra*, Montagu's Harrier *Circus pygargus* and Pallid Harrier *Circus macrourus*, was considered for identifying potential grassland habitats. The data generated through field surveys, landscape surveys, interviews and species presence data of recent past (2018 onwards) was over laid on a grid-based map to assess the potential areas which need to be conserved. The potential grasslands were demarcated using Google Earth. Other fauna like Striped Hyena *Hyaena hyaena*, Small Indian Fox *Vulpes bengalensis*, Golden Jackal *Canis aureus*, Jungle Cat *Felischaus*, Egyptian Vulture *Neophron percnopterus*, Amur Falcon *Falco amurensis*, Bonelli's Eagle *Aquila fasciata*, and Short-toed Snake Eagle *Circaetus gallicus* were also documented.

Grassland mapping

Using species distribution data and ground knowledge, polygons were drawn around grassland patches in the district. According to the population size and presence of key grassland obligatory species, the grassland areas were categorised as Moderate Potential, High Potential and Very High Potential Areas. These sites were intensively monitored before making any conservation interventions.

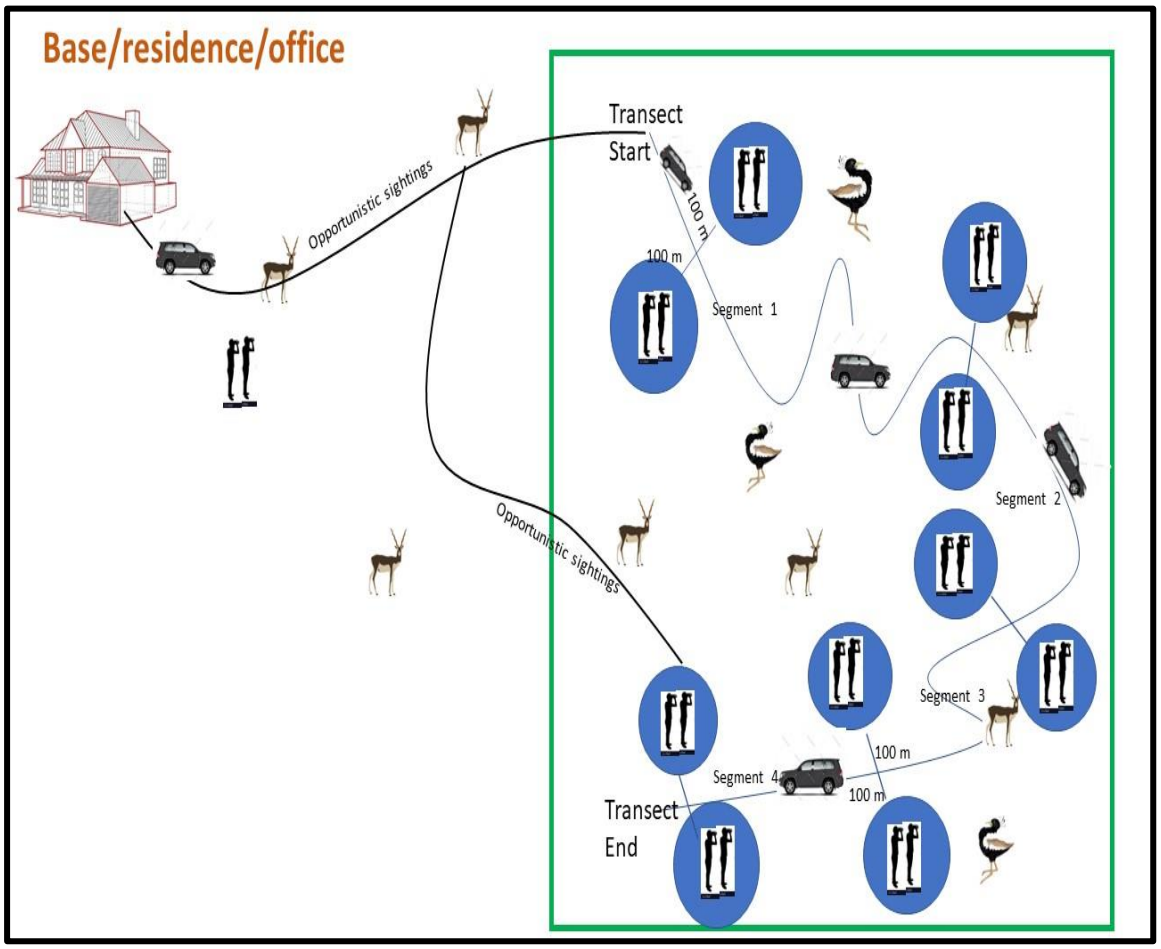


Figure 5 Landscape survey using the Grid method

Results

A) Early winter survey: Nov 2021 - Threat assessment

The major threats in potential grassland areas were assessed during the landscape survey i.e., quarry, power lines, roads, settlements, and free ranging dogs. The threats were recorded in and near habitat patches at an interval of 2 km on the transect line, while those in the periphery of 1 km from town or villages were avoided (not considered).

Among the threats recorded from all sampled grids (N=99), roads had highest probability of occurrence (0.8173), followed by powerline (0.684), settlements (0.1737), dogs (0.0784) and quarry (0.0716). The strongly significant (P=0.0000077, P<0.05) moderate positive correlation (r=0.43271) was observed between probability of occurrence of powerlines and settlements; resulting in increased probability of settlements, the probability of powerlines will also increase and vice versa. The significant (P=0.0048, P<0.05) lower positive correlation (r=0.28068) was observed between probability of occurrence of roads and powerlines. The significant (P=0.011, P<0.05) lower positive correlation (r=0.25198) was observed between probability of occurrences of settlements and dogs. With increased probability of settlements, the probability of dogs will also increase and vice versa. The significant (P=0.022, P<0.05) lower negative correlation (r=0.-22921) was observed between probability of occurrence of roads and quarry.

Tehsil	Threats (Avg. Probability of occurrence)				
	Dog	Settlement	Powerline	Roads	Quarry
Basavkalyan	0.0905	0.2765	0.7825	0.7455	0.063
Humnabad	0.094737	0.063158	0.386842	0.762105	0.017895
Bhalki	0.0715	0.309	1	1	0.0275
Aurad	0.037778	0.115185	0.536296	0.848889	0.085185
Bidar	0.097692	0.104615	0.714615	0.73	0.164615

Table 1- Tehsil wise average probability of threat occurrence

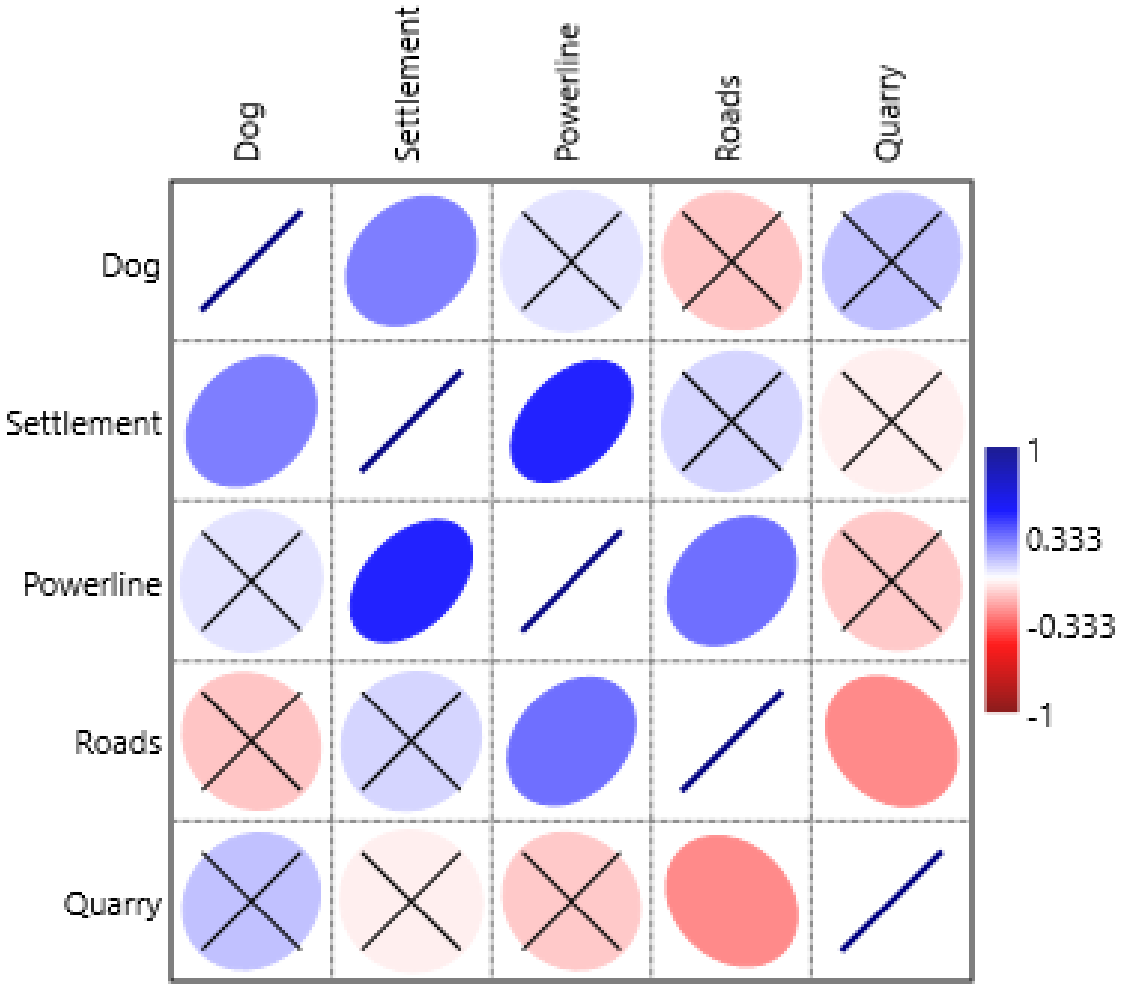


Figure 6 Threat correlation chart: Circles with cross inside show non-significant correlation. Ellipses with pale blue color show lower positive correlation. Ellipses with dark blue color show moderate positive correlation and Ellipses with pale red color indicate lower negative correlation. The bars in diagonal places indicate self-correlation.

Image 5 Mortality in Bustards and Floricans due to collision with High Tension Powerlines has emerged as one of the major threats and it neesd to be addressed in Bidar landscape survey with proper planning © Rushikesh Pawar

Image 6 Night view of solar plant, a major cause of light pollution near the grassland, Chondi © Supriya Hangal

Image 7 Not a wetland - view of large solar plant in Chondi area © Rushikesh Pawar

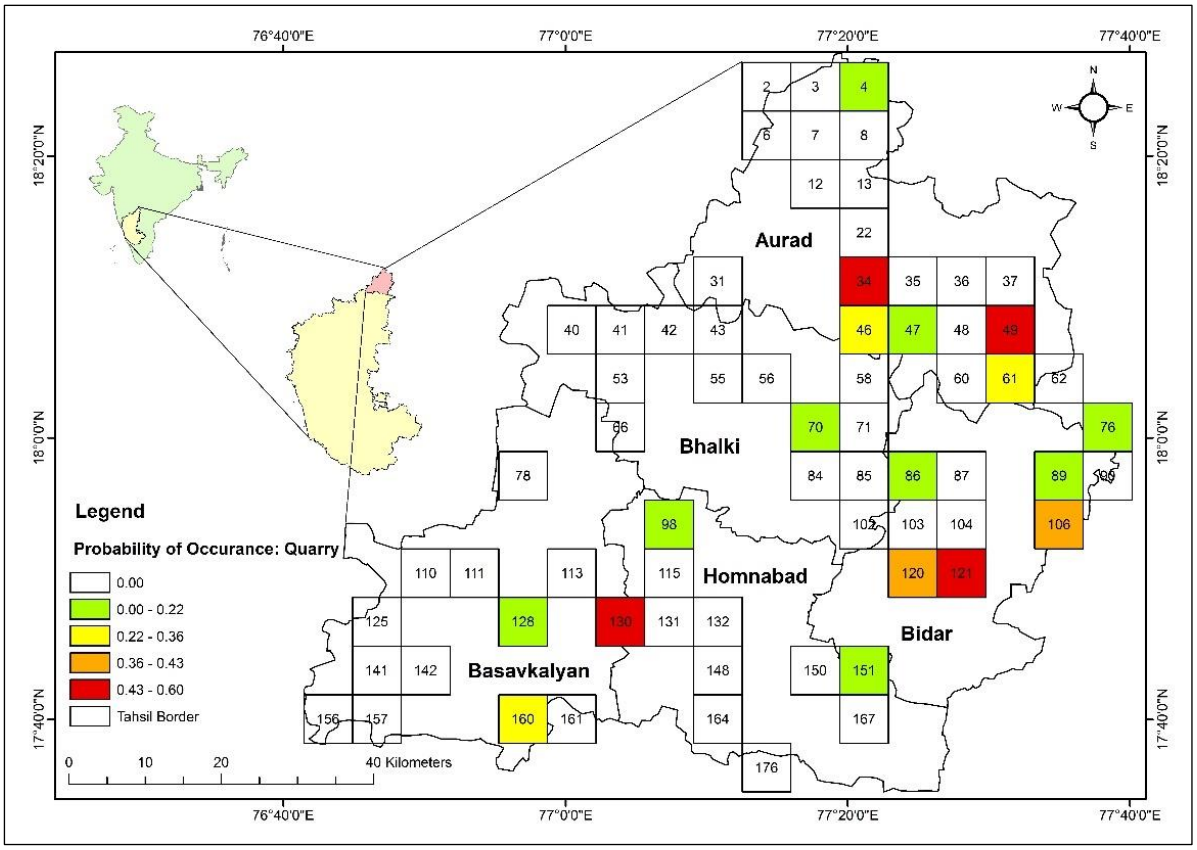


Figure 7 Probability of occurrence of quarry in potential grassland conservation areas

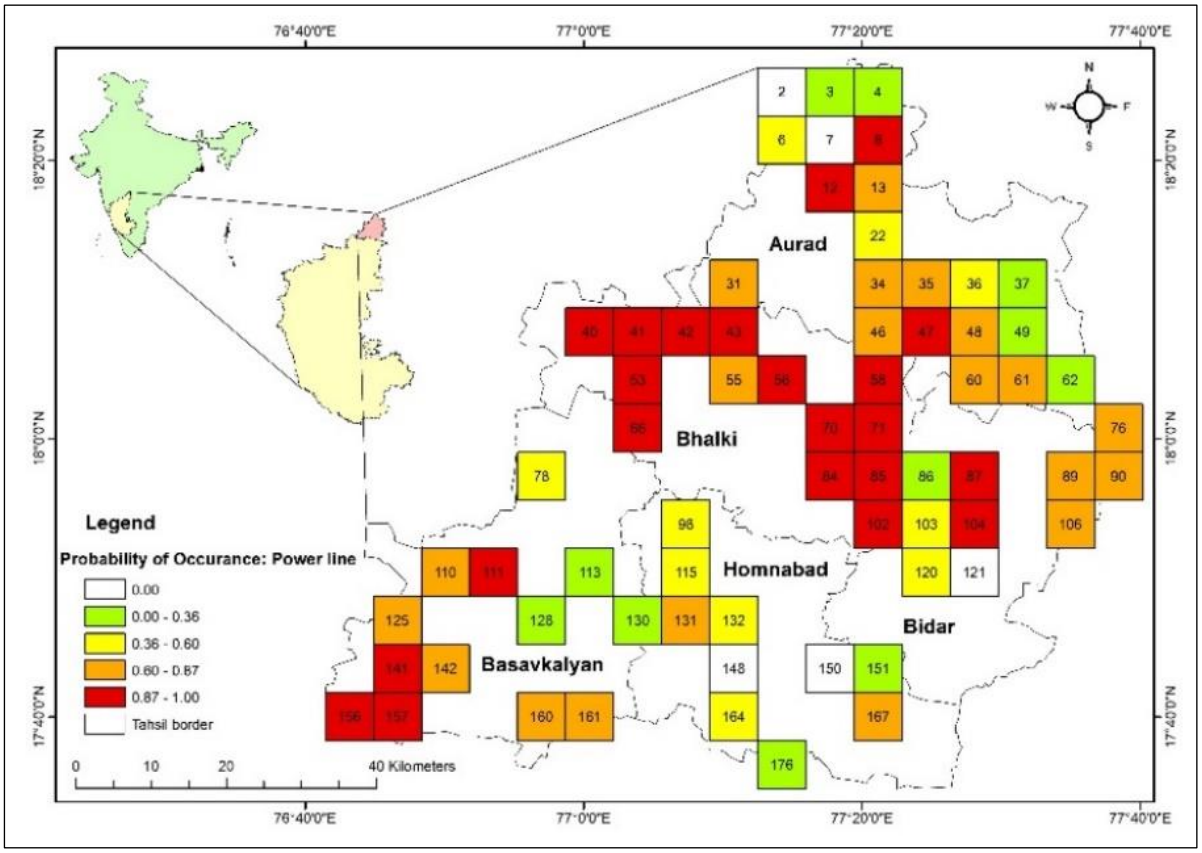


Figure 8 Probability of occurrence of powerlines in potential grassland conservation areas

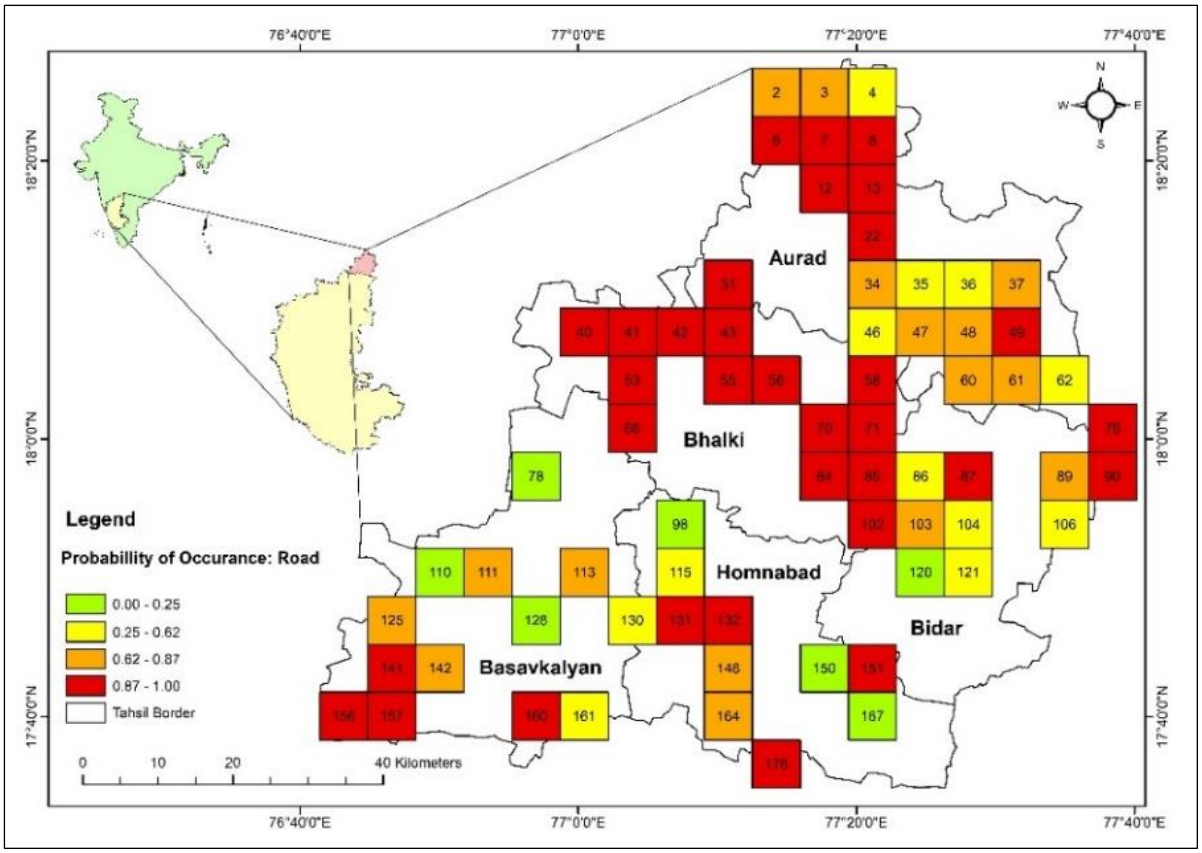


Figure 9 Probability of occurrence of roads in potential grassland conservation areas

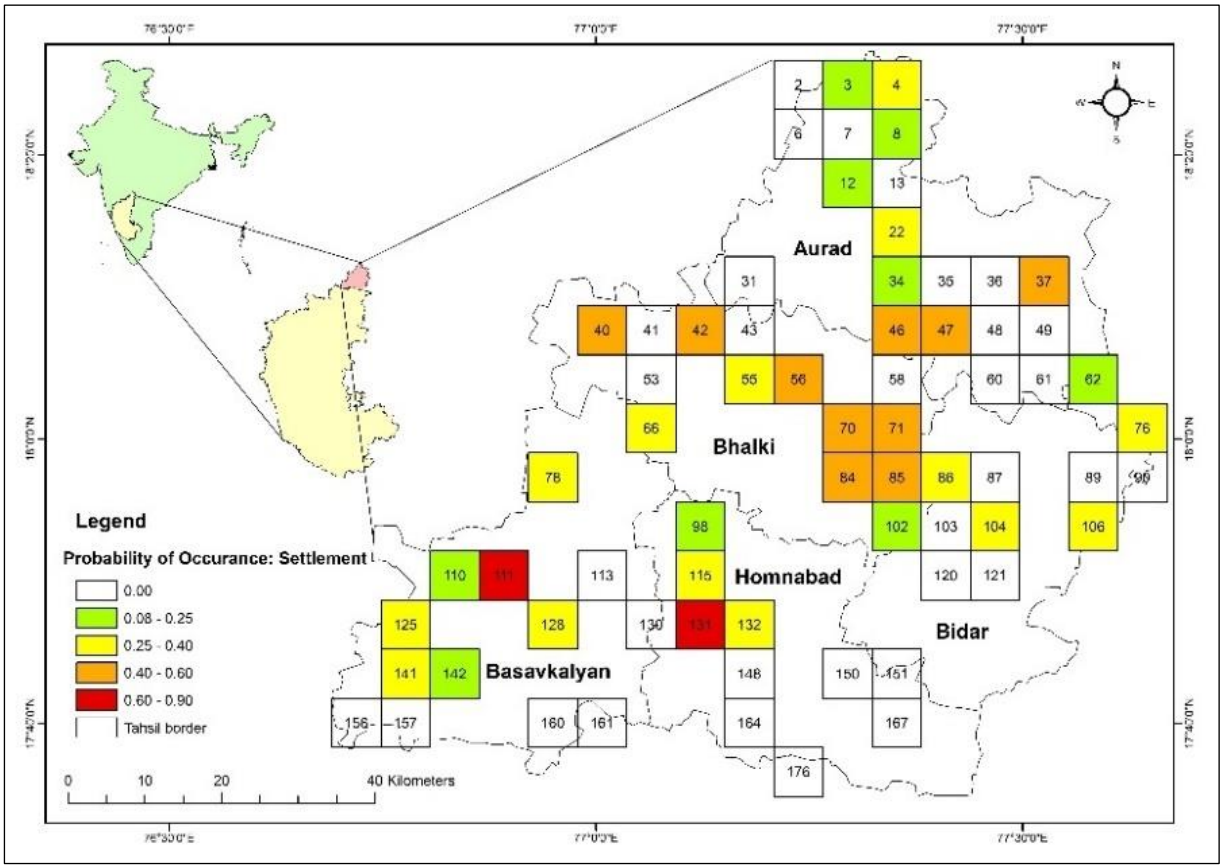


Figure 10 Probability of occurrence of settlements in potential grassland conservation areas

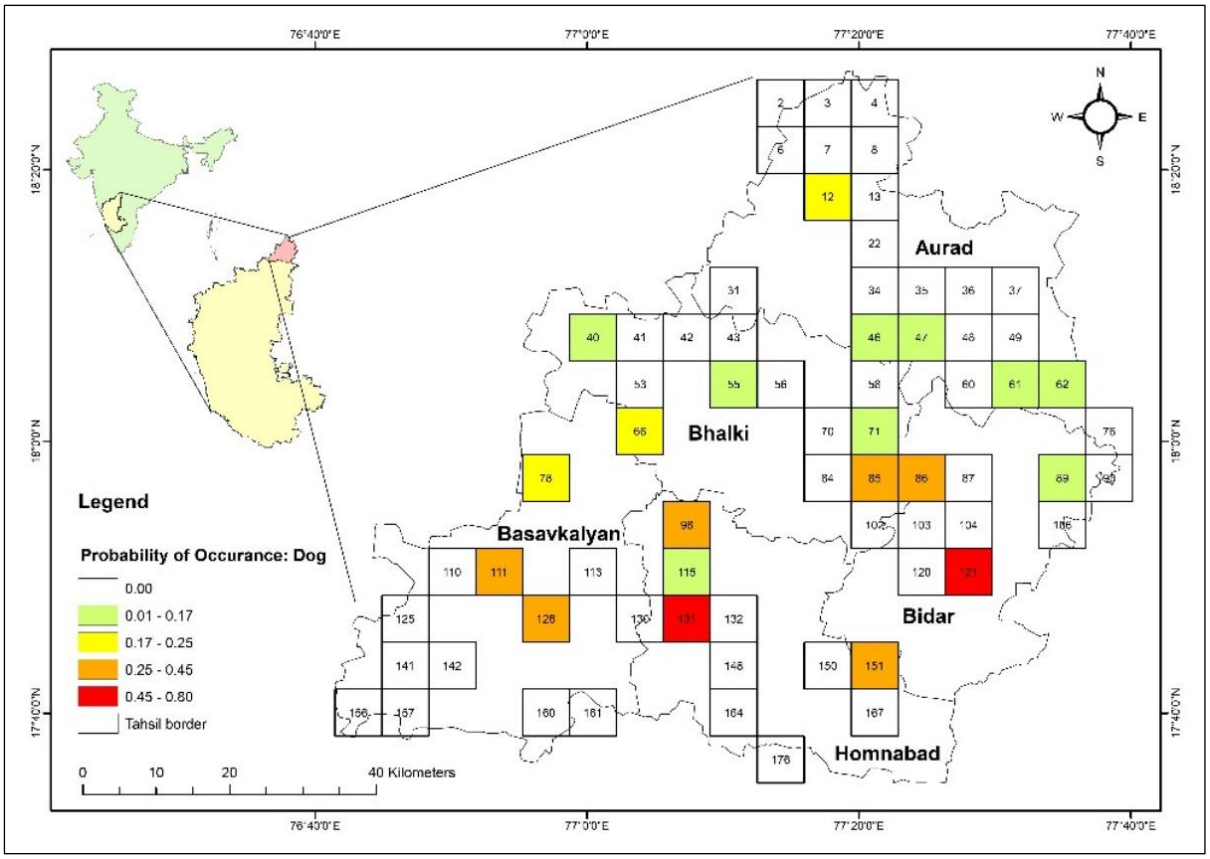


Figure 11 Probability of occurrence of free ranging dogs in potential grassland conservation areas

Image 8 Free-ranging dogs pose a direct threat to wildlife. A dog chases a blackbuck in Chota Fall grassland @ Pooja Gosavi

B) Late Winter Survey: Feb 2022

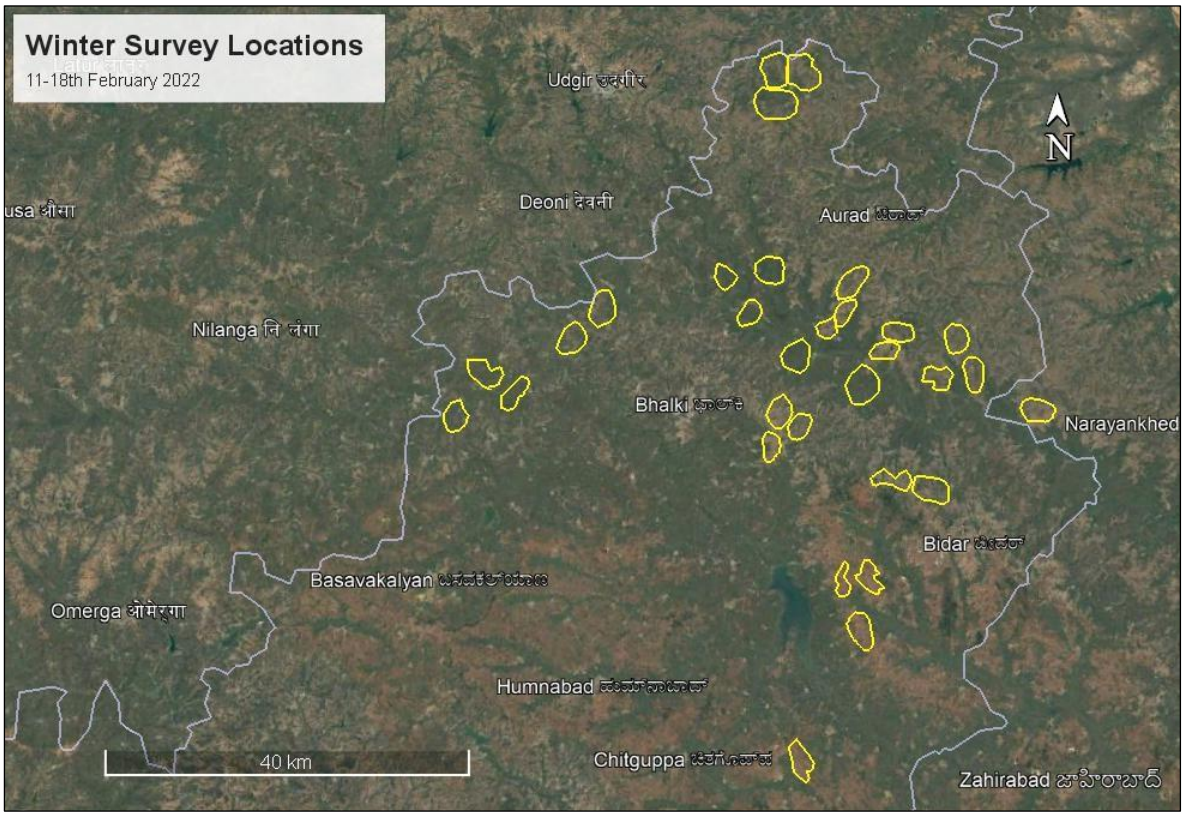


Figure 12 Potential grassland conservation areas from the Post-Monsoon Lesser Florican Survey were used for the winter survey in November 2021.

The winter survey was carried out from 12-18th February 2022. The total 31 sites were demarcated from potential grassland habitats identified in Post monsoon Lesser Florican survey conducted in November 2021. In this survey the vegetation, land pattern, and Grassland associated species were observed.

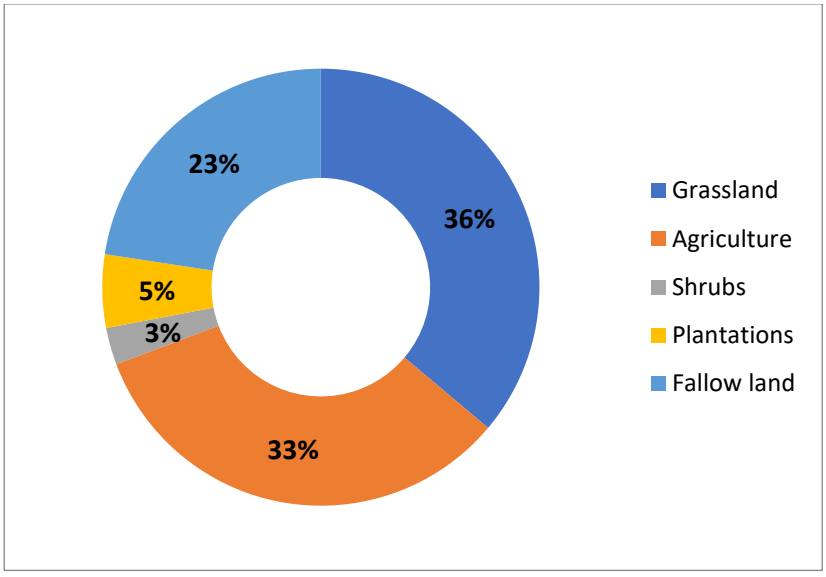


Figure 13 The land cover observed during the survey through sampling method, indicates that grasslands are still available in Bidar district

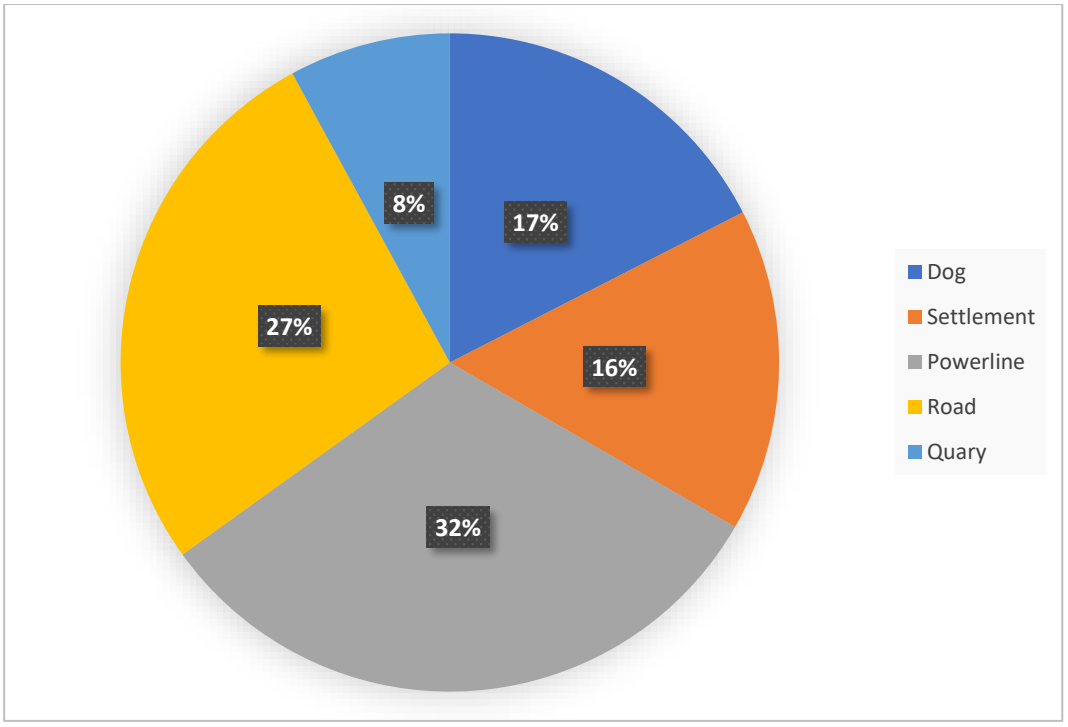


Figure 14 Major threats to the wildlife and grassland habitat

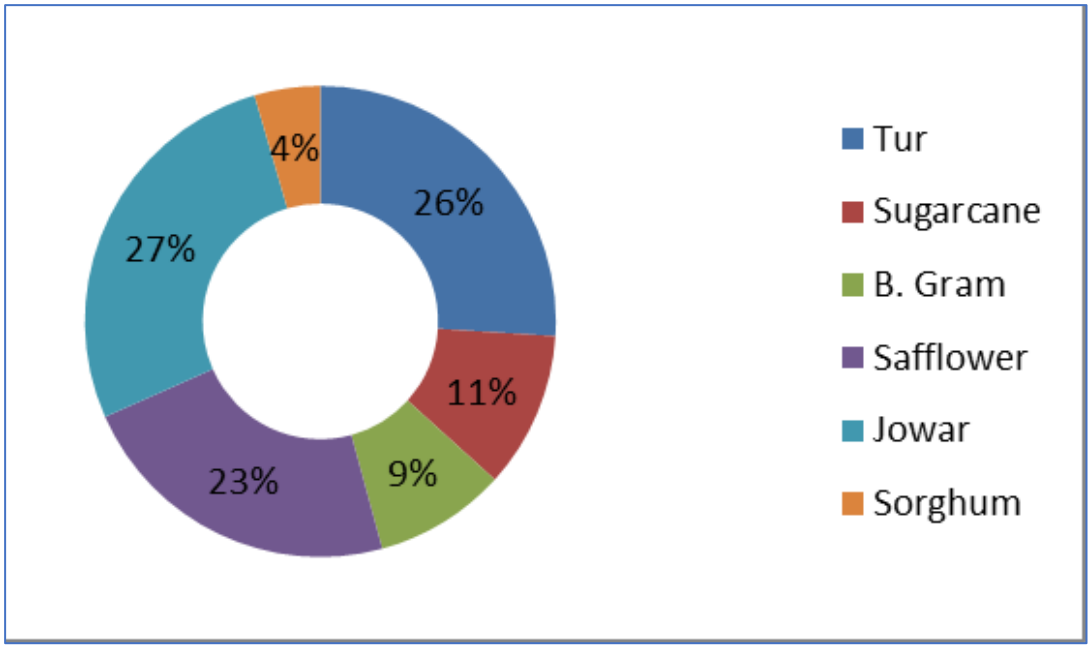


Figure 15 Major crops seen in survey area during late winter survey

Grassland obligate Avifauna sightings

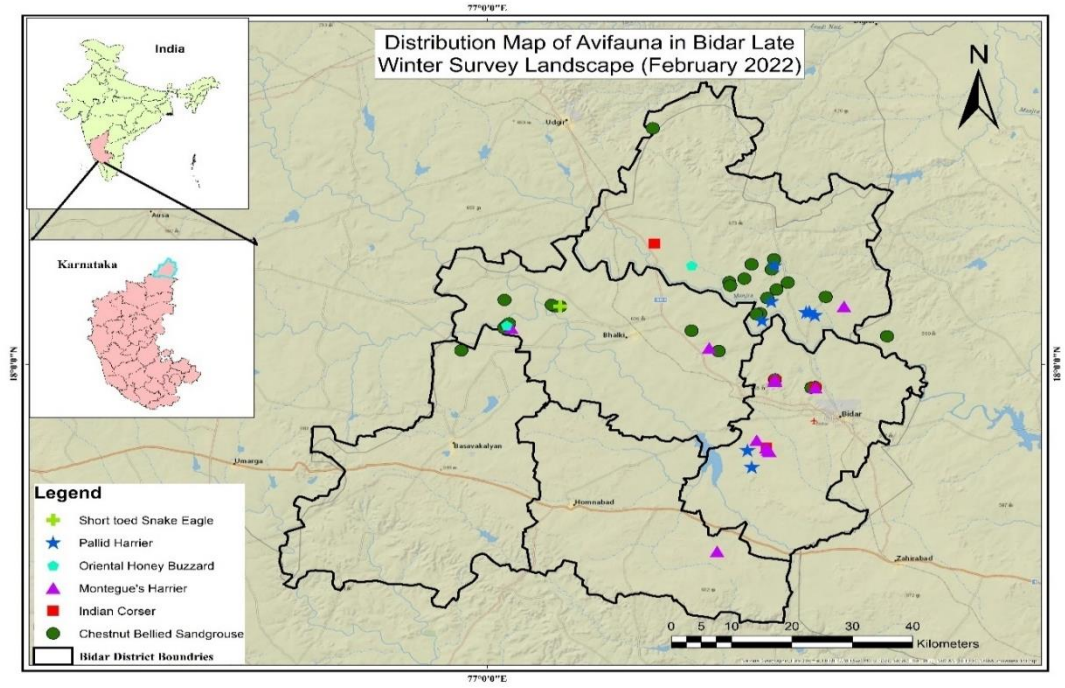


Figure 16 Sightings of grassland obligate species like Courser, Sandgrouse and Raptors during late winter surveys

Sightings of mammals

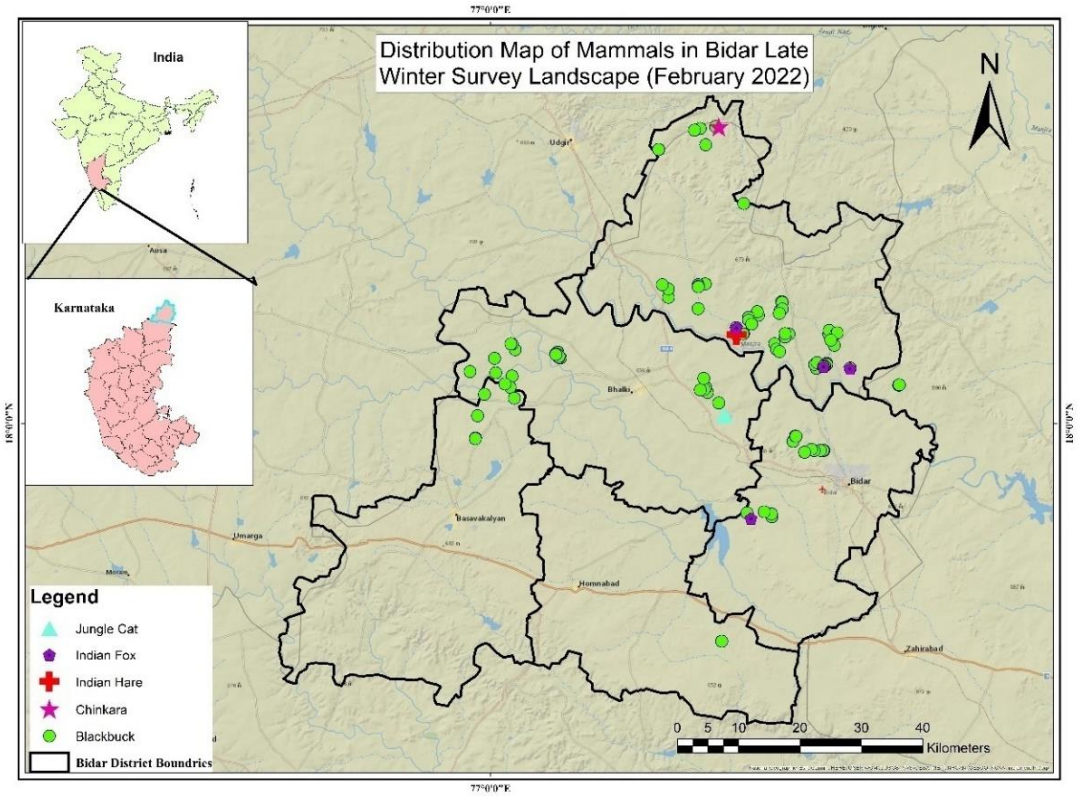


Figure 17 Sightings of Mammals during late winter survey

In the winter survey, the major agricultural crops observed were Green gram *Vigna radiata*, Bengal gram *Cicer arietinum*, Safflower *Carthamus tinctorius*, Sorghum bicolour.

Grasses in the study area is include Marvel grass *Dichanthium annulatum*, Ginger grass *Cymbopogon martini*, Gamba grass *Andropogon* Spp., Feather finger grass *Chloris virgata*, *Setaria pumila*, *Chrysopogon fulvus*, Crowfoot grass *Dactyloctenium aegyptium*, Aleppo grass *Sorghum halepense*, Desert black-millet *Melanocenchris jacquemontii*, Kangaroo grass *Themeda triandra*, *Saheama*, Gold-beard grass *Chrysopogon gryllus*, Black *speargrass*, *Heteropogon contortus*.

The Oriental Honey Buzzard *Pernis ptilorhynchus*, *Indian Courser Cursorius coromandelicus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, and Short-toed snake Eagle *Circaetus gallicus* are among the avifauna species that were observed.

The mammals observed in various areas are as follows.

1. **Blackbuck *Antilope cervicapra***: The Blackbucks were recorded in 27 out of 31 sites surveyed. The maximum herd size recorded was of 120 individuals at Chetnal in Aurad tehsil. The average herd size recorded was of 9-10 individuals. A total of 881 individuals were recorded during the survey. The estimated population in survey area is 800-1,000 individuals.

2. **Chinkara *Gazella bennettii***: The Chinkara was recorded at Mudkhed–Jamakandi-Hokrana areas in the northern most parts of the district. During survey only 3 individuals in a group were recorded. The dung pellets were recorded at various sites (N= 06).

3. **Indian Fox *Vulpes bengalensis***: The Indian Fox was recorded at five sites. Both direct and indirect sighting methods were implied to detect the presence of species. In indirect sighting method scat, footprint, and den were used as signs. The active dens were recorded at four sites.

4. Great Indian Bustard (GIB) *Ardeotis nigriceps*: The positive interview with locals regarding the presence of Great Indian Bustard (GIB) was recorded near Lakkangaon in Bhalki tehsil on February 16, 2022; claiming the sighting of bird within 15 days before interview nearly 2 km from Lakkhangaon in recently harvested Bengal gram field.

C) Monsoon survey: July-Aug 2022

Efforts taken

Of the 114 grids, 95 grids were surveyed, which compose more than 83% of grids and an area of 2,375 sq.km. During the survey, an average length of 12 km transect was covered in each grid on vehicle, around 950 km length of the transect was covered along with a 10-minute point count at an interval of 2 km each. Overall, 454 - point counts 454 x 10min = 4,540 minutes were conducted for the data. In each team, 4 observers were deployed. Therefore 454 x 4 = 1,816 minutes or 30.2 human-hours were spent for the point count observation.

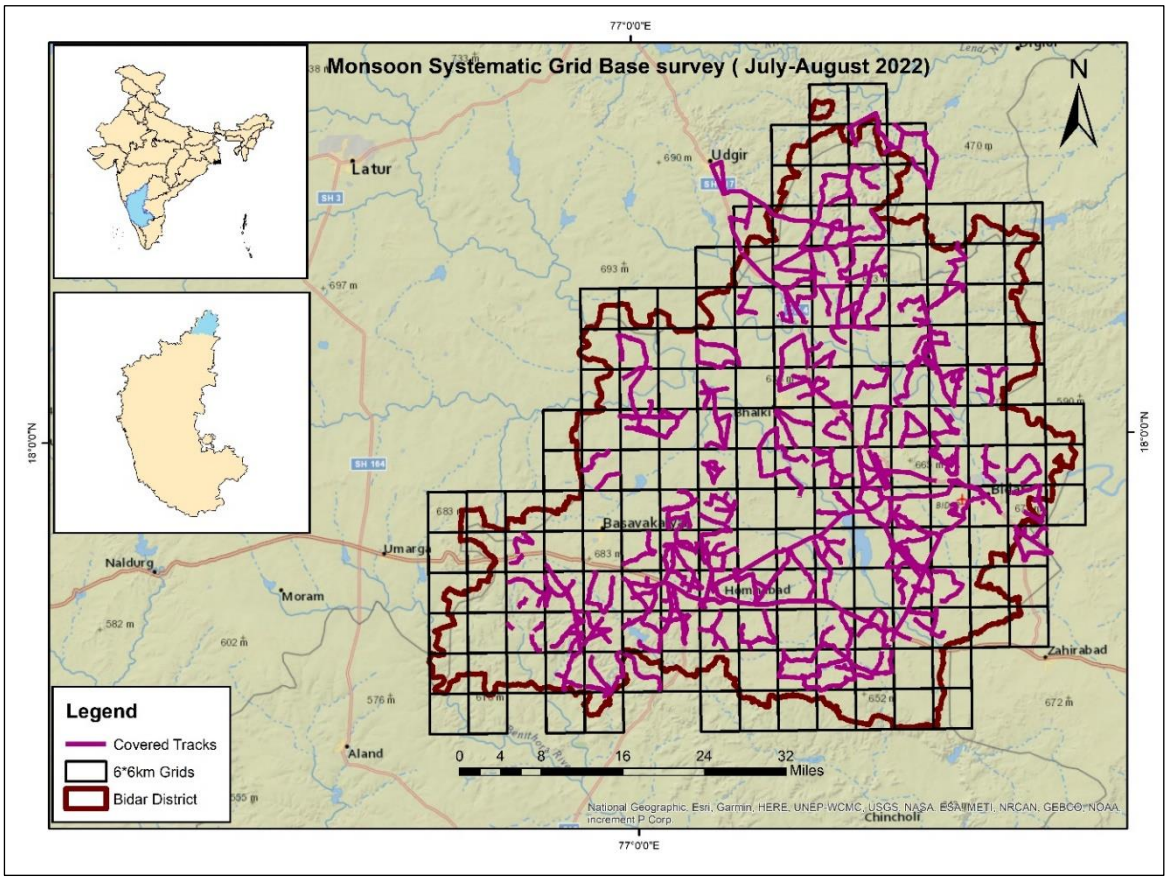


Figure 18 Grids of landscape survey in Bidar, Karnataka

Common trees and shrubs observed during survey

In Bidar, tree species such as Tamarind *Tamarindus indica*, Neem *Azadirachta indica*, Mango *Mangifera indica*, Babul *Acacia nilotica*, Peepal *Ficus religiosa* Spp., and shrub species such as Indian mallow *Abutila indicum*, White prickly poppy *Argemone albiflora*, *Matura* tea tree *Senna auriculata*, Ashwagandha *Withania somnifera*, Tiny periwinkle *Catharanthus pusillus*, Rubber vine *Cryptostegia grandiflora*, Foxtail *Setariaitalica*, Coatbuttons *Tridax procumbens*, etc. were observed.

Grasses observed during survey

Bidar is an area where the vegetation is dominated by grasses of Family Poaceae. Grasses include Marvel grass *Dichanthium annulatum*, Ginger grass *Cymbopogon martini*, Gamba grass *Andropogon*, Feather finger grass *Chloris virgata*, *Setariapumila*, *Chrysopogon fulvus*, Crowfoot grass *Dactyloctenium aegyptium*, Aleppo grass *Sorghum halepense*, Desert black-millet *Melanocenchris jacquemontii*, Kangaroo grass *Themeda triandra*, *Saheama*, Gold-beard grass *Chrysopogon gryllus*, Black speargrass *Heteropogon contortus*.

Invasive plants observed during survey

During landscape survey invasive shrubs species Crown flower *Calotropis gigantea*, Rubberbush *Calotropis procera*, Angel's trumpet *Datura innoxia*, Mesquit *Prosopis juliflora*, Sickla senna *Senna tora*, Palas *Butea monosperma*, *and* invasive herb species Burkill *Cassia hirsuta*, Sliver Cock comb *Celosia argentea*, Pignut *Hyptis suaveolens*, Rose balsam *Impatiens balsamina*, *Mimosa pudica*, *Parthenium hysterophorus* were observed.

Crop pattern observed during survey

Agriculture is the main occupation in rural parts of the Bidar district. Agriculture has specific pattern depending on the local ecology, it is mostly dry or rain-dependent cultivation in which Jowar *Sorghum bicolor* is grown in combination with pulses, oil seeds, Wheat, and other cereals. Cultivation is two seasons, Rabi or "winter cultivation" (August–January), and Khari or "monsoon cultivation" (June–September). In the Rabi season Wheat, Mustard, Bengal gram, Sugarcane and in *Kharif* season Paddy, Maize, Jowar, Bajra, Toor, Moong, Urad, Cotton, and Soya bean are grown. Major agricultural crops are Soya bean *Glycine max*, Green gram *Vigna radiata*, Bengal gram *Cicer arietinum*, Rice *Oryza sativa*, Wheat *Triticum*, Red gram *Cajanus cajan*, Cotton *Gossypium* Spp., Sugarcane *Saccharum officinarum*, and Chilly *Capsicum frutescens*.

Species observed during survey

In landscape survey, Black-winged Kite *Elanus caeruleus*, Chestnut bellied Sandgrouse *Pterocles exustus*, Grey Francolin *Francolinus pondicerianus*, Indian Courser *Cursorius coromandelicus*, Oriental honey Buzzard *Pernis ptilorhynchus*, Painted Francolin *Francolinus pictus*, Rain Quil *Coturnix coromandelica*, Short-toed snake-eagle *Circaetus gallicus*, Tawny Eagle *Aquila rapax*, White-eyed Buzzard *Butastur teesa*, Yellow wattled lapwing *Vanellus malabaricus etc.* Avifauna species were observed.

Mammals such as Blackbuck *Antilope cervicapra*, Chinkara *Gazella bennettii*, Grey Mangoose *Herpestes edwardsii*, Indian golden Jackal *Canis aureus indicus*, Indian fox *Vulpes bengalensis*, *etc.* were observed.

Green gram *Vigna radiata* @Pooja Gosavi

Black gram *Vigna mungo* @Pooja Gosavi

Soya bean *Glycine max* @Pooja Gosavi

Red gram *Cajanus cajan* @Pooja Gosavi

Image 9 Major monsoon crops in the study area

Dichanthium annulatum
(Photo : A. Mohan)

Chrysopogon
(Photo : Prasad Bolde)

Chrysopogon fulvus
(Photo : Prasad Bolde)

Heteropogon contortus
(Photo : Prasad Bolde)

Image 10 Major grasses found in study area

Themeda Spp.

Andropogon Spp.

Cymbopogon Spp.

Apluda Spp.

(Photo : A. Mohan, P. Bolde, Pooja Dange)

Image 11 Major grasses found in study area

Avifauna sighted during monsoon season

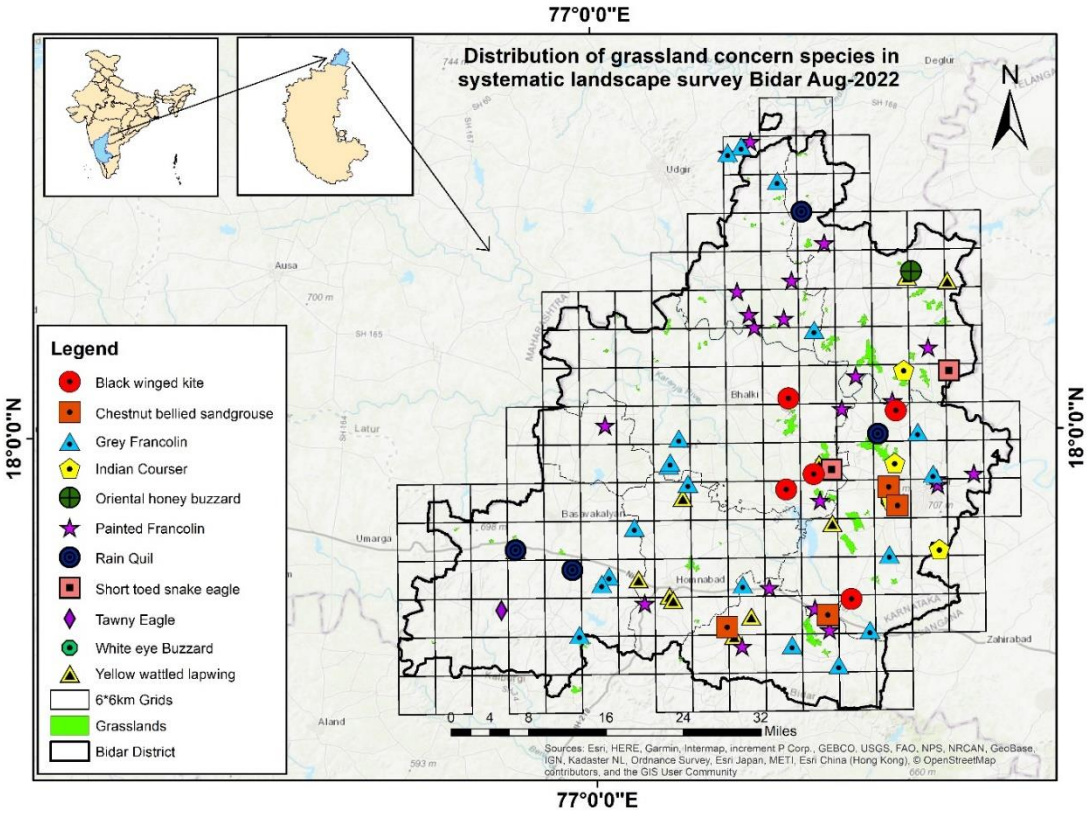


Figure 19 Avifauna observed during the monsoon survey August 2022 in Bidar district, Karnataka

Sightings of mammals during monsoon survey

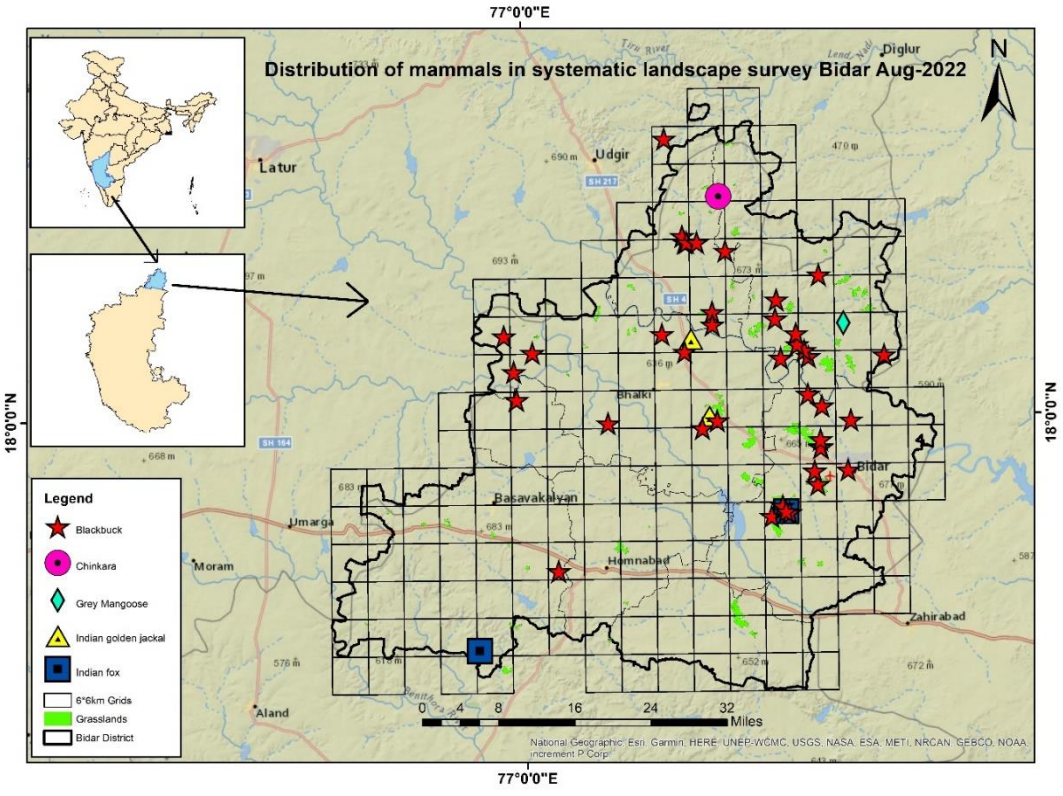


Figure 20 Mammals observed during the monsoon survey August 2022 in Bidar district, Karnataka

F) Winter survey 2022

The regular winter surveys were conducted from September 2022 to December 2022 in the Potential Grasslands of Bidar district for the presence of Lesser Florican and grassland-associated species and their habitats. Interviews with people for secondary information regarding Lesser Florican, Decoy experiment and Entomology study w were carried out during this period. The grasslands and potential areas in entire Bidar district were observed during the survey. The winter crop pattern, vegetation, land cover, and invasive were observed.

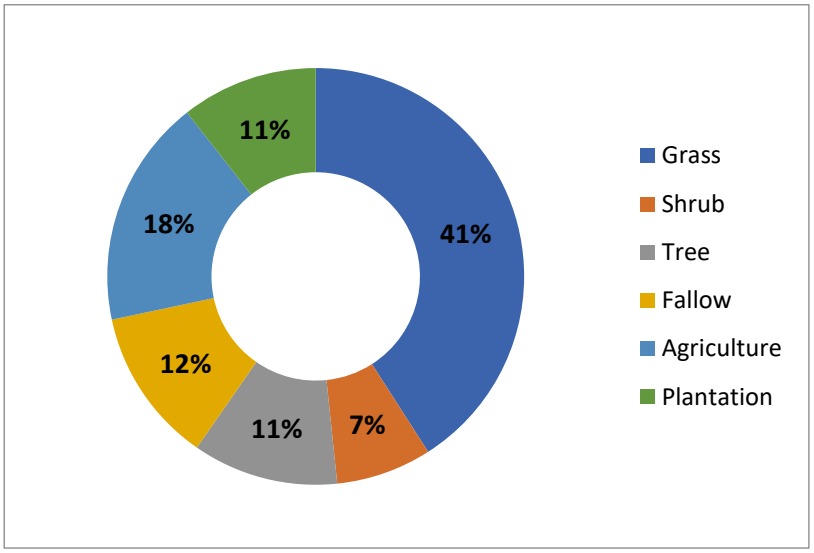


Figure 21 Major vegetation types observed in the winter survey

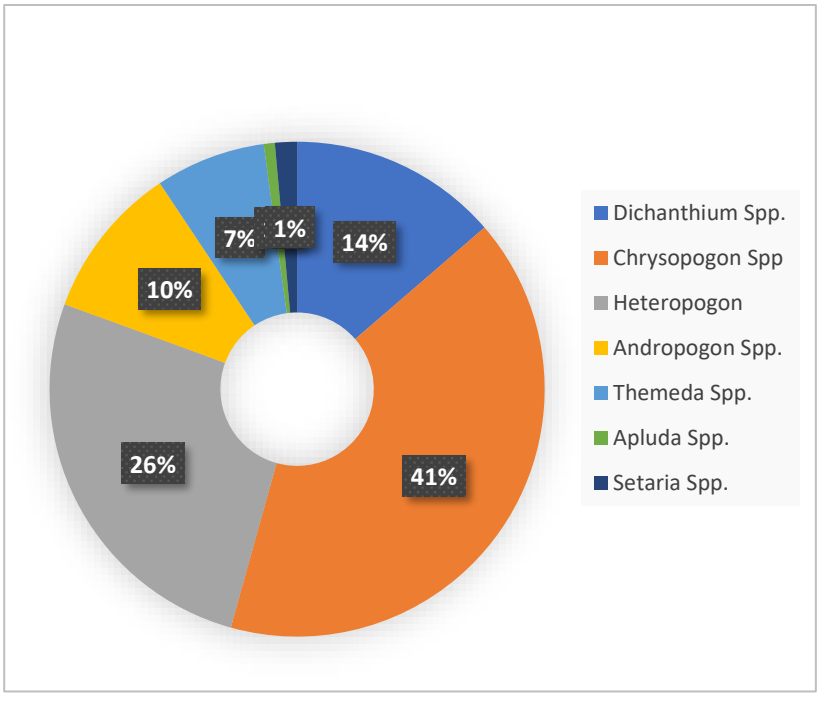


Figure 22 Dominant grasses observed during winter survey

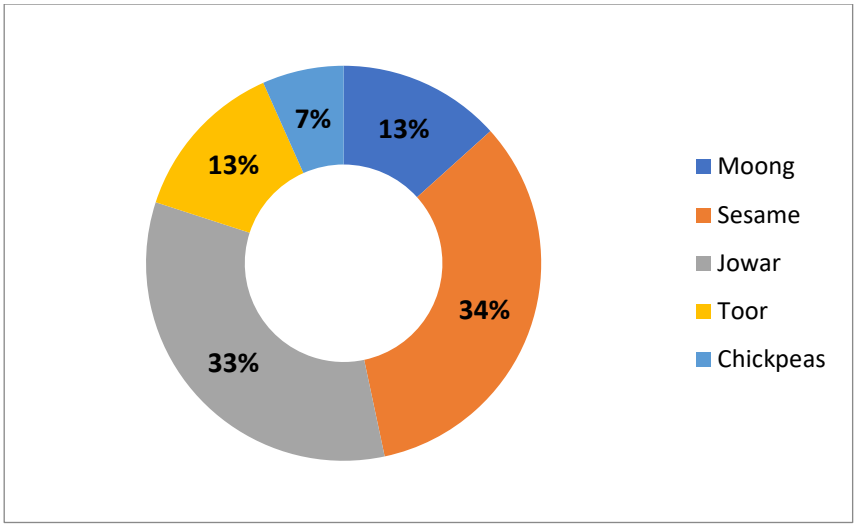


Figure 23 Important crops grown in Bidar during winter survey

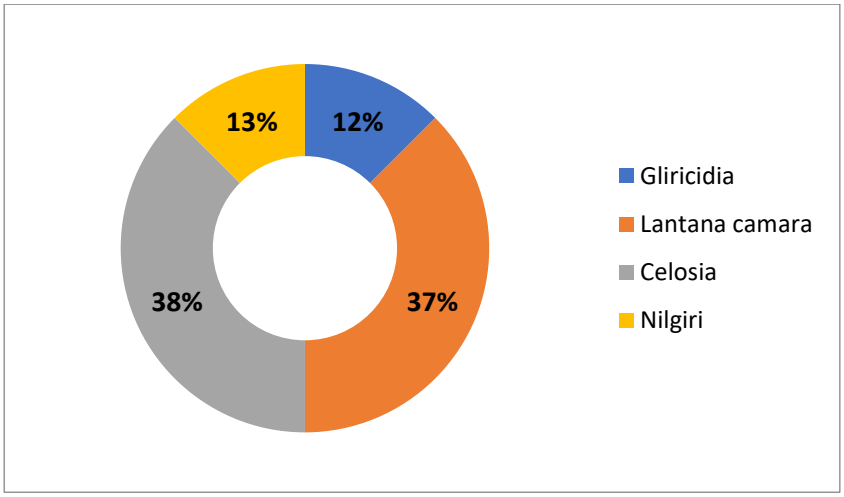


Figure 24 Dominant Invasive Plants observed during winter survey

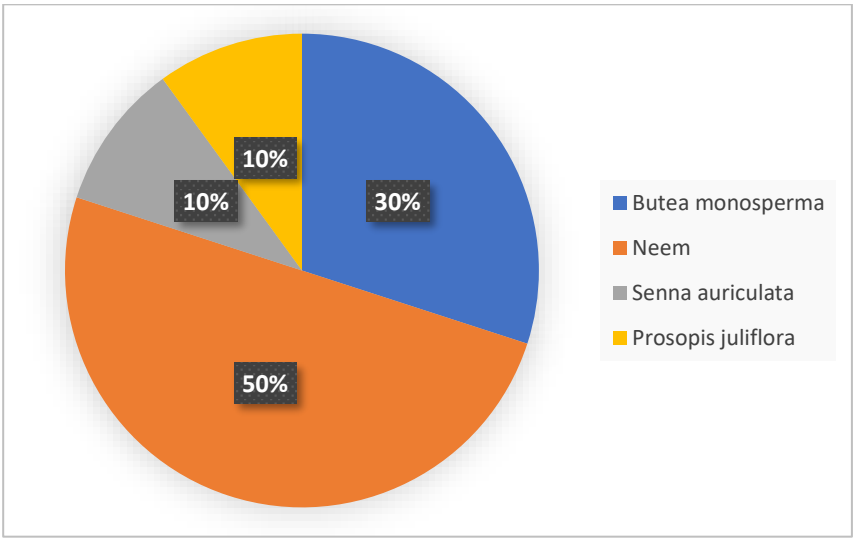


Figure 25 Dominant Trees observed during winter survey

Grassland obligate Avifauna sightings

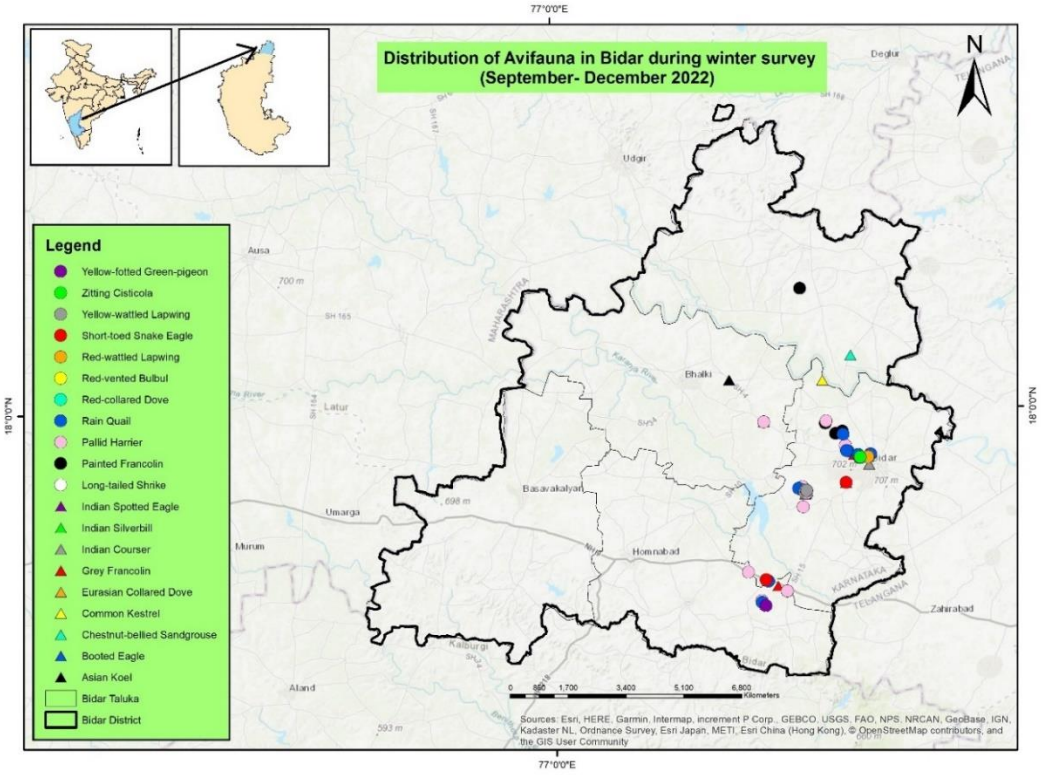


Figure 26 Avifauna observed during the winter survey

Sightings of mammals

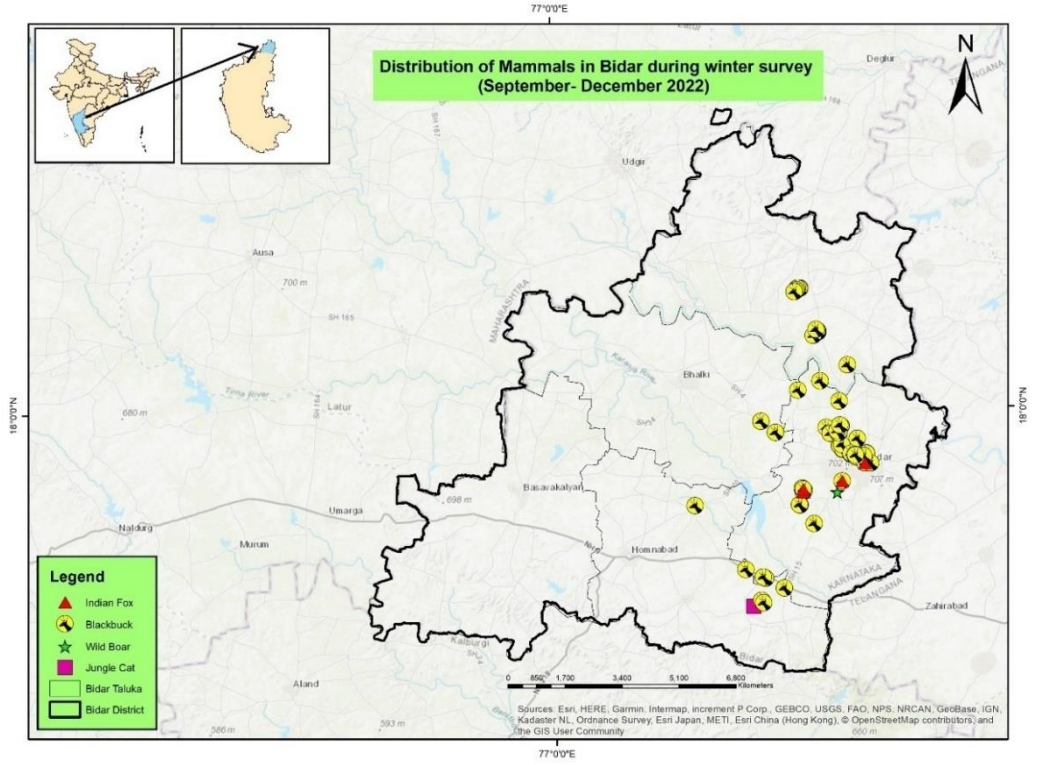


Figure 27 Mammals observed during the winter survey

Major agricultural crops seen were Green gram *Vigna radiata*, Bengal gram *Cicer arietinum*, Red gram *Cajanus cajan*, Sesame *Sesamum indicum* jowar *Sorghum bicolour*.

Grasses seen in the study area include Marvel grass *Dichanthium annulatum*, Ginger grass *Cymbopogon martini*, Gamba grass *Andropogon* Spp., Desert black-millet *Melanocenchris jacquemontii*, Kangaroo grass *Themeda triandra*, Matura tea tree *Senna auriculata*, Ashwagandha *Withaniasomnifera*, Tiny periwinkle *Catharanthuspusillus*, Rubber vine *Cryptostegia grandiflora*, Foxtail *Setariaitalica*, Coat buttons *Tridax procumbens*, *Saheama*, Gold-beard grass *Chrysopogon gryllus*, Black *speargrass*, *Heteropogon contortus*. Feather finger grass *Chloris virgata*, *Setaria pumila*, *Chrysopogon fulvus*, Crowfoot grass *Dactyloctenium aegyptium*, Aleppo grass *Sorghum halepense*, shrubs include Indian mallow *Abutila indicum*, White prickly poppy *Argemone albiflora*, were observed.

Tree species such as *Butea monosperma*, Neem *Azadirachta indica*, *Senna auriculate*, *Prosopis juliflora*, etc were observed.

In the study area, Yellow-footed Green-pigeon *Treron phoenicopterus*, Zitting Cisticola *Cisticola juncidis*, Red-wattled Lapwing *Vanellus indicus*, Red-collared Dove *Streptopelia tranquebarica*, Long-tailed shirke *Lanius schach tricolor*, Indian Spotted Eagle *Clanga hastata*, Indian Silverbill *Euodice malabarica*, Eurasian Collared Dove *Streptopelia decaocto*, Common Kestrel *Falco tinnunculus*, Booted Eagle *Hieraaetus pennatus*, Asian Koel *Eudynamys scolopaceus*, Oriental Honey Buzzard *Pernis ptilorhynchus*, Indian Courser *Cursorius coromandelicus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, and Short-toed snake eagle *Circaetus gallicus* are among the avifauna species that were seen.

In mammals Blackbuck *Antilope cervicapra*, Jungle cat *Felis chaus*, Wild boar *Sus scrofa*, Indian fox *Vulpes bengalensis* are some notable species found in the study area.

G) Summer survey 2023

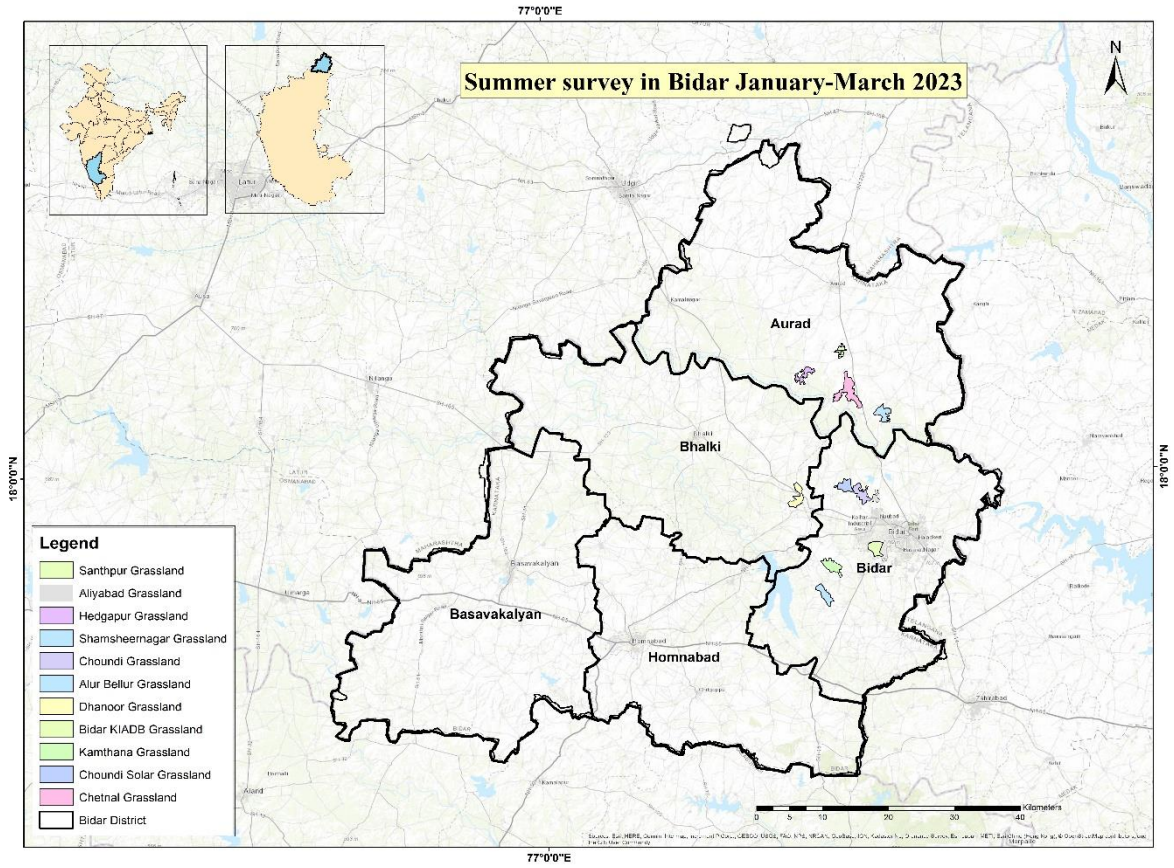


Figure 28 Based on the data and potential habitat for the Lesser Florican, 11 locations were chosen. Avifauna and mammal status and sudden habitat loss were also noted

Crops

Agriculture in the study area had its own specific form. Drawing on the specification of the local ecology, agriculture is mostly dry cultivation or rain-dependent cultivation in which a wide variety of local Jowar *Sorghum bicolor* is grown in combination with pulses, oil seeds, wheat, and other cereals. Cultivation is restricted to two seasons, Rabi or "winter cultivation" August–January, and Kharif or "monsoon cultivation" June–September. In the Rabi season wheat, mustard, gram, and Kharif season crop Paddy, Maize, Jowar, Bajra, Toor, Moong, Urad, Cotton, and Soya bean. Major agricultural crops are Green gram *Vigna radiata*, Bengal gram *Cicer arietinum*, Rice *Oryza sativa*, Wheat *Triticum*, Red gram *Cajanus cajan*, Cotton *Gossypium* Spp., Sugarcane *Saccharum officinarum*, and Chilly *Capsicum frutescens.*

Grasses

Grasses in the study area include Marvel grass *Dichanthium annulatum*, Gingergrass *Cymbopogon martini*, Gamba grass *Andropogon* Spp., Feather finger grass *Chloris virgata*, *Setaria pumila*, *Chrysopogon fulvus*, Crowfoot grass *Dactyloctenium aegyptium*, Aleppo grass *Sorghum halepense*, Desert black-millet *Melanocenchris jacquemontii*, Kangaroo grass *Themeda triandra*, *Saheama*, Gold-beard grass *Chrysopogon gryllus*, Black *speargrass*, *Heteropogon contortus.*

Shrubs
Shrubs include Indian mallow *Abutila indicum*, White prickly poppy *Argemone albiflora*, Matura tea tree *Senna auriculata*, Ashwagandha *Withania somnifera*, Tiny periwinkle *Catharanthus pusillus*, Rubber vine *Cryptostegia grandiflora*, Foxtail *Setaria italica*, Coatbuttons *Tridax procumbens* were observed.

Invasive Plants
During the survey invasive plants such as Crown flower *Calotropis gigantea*, Rubber bush *Calotropis procera*, Angel's trumpet *Datura innoxia*, Mesquit *Prosopis juliflora*, Sickla senna *Senna tora*. Invasive herbs species Burkill *Cassia hirsuta*, Sliver Cock comb *Celosia argentea*, Pignut *Hyptis suaveolens*, Rose balsam *Impatiens balsamina*, *Mimosa pudica*, *Parthenium hysterophorus* were observed.

Common Trees
In the study area, Tamarind *Tamarindus indica*, Neem *Azadirachta indica*, Mango *Mangifera indica*, Babul *Acacia nilotica*, Peepal *Ficus religiosa* Spp. were the commonly observed trees.

Avifauna
In study area, Yellow-footed Green-pigeon *Treron phoenicopterus*, Common Kestrel *Falco tinnunculus*, Booted Eagle *Hieraaetus pennatus*, Indian Courser *Cursorius coromandelicus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, Yellow wattled lapwing *Vanellus malabaricus* and Short-toed snake Eagle *Circaetus gallicus* were some of the avifauna species observed.

Mammals

In mamamals Blackbuck *Antilope cervicapra*, Indian grey wolf *Canis lupis pallipas*, Indian fox *Vulpes bengalensis* are some notable species observed.

The dominat vegetation and land cover shown in Chart as follows.

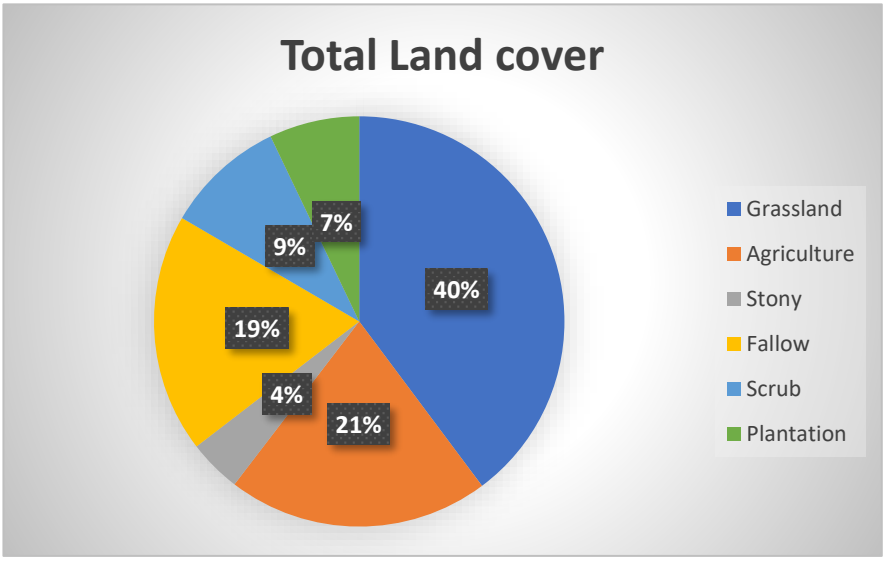


Figure 29 The total land cover as observed in 11 selected sites

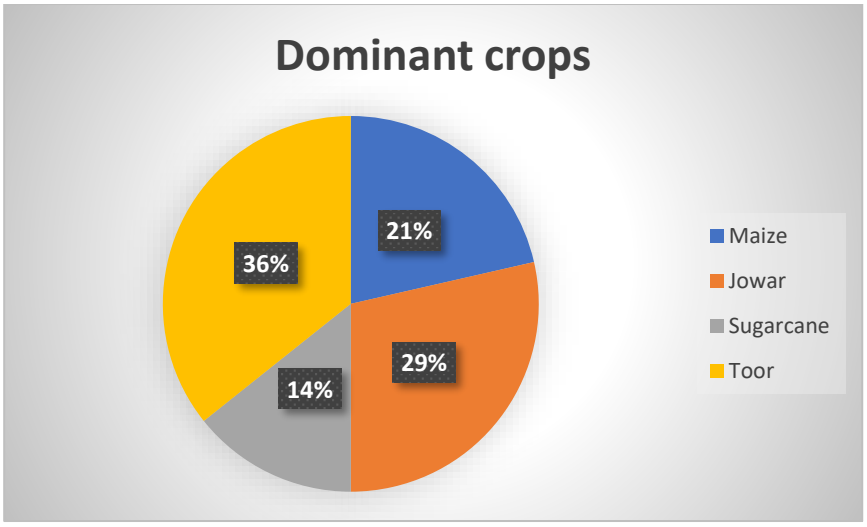


Figure 30 The dominant crops observed in 11 selected sites

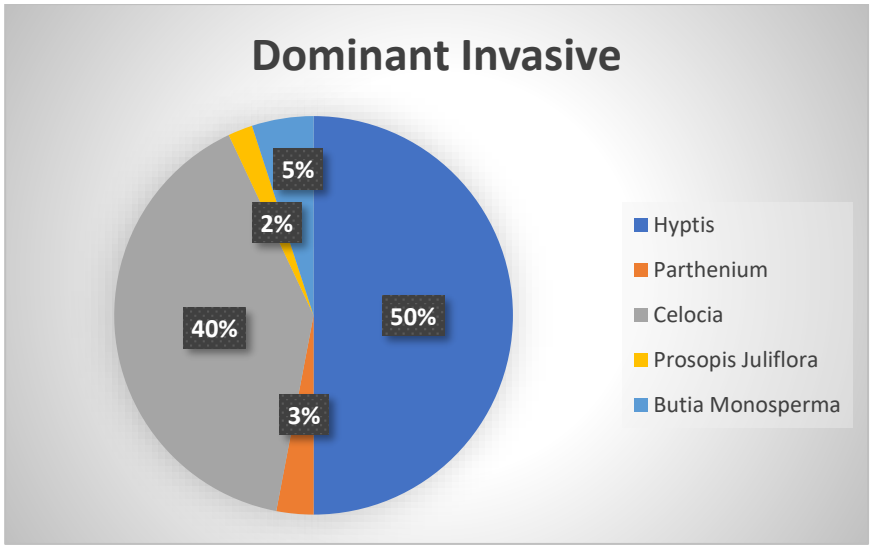


Figure 31 The dominant invasive species observed in 11 selected sites

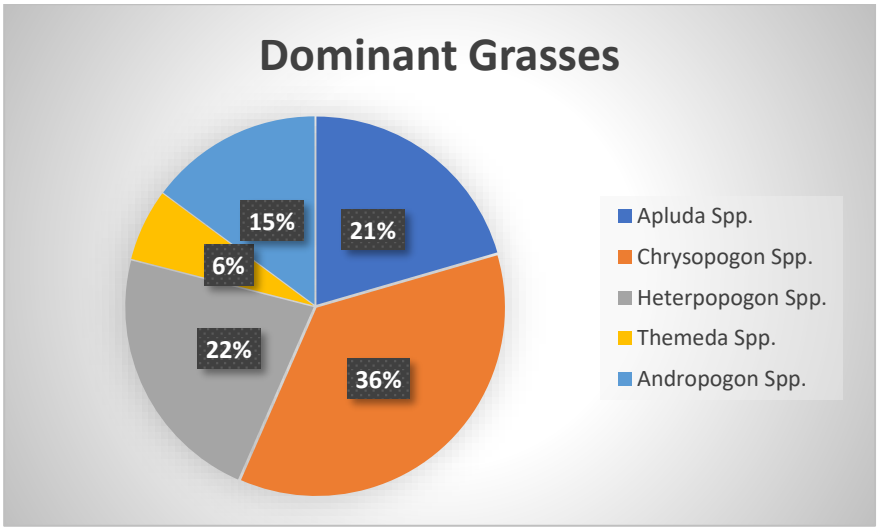


Figure 32 Dominant Grass species observed in 11 selected sites

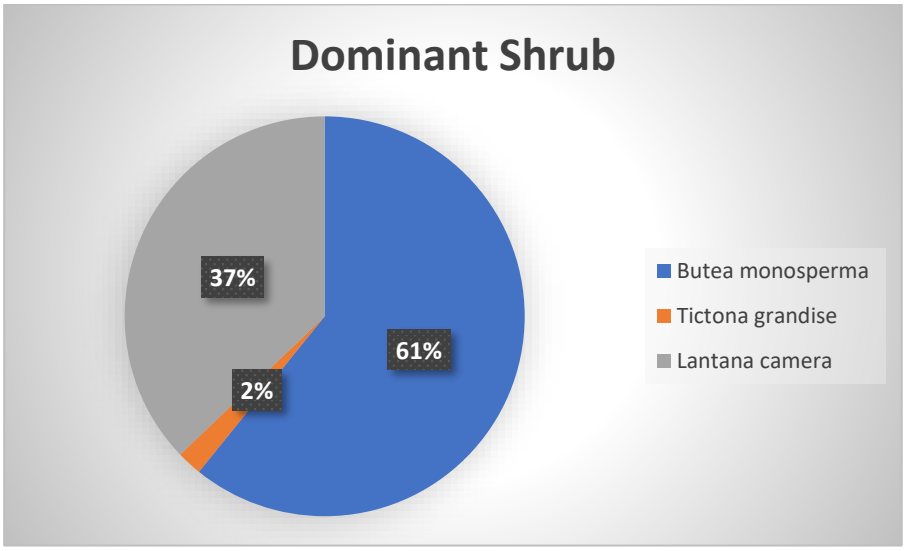


Figure 33 Dominant Shrub species observed in 11 selected sites

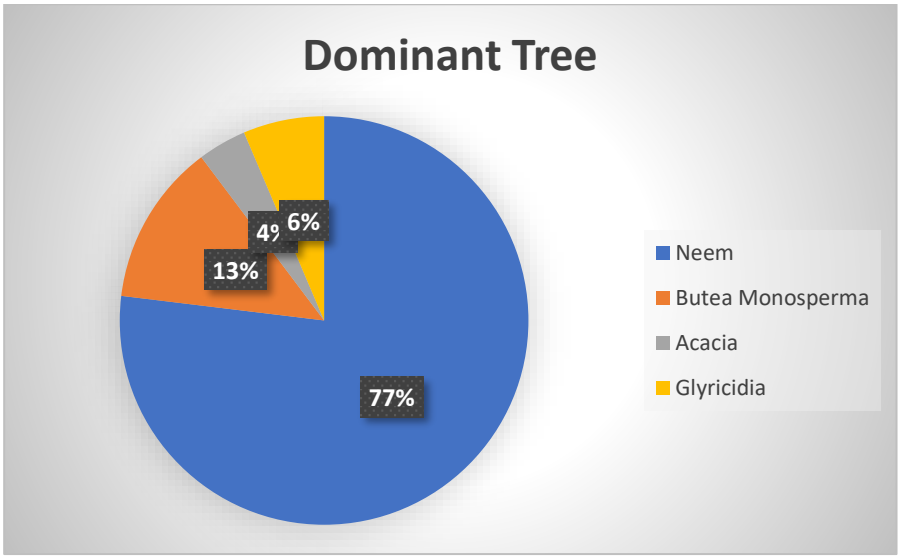


Figure 34 Dominant Tree species observed in 11 selected sites

Distribution of Avifauna

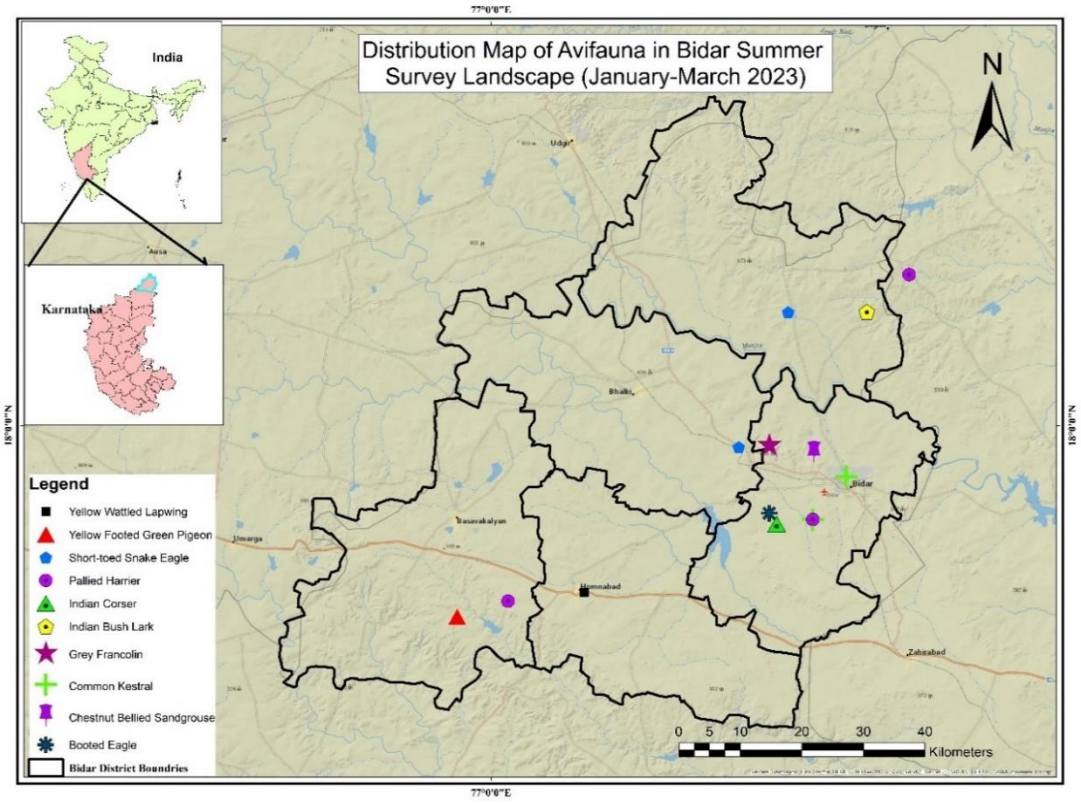


Figure 35 The distribution of avifauna observed during January to March 2023 in Bidar

Distribution of Mammals

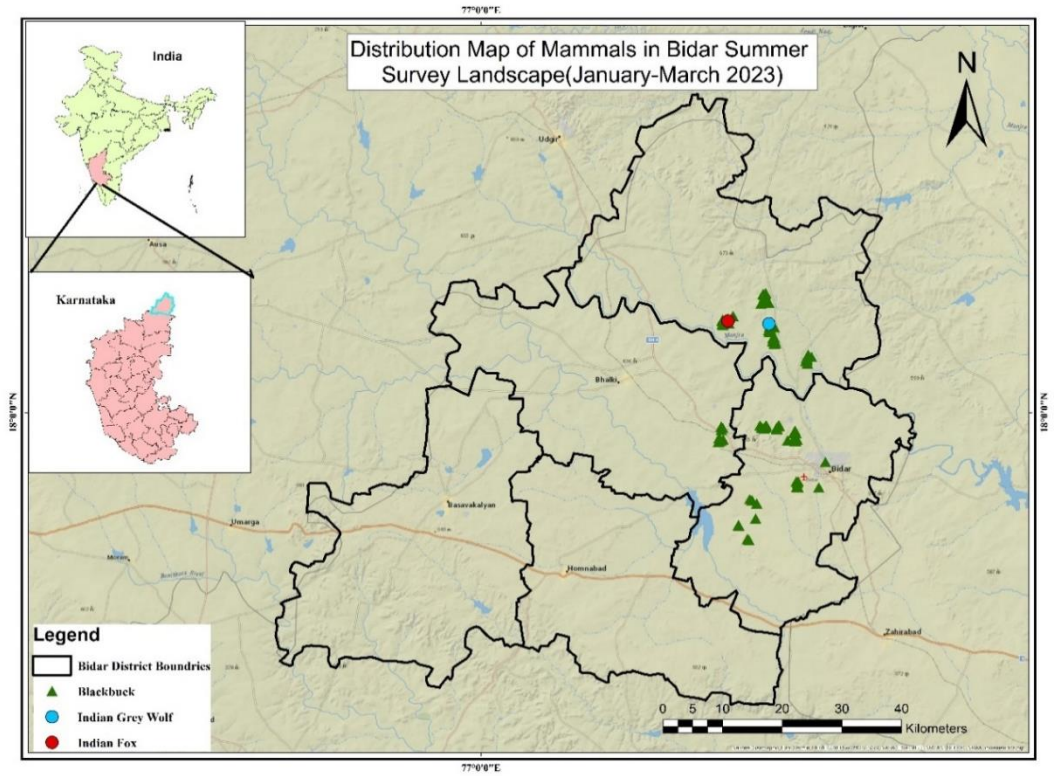


Figure 36 The distribution of mammals observed during January-March 2023 in Bidar

Lesser Florican sightings in Bidar

The species breeds in the Southern part of India during the northeast monsoon (October to December) where, the grass height attains maximum level. In Bidar, status and distribution of Lesser Florican were assessed in a systematic manner **during 2019-20 (Table 2).** by Karnataka State Forest Department and Bombay Natural History Society (BNHS) **since project period August 2021 to March 2023 (Table 3)** as given in the following tables and map.

SN	Place	Lat.	Long.	Number & Sex	Date	Habitat
1.	Chetnal, Bidar, Karnataka	18.10026	77.41919	1	Sep-19	Grassland
2.	Alur (B), Bidar, Karnataka	18.0832	77.48151	1	Oct-19	Grassland
3.	Mamdapur, Bidar, Karnataka	17.97808	77.44286	1	Nov-19	Grassland
4.	Mamdapur, Bidar, Karnataka	17.97784	77.44729	1	Nov-19	Grassland
5.	Mamdapur, Bidar, Karnataka	17.97388	77.44679	1	Jan-20	Grassland
6.	DhanurTanda, Bidar, Karnataka	17.97754	77.3605	1	Mar-20	Grassland

Table 2 Lesser Florican sightings reported by Karnataka Forest Department during 2019-2020

SN	Place	Lat.	Long.	Number & Sex	Date	Habitat
1.	Chondi	17.96729	77.45104	1 (Female)	08-Aug-21	Grassland
2.	Santhpur	18.16941	77.42773	1 (Female)	22 and 24 Aug-21	Grassland
3.	Alur (B)	18.08274	77.48441	1 (Female)	12-Sep-21	Grassland
4.	Hungi	17.93649	77.29065	1 (Female)	08-Nov-21	Grassland
5.	Kamthana	17.87645	77.40033	1 (Male)	11 and 13 Nov-21	Grassland
6.	Kamthana	17.87645	77.40033	1 (Male)	22-Nov-22	Grassland

Table 3 Lesser Florican sighted during project period, August 2021 to March 2023

Lesser Florican has been recorded seven times from Mamdapur–Chondi, Aliyabad, Santhpur, Alur-Belur, Kamthana and Jyanthi-Hundi K for during August 2021 to December 2022. Among these sightings, a female bird was sighted four times while a male bird was sighted twice (Narwade *et al.* 2022).

1. A solitary female bird was sighted three times in August, once in Chondi (8th Aug 2021)
2. A female sighted twice in Santhpur area in short time span of two days on Aug 22 and 24, 2021.
3. A female was sighted on September 12, 2021 at Alur grasslands.

4. A female bird flushed by a trespassing farmer was recorded by the survey team at Jyanthi-Hungi K. area of Bhalki range on November 08, 2021. The bird was in Sorghum *Sorghum bicolor* field, with an average height of 30cm. The bird took flight and landed nearly 100 meters away in the Bengal Gram *Cicer arietinum* field and immediately took shelter in the field of Pigeon Pea *Cajanuscajan* with an average height of 150 cm.
5. A male bird was seen in breeding plumage by the survey team at Kamthana, Bidar range on November 11 and 13, 2021; but no display was recorded. Most sightings are from the grasslands near plantations and traditional agricultural areas.
6. On the same site at Kamthana a male was sighted for few minutes on November 22, 2022 which indicates the area used by the birds was just a stopover site.

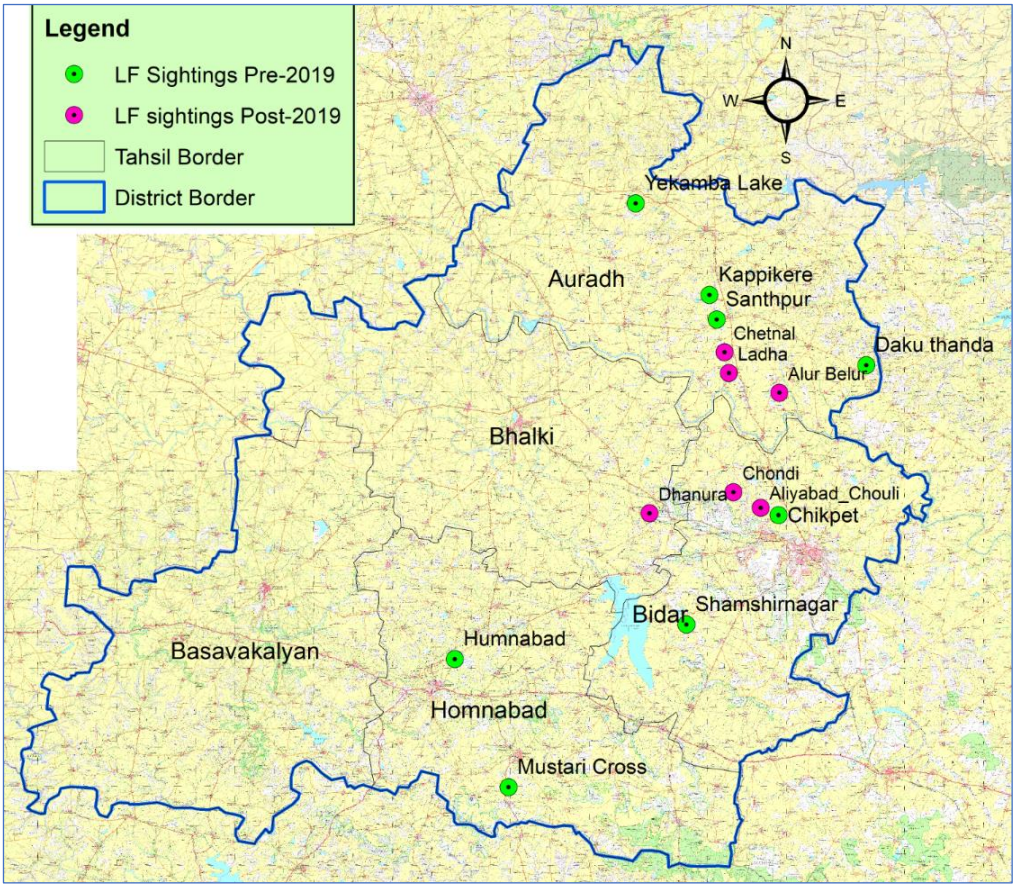


Figure 37 Lesser Florican sightings in Bidar district based on pre 2019 and post 2019 records

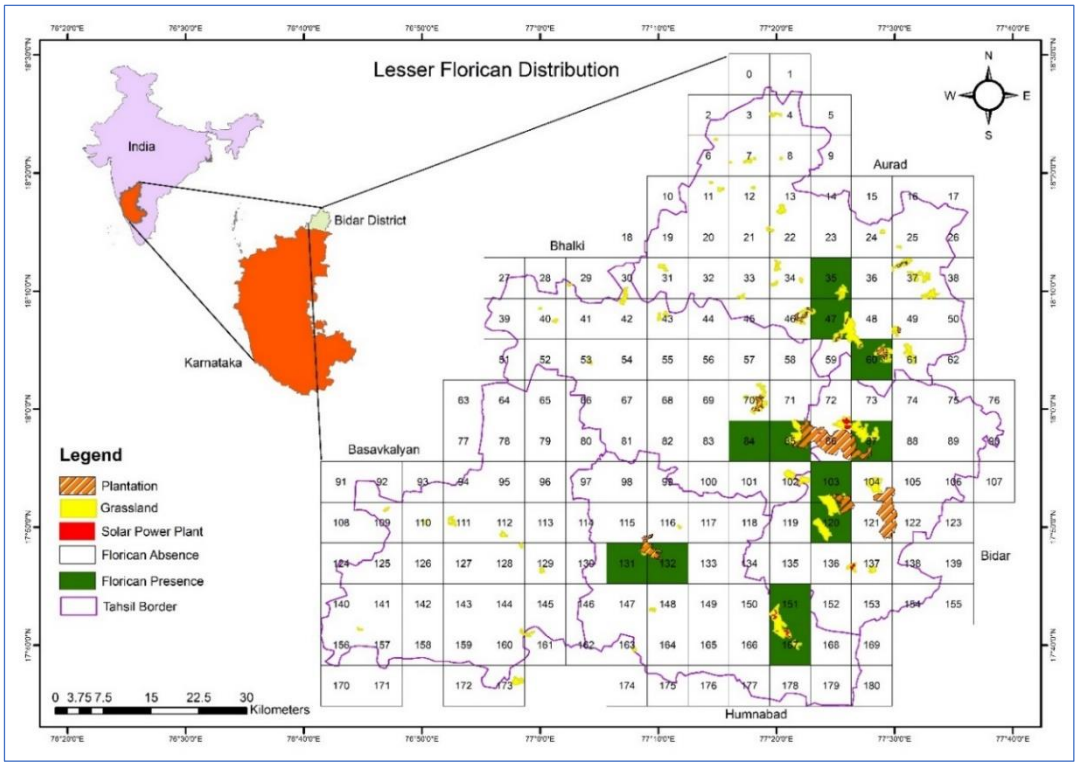


Figure 38 Distribution map of Lesser Florican (2019-2022)

Satellite tagged Florican in Bidar at Khanapur

The site visits were conducted in the areas where a satellite tagged male Lesser Florican moved to Bidar district after spending the breeding season in Ajmer (Personal communication and tagging data shared by Dr. Sutirtha Dutta, Scientist, Wildlife Institute of India). The bird spent almost two months in Bidar at the following locations.

Figure 39 Google earth Image of Khanapur-Sorahalli grassland area

Khanapur is a village in Bidar district of Karnataka state and falls under grid 61. During its visit, a total of 1 sq. km area was observed. Alur-Bellur grassland which is one of the known grasslands is about 5 km from this sighting location.

1. Lesser Florican sighting location no. 1

The first location (18°04'08.3"N 77°31'37.2"E) is 426 meters from the Bidar-Wadgoan Road, it is flat, stony terrain and fallow land covers a significant portion of the area. In a small portion of the grassland area major grasses such as Apluda *Apluda mutica*, Cymbopogon *Cymbopogon citratus*, Themeda*Themeda triandra* are present. In the second week of January 2023 crops such as Safflower *Carthamus tinctorius*, Jowar *Sorghum bicolor*, Jawas *Linum usitatissimum*, Maize *Zea mays*, Toor *Cajanus cajan*, Chickpea *Cicer arietinum* were standing in the agriculture field. Neem *Azadirachta indica* (2) Tamarind *Tamarindus indica* (1) trees and *Butea monosperma*, *Ziziphus* sp., *Acacia nilotica* shrubs were seen in the sighting area. Invasive species Celosia *Celosia argentea* was found in all over fallow land and grassland. Blackbuck *Antilope cervicapra* (11 female) were sighted during field visit. The birds sighted in this region were Black-winged Kite *Elanus caeruleus* (1), Siberian stonechat *Saxicola maurus*, Indian Peafowl *Pavo cristatus* (call), Rose-ringed Parakeet *Psittacula krameri*, Eurasian Collared Dove *Streptopelia decaocto*, Pied Bushchat *Saxicola caprata*, Black Drongo *Dicrurus macrocercus*, Greater Coucal *Centropus sinensis*, Grey Francolin *Ortygornis pondicerianus* (call), Ashy-crowned Sparrow lark *Eremopterix griseus* (call).

2. Lesser Florican sighting location no.2

This location (18°04'18.2"N 77°31'30.0"E) is 619 meters from the Bidar-Wadgoan Road. It is a flat, stony terrain with fallow land covering significant portion of the area. Semi-arid grassland and agriculture covers a small portion of the area. Grassland supports major grasses such as Apluda *Apluda mutica*, Cymbopogon *Cymbopogon citratus*, Themeda *Themeda triandra*. Invasive species Celosia *Celosia argentea* were found all over fallow land and grassland. Two *Butea monosperma* shrubs and one Neem *Azadirachta indica tree were* present at the sighting area. During the visit Safflower *Carthamus tinctorius*, Jowar *Sorghum bicolor*, Maize *Zea mays*, Toor *Cajanus cajan*, Chickpea *Cicer arietinum* were the crops in agriculture fields. The birds sighted in this region were Chestnut bellied Sandgrouse *Pterocles exustus* (13), Pallid Harrier *Circus macrourus*, Bay-backed shrike *Lanius vittatus*, Siberian stonechat *Saxicola maurus* (F), Blue rock pigeon *Columba livia*, Large grey babbler *Argya malcolmi*, Rufous tail lark *Ammomanes phoenicura*, Rose-ringed Parakeet *Psittacula krameri*, Eurasian collared-Dove *Streptopelia decaocto*, Black Drongo *Dicrurus macrocercus*, Grey Francolin *Ortygornis pondicerianus* (call), Indian Peafowl *Pavo cristatus* (call) and also Blackbuck *Antilope cervicapra* (Adult male 1, Subadult male 1, Female 18) were sighted.

Image 12 PTT tagged bird location site: habitat area, Khanapur

Lesser Florican reported in Deccan Plateau during the project period

SN	Place	Lat.	Long.	Number & Sex	Date	Habitat	Reference
1.	Osmansagar lake, Ranga Reddy Telangana	17.38961	78.24782	1	2016	In dry part of a waterbody	Deccan Chronicle, March 2022
2.	Tadoba-Andhari TR buffer area, Chandrapur, Maharashtra	20.44188	79.34638	1 (Female)	May-21	Captured in trap cameras	Times of India, Aug 2021.
3.	Near Shivta, Aurangabad, Maharashtra	20.160866	75.567033	1	11-Apr-22	Agriculture	WII PTT tagged bird
4.	Near Jalgaon Mete, Aurangabad, Maharashtra	20.143093	75.582966	1	11-Apr-22	Agriculture	WII PTT tagged bird
5.	Near Ghodeshwar, Solapur, Maharashtra	17.534688	75.536933	1	11-Apr-22	Agriculture	WII PTT tagged bird
6.	Near Mullal, Vijayapura, Karnataka	16.742348	75.944333	1	11-Apr-22	Agriculture	WII PTT tagged bird
7.	Near Mullal, Vijayapura, Karnataka	16.7418	75.95196	1	11-Apr-22	Agriculture	WII PTT tagged bird
8.	Jigalur, Gadag, Karnataka	15.669106	75.788566	1	11-Apr-22	Agriculture	WII PTT tagged bird
9.	Jigalur, Gadag, Karnataka	15.66206	75.799233	1	11-Apr-22	Agriculture	WII PTT tagged bird
10.	Rollapadu Wildlife Sanctuary, Kurnool, Andra Pradesh	15.75916	78.36759	1	11-Oct-22	Grassland	BNHS team, observations
11.	Himayat Bagh, Aurangabad, Maharashtra	19.902325	75.331841	1	27-Oct-22	Open area	Dr Kishor Pathak, Aurangabad
12.	Nellutla, Warangal, Telangana	17.074645	79.207412	1	22-Dec-22	Agriculture	WII PTT tagged bird
13.	Seetarampur, Ranga Reddy, Telangana	17.559617	79.23793	1	22-Dec-22	Agriculture	WII PTT tagged bird
14.	Chamorshi, Gadchiroli, Maharashtra	19.925445	79.890105	1 (Female)		Agriculture & Plantation	Mohan Ram *et al.*, 2022

Table 4 Lesser Florican sightings in Deccan Plateau, Maharashtra, Telangana, Karnataka, and Andhra Pradesh during study period

Image 13 A male Lesser Florican was rescued in Solapur city, nearly 200 km from Bidar on 02/11/2021. The bird was released on 03/11/2021 by Concerned staff of Range Forest office, GIB Sanctuary, Nannaj, Solapur after ringing by BNHS.

Grassland associated fauna observed during survey period in Bidar

Tehsil wise briefs

The study area is very diverse in its fauna. The current study was conducted in different types of habitats (agriculture, grassland, fallow land, shrubland, plantation, etc.) of the study area.

Bidar– Most common herpeto fauna in the area are Monitor lizard *Varanus*, two different types of Fan-throated lizard *Sarada superba*, *Sitana spinaecephalus*, Russell's viper *Daboia russelii*, Common krait *Bungarus caeruleus*, Rat snake *Panthero phisobsoletus*. Birds species recorded from this site include – Lesser Florican *Sypheotides indicus*, Amur Falcon *Falco amurensis*, Bonelli's Eagle *Aquila fasciata*, Booted Eagle *Hieraaetuspennatus*, Changeable Hawk-eagle *Nisaetuscirrhatus*, Indian spotted eagle *Clangahastata*, Greater spotted eagle *Clangaclanga*, Short-toed snake eagle *Circaetusgallicus*, Montagu's Harrier *Circus pygargus*, Pallid Harrier *Circus macrourus*, Marsh harrier *Circus aeruginosus*, Siberian stonechat *Saxicola maurus*, Red-headed Bunting *Emberiza bruniceps*. Mammals seen were- Blackbuck *Antilope cervicapra*, Indian wolf *Canis lupus pallipes*, Small Indian Fox *Vulpes bengalensis*, Golden jackal *Canis aureus*, Hanuman Langur *Simia entellus*.

Aurad – Major fauna represented from this area is – Lesser Florican *Sypheotides indicus*, Egyptian vulture *Neophron percnopterus*, Bonelli's Eagle *Aquila fasciata*, Booted eagle *Hieraaetus pennatus*, Changeable Hawk-eagle *Nisaetus cirrhatus*, Indian spotted eagle *Clanga hastata*, Greater spotted eagle *Clanga clanga*, Short-toed snake eagle *Circaetus gallicus*, Greater Short-toed Lark *Calandrella brachydactyla*, Common Kestrel *Falco tinnunculus*, Siberian

stonechat *Saxicola maurus*, Red-headed Bunting *Emberiza bruniceps*. Whereas Mammal species includes- Blackbuck *Antilope cervicapra*, Indian wolf *Canis lupus pallipes*, Small Indian fox *Vulpes bengalensis*, Jungle cat *Felis chaus*, Chinkara *Gazella bennettii*, Indian grey mongoose *Herpestes edwardsii*.

Bhalki– Bhalki shows moderate grassland area and represents faunal diversities like Lesser Florican *Sypheotides indicus*, Short-toed snake eagle *Circaetus gallicus*, Greater Short-toed Lark *Calandrella brachydactyla*, Common kestrel *Falco tinnunculus*, Siberian stonechat *Saxicola maurus*, Red-headed bunting *Emberiza bruniceps*, Changeable Hawk-eagle *Nisaetus cirrhatus*, Indian spotted eagle *Clanga hastata*, Greater Spotted Eagle *Clanga clanga*, Indian wolf *Canis lupus pallipes*.

Humnabad– The species recorded from this area are Lesser Florican *Sypheotides indicus*, Pallid Harrier *Circus macrourus*, Montagu's Harrier *Circus pygargus*, Blackbuck *Antilope cervicapra*, Indian Wolf *Canis lupus pallipes*, Golden Jackal *Canis aureus*, Jungle Cat *Felischaus*.

Basavkalyan– The presence of species seen in this region is Montagu's Harrier *Circus pygargus*, Pallid Harrier *Circus macrourus*, Short-toed Snake Eagle *Circaetus gallicus*, Greater Short-toed Lark *Circaetusgallicus*, Common Kestrel *Falco tinnunculus*, Siberian Stonechat *Saxicola maurus*, Blackbuck *Antilope cervicapra*, Indian Wolf *Canis lupus pallipes pallipes*.

Some of the important fauna observed in the study area are as follows.

1) Indian Grey Wolf

The Indian Grey Wolf *Canis lupus pallipes* is an apex predator of the grassland ecosystem. With degradation of grasslands, their population is declining. The estimated population of wolves in the Indian subcontinent is ranging between 2,000-3,000 individuals only and the trend of population is declining (Hennelly *et al.* 2021). The species is protected under Schedule-I of the Indian Wild Life (Protection) Act, 1972.

Image 14 Indian grey wolf in Chetnal grassland highlights the priority to identify the potential grasslands to be conserved @ Rushikesh Pawar

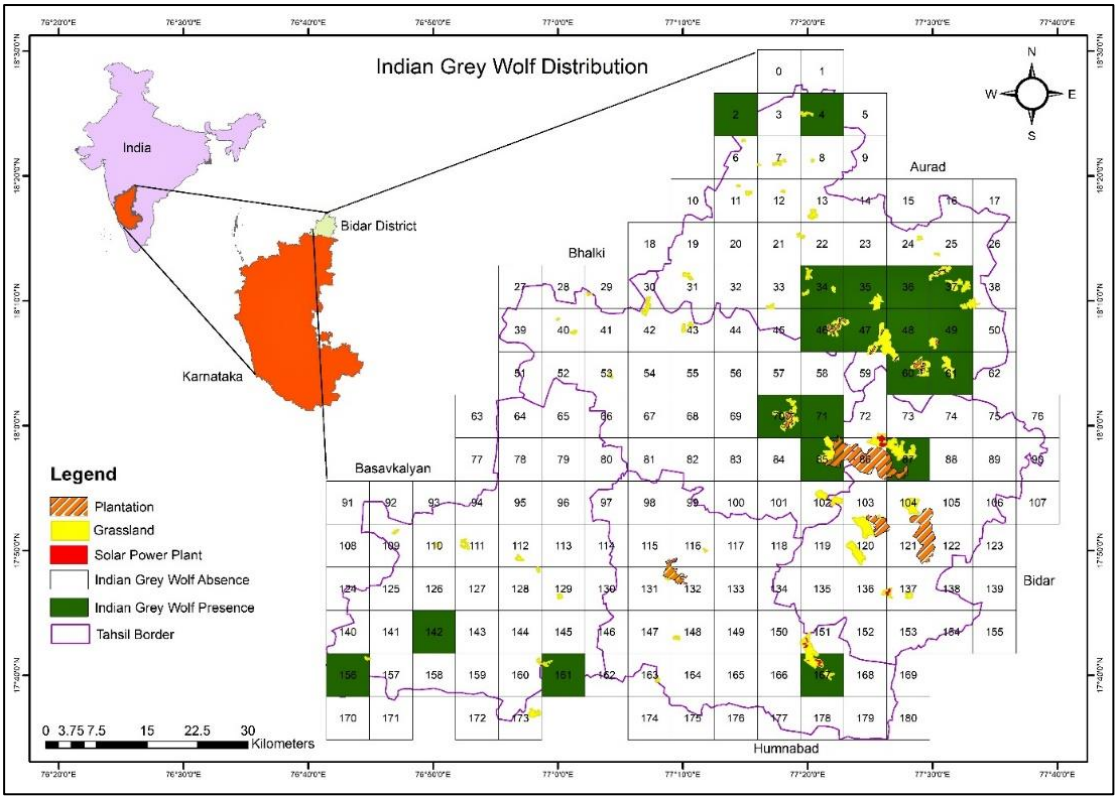


Figure 40 Distribution of Indian Grey Wolf in Bidar District in 2021- 2023

During the study period from October-July 2022, wolves were recorded from Chatnal, Alur-Bellur, and Hedgapur areas. The presence of wolves was also recorded at Yalgunditanda, Hulgunthi, Markal, Konmelkonda, Nirna, Dongargaon, Bhosga, Batgera, Dhadaknal, Ujani areas based on field studies, camera trap records and interviews with locals as well as nomads (Dhangar). The crude estimated population of wolves in Bidar district would be less than 20 (Aurad: 3-5, Bhalki: 3-5, Basavkalyan: 2-4, Humnabad: 2-4, and Bidar: 1-2). Lately two subadult males were recorded in Chetnal Grassland in March 2023.

2) Blackbuck

The Blackbuck *Antilope cervicapra* is a medium-sized diurnal ungulate antelope species native and endemic to the Indian subcontinent. The social organizations of Blackbucks include a mixed herd formed by males and females of different age groups, a Harem herd or territorial herd with one territorial male and females from all age groups, and a bachelor herd constituting only male members. This species is the state animal of Punjab, Haryana, and Andhra Pradesh. Blackbucks were formerly distributed across almost the entire Indian subcontinent extending up to the Terai zone of Nepal but they became extinct in Pakistan and Bangladesh (Prater 1971). Presently, in India, the Blackbuck is common and widely distributed throughout the country. Large Blackbuck populations are present in some Protected Areas of Rajasthan, Punjab, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Odisha, Telangana, Andhra Pradesh, and Tamil Nadu. The population in India increased from an estimated 22,000-24,000 in the 1970s to an estimated 50,000 (out of which 35,000 are mature individuals) by the year 2000, with the largest number in the states of Rajasthan,

Punjab, Madhya Pradesh, Maharashtra, and Karnataka (Meena & Saran 2018). Although the species is categorized as Least Concern by the IUCN, the population of this species is dwindling because of the loss of its primary habitat – grasslands. It is listed under Schedule I of the Wild Life (Protection) Act 1972.

Image 15 Territorial herd in Chetnal area during the monsoon survey 2022, Bidar © Rushikesh Pawar

Landscape survey in winter (October–November 2021)

The field surveys were conducted from October 31, 2021 to November 29, 2021. In this survey, 99 grids were surveyed during the landscape survey. During the survey, 816 Blackbucks were sighted according to the groups mentioned in the following Table.

Sr. No.	No. of individuals in a group	No. of Groups	Total Count
1	0–10	103	368
2	11–50	19	378
3	51–350	1	70
	Total	**123**	**816**

Table 5- Total count of Blackbucks sighted during the landscape survey in Bidar District in winter 2021

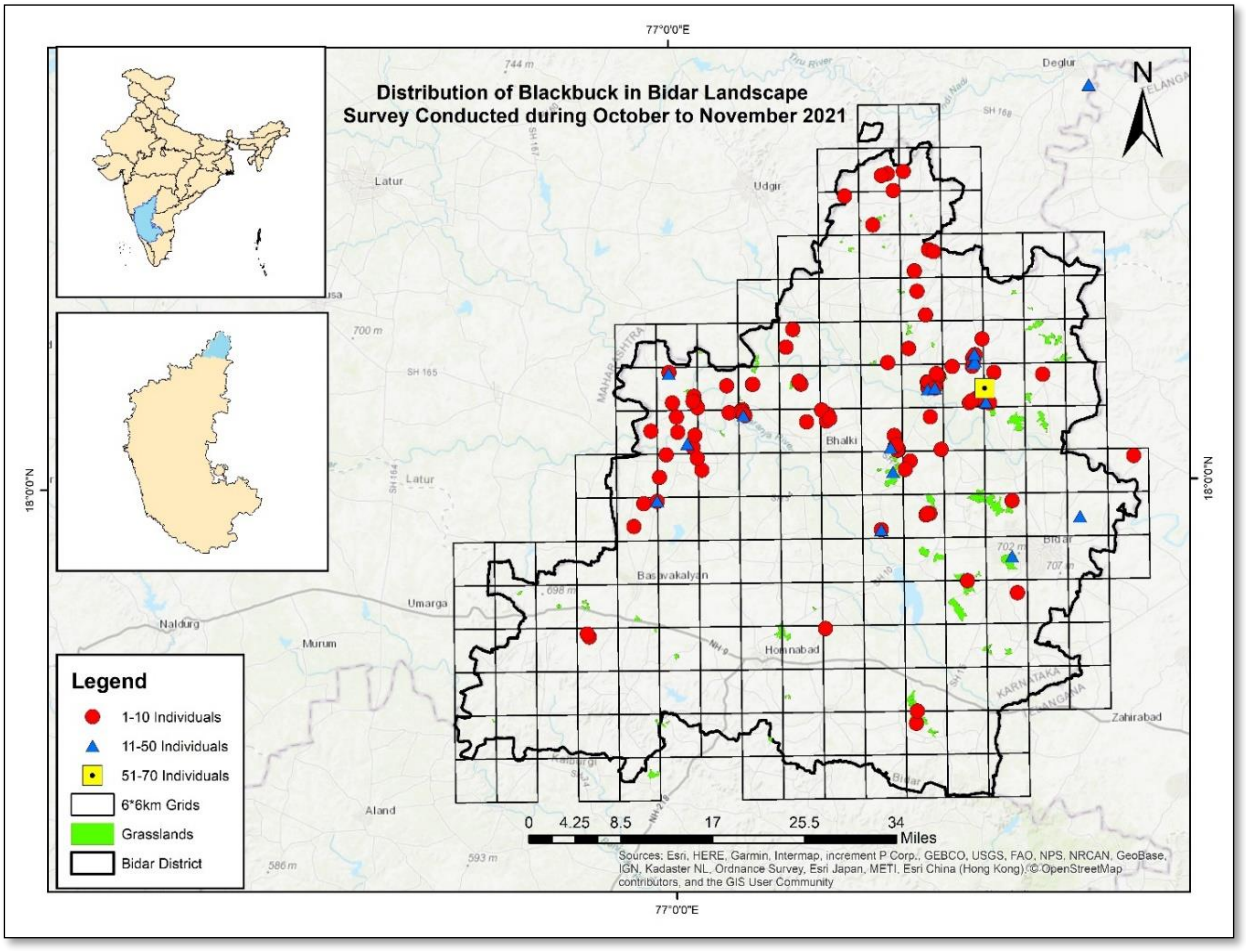


Figure 41 Distribution of Blackbucks in Bidar district during October to November 2021

Landscape survey in monsoon: July–August 2022

The surveys were conducted from July 20, 2022 to August 03, 2022 in the monsoon. Out of 114 grids, 95 grids were surveyed, which compose more than 83% of grids covering an area of 2,375sq.km. Blackbucks were sighted according to the groups mentioned in Table 6

Sr. No.	No. of individuals in a group	No. of Groups	Total Count
1	0–10	16	53
2	11–50	27	532
3	51–350	4	656
	Total	47	**1,241**

Table 6- Total count of Blackbucks observed during Bidar district Monsoon Landscape survey, 2022

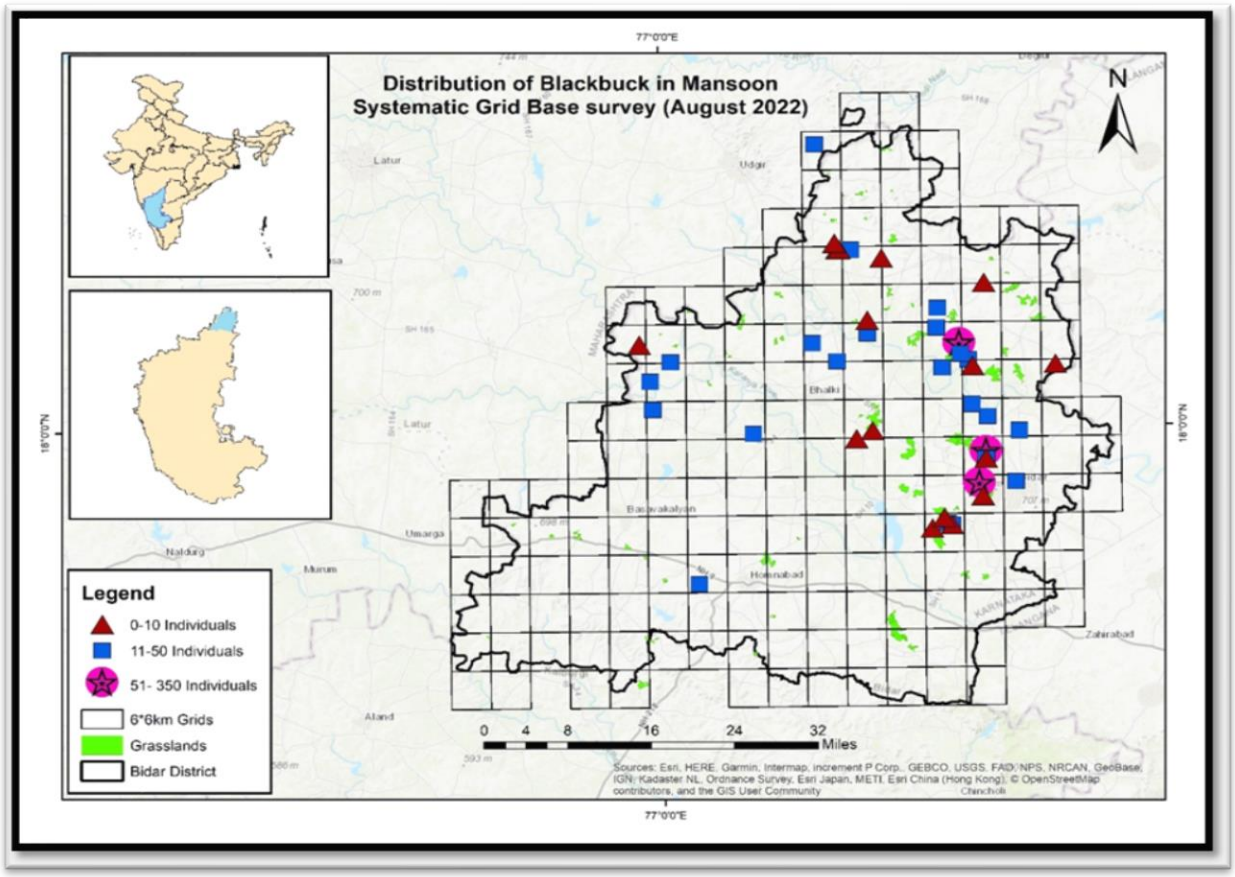


Figure 42 Distribution of Blackbucks in Bidar observed during the Monsoon landscape survey in August- 2022

Summer survey: January to March 2023

11 sites were selected, based on the records of congregation of Blackbucks and size of the area. During 3 visits to these sites, 794 individuals of Blackbucks were recorded. The total count is as follows:

Sr. No.	No. of individuals in a group	No. of Groups	Total Count
1	0–10	77	281
2	11–50	20	398
3	51–350	2	115
	Total	99	**794**

Table 7- Total count of Blackbucks in Bidar district, Summer survey January to March 2023

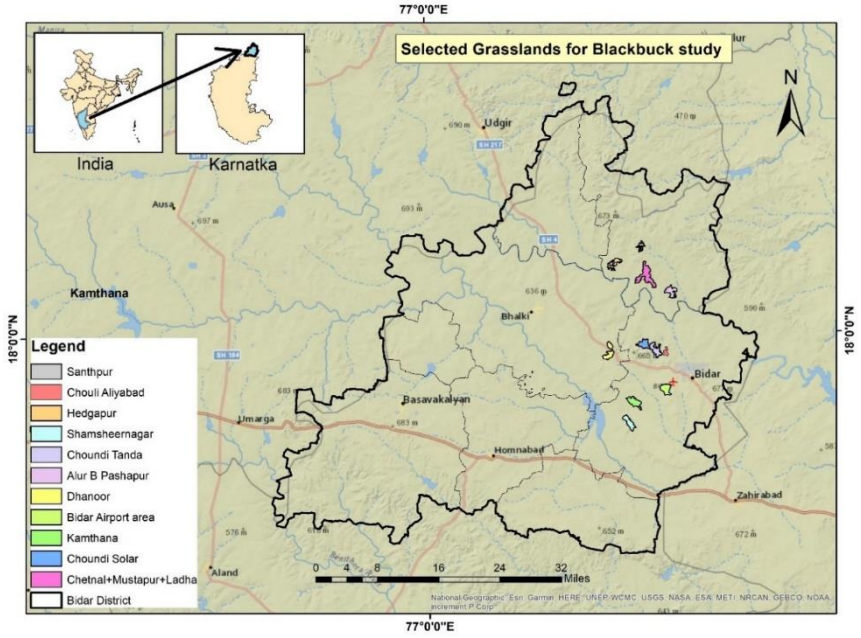


Figure 43 Blackbuck Study area in Bidar district

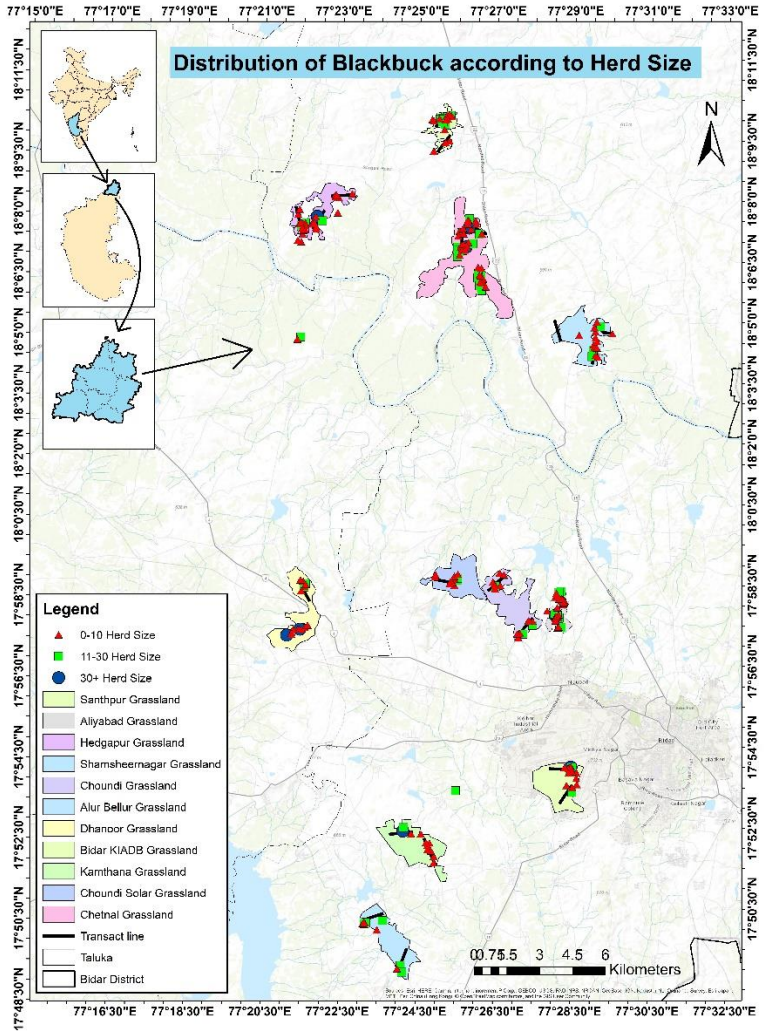


Figure 44 Distribution of Blackbucks in Bidar during the landscape survey in monsoon August- 2022

3) Lesser Florican Decoy experiment- September 2022

Results: During the decoy experiment at the Chondi, Chondi Solar, Kamthana, Aliyabad, AllurBellur, Chetnal, and Santhpur grasslands, we were unable to capture the conspecific response using a camera trap or during open observation hours. The heterospecific response could not be captured in camera trap records, but it could be seen during the observation period. The Blackbucks reacted inquisitively to the decoys, coming closer to them while maintaining an alert stance and lowering their necks from about 20 meters away. The Black drongo was observed being attracted to the Audio and attacking the decoy three times.

Discussion: Decoys were primarily used in avian ecology and conservation studies to trap birds, draw birds to safe havens or restored areas, as research tools to draw birds, etc. (Sutherland et al., 2021). Our experiments with 2D decoys were able to draw some heterospecifics but not conspecifics conclusions. *Chrysopogon fulvus* and *Chrysopogon gryllus* are the dominant species in the grasslands of Chondi, Chondi Solar, Kamthana, Aliyabad, Alur-Bellur, Chetnal, and Santhpur, attaining a height of nearly 1 meter after mid-September, decreases the visibility in most of the grass patches. After the second week of September, Pigeon pea *Cajanus cajan*, took over the agricultural region, with crop height upto 1 meter providing suitable cover for the bird to hide, which may have impacted the possibility of spotting this elusive species among the thick cover. Previous research raised questions about the effectiveness of 2D decoys, asserting that 3D decoys are superior to 2D decoys at luring the target species (Podolsky 1990; Crozier and Gawlik 2003). This is probably one of the reasons why, during the study period, our decoys failed to draw the attention of Floricans.

Image 16 Decoy of the male Lesser Florican in Chondi grassland, Bidar © Rushikesh Pawar

Important Grasslands and corridors in Bidar

Based on the study conducted in 2021 and 2022, the potential wildlife areas were identified by overlaying the distribution of all grassland indicator species i.e., Lesser Florican *Sypheotides indicus*, Indian grey wolf *Canis lupus pallipes*, Chinkara *Gazella bennettii*, Blackbuck *Antilope cervicapra*, Montagu's Harrier *Circus pygargus* and Pallid Harrier *Circus macrourus*. A total of six clusters were identified with two major and four minor clusters as potential wildlife areas, and are labelled as Cluster-I, II, III, IV, V and VI.

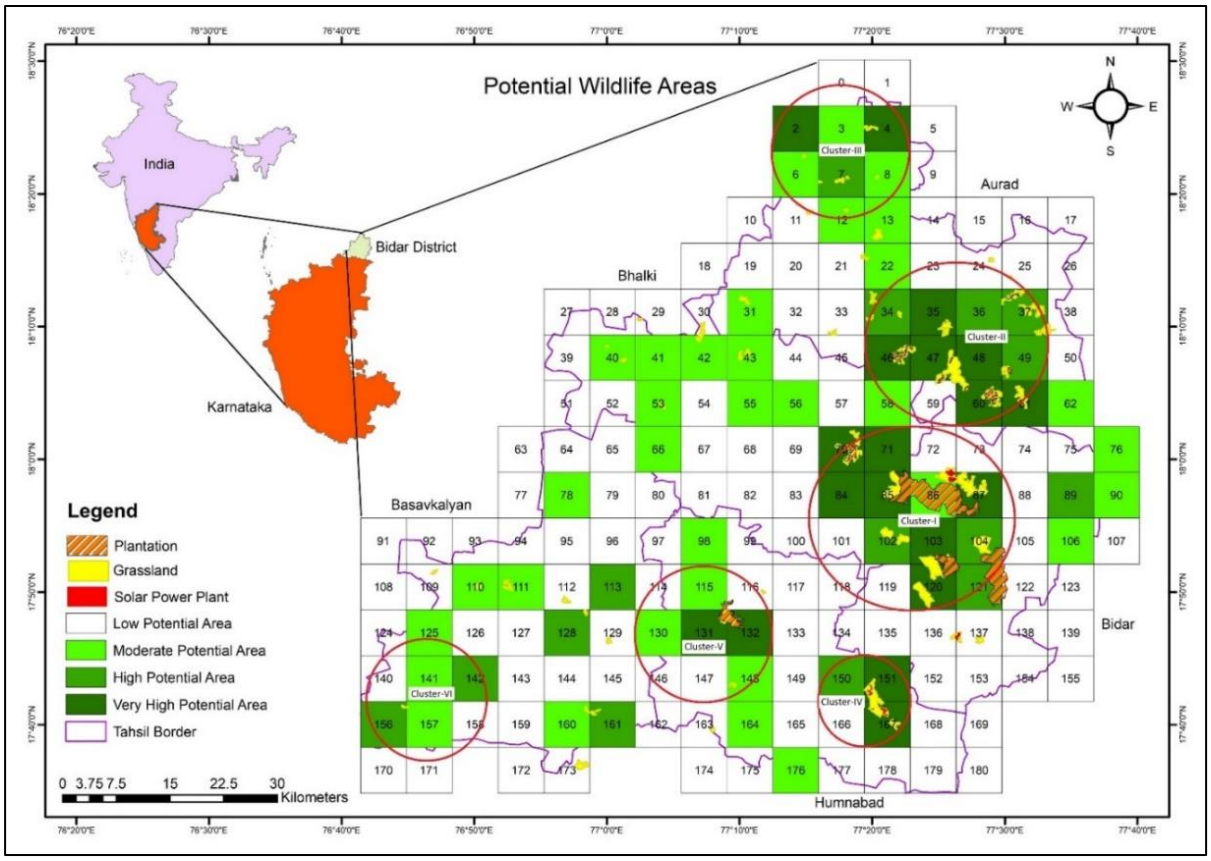


Figure 45 Proposed potential grassland conservation areas and categorized as Moderate Potential Areas, High Potential Areas and Very High Potential Areas and marked into the Cluster areas

1. **Block/Cluster I:** Among major clusters, the first cluster (Cluster-I) is a mosaic of plantations, grasslands, and traditional agricultural areas from Kamthana, Shamshirnagar, Dhanura, Konmelkonda, Tegampur, Mamdapur-Chondi, Chouli-Aaliyabad areas consisting grid no. 70, 71, 84, 85, 86, 87, 102, 103, 104, 120 and 121. The major fauna represented from this area are Lesser Florican *Sypheotides indicus*, Indian Grey Wolf *Canis lupus pallipes*, Blackbuck*Antilope cervicapra*, Small Indian Fox *Vulpes bengalensis*, Golden Jackal *Canis aureus*, Jungle Cat *Felis chaus*, Amur Falcon *Falco amurensis*, Bonelli's Eagle *Aquila fasciata*, Montagu's Harrier *Circus pygargus*, Marsh harrier *Circus aeruginosus* and Pallid Harrier *Circus macrourus*. In this cluster Konmelkonda, Dhanura, Honnekere, Kamthana, Chitta Forest, Shamshirnagar are the major protected areas (plantations).

2. **Block/Cluster II**: Second cluster is a mosaic of traditional agriculture, fallow lands, grasslands and plantations from Alur-Belur, Khanapur, Ujani, Ladha, Chatnal, Mahagaon, Santhpur, and Hedgapur areas consisting of grid no. 34, 35, 36, 37, 46, 47, 48, 49, 60 and 61. The major fauna represented from this area are Indian Grey Wolf *Canis lupus pallipes*, Lesser Florican *Sypheotides indicus*, Egyptian Vulture *Neophron percnopterus*, Blackbuck *Antilope cervicapra*, Small Indian Fox *Vulpes bengalensis*, Jungle Cat *Felis chaus*, Bonelli's Eagle *Aquila fasciata*, Short-toed Snake Eagle *Circaetus gallicus*, Montagu's Harrier *Circus pygargus* and Pallid Harrier *Circus macrourus*. In this cluster Alur-Belur, Khanapur, Chetnal, Mahagaon, Ladha and Hedgapur are the major protected areas (plantations).

3. **Block/Cluster III**: Among minor clusters, cluster-III is a mosaic of traditional agriculture, fallow lands, and grasslands with undulating terrain at Chikhali, Mudkhed, Hokrana, Dapka, Kherda and Lingi areas consisting of grid no. 2, 3, 4, 6, 7 and 8. The major fauna represented from this area are Chinkara *Gazella bennettii*, Indian Grey Wolf *Canis lupus pallipes*, Small Indian fox *Vulpes bengalensis*, Blackbuck *Antilope cervicapra*, Montagu's Harrier *Circus pygargus*, and Pallid Harrier *Circus macrourus*.

4. **Block/Cluster IV**: It is a mosaic of grasslands, traditional agriculture, and fallow lands near Nirna village consisting of grid no. 150, 151 and 167. The major fauna from this area are Blackbuck *Antilope cervicapra*, Indian Grey Wolf *Canis lupus pallipes*, Pallid Harrier *Circus macrourus* and Montagu's Harrier *Circus pygargus*.

5. **Block/Cluster V**: It is a mosaic of plantations and grasslands at the outskirts of Humnabad near "Chota Falls" consisting of grid no. 130, 131, 132, 148 and 115. The major fauna from this area are Blackbuck *Antilope cervicapra*, Lesser Florican *Sypheotides indicus*, Indian Jackal *Canis aureus indicus*, Jungle Cat *Felis chaus*, and Montagu's Harrier *Circus pygargus*.

6. **Block/Cluster VI**: It is dominated with traditional agriculture and fallow lands with undulating terrain from Ladwanti, Siruri, Bhosga, Batgera and Attur consisting grid no. 141, 142, 156 and 157. The major fauna represented from this area are Indian Grey Wolf *Canis lupus pallipes*, Blackbuck *Antilope cervicapra*, Indian Jackal *Canis aureus indicus* and Montagu's Harrier *Circus pygargus*.

SN	Cluster	Site Name	Grassland Area (in acres)	Plantation area in surrounding (in acres)
1	2	Chota Falls	569	-
2	2	Near Hippalgaon	66.22	-
3	2	Belkuni Chaudhari	55.35	-
4	2	Santhpur	373	-
5	2	Beldhal	375.6	86.96
6	2	Medpalli	338.53	-
7	2	Ujani	209.05	-
8	2	Damlatanda-Ujani	368.18	-
9	2	Hedgapur	568.34	333
10	2	Chetnal	1954	175

11	2	Alur K.	207.56	-
12	2	Alur	889	-
13	2	Khanapur	481.85	142
14	1	Paigampur	948.88	432
15	1	Chondi	1759.39	76,610
16	1	Chouli-Aliyabad	306.41	-
17	1	Dhanura	951.35	-
18	1	Halhalli	358.3	-
19	1	SangulgiTanda	303.93	-
20	1	Kamthana	1235	1344
21	1	Shamshirnagar	854.98	-
22	1	Bidar Airport Area	892.05	-
23	1	Chitta Forest	3970.98	3970.98
		Total	**18,036.95**	**83,092.96**

Table 8 Important grassland sites in Bidar

Loss and degradation of grasslands

Bidar district is an area known for its grasslands, which are characterized by a mix of herbaceous and woody vegetation. These grasslands are undergoing continuous changes over the years due to various anthropogenic causes, some of which are discussed below:

1. **Land use changes**: Land-use change is one of the major reasons for grassland changes in Bidar, causing direct loss by shrinking the area. Conversion of grasslands in to agriculture/croplands, invasion of industries like renewable energy projects Solar energy projects and real estate and plotting for commercial selling and urbanization are the present causes for shrinking area. Other forms of disturbances are particularly areas adjacent to urban centers and transportation routes where increased human activities lead to increased pressure on the land and natural resources.
2. **Grazing:** Grazing is another important factor that affects grasslands in Bidar. Uncontrolled grazing can cause overgrazing and trampling of vegetation, leading to a decline in biodiversity and ecosystem functions.
3. **Fire:** Fire is a natural process in grasslands that helps maintain their structure and biodiversity. However, changes in fire frequency and intensity due to human activities and climate change can have negative impacts on grassland ecosystems.
4. **Invasive species:** Invasion of non-native plant species can also lead to changes in grassland ecosystem. Invasive species can outgrow native species, reducing the biodiversity and altering the ecosystem processes.

Of the 23 sites, land use changes were recorded at 15 sites. In those 15 sites, **12,018.98** acres of grassland in 2021 has now reduced to **10,502.15** acres, losing **1,516.83** acres which is nearly 13% of grassland habitat (See the Fig. 20 and table 7). Overall, the grasslands in Bidar are undergoing rapid changes due to anthropogenic causes. Understanding the causes of these changes is critical for developing effective management strategies to conserve these valuable ecosystems. This loss of habitat can have significant impacts on the wildlife that depend on grasslands for their survival. The reduction in grassland area is likely due to a variety of factors, including the expansion of agriculture and other human activities.

If this trend continues, it is likely that the entire grassland area will be lost within the next 10 years. This would be a devastating blow to the ecosystem and the wildlife that depend on it. The loss of grasslands is a warning sign of complete loss of this vital ecosystem. The

consequences of losing grasslands can be severe and far-reaching, and we must work together to conserve and protect them for the benefit of both wildlife and humans.

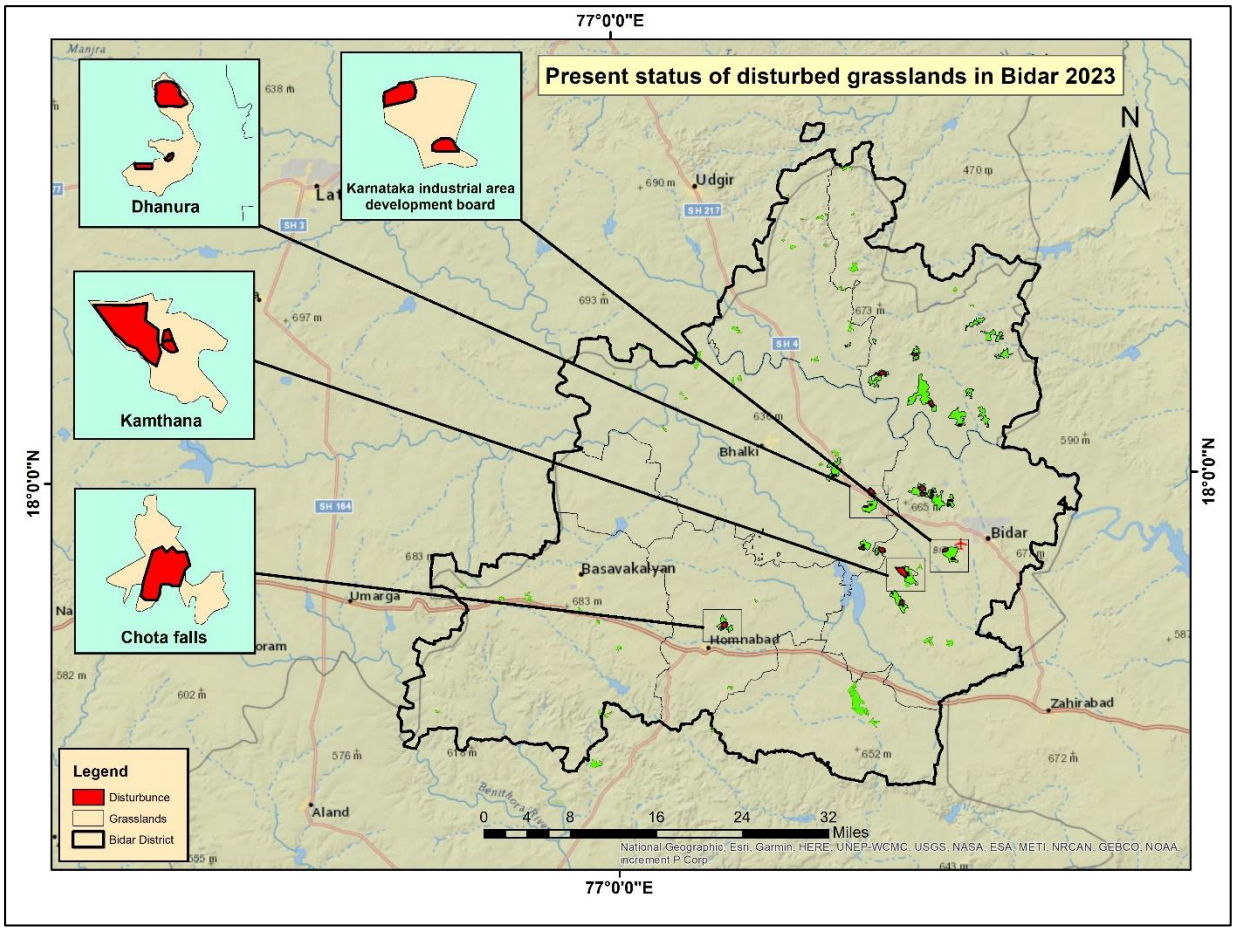


Figure 46 Loss of grasslands due to land use changes observed during study period in Bidar 2021-2023 (red portion indicates loss of grasslands)

Image 17 Priority Grassland converting into Solar Plant area, Chota falls, Humnabad © Rushikesh Pawar

SN	Cluster	Area Name	Grassland Area (in acres)	Habitat loss (in acres)	Grassland patches left now (in acres)	% loss
1.	2	Chota Fall	569	156	413	27
2.	2	Belkuni Chaudhari	55.35	19	36.35	34
3.	2	Santhpur	373	114.64	258.36	31
4.	2	Hedgapur	568.34	131	437.34	23
5.	2	Chetnal	1954	103	1851	5
6.	2	Alur	889	24	865	3
7.	1	Paigampur	948.88	20	928.88	2
8.	1	Chondi	1759.39	56.9	1702.49	3
9.	1	Chouli-Aliyabad	306.41	55.26	251.15	18
10.	1	Dhanura	951.35	146.73	804.62	15
11.	1	Halhalli	358.3	36	322.3	10
12.	1	SangulgiTanda	303.93	119	184.93	39
13.	1	Kamthana	1235	271.31	963.69	22
14.	1	Shamshirnagar	854.98	144.38	710.6	17
15.	1	Bidar Airport Area	892.05	119.61	772.44	13
		Total	**12018.98**	**1516.83**	**10,502.15**	**13**

Table 9 Loss of grassland habitat due to land use changes

Image 18 Grassland conversion into plotting areas, Santhpur © Rushikesh Pawar

Insect diversity in the grasslands of Bidar

Insects are one of the most dominant groups in the animal kingdom in terms of diversity and abundance. They play a vital role in the food web, in terrestrial as well as aquatic ecosystems, by being the primary consumers and also by forming a strong prey base, at both larval and adult stages. Different ecosystem services provided by insects such as pollination, biological control, wildlife nutrition etc. are well documented (Losey & Vaughan 2006; Dangles & Casas 2019). Studies indicate that grassland and savanna birds consume approximately 60 million tons of insects per year mainly including orders like Coleoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera, and Orthoptera (Nyffeler et al. 2018). There are studies on the feeding habits of the Bustard species in India, especially Lesser Florican, enumerating that insects form an important part of their omnivorous diet both in breeding and non-breeding phase (Sankaran & Rahmani 1986; Sankaran 1991). Hence it is very necessary to study and monitor the insect diversity as the food of this species that has specific breeding and non-breeding ranges and also considering the fact that it has a distinct habitat choice owing to the sensitivity towards the disturbance (Sankaran 1997).

Method

Insects were surveyed from 16th to 20th October 2022 during 08:00 to 11:30hrs in the morning and from 16:30 to 18:30hrs in the latter half of the day considering the weather conditions and taxa activity. Study locations are Aliyabad, Kamthana, Nirna, Alur, Chetnal, and Chondi grassland areas. The study was conducted by combination of methods using randomly placed 10x10m quadrants and by taking opportunist observations. Total eleven quadrants were studied. Two quadrants each at Kamthana, Alur, and Chetnal were studied by active visual encounter method where the ground vegetation was sparse while, sweep net method was used in two quadrants at Nirna and one each at Aliyabad, Chondi and Kamthana where vegetation was suitable for the use of net.

These methods were used considering the limitation on the extent of different study methods for different insect groups and also in order to include maximum insect orders. Insects were actively searched in their microhabitats like on the vegetation, in the dung, under the rocks and along the waterbodies. Different life stages, sex and activity of the insects were noted. Unidentified insects were either hand-picked or caught with a net for photographs of morphological characters and released back.

Pit-fall trap method was also carried out at one location, i.e. Chondi grassland. Six transparent plastic cups of approximately 10cm were installed in the soil with a distance of 20m between two installations. Two cups were filled with water whereas four were without any solvent.

Results

In total, we documented 61 species of insects belonging to 11 orders and 33 families. Some insect groups like Coleoptera (beetles), Neuroptera (antlions, lacewings), and Hemiptera (bugs) require detailed observation of morphological characters and sometimes dissection of the genitalia for the species level identification hence, such species were identified till the family or genus level.

Although the data from different methods and habitats cannot be compared directly, overall certain insect groups were represented more in numbers. Without the inclusion of social insects like ants and termites, we recorded a greater number of insect individuals (n=132) by active visual encounter method than using sweep net method (n=90). Highest number of individuals (n=28) recorded were Katydid sp., probably belonging to subfamily Conocephalinae (Cone-headed Katydid). One or two individuals recorded were flying insects like butterflies, moths or odonates and antlion.

In Result, the study area is a mosaic of various habitats mainly grasslands, revenue lands, agricultural lands and open plateaus with sparse grasses and short herbs. Some of the dominant grass species were – *Heteropogon* Spp., *Chrysopogon* Spp., *Andropogon* Spp., *Dicanthium* Spp., *Lophopogon* Spp. Some deciduous trees like *Cassia fistula* were also present. The study locations Aliyabad, Kamthana, Nirna, Alur, Chetnal, and Chondi grassland has the good number of insect count which is potential habitat for Lesser Florican, Great Indian Bustard (GIB) and other Grassland associated species.

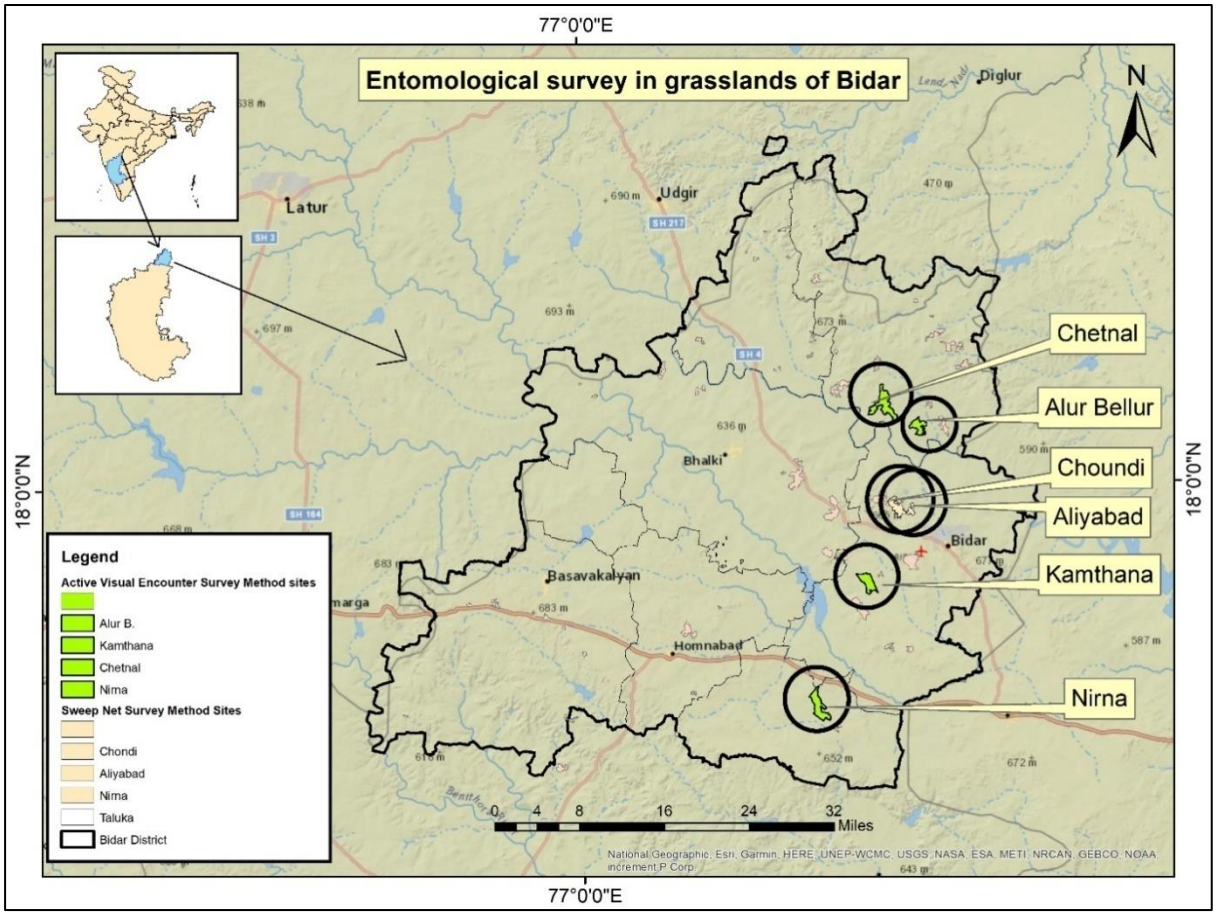


Figure 47 Entomology survey in Chetnal, Alur B., Choundi, Aliyabad, Kamthana, and Nirna Grasslands

The checklist of the insects observed is as follows:

Sr. no.	Order	Family	Scientific Name	Common Name
1	Blattodea	--	--	Cockroach
2	Blattodea	--	--	Termite
3	Coleoptera	Buprestidae	*Sternocerachrysis*	Jewel Beetle
4	Coleoptera	Coccinellidae	--	Ladybird Beetle
5	Coleoptera	Carabidae	--	Ground Beetle
6	Coleoptera	Scarabaeidae	--	Dung Beetle
7	Dermaptera	--	--	Earwig
8	Diptera	Muscidae	*Musca* sp.	House Fly
9	Diptera	Sciomyzidae	--	Marsh Fly
10	Diptera	Syrphidae	*Paragus* sp.	Hover Fly
11	Diptera	Syrphidae	--	Hover Fly sp. 1
12	Hemiptera	Cicadellidae	--	Leafhopper
13	Hemiptera	Coreidae	--	Leaf-footed Bug
14	Hemiptera	Gerridae	--	Aquatic Bug
15	Hemiptera	Pentatomidae	*Agonoscelisnubila*	Stink Bug
16	Hemiptera	Pentatomidae	--	Stink Bug sp. 1
17	Hemiptera	Pentatomidae	--	Stink bug sp. 2
18	Hemiptera	Pyrrhocoridae	*Dysdercus*sp.	Red Silk Cotton Bug
19	Hemiptera	Reduviidae	--	Assassin bug sp. 1
20	Hemiptera	Reduviidae	--	Assassin Bug sp. 2
21	Hemiptera	--	--	Spittle Bug
22	Hymenoptera	Apidae	*Amegilla*sp.	Blue-banded Bee
23	Hymenoptera	Apidae	*Apis*sp.	Bee
24	Hymenoptera	Formicidae	--	Ant
25	Hymenoptera	Vespidae	--	Wasp
26	Lepidoptera	Crambidae	--	Grass Moth sp. 1
27	Lepidoptera	Crambidae	--	Grass Moth sp. 2
28	Lepidoptera	Erebidae	--	Owlet moth
29	Lepidoptera	Erebidae	--	Tussock Moth
30	Lepidoptera	Gelechiidae	--	Twirler Moth
31	Lepidoptera	Geometridae	--	Looper Moth
32	Lepidoptera	Limacodidae	--	Stinging Nettle Moth
33	Lepidoptera	Lycaenidae	*Zizulahylax*	Tiny Grass Blue
34	Lepidoptera	Lycaenidae	*Zizeeriakarsandra*	Dark Grass Blue
35	Lepidoptera	Lycaenidae	*Freyeriaputli*	Black-spotted Grass Jewel
36	Lepidoptera	Nymphalidae	Acraea terpsicore	Tawny Coster
37	Lepidoptera	Nymphalidae	*Junonialemonias*	Lemon Pansy
38	Lepidoptera	Nymphalidae	*Junoniaorithya*	Blue Pansy
39	Lepidoptera	Nymphalidae	*Vanessa cardui*	Painted Lady
40	Lepidoptera	Nymphalidae	*Ypthimaasterope*	Common Threering
41	Lepidoptera	Pieridae	*Catopsiliapomona*	Common Emigrant
42	Lepidoptera	Pieridae	*Euremahecabe*	Common Grass Yellow

43	Lepidoptera	Pieridae	*Euremabrigitta*	Small Grass Yellow
44	Neuroptera	Chrysopidae	--	Lacewing
45	Neuroptera	Myrmeleontidae	--	Antlion
46	Odonata	Coenagrionidae	*Ischnuranursei*	Pixie Dartlet
47	Odonata	Coenagrionidae	*Ischnurarubilio*	Golden Dartlet
48	Odonata	Lestidae	*Lestesconcinnus*	Dusky Spreadwing
49	Odonata	Libellulidae	*Diplacodestrivialis*	Ground Skimmer
50	Odonata	Libellulidae	*Trameabasilaris*	Red Marsh Trotter
51	Odonata	Libellulidae	*Trithemis* sp.	Marsh Hawk
52	Odonata	Libellulidae	*Pantalaflavescens*	Wandering Glider
53	Orthoptera	Acrididae	*Acrida* cf. *exaltata*	Slantface Grasshopper
54	Orthoptera	Acrididae	--	Short-horned Grasshopper sp. 1
55	Orthoptera	Acrididae	--	Short-horned Grasshopper sp. 2
56	Orthoptera	Gryllidae	--	Cricket
57	Orthoptera	Tetrigidae	--	Pygmy Grasshopper sp. 1
58	Orthoptera	Tetrigidae	--	Pygmy Grasshopper sp. 2
59	Orthoptera	Tettigoniidae	--	Unid katydid sp. 1
60	Orthoptera	Tettigoniidae	--	Unid katydid sp. 2
61	Zygentoma		--	Silverfish

Table 10 List of the insects observed in the grasslands of Bidar

Image 19 Active visual encounter Quadrant method used for Insect study at Kamthana grassland

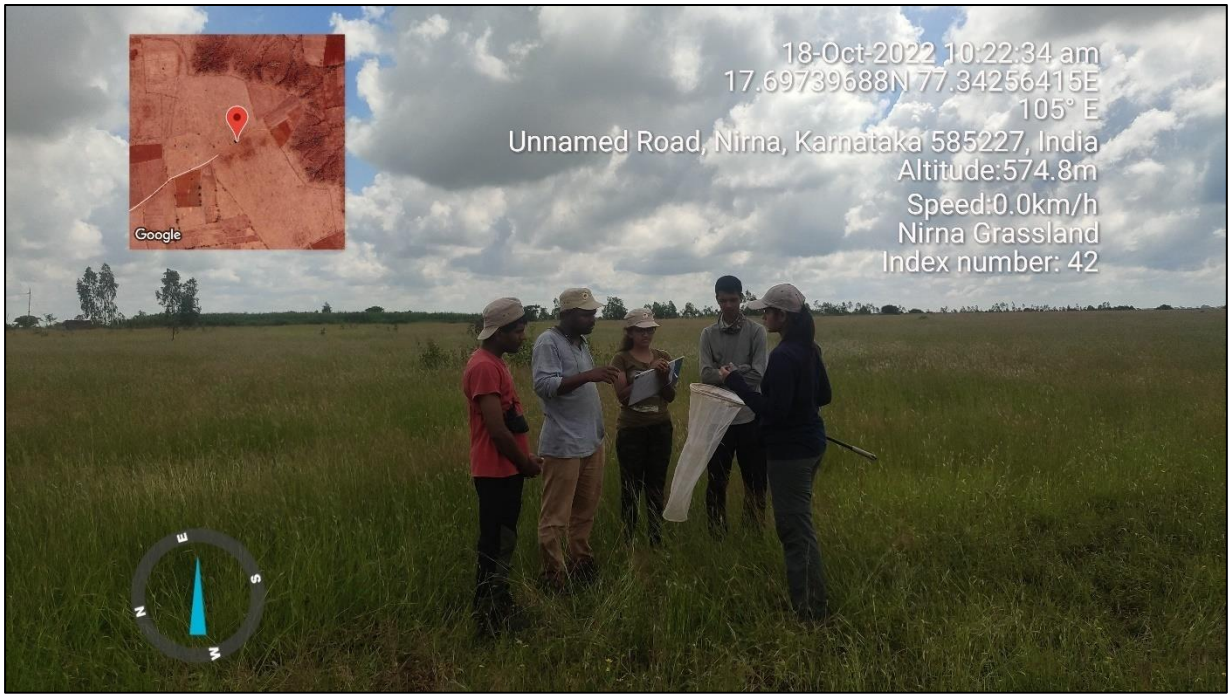


Image 20 Sweep net method used for capturing insects at Nirna Grassland

Image 21 Aliyabad Grassland © Rushikesh Pawar

Fig: Kamthana Habitat

Fig.: Chetnal Habitat

Fig.: Cone-headed Katydid

Fig.: Short-horned Grasshopper

Fig.: Stinging-nettle moth caterpillar

Fig.: Assassin Bug

Fig.: Stink Bug (*A. nubile*)

Fig.: Pygmy Grasshopper

Figure 22 – Various insects observed in the selected sites

Discussion

Government initiatives for the conservation of Lesser Florican

Florican conservation has been a priority for the Indian Government since 2009 when it got included as one of the priority species for recovery by the Ministry of Environment, Forest, and Climate Change (MoEF&CC), under the scheme of Integrated Development of Wildlife Habitat. Despite these tremendous conservation efforts, the number of Lesser Floricans (LF) in Indian Grasslands is still declining. A serious cause for this decline is loss of grasslands and more over the breeding habitat which is under severe threat from change in land-use (Birdlife International2021). Grasslands have always been neglected from a conservation point of view as it is considered as wastelands that have the potential to be converted into agricultural land, solar power plants, and windmills. Western Indian grasslands where Lesser Florican inhabits, are naturally fragmented and the increasing anthropogenic pressure adds an escalating impact to the degradation of these natural grasslands (Sankaran 1997). It is found that Floricans tend to avoid grasslands that are overgrazed and thus degradation of large continuous grasslands into smaller patches is a serious threat to their survival (Narwade *et.al.* 2015).

As per the data presented by Government of India in United Nations Convention to Combat Desertification (UNCCD) during 14thConference of Parties (COP); since year 2005 to 2015, India lost approximately 31% grassland habitats because of land conversion for many anthropogenic activities like urbanization, industrialization, and agriculture etc. The Grasslands in the Aravalli range in Rajasthan underwent severe degradation; other states where land has been severely destroyed include Maharashtra, Karnataka, Gujarat, and Uttar Pradesh. Due to increasing anthropogenic pressure the rate of degradation of grasslands is exponentially high, thus it is very important now to conserve them before the situations go irreversible.

Long-term planning for the conservation of grasslands in Karnataka

Grasslands are vulnerable to weed invasion, garbage dumping, hunting of wild fauna by free-ranging dogs (especially bird nesting areas), invasion of exotic trees, and habitat fragmentation due to various disturbances that can cause severe soil compaction, erosion, and damage.

Projects implemented in protected and community areas have different circumstances and challenges. The creation of grassland habitat fits in well with landfill capping, quarries, and other sites where restoration needs can be appropriately met through grassland creation or restoration. Exotic invasive plants make it difficult to develop or restore a grassland habitat. Utilizing technical advice to ensure there are native species in the seed mix and working diligently to monitor and control invasive species on a regular basis There is a great deal of regional and even local variation in grassland habitat types and their appropriate species composition, maintenance regimes, etc. Teams should use reference information about the grassland types for their region, as well as local expertise, to determine the appropriate grassland types to restore or create.

- Knowledgeable staff or local experts from an existing initiative, NGO or university can provide training and easy-to-use tools for project implementation and monitoring.
- Outreach efforts can also help educate the community about the significance of the project.

- Incorporate an ecologically appropriate plan for maintaining the open nature of the grassland that includes mechanical, chemical, and cultural approaches.
- Monitor the grassland for invasive species and apply appropriate and safe control methods.
- Establish it for at least 3 years following planting or start of maintenance, with an expressed commitment of 7 years.
- Include regular, credible monitoring of one or more grassland-dependent wildlife species, such as Bustards, Florican, Blackbuck, Wolf, Fox etc.
- Establish a baseline of plant and animal species in the grassland habitat, upon which the desired outcomes can be based and evaluated.

Benefits of grassland conservation

Grasslands are not only the hay or home for some species but also provide us with essential ecosystem services through many dimensions and processes, including plant pollination, nutrient cycling, maintenance of beneficial insect populations, air cleaning, pollution treatment, carbon sequestration, and water purification. Numerous processes ensure the availability of essential resources, such as water, oxygen, and nutrients, for organisms, including humans. While overall biomass production can be similar in both forests and grasslands, the biomass flow is much more intensive in grasslands, contrary to forests, where biomass is mostly accumulated in timber. Also, soil formation processes are different in both ecosystems. In grasslands, the accumulation of organic matter is much more intensive.

Landscape approach

By using the subset of data regarding agriculture and grassland boundaries, expert opinion and local knowledge are required to delineate current high-growth farming communities. There is a need to come up with a map of the current risk of agricultural conversion before implementing grassland conservation on a landscape level using a conceptual species-specific spatial model. June–September precipitation is the primary climatic factor causing fluctuations in community biomass production. Ecosystem stability increases progressively from species to functional groups to whole communities. Many times, perspectives on herbivore-based conservation need to be changed to holistic approaches..

Connecting with the state, national, or international goals

1. Species recovery plans – Bustards and Floricans.
2. Centrally Sponsored Schemes (CSS).
3. Compensatory Afforestation (CAMPA).
4. The UN Decade on Ecosystem Restoration (2021-2030).
5. Climate agreements around REDD+ call for decreasing deforestation and increasing the carbon storage capacity of forests—in short, more biomass.
6. The 10-year strategic plan of the UN Convention to Combat Desertification (UNCCD).
7. Parties to the Convention on Biological Diversity (CBD) have agreed to a target of restoring at least 15% of degraded ecosystems by 2020 (Aichi Target 15).
8. To meet existing international commitments Sustainable Development Goals (SDG)/ Millennium Development Goals (MDG) and climate change.
9. The Bonn Challenge is a global goal to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020 and 350 million hectares by 2030.
10. National Mission for Green India.

Strategies recommended to strengthen the conservation impact of the project

1. **Collaboration -** Through collaboration, we can share knowledge and goals to maximize the outcomes for our grasslands and for the community. Ecologists and local communities can play a crucial role in helping the government to achieve its targets.
2. **Grazing -** Implement a grazing plan that balances the needs of grazing species and the ecosystem where grazing takes place; grazing will be managed in a way that provides for the needs of grazing animals, as well as for the needs of native wildlife, and habitats.
3. **Selection of site -** To be located adjacent to existing protected grassland and managed in alignment with that grassland.
4. **Opportunities** – Conduct long-term conservation research on one of the neglected ecosystems in India – the grasslands.
5. **Commitment** – Develop 10-15 years of partnerships that will help to design, create, or monitor the project
6. **Partners -** Connect the project to local, regional, or national funding agencies.
7. **Species which will be benefitted -** Bustards, Floricans, Blackbucks and Wolves will be benefitted. Management plans to fully support the target species and support the conservation and education objectives.
8. **Documentation -** planning, implementation, maintenance, and monitoring of the project through map/image showing the relative size and approximate location of the project. Monitoring logs that show the frequency, type, and results of monitoring of the project.
9. **Citizen science programme** – Develop a monitoring protocol for including citizens in the conservation programme.
10. **Cumulative Impact Assessment** – Grassland habitat is fragmented by infrastructures and there is a need to minimize fragmentation and conduct baseline data. Grasslands are immovable. Development needs to be planned in a way to minimize damage to grasslands from future land-use conflicts and growth.

Incentivizing conservation actions in non-PAs

1. Through carbon offset (or carbon credit) which is a tradeable unit representing one ton of Carbon Dioxide reduced or sequestered.
2. Carbon offsets can be sold to emitters to offset their greenhouse gas emissions.
3. Promoting Bustard/Florican friendly practices by encouraging organic farming (for example for seed, equipment, labor costs, land sparing model, grassland development)

Expected outcomes

1. Increased political support and creating a vast opportunity to sequester carbon while enhancing the livelihoods of the local people across landscapes.
2. Identification of obstacles to grassland conservation and restoration along with useful steps to address them through national and sub-national plans, policies, and institutional frameworks.
3. Increase capacity building, efforts to increase required resources for conservation and restoration and develop a credible measurement and monitoring system. By identifying the gaps in collaboration with partners through learning events and exchanges.

4. Create a new funding opportunity for scaling up conservation and restoration activities in given geographic areas.

Conservation strategies for Bidar and surrounding areas

The agropastoral landscape mixed with scrublands of Bidar district, is a unique and important ecosystem that provides habitat for a variety of important wildlife species, including the critically endangered Lesser Florican and Great Indian Bustard (GIB). In addition to these two flagship species, the habitat also supports a number of other important wildlife species, including the Grey Wolf *Canis lupus pallipes*, Small Indian Fox *Vulpes bengalensis*, Golden Jackal *Canis aureus indicus*, and Blackbuck *Antilope cervicapra* (Narwade *et al.* 2022).

The landscape comprises of mosaic pattern of cultivated lands, fallow fields, and grasslands, interspersed with scrublands and other vegetation types (Roy *et al.* 2015). It is shaped by the traditional land use practices of local communities, who rely on the land for agriculture, grazing, and other livelihood activities. However, the expansion of agriculture and other human activities in semi-arid grasslands has led to the conversion of grasslands and other natural habitats, threatening the survival of wildlife species that depend on them (Mohan *et al.* 2015).

Importance of Bidar as a non-breeding range, corridor for Lesser Florican

Though occurrence of Lesser Florican in Bidar is indeed comparatively low (3 times in 2022, one are direct sighting and two is PTT tagged bird locations), but the fact that the area falls under the species' nonbreeding range where it spends nearly 7 to 9 months, makes it important to conserve the gras slands in this region (Mohan *et al.* 2022; BirdLife International 2023).
Here are few explanations;

The non-breeding range - refers to the area where the species spends most of the year outside the breeding range. Conservation of the nonbreeding range is important for the survival and recovery of the species, as it provides critical habitats for feeding, roosting, and other activities that are necessary for the birds to maintain its good state and prepare for breeding.

Corridor - The grasslands in Bidar also serve as a migration corridor for Lesser Florican and other bird species. Conserving these habitats ensures that the species can move freely between different areas of their range.

Ecological Connectivity - The grasslands in Bidar are also important for maintaining ecological connectivity in the region. They provide vital habitats for other wildlife, such as insects, small reptiles, which are important prey items for Lesser Florican and other bird species. Conserving these habitats ensures that the entire ecosystem remains healthy and functioning, which is important for sustaining biodiversity and ecosystem services.

Adopting Lesser Florican as the flagship species in the Bidar region

Flagship species are species that are chosen strategically to raise public awareness or financial support for conservation action. These species are usually charismatic, have cultural or ecological significance, are threatened with extinction, and are used as symbols to represent the larger conservation issues and challenges of an ecosystems. By focusing on flagship

species, conservation organizations and campaigns can draw attention to the importance of biodiversity and the need to protect ecosystems. These species can help to raise public awareness of the conservation issues facing ecosystems and engage people in efforts to protect them. (Mice *et al.* 2023). Conserving the Lesser Florican in Bidar has both ecological and conservation value. It is important to recognize that the species is an indicator of the health of grassland ecosystems, and conserving the species requires the preservation of grasslands and their associated wildlife (Collar 2021). Adopting the Lesser Florican as the flagship species for conservation can have significant benefits for the conservation of the overall ecosystem in Bidar as mentioned below.

1. **Habitat Protection:** The conservation of the Lesser Florican requires the preservation of grasslands and their associated habitats. By conserving these habitats, other species that share the same habitat can also benefit, as they depend on the same resources and ecological processes.
2. **Ecosystem Connectivity:** The conservation of the Lesser Florican can also promote ecosystem connectivity in the region, allowing for the exchange of genetic material and individuals between different populations. This can reduce the risk of genetic isolation and increase the resilience of the ecosystem to disturbances.
3. **Awareness and Education:** Adopting the Lesser Florican as the flagship species for conservation can also raise awareness among local communities and other stakeholders about the importance of conserving grasslands and their associated biodiversity. This can help promote a culture of conservation and ensure that conservation efforts are sustainable and effective.
4. **Collaborative Conservation:** The conservation of the Lesser Florican can also promote collaborative conservation efforts that involve multiple stakeholders, including local communities, government agencies, NGOs, and other sectors. This can promote knowledge-sharing, capacity building, and effective implementation of conservation strategies that benefit multiple species and the overall ecosystem.
5. **Benefits to locals -** The conservation of the Lesser Florican can also help promote ecotourism and generate economic benefits for local communities.
6. **Ecosystem approach -** By focusing on conserving the Lesser Florican , other species that share the same habitat can also benefit, including the Grey Indian Wolf *Canis lupus pallipes*, Small Indian Fox *Vulpes bengalensis*, Grassland birds like Indian Courser *Cursorius coromandelicus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, Yellow-wattled Lapwing *Vanellus malabaricus*, and others species.

Challenges in conserving private grasslands

It is important to recognize the cultural, economic, and ecological values of these habitats and develop effective conservation strategies that involve local communities, government agencies, and other stakeholders (Darvill and Lindo 2016).

It is true that majority of grasslands are private lands, which makes it challenging to protect them. Many private landowners may not be aware of the ecological importance of grasslands or may prioritize economic benefits over conservation. Additionally, traditional conservation approaches, such as protected areas, may not be effective or feasible on private lands. One potential solution to this challenge is to acquire the lands and protect them. This approach involves purchasing the land from private landowners and establishing a protected area for grassland conservation. Protected areas can help to ensure the long-term conservation of grasslands and the species that depend on them by restricting human activities that could degrade the habitat.

However, land acquisition can be a complex and expensive process. It requires significant resources, including funding for land purchases, staff to manage the protected area, and ongoing monitoring and enforcement. It is also important to work with local communities and stakeholders to ensure that their interests are considered and to build support for grassland conservation efforts. Another approach to protecting grasslands on private lands is through incentive-based programs that encourage land owners to adopt conservation practices. These programs can provide financial or other incentives to land owners who implement practices that benefit grassland conservation, such as rotational grazing, planting native grasses, or conserving water resources. Overall, protecting grasslands on private lands is a complex challenge that requires creative solutions and collaboration between multiple stakeholders. Land acquisition is one potential option, but it is important to consider other approaches as well, such as incentive-based programs and partnerships with private land owners. By working together to protect grasslands, we can help to ensure the survival of these important ecosystems and the species that depend on them.

Therefore, conserving the grasslands in Bidar is crucial for the long-term survival of these species, and for maintaining the ecological integrity of the region. Conserving the grasslands in Bidar is crucial for the long-term survival of the Lesser Florican *Sypheotides indicus*, Grey Indian Wolf *Canis lupus pallipes*, Blackbuck *Antilope cervicapra*, and other dependent species.

Recommendations to save Lesser Florican and grasslands in Bidar

In the past, owing to the presence of the Cheetah, Bidar district was famous as a hunting ground. Over the period, the grassland habitats declined in number, size and quality. Finding intact grasslands became rare in the district. All over the region, most of the grasslands were converted into either agriculture lands or in to plantation patches. Grasslands are in danger due to expansion of agriculture area, industrialization, mining, intrusion of invasive plant species, plantation of exotic trees, overgrazing, and free ranging dogs.

However, some grassland patches still persist, but unfortunately most of them are degraded in status and low quality. Moreover, the majority of these remaining grasslands are either owned by people or revenue department. These patches are also last home for the Critically Endangered Lesser Florican *Sypheotides indicus*, Endangered Indian Grey Wolf *Canis lupus pallipes*, Endangered Egyptian Vulture *Neophron percnopterus*, Chestnut-bellied Sandgrouse *Pterocles exustus*, Indian Courser *Cursorius coromandelicus*, other ground nesting bird species which are also declining in population.

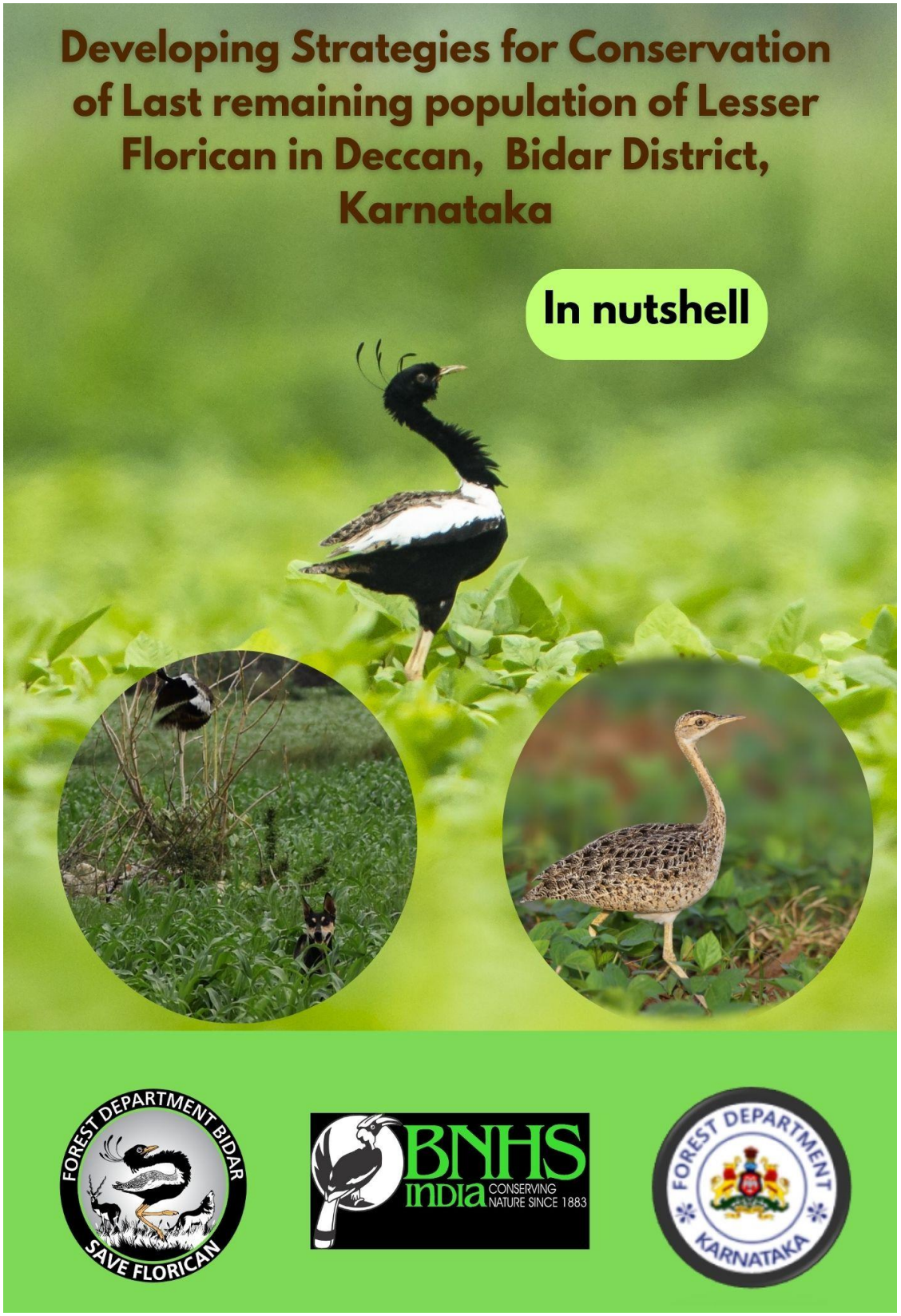
Since the grasslands are owned by the people and revenue or other departments, it is difficult to conduct conservation interventions. For the survival of above-mentioned species, it is necessary and urgent to save the existing grasslands and restore new grassland habitats which come under the Forest Department in the Bidar district. For initial small-scale implementation, entire Aurad tehsil of district Bidar has been proposed under conservation intervention site.

1. **Protection of already identified grasslands and corridors.**
    a. Handing over land from revenue to FD
    b. Purchasing of some land as priority areas
2. **Exploring possibilities to declare community or conservation reserves for protection of grassland fauna** – Since there is no protected area available for the conservation of wildlife in Bidar district possibility of declaring 1) community reserve

on community or private lands; 2) Conservation Reserve on government owned lands, will be explored through consultation of gram sabhas.

3. **Habitat restoration - A. Removing exotic plant species:** weeds/shrub/tree plantations (*Hyptis* spp, *Cassia uniflora*, *Celosia* spp, *Alternanthera* spp, *Lantana* Spp. and *Parthenium* Spp., *Cassia tora*, *Xanthium strumarium*, *Gliricidia* plantation).
4. **Developing grasslands:** Development and management of grasslands on private or government owned lands.
5. **Florican-friendly cropping:** Promoting Florican friendly crops like Green gram *Vigna radiata*, Sorghum *Sorghum bicolor*, and encouraging organic farming, reducing pesticide usage around the Florican and Wolf potential areas.
6. **Addressing issue of free-ranging dogs**: Free ranging dogs have become a serious problem all over the grasslands in Bidar, mainly for the ground nesting birds. Dogs also contaminate the Wolf with canid-distemper disease. Controlling dog populations in a holistic program in neighboring villages of grasslands is needed.
7. **Mitigation of collision of birds with high-tension powerlines:** Installation of reflectors/ bird flight diverters on powerlines to mitigate collisions of the birds. A small stretch being used by the Floricans can be selected for installation of bird diverters on a pilot basis to understand the feasibility.
8. **Awareness and outreach**: Conducting outreach programs among school children, villages, and multiple stakeholders to generate support.
9. **Conducting workshops for capacity building for the antipoaching squad** – For strengthening Forest Staff with capacity building programs, the workshop would be conducted on implementation of wildlife act in terms of hunting and filing cases.
10. **Strengthening the protection measures:** Providing the four-wheelers and bikes for patrolling and guarding the grasslands.
11. **Monitoring and evaluation of the implementation -** Research studies to understand the effects of restoration of grasslands, habitat preferences by the wildlife.
12. **Construction of underpasses or over bridges for the wildlife –** Mammals like Blackbuck *Antilope cervicapra*, Chinkara *Gazella bennettii* and Grey wolf *Canis lupus pallipes* move in large areas, especially grasslands and corridors. There is a dire need of making underpasses or over bridges for their smooth movement.

Conservation strategies in nutshell



About Lesser Florican - in brief

1

Dance of Courtship

This flamboyant bird's courtship ritual involves leaping up in the air and showcasing its plumage. It does this between 500 and 600 times a day to attract a mate

Photo by Surendra Chuahan
Bird Illustration – Handbook of the Birds of the World Alive. Lynx Edicions (2018)

Lesser Florican

(Sypheotides indicus)

Status	**ENDANGERED**
Geography	Only found in India. Shokaliya, Ajmer landscape in Rajasthan and Velavadar in Gujarat hold more than 70 - 80% of global population
Habitat	Found in dry grasslands at lowland areas with scattered bushes and scrubs, traditional low height crops like pulses

Key Threats

Habitat Loss

80% of grasslands converted to intensive agriculture within the last 20 - 30 years. Intensive mining, new renewable energy power plants and associated structures like power transmission lines.

Overgrazing

High livestock grazing pressure makes grasslands unusable by floricans. Grasslands invaded by exotic plant *Prosopis juliflora*

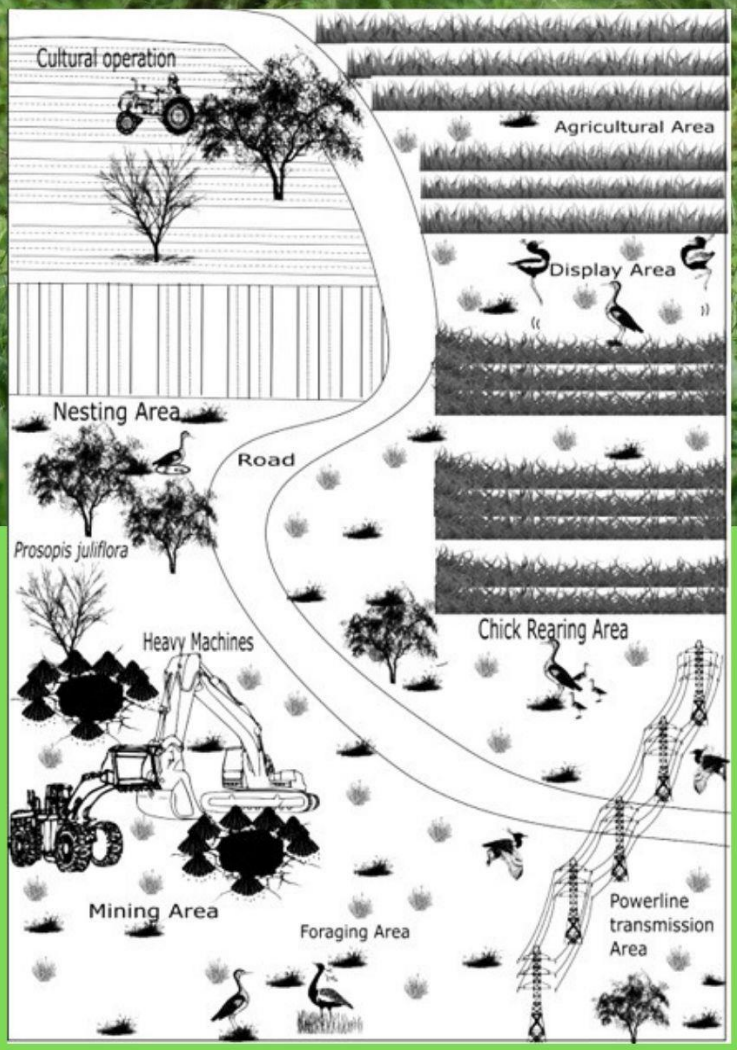
In Numbers:

Less than

700

mature individuals

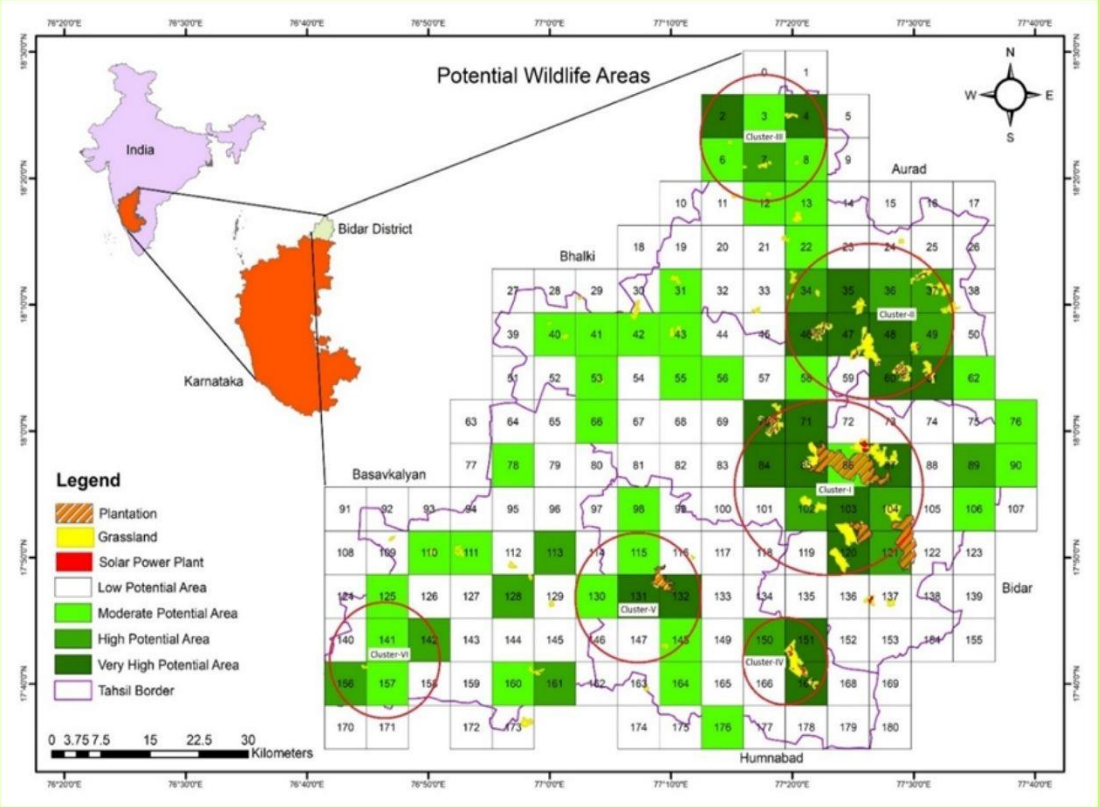
2



Minimum habitat requirements of the Lesser Florican and threats to them

BNHS helped the Bidar Forest Division to identify the conservation priority sites

3



1.	Cluster I: Among major clusters, first cluster (Cluster-I) is a mosaic of plantations, grasslands and traditional agricultural areas from Kamthana, Shamshirnagar, Dhanura, Konmelkonda, Tegampur, Mamdapur-Chondi, Chouli-Aaliyabad. In this cluster Konmelkonda, Dhanura, Honnekere, Kamthana, Chitta Forest, Shamshirnagar are the major reserve forests (plantations)..
2.	Cluster II: Second cluster is a mosaic of traditional agriculture, fallow lands, grasslands and plantations from Alur-Belur, Khanapur, Ujani, Ladha, Chatnal, Mahagaon, Santhpur, Hedgapur areas. In this cluster Alur-Belur, Khanapur, Chatnal, Mahagaon, Ladha and Hedgapur are the major reserve forests (plantations).
3.	Cluster III: Among minor clusters, cluster-III is a mosaic of traditional agriculture, fallow lands and grasslands with undulating terrain at Chikhali, Mudkhed, Hokrana, Dapka, Kherda and Lingi areas.
4.	Cluster IV: It is a mosaic of grasslands, traditional agriculture and fallow lands near Nirna village.
5.	Cluster V: It is a mosaic of plantations and grasslands at outskirts of Humnabad near “Chota falls”.
6	Cluster VI: It is dominated with traditional agriculture and fallow lands with undulating terrain from Ladwanti, Siruri, Bhosga, Batgera and Attur.

1. Protection of priority grassland areas and wildlife corridors

4

After conducting thorough landscape surveys for two subsequent years and regular field visits, survey team has identified few priority areas for the habitat restoration process. It is recommended to the Forest department to purchase land from the Revenue department or any external source for restoration to conserve the identified grassland areas. Once the land is under Forest department, safe corridors for animal movement can be developed.

For smooth movement of the wildlife, underpasses or overpasses are essential

Protection of habitat

a. Handling over land (critical habitat) from Revenue Department to Forest Department

b. Purchasing of some land as priority areas through CSR schemes

2. Exploring possibilities to declare community conservation reserves for protection of wildlife in Bidar

5

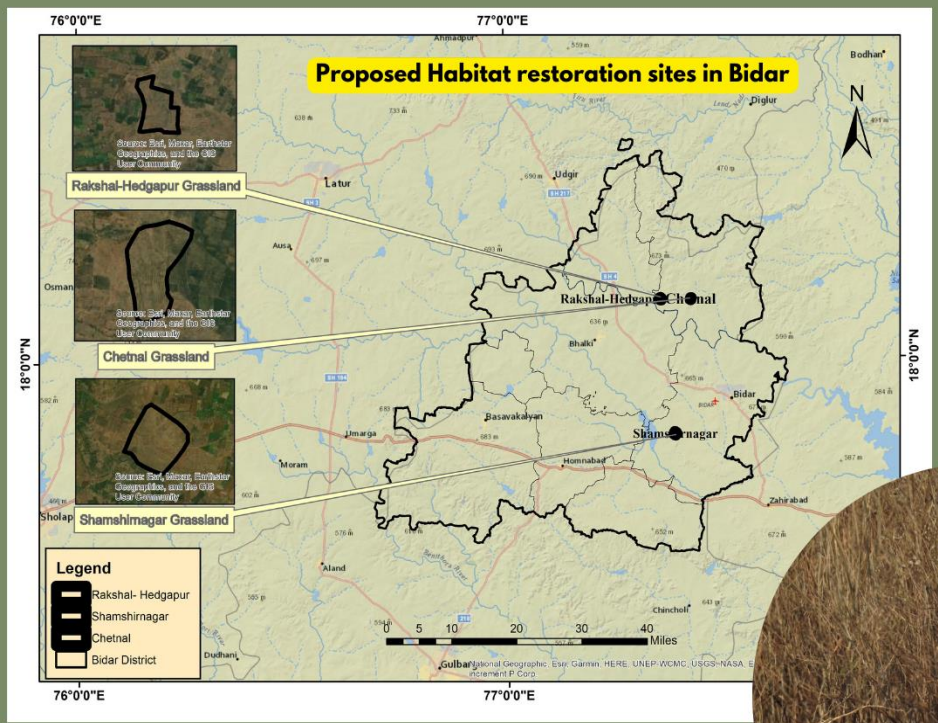
Components of Conservation Action Plan

- Sanction for creation and regulation for CCA in WLPA 1972 – Section 36A, 36B, 36C, 36D
- Conservation area planning and designing
- Demarcation of boundaries
- Habitat Restoration
- Grassland development
- Habitat Protection
- Species Protection

- **Sites with high congregation of grassland associated species have been identified where possibility of declaring them as community conservation reserves will be explored.**
- **Multi-stakeholder meetings would be arranged for participatory conservation work.**

3. Habitat restoration- removing exotic plant species

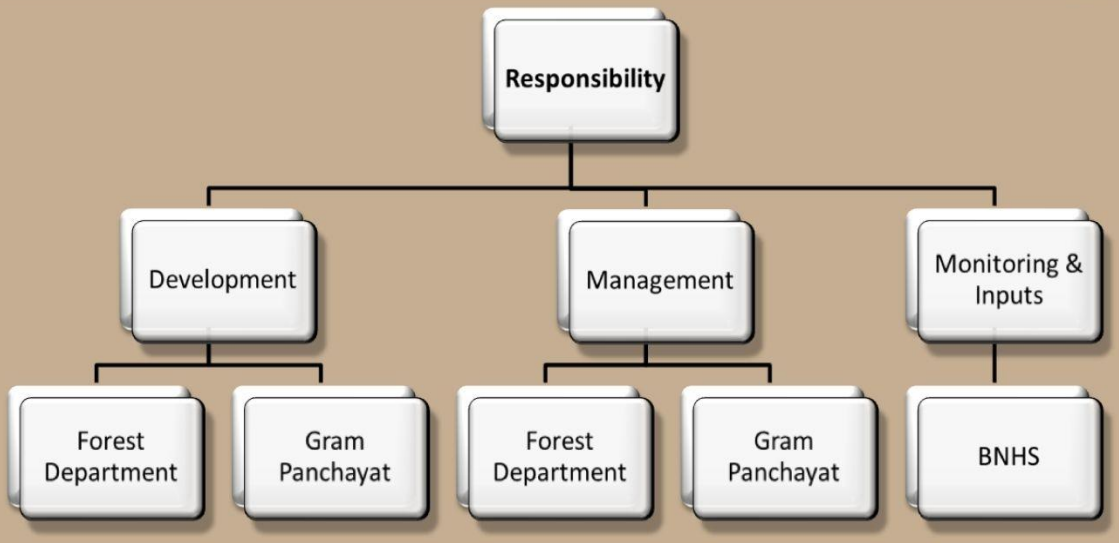
- Habitat restoration is a scientific way of repairing and restoring the disturbed ecosystem back to its undisturbed former state.
- Several studies on the impact of habitat restoration programs found that grassland restoration can benefit birds by re-establishing their habitat or improving its quality, which can lead to increased breeding success and population stability.
- It can be accomplished through biotic factors (species composition, interactions among species) to historical levels.
- The goal of restoration is to initiate an ecosystem's recovery after disturbance and bring back its natural habitat for future generations.
- Restoration process consists of 3 phases, planning, implementation, and monitoring.
- Habitat restoration sites will be managed by the forest department through uprooting exotic species, sowing grass seeds, and protecting from threats, and scientific and technical help of the BNHS.
- This is a time bound action plan, in summer uprooting of invasive exotic plants can be done followed by sowing in Monsoon. Removal of exotic plant species such as *Hyptis* spp., *Cassia* spp., *Celosia* spp., *Alternanthera* spp., *Lantana* spp., *Parthenium* spp., *Xanthium strumarium*, *Gliricidia sepium*. plantation.
- Conditions will be made favorable for the better growth of the grasses in restored sites.



Map showing Proposed sites for habitat Restoration (Hedgapur, Chetnal and Shamsheernagar)

4. Developing grasslands

7



- After uprooting the exotic and invasive species in the summer season, the restoration site has to be analyzed for the presence of native grass species, and *Ziziphus* spp., before the sowing process in monsoon.
- Selection and collection of native palatable grass seeds
- Seed ball preparation.
- During monsoon the site will be prepared by ploughing and sowing of seed balls.
- After sowing the site is to be protected by covering with fence, from the grazers, dogs and other animals.
- There should be continuous monitoring by local community by spreading awareness about grassland conservation.
- The response of other species towards the newly developed grassland, growth of grass, maintaining the height of grass for Lesser Florican etc. are to be monitored.

8

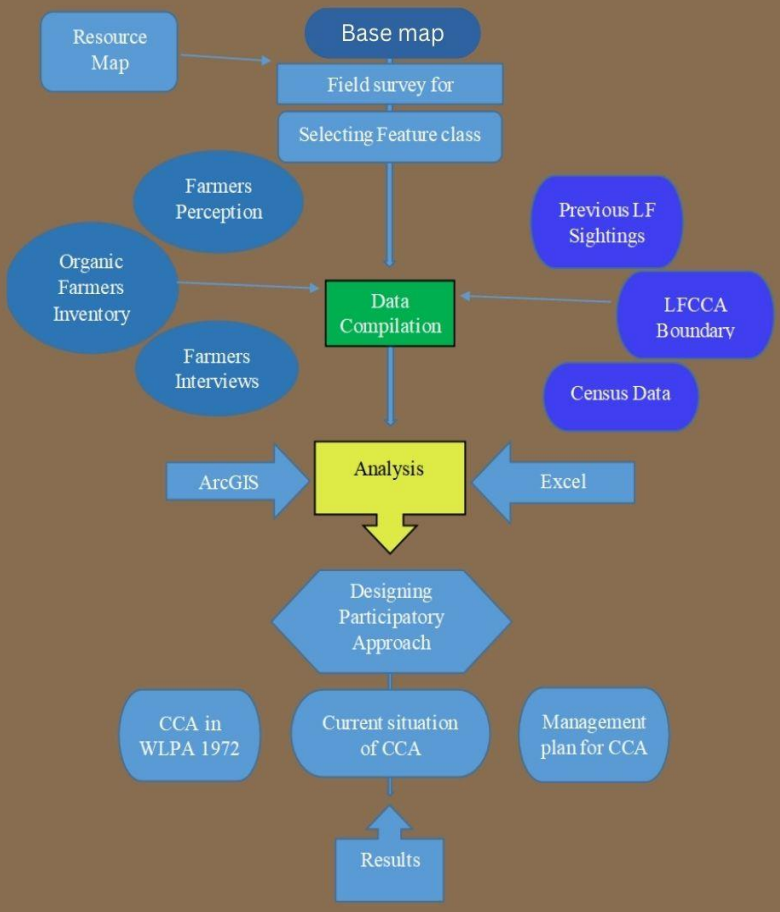
5. Florican Friendly Agriculture Practises (FFAP) is the only way to save the species surviving in agropastoral landscape

Objective	Target group	Purpose
Create a network of Kharmor Mitra, strengthen their capacity	Farmers, local people	for monitoring the birds and site understanding threat and site-specific solutions
Developing a model for Florican-Friendly Agricultural practices	Enrolment of Farmers Wherever possible take help from Agri Dept., Forest Department	Minimum use of chemicals, Less use of heavy machines and manual harvesting
Incentives, recognition to the people who contribute in conservation	Felicitation program, Monetary incentives after regular monitoring	Protecting habitat and birds on site

Florican Friendly Agriculture Practices (FFAP) - Process

Resource mapping	• Preparation of map and documentation through Field Survey • Digitization of secondary data
Ethnographic & Demographic methods	• Farmers Perception • Organic Farmers Inventory • Documentation of village wise Data
Data Analysis	• Preparing Resource map • Finding community reserve Management needs
Designing Participatory conservation plan.	• Preparation of Community conserve area's management plan

FFAP conceptual Design



6. Addressing issue of free- ranging dogs

10

1. Free-ranging dogs are the major predators of ground-nesting birds, especially eggs and chicks. So it is very important to control the free-ranging dog population within the priority area.
2. Provide incentives to the Gram Sabha for humanely euthanize dog as per WHO protocols or internationally accepted methodologies for euthanasia of IAS (Invasive Alien Species) and disease vector animals.
3. Private pest control agencies could take contract for removal and euthanasia of dog.
4. Private agencies could be paid to remove dog from within protected area.

7. Mitigation measures to avoid collision of birds with high tension transmission (HTTL)

11

- Mapping of HTTL in highly sensitive areas (with dimension and capacity)
- Powerlines in a highly sensitive area are to be undergrounded
- Installation of bird diverters and reflectors in the medium-sensitive area and study of their efficacy in Bidar.
- Advocacy - All new renewable energy projects need to consult Forest Department before installing their plant.
- Digitization of power sub-stations and grids, to understand the spread-out of powerlines in sensitive areas.

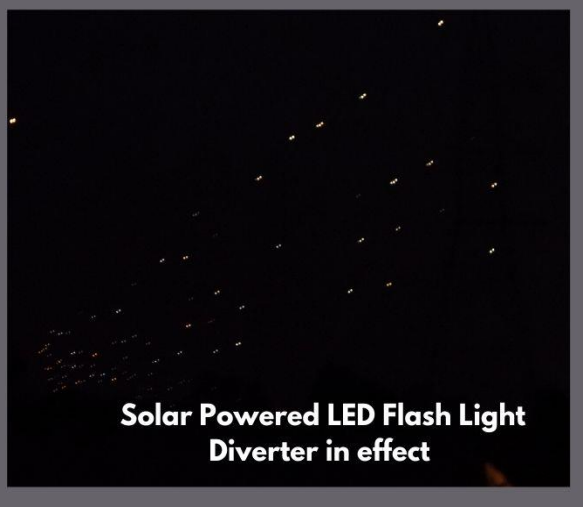
Types of Bird Flight Diverters to be used

A firefly Bird Flight Diverter

A solar powered LED flash light BFD

A non LED BIRD FLIGHT DIVERTER

A combination of firefly and LED flash light BFD seen



Solar Powered LED Flash Light Diverter in effect

8. Awareness and Outreach Program

12

Logo

Cap

Sculpture

T-shirt

Outreach program helps in achieving awareness about the importance and need of conservation of grassland habitats and its associated species to a large group of people. Along with the Lesser Florican survey, BNHS has been conducting various outreach programs in collaboration with Karnataka Forest department staff, local government bodies like collector office , NGO's and schools. Meetings are held to discuss about grassland habitat, and its associated species, their current status, challenges, threat and conservation measures. Presentation and awareness programs are conducted for school children and local people to educate them about the importance of need for grassland development and conservation. To create the interest among the children notepads, caps, T-shirts, sculptures and other materials with Lesser Florican logo on them are given to the children.

School Awareness Program to educate the young generation

13

By interactions with students the team found out, that there is lack of proper knowledge about the wildlife among the students. It is very necessary to conduct awareness among the students and also general public about their surrounding habitat and the species dwelling in there. Awareness program about Cheetah reintroduction in India was conducted in different schools of Bidar district. In this program BNHS team presented PPTs about Cheetah, IUCN status, its habitat, and need for conservation. Explaining students about the importance and conservation of Grassland habitat was easy, as they could relate it to their surrounding environment where they observe Blackbuck, Peafowls, Sandgrouse, Lapwings, etc. in their everyday life.

The need to save the species from extinction as well as bringing the extinct animals like Cheetah back need to be emphasized

9. Conducting a workshop for capacity building

14

Training program for the personnel involved in Lesser Florican project activities need to be conducted regularly

Experience sharing with the people working in various landscapes in the grasslands of India

10. Monitoring and evaluations of the implementation

15

SN	ACTION	IMPLIMENTATION AND MONITORING	EXPECTED OUTCOME	EVALUATION INDICATOR
1	Protection of priority grassland areas and wildlife corridors	Marking of high, moderate & low sensitivity areas	1. Grassland area policy come into existence 2. Easy movement of animals across habitats	Some of the habitats will get spared from the heavy land use changes
2	Exploring possibilities to declare community or conservation reserves	Community/Conservation reserve management committee will oversee the conservation work	Community governed species centric grassland reserves become functional	Atleast one community and one conservation reserve will get established
3	Habitat restoration	Uprooting of exotic and invasive plant species, Monitoring response of native biodiversity	Reappearance of native flora and fauna, more suitable habitat provided	Habitat restoration pilot program gets implemented in first two years
4	Developing grasslands	Grass seed collection, seed ball preparation, sowing or transplanting the saplings	Grassland plots get developed in restored areas	Grass height, insect congregation, bird interactions
5	Florican Friendly Agriculture Practises (FFAP)	Enrollment of farmers, incentives , monitoring the scheme	Use of least amount of chemicals, manual harvesting instead of machines	Less disturbance to the wildlife, presence of key species in farms

10. Monitoring and evaluations of the implementation

SN	ACTIVITY	IMPLIMENTATION AND MONITORING	EXPECTED OUTCOME	INDICATOR
6	Addressing issue of free- ranging dogs	Pest control agency and local involvement in removal of dogs from sensitive areas. Euthanasia in high sensitive areas	Reduction in number of free-ranging dogs, reduces the threat for wildlife	Creating few high sensitive areas become free from feral dogs
7	Mitigation measures to avoid collision of birds with high tension powerline	Undergrounding Powerlines, controlling installation of new projects. Use of bird diverters and reflectors	Reduction in mortatlity of birds due to collision, leading to increase in bird life-span	Creating collision free habitat in high prioritized sensitive areas
8	Awareness and outreach program	1. Distributing wildlife souvenir to promote conservation awareness 2. Outreach programs in schools	Educating the students about the importance of wildlife and need of conservation	Locals become aware of the wildlife around them and their part in conservation
9	Conducting a workshop for capacity building	Capacity building for monitoring birds, habitat, creation of awareness and implementation of conservation actions on ground	1. Staff will be fully sensitized about species and habitat 2. Hand-holding of the community for engaging into conservation work	Trained team of forest staff and locals of implementation and monitoring of conservation plans

Annexures

Annexure 1 - List of the birds and mammal species Sighted during Landscape survey in Bidar

SN	Common name	Scientific name	Migratory status	IUCN status	WPA 1972 schedule
1.	Lesser Florican	*Sypheotides indicus*	M	CR	I
2.	Bonelli's Eagle	*Aquila fasciata*	R	LC	I
3.	Short-toed Snake Eagle	*Circaetus gallicus*	R	LC	I
4.	Montagu's Harrier	*Circus pygargus*	M	LC	I
5.	Pallid Harrier	*Circus macrourus*	M	NT	I
6.	Egyptian vulture	*Neophron percnopterus*	R	EN	I
7.	Indian Courser	*Cursorius coromandelicus*	R	LC	IV
8.	Chestnut-bellied Sandgrouse	*Pterocles exustus*	R	LC	IV
9.	Sykes's lark (Tawny Lark)	*Galerida deva*	R	LC	IV
10.	Rufous-tailed Lark	*Ammomanes phoenicura*	R	LC	IV
11.	Grey Francolin	*Ortygornis pondicerianus*	R	LC	IV
12.	Painted Francolin	*Francolinus pictus*	R	LC	IV
13.	Rain quail	*Coturnix coromandelica*	R	LC	IV
14.	Barred buttonquail	*Turnix suscitator*	R	LC	IV
15.	Rock bush quail	*Perdicula argoondah*	R	LC	IV
16.	Ashy crown sparrow lark	*Eremopterix griseus*	R	LC	IV
17.	Indian Bush lark	*Mirafra erythroptera*	R	LC	IV
18.	Yellow wattled lapwing	*Vanellus malabaricus*	R	LC	IV
19.	Indian Gray Wolf	*Canis lupus pallipes*	R	EN	I (part l)
20.	Blackbuck	*Antilope cervicapra*	R	LC	I (part l)
21.	Small Indian Fox	*Vulpes bengalensis*	R	LC	II (part l)
22.	Jungle Cat	*Felis chaus*	R	LC	II (part l)
23.	Nilgai	*Boselaphus tragocamelus*	R	LC	III

Abbreviations: M=Migratory, R=Resident, CR= Critically Endangered, EN=Endangered, NT=Near Threatened, LC=Least Concern. WPA= Wild Life (Protection) Act-1972, IUCN= International Union for Conservation of Nature.

Annexure 2 – Common grass and shrubs species Sighted in Bidar

SN	*Scientific Name*	Common Name
1.	*Justicia procumbens*	Water willow
2.	*Heteropogon* Spp.	Black spear grass
3.	*Dichanthium* Spp.	Marvel grass, Sheda grass
4.	*Themeda* Spp.	Kangaroo grass, Red grass
5.	*Chrysopogon* Spp.	Vetiver grass
6.	*Aristida* Spp.	Common needle grass
7.	*Cymbopogon* Spp.	Lemon grass
8.	*Andropogon* Spp.	Beard grass

Cynodon dactylon

Dodonaea_viscosa

Mimosa pudica

cyanotis

Dicanthium anulatum

Themeda Spp.

Chrysopogon fulvus

Hetropogon Spp.

Cyperus alatus

Aristida Spp.

Hexasepalum teres

Parasopubia delphilifolia

Figure 23 Common grass and shrubs Species observed in various landscape surveys in Bidar

Annexure 3 - Lesser Florican sighting records in Karnataka

S. N	Latitude	Longitude	Old/ New	Place	District	State	Reference
1	12.99273	75.38926	Old	South Kanara (Karavali)	Karavali	Karnataka	Jerdon 1864
2	13.00818	77.95444	Old	Mallur	Kolar	Karnataka	Mcinroy 1880
3	12.33443	76.71935	Old	East Mysore	Mysore	Karnataka	Mcinroy 1880
4	15.50347	74.92625	Old	Dharwar	Dharwar	Karnataka	Butler 1881
5	15.91659	74.59125	Old	Belgaum	Begaum	Karnataka	Butler 1881
6	13.00891	77.86761	Old	Bangalore	Bengaluru	Karnataka	Anderson 1883
7	13.9894	75.55884	Old	Shimoga	Shimoga	Karnataka	Anderson 1883
8	13.88767	74.60717	Old	Kanara	Karavali	Karnataka	Barnes 1891
9	15.34506	74.75573	Old	Halyal (=Haliyal) North Kanara	Karavali	Karnataka	Davidson 1898
10	13.33685	77.41365	Old	Bangalore	Bengaluru	Karnataka	Betham 1911
11	13.42968	77.13087	Old	Tumkur	Tumkur	Karnataka	Baker 1912
12	12.36211	76.71935	Old	Mysore	Mysore	Karnataka	Phythian-Adams 1940
13	13.04783	76.07875		Hassan	Hassan	Karnataka	Worth 1953
14	14.70432	74.28222	Old	Belikeri	Uttar Kannad	Karnataka	Abdulali 1969
15	15.46345	76.66361	Old	Tungabhadra, Tungabhadra Wildlife Sanctuary	Ballari	Karnataka	Goriup&Karpowicz 1985
16	13.1492	77.4833	New	Hesaragatta, Bangaluru	Bengaluru	Karnataka	Raghavendra, M., 2011
17	12.20649	75.8222	New	Virajpet, Gonikoppal, Coorg, Karnataka	Kodagu	Karnataka	Monnappa, B., 2012.
18	12.18	75.78	Recent	Virajpet, Gonikoppal, Coorg, Karnataka	Kodagu	Karnataka	Monnappa, B. C, & Santhosh Kumar P. 2018
19	17.97744	77.44432	Recent	Chondi, Bidar, Karnataka	Bidar	Karnataka	Vivekanadhababurao 2020
20	17.87328	77.41423	Recent	Kamtana, Bidar, Karnataka	Bidar	Karnataka	Vivekanadhababurao 2020
21	15.66278	75.79738	Recent	Jigalur and Jakkali	Gadag	Karnataka	WII 2021

Annexure 4 – Great Indian Bustard (GIB) sighting records in Karnataka

SN.	Lat.	Long.	Old/ New	District	Place	Source
1	16.35000	75.61667	Past	Bagalkote	Bilgi	Rahmani and Manakadan 1990
2	16.20444	75.50200	Past	Bagalkote	Kaladgi	Hamilton 1892
3	15.81845	76.72905	Past	Raichur	Pagadadinni, Sindhanur	Ali and Rahmani 1985, Rahmani and Manakadan 1990
4	16.19649	77.32369	Past	Raichur	Rampur	Rahmani and Manakadan 1990
5	16.19376	75.53189	Past	Bagalkot	Tulsigere	Rahmani and Manakadan 1990
6	16.06666	75.36565	Past	Belgaum	Batkurki	Ali and Rahmani 1985; Rahmani and Manakadan 1990
7	15.96365	77.30667	Past	Raichhur	Bichale (Tungabhadra)	Cornwallis 1983; Rahmani and Manakadan 1990,
8	15.71667	75.96667	Past	Koppal	Hagedal	Neginhal 1983
9	14.81667	75.61667	Past	Haveri	Guttal	Rahmani and Manakadan 1990
10	14.58233	75.88400	Past	Davangere	Kondajji	Rahmani and Manakadan 1990
11	14.22133	76.39856	Past	Chitradurga	Chitradurga	Rahmani and Manakadan 1990
12	13.79999	76.29000	Past	Chitradurga	Hosdurga	Neginhal 1983
13	13.65856	76.74133	Past	Tumkur	Bukkapatna	Rahmani and Manakadan 1990
14	12.99419	76.85378	Past	Tumkur	Yediyar	Rahmani and Manakadan 1990
15	13.00352	77.37278	Past	Bengaluru	15 km west of Bengaluru	Baker and Inglis 1930
16	13.11194	77.39795	Past	Bangalore Rural district	Nelamangala	Ali and Wistler 1942-1943
17	12.33333	76.43000	Past	Mysore	Bilikere	Baker and Inglis 1930
18	11.90000	77.21667	Past	Chamarajan agar	Biligirirangan hills	Neginhal 1983
19	11.80556	76.69222	Past	Chamarajan agar	Gundlupet	Phythian and Adam 1940
20	13.98870	76.63673	Past	Chitradurga	Hiriyur	Ali and Wistler 1942-43
21	16.73319	75.50078	Past	Vijayapura	Vijayapura	Rahmani and Manakadan 1990
22	15.10965	76.85233	Past	Ballari	Ballari	Rahmani and Manakadan 1990

SN.	Lat.	Long.	Old/ New	District	Place	Source
23	13.03968	76.14030	Past	Hasan	Hasan	Rahmani and Manakadan 1990
24	14.64377	75.70226	Old	Haveri	Ranibennur Blackbuck Sanctuary	Neginhal 1983, Rahmani and Manakadan 1990, Kumara and Mohan Raj 2007
25	15.40691	75.96339	Old	Koppal	Bannikoppa	Kumara and Mohan Raj 2007
26	13.75926	76.91574	Old	Tumkur	Sira	Kumara and Mohan raj 2007
27	16.10029	76.10804	Old	Gadag	Hagedal	Gorpade 1996, Bhat et al 2005
28	15.80092	74.51897	Recent	Belgaum	Yellur	Niranjan Santh 2016
29	17.64443	76.46316	Recent	Kalaburagi	Nirgudi	Bilal *et al* 2016
30	17.31903	75.63605	Recent	Kalaburagi	Chadchan	Bilal *et al* 2016
31	17.32505	76.04297	Recent	Vijayapura	Agarkhed	Bilal *et al* 2016
32	16.77420	75.36763	Recent	Vijayapura	Telsang	Bilal *et al* 2016
33	16.72705	75.46258	Recent	Vijayapura	Gothe	Bilal *et al* 2016
34	16.74643	75.56972	Recent	Vijayapura	Dhanyal	Bilal *et al* 2016
35	16.73865	75.67170	Recent	Vijayapura	Khatijapur	Bilal *et al* 2016
36	16.89564	75.50578	Recent	Vijayapura	Somadevarahatti	Bilal *et al* 2016
37	15.68742	77.01201	Recent	Mittesugur	Ballari	Samand 2016
38	15.74720	77.06342	Recent	Basarahalli	Ballari	Samand 2006: Samand 2016

Annexure 5 Photo documentaion

Glimpses of Mammals of Bidar

Blackbuck @ Minal Pawar

Indian Jackal @Pooja Gosavi

Small Indian Fox @Pooja Gosavi

Indian Grey Mongoose @Rushikesh Pawar

Image 24 Blackbuck, Indian Jackal, Small Indian Fox and Indian Grey Mongoose sighted in Bidar

Glimpses of Avifauna of Bidar

Greater Spotted Eagle @ Rushikesh Pawar

Montague's Harrier @ Minal Pawar

Short-toed Snake-eagle @ Rohit Kulkarni

White-eyed Buzzard @ Minal Pawar

Red-necked Falcon@ Rohit Kulkarni

Common Kestrel @ Nikhil Ghadigaonkar

Grey Francolin @ Pooja Gosavi

Chestnut-bellied Sandgrouse@ Minal Pawar

Indian Nightjar @ Surpriya Hangal

Painted Francolin @ Supriya Hangal

Rain Quail @ Pooja Gosavi

Indian Thick-knee @ Rushikesh Pawar

Indian Courser @ Rushikesh Pawar

Yellow-wattled Lapwing @ Rushikesh Pawar

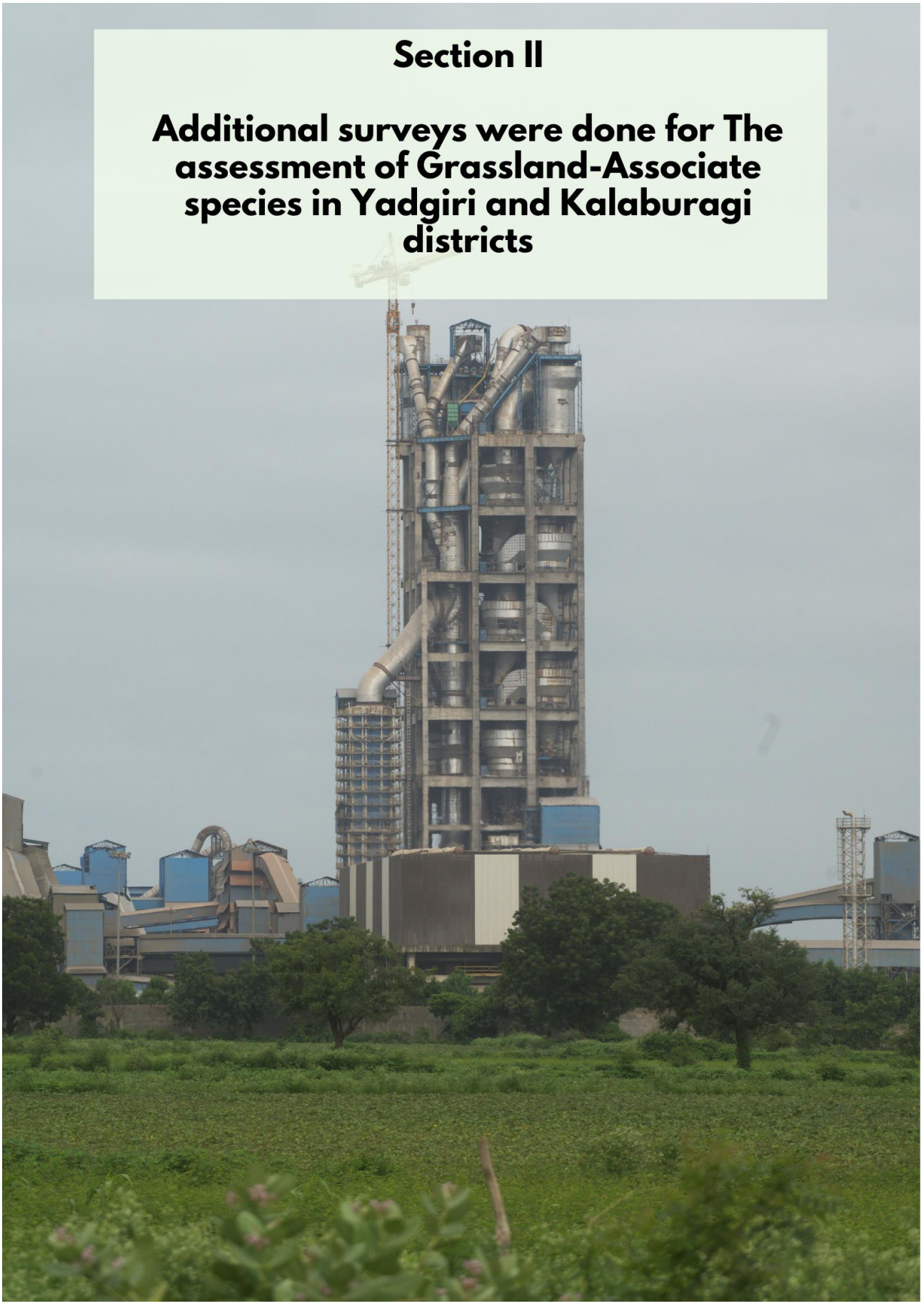
Red-headed Bunting @ Pooja Gosavi

Sykes's Lark @ Pooja Gosavi

Image 25 Avifauna sighted in Bidar

Section II

Additional surveys were done for The assessment of Grassland-Associate species in Yadgiri and Kalaburagi districts



Section II -Yadgiri and Kalaburagi – Status assessment

Survey Team

Sr. No.	Participants	Designation
1	Dr. Sujit Narwade	Assistant Director, BNHS
2	Rushikesh Pawar	Project Associate-I, Lesser Florican Project, Bidar
3	Rajesh Parmar	Driver/Field Assistant
4	Rohit Kulkarni	Volunteer, Lesser Florican Project, Bidar
5	Pooja Gosavi	Volunteer, Lesser Florican Project, Bidar
6	Supriya Hangal	Volunteer, Lesser Florican Project, Bidar
7	Sachin Bishnoi	Volunteer, Lesser Florican Project, Bidar
8	Tarkik Varma	Volunteer, Lesser Florican Project, Bidar
9	Som Saple	Volunteer (Belgum)
10	Shriraj Yadav	Volunteer (Belgum)
11	Gaurang Nilajkar	Volunteer (Belgum)
12	Sainath	Volunteer (Belgum)
13	ShivkumarVastrad	Driver
Forest Staff		
14	Bhavikatti	DFO (Kalaburagi)
15	Sunilkumar Chavan	ACF (Kalaburagi)
16	Sachin Patil	RFO (Kalaburgi)
17	Bhagayat	DyCF (Yadgiri)
18	Mohammad Asad	ACF (Yadgiri)
19	B.P. Nayak	DRFO (Bonal WLS)
20	Siddarood Ji	Forest Guard (Aland)
21	Mohammad Mujahid	Yadgiri
22	Balbheem Rathor	Khanapur Kalaburgi
23	Mallikarjun Shirole	Watcher (Aland)
24	Shivappa Sangolagi	Watcher (Aland)
25	Devappa Chittapur	watcher (Chittapur)
26	Bashumiya Gobbur	Watcher (Kalaburagi)
27	Goutam M Parturkar	Watcher (Kalaburagi)

Objectives

1. Identify the distribution of grasslands in selected parts of the Kalaburagi and Yadgiri districts.
2. To evaluate the status of grassland obligatory species in selected parts of the Kalaburagi and Yadgiri districts.
3. To assess the threats which are the causing degradation of the grassland habitats.
4. To suggest measures for the conservation of grasslands with a special reference to the Great Indian Bustard (GIB) and Lesser Florican.

Study Area

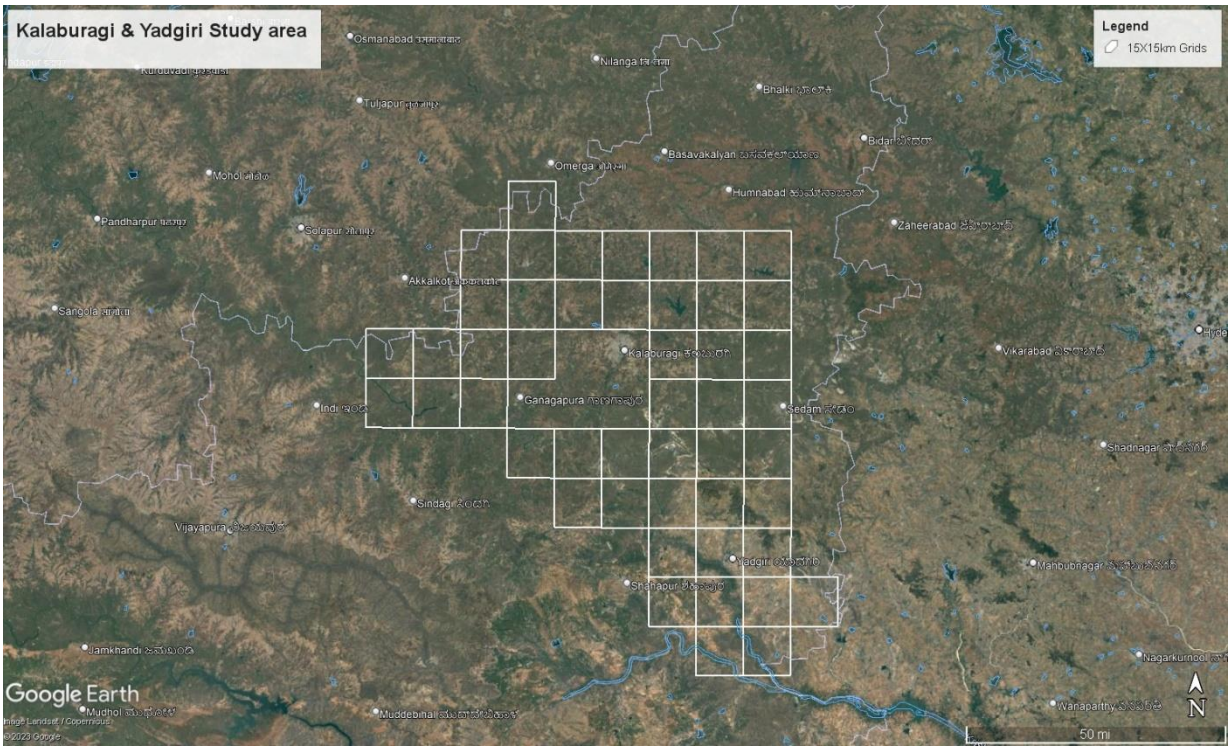


Figure 48 Study area of Kalaburagi and Yadgiri districts

Kalaburagi district – It is one of the three districts that were transferred from Hyderabad State to Karnataka state at the time of the re-organization of the state in 1956. The district is one of the 30 districts of Karnataka State. It is located in the Deccan Plateau in the Northern part of the state and lies between 76°.04′ and 77°.42 E, and 17°.12′ and 17°.46′N, covering an area of 10,951 km². It is bounded on the west by the Bijapur district of Karnataka and Sholapur district of Maharashtra, on the west by RangaReddy and Medak districts of Telangana State, on the north by the Bidar district of Karnataka, Osmanabad district of Maharashtra and on the south by the Yadgiri district of Karnataka. Two main rivers, Krishna and Bhima, flow in the district. Black soil is the predominant soil type in the district. The district has a large number of tanks which, in addition to the rivers, irrigate the land. The Upper Krishna Project is a major irrigation venture in the district. Bajra *Pennisetum glaucum*, Toor *Cajanus cajan*, Sugarcane *Saccharum Spp*., Groundnut *Arachis hypogaea*, Sunflower *Helianthus annus*, Sesame *Sesamum indicum*, Castor bean *Ricinus communis*, Black gram *Vigna mungo*, Jowar *Sorghum bicolor*, Wheat *Triticum Spp*., Cotton *Gossypium herbaceum*, Ragi *Eleusine coracana*, Bengal gram *Cicer arietinum*, and linseed *Linum usitatissimum*are grown in this district (District Gazetteer).

The weather in Kalaburagi consists of 3 main seasons. The summer spans from late February to mid-June. It is followed by the southwest monsoon which spans from late June to late September heavy rainfall may go up to 750mm. It is then followed by dry winter until mid-January. Barring the hot summer months, the salubrious weather of Kalaburagi makes a visit to this historical city a pleasant one. Temperatures during the different seasons are Summer: 38 °C to 44 °C; Monsoon: 27 °C to 37 °C, and Winter: 11 °C to 26 °C (District Gazetteer).

Yadgiri District –It was carved out from the erstwhile Kalaburagi District as the 30th district of Karnataka on 31st December 2009. It is located in the Northeastern part of the state, surrounded by Kalaburagi in the North, Raichur in the South, Vijayapur in the West, and the state of Telangana in the East. Yadgiri District is the 2nd smallest district in the

state, spread across 6 talukas namely Shorapur, Hunasagi, Shahpur, Wadagera, Yadgiri, and Gurmitkal, and with Yadgiri as the district headquarter. The vast stretch of fertile black soil of the district is known for the bumper Red gram and Jowar Crops and the district is also referred to as the "Daal bowl" of the state. Yadgiri district is spread over an area of 5,270 sq. km constituting 8.46 percent area of Karnataka State (District Gazetteer).

The geographical location of Yadgiri is 16°20′ to 17°45′ N and 76°4′ to 77°42′ E. The region is generally hot and the temperature of this region is approximately 45ºC (max) and 22ºC (min). Yadgiri has been blessed by the incessant flowing of two main rivers, 'Krishna' and 'Bhima'. In addition to these two, a few tributaries flow in this region. Jowar *Sorghum bicolor* and Paddy *Oryza sativa* are the major crops grown in this district. The major commercial crop grown is Cotton *Gossypium herbaceum*. The district has a net-sown area of 75.11 percent of the total geographical area, which is 5,16,088 Hectare (District Gazetteer).

Methods

The landscape level survey was conducted during monsoon from August 09, 2022 to August 16, 2022, covering the entire Kalaburagi district to assess the status and distribution of Lesser Florican and other grassland-associated species of the study area. For the landscape survey, the 15 km x 15 km grids have been laid over the entire district. Some of the grids are demarked because of cities and large settlements, 48 grids have been surveyed during the landscape survey for the presence of Lesser Florican, grassland-associated species, and their habitats. Secondary information based on interviews regarding Lesser Florican and associated species occurrence and perceived threats were collected from local respondents (Herders/farmers, with age 50< preferred).

Human resources/teams

Four to five teams were deployed to carry out the survey, comprising a minimum of four persons, one biologist/scientist/birdwatcher who is experienced to identify the species on the spot, one photographer, one data collector, and one volunteer. Survey teams conducted the ground survey in the grids following the vehicle transects and point count methods, in the early morning hours 06:00 hrs to 12:00 hrs, and late evening hours 15:00 hrs to18:30 hrs depending on the light on the ground situation. Thus, each team was assigned to survey one grid in the morning and another grid in the evening every day. Important habitat characteristics such as land cover, topography, and human disturbances were recorded at an interval of 2 km. Dominant land-cover type, terrain type, and vegetation composition within a 100 m radius from the point were recorded systematically to assess the habitat quality.

Equipments used

Each team was equipped with a GPS to record the tracks, a Binocular to observe and identify the species, a Range finder to measure the distance of the animal from the observer, and a Camera to record the species sighting through photographs.

Data Collection

All the observations were entered in the Data Collection App designed specifically for landscape surveys by BNHS, and The Bustard Program. The App has all the parameters to enter such as GPS location, date & time, weather, terrain, vegetation cover, insect count,

animal name, and also vegetation details like name and specification of grasses, trees, shrubs, and invasive species. The sighting of an individual animal or a group of individuals among any of the species mentioned above has been considered as one sighting. For each sighting, the number of individuals, sex if possible, sighting angle, and sighting distance from the vehicle transect line have been recorded along with Latitude and Longitude inmates during the vehicle line transect.

At every point count, species sightings, and habitat parameters like terrain type, flat, slope, and undulating and vegetation type grassland, agriculture land, and forest/plantation corresponding to each animal sighting within a 100m radius have been recorded.

Important habitat characteristics such as land cover, topography, and human disturbances have been recorded at an interval of 2km. Dominant land-cover type within a 100 m radius of the point shall be recorded as fallow, agriculture, grassland, scrubland, and plantation.

Vegetation composition within a 100 m radius of the point was recorded as the percentage of area covered by short, medium, and tall grasses the name of the grass was identified using various references. The percentage of shrub cover and tree cover along with the species name was recorded.

Tracks: The tracks have been saved using GPS. The habitat data along with anthropogenic disturbances has been recorded at every 2 km interval. If two or more trails are laid in one grid, then they will be recorded separately with separate track IDs.

The distribution data of grassland indicator species like Lesser Florican *Sypheotides indicus*, Indian Grey Wolf *Canis lupus pallipes*, Chinkara *Gazella bennettii*, Blackbuck *Antilope cervicapra*, Montagu's Harrier *Circus pygargus*, and Pallid Harrier *Circus macrourus*, was considered for identifying potential grassland habitats.

Survey efforts were taken in brief

- **Duration –August 09 to August 16, 2022**
  - Grid size: **15 kmx15km**;
  - Grids planned to cover excluding heavy settlement and non-suitable areas**-48**
  - Actual grids covered and sampled**- 31**
  - Dedicated teams involved**-04**
  - Observers in Each Team **- 04**
  - Average distance covered in each grid**- 20 km**
  - Total distance covered–31x20 =**620km**.
  - Observation time – 06:00 hrs to 12:00 hrs 15:00 hrs to 18:30 hrs
  - Total Observation – 220 Point counts x 10 min = **2200 Min**
  - Total Human Hours in Landscape survey = 220 Point counts x 4 observers in each team = **660 Minutes** or **14.66 Human Hours**

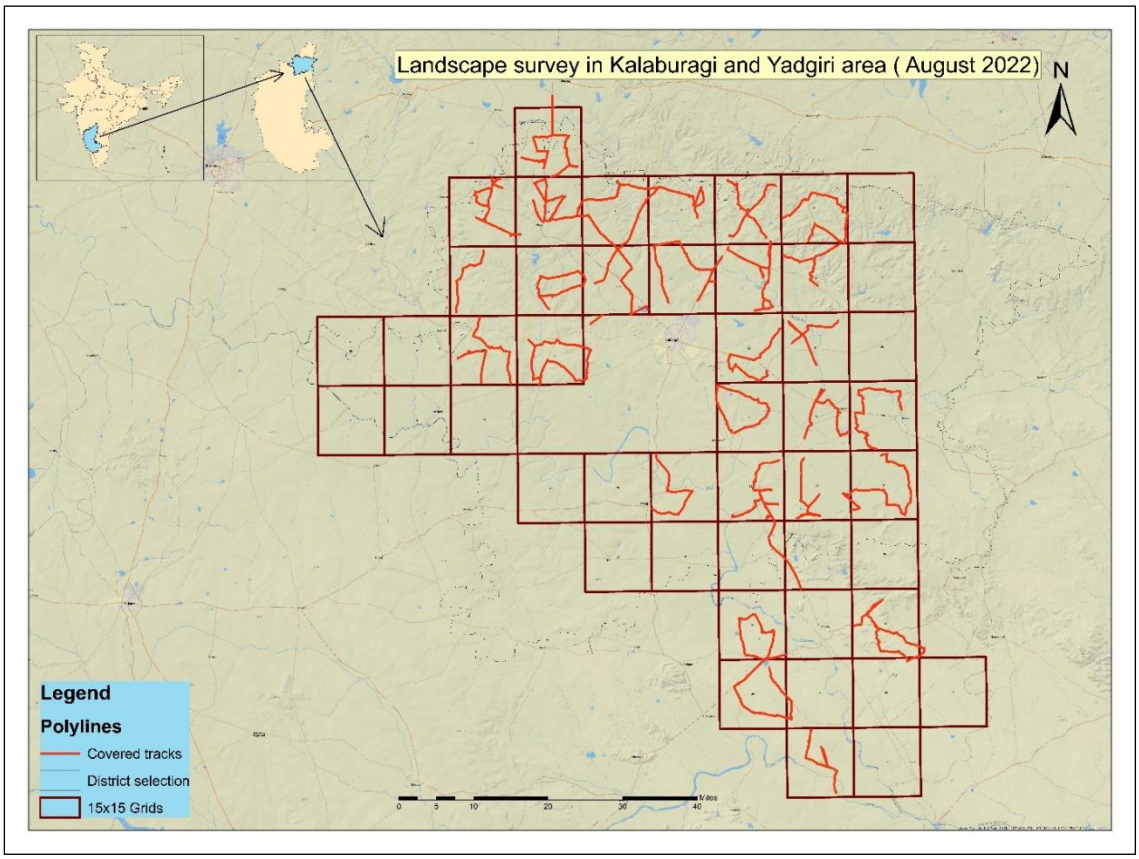


Figure 49 Track covered during the Landscape Survey

Results

Crops

The major crops were found in the landscape such as Cotton *Gossypium herbaceum*, Soybean *Glycine max*, Moong (Green Gram) *Vigna radiata*, Urad (Black Gram) *Vigna mungo*, and Banana *Musa acuminata*. The crops such as Toor (Peagon Pea) *Cajanus cajan*, Jowar (Sorghum) *Sorghum bicolor*, and Maize *Zea mays* are cultivated in small numbers.

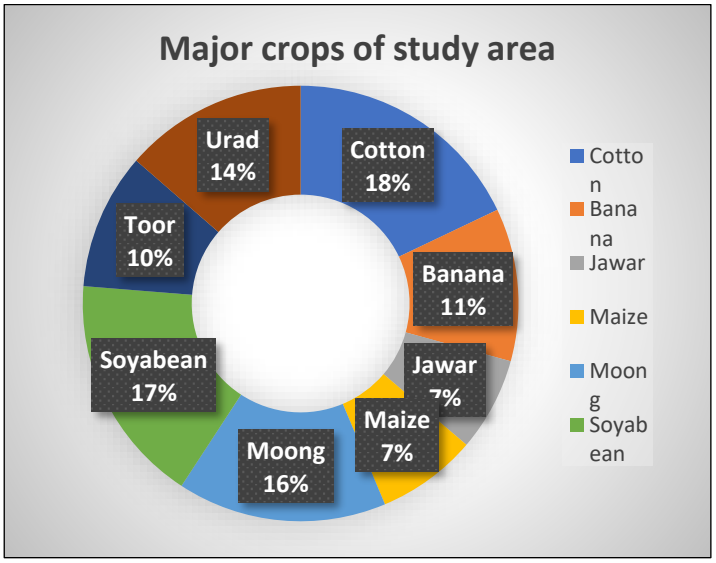


Figure 50 Crops observed during the Landscape Survey

Grass

A Total of 8 dominant and common species of grasses were observed during the survey. The grass community was found to be dominated by *Cynodon dactylon*, *Digitarias anguilnalis*, *Dichanthium* Spp., *Heteropogon triticeus*, *Typha latifolia*, *Chrysopogon fulvus* and some unidentified grass.

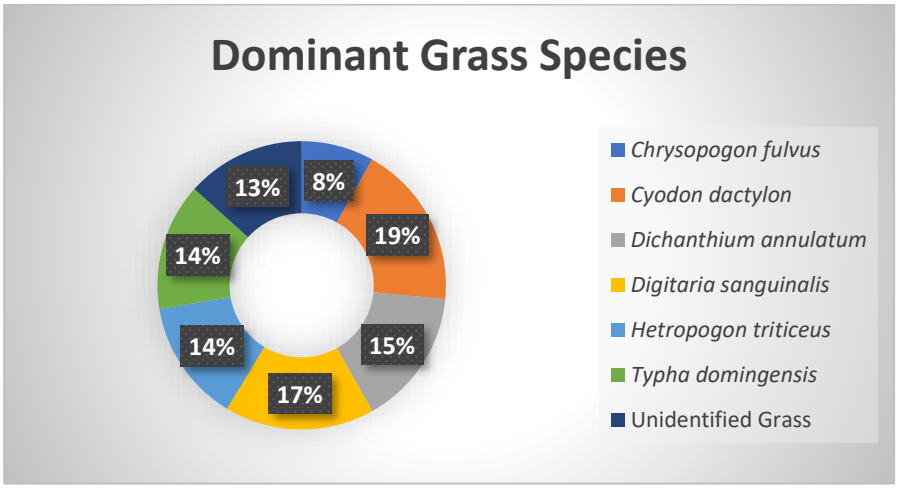


Figure 51 Grasses observed in Landscape survey

Invasives

Invasives are the major threats to Grasslands. They cover major land surfaces. The invasives observed in the landscape are *Hyptis* Spp., *Parthenium* Spp., *Cassia uniflora*, *Lantana camara*, and *Prosopis juliflora*, and other unidentified plants.

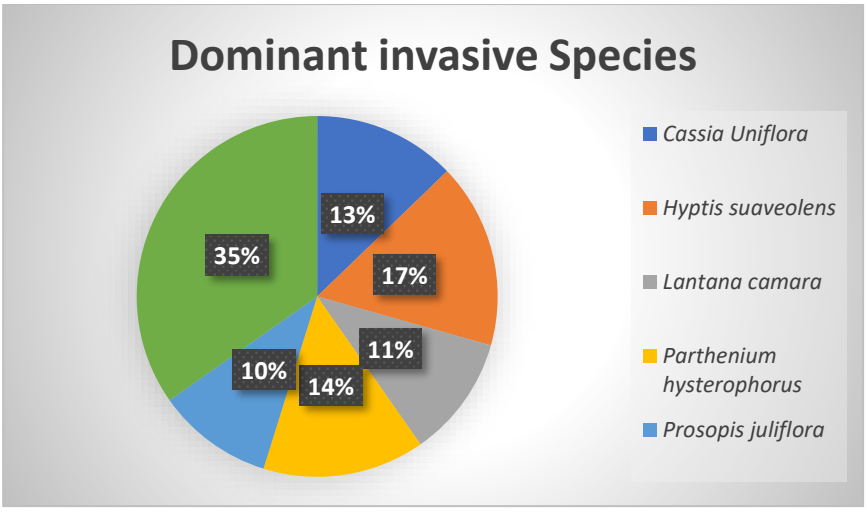


Figure 52 Invasive species observed during landscape survey

Species Distribution

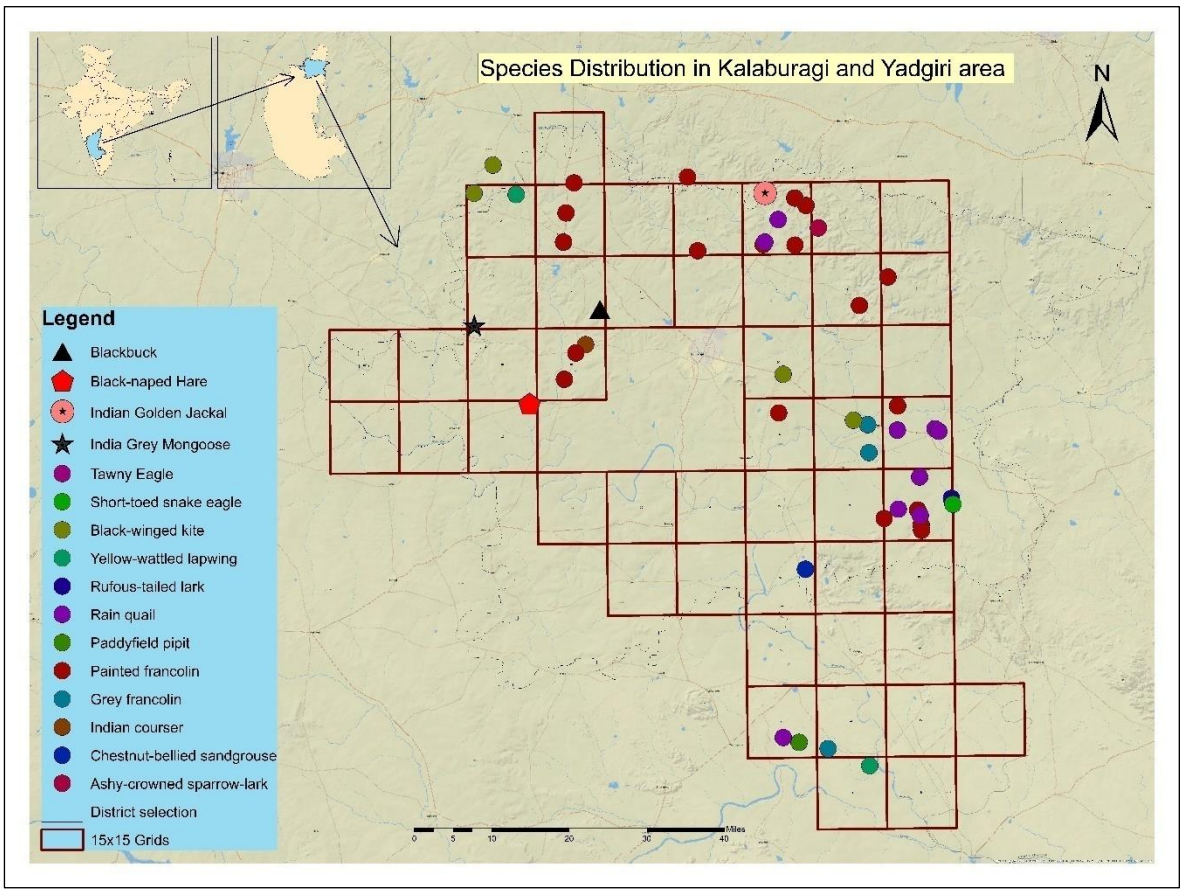


Figure 53 Species Distribution in Kalaburagiand Yadgiri area

In the study area, Blackbuck *Antilope cervicapra* is a large and important herbivore mammal that present in this region in very few numbers. Indian Golden Jackal *Canis aureus indicus*, Indian Grey Mongoose *Herpestes edwardsii* & Black-naped Hare *Lepus nigricollis* are some notable mammalian fauna. The avifauna in this region is Grey Francolin *Ortygornis pondicerianus*, Painted Francolin *Francolinus pictus*, Rain Quail *Coturnix coromandelica*, and lark species such as Rufous-tailed Lark *Ammomanes phoenicura*, Ashy-crowned Sparrow-Lark

Image 26 Large agriculture area with hill regions at Yadgiri @ Rushikesh Pawar

*Eremopterix griseus*are are common. Chestnut-bellied Sandgrouse *Pterocles exustus*and Yellow-wattled Lapwing *Vanellus malabaricus* are some of the frequently seen avian species. Raptors like Short-toed Snake-eagle *Circa etusgallicus* and Tawny Eagle *Aquila rapax* are commonly found in this region.

Threats

Kalaburagi and Yadgiri areas have major agriculture and industrial patches. In the agricultural area spraying herbicides and pesticides are a major threat to birds and mammals. This chemical is very harmful to birds and mammals which are dependent grasses and crops. These spraying machines are also making loud noises which disturb the birds. In this region, the number of grasslands is very low. Therefore, grassland-oriented species like Blackbuck, Wolf and Jackal are found in very low numbers. The major Mining and Industrial areas near settlements, Solar area and High-tension powerlines are also recorded in the area. Human activity and dogs are also a threat in the area.

Image 27 Industries such as cement & chemicals are major threats to the grassland area @ Rushikesh Pawar

Discussion

The Kalaburagi and Yadgiri districts have typical vegetation composed of scrub and thorny plants. The rainfall is low in these regions. Thorny shrubs and trees were observed during the survey. The area has a very low number of grasslands, resulting in low grassland diversity. Across the study area, traditional agricultural areas were also observed. The soil type comprises of rich alluvial soil from the plains of the Krishna River and dry alkaline soil from the arid hill region. Cotton, Moong, and Soya beans are the major crops in the area. These crop areas have the potential to provide habitat for grassland obligatory species like the Lesser Florican and Great Indian Bustard. The grasslands in these regions are under numerous threats as a result of severe anthropogenic pressures, including land pattern change, grazing pressure, fragmentation, invasive species, and disturbance involving infrastructure such as Solar panels, High tension powerlines, roads, industries, developing settlements, and mining. Because of this, a low population of Blackbucks was sighted in the area. Open grassland patches in Kamalpur and Mahagaon cross areas and agriculture patches in Aland and Gandgapura areas are potential sites for the Great Indian Bustard and Lesser Florican.

Lesser Florican *Sypheotides indicus* is the flagship species of grasslands of the Indian subcontinent. Lesser Florican is most visible during the monsoon season in north-western India, where it breeds. Its population and range are declining at a disturbing rate as a result of breeding habitat loss and threats in non-breeding habitats, which are thought to be in south and southeast India. Their breeding habitats in north-western India have declined drastically, which is thought to be a major cause of the species decline, and little is known about its non-breeding habitat, which is thought to be in Central and South India.

In Situ conservation is the best method for the conservation of Lesser Florican and Great Indian Bustard (GIB). The conservation efforts for the species is to provide protection by creating conservation areas and implementing strict patrols, prevent infrastructural and industrial development, mitigate powerlines, manage grasslands by consolidating contiguous areas, restricting grazing during monsoon, and removing exotic shrubs and tree plantations of *Prosopis juliflora* and *Gliricidia* Spp., Promote Florican-friendly practices, e.g., organic farming, monsoon stall-feeding, and to create networks of "Florican friends" to report and monitor of potential area.

The potential effects of development projects on the surrounding environment must be taken into account, and steps must be taken to reduce any environmental losses. Strict measures must be taken by the Forest Department and private organizations to restore the grasslands to their proper proportion. These measures include limiting land use changes, boosting human activity, and educating the public about the significance of grassland restoration. By increasing the natural grassland vegetation and adhering to traditional agriculture, it is possible to conserve and protect the population of Lesser Floricans and the Great Indian Bustard. The only effective way to preserve the last remaining population of the Great Indian Bustard, Lesser Florican, and other grassland essential species is by identifying potential landscapes, protecting the area, and encouraging traditional agriculture.

Image 28 GIB and LF Workshop at Kalaburagi Forest Office during landscape survey

Image 29 Team BNHS attended the 15th August 2022 Independence Day celebration at Yadgiri Forest division during landscape survey

Conserned Grassland associated birds list of Kalaburagi and Yadgiri landscape

SN	**Common Name**	**Scientific Name**	**WLPA Schedule**	**IUCN Red List**
1	Grey Francolin	*Ortygornis pondicerianus*	Sch lV	LC
2	Painted Francolin	*Francolinus pictus*	Sch lV	LC
3	Rain Quail	*Coturnix coromandelica*	Sch lV	LC
4	Barred Buttonquail	*Turnix suscitator*	Sch lV	LC
5	Rock Bush-quail	*Perdicula argoondah*	Sch lV	LC
6	Yellow-legged Buttonquail	*Turnix tanki*	Sch lV	LC
7	Lesser Florican	*Sypheotides indicus*	Sch l (part lll)	CR
8	Great Indian Bustard	*Ardeotis nigriceps*	Sch l (part lll)	CR
9	Egyptian Vulture	*Neophron percnopterus*	Sch l (part lll)	EN
10	Bearded Vulture	*Gypaetus barbatus*	Sch l (part lll)	NT
11	Red-headed Vulture	*Sarcogyps calvus*	Sch l(part lll)	CR
12	Cinereous Vulture	*Aegypius monachus*	Sch l(part lll)	NT
13	White-rumped Vulture	*Gyps bengalensis*	Sch l(part lll)	CR
14	Indian Vulture	*Gyps indicus*	Sch l(part lll)	CR
15	Short-toed Snake-eagle	*Circaetus gallicus*	Sch l	LC
16	Tawny eagle	*Aquila rapax*	Sch l	VU
17	Bonelli's Eagle	*Aquila fasciata*	Sch l	LC
18	Rufous-tailed Lark	*Ammomanes phoenicura*	Sch lV	LC
19	Tawny Lark (Sykes's Lark)	*Galerida deva*	Sch lV	LC
20	Ashy-crowned Sparrow Lark	*Eremopterix griseus*	Sch lV	LC
21	Indian Bushlark	*Mirafra erythroptera*	Sch lV	LC
22	Chestnut-bellied Sandgrouse	*Pterocles exustus*	Sch lV	LC
23	Yellow-wattled Lapwing	*Vanellus malabaricus*	Sch lV	LC
24	Indian Nightjar	*Caprimulgus asiaticus*	Sch lV	LC

25	Savanna Nightjar	*Caprimulgus affinis*	Sch lV	LC
26	Red-wattled Lapwing	*Vanellus indicus*	Sch lV	LC
27	Ashy Prinia	*Prinia socialis*	Sch lV	LC
28	Baya Weaver	*Ploceus philippinus*	Sch lV	LC
29	Black Drongo	*Dicrurus macrocercus*	Sch lV	LC
30	Black-headed Ibis	*Threskiornis melanocephalus*	Sch lV	NT
31	Black Kite	*Milvus migrans*	Sch l	LC
32	Black-winged kite	*Elanus caeruleus*	Sch l	LC
33	Brahminy Kite	*Haliastur indus*	Sch l	LC
34	Crested Serpent-eagle	*Spilornis cheela*	Sch l	LC
35	Eurasian Collered-dove	*Streptopelia decaocto*	Sch lV	LC
36	Oriental Honey-buzzard	*Pernis ptilorhynchus*	Sch l	LC
37	Indian Courser	*Cursorius coromandelicus*	Sch lV	LC
38	Indian Thick-knee	*Burhinus indicus*	Sch lV	LC
39	Large Grey babbler	*Argya malcolmi*	Sch lV	LC
40	Long-tailed Shrike	*Lanius schach*	Sch lV	LC
41	Eurasian Marsh-Harrier	*Circus aeruginosus*	Sch l	LC
42	Paddy-field Pipit	*Anthus rufulus*	Sch lV	LC
43	Plain Prinia	*Prinia inornata*	Sch lV	LC
44	Purple-rumped Sunbird	*Leptocoma zeylonica*	Sch lV	LC
45	Montagu's Harrier	*Circus pygargus*	Sch l	LC
46	Shikra	*Accipiter badius*	Sch l	LC
47	Siberian Stonechat	*Saxicola maurus*	Sch lV	LC
49	Spotted Owlet	*Athene brama*	Sch lV	NT
50	Indian Spot-billed Duck	*Anas poecilorhyncha*	Sch lV	LC
51	White-eyed Buzzard	*Butastur teesa*	Sch l	LC

Table 11 List of conserned birds

Conserned Grassland associated mammals list of Kalaburagi and Yadgiri landscap

SN	**Common Name**	**Scientific Name**	**WLPA Schedule**	**IUCN Red List**
1	Blackbuck	*Antilope cervicapra*	Sch I(part l)	LC
2	Chinkara	*Gazella bennettii*	Sch I(part l)	LC
3	Nilgai	*Boselaphus tragocamelus*	Sch III	LC
4	Indian Fox	*Vulpes bengalensis*	Sch II (part l)	LC
5	Golden Jackal	*Canis aureus*	Sch II (partll)	LC
6	Indian Wolf	*Canis lupus pallipes*	Sch l (part l)	EN
7	Striped Hyena	*Hyaena hyaena*	Sch III	NT
8	Jungle cat	*Felis chaus*	Sch II (part l)	LC
9	Black-naped Hare	*Lepus nigricollis*	Sch IV	LC

Table 12 list of conserned mammals

Bonal Lake conservation site visit - as suggested by the office of DyCF, Yadgiri

Bonal lake bird conservation site located in Bonal village in Shorapur taluka of Yadgiri district, Karnataka, is the second largest bird sanctuary after Ranganthittu in Karnataka. The Bonal Lake which is surrounded by rock hillocks is believed to be built by Surpur King Raja Pam Naik in the 17th century; it is extended to 676 acres with a 10-12 feet average depth. Bonal Lake Bird Sanctuary is 10 km west of the city of Shorapur. Bonal village is situated in the North-eastern part of Karnataka at Lat.16.52691, long.76.65669. The bird sanctuary is surrounded by Mangloor to the North, Peth Ammapura to North East, Bonal to South East, Chiknalli to the Southwest, and Kurbantalahalli to the west. Along with the rainwater, the Krishna River is the major source of water for the Bonal tank. A private Hydropower plant is situated beside the tank, and it is controlled by DC.

The sanctuary has its origins in the Bonal Tank, a water conservation tank built by the 17th century ruler of Surpur Pam Naik, later during the British period Meadows Taylor, the British administrator at Shorapur extended the area. The Bonal bird sanctuary is extends up to 2 sq.km in surrounding Paddy fields. The major occupation of the people in and around Shorapur is farming. Shorapur is a large producer of Cotton, Pulses and Paddy.

Bonal Lake is the second largest freshwater reservoir; it is home to around 10,000 birds belonging to about 40 species, both native and migratory. Efforts were made from 1995 to declare the water body as a bird conservation reserve under section 36(A) of the Wildlife Protection Act of 1972. In 2019 a proposal has been sent to Karnataka Govt. to declare this tank as "Bonal Bird Conservation Reserve".

Figure 54 Study area of Bonal Lake Bird Reserve

Bonal Lake Bird Conservation Reserve -

On the 15th Aug 2022 afternoon, BNHS Team visited Bonal Lake. Mr. Basavaraj Nayak (DRFO, Talwargera section) and Mr. Suresh (Chiknalli watcher) briefed about the background of Bonal Lake, its origin, vegetation pattern, surrounding crop pattern, and bird sightings. BNHS Team observed birds from two watch towers on the lake's southern shoreline.

During this visit BNHS team sighted Raptors, Wetland birds and common birds such as:

Sr. no	Common Name	Scientific Name	IUCN Status	WPA Status
1	Little Grebe	*Tachybaptus ruficollis*	LC	Sch IV
2	Black Headed Ibis	*Thireskiornis melanocephalus*	NT	Sch IV
3	Black Crowned Night Heron	*Nycticorax nycticorax*	LC	Sch IV
4	Pond Heron	*Ardeola grayii*	LC	Sch IV
5	Grey Heron	*Ardea cinereal*	LC	Sch IV
6	Great Cormorant	*Phalacrocorax carbo*	LC	Sch IV
7	Indian Cormorant	*Phalacrocorax fuscicollis*	LC	Sch IV
8	Little Cormorant	*Microcarbo niger*	LC	Sch IV
9	Osprey Eagle	*Pandion haliaetus*	LC	SchI (PartIII)
10	Eurasian Coot	*Fulica atra*	LC	Sch IV
11	Black Winged Stilt	*Himantopus himantopus*	LC	Sch IV
12	River Tern	*Sterna aurantia*	VU	Sch IV
13	Great Egret	*Ardea alba*	LC	Sch IV
14	Intermediate Egret	*Ardea intermedia*	LC	Sch IV
15	Cattle Egret	*Bubulcus ibis*	LC	Sch IV
16	Little Egret	*Egretta garzetta*	LC	Sch IV
17	Green bee-eater	*Merops orientalis*	LC	Sch IV
18	Common Iora	*Aegithina tiphia*	LC	Sch IV
19	Purple-rumped Sunbird	*Leptocoma zeylonica*	LC	Sch IV
20	Purple Sunbird	*Cinnyris asiaticus*	LC	Sch IV
21	Baya Weaver	*Ploceus philippinus*	LC	Sch IV

Table 13 Birds observed during the Bonal lake Bird conservation reserve visit

Birds observed at Bonal lake bird reserve

Osprey Eagle

Grey Heron

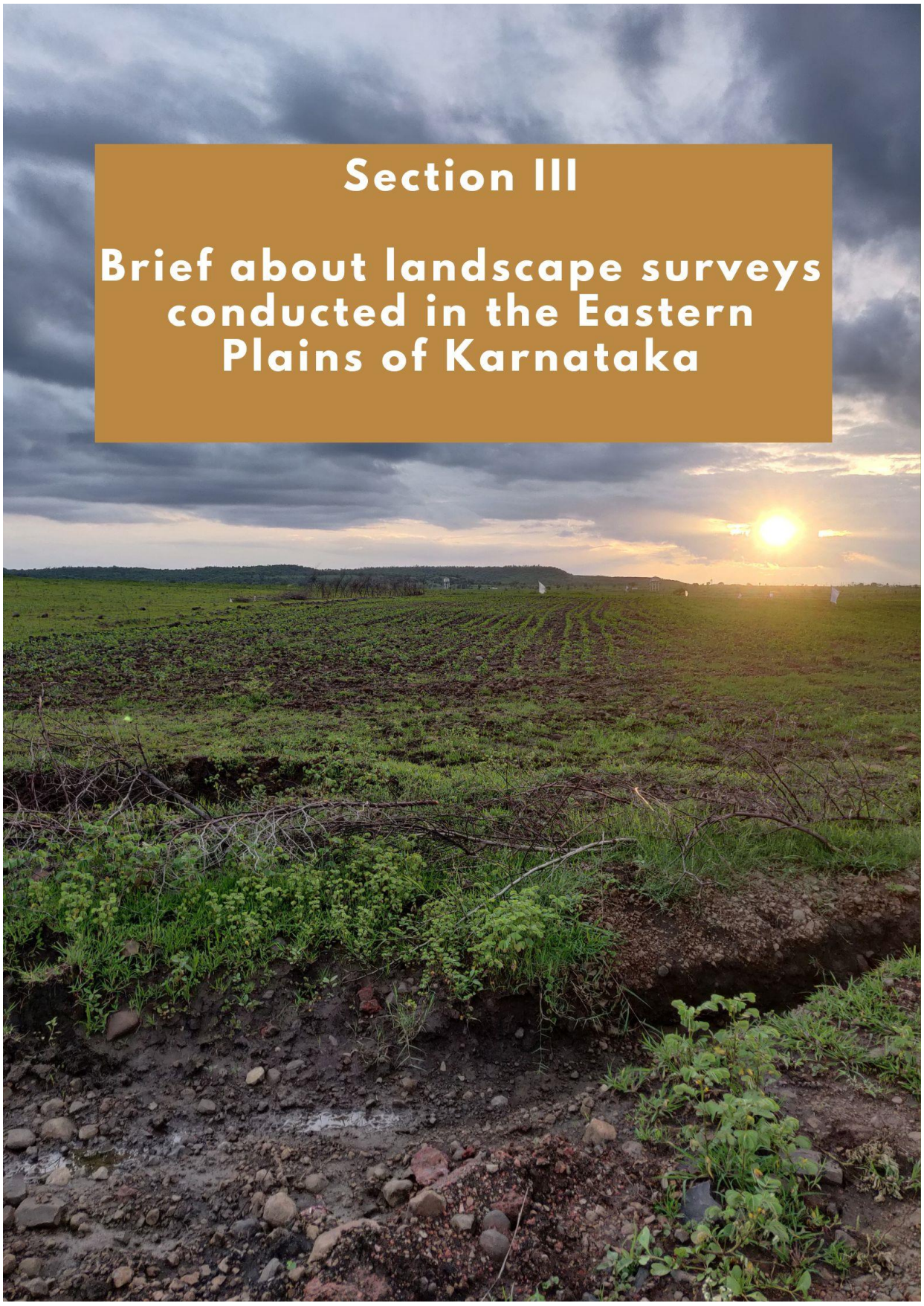
Black headed Ibis

Eurasian coot

Common iora

Indian cormorant, River turn

Image 30 Various avifauna observed in Bonal lake bird reseve



Section III

Brief about landscape surveys conducted in the Eastern Plains of Karnataka

Section III

Eastern Plains of Karnataka - Vijayapura, Bagalkote, Koppal, Gadag, and Ballari districts of Karnataka

BNHS Survey Team

SN	Name	Designation
1	Dr. Sujit Narwade	Assistant Director, BNHS, and coordinator
2	Karan Dabholkar	Researcher
3	Ganesh Pallela	Research Fellow
4	Supriya Hangal	Intern, Lesser Florican Project
5	Pooja Gosavi	Intern, Lesser Florican Project
6	Vaishnavi Pathak	Intern, Lesser Florican Project
7	Akshata Palve	Intern, Lesser Florican Project
8	Rohit Kulkarni	Intern, Lesser Florican Project
9	Mrunali Raut	Survey participant
10	Vaibhav Haldipur	Survey participant
11	Atharv Togattiwar	Survey participant
12	Chinmay Gundaram	Survey participant
13	Nikhil Ghadigaonkar	Survey participant
14	Akshay Gahare	Survey participant

Interactions with FD and other people

SN	Name	Designation
1	Mr. Desai	Honorary Wildlife Warden, Bagalkote district
2	Praveen Baddi	RFO Research, Badami
3	Hanumant Doni	RFO, Bilagi
4	Girish	DRFO, Siruguppa GIB area
5	Rajashekar Reddy	Watcher, Siruguppa
6	Mahesh	Watcher, Siruguppa
7	Ramesh Desai	Lecturer, Govt. Industrial Training Institute, Vijayapura
8	Dr. Samad Kottur	

Objective

1. Identify the distribution of grasslands in selected parts of the Eastern Plains.
2. To evaluate the status of grassland obligatory species in selected parts of the Eastern Plains.
3. To assess the threats which are the cause for degrading grassland habitats.
4. To suggest measures for the conservation of grasslands with special reference to the Great Indian Bustard (GIB) and Lesser Florican.

About Eastern plains

The study of the Eastern Plains of Karnataka was carried out with a private funding agency. The Eastern Plains of Karnataka refer to the eastern region of the state of Karnataka in India, which is characterized by flat plains and plateaus. This region covers the districts of Ballari, Raichur, Koppal, Bidar, and Kalaburagi. The Eastern Plains of Karnataka are part of the Deccan Plateau and are known for their semi-arid climate, with hot summers and dry winters.The region is predominantly agricultural, with Cotton *Gossypium herbaceum*, Groundnut *Arachis hypogaea*, Maize *Zea mays*, Paddy *Oryza sativa*, Sugarcane *Saccharum Spp*., Ragi *Eleusine coracana*, Jowar *Sorghum bicolor* and Sunflower *Helianthus annus* being grown extensively. The area is also rich in mineral resources, with significant deposits of iron ore, manganese, and gold.

The Eastern Plains are known for their grasslands, which are spread across several districts of the region, including Ballari, Raichur, Koppal, and Kalaburagi. These grasslands are typically dry and semi-arid, with scattered trees and shrubs. The grasslands of the Eastern Plains of Karnataka are an important habitat for several species of wildlife, including the Blackbuck *Antilope cervicapra*, Chinkara *Gazella bennettii*, and Indian Wolf *Canis lupus pallipes*. These grasslands are divided into two main types: tropical savanna grasslands and thorn scrub forests. The tropical savanna grasslands are characterized by tall grasses and scattered trees, while the thorn scrub forests are dominated by thorny shrubs and small trees.

The grasslands of the Eastern Plains of Karnataka have a rich diversity of plant species, including several species of grasses, shrubs, and trees. Some of the prominent grass species found in the region include *Cenchrus ciliaris*, *Eragrostis* Spp., and *Panicum* Spp. The grasslands also have several medicinal plant species, including *Aloe vera* and *Gymnema sylvestre*. The grasslands of the Eastern Plains of Karnataka are an important source of livelihood for the local communities, who depend on the grazing lands for their livestock. However, the grasslands are also facing several threats, including land use change, overgrazing, and habitat fragmentation, which have resulted in a decline in the grassland ecosystem and the loss of several species of wildlife. Efforts are being made to conserve the grasslands of the Eastern Plains of Karnataka, including the establishment of protected areas and the promotion of sustainable land use practices.

Study Area

Survey area was divided into four blocks as per the geographical area of the districts as given below.

1) Vijayapura - heavy energy infrastructure (Kudgi, Basvan Bagewadi).
2) Bagalkote - area under influence of Alamatti dam and its backwater, mining and intensive agriculture (Hungund-Ilkal).
3) Koppal - Rocky undulating terrain (Gajendragadh).
4) Gadag - open flat traditional croplands.
5) Ballari – Siruguppa Great Indian Bustard (GIB) area.

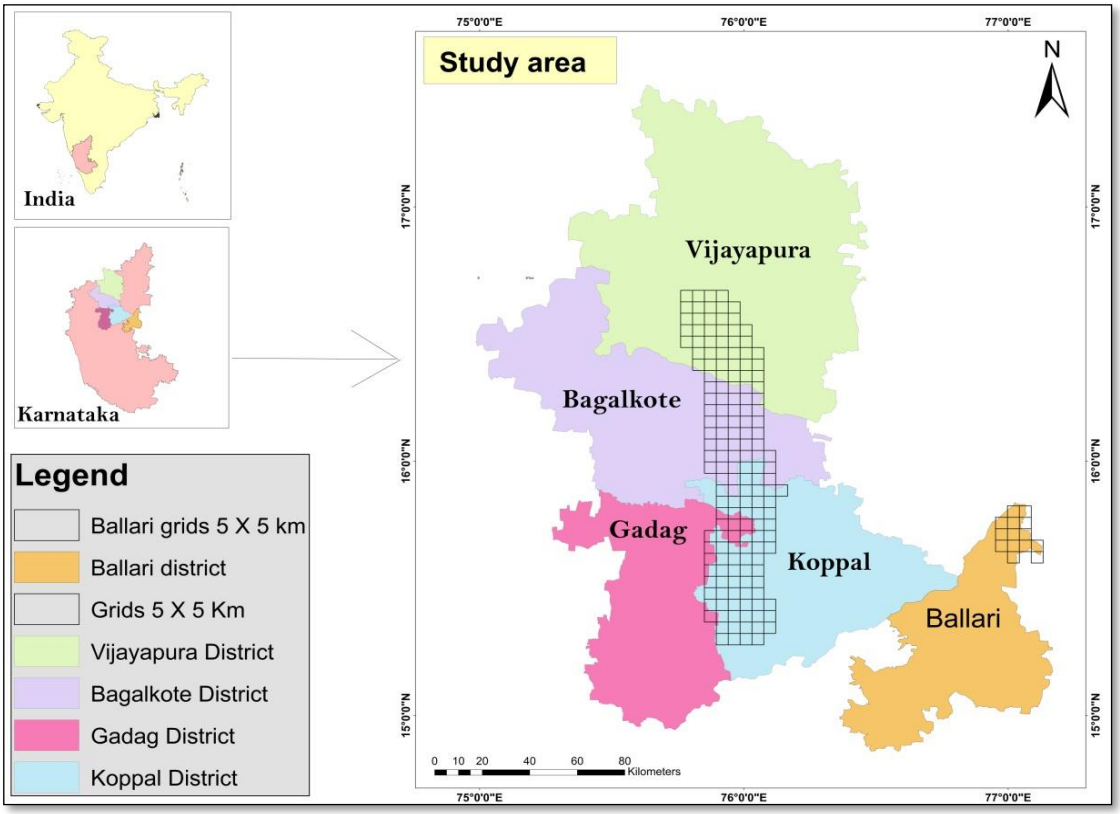


Figure 55 Map of study area

Vijayapura

The Vijayapura study area falls under Basavana Bagewadi taluka, of Vijayapura district in the State of Karnataka, India. It is 44.4km away from main city of Vijayapura district, located at 16°20'30"–16°34'30" N & 75°47'30"–75°58'0" E. The Taluka is bounded by Sindgi on North and North-East, Vijayapura on North and North-West, Muddebihal taluka on South-East, Bilgi taluka on West and Bagalkote taluka in the south.

The entire taluka is categorized as Deccan Pedi plain. Physiographically, it can be divided into four units namely, residual hills, pediments, Pedi plains and valleys. The long and narrow stretch of flat land along the course of the river Krishna in a few villages, namely Almatti, Abbihal, Benal, Devalapur, Gonal and Nidagundi remain submerged under the backwaters of Almatti dam most of the year.

The taluka experiences semi-arid climate with extreme summer. Dryness and hot weather prevail in major part of the year. The year is usually divided in four seasons: Summer from March to May, Rainy season or South-West monsoon from June to September, post monsoon covering the months of October and November and winter season from December to February. Annual rainfall of the taluka is 665 mm. The taluka is occupied by two types of soils, clayey and loamy soils. The soil texture varies from coarse granular murrum to fine clayey deposits. In the richest part, the soil is formed alluvial clay like which is fairly deep along the river and shallow on the hilly region. The natural vegetation is Dry Deciduous or Thorn type of forest.

In Grassland the vegetation is dominated by grasses *Dichanthium*, *Chrysopogon* Spp. Common tree species found in this area are Neem *Azadirachta indica*, *Eucalyptus*, Mango *Mangifera indica*, Tamarind *Tamarindus indica*, Banyan *Ficus benghalensis*, Coconut *Cocus nucifera*. It is also observed that the shrubs species like Babul *Acacia nilotica*, Khair *Senegalia catechu*, and Bare are also found in this area. In addition to artificially regenerated plantations of tree species like *Ficus* spp, *Gliricidia*, ornamental species like Gulmohar *Delonix regia*, *Peltophorum*, Rain tree, Agave spp, etc., have been introduced in the same area. Remaining area are much diverse and supports the extensive growth of invasive species like *Prosopis juliflora*, *Parthenium*, *Senna uniflora*, *Cassia tora*, *Alternanthera*, *Hyptis*, *Lantana camara.*

Agriculture is the main occupation in Basavan Bagewadi taluka. Major crops grown in the area include the cereal crops Jowar *Sorghum bicolor*, Maize *Zea mays*, Bajra *Pennisetum glaucum* and Paddy *Oryza sativa* minor millets, Bengal gram *Cicer arietinum*, Green gram *Vigna radiata*, Toor *Cajanus cajan*, Horse gram *Macrotyloma uniflorum*, Cowpea *Vigna unguiculata*, Black gram *Vigna mungo*, etc. Horticulture crops include the fruits and vegetable crops. Cash crops like Sugarcane *Saccharum Spp*., Cotton *Gossypium herbaceum*, Soyabean *Glycine max*, etc., and oilseed crops like Sunflower *Helianthus annus*, Groundnut *Arachis hypogaea* and Safflower *Carthamus tinctorius* are grown here.

On account of absence of large forest areas, scattered nature of the existing forest areas coupled with presence of tree or grass cover, so the density of wildlife is extremely low. Information on various other forms like the birds, reptiles, butterflies, amphibians, is either not available or is only in a crude form. Primates like Grey Langur *Semnopithecus Spp*. occasionally sighted in many localities of Basavan Bagewadi areas. Black-naped Hare *Lepus nigricollis* and Wild Pig *Sus scrofacristatus* are commonly distributed throughout the district.

Image 31 Kudgi Thermal Plant

Bagalkote

Bagalkote division is situated in the northern part of Karnataka at an average elevation of 533 meters (1,749 ft). It is situated at 16°08'08.5"N, 75°37'14.9"E. The total extent of forest area of Bagalkote division is 83,893 hectares which constitute about 12.76 of its geographical area of 6,575 Km². The division is spread over six talukas, namely Bagalkote, Badami, Hungund, Bilagi, Mudhol and Jamkhandi. Bagalkote division has one Wildlife Sanctuary, namely, Yadahalli Wildlife Sanctuary, which is situated in the forests of Bilagi and Mudhol talukas to protect the Chinkara (Indian Gazelle) *Gazella bennettii*. The Sanctuary covers an area of 9,636 hectares.

The climate is warm and dry throughout the year and rainfall is scarce. The temperature ranges from 15° C (minimum) to 42° C (maximum). The average rainfall in the district is 562 mm, receives 40% of the total rainfall in the south west monsoon from June to September. Bagalkote is devoid of large canopy tree vegetation, the region is semi-arid. The Rivers Krishna, Ghataprabha and Malaprabha flow through the region but are non-perennial. Soil in the area can be categorized as either the majority black or minority red. Black soil retains moisture and is often used for the cultivation of cotton *Gossypium herbaceum*. Besides Groundnut *Arachis hypogaea*, Cotton *Gossypium herbaceum*, Maize *Zea mays*, Bajra *Pennisetum glaucum*, Wheat *Triticum Spp*., Sugarcane *Saccharum Spp*., Tobacco *Nicotiana Spp*. and Jowar *Sorghum bicolor* are primarily cultivated in Bagalkote. Common rock type in the region includes greenstone, quartzite, sandstone and limestone. The dry climate makes the region susceptible to drought and crop failure.

Image 32 Installation of High-tension powerlines

Koppal

Koppal District located in the northern interior of Karnataka state between 15°-21'–15° -45'N, 76°-10' – 76°-32' E, covers an area of 8,458 sq. km, bounded by the districts of Raichur, Bagalkote, Gadag, and Ballari. The district comprises 7 talukas namely Koppal, Gangavathi, Yelburga, Kustagi, Kanakagiri, Kukanoor, and Karatagi. In the north of the district flows Krishna River and Vedavathi in southern border.

Different soils such as black cotton soil, red soils, deep black soils, red sandy soil are predominantly present in the Koppal region (Ramamurthy *et al.* 2009). The district witnesses' regular showers with a range of 546 mm to 701 mm rainfall, maximum rainfall is observed from July to October. The temperature ranges between 16°C to 42°C. The landscape of this region is a mixture of flat and undulating terrain with mosaic pattern of rocky hills, stony, open fallow land, agriculture, grassland, and forest areas.

Agriculture is monsoon and ground water dependent, with less irrigational advances. The south-west Monsoon is active during Oct-Nov, causing rainfall in the region. The crops grown here are mainly cereals, pulses, oil seeds and commercial crops, which includes Jowar *Sorghum bicolor*, Bajra *Pennisetum glaucum*, Wheat *Triticum Spp.*, Maize *Zea mays*, Millets, Ragi *Eleusine coracana*, Toor *Cajanus cajan*, Horse gram *Macrotyloma uniflorum*, Green gram *Vigna radiata*, Ground-nut *Arachis hypogaea*, Sunflower *Helianthus annus*, Safflower *Carthamus tinctorius*, Sesame *Sesamum indicum*, Cotton *Gossypium herbaceum*, Sugarcane *Saccharum Spp.*, Tobacco *Nicotiana Spp.*, Arecanut *Areca catechu*, etc. Fruits such as Banana *Musa Spp.*, Pomegranate *Punicagranatum*, Grapes *Vitis Spp.*, Pineapple *Ananas comosus*, Mango *Mangifera indica*, etc are also grown in this region. There are also many horticulture plantations growing variety of flowers in this region.

The tree species like Ballarijali, Banni and Neemare predominantly found in this area (Pratibha *et al.* 2019). Shrubs such as Lantana Spp., *Parthenium Spp.*, *Prosopis Spp.*, *Hyptis Spp.*, *Cassia* Spp., *Senna* Spp., *Calotropis*, Babool, etc are commonly found in the open lands of the region. These

grasslands often categorized as "wastelands", are home to a wide number of species; both herbivores and carnivores. Blackbucks *Antilope cervicapra*, Chinkaras *Gazella bennettii*, Wild boar *Sus scrofacristatus*, Striped Hyenas *Hyaena hyaena*, Sloth Bears *Melursus ursinus*, Leopards *Panthera pardus*, Civet cats *Viverricula Spp*., Rusty-spotted cats *Prionailurus rubiginosus*, Jungle cats *Felis chaus*, Indian Eagle-owl *Bubo bengalensis*, Small Indian Fox *Vulpes bengalensis*, Indian Jackals Canis aureus, Mongooses and Monitor lizards, and Wolves thrive in this environment.

Though neglected for many years, Koppal grasslands have been home for some of the rarest wildlife that is found in India. Wolves, the apex predators of the area are not just dependent on the wild herbivores but also feed on sheep and goats. The Striped Hyena *Hyaena hyaena* and critically endangered Great Indian Bustard (GIB) *Ardeotis nigriceps* are still struggling to survive in these lands without any protection. It is said that less than 500 Great Indian Bustards are left in India and about 20-25 Bustards are recorded in Ballari and Koppal districts.

Gadag

Gadag district of Karnataka was formed in 1997, when it was split from Dharwad District. It is located between 15.4°N and 65,75°E. It borders Bagalkote, Koppal, Ballari, Haveri, Dharwad and Belgaum District. The district comprises seven taluks namely Gadag, Mundargi, Nargund, Ron, Shirahatti, Gajendragad, and Lakshmeshwar. In the north border flows Malaprabha River and in Southern border flows Tungabhadra River.

Throughout the district, black soil is prominent but red soil with sand is also there in some parts. It has moderate temperature; weather is pleasant and healthy. The maximum temperature is upto 42° C in the month of April and May and minimum 16° C in some months. The Kappatgudda hill ranges are considered to have shrubby vegetation and medicinal plants. The Kappatgudda forests have been declared as a Wildlife Sanctuary in 2019 covering an area of 17,872 hectares. Mining is one of the major industries in the district. Mineral resources are rich in the district. Building stone sand, gray & pink granite iron ore and gold are mineral resources of mining in Gadag, Mundaragi and Shirahatti talukas.

The agriculture is mainly restricted by number of rainy days. As the rainfall is bimodal and peak rainfall is during July and August, Kharif season is predominant and Rabi season is unsure as far as cropping is concerned. The whole district represents uniform rainfall pattern. The cropping in Rabi season is always open to the risk of moisture deficits. Gajendragadh (Gajendra: Elephant; gadh: fort), is a historical place in the Gadag district. The name is because the city looks like elephant body in the bird view. This place is known for its hill station and hill strip. Gajendragadh is located at 15.73°N 75.98°E with an average elevation of 643 meters (2109 feet).Minerals & Metals Trading Corporation (MMTC) Limited has installed more than 25 wind mills in the Gajendragadh region.

Environmental issues: Windmills set up to generate wind energy, are posing a threat to the very existence of rare hyenas and wolves at Gajendragadh. Three years ago, Gajendragadh was recognized as a safe haven for highly endangered species like the Indian Grey Wolf *Canis lupus pallipes* and Striped Hyenas *Hyaena hyaena*, but then came wind farming and wind mills with huge noisy fans and human traffic to maintain these machines. It drove away these species from their habitat. The Indian Grey Wolf *Canis lupus pallipes* found in the Deccan plateau is considered

as secondary predators with significant roles in the food chain, the numbers of this nocturnal and diurnal species are dwindling rapidly due to poaching, loss of habitat and threat from feline species. The Indian Striped Hyena *Hyaena hyaena*, a scavenger species is also found in this area.

Ballari

Ballari (15.15^0 N, 76.93^0 E) district extends from south-west to north-east and is situated on the eastern side, almost in the centre of Karnataka state. The district is bounded on the north by Raichur district, on the west by Vijayanagara district, on the south by Chitradurga district and on the east by Ananthapur and Kurnool districts of Andra Pradesh. Ballari district consists of Ballari, Kampli, Sandur, Siruguppa, and Kurugodu talukas.

The district stands in the midst of a wide, level plain of black cotton soil. Granite rocks and hills form a prominent feature of Ballari. The district has highest deposits of iron ore in India. The mining industries have increased in number in recent decade.

The yearly temperature of the district is 29.73^0 C with minimum of 23.99^0 C to maximum 32.56^0 C. and is higher than India's averages. Ballari typically receives about 22.89 millimeters of precipitation and has 28.1 rainy days annually.

The Great Indian Bustard (GIB) area falls in the interior parts of Siruguppa taluka of Ballari district. The large expanse of eastern plains that contain black cotton soil, was once home to legendary Asiatic Cheetah *Acinonyx jubatus* with herds of Blackbucks *Antilope cervicapra* that were roaming in the excellent grassland. But now the Asiatic Cheetah became extinct in India, entire grassland was cut into bits and pieces by the farmers to grow crops that depend upon the monsoon.

Agriculture is the main source of income for more than 90% of the population of these villages. Most of the agriculture is depending upon the rain and some of the farmers get water from Tungabhadra irrigation canals.

The GIB area spread across 55 sq.kms with black soil between Raravi-Kuruvalli-Hacchlli-TsallaKudluru-Ravihal-Bommalapura is an important region. The area was once grassland and has been converted into farmlands for cultivation of rainfed crops. Traditionally the farmers were cultivating Jowar *Sorghum bicolor*, Pearl millet *Pennisetum glaucum*, Fox-tail millet *Setariaitalica*, etc. But lately, they have switched over to the cash crops like BT Cotton *Gossypium herbaceum*, Bengal gram *Cicer arietinum*, Sunflower *Helianthus annus* and Chilly. The change of crop pattern also plays a role for survival of Great Indian Bustards amidst heavy population and busy agricultural activities. The cotton plants provide excellent shelter and nesting site for the birds. When the crop is dried the bird camouflages with its snuff colored background. Therefore, the crop pattern also influences the birds to prefer the landscape in this region.

The flora found in the region are Bengal quince *Aegle marmelos*, Bitter albizzia *Albizzia amara*, Neem *Azadirachta indica*, Banyan tree *Ficus bengalensis*, Peepal tree Ficus regiliosa, White fig tree *Ficus virens*, Toddy palm *Borassus flabellifer*, Khejri tree *Prosopis cineraria*, Gum tree *Eucalyptus mannifera*, Indian beech tree *Millettia pinnata*, Cape gum, *Agave*, Desert Date *Balanites aegyptiaca (L.) Delile*, Apple Sodom *Calotropis procera*, Indian mulberry *Morinda citrifolia*, Mesquite tree *Prosopis glandulosa*, etc.

The fauna found are Great Indian Bustard (GIB) *Ardeotis nigriceps*, Blackbuck *Antilope cervicapra*, Indian Fox *Vulpes bengalensis*, Indian Jackal *Canis aureus indicus*, Jungle Cat *Felis chaus*, Indian Grey Mongoose *Herpestes edwardsii*, Black-naped Hare *Lepus nigricollis*, etc.

Image 33 Spraying of chemicals on crops

Methodology

The landscape level survey was conducted during monsoon from September 26, 2022 to October 06, 2022, to assess the status and distribution of Lesser Florican, Great Indian Bustard (GIB) and other grassland-associated species of the study area. In the landscape survey, 5km x 5km grids were laid over the entire study area. Total 62 out of 87grids were surveyed during the landscape survey for the presence of Lesser Florican, grassland-associated species, and their habitats.

Secondary information based on interviews regarding Lesser Florican and associated species occurrence and perceived threats were collected from local respondents (Herders/farmers, with age 50< preferred).

Human resources/teams

Four teams were deployed to carry out the survey, comprising a minimum of four persons, one biologist/scientist/birdwatcher who is experienced to identify the species on the spot, one photographer, one data collector, and one volunteer. Survey teams conducted the ground survey in the grids following the vehicle transects and point count methods, in the early morning hours 06.00 to12.00, and late evening hours 15.00 to 18.30 depending on the availability of light. Thus, each team was assigned to survey one grid in the morning and one in the evening every day.

Important habitat characteristics such as land cover, topography, and human disturbances were recorded at an interval of 2 km. Dominant land-cover type, terrain type, and vegetation composition within 100 m radius from the point were recorded systematically to assess the habitat quality.

Equipments used

Each team was equipped with a GPS to record the tracks, a Binocular to observe and identify the species, a Range finder to measure the distance of the animal from the observer, and a Camera to record the species sighting through photographs 5 sets.

Data Collection

All the observations were entered in the Data Collection App designed specifically for landscape surveys by BNHS, and The Bustard Program. The App has all the parameters to enter such as GPS location, date & time, weather, terrain, vegetation cover, insect count, animal name, and also vegetation details like name and specification of grasses, trees, shrubs, and invasive species.

Important habitat characteristics such as land cover, topography, and human disturbances have been recorded at an interval of 2km. Dominant land-cover type within a 100 m radius of the point shall be recorded as fallow, agriculture, grassland, scrubland, and plantation.

Vegetation composition within a 100 m radius of the point was recorded as the percentage of area covered by short, medium, and tall grasses the name of the grass was identified using the soft copy of the booklet about grasses. The percentage of shrub cover and tree cover along with the species name was recorded.

The sighting of an individual animal or a group of individuals among any of the species mentioned above has been considered as one sighting.

For each sighting, the number of individuals, sex if possible, sighting angle, and sighting distance from the vehicle transect line have been recorded along with Latitude and Longitude inmates during the vehicle line transect.

At every point count, species sightings, and habitat parameters like terrain type, flat, slope, and undulating and vegetation type grassland, agriculture land, and forest/plantation corresponding to each animal sighting within a 100m radius have been recorded.

Tracks

The survey tracks have been saved using GPS. The habitat data along with anthropogenic disturbances has been recorded at every 2 km interval. A separate track ID was allocated to every trail in case two or more trails are laid in one grid.

The distribution data of grassland indicator species like Lesser Florican *Sypheotides indicus*, Indian Grey Wolf *Canis lupus pallipes*, Chinkara *Gazella bennettii*, Blackbuck *Antilope cervicapra*, Montagu's Harrier *Circus pygargus*, and Pallid Harrier *Circus macrourus*, was considered for identifying potential grassland habitats. The data generated through field surveys, landscape surveys, interviews, and species presence data of the recent past i.e. 2018 onwards was over laid on a grid-based map to assess the potential areas which need to be conserved.

Survey efforts taken in brief

- Landscape Survey Date–**September 25, 2022 to October 08, 2022**
- Grid size- **5 kmx5km;**
- Grids planned to cover excluding heavy settlement and non-suitable areas - **178**
- Actual grids covered and sampled- **132**
- Dedicated teams involved-**04**
- Observers in Each Team - **03**
- Average distance covered in each grid- **8 km**
- Total distance covered–132 Grids X 8 Average distance =**1056km**.
- Observation time – Morning: 06:00 hrs to 10:00 hrs = **4 Hours**,
  Evening: 15:00 hrsto18:30 hrs= **3.30 Hours**
- Total Observation time – **7.30 Hours**
- Total Observation Per day - 07:30 hours x03 Observers = **21.9 Hours**
- Total Observation Days - **13 Days**
- Total Observation Hours in Landscape survey - Total Observation per Day xTotal Observation Days- 21.9 hours x13 Days = **284.7 Hours**.

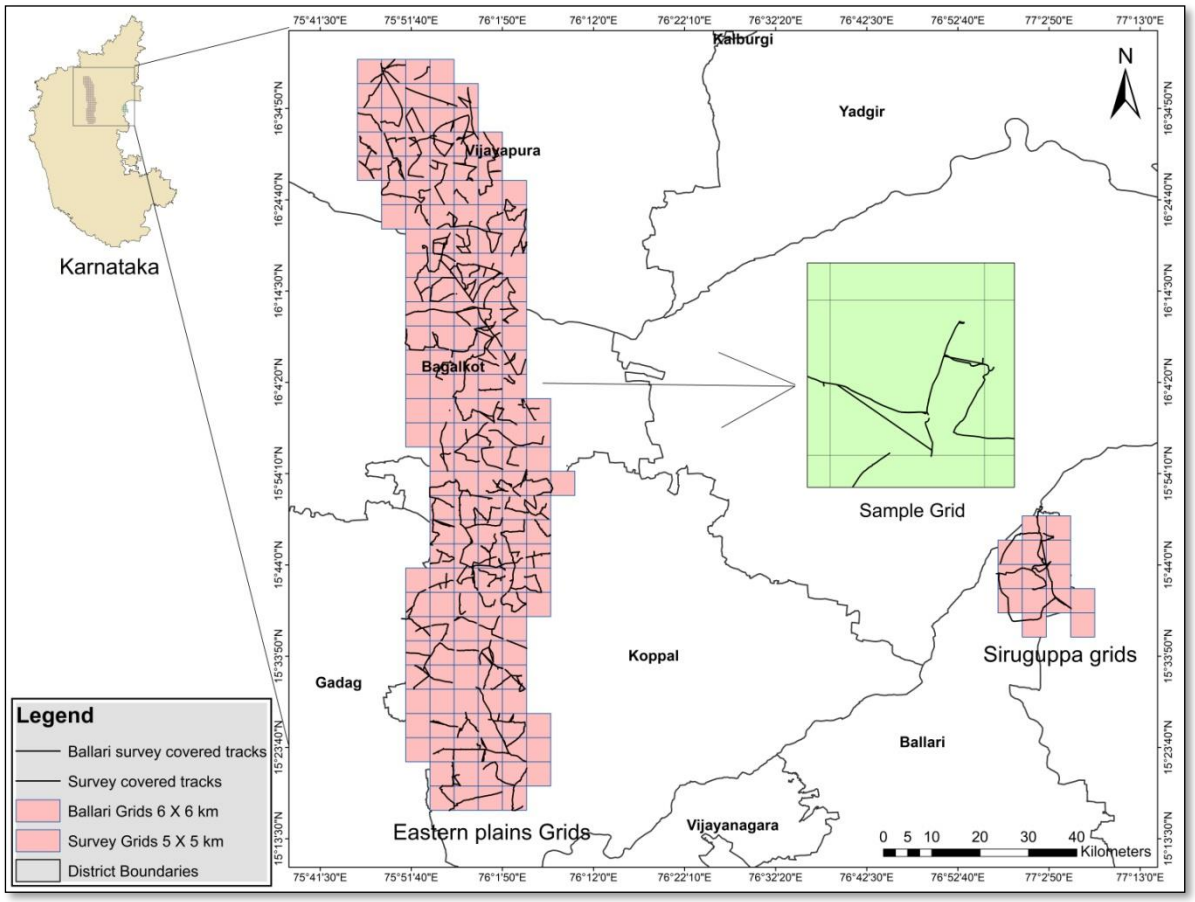


Figure 56 Map showing tracks and grids covered

Observations

The typical vegetation comprises scrub and thorny plants. The rainfall is low. Thorny shrubs, Babul trees *Acacia nilotica*, Elephant apple *Dillenia indica*, Gooseberry *Phyllanthus acidus*, and Soapnut trees *Sapindus* Spp. were observed during the survey. Across the study area traditional agricultural areas were also observed. The soil type of this region comprises of rich alluvial soil from plains of Krishna River to a dry alkaline soil from arid hill region.

The vegetation mainly comprises of crops, grasses, shrubs, and trees. The percentatge of the distribution of vegetation is represented graphically.

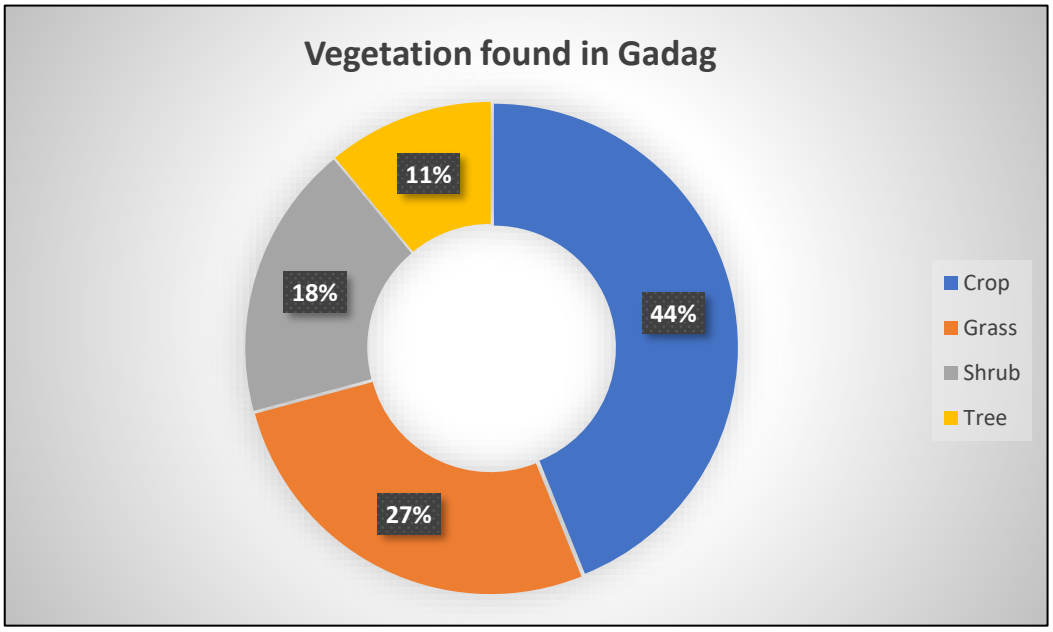


Figure 57 Dominant vegetation in Gadag

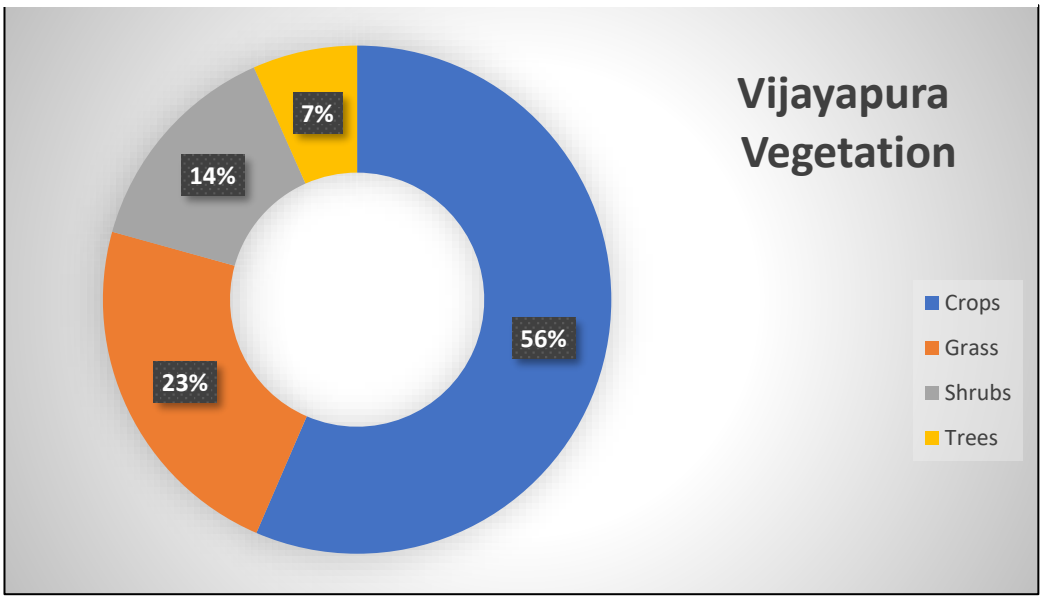


Figure 58 Dominant vegetation in Vijaypura

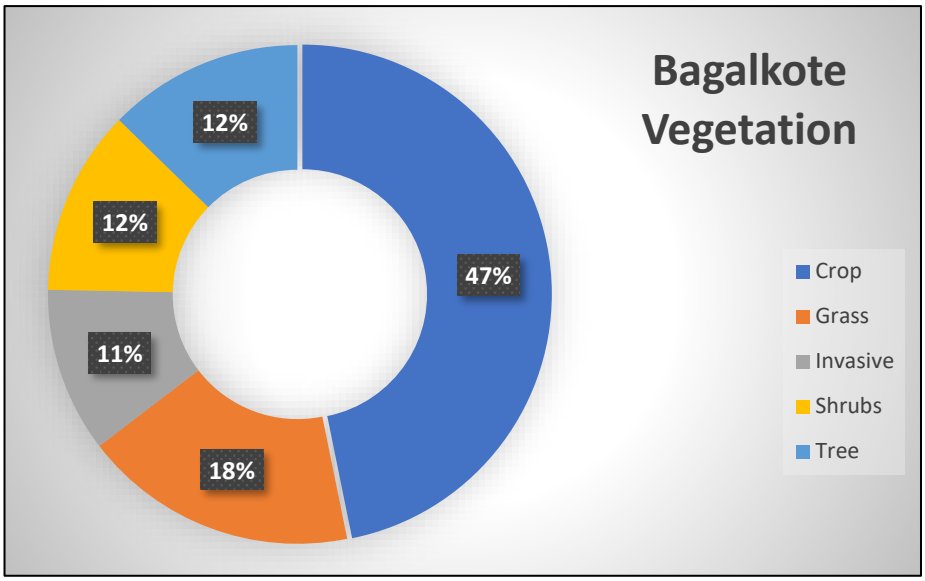


Figure 59 Dominant vegetation in Bagalkote

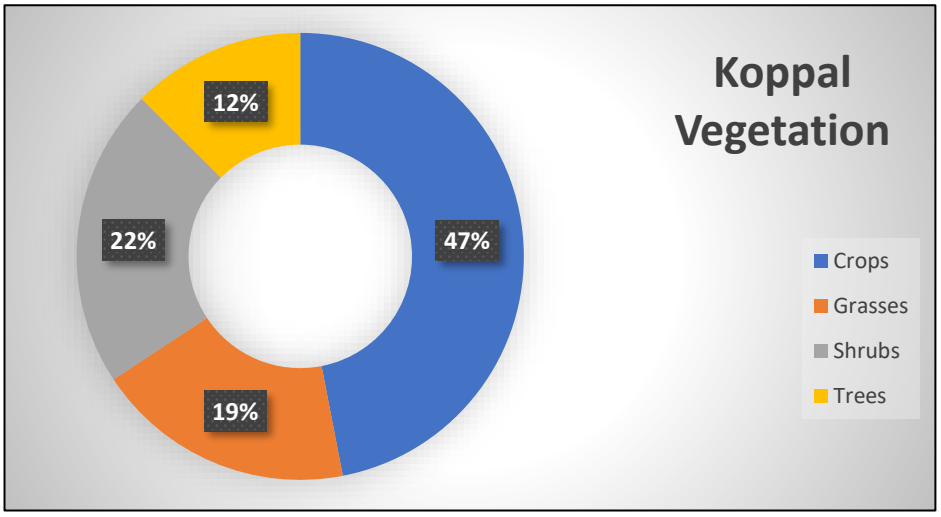


Figure 60 Dominant vegetation in Koppal

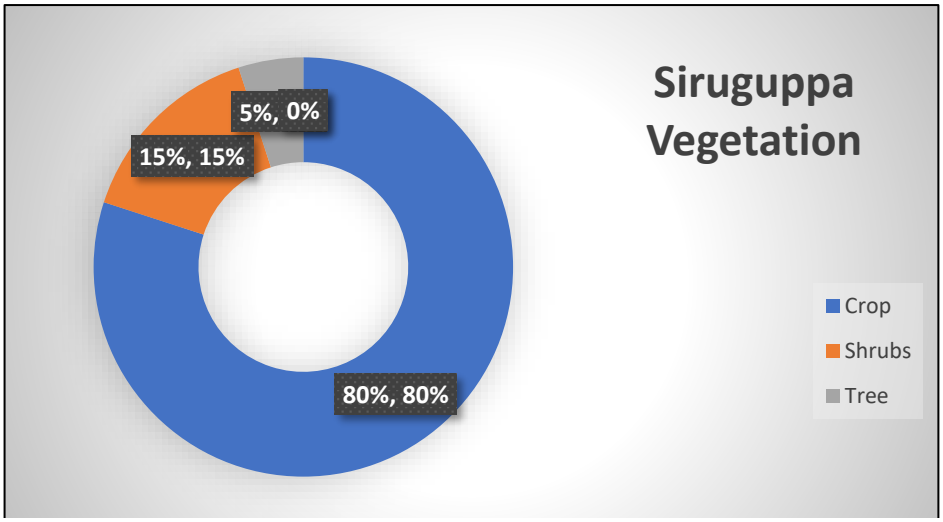


Figure 61 Dominant vegetation in Siruguppa

Crops such as Jowar *Sorghum bicolor*, Maize *Zea mays*, and Cotton *Gossypium herbaceum* are the major crops of this landscape. Sugarcane *Saccharum Spp.*, Groundnuts *Arachis hypogaea* and Tobacco *Nicotiana Spp.* are some of the commercial crops. Pigeon pea *Cajanus cajan*, Green gram *Vigna radiata* and Black gram *Vigna mungo* are some of the pulses. Groundnuts or peanuts *Arachis hypogaea*, common sunflower *Helianthus annus L.* and soyabean *Glycine max* are commonly cultivated crops.

Dominant grasses observed are *Dichanthium*, *Chrysopogon*, *Heteropogon*, *Aristida*, Yellow-Bristle *Stygobromus lucifugus*, etc. Shrubs observed are mainly invasive species such as *Prosopis*, *Lantana*, *Cassia*, *Hyptis*, *Parthenium*, etc. Trees seen were *Acacia*, Neem *Azadirachta indica*, Palm, Coconut *Cocus nucifera*, Mango *Mangifera indica*, etc. Fauna includes the Indian Wolf *Canis lupus pallipes pallipes*, Indian Small Fox *Vulpes bengalensis*, Golden Jackal *Canis aureus*, and Jungle Cat *Felis chaus* representing the apex mammalian predators. The Blackbuck *Antilope cervicapra*, is a large and important herbivore mammal that dwells in this region. Indian Crested Porcupine *Hystrix indica* and Black-naped Hare *Lepus nigricollis* are some notable mammalian fauna.

This landscape is also home to Critically Endangered Bustard species like Lesser Florican *Sypheotides indicus* and Great Indian Bustard (GIB) *Ardeotis nigriceps*.

Image 34 Blackbuck seen near Koppal

Along with Grey Francolin *Ortygornis pondicerianus*, Painted Francolin *Francolinus pictus*, Rain Quail *Coturnix coromandelica*, Barred Buttonquail *Turnix suscitator*, Rock Bush-quail *Perdicula argoondah*, Yellow-legged Button-quail *Turnix tanki*, and lark species like Rufous-tailed Lark *Ammomanes phoenicura*, Sykes's lark (Tawny Lark) *Galerida deva*, Ashy-crown Sparrow-Lark *Eremopterix griseus*, and Indian Bush lark *Mirafra erythroptera* are common. Chestnut-bellied Sandgrouse *Pterocles exustus*, Yellow-wattled Lapwing *Vanellus malabaricus*, Indian Nightjar

Caprimulgus asiaticus, Savanna Nightjar *Caprimulgus affinis* are some of the frequently seen avian species. Raptors like the Short-toed Snake-eagle *Circa etusgallicus*, Tawny Eagle *Aquila rapax*, Bonelli's Eagle *Aquila fasciata*, and Harriers are commonly found in this region.

Two Forest watchers Rajashekhar Reddy and Mahesh showed the entire GIB area to the team. The landscape of Siruguppa GIB area is dominantly an agriculture land. There are vast stretches of cotton fields and in between are some chilly fields, Neem trees *Azadirachta indica*, *Prosopis juliflora*, and other invasive plants. Blackbucks were sighted from a distance of more than 600m. There was no sighting of GIB, but the watchers informed that they sighted the birds in the month of June-July 2022.

Image 35 Agricultural patch in Siruguppa GIB area

Image 36 BNHS team visit to Siriguppa Great Indian Bustard sites with local forest staff

Threats

Habitat in Vijayapura Block was found disturbed due to rapid change in land use and intensive agriculture pattern. Windmills and High-tension power lines were found to be major threats to the habitat and the wildlife. There was not a single sighting of Blackbucks *Antilope cervicapra* in this region. Similarly, the habitat of Bagalkote Block was also disturbed by a major change in agricultural patterns, irrigation facilities, and a huge amount of water availability due to Almatti Dam. Traditional crops (grains and pulses) have been replaced by commercial crops like Sugarcane *Saccharum Spp.* which is not suitable for grassland-dependent species. In Koppal Block it was observed that the area is disturbed by mining and a surge of high-tension power lines. However, wildlife was encountered easily here. Blackbucks *Antilope cervicapra*, Indian Fox *Vulpes bengalensis*, Grey Wolves *Canis lupus pallipes*, etc. were observed in this block. There was a continuous expansion of windmills and high-tension power lines in Gadag Block. Agriculture is dominated by traditional crops like grains. Blackbucks *Antilope cervicapra* were seen widely distributed indicating that the area is still less disturbed. There is a Chinkara Wildlife Sanctuary in Yadhalli in Bagalkote district, which is nearly 40 km away from the survey area polygon, where 100 Chinkaras *Gazella bennettii* resides in shrubby vegetation and rocky plateaus. The habitat of Siruguppa is less disturbed with human activities but the change in agriculture pattern from traditional crops to commercial crops has negative impact on the GIB area.

Overall major threats were wind turbines, rapid land use changes, existing and proposed heavy energy infrastructure (power substations, HT powerlines, thermal plants), intensive agriculture (chemical use, change in cropping pattern), and unplanned development (sugar factories, mining, etc.). From our field observations, Vijayapura and Bagalkote blocks were highly disturbed areas than the Koppal and Gadag blocks.

None of our team members found any GIB and Lesser Florican during survey period. But secondary information suggested that these two species have been reported at two sites near and around the survey area. LF has been recorded at two sites (Jakkalli and Mullal) during non-breeding (winter) period and GIB at Sompur (during survey period). Lesser Florican are reported to breed in North-west parts of India in monsoon and spending winter in southern parts of the Deccan Plateau. If there will be no corridors left then movement of these landscape species will behindered. This shows importance of the survey area, especially Koppal and Gadag blocks for survival of the last remaining individuals of Bustards/Floricans in Karnataka. With proper assessment and site-specific conservation action plans, one can save the fast-declining populations of the grassland associated species.

Human activities like mining, solar plants, windmills, and high-tension powerlines are causing significant loss to wildlife by disrupting their natural habitat. The rapid pace of land use conversion is not controlled, making it difficult to manage. Developmental projects must consider the impacts on natural habitats and minimize environmental losses. To restore grasslands, Forest departments and private organizations must take strict actions, control land use changes, increase human activities, and educate the public about grassland restoration. The Great Indian Bustard (GIB) and Lesser Florican population can be conserved and protected by increasing natural grassland vegetation and following traditional agriculture. Identifying potential landscapes, conserving areas, and encouraging traditional agriculture are the best methods for conserving these species.

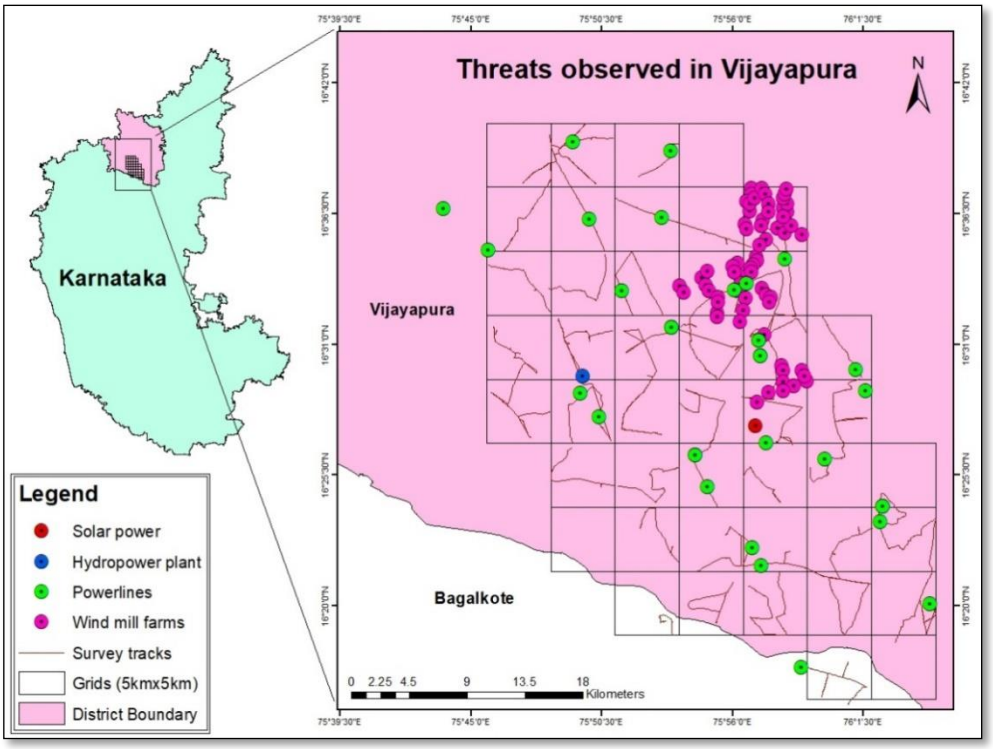


Figure 62 Threats to the habitat and species in Vijaypura

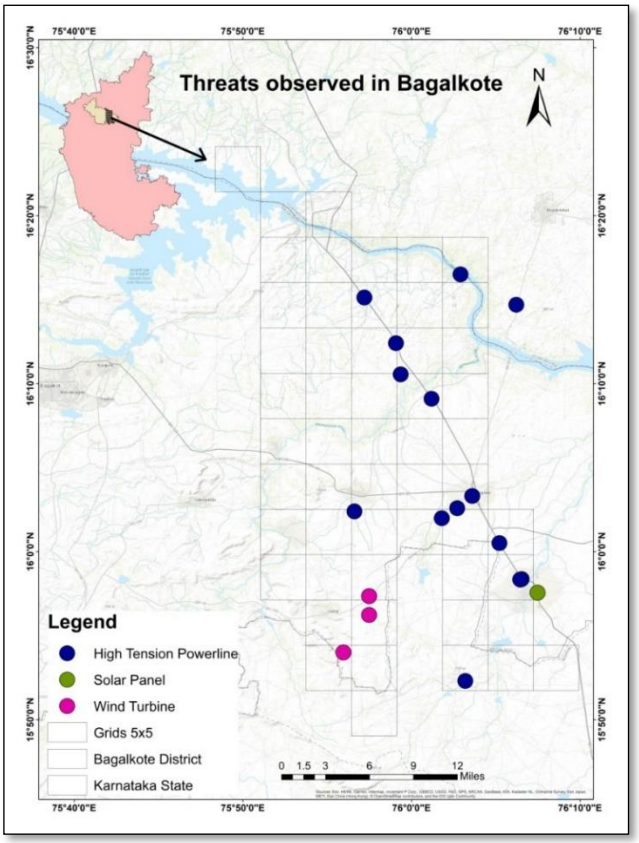


Figure 63 Threats in Bagalkote study area

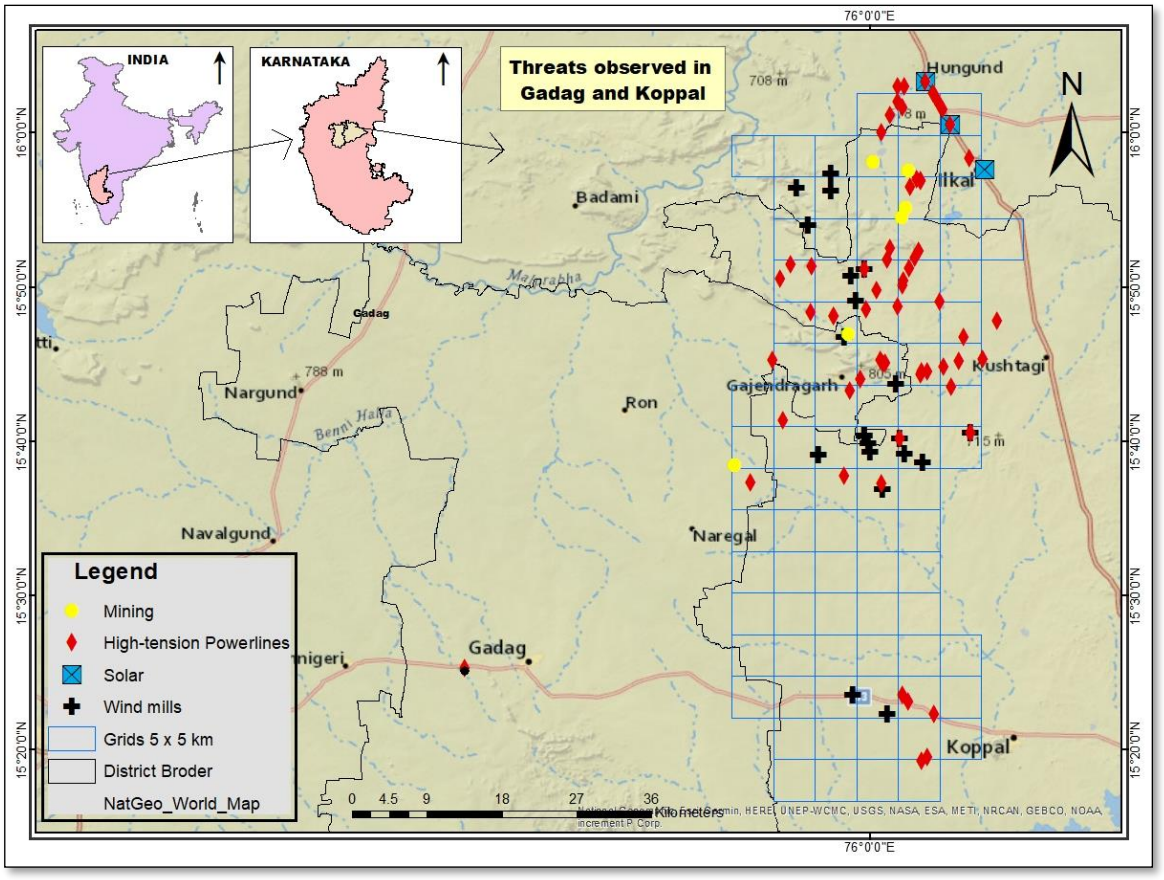


Figure 64 Threats in Gadag and Koppal study area

Lesser Florican recorded near the study area

- **Jigalur and Jakkalli** (15°39'46.0"N 75°47'50.6"E): A tagged Florican by Wildlife Institute of India in Ajmer in year 2020, was being traced to know its movement in the Deccan. It was recorded near Jigalur and Jakkalli near Gadag in winter season. This location is near to Nidagundi and nearly 9 km away from the polygon (study area), which comes under grid 118 of the survey. This place was visited during the scoping visit to observe the landscape of the region. Jigalur and Jakkalli is an area of mosaic landscape with agriculture, shrubland, and fallow land.

Great Indian Bustard (GIB) recorded near the study area

- **Bannikoppa** (15°24'24.9"N 75°57'48.2"E): An individual GIB was sighted near Bannikoppa railway station on December 08, 2001, while traveling through train from Koppal to Gadag (Kumara and Mohan Raj 2007). The Bannikoppa region is suitable for birds with flat and vast terrain with agriculture, shrubland, and fallow land. This point comes under grid number 152 of the study area. During the survey, the landscape of the region was observed to check for any signs of bird.
- **Sompur** (15°25'03.5"N 75°53'21.4"E): In Oct 2022 the Great Indian Bustard (GIB) was sighted near Sompur Road Railway station by Mr Mandar Khadilkar from Mumbai while traveling from Koppal to Gadag (10-15 km away from Bannikoppa). The site was revisited by the team as it falls under grids 144 & 145 of the survey. The terrain is a flat, mosaic pattern of agriculture, fallow land, and scrubland. The soil type of this region is black cotton soil.

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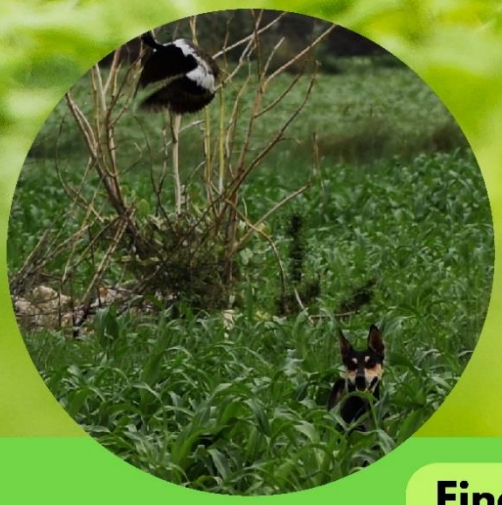

Final Report
March 2023

FOREST DEPARTMENT BIDAR
SAVE FLORICAN

BNHS INDIA CONSERVING NATURE SINCE 1883

FOREST DEPARTMENT KARNATAKA