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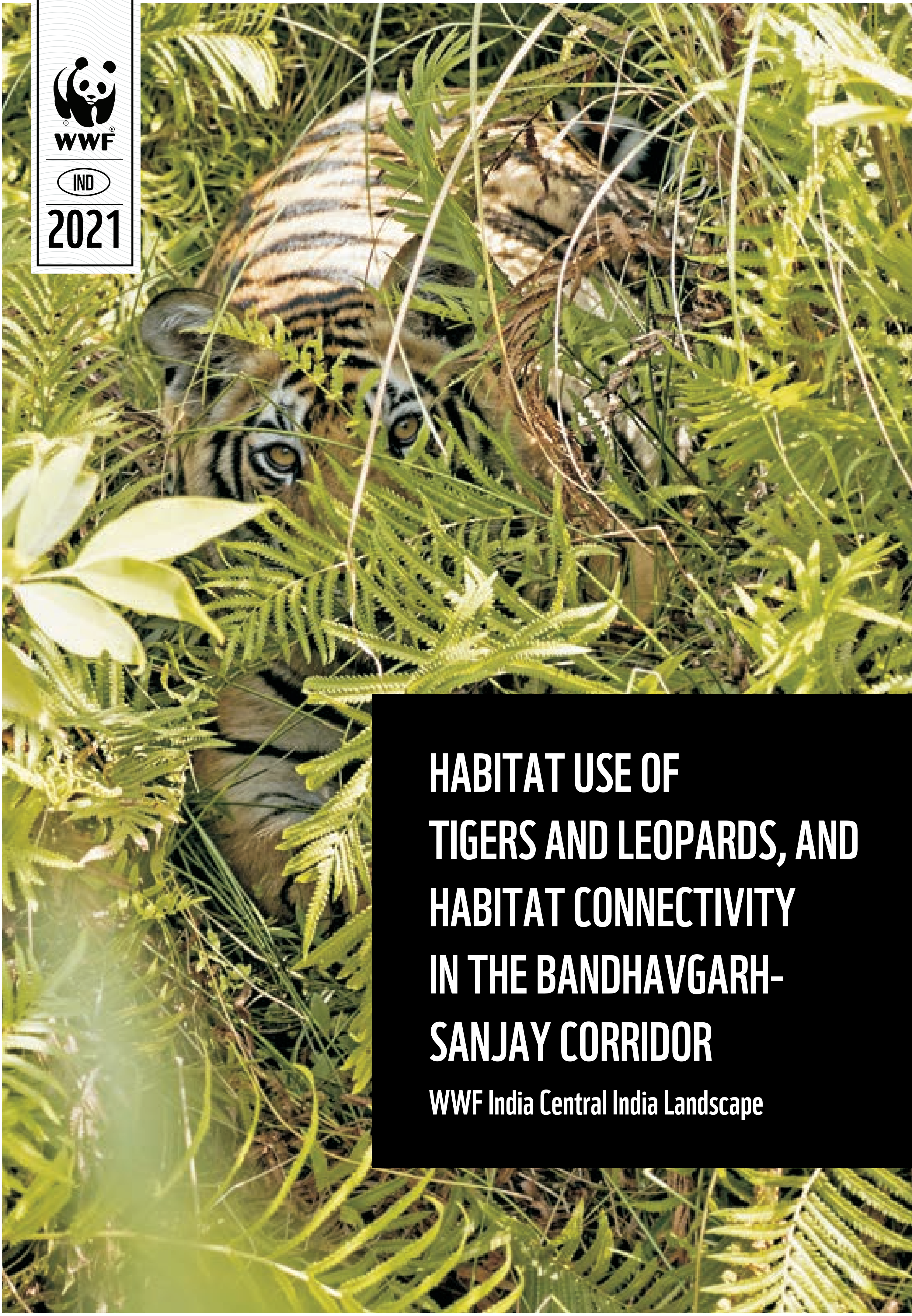

HABITAT USE OF TIGERS AND LEOPARDS, AND HABITAT CONNECTIVITY IN THE BANDHAVGARH-SANJAY CORRIDOR

WWF India Central India Landscape

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HABITAT USE OF TIGERS AND LEOPARDS, AND HABITAT CONNECTIVITY IN THE BANDHAVGARH-SANJAY CORRIDOR

WWF India Central India Landscape

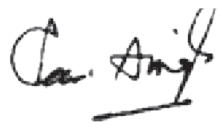
FOREWORD

WWF India has been working in the Central India Landscape for the last two decades, with a focus on conserving tigers, co-predators, prey and their habitats and movement corridors. The Bandhavgarh and Sanjay Tiger Reserves are the key tiger bearing areas in the north-eastern part of this Landscape. This area of the Central India Landscape forms an important connectivity with the eastern aspect – extending from the Kaimur hills to Chhotanagpur Plateau and the Eastern Ghats. Strengthening conservation of tigers in Bandhavgarh and recovery of tigers in Sanjay is critical for the long-term survival in this landscape.

This report acknowledges the importance of connectivity in this region and aims to inform proposed development plans in view of securing wildlife movements in the Bandhavgarh – Sanjay corridor. The report provides baseline information on the ecological and related aspects within the corridor.

We thus attempt to understand how large carnivores navigate a matrix of modified and human-dominated areas including linear infrastructure, extractive and production industries, and human settlements interspersed with forests and farmlands. Further, it presents findings on the habitat use by tigers and leopards; maps human-wildlife conflict zones; land-use patterns concerning linear infrastructure and industries; and occurrences of forest fires in the Bandhavgarh-Sanjay corridor.

In aggregate of the knowledge contained above, we hope to contribute towards the conservation of the tiger and other species as well, the ecological aspect of the area.



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SG and CEO, WWF India

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Foreword

The state of Madhya Pradesh has pioneered conserving wildlife corridors in India by recognizing the importance of natural and semi-natural spaces between Protected Areas acting as a network where species disperse and occupy, using information provided by scientific studies of the dynamics of species behaviour, land use change, and socio-ecological parameters that define landscape matrix. Given the fact that Madhya Pradesh encompasses largest forest cover in the country and large populations of large carnivores such as tigers and leopards, wildlife corridors become the primary and natural links that maintain populations for longer term.

Furthermore, its geographic location acts as a corridor connecting several states – Maharashtra to the south, Chhattisgarh to the east, Uttar Pradesh to the north, and Rajasthan to the west – all of these regions have witnessed tigers dispersing through Madhya Pradesh, reiterating the fact that corridor connectivity is an important aspect of tiger behaviour.

In eastern Madhya Pradesh, the network of Bandhavgarh Tiger Reserve and Sanjay Tiger Reserve is an important dispersal area for wild animals, connecting Guru Ghasidas National Park in Chhattisgarh and further with eastern Indian states. Together with the protected and reserved forests serving as a corridor, this region supports about 130 tigers.

The report "Habitat use of tigers and leopards, and habitat connectivity in the Bandhavgarh-Sanjay Corridor" serves as yet another important study in our understanding of habitat use of tigers in a human-dominated matrix; it provides a detailed account of the profile of this corridor by identifying important elements critical for ensuring habitat connectivity.

This report adds to the knowledge of the wildlife corridors of Madhya Pradesh by establishing the status of this region. I congratulate the field team of Bandhavgarh and Sanjay Tiger Reserves and WWF India for this study and I hope the findings of this report help aid conservation efforts of Madhya Pradesh Forest Department.

(Jasbir Singh Chauhan)
PCCF (Wildlife) & CWLW
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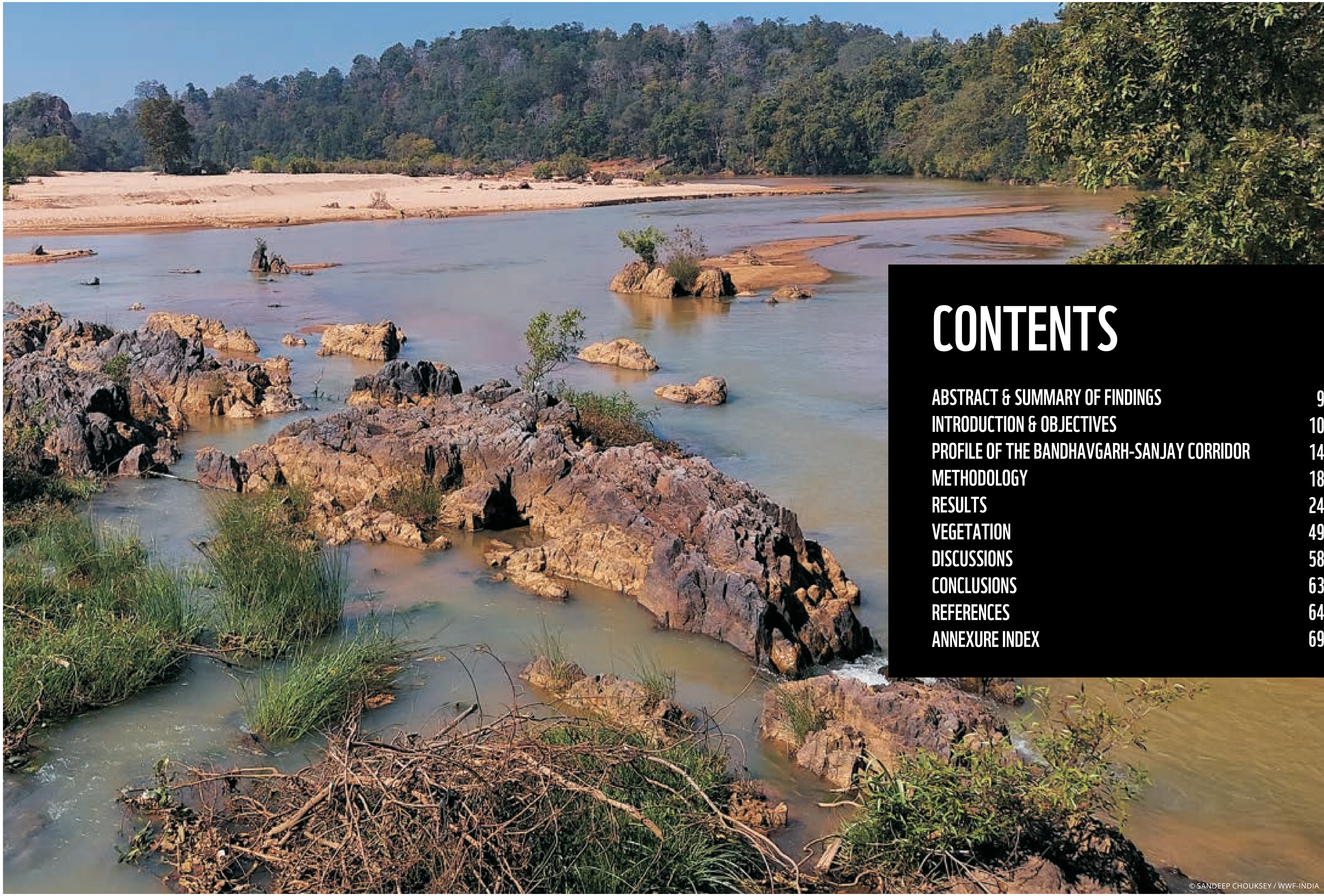

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ABSTRACT

Habitat connectivity in a mosaic landscape is paramount for large mammal conservation. Corridors connecting protected areas or other important habitat blocks allow for essential biological processes like dispersal, immigration and emigration, and also extend habitats for many terrestrial mammals. Maintaining habitats amidst a mosaic multiple-use landscape connecting the protected areas is important to maintain ecosystem balance as well as viable and genetically diverse populations. We determined habitat use for tigers and leopards as flagship large carnivore species in 4753 km^2 area connecting Bandhavgarh Tiger Reserve, Sanjay Tiger Reserve, and Guru Ghasidas National Park, three important protected areas in north-eastern part of central India with an estimated population of 132 tigers. With an average density of 143.33 persons per km^2 compared to the average density of 212.5 per km^2 of three districts comprising major area of the corridor, it comprises 23% of the total forest cover of the three districts of Shahdol, Umaria, and Koriya.

We determined habitat use probabilities to be 0.96 ±0. 08 (95%CI 0.24-0.99) and 0.93 ±0. 11 (95%CI 0.26-0.99) for tigers and leopards respectively in this corridor. Of eight environmental and anthropogenic variables considered, the two major factors positively influencing tiger and leopard habitat use were forest cover and wild prey presence. We also spatially assessed and mapped six threats to wildlife within the corridor that need to be key elements of conservation plans:
(I) human wildlife conflict, (ii) wildlife crime, (iii) forest fire, (iv) land use change, (v) infrastructure, and
(vi) extractive industries, and briefly discuss the demography of the corridor. This report provides insights to prioritize connectivity conservation by identifying areas where wildlife may face disproportionately high risks, or where landscape permeability is most compromised. We recommend a suite of actions, ranging from strengthening protection to institutionalizing participatory conservation to strengthen conservation in this vital corridor.

SUMMARY OF THE FINDINGS

We considered six elements to understand factors affecting habitat connectivity in the Bandhavgarh-Sanjay corridor;

(i) Tiger and leopard habitat use: The corridor area is actively used by both the carnivores in the state of Madhya Pradesh, and the habitat use probability is determined by forest cover and wild prey availability.

(ii) Human-wildlife conflict: The corridor area has recorded highest cases of livestock depredation for the state attributed mostly to tigers and leopards throughout the corridor region with a higher frequency towards Bandhavgarh Tiger Reserve, compared to seven Forest Divisions and three Tiger Reserves of the state. Direct human encounters are spread across the corridor area although more frequently reported from the central and the southern corridor areas in higher frequency towards Bandhavgarh Tiger Reserve.

(iii) Wildlife crime: Cases registered as criminal offences resulting in death of a scheduled wild animal are recorded across the corridor area. We recommend regular patrol and monitoring across the corridor area, particularly to dismantle wire and live wire traps, and discourage use of country bombs and guns and local weapons to hunt wildlife through public engagement.

(iv) Forest fire: The frequency of fire events and heatmaps identify the corridor area to be susceptible to forest fires. Since most fire incidences are man-made and accidental in nature, we recommend that the entire corridor area follow fire protection regime and management practices of nearby protected areas and engage local communities through awareness and participatory fire management practices.

(v) Land use and land cover: We discuss area under forest and non-forest between 2010 and 2019, and identify region where ecosystem restoration efforts can focus based on the vegetation profile of the corridor provided under this study (see section 4.5.1).

(vi) Infrastructure and extractives industries: We identify major roads, railways, existing industries and coal deposits that may threaten the integrity of the corridor area. We report two critical areas for train and vehicle-wild animal collision cases on NH78 and SH9 roadways.

1. INTRODUCTION

The processes of population isolation, driven primarily by habitat loss and fragmentation, lead to population extinctions and reduction in biological diversity (Rosenberg, Noon & Meslow, 1997). That isolated populations are significantly more prone to extinction with increasing interpopulation distance has been characterized in various taxa, including insects (Saccheri et al., 1998), fishes (Magnuson et al., 1998), frogs (Sjögren, 1991), snakes (Webb, Brook & Shine, 2002), and mammals – from the small island marsupials (Miller et al., 2011) to large carnivores such as tigers (Sagar et al., 2021). Habitat loss and fragmentation is considered to be the greatest threat to biodiversity, particularly terrestrial mammals, with studies predicting on an average ten ecoregional mammal extinctions due to human land use change (Kuipers et al., 2021), and with global threat of climate change, it is likely to exacerbate threat to over 54% of biodiversity in 18.5% of the ecoregions (Segan, Murray & Watson, 2016). As protected areas transformed into island spaces amidst a mosaic human-dominated land-uses, the concept of biological-, wildlife-, and habitat-corridors was advocated in early 1980s 'to increase the connectivity of otherwise isolated patches' (Rosenberg, Noon & Meslow, 1997; Beier & Noss, 1998). This connectivity relies on several dynamic features a population is subject to; including spatial, such as distance to the nearest habitat patch of any size, the nearest large patch, and the nearest occupied source patch (Prugh et al., 2008), life-history requirements such as food availability and territory (Harihar & Pandav, 2012; Chanchani & Gerber, 2018), and behaviour, including movement patterns often in human-dominated areas (Habib et al., 2020; Barber-Meyer et al., 2012; Harihar & Pandav, 2012).

The concept of corridors was a considered a paradigm of population ecology and conservation biology. It serves as a medium of interchange of individuals from isolated populations which would increase local and regional population persistence, reduce extinction rates, and increase colonization rates (Rosenberg, Noon & Meslow, 1997). Studies that looked at extinction vis-à-vis isolation increasingly affirmed that corridor function was paramount to conservation. Among the early proponents underscoring the importance of connectivity was in a butterfly species which showed decreasing heterozygosity in isolated metapopulations, indicated by adversely affected larval survival, adult longevity, and egg-hatching rate, leading to extinctions in several isolated populations (Saccheri et al., 1998). Inbreeding as one of the direct effects of isolation is also seen in large carnivores such as tigers. The rather-common occurrence of pseudomelanistic tigers in Similipal Tiger Reserve, characterized by broad, darker and merged stripes, was considered an anomalous phenotype in natural populations associated with loss of genetic diversity in bottlenecked or inbred populations, with the results suggesting that genetic rescue to increase heterozygosity would likely decrease inbreeding depression (Sagar et al., 2021). Maintaining – or managing – this immigration is significant for increasing genetic diversity. The pervasive drivers are environmental and demographic stochastic factors. A study of multiple metapopulations of pool frogs showed that inbreeding depression among populations within two km or less from the neighbouring population was not a determining factor of extinction as much as combined environmental and demographic stochasticity in isolated populations which brought about a reduction or absence of egg-carrying females in some years, in addition, predation also naturally limited population growth. In case of increased isolation and environmental and demographic factors, the likelihood of populations facing extinction increased (Sjögren, 1991).Often, human-mediated factors accelerate population declines. The direct mediators of extinction, such as removing individuals through their habitat, has been observed in several taxa, from the endangered broad-headed snake in Australia which is driven to local extinction due to the illegal pet trade (Webb, Brook & Shine, 2002), to the Malayan tiger, facing an intermediate population crash with only 200 individuals remaining in isolated rainforests of Malaysia due to poaching, human-tiger conflicts, decreasing habitat quality, and infectious diseases bringing them closer to the threat of extinction (Ten et al., 2021).

The function of a corridor is well established in conservation science. Corridor functionality is affected by the landscape it is embedded in. Prugh et al. (2008) remark that habitat patches are not islands, the surroundings provide sufficient benign conditions which may serve as areas to live and reproduce, with area sensitivity higher in human-dominated matrix than with natural matrix. The deterministic factors of the functionality of the corridor can be broadly classified into two physical components, the distance and shape of the corridor, and the composition of the corridor. A study of four carnivore species – three large and one small – showed that genetic connectivity is influenced by land-use and land-cover for the large carnivores, with dispersal ability differing significantly between the four species based on body size and trophic level occupied by the species (Thatte et al., 2019). The composition of the corridor is also determined by several factors, including the species using the area. Large, wide-ranging mammals such as the African Elephant showed spatiotemporal changes in use of corridors, influenced by vegetation cover, human disturbance, but also the social and resource needs of individual elephants (Green et al., 2018).

The earlier definition of a corridor as often a linear (with length greater than width), smaller, and ecologically different from the matrix on the either size (Rosenberg, Noon & Meslow, 1997), has been revised over the years as the understanding of population exchanges have enhanced. The IUCN defines an 'ecological corridor' as a clearly defined geographical space that is governed and managed over the long term to maintain or restore effective ecological connectivity (Hilty et al., 2020). The Convention on the Conservation of Migratory Species (CMS) definition for ecological connectivity is the unimpeded movement of species and the flow of natural processes that sustain life on Earth (CMS, 2020). Their roles in a species' life-history requirements are different – from mere dispersal to being a part of a territory. In central India, tiger populations connected by forest corridors showed highest rates of contemporary gene flow than those that have lost a considerable forest cover and hence connectivity (Sharma et al., 2013).Corridors as habitats and not merely dispersal routes are also increasingly being considered. In addition to movement facilitation, some species also meet some life-history requirements in corridors. This is likely the case for a small carnivore such as the Jungle Cat, that has a median dispersal distance of ~8 km, occurs at higher densities than larger carnivores even outside PAs, does not face many barriers to movement in central India (Thatte et. al. 2019), and is likely a corridor dweller/ has home ranges/ breeding population within the areas that serve as corridors for larger species. In case of the African Elephant, herds were shown to prefer corridor sites with lower disturbance during the day and moved closer to roads – in other words, use more disturbed areas of the corridors – at night to traverse the corridor (Green et al., 2018). For a large carnivore such as the tiger, such patterns were observed between individuals with home ranges inside a protected area and outside; those outside of protected areas showed significant displacement in the night than in the day, although both showed little-to-no difference in total hourly displacement rate within and outside protected areas (Habib et al., 2020).

A study that aims to understand habitat use and habitat connectivity has to acknowledge a corridor as a state-space which is a crucial part of a species' life-history requirement other than dispersal. In this context, understanding extinction and isolation gradients for a species requires a holistic approach. How resistant is the matrix within or beyond the designated corridor for a species is often influenced by environmental and human-induced stochastic elements. In addition, how humans and wildlife interact in these shared-space also needs a broad understanding. While landscape features such as high human density, built-up areas, linear infrastructure, and dams and extractive industries, as well as rivers and valleys, mountains, and other large natural features, are identified as physical barriers to animal movement, human presence and behaviour as a factor affecting corridor functionality is also an important aspect. Dubbed 'anthropogenic resistance,' Ghoddousi et al. (2020) define it as impacts of human behaviours on species' movement, including psychological (individual), social (group), and policy decisions. Factors such as risk to wellbeing and property also influences connectivity (*ibid*), often leading to retaliation in the form of hunting corridor animals for being 'problem' animals through illegal means such as poisoning, trapping, and actively shooting. On the other hand, that wild animals and humans cooccur and coexist in parts of the world such as in central India in spite of centuries of destruction of wild animals for sport, stands as a test of time that large carnivores and humans can and do share space in the 21st century.A study of how local communities navigate spaces in two

Team conducting the sign survey in Bandhavgarh-Sanjay Corridor

central Indian tiger reserves for their daily livelihood revealed that behavioural responses varied with the type of risk, influencing the speed and directedness of movement if people perceive presence of a wild animal, especially a large carnivore, in an area (Read et al., 2021). Sudden encounters with wild animals or damage to property are not isolated events. Several countries provide compensation for the loss of life or property. How these are treated is a key determinant of whether a corridor serves its purpose or becomes a death-trap. In India, a majority of states (27 out of 29 states for at least one or more policy) provide compensation irrespective of where the incident took place, a protected area or outside of it (Karanth, Gupta & Vanamamalai, 2018). While compensation benefitting people and wildlife remains to be tallied (Nyhus et al., 2003; Karanth, Gupta & Vanamamalai, 2018), in view of negative interactions and mitigation programmes with an objective to reduce retaliatory killings of wild animals while compensating for the loss, the question whether corridors are places of coexistence or cooccurrence, or, in other words, favouring wild animals for humans, is a burning issue. In the 21st century, as the world stares at two extremes, of local-to-global awareness of the natural world and the local-to-global effects of manmade climate-change, a wildlife-, biological-, and habitat-corridor remains an important area for conservation interventions made possible so long as the integrity and functionality of these corridors are collectively conserved.

In India, the central India and Eastern Ghats, covering eight states and with over 24 Tiger Reserves, comprise roughly a third of India's tiger population (about 1,033 tigers out of 2,967, Jhala et al., 2020). Of this, over half (approximately 526 tigers) are present in the state of Madhya Pradesh, of which 14% are found outside of protected areas, most of them (est. 57 tigers) in four corridor areas. The central Indian wildlife corridors are well studied for their connectivity particularly for large carnivores (Rathore et al., 2012; Borah et al., 2015; Sharma et al., 2013), mapping of habitat connectivity (Dutta et al., 2015), modelling threat of extinction (Thatte et al., 2018), land-use and land-cover change (Banerjee, Kauranne & Mikkila, 2020) as well as for ecosystem restoration (Dutta, Sharma & DeFries, 2018), providing a comprehensive understanding of the corridor- and landscape-specific ecological and anthropogenic influences in this tiger stronghold. Factors which influence habitat-use, spatiotemporal scale of human-wildlife conflict, pervasiveness of wildlife crime, and frequency of forest fires, are elements that also affect connectivity laterally – that is, they are often underrepresented or underestimated to affect connectivity. In an attempt to identify elements influencing habitat use and connectivity of corridors, we assessed the forested areas connecting Bandhavgarh and Sanjay, two tigers in the state of Madhya Pradesh, and Guru Ghasidas National Park in Chhattisgarh, that are known to harbour about 132 tigers. This report aims to provide an overview of the corridor to design, strengthen, and innovate management practices, engage communities, and identify potential barriers to functionality in the future.

OBJECTIVES

1. Establish a monitoring protocol and generate baseline estimates for the probability of occurrence particularly for tigers, leopards and other wildlife in the corridor.

2. Assess the occurrence of large carnivores as a function of environmental and anthropogenic factors of management relevance.

3. Map human-wildlife conflict areas from a long-term database, with a specific focus on livestock depredation and human death and injury.

4. Assess and map wildlife crime, forest fire areas and infrastructure and mining pressures in the corridor to identify support prioritization of management and conservation planning actions.

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2. PROFILE OF THE BANDHAVGARH-SANJAY CORRIDOR

The area connecting Bandhavgarh and Sanjay Tiger Reserves, and Guru Ghasidas National Park lies between latitude 24° 00' and 23° 24' North and longitude 81° 06' and 81° 51' East. This wildlife corridor is spread over five districts, Umaria, Shahdol and Sidhi in Madhya Pradesh, and Koriya in Chhattisgarh, and parts of Anuppur district in Madhya Pradesh, covering up to 21,607 km² area identified by Qureshi et al, 2014 as habitat size including 1598.1km² of Bandhavgarh Tiger Reserve, 1674.5 km² of Sanjay Tiger Reserve (ENVIS 2021), and 1,440 km² of Guru Ghasidas National Park. The corridor area is interspersed with agriculture fields, villages and small towns, and linear infrastructures. The National Tiger Conservation Authority and Wildlife Institute of India (Qureshi et al., 2014) have identified three geographically distinguished arms between the two Protected Areas viz. the northern corridor (Corridor 1), the central (Corridor 2) and southern (Corridor 3). Corridor 1 and 2 connect the Panpatha range of Bandhavgarh Tiger Reserve with Dubri range of Sanjay Tiger Reserve from two directions and corridor 3 connects the Manpur and Dhamokhar buffer ranges of Bandhavargh with Pondi and Mohan ranges of Sanjay Tiger Reserve via Guru Ghasidas National Park (Fig 1). This corridor is a Least Cost Path of 2 km width, including a 1.5 km buffer considered as the minimal essential corridors joining two tiger reserves (*ibid*).

2.1 FOREST TYPE

Forest types within the corridor include dry peninsular sal (5B/C1) and northern dry mixed deciduous forest (5B/C2) (Champion and Seth, 1968). In most places sal (*Shorea robusta*) occurs either in pure stands, or with associates that include *Terminelia tomentosa, Terminelia bellerica, Pterocarpus marsupium, Diospyrus melanoxylon, Anogeissus latifolia, Cassia fistula, Albizzia procera, Acacia catechu, Bosewellia serrata, Ficus and Phoenix sp.,* and *Tectona grandis* (mostly seen in plantations). *Eucalyptus* sp. and *Gliricidia sepium* are found in plantations on revenue and forest lands for timber, pulp, and fuelwood. Degraded areas and agricultural land are associated with economically important trees such as *Madhuca indica, Mangifera indica, Syzygium cumini, T. tomentosa, T. bellerica,* and *D. melanoxylon*. Bamboo *Dendrocalamus strictus* stands are uncommon within the corridor but occur within the protected areas. Understory shrubs include *Zizyphus sp., Capparis decidua, Calotropis gigantea and C. procera, Carissa sp., Woodfordia fruticosa, Crotalaria sp.*, etc, and their growth is especially prolific in degraded and open forests. Major invasive species include *Ageratina adenophora, Parthenium hysterophorus, Mesosphaerum suaveolens,* and *Lantana camara*. While the former two species are more common in overgrazed areas closer to human settlements, the latter two are common in forest areas frequently subject to forest fires.

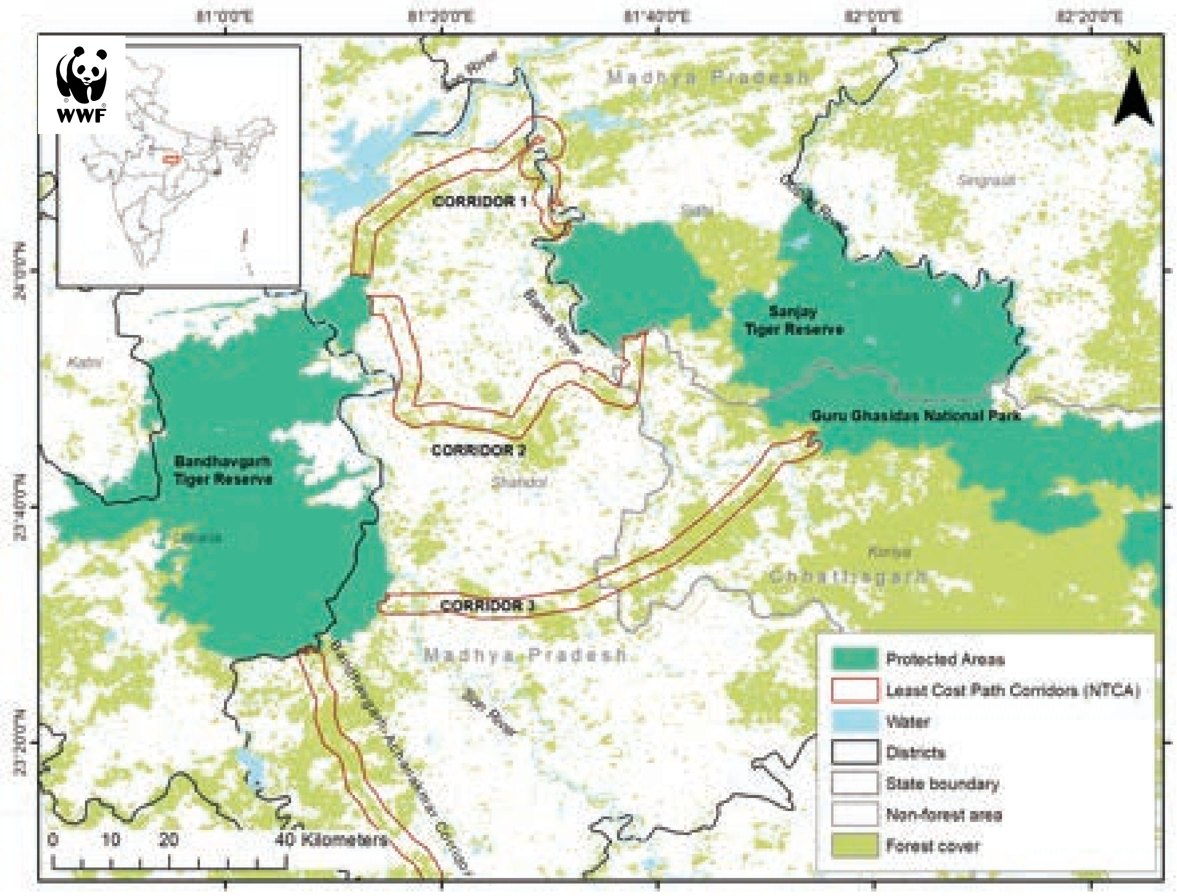

Fig 1. Corridor connecting Bandhavgarh Tiger Reserve, Sanjay Tiger Reserve, and Guru Ghasidas National Park (Corridor 1, 2, and 3) and the larger landscape. This map shows the Least Cost Path corridor as per Qureshi et al. (2014) and NTCA (2020).

2.2 GEOGRAPHY AND TOPOGRAPHY

Geographically the corridor is located in north-eastern section of Madhya Pradesh adjoining north-western Chhattisgarh. Its western and eastern limits are the Kaimur range of Vindhyan mountain range (Singh, 2016) Chhota Nagpur plateau. The average elevation is between 245 and 500 m, with Corridors 1 and 2 largely spanning undulating hilly terrain and Corridor 3 containing some hilly regions, with elevations of up to 700 m. The southern portion of the three corridors connects with the Maikal Hills. This region is also an important corridor between Bandhavgarh and Achanakmar Tiger Reserves, but was not surveyed in the present study.

2.3 HYDROLOGY

The corridor area is drained by two major rivers that flow from south two north: the west-lying Son, and Banas, its tributary to the east (Fig 1). The Son merges into the Ganga in the adjacent state of Bihar. Other important tributaries of the Son within the corridor are Kunak, Chuwadi, Tipan, Chandas and Bakan (CGWB, 2013), whereas key tributaries of the Banas River include Jhanapar, Kormar, Rampa and Odari. The Bansagar dam is a multistate, multipurpose reservoir on Son River, located to the north of the corridor, primarily for irrigation, drinking water supply to dry regions of Madhya Pradesh, Bihar, and Uttar Pradesh.

2.4 CLIMATE

The region lies in the tropical zone with three distinct seasons characterized by a hot summer, well distributed rainfall during the south-west monsoon season and mild winter (CGWB, 2013). The climate is largely warm and humid. The summer season sets in the month of March and lasts till June with highest temperatures peaking at around 45˚C. The average minimum and maximum temperatures observed are 31.6˚C and 34˚C, respectively (Chauhan & Quamar, 2013). Monsoon usually arrives towards the end of June with first spells between June 15th to June 20th. The area of the corridor experiences an average rainfall of 1211.6 mm (Census of India, 2011a). Summer rains due to thunderstorms are common between March and May months and are particularly important to extinguish summer fires. Winter sets in from November and lasts till the end of February. The average minimum and maximum temperatures during winter are 16.3˚C and 21˚C respectively. Sometimes during the month of January the temperature reaches around 1˚C. At least 5% of rains during the winters are due to the north-easterly monsoons.

2.5 SOIL AND MINERALS

The soils in the area are generally of clayey loam type with sandy loam soil. Some parts are covered with slightly deep soil and fine loamy soils. The southern region is covered by very shallow loamy soils. Minerals found in the area are coal, fire clay, ochers, marble, and the northern parts have iron ore deposits (Census of India, 2011).

2.6 FAUNAL DIVERSITY

Among large mammals, the carnivore species found in this corridor are the tiger (*Panthera tigris tigris*), leopard (*Panthera pardus fusca*), sloth bear (*Melursus ursinus*), dhole (*Cuon alpinus*), striped hyena (*Hyaena hyaena*), Indian jackal (*Canis aureus indicus*) and Indian wolf (*Canis lupus pallipes*); and large herbivores such as the nilgai (*Boselaphus tragocamelus*) and sambar (*Rusa unicolor*). Chital (*Axis axis*), barking deer (*Muntiacus muntjak*), blackbuck (*Antilope cervicapra)*, chinkara (*Gazella bennettii*) and chousingha (*Tetracerus quadricornis*) are also found in the corridor area. The corridor also harbours small carnivore mammals such as jungle cat (*Felis chaus)*, honey badger (*Mellivora capensis*), small Indian (*Viverricula indica*) and Indian palm civet (*Paradoxurus hermaphroditus*), Indian fox (*Vulpes bengalensis*) as well as Asiatic wild cat (*Felis lybica ornata*) and Rusty spotted cat (*Prionailurus rubiginosus*). The corridor also provides connectivity to the wild Asian elephant (*Elephas maximus*) population which migrate from Chhattisgarh and Odisha to Sanjay Tiger reserve. Elephants forayed into Bandhavgarh Tiger Reserve from Amarkantak (Auppur District) in 2018 and have also used the corridor areas for local movement. The area also supports variety of avian species; about 166 species of birds are recorded from the area (www.ebird.org). The mountainous regions and forests of the corridor also provide ideal nesting ground for vultures in the immediate vicinity of Bandhavgarh and Sanjay Tiger Reserves. Four resident vulture species i.e., White-rumped Vulture (*Gyps bengalensis*), Long-billed Vulture (*Gyps indicus*), Red-headed Vulture (*Sarcogyps calvus*) and Egyptian Vulture (*Neophron percnopterus)* and two migratory species viz. Himalayan (*Gyps himalayensis*) and Eurasian griffon (Gyps fulvus) have been documented (Kumar et al, 2015; Bhushan et al., 2021). While region-specific studies on the herpetofauna is lacking, of the 105-odd herpetofauna species documented in Madhya Pradesh (Chandra & Gajbe, 2005), a majority is likely to be found in this region. The gharial (*Gavialis gangeticus*), a critically endangered crocodilian, is found upstream on Son River and is protected in the Son Gharial Wildlife Sanctuary about 100 km north-east of the corridor.

A flock of Greylag geese (Anser anser), a winter migratory to central India, observed flying close to one of the lakes in the corridor area. The district of Shahdol, which comprises a large part of the corridor, is known for its lakes, from which it derives its name, Shah = a thousand, dol = lakes.

2.7 REGIONAL DEMOGRAPHY

With a major portion of the corridor comprised in the districts of Shahdol, Umaria, and Koriya, we present the regional demography focused on these three districts. The total population of these three districts is 2,369,738 with about 77.4% of the population residing in rural areas. The population densities of Shahdol and Umaria are 172 persons per km^2 and 158 persons per km^2 (compared to the state's 236 per km^2), and of Koriya 100 persons per km^2 compared to the state's 189 per km^2. The literacy rate of the three districts is 57.33% (Shahdol 66.67%, Umaria 65.89%, and Koriya 70.64%), lower than the states' average 70.44%.

The three districts show decadal growth rate of 17.39%, 24.96%, and 12.38% respectively (compared to Madhya Pradesh state's 20.3% and Chhattisgarh state's 22.59%) (Census of India, 2011a, 2011b, 2011b).

The major tribal communities are Gond, Baiga, Bhil, and Kol. There are 43 Scheduled Tribe communities as per the 2011 census, comprising 45.6% of the total population (Census of India, 2011a, 2011b, 2011b). These communities have rich ethnobotanic knowledge with several villages relying on forests for at least a part of livelihood or sustenance through collection of dietary and medicinal flora, fuelwood, and to graze livestock.

Table 1. Forest Department area relevant to the Bandhavgarh-Sanjay corridor.

Sr. No.	District	Forest Division	Type of forest	Area (in km^2)
1	Shahdol	North Shahdol	Reserve Forest	59.85
2			Protected Forest	38.15
3		South Shahdol	Reserve Forest	71.88
4			Protected Forest	26.62
5	Umaria	Umaria	Reserve Forest	64.09
6			Protected Forest	18.80
7	Anuppur	Anuppur	Reserve Forest	49.15
8			Protected Forest	32.26
9	Koriya	Manendragad	Reserve Forest	10.87
10			Protected Forest	72.31
11		Total	Reserve Forest	255.84
12			Protected Forest	188.14
13			**Total**	443.98

Note: Figures from North Shahdol Division Work Plan (2016-17 to 2025-26), South Shahdol Division Work Plan (2018-19 to 2027-28), Umaria Division Work Plan (2017-18 to 2026-27), and Anuppur Division Work Plan (2008-09 to 2017-18). Note that not entire forest divisions form Bandhavgarh-Sanjay corridor.

2.8 HISTORY OF FOREST PROTECTION AND MANAGEMENT

The Bandhavgarh Tiger Reserve, notified in 2007, comprises Bandhavgarh National Park (notified 1968) and Panpatha Wildlife Sanctuary (notified 1983). The Sanjay Tiger Reserve, notified in 2011, comprises Sanjay National Park (notified 1981) and Dubri Wildlife Sanctuary (notified 1975). Guru Ghasidas National Park was carved out of Sanjay National Park after the state of Chhattisgarh separated from Madhya Pradesh in the year 2000. Prior to declaration as protected areas, Bandhavgarh and part of Sanjay were a part of the hunting grounds, locally called Shikargarh, of the erstwhile princely state of Rewa, whereas Guru Ghasidas National Park was a hunting ground of the princely state of Surguja. About a hundred tigers were killed by each ruling king in the region. Maharaja Ramanuj Saran Singh Deo, the last ruler of the Surguja State, is noted to have hunted over 1,700 tigers during his rule, and is also noted to have hunted the last cheetah of India in 1951 in the present-day district of Koriya which forms an integral part of the wildlife corridor on the side of the state of Chhattisgarh. The white tiger, famously remembered as Mohan, was captured by Raja Martand Singh of Rewa State in 1951 when he shot the mother tiger and captured four cubs, one of which was white. One Forest Range of Sanjay Tiger Reserve, where the tiger was supposedly captured, is named Mohan. The progeny of Mohan the white tiger is spread across the zoos of the world, in North America, Europe, as well as nationally in India.

The districts of Shahdol, Umaria, and Anuppur were a part of the Rewa administrative division, which were separated as Shahdol Division in 2008. Shahdol Circle was formed comprising working forest divisions of these districts, whereas Manendragarh is a part of the Surguja Circle of Chhattisgarh. The area under Forest Department is summarized in Table 1 (See Annexure A for list of Forest Ranges).

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The State Forest Department has created water-retaining structures in areas of the corridor to sustain wildlife during the dry season.

3. METHODOLOGY

3.1 SURVEY DESIGN

The study area covered 4753 km^2 area divided into 388 grids of 3.5 x 3.5 km (12.25 km^2) spanning areas within and around the least-cost paths identified by Qureshi et al. (2014) and NTCA (2020). We considered a distance from 3.5 km up to 15 km on both the sides of the identified least cost path corridor, depending upon the land use pattern, land ownership, and given considerable forest cover that could be preferred by tigers and leopards (Fig 2a, 2b). The survey datasheets are provided in Annexure B and the grid files in Annexure C.

A total of 2756.25 km^2 (225 grids) was surveyed intensively for tiger and leopard habitat use on the Madhya Pradesh side of the corridor (occupancy study area), with permission from the Madhya Pradesh Forest Department. All grids contained at least a portion of land governed by the state forest department and revenue land under agriculture.

No field surveys were conducted on the Chhattisgarh side of the corridor owing to delays in receiving permits, hence data was only drawn from remotely sensed imagery) (Fig 2a).

The study area comprised government land under the Forest Department as Reserved Forest (RF) and Protected Forest (PF), and revenue land. Administratively, the Madhya Pradesh portion of the study areas is under the Shahdol Circle, covering parts of North Shahdol Forest Division, South Shahdol Forest Division, Umaria Forest Division, Anuppur Forest Division, and a part of Sidhi Forest Division of Rewa Circle. On the Chhattisgarh side of the corridor, it falls in the Manendragarh Forest Division of Surguja Circle.

The forest complex of Bandhavgarh and Sanjay Tiger Reserves and Shahdol Forest Circle comprise 42 Forest Ranges, of which 13 are a part of the corridor and nine and eight, respectively, of Bandhavgarh and Sanjay Tiger Reserves (Fig 2a; Annexure A).

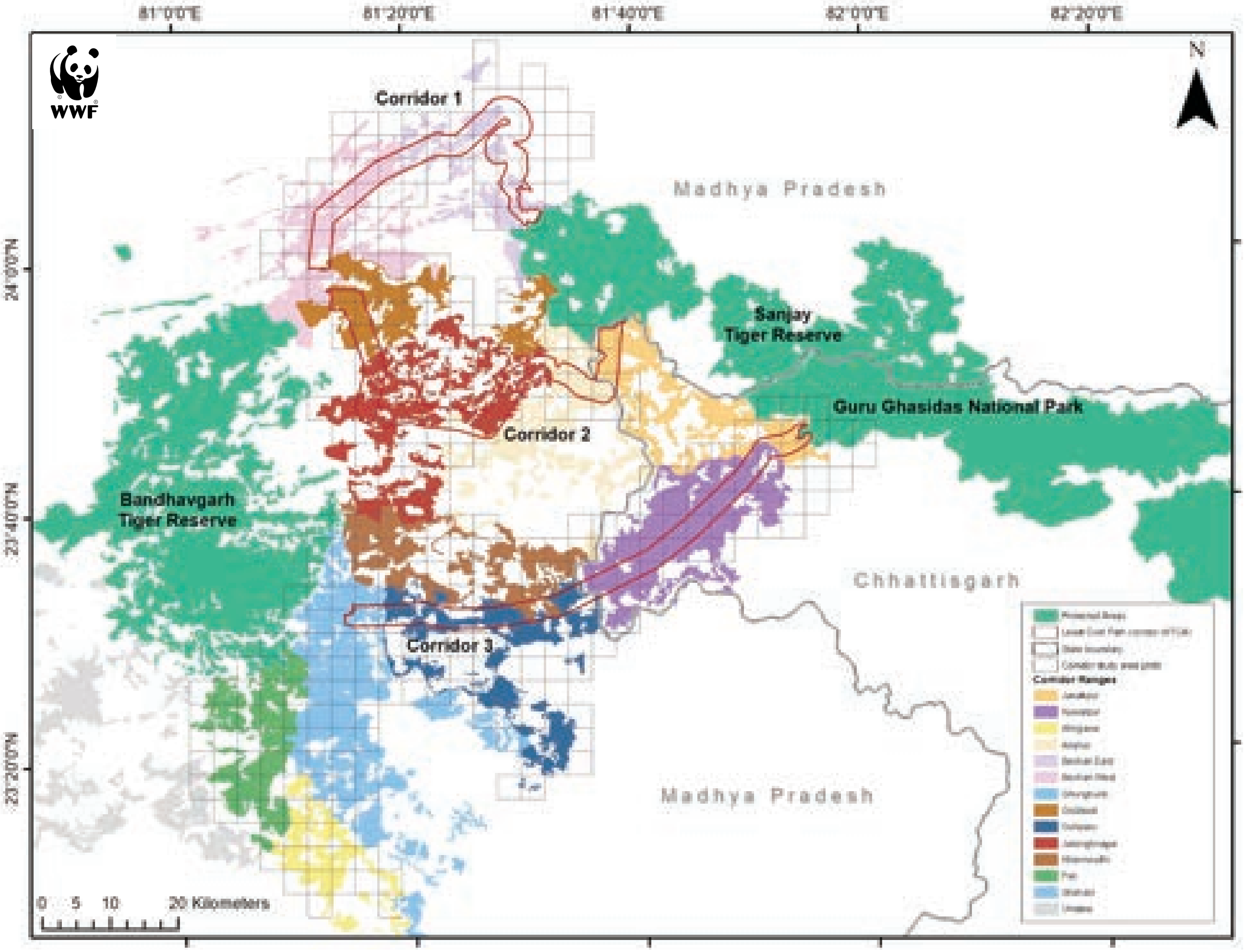

Fig 2a. Study grids and the least cost path corridor connecting Bandhavgarh and Sanjay Tiger Reserves, and Guru Ghasidas National Park, corridor Forest Ranges, and study grids.

The least cost path corridors identified between the Protected Areas are three geographically distinguished areas;

Corridors 1 and 2 pass through North Shahdol Forest Division, connecting Panpatha Buffer range of Bandhavgarh and Dubri range of Sanjay.

Corridor 3 connects Dhamokhar and Manpur buffer ranges of Bandhavgarh with Pondi and Mohan ranges of Sanjay via South Shahdol Forest Division, parts of Umaria and Anuppur Forest Divisions, and Guru Ghasidas National Park in Chhattisgarh.

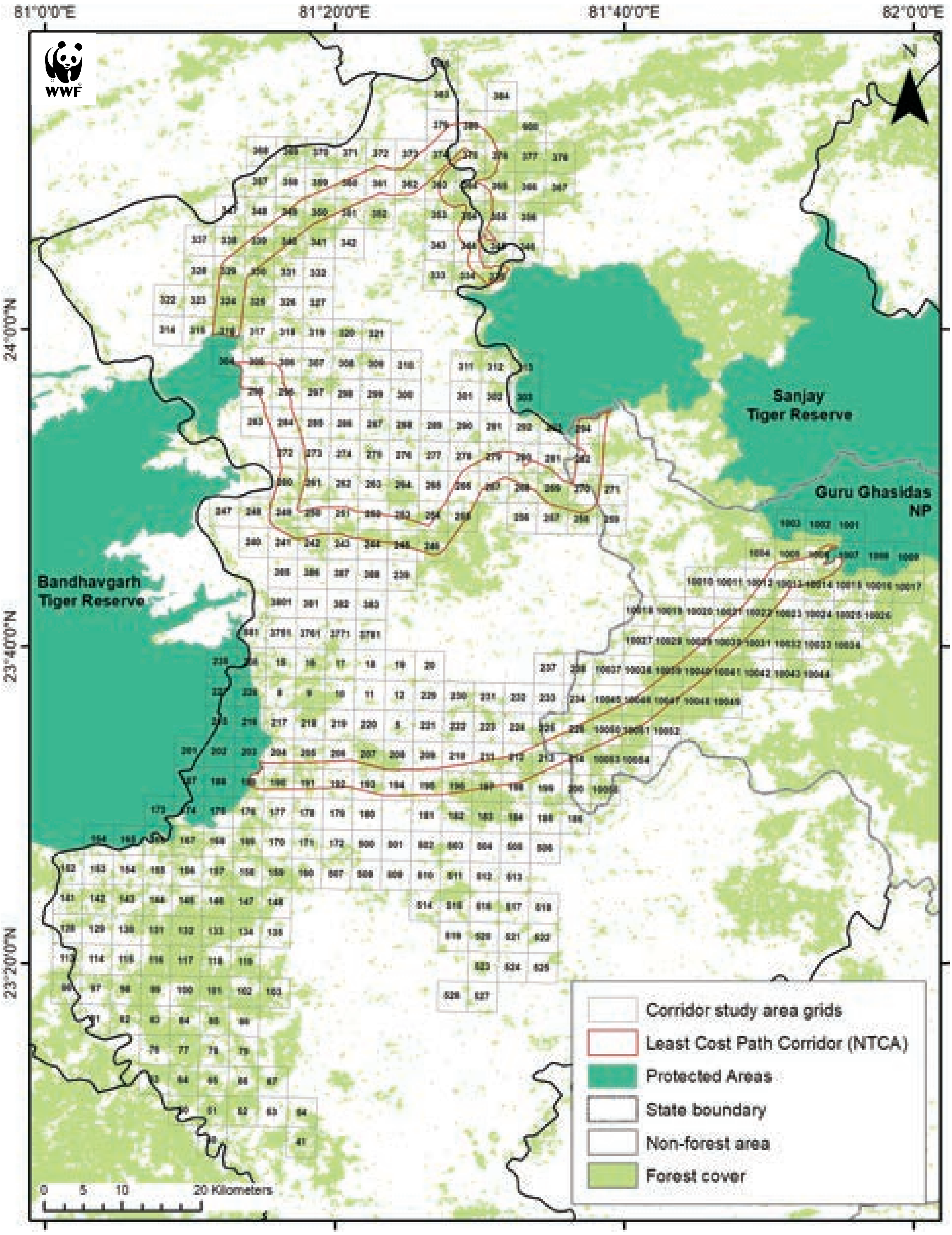

Fig 2b. Labelled corridor study area grids.

A pugmark of a leopard (*Panthera pardus fusca*) on one of the kuchha-roads connecting two villages through the corridor.

A pugmark of a tiger (*Panthera tigris*) in one of the kuchha-roads connecting two villages through the corridor.

Chinkara (*Gazella bennettii*) is one of the antelopes found in the corridor areas.

Chital (*Axis axis*) pellets in one of the corridor areas.

3.2 OCCUPANCY

To assess tiger and leopard habitat use, a sign survey was conducted in grids by sampling selected grids (Fig 2b). Surveys were conducted along forest trails in 225 grids, in each of which surveyors covered 3.5 km on foot. Data was collected on 500 m long spatial replicates of trails. Detection (1) and non-detection (0) data of target species were recorded on each segment following protocols adopted by Karanth et al., 2011 and Srivathsa et al., 2017. Surveys were conducted between 0500 hrs and 1200 hrs for direct and indirect evidences of mammal species presence (scrapes, rake, scat, pug marks, and direct sightings). Covariate data was also collected for each segment including wild ungulate prey presence, human presence (direct and indirect such as foot trails and signs of wood extraction), and habitat status (vegetation type, tree densities, and floral diversity). Evidences of anthropogenic disturbances such as signs of lopping, livestock grazing and fuelwood collection were also recorded within each grid and remotely sensed data was collated for some additional variables (Table 2).

We analysed our data using a model that accounts for spatial clustering of the response variable, given that animal signs along trail segments are likely to be spatially auto-correlated as per Hines et al. (2010). Analyses were implemented in program MARK (ver. 9.0, White and Burnham, 1999). This model has four parameters: Ψ - the probability that the segment is used by the species, p - the probability of detecting the species, and θ and θ' - the probabilities of habitat use of a segment given the non-use and use of the previous segment respectively. In our analysis, we used a two-step approach to model parameters of interest, to first identify factors that explained spatial variation in detection probability, and then modelling variation in Ψ (Karanth et al., 2011, Chanchani et al., 2015). We fit 30 and 15 models, respectively, to estimate habitat use probabilities for tigers and leopards, and assessed model support using AIC (Burnham and Anderson, 2002).

Table 2. Covariates collected along the sampled units and using remote sensing and their expected influence on p and Ψ.

Covariate (collated for every grid)	Description	Observed range of values (mean (SD))	Parameter and expected influence	Reference
Weather	2 categories (Clear - 1 and rainy - 0). Considered only for the day of the survey, with the expectation that rainfall would obscure signs	0.72 (0-1)	p (-) for rainy and p (+) for clear	
Wild ungulates (Encounter rate)	Segment wise encounter rate index of all wild prey species combined. Species include: (1) Tiger prey species: spotteddeer+chinkara+nilgai+sambar+barkingdeer+wildpig (2) Leopard prey species: spotteddeer+chinkara+nilgai+sambar+barkingdeer+wildpig+langur. summation of presence of each species/total trail length in grid (km).	Tiger 0.48 (0-2) Leopard 0.57 (0-2)	psi (++)	Barber-Meyer et al., 2012

Covariate (collated for every grid)	Description	Observed range of values (mean (SD))	Parameter and expected influence	Reference
Landscape permeability (mean)	Raster values represent current. 0 = high resistance/low permeability, 0.4 = low resistance/high permeability. It represents landscape resistance values based on genetic connectivity between PAs using landscape variables known to affect tiger dispersal, such as land cover (forest, degraded or scrub forest, agriculture, built-up areas), human settlements, roads and railways, density of linear features.	5.18 (0.96-9.02)	*Ψ (++) with increasing permeability*	Thatte et al., 2018
Landscape Permeability (SD)		0.98 (0.014-3.613)		
Waterbodies (km)	Data was extracted form WWF HydroSHEDS dataset. Length of streams and rivers in km.	2.74 km - (0 11.33)	*Ψ* (+)	Lehner et al.' 2008
Distance to core (km)	Shapefiles of BTR and STR core files were used to calculate the distance to the corridor grids in km.	9.99 km (0-34.8)	*Ψ* (++)	-
Forest area (km^2)	Copernicus 100m data layer.	6.88 km^2 (0.16-14.45)	*Ψ* (++)	Buchhorn et al., 2020
Built-up area (km^2)		0.30 km^2 (0-2)	*Ψ* (-)	
Night lights	Data was used form NASA's Black Marble data set for the year 2018 at 1 km resolution. The raster value depicts the DN value (intensity).	4.80 (0-221.55)	*Ψ* (--)	Roman et al., 2018
Human density (persons per grid)	Data extracted from 2011 population census data. The village polygon file was converted to point file. Each grid polygon was given all the attributes of the point closet to its boundary. Human density was computed as the number of persons per grid.	108.35 per gird (0-1822.36)	*Ψ* (--)	Census of India, 2011

3.3 HUMAN-WILDLIFE CONFLICTS AND WILDLIFE CRIME

Data for (i) human injury and loss of life and (ii) livestock depredation and (iii) wildlife crime reports was obtained from Madhya Pradesh Forest Department for the years 2011-2019 (Madhya Pradesh Forest Department, n.d.). This data includes information on location of the incident at Forest Beat-level, date of the incident, and other details such as compensation paid to the loss-bearer in case of (i) and (ii) and case registered against the accused in case of (iii).

We mapped this data at Forest Beat-level since exact latitude – longitude coordinates were not available. We retained cases of human injury and loss of life at beat-level (as counts) and translated livestock depredation into year-wise incident recorded (1) and incident not recorded (0) per grid to understand the spatial extent of the recorded incidents. Cases of wildlife crime registered as a criminal offence resulting in death of a scheduled wild animal (Wildlife Protection Act, 1972) by the Madhya Pradesh Forest Department were also mapped and analysed at Forest Beat-level and Forest Division-level. We performed correlation and chi-square tests to understand statistically significant correlations between variables, particularly to understand correlations in the spatiotemporal patterns of the reported cases.

3.4 FOREST FIRE

Fire incident points were obtained from Fire Information for Resource Management System (FIRMS) MODIS Collection 6 (375 m resolution) as vector points (NASA, 2021) for years 2011 to 2019. This dataset was used to identify temporal (season-wise) and spatial (fire events in various land-use and land cover categories) in the corridor. We performed Pearson's r to test whether the correlation between fires in forest land and in non-forest lands were significantly correlated.

Under MODIS active fire detection, a hotspot/active fire detected is represented at the centre of a 1 km pixel and does not account for actual fire spread size. Each event is therefore represented as a vector point within the 1 km pixel (NASA, 2021a). MODIS also corrects for surface reflectance using atmospheric correction algorithm to avoid indicating reflections from leaf surface, water bodies, and man-made structures as fire events and provides brightness temperature (in Kelvin) (*ibid*).

3.5 LAND USE AND LAND COVER

We used the Copernicus Global Land Service (CGLS; 300 m resolution) for the years 2010 and 2019 (Buchhorn et al., 2020) to identify five broad-level land use and land cover categories, area under forest, area under agriculture, area under grasslands and shrubland, and built-up area. The 300 m resolution dataset is considered to have a good spatial consistency with good precision to monitor temporal vegetation changes (Fuster et al., 2020). These categories were identified at grid-levels (3.5 x 3.5 km). Land use and land cover data were analysed at grid-level to identify proportion (in km^2) of land under forest and non-forest cover, and changes in land use and land cover between the years 2010 and 2019.

3.6 VEGETATION COMPOSITION

The vegetation composition and structure of the corridor area was assessed concurrently with sign survey in the occupancy study area grids. Two circular plots of 15 m radius, one at the start and one at end point of the 3.5 km trail were surveyed to document floral composition indicative of the grid vegetation attributes. Attributes recorded included tree species, within the 15 m, whereas shrub species and percent cover composition were noted in a 5 m radius plot within the 15 m radius plot which was also surveyed to assess the shrubs and invasive species. Finally, forbs, grasses and herbaceous plant species diversity was recorded within a 1 m radius plot.

Grass species were later categorized as per their palatability status to herbivore animals. Grasses were graded A (highly palatable), B (moderately palatable) and C (palatable before flowering and in resource-scarce periods) (Gorade & Datar, 2014; Uikey, 2018; Panchal, 2018).

A checklist of the floral species including tree, shrubs, forbs & herbs and grasses which were recorded during sampling and observed during surveys has been included as Annexure D.

The collected data was analysed grid-wise to calculate density per hectare for trees and percentage cover of invasive species, and mapped using ArcGIS® 10.1 (Esri Inc, 2020). Forest type for each grid was also determined by calculating ratio of tree species present in the grid in order to profile tree densities and floral diversity vis-à-vis land use and land cover in the corridor area and habitat use by tigers and leopards.

4. RESULTS

4.1 HABITAT USE BY TIGERS AND LEOPARDS

Between December 2019 and January 2020, we surveyed 1,575 segments across 225 grids, covering a total distance of 683 km. This section discusses the habitat by tigers and leopards use in Bandhavgarh-Sanjay Corridor.

4.1.1 TIGER HABITAT USE

We expected that areas (grids) with abundant prey occurrence and extensive forest cover will be used more extensively by tigers, whereas grids with low proportion of forests will have high probability of use only if they are also associated with high prey and water availability. We used additive combinations of ten covariates to investigate factors influencing heterogeneity in tiger habitat use.

Rainfall (weather covariate) did not have a significant impact on detection probability (p). Detection probability was estimated to be 0.31 ±0.05 (95%CI 0.21-0.44). Among the 30 models, the best fit model (AIC weight = 669.09) that influenced tiger habitat use was the effect of prey availability and forest cover, with prey availability having a significant effect on habitat use (Fig 3a, 3b, and 5a; see Annexure E for grid-wise occupancies for the best fit model and details of all models). Since no single model was well supported (Table 4), the model-averaged estimates for habitat use Ψ value was 0.96 ±0.08 (95%CI 0.24-0.99), much higher than the naïve occupancy of 0.28. Grid-specific tiger habitat use estimates ranged from 0.03±0.05 in areas with low forest cover and lack of prey base to 1 ±0.00 in areas with moderate forest cover but a higher prey base (Fig 5a). Tiger occurrence probability was low 0.05 ±0.03 (95%CI 0.02-0.14) when the previous segment was not used (θ), and several orders of magnitude higher when the present segment was also used (θ' = 0.89 ±0.06, 95%CI 0.67-0.97).

Table 3. Model selection results for alternative parameterizations of detection probability as a function of covariates. A global structure was held for Ψ.

Model	AICc	AICc wt	Model Likelihood	k	-2log(L)
{Ψ(prey+forest+builtup+perm_mean+water+nlights+popdens) θ(.) θ'(.) p(.)}	669.09	0.50	1	11	645.85
{Ψ (prey+forest+builtup+perm_mean+water+nlights+popdens) θ(.) θ'(.) p(weather)}	669.14	0.49	0.97	12	643.67

Abbreviations: prey = prey encounter rate, forest = forest cover, water = waterbodies; perm_mean = mean value of landscape permeability for the grid, popdens = human population density (per grid), nlights = night lights; builtup = built-up area.

Table 4. Model selection results for Ψ as a function of covariates, and associated coefficient estimates for models with ΣAICcwt > 0.11

Model	AICc	AICc wt	K	-2log (L)	Estimated β (SE)		
					prey	Forest	water
Ψ(prey+forest) θ(.) θ'(.) p(.)}	663.41	0.25	6	651.02	8.36 (4.06)	0.26 (0.18)	
Ψ(prey) θ(.) θ'(.) p(.)}	664.54	0.14	5	654.27	7.8 (3.04)		
Ψ(forest+water+prey) θ(.) θ'(.) p(.)}	665.11	0.11	7	650.6		0.21(0.18)	-0.02

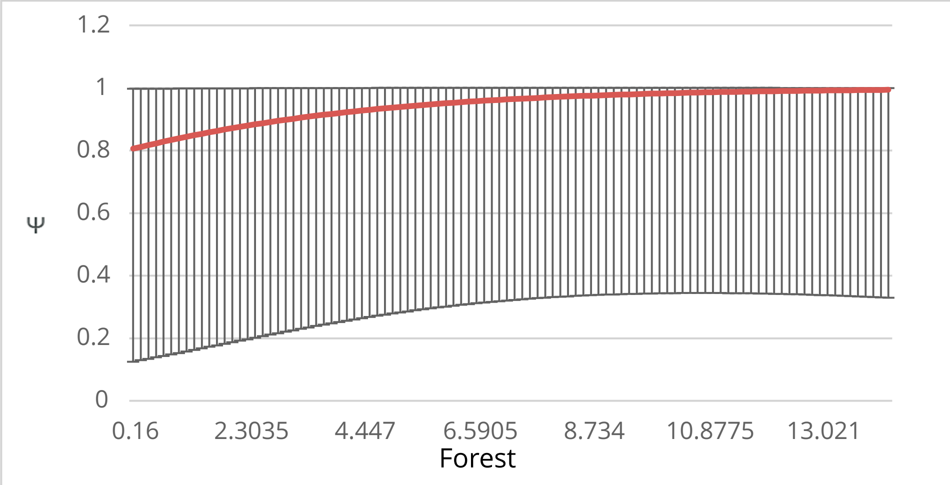

Fig 3a. Relationship between tiger habitat use and area under forest cover (in km^2). Dashed lines represent 95% confidence intervals.

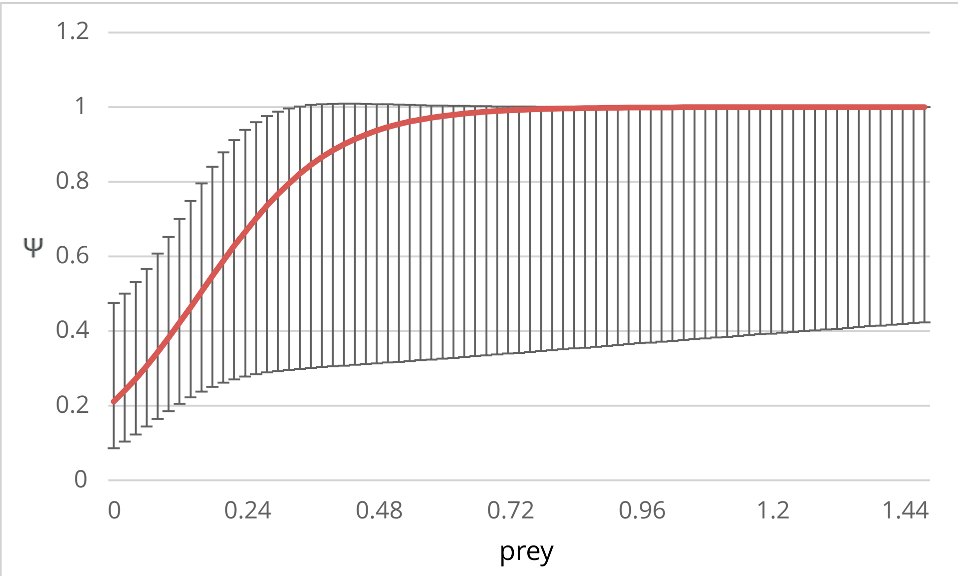

Fig 3b. Relationship between tiger habitat use and the prey encounter rate. Dashed lines represent 95% confidence intervals

4.1.2 LEOPARD HABITAT USE

We used seven covariates to understand factors that affect leopard habitat use (Table 2). The expectations for leopard habitat use were similar to that of the tiger; we expected leopard habitat use to be higher in areas with extensive forest cover and wild prey availability. However, given that it is among the most resilient of the big cats, with studies in central India showing leopards to have maintained migration–drift equilibrium in some corridors, where genetic drift which may result from isolated populations is balanced by migration of individuals from one population to another (Dutta et al., 2013), we considered that human population at moderate levels might only minimally influence leopard habitat use in this corridor.

We found that weather as a detection covariate did not have a significant impact on detection probability (p).

Detection probability was estimated to be 0.31 ±0.06 (95%CI 0.21-0.44). Of the 15 models, the best fit model that significantly affected leopard habitat use was prey occurrence and forest cover, with prey availability having a significant effect on habitat use (Fig 4a, 4b; see Annexure E for grid-wise occupancies for the best fit model and details of all models). Since no single model was well supported (Table 6), the model-averaged estimates for habitat use Ψ value was 0.93 ±0.11 (95%CI 0.26-0.99), much higher than the naïve occupancy of 0.22. Grid-specific leopard habitat use estimates ranged from 0.24±0.13 in areas with low forest cover and lack of prey base to 1 ±0.00 in areas with moderate forest cover but a higher prey base (Fig 5b). Leopard occurrence probability was low 0.05 ±0.03 (95%CI 0.02-0.14) when the previous segment was not used (θ), and higher when the present segment was also used (θ' = 0.89 ±0.06, 95%CI 0.68-0.97) and p was 0.31 ±0.05 (95%CI 0.21-0.44).

Table 5. Model selection results for alternative parameterizations of detection probability as a function of covariates. A global structure was held for Ψ.

Model	AICc	AICc Weights	Model Likelihood	Num. Par	-2log(L)
{Ψ(prey+forest+water+popdens)} θ(.) θ'(.) p(.)}	668.56	0.53	1	8	651.89
{Ψ(prey+forest+water+popdens)} θ(.) θ'(.) p(weather)}	668.88	0.46	0.85	9	650.04

Abbreviations: prey = prey encounter rate, forest = forest cover, water = waterbodies; popdens = human population density (per grid).

Table 6. Model selection results for Ψ as a function of covariates, and associated coefficient estimates for models with ΣAICcwt > 0.19.

Model	**AICc**	**AICc Weights**	**k**	**-2log(L)**	**Estimated β (SE)**			
					prey	**forest**	**nlights**	**Popdens**
Ψ(prey+forest) θ(.) θ'(.) p(.)	666.12	0.28	6	653.73	8.36(3.90)	0.21(0.19)		
Ψ(prey+forest+pop dens) θ(.) θ'(.) p(.)	666.7338	0.21	7	652.21	7.54(4.06)	0.26(0.18)		-0.003(0.003)
Ψ(prey+forest+nlights) θ(.) θ'(.) p(.)	666.93	0.19	7	652.42	7.2(3.77)	0.27(0.24)	-0.05(0.04)	

Abbreviations: prey = prey encounter rate, forest = forest cover, popdens = human population density (per grid), nlights = night lights.

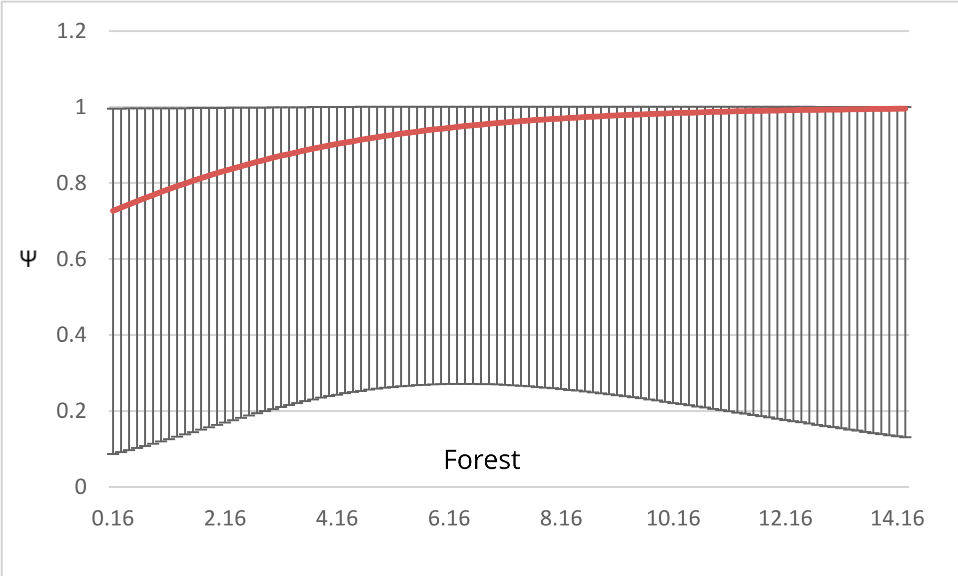

Fig 4a. Relationship between leopard habitat use and area under forest cover (in km²). Dashed lines represent 95% confidence intervals.

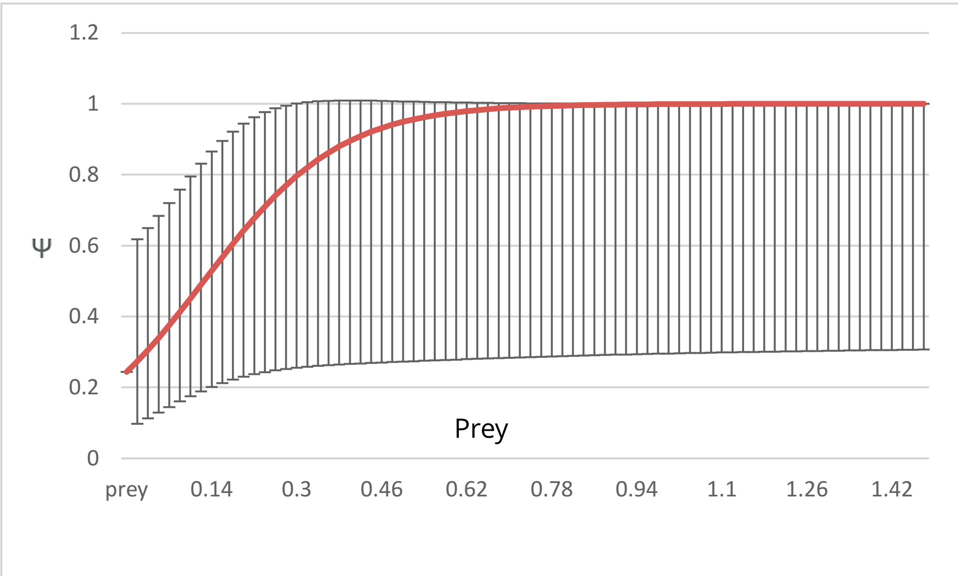

Fig 4b. Relationship between leopard habitat use and the prey encounter rate. Dashed lines represent 95% confidence intervals

Of the estimated 132 tigers in the part of the landscape comprising the Bandhavgarh-Sanjay corridor, 16% (n = 21) were photo-captured in the corridor areas of North Shahdol, South Shahdol, and Umaria forest divisions, with an average density of 1.26 per 100 km^2(Jhala et al., 2020). This density is lower than that for Bandhavgarh (5.83 ±0.57; est. 104 unique tigers) but higher than Sanjay (0.23 ±0.1; est. 5 unique tigers) (*ibid*). We found that wild prey species and forest cover played an important role in determining tiger and leopard habitat use in the corridor. Prey species densities were not determined under this study, and it remains to be studied under NTCA Phase III and IV monitoring as well, but we found high prey encounter rate for large-bodied prey including chital,sambar, nilgai, as well as for barking deer and chinkara.

Leopards were found to be tolerant of human presence, showing a sigmoid-shaped decline in habitat use as human population increases, indicating that in presence of ample forest cover and prey base, leopards tolerate certain thresholds of human populations (average density of humans in the surveyed grids = 108.35 (SD ± 162.8) persons per grid).

Free-range grazing in the corridor is a common feature, often requiring lopping for trees to gain access to foliage.

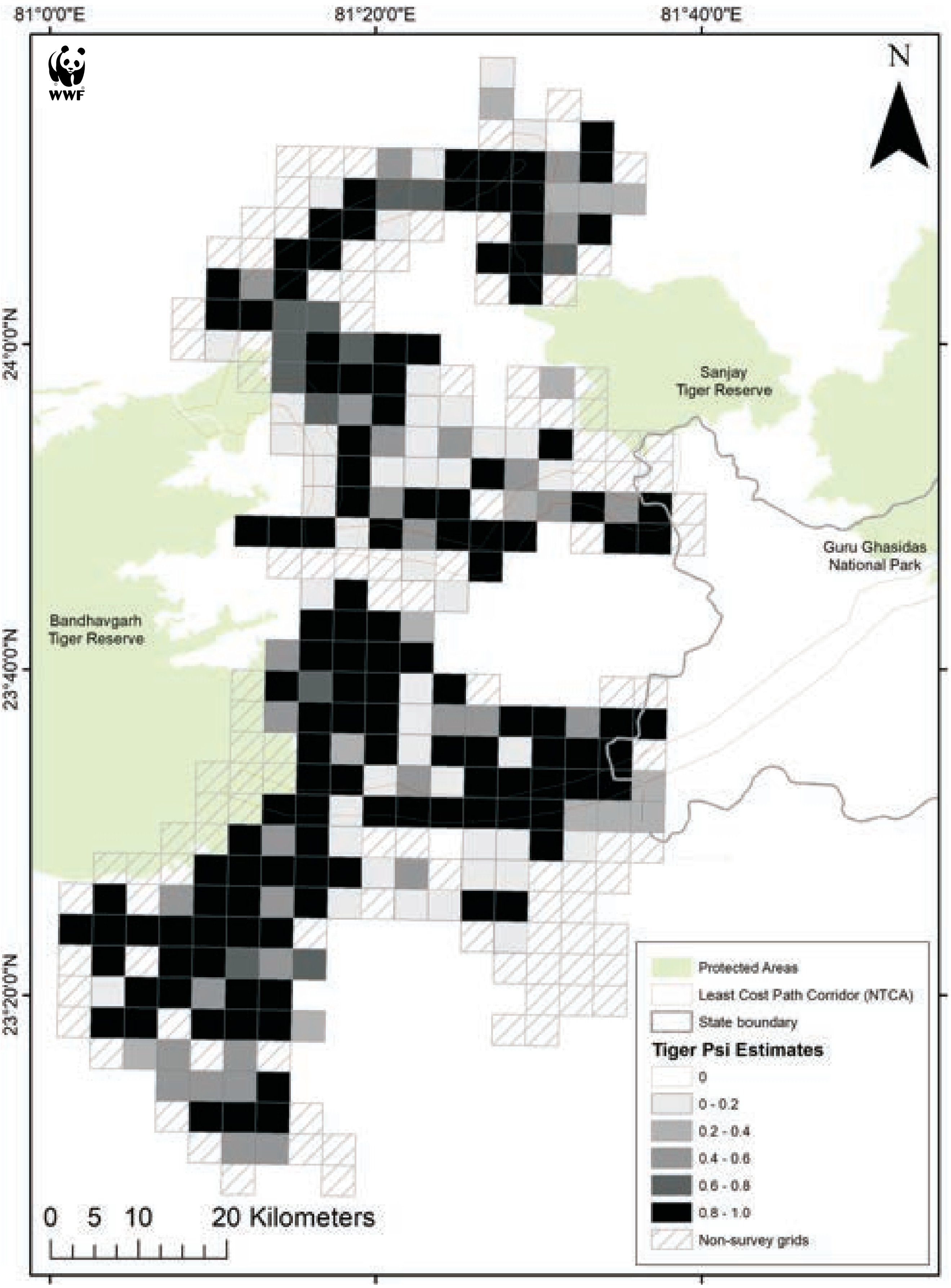

Fig 5a. showing spatially explicit habitat use estimates at the grid scale from the top model (Ψ(prey+forest) θ(.) θ'(.) p(.)) for tigers

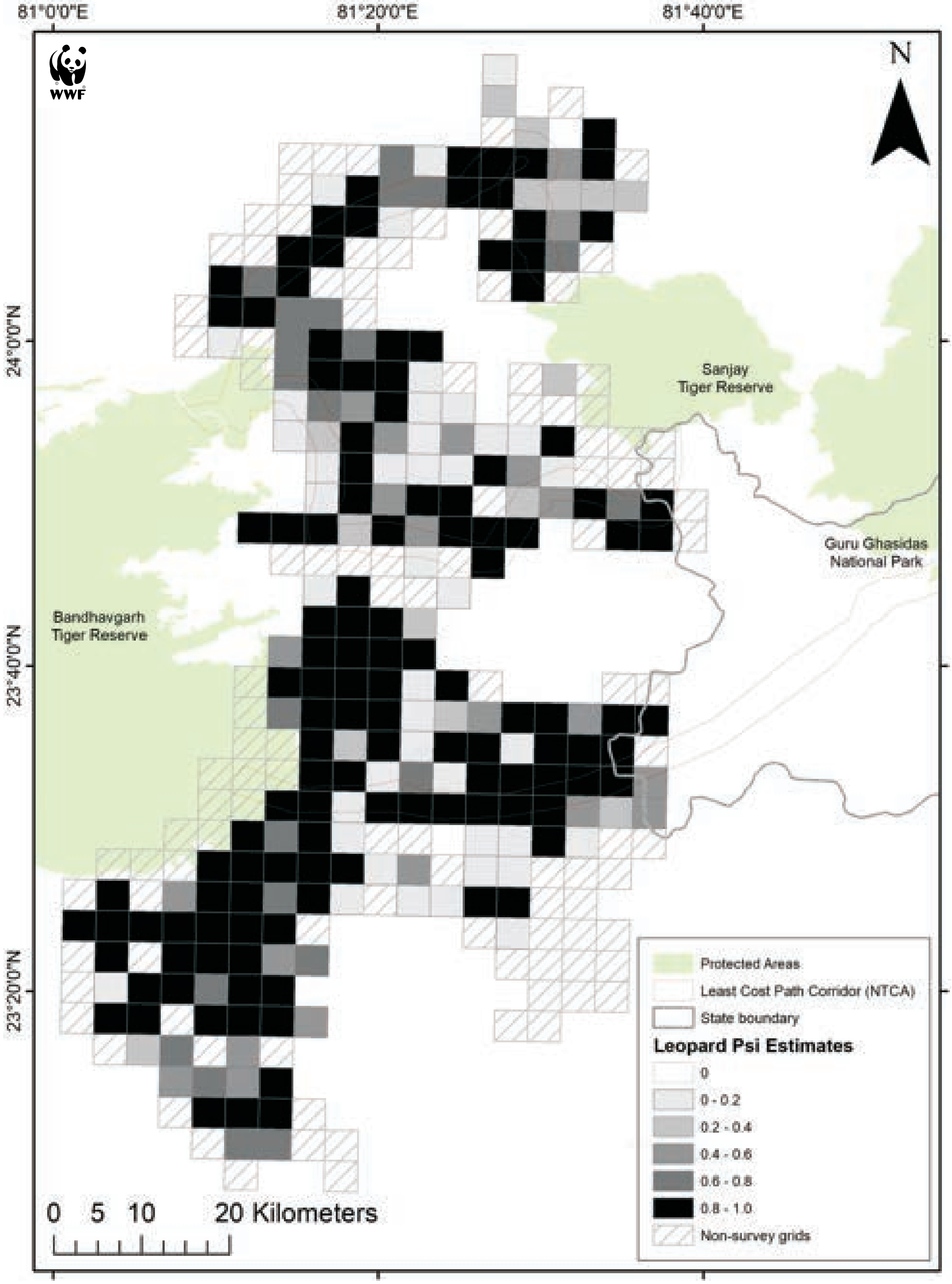

Fig 5b. showing spatially explicit habitat use estimates at the grid scale from the top model (Ψ(prey+forest) θ(.) θ'(.) p(.)) for leopards

4.1.3 HUMAN ACTIVITY

Human activity was measured in terms of human presence and activity in the forest, open-ended questions with Forest Department and local communities, as well as intensity of signs such as wood cutting and lopping, trails and livestock. Direct human presence was found in 49% of the survey grids. Pressures on the forest in the form of wood extraction in terms of percentage of total grids was 12.74%, most which was from wood cutting and lopping. NTFP collection was detected (during the survey)/ reported (for summer season) in 46% of grids, and livestock presence was observed in 95% of the grids. The direct human-use of these forests is legally limited to extraction of fallen dry wood, NTFP extraction, and livestock grazing in protected forests, and tree cutting and lopping are allowed under *nistar* rights in designated areas.

Wood extraction from the corridor

4.2 HUMAN-WILDLIFE CONFLICT

In this section, we map and analyse patterns of human carnivore conflict in the Shahdol Circle, parts of which lie within the corridor. We focus on spatial and temporal patterns of (i) human injury and loss of life and (ii) livestock depredation by wild animals, for the duration of 2011-2019 (Annexure F).

In terms of cases of human injury or loss of life registered by the Forest Department, Shahdol Circle ranks the highest (28.69% of total cases for eight Forest Circles and six Tiger Reserves) in the state of Madhya Pradesh, followed by Jabalpur Circle (16.92%) and Chhatarpur Circle (14.88%) (Madhya Pradesh Forest Department, n.d.). Of these, majority of cases in all the three divisions were attributed to jackals, followed by sloth bears and wild pigs.. Of 94 cases of tiger encounters recorded between 2011-2019 among eight Forest Circles and six Tiger Reserves of Madhya Pradesh, Shahdol Circle ranks second (29.78%) after Bandhavgarh Tiger Reserve (31.91%). With respect to cases attributed to leopards, Shahdol ranks fourth (10.75%) after Balaghat (11.39%), with Jabalpur (17.08%) and Chhatarpur (15.18) ranking first and second, respectively. Of the eight Forest Circles and six Tiger Reserves, Shahdol Circle has recorded highest number of sloth bear attack cases (27.89%), followed by Balaghat (12.84%), and Chhatarpur (10.91%) (Fig 6a).

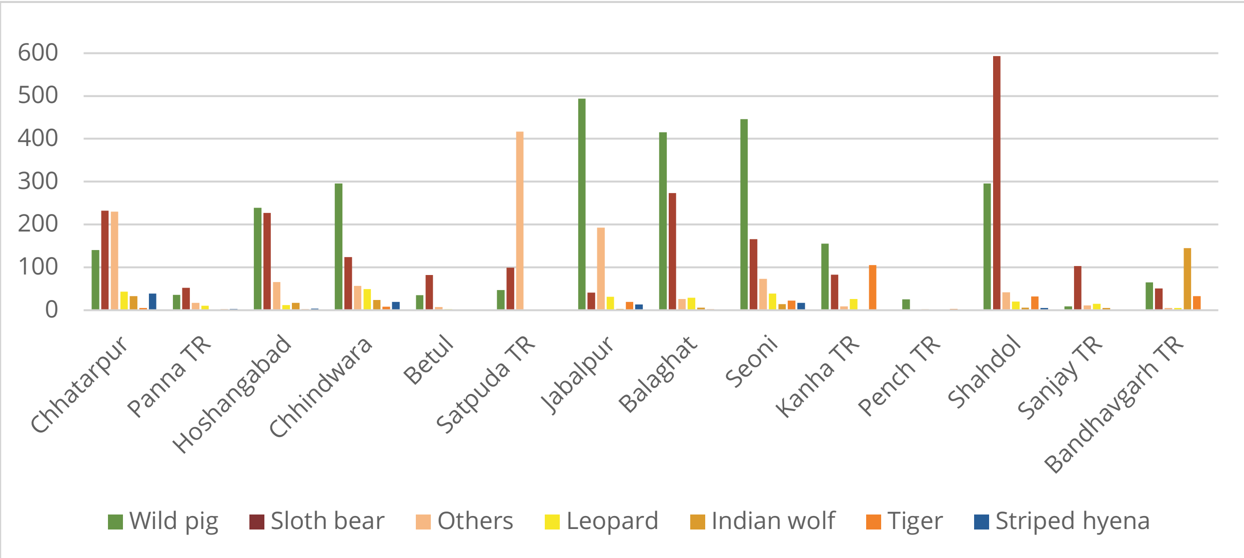

Fig 6a. Cases of human injury or loss of life in eight Forest Circles and six Tiger Reserves of Madhya Pradesh for 2011-2019. Note: Shahdol, Sanjay TR and Bandhavgarh TR form the Bandhavgarh-Sanajy corridor area in the state of Madhya Pradesh.

With respect to livestock depredation by wild animals (for duration of 2011-2019), Shahdol Circle ranks second with an average of 672 livestock depredation cases reported per year, after Bandhavgarh Tiger Reserve (874 cases per year), and is followed by Kanha Tiger Reserve (514 cases per year) and Balaghat Circle (386 cases per year). Of the total cases, majority of the cases (53.92% to 72.2%) for these three areas were attributed to tigers, and 26.07% to 43.97% of the cases to leopards. Livestock depredation cases attributed to tigers in Shahdol Circle were 56.10% and for leopards 38.72%, and the rest were attributed to wild canids, hyena, and other wildlife (5.17%) (Fig 6b).

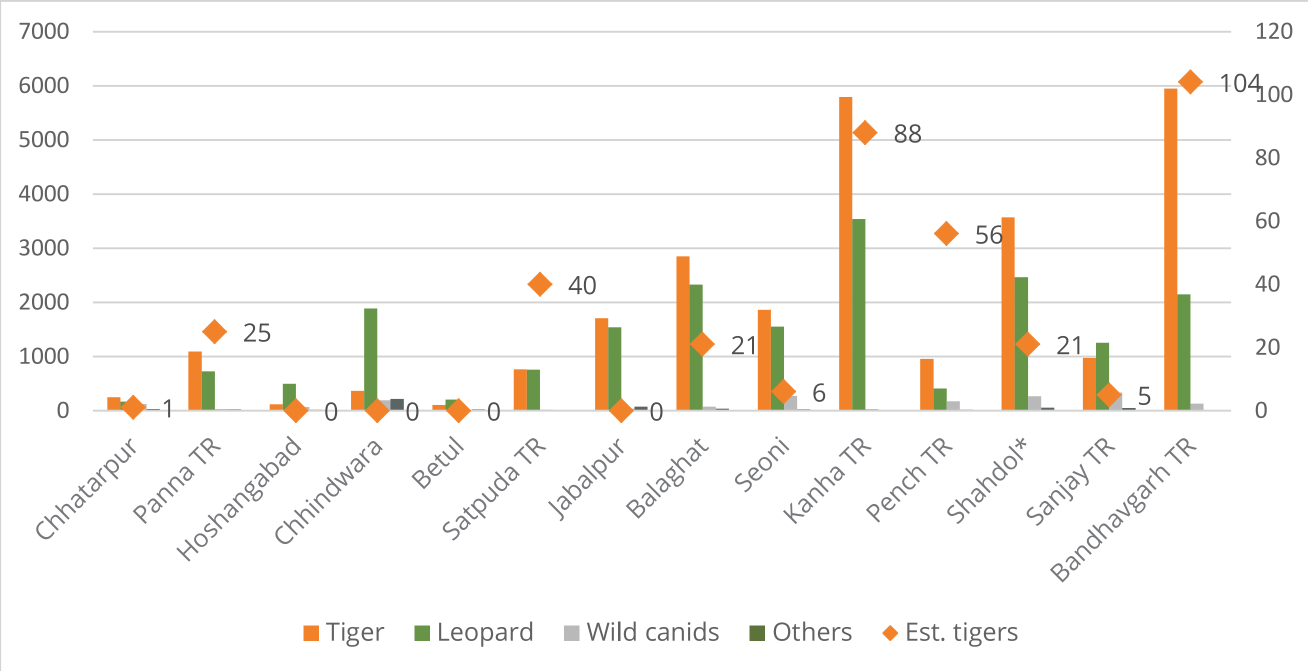

Fig 6b. Cases of livestock depredation in eight Forest Circles and six Tiger Reserves of Madhya Pradesh for 2011-2019. Orange dots denote estimated tiger numbers in each Forest Circle as per All India Tiger Estimation 2018 figures (Jhala et al., 2020). Note: Shahdol Circle, Bandhavgarh and Sanjay Tiger Reserves form a part of the Bandhavgarh-Sanjay Corridor.

4.2.1 Human injury and loss of life

In the corridor study area, Umaria Forest Division recorded the highest number of deaths caused by tiger (n = 9), in addition to one from South Shahdol between 2014-2018, most of the incidents were reported in Ghunghutti and Pali Forest Ranges. Most number of injuries (n = 11) were also recorded in Ghunghutti and Pali ranges. One case of loss of life was recorded from outside of corridor area in Keswahi Range of South Shahdol Forest Division (Fig 7).

Three instances of loss of life due to leopards were recorded from the corridor, two in South Shahdol and one in Umaria Forest Division. Most of the cases of encounters with leopards resulted in injuries, withseven cases recorded from Umaria (n = 4), North Shahdol (n = 2), and South Shahdol (n = 1). Cases of leopard attacks from Anuppur Division (n = 3) and Amjhor Forest Range of North Shahdol, both not a partof the study area but forming contiguous forests, were also recorded.

Loss of life due to Sloth Bear was recorded from across the forest divisions, most cases from South Shahdol Forest Division (n = 4), three from North Shahdol, and one from Umaria of the total eight recorded cases. Sloth Bear encounters are spread out across the forested areas of this region, with 13 cases recorded from adjoining forest areas outside of the corridor study area. A total of 105 cases of injury are recorded from the study area, most of which from South Shahdol (n = 48), followed by North Shahdol (n = 46), and Umaria (n = 12) Forest Divisions. Contiguous forests outside the study area recorded 227 cases. Within the study area, highest number of cases (n = 6) were recorded from Jaisinghnagar and Khannoudi ranges, and outside the study area, from Jaitpur and Keshwahi Forest Ranges.

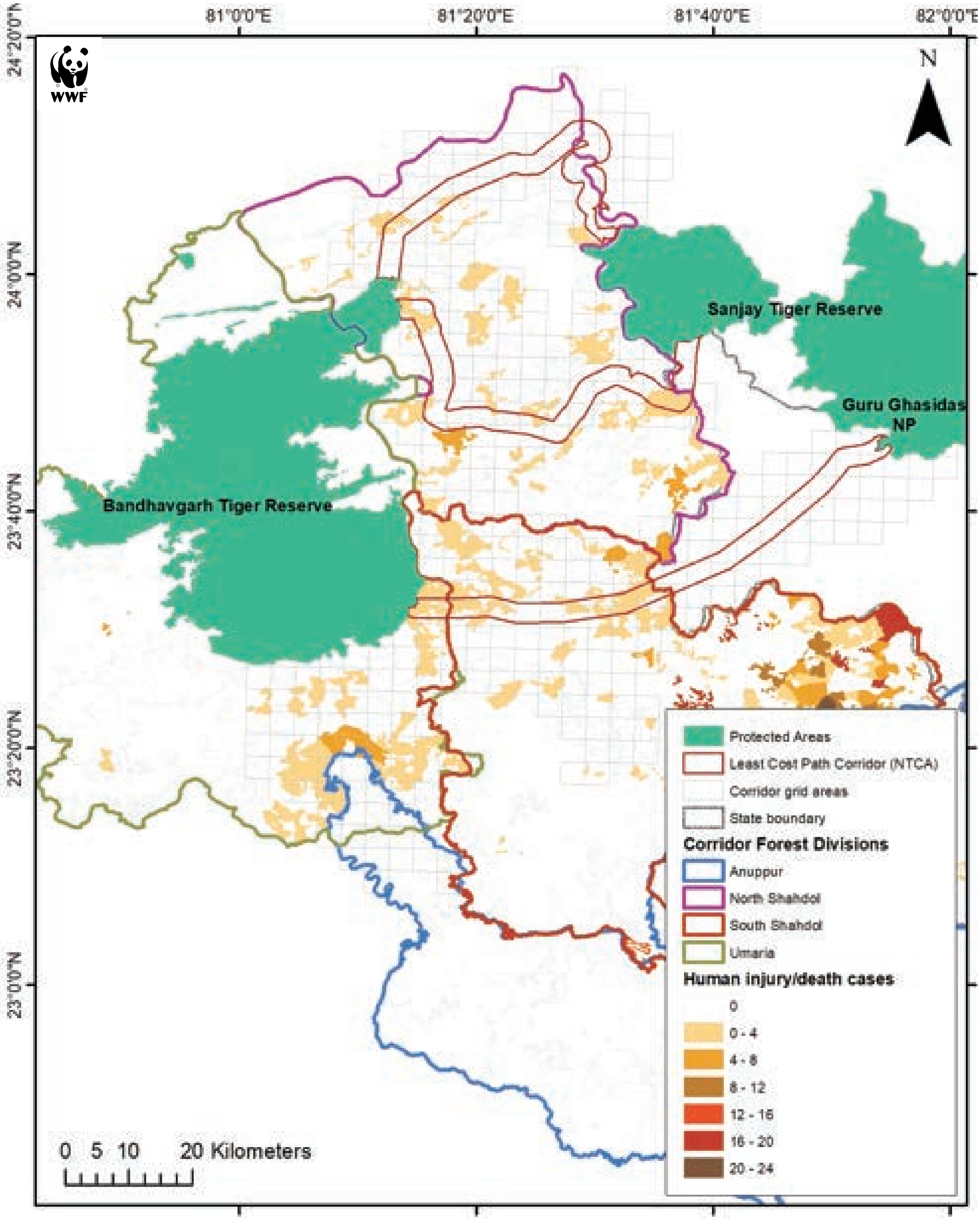

Figure 7. Forest Beat-wise locations of reported human injury/loss of life cases attributed to tigers, leopards and sloth bears for 2011-2019 in the corridor area (denoted by grids and least cost path corridor) and the adjoining forest areas.

Domestic ungulates cattle using the corridor.

4.2.2 Livestock depredation

Livestock depredation by wild animals in the corridor area is showing a gradual increase (r^2 = 0.157, p = 0.29 in Shahdol; r2 = 0.255, p = 0.165 in Bandhavgarh; and r^2 = 0.555, p = 0.02 in Sanjay Tiger Reserves). The overall change in the duration of nine years (2011-2019) is not significant for tigers (r^2 = 0.01, p = 0.793) but is showing an increase for livestock depredation by leopards (r^2 = 0.762, p = 0.002).

Of the three Forest Divisions of Shahdol Circle that are a part of the corridor, Umaria Division has shown the greatest number of livestock depredation cases attributed to tigers (73.20%), followed by North Shahdol (17.08%) and least by South Shahdol (8.62%). On the other hand, cases attributed to leopards were highest in South Shahdol (42.49%), followed by Umaria (27.04%), and North Shahdol (17.42%) (Fig 8a, 8b).

Domestic ungulates goats using the corridor.

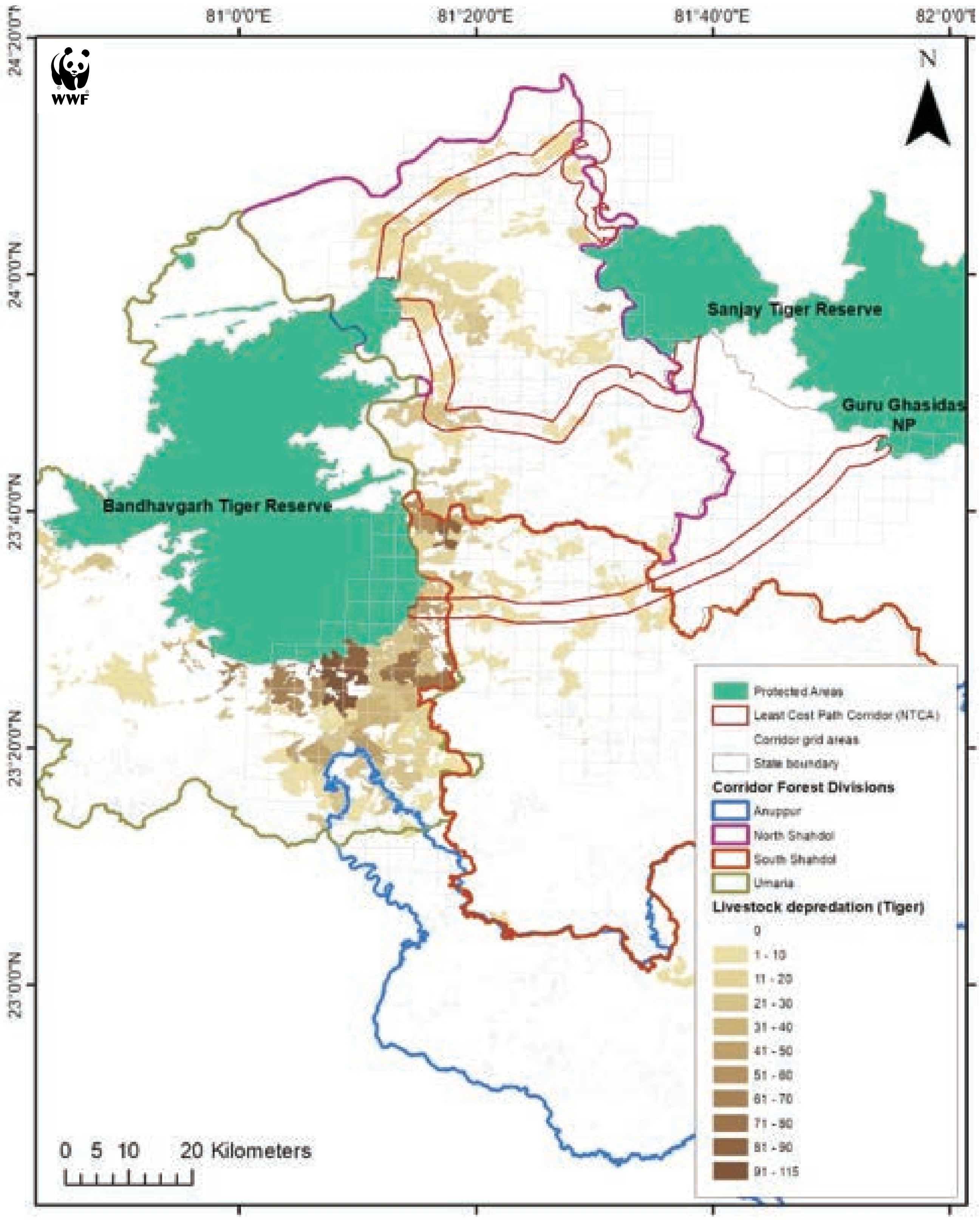

Fig 8a. Livestock depredation incidents attributed to tigers mapped at Forest Beat-level for the corridor and surrounding areas.

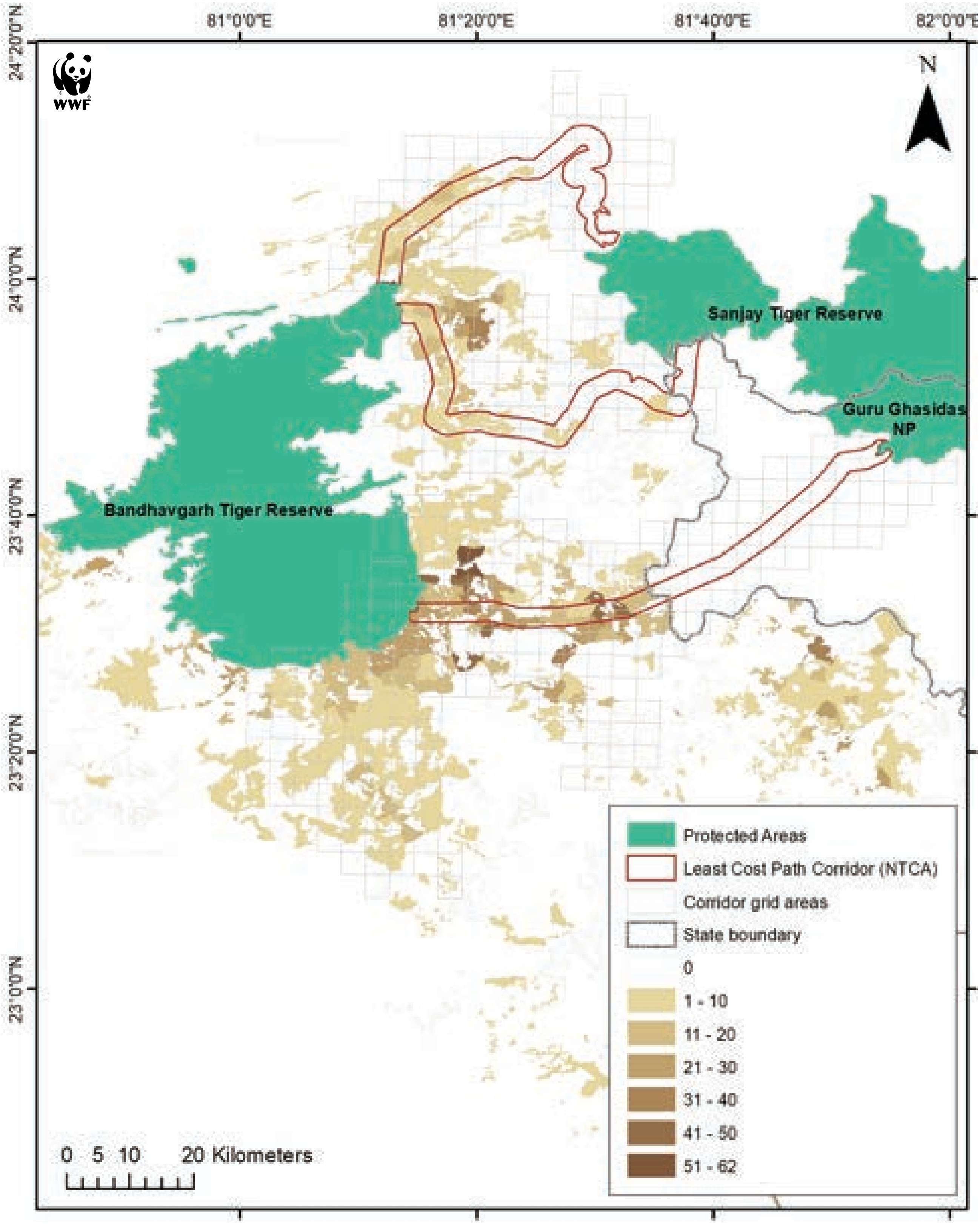

Fig 8b. Livestock depredation incidents attributed to leopards mapped at Forest Beat-level for the corridor and surrounding areas.

Temporal patterns of incidents between tigers and leopards differed if cases per month were aggregated (Fig 9a, 9b). While cases peaked in the month of January for tigers (n = 362), the peak was in April (n = 322) for leopards. Similarly, lowest cases for incidents attributed to tigers were in the months of November (n = 254) March (n = 257), the lowest cases for leopards were in the months of August (n = 145) and September (n = 154).

This trend was not reflected in individual years. Grouping months according to three key seasons; summer (March to June), monsoon (July to October), and winter (November to February), we found a significant difference in temporal patterns of livestock depredation incidents for all carnivores (37% in summer (n = 2282); $\chi 2 = 33.285$, $p = 5.919e-08$), for tigers (35% in summer (n = 1180); $\chi 2 = 6.4196$, $p = 0.04037$) and leopards (44% in summer (n = 2282); $\chi 2 = 129.77$, $p = 2.2e-16$), indicating a trend we associate with livestock movement patterns which change with seasons, particularly in summer where, livestock travel farther and nearer to water sources also used by wild carnivores.

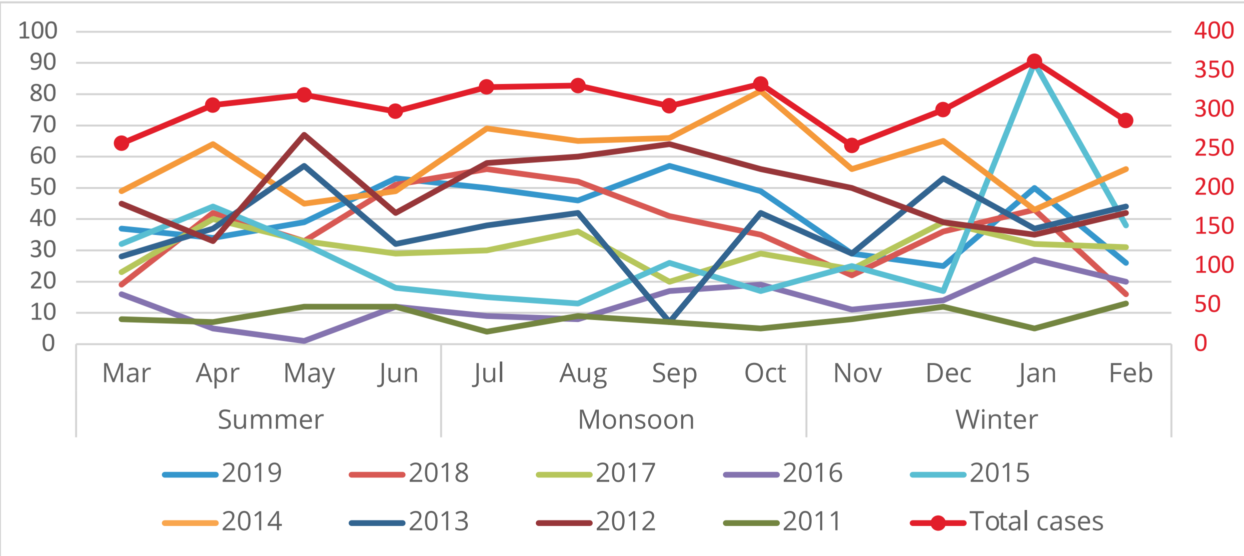

Fig 9a. Season and month-wise trends in livestock depredation cases attributed to tigers for 2011-2019, with total cases on secondary axis.

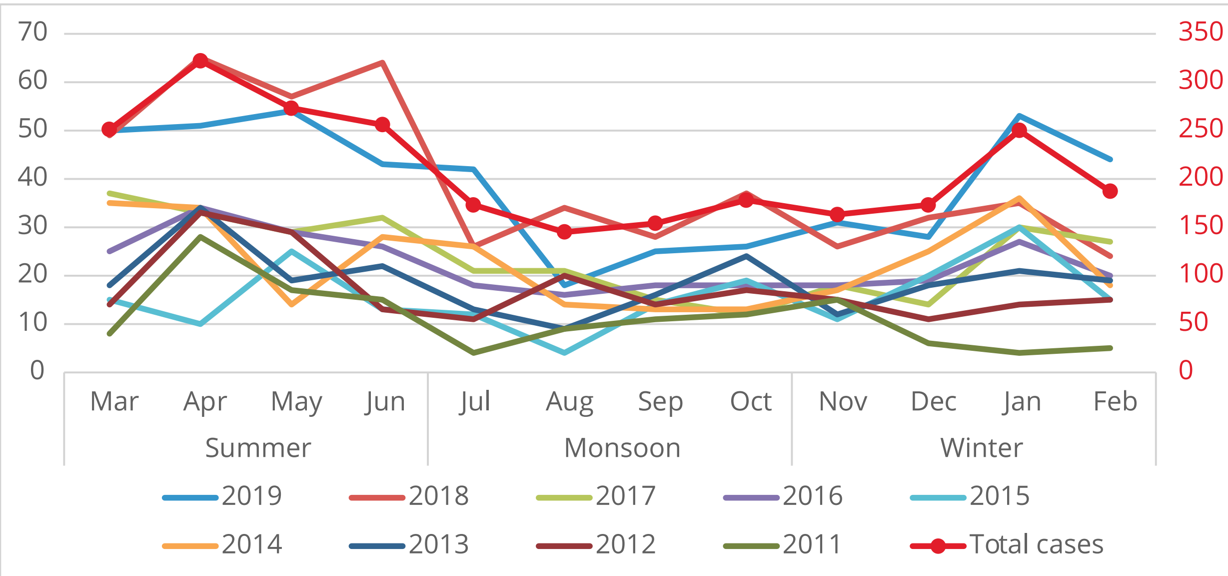

Fig 9b. Season and month-wise trends in livestock depredation cases attributed to leopards for 2011-2019, with total cases on secondary axis.

To understand spatial patterns of livestock depredation, incidents were classified into occupied and unoccupied in each grid (Fig 10a, 10b). Between 2011 and 2019, there is a 77.84% spatial increase for incidents attributed to tigers and 53.72% increase for leopards. While there wasn't a significant seasonal variation in this increase, spatial increase for tigers was more in summer (89.23%), followed by winter (86.76%), and monsoon (80%) between 2011 and 2019. For leopards, spatial increase was more in winter (73.82%), followed by monsoon (54.36%) and summer (51.18%). The yearly increase in spatial pattern of the incidents attributed tigers was 21.21% and for leopards 9.27% (Annexure F).

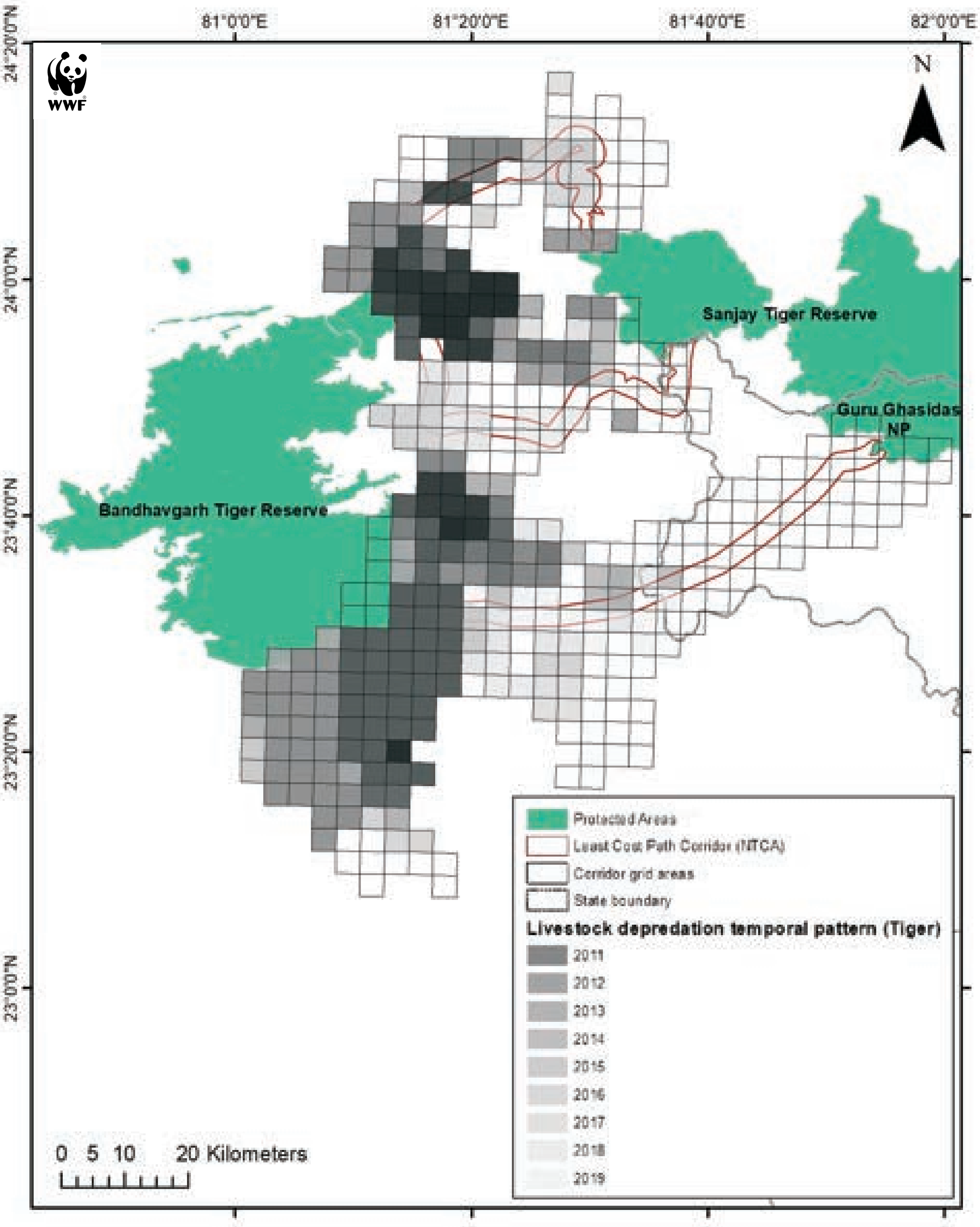

Figure 10a. Map showing temporal gradient (2011-2019) of livestock depredation cases attributed to tigers in corridor study area grids.

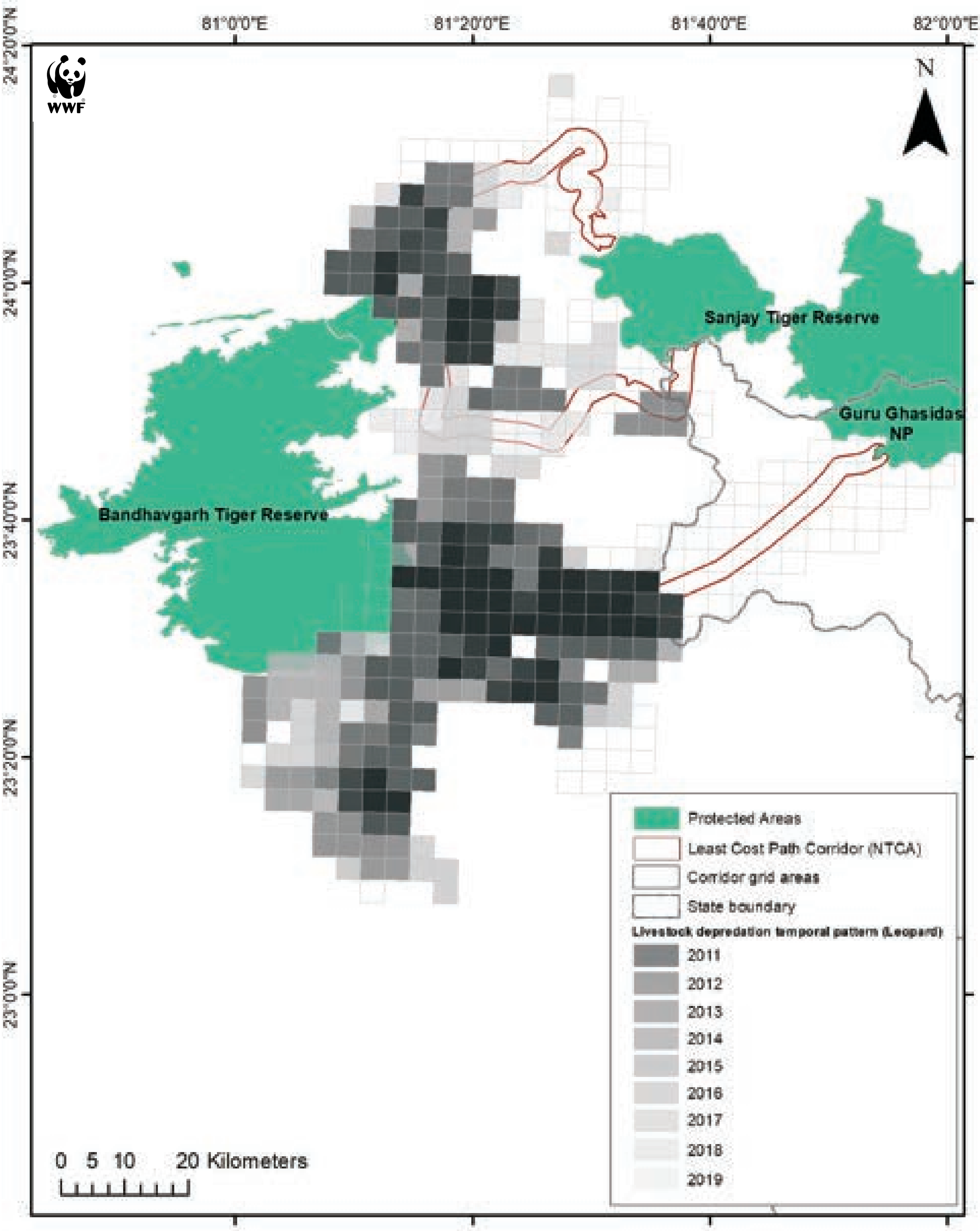

Figure 10b. Map showing temporal gradient (2011-2019) of livestock depredation cases attributed to leopards in corridor study area grids.

Livestock depredation cases attributed to tigers and leopards varied with distance from the tiger reserves. About 85.66% of the cases attributed to tigers were within 15 (SE ±0.41) km from Bandhavgarh Tiger Reserve, whereas most (35.61%) of the cases were 60-75 km from Sanjay Tiger Reserve (Fig 11a).

Cases attributed to leopards showed a similar trend as well (Fig 11b), with cases attributed to leopards centered more between 15-90 km from both the tiger reserves, indicating a weaker correlation to distance from the tiger reserves.

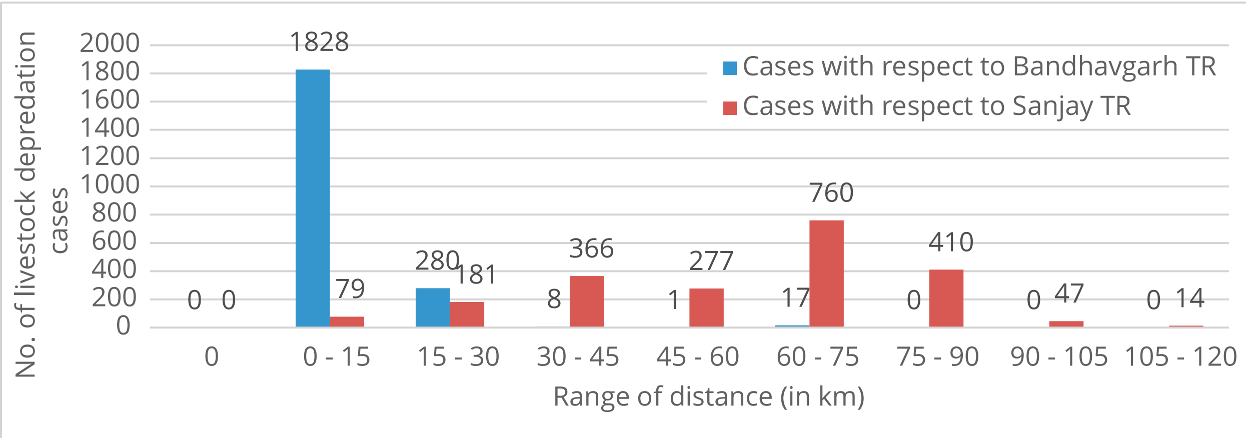

Fig 11a. No. of livestock depredation cases attributed to tigers with respect to distance from Bandhavgarh and Sanjay Tiger Reserves (in km).

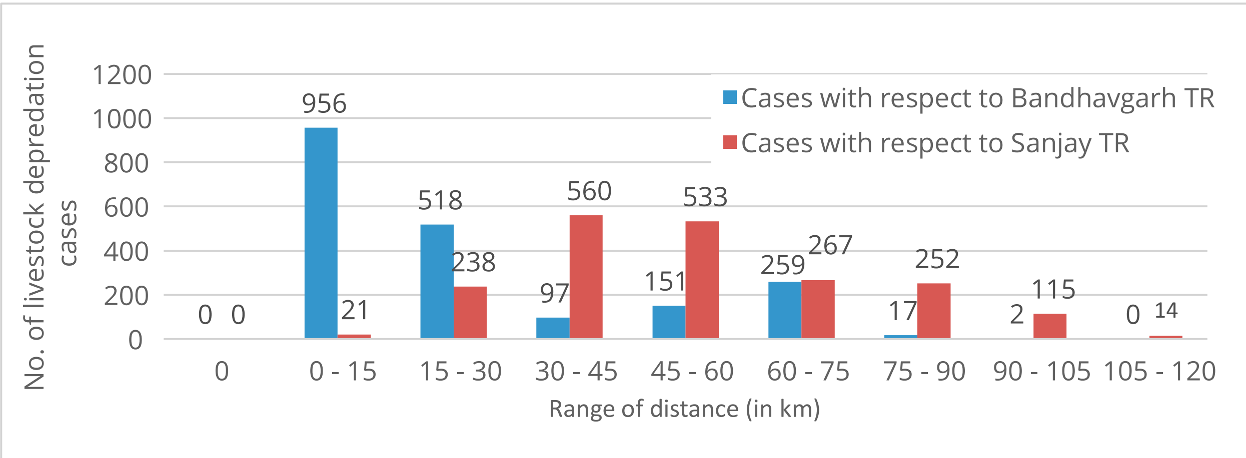

Fig 11b. No. of livestock depredation cases attributed to leopards with respect to distance from Bandhavgarh and Sanjay Tiger Reserves (in km).

4.3 WILDLIFE CRIME

Under the Wildlife Protection Act, 1972, wildlife crime comprises any incident – intentional or accidental – resulting in death of a scheduled wild animal (ENVIS, 2014), whereas, offenses related to forestry such as illegal felling of trees are registered under both, Wildlife Protection Act, 1972 and Forest Conservation Act, 1980. Cases are registered by the state Forest Department through POR and FIR, and followed up in local courts. Both, the protected areas and forest divisions, are mandated to report crime cases.

We considered data for years 2011 to 2019 for four Forest Divisions in Shahdol Circle, viz., Anuppur, North Shahdol, South Shahdol and Umaria, and Bandhavgarh and Sanjay Tiger Reserves (Madhya Pradesh Forest Department, n.d.; Fig 12a; see Annexure G).

Of the 366 registered cases, maximum (29.23%) cases were reported from Anuppur forest Division followed by Umaria (22.40%), North Shahdol (18.58%), Sanjay (12.57), South Shahdol (9.84%), and Bandhavgarh (7.38%) (Fig 12b).

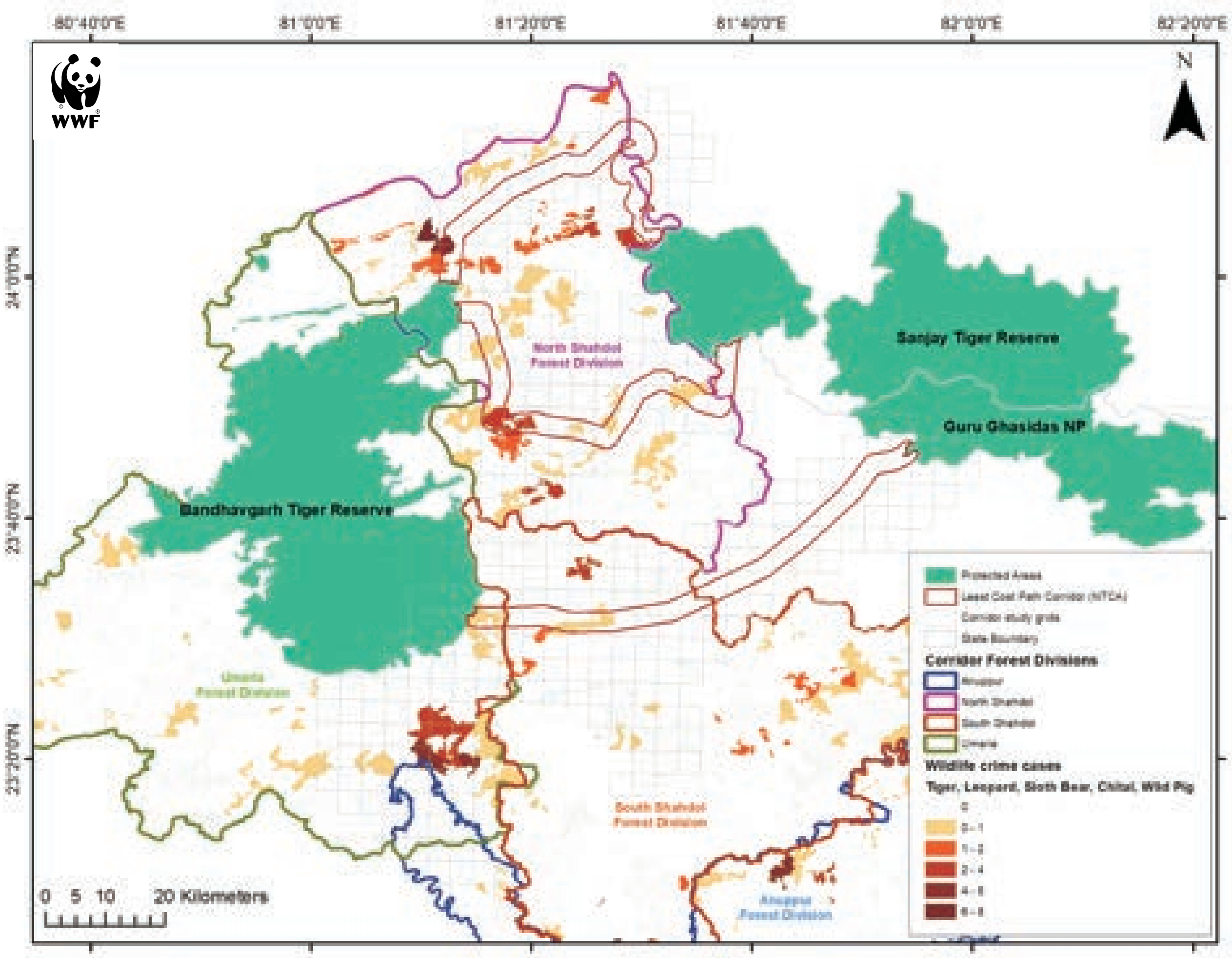

Fig 12a. Areas from where wildlife crime cases have been registered between 2011-2019 for the Bandhavgarh-Sanjay corridor and surrounding areas in the state of Madhya Pradesh.

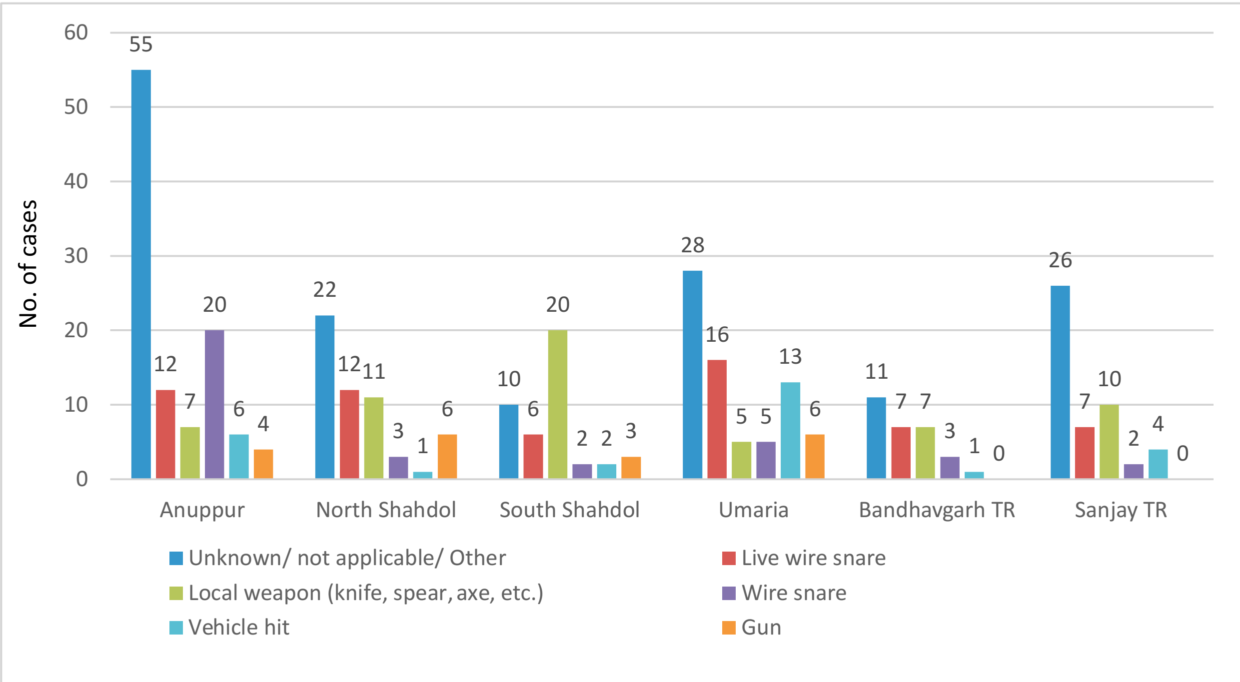

Fig 12b. Division-wise six types of cases (>20) registered between 2011-2019.

Most cases registered were under 'unknown, not applicable and other' category (36.67%), a broad category where cases may be filed at the discretion of the officer who registers the case which may be pending investigation at the time of record-keeping. We classified the 11 other categories into four depending on how the animal died; poaching, retaliation, vehicle and train hit, and feral dogs (Fig 13a). Majority of the cases were registered as a case of poaching (75.44%), followed by vehicle and train hit (15.79%), retaliatory killing (5.7%) and feral dogs (3%). Of all the registered categories, live wire snares resulted in deaths of 56 animals (15.56%), followed by use of local weapon such as spear, axe, knife, arrow, bamboo stick (n = 50, 13.89%), and wire snares (n = 30, 8.33%). In other words, 15 in every hundred crime cases reported in the corridor area were for live wire snares, 13 for local weapons, and eight for wire snares (Fig 13b).

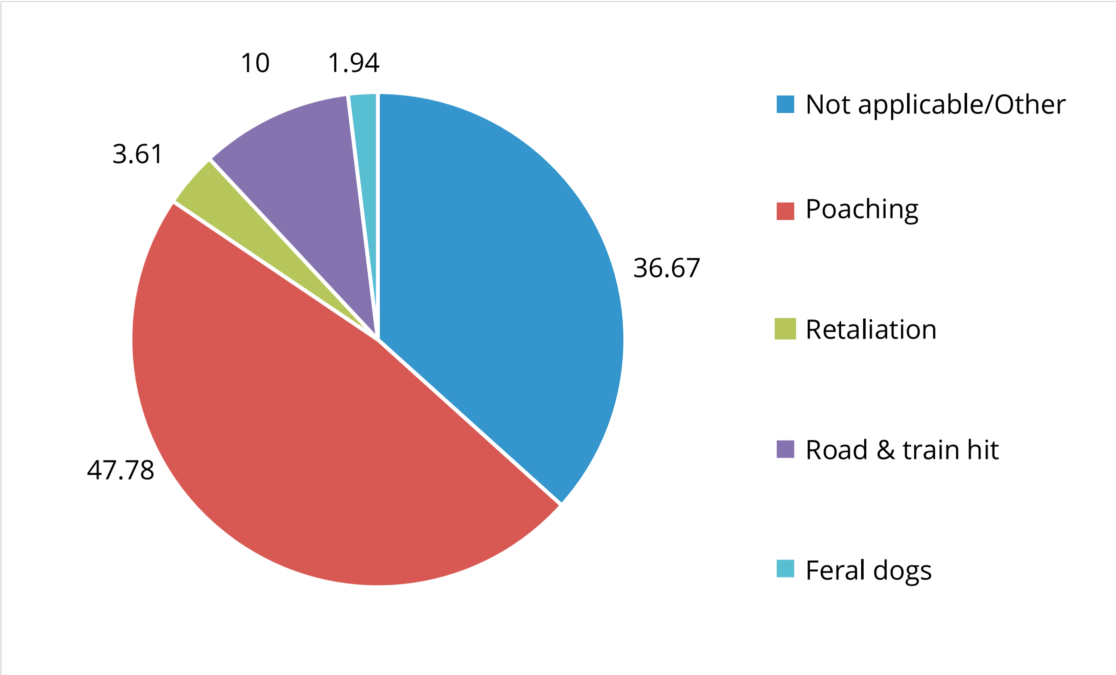

Fig 13a. Four broad categories of wildlife crime cases reported in the Bandhavgarh-Sanjay corridor for 2011-2019.

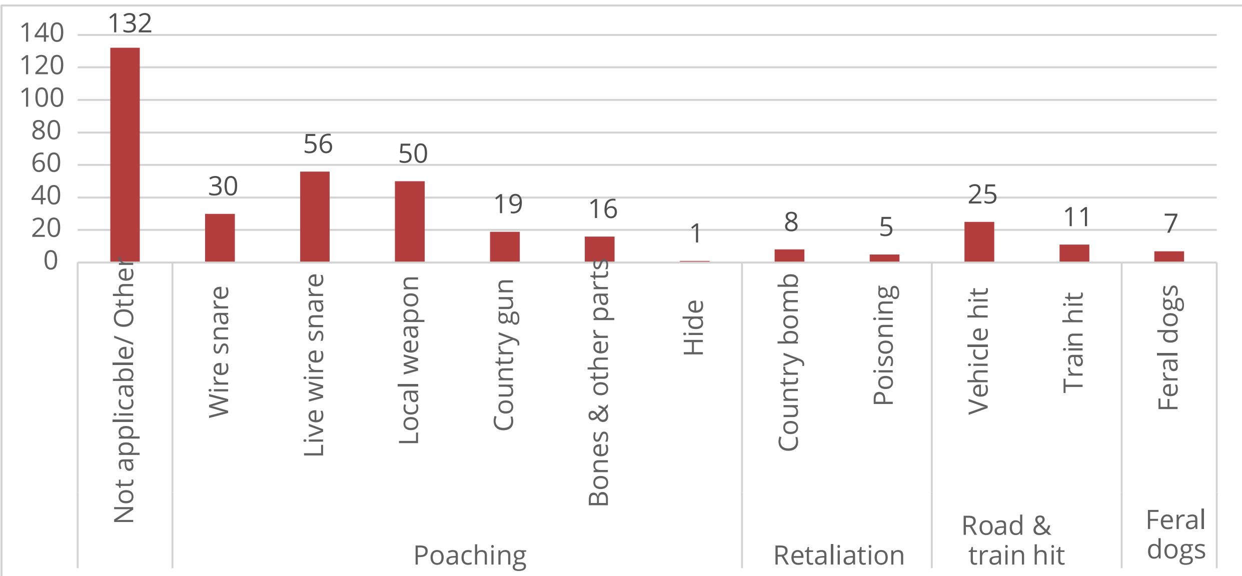

Fig 13b. Number of wildlife crime cases recorded in the Bandhavgarh-Sanjay corridor for 2011-2019 categorized as per the registered case.

Cases registered over the nine-year period show an increase in train hit cases (54% increase), vehicle hit cases (22.6% increase), wire snares (21.88% increase), and live wire snares (15.19% increase). Recovery of bones and other body parts as a result of contact patrols saw an increase of 79.76%. On the other hand, cases registered for death due to country-made bombs and guns reduced by 10% and 14.81%, respectively.

A total of 26 species of wild animals were reported, including 17 species of mammals, four birds, and five reptiles. Of these, six are under Schedule I part 1 of the Wildlife Protection Act, 1972, four under Schedule I part 2, two under Schedule I part 3, three under Schedule II part 1, and six and five species, respectively, under Schedule III and Schedule IV.

Most of the reported cases were for wild pig (45.71%), chital (22%), and sloth bear (8.29%). Tigers and leopard cases were 3.14% (n = 11) and 5.14% (n = 18), respectively.

We also looked at the causes of these deaths. Most cases of wild pigs were reported under local weapons (19.38%) and live wire traps (8.75%). Cases of chital were reported under vehicle hit (15.58%), feral dogs (7.79%), and train hit (6.49%). Among the three large carnivores, cases of sloth bears were reported under live wire snare (37.33%) and vehicle hit (6.9%). Tiger cases were reported under live wire snare (63.64%) and poisoning (26.36%), and for leopards under live wire snare (50%) and wire snare (11.11%) (Fig 14).

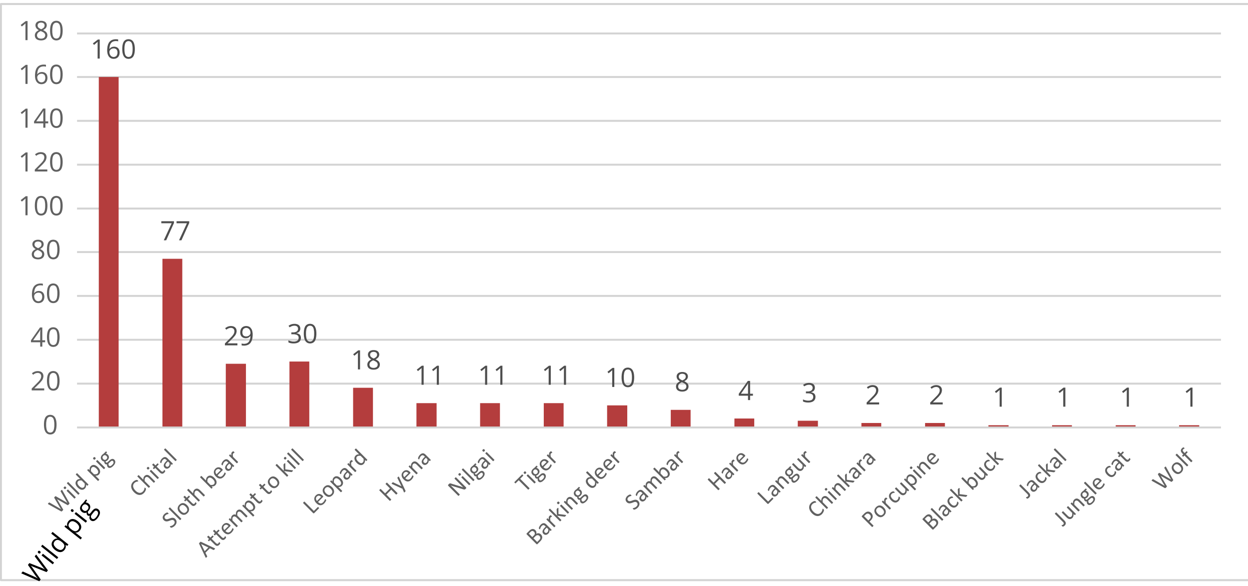

Fig 14. Number mammalian species reported in wildlife crime cases (2011-2019).
Note: "Attempt to kill" category does not represent any particular species but only the act of offence.

A roadkill of an Indian Fox (*Vulpes bengalensis*) on one of the roads in the corridor. Vehicle hit cases are higher in corridor areas than the entire forest complex.

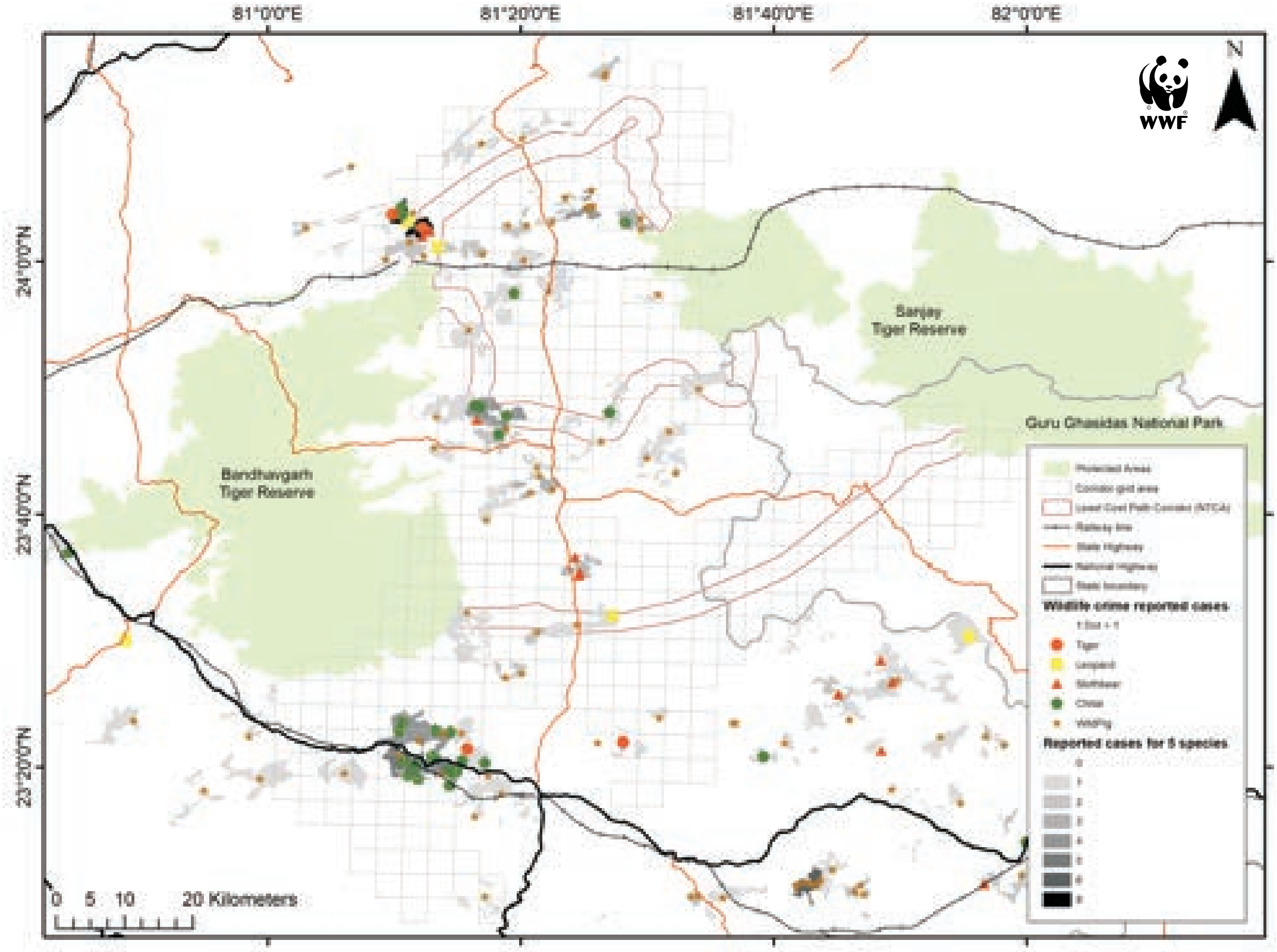

Fig 15. Spatial distribution of wildlife crime cases reported for tiger, leopard, sloth bear, chital, and wild pig.

We report spatial extent of the data range-wise for causes of deaths (Fig 15). The forest complex of Bandhavgarh and Sanjay Tiger Reserves and Shahdol Forest Circle comprises 40 Forest Ranges, of which 12 are a part of the corridor and nine and eight, respectively, of Bandhavgarh and Sanjay Tiger Reserves. Wildlife crime cases were reported in 23 ranges of the Shahdol circle, five of Bandhavgarh and eight of Sanjay Tiger Reserves. Of the 381 total cases reported for mammals, 60.37% (n = 230) were reported in the corridor ranges. Of these, most were recorded in North Shahdol Division (29.57%), Umaria (23.91%), followed by South Shahdol (8.70%). Bandhavgarh and Sanjay Tiger Reserves comprised 14.35% and 18.26%, respectively.

Of the 11 categories of cases registered (excluding two general unclassified categories, see Figure 13b), live wire snares (15.56%) were reported in Umaria (3.96%) - of this, most cases were reported from Ghunghuti (n = 6 of 16) and Umaria (n = 4 of 16) ranges, followed by 2.97% each in Anuppur (Anuppur range, n = 5 out of 12) and North Shahdol (East Beohari range, n = 9 out of 12). Use of local weapons was the second most commonly recorded case (13.88%), most reported from South Shahdol (4.95%) in the Gohparu (n = 7 out of 20) and Jaitpur (n = 5 out of 20), and North Shahdol (2.72%) in the East Beohari (n = 4 out of 11) and Jaisinghnagar (n = 3 out of eleven). Third most commonly reported cases were for wire snares (8.33%), of which most were reported in Anuppur (4.85%) in Anuppur (n = 6 out of 20) and Ahirgawa (n = 5 out of 20) ranges, and from Umaria (1.24%) in Ghunghuti range (n = 2 out of 5). Cases recorded under vehicle and train hits are discussed in Section 4.6.1.

Low-tension powerlines passing through forests which provide electricity to settlements are often exploited by using the exposed transmission wires to set live-wire traps

4.4 FOREST FIRE

Fire events were obtained from NASA FIRMS MODIS Collection 6 (375 m resolution) as vector points to identify fire frequencies in the corridor area from 2011 to 2019 (NASA, 2021). There was no yearly-trend in fire events. Majority of fire events were identified in the months of March and April (91%), very few in May, June, August, and February (9%) (Fig 16a, 16b).

We found a strong correlation between fire events and forest cover and land use of the surveyed area. Fire events increased as forest cover increased ($r = 13.523$, $p < 2.2e\text{-}16$) and decreased as area under agriculture increased ($r = -10.753$, $p < 2.2e\text{-}16$). While forest fires are restricted to summers, its effect on wild ungulate population may be more severe than on wild carnivores. In addition to gradual degradation of the habitat, it also changes vegetation composition from palatable to non-palatable invasive species. In parts of the corridor where fire has repeatedly spread, it has been observed that trees such as *Chloroxylon swietenia* and *Wrightia tinctoria*, both tolerant of fires, are common, along with invasive species such as *Mesosphaerum suaveolens* that replaces native ground vegetation.

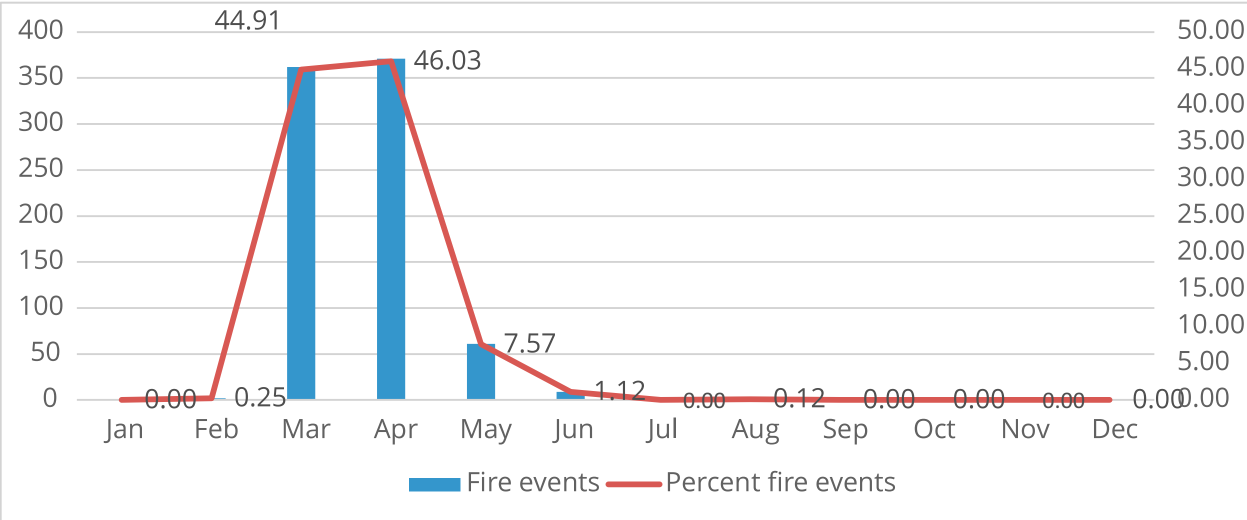

Fig 16a: Month-wise fire events and percent values (secondary axis) for duration of 2011-2019 in the corridor area.

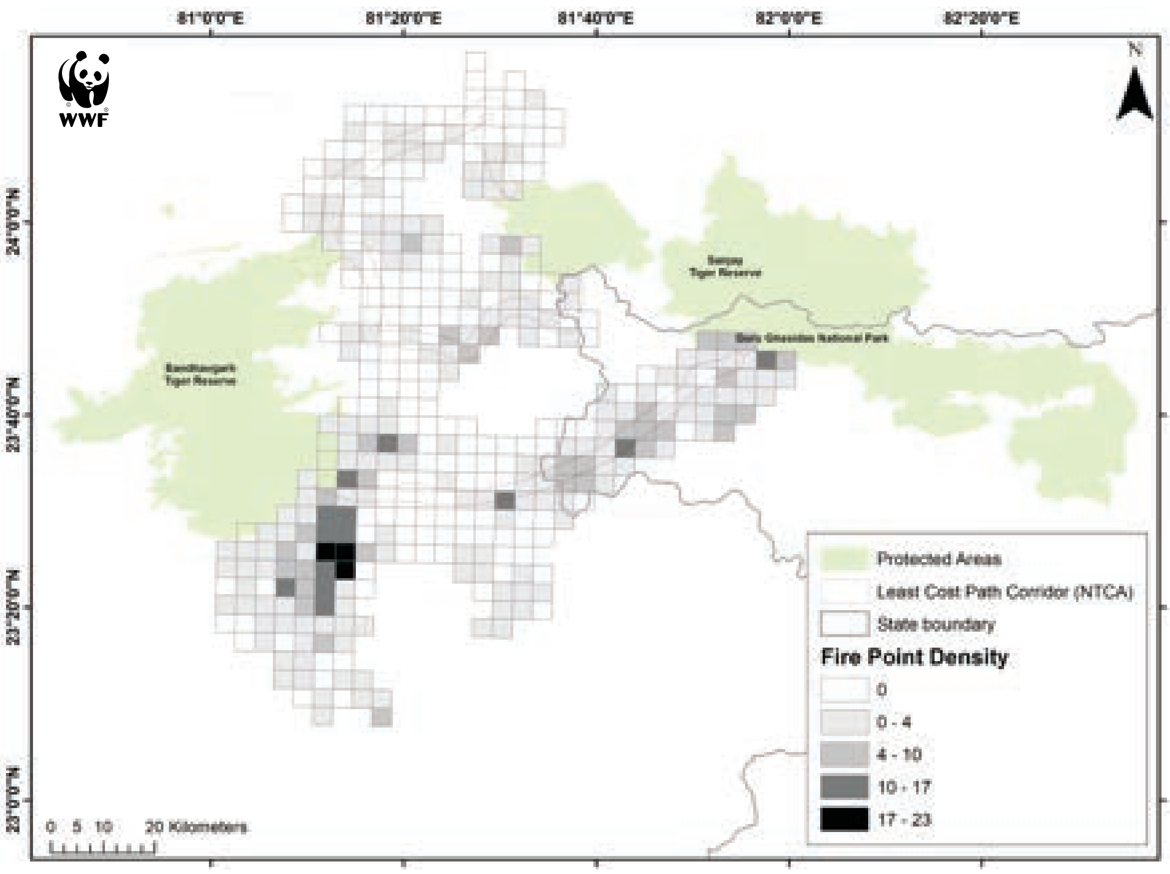

Fig 16b. Grid-wise forest fire incidences (fire events per grid) in the corridor area.

4.5 LAND USE AND LAND COVER

4.5.1 Forest and Non-forest areas

We used the Copernicus Global Land Service (CGLS) for the years 2010 and 2019 to identify land-use changes in the corridor area (Buchhorn et al., 2020; Annexure H). Of the corridor study area (4,753 km^2, covering 388 grids), 72% of the grids showed no observable changes to land cover. We report an average of 2.5% reduction in non-forest areas and an increase of 7.7% of area under forests. Of this, the parcel reduction in non-forest area was highest (18%) in area of under 1 km^2, and the parcel gain in forest area is highest (16.5%) under 1 km^2 as well. Only two grids showed a large decrease in non-forest area of >5 km^2 and one grid showed a large increase in forest area of >5 km^2 (Fig17).

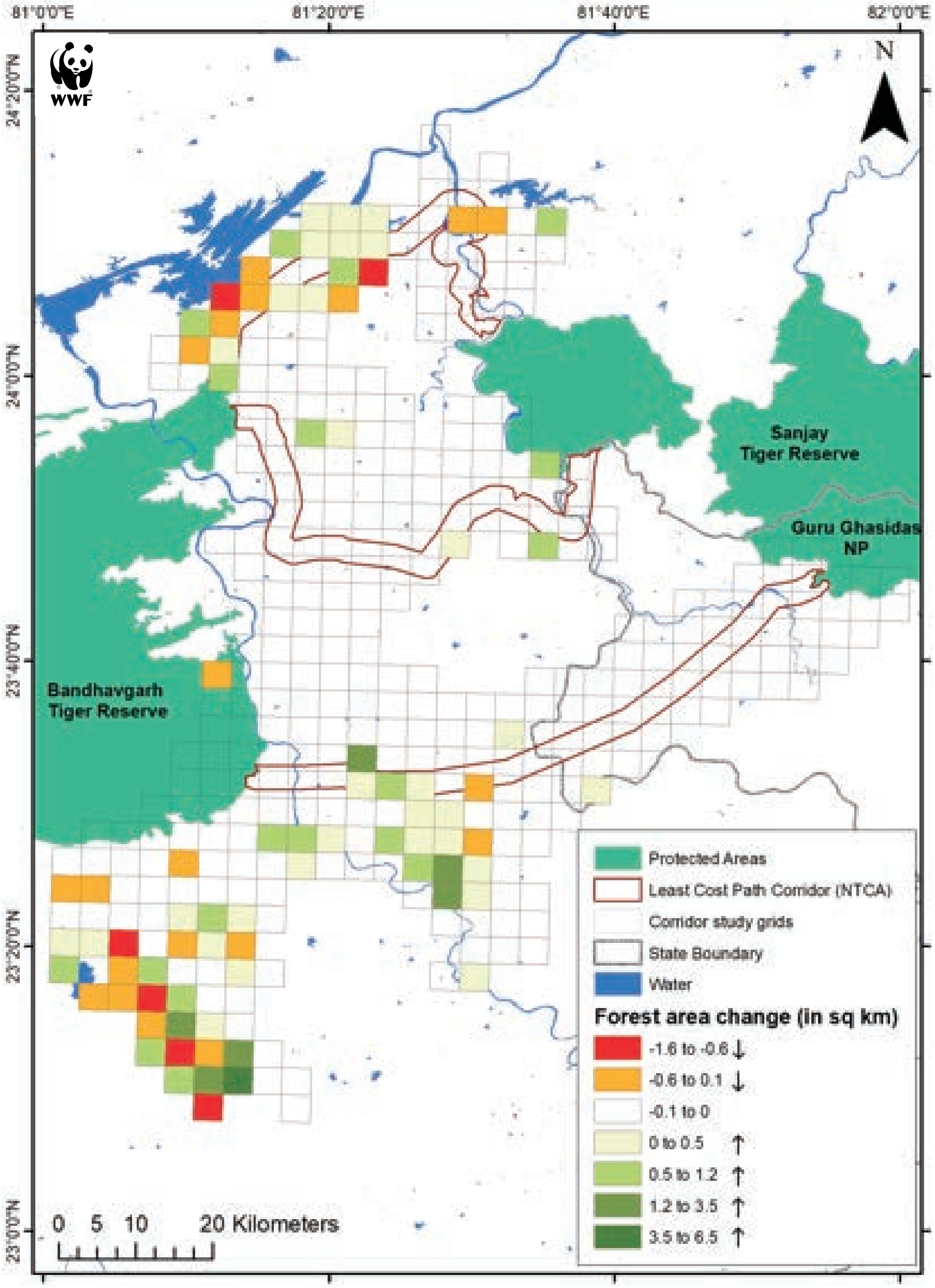

Fig 17. Grid-wise change in forest area (in km^2) between 2010 and 2019 (Buchhorn et al., 2020)


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4.5.2 VEGETATION

4.5.2.1 Floristic species composition

Floristic composition of an area shows the quality of habitat and its suitability for wildlife. It also helps in understanding climatic condition, edaphic features, and anthropogenic pressures in an area (Ullah et al, 2020). The floristic composition comprises trees, shrubs, forbs, herbaceous plant species, and grasses. A total of 225 grids surveyed recorded 198 floral species belonging to 54 families from 443 sample plots of 15 m radius which covered 313.13 km^2 of area (Annexure D). Among 54 families, four families viz. Poaceae (43 species), Fabaceae (17), Malvaceae (11) and Asteraceae (9) were the most diverse and remaining 50 families were represented by less than 6 species.

4.5.2.2 Vegetation structure

The average density of total tree species for Bandhavgarh Sanjay corridor was 555.86 (SE ±16.10) individuals per ha. Sal (*Shorea robusta*) and tendu (*Diospyrus melanoxylon*) were the dominant tree species among all forest ranges, with most of the grids represented by mixed and dry deciduous forest type which was categorized using the dominance value of the tree species in grids (Fig 18a, 18b).

While the majority of the grids (25.89%) showed tree density of 100-200 trees per ha, species richness of 10-15 species was found in 32.14% of the grids (Fig 19a; see Annexure I). Only 2.23% (n = 5) showed high tree density and 1.34% (n = 3) high species richness. Most of this corridor habitat was identified as mixed deciduous type (63.80% of 221 surveyed grids), followed by sal-dominant forests (17.19%) and open forest (16.74%) (Table 7; Annexure I).

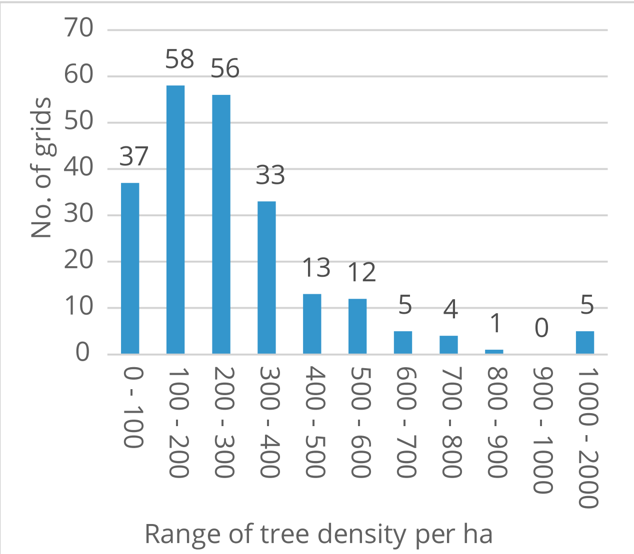

Fig 18a. Proportion of grids with respect to tree densities (per ha).

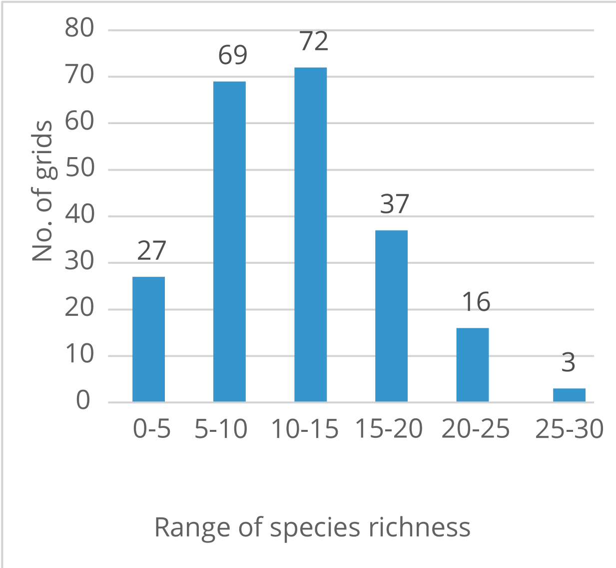

Fig 18b. Proportion of grids with respect to species richness.

Table 7. Broad categories of forests types in the corridor (see Annexure I for grid-wise details).

Category	Description	No. of grids
Sal Forest	>50% sal trees	38
Mixed deciduous	All sp. mixed	141
Dry Deciduous	Deciduous tree species	2
Bamboo Forest	>50% Bamboo	1
Open Forest	<25% tree density	37
Plantation	Teak or Eucalyptus >50%	2

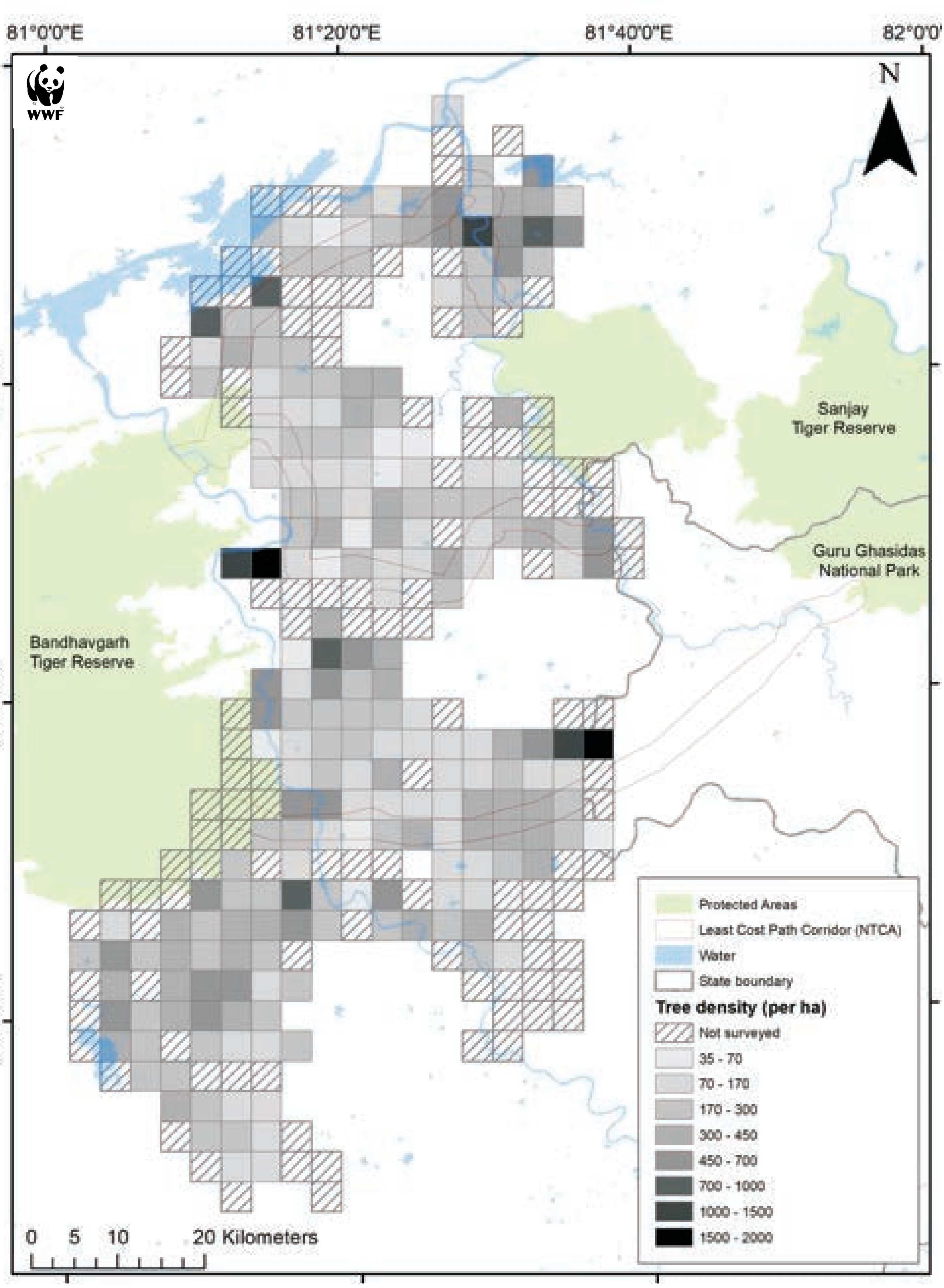

Fig 19a. Tree densities (per ha) in the corridor study area grids.

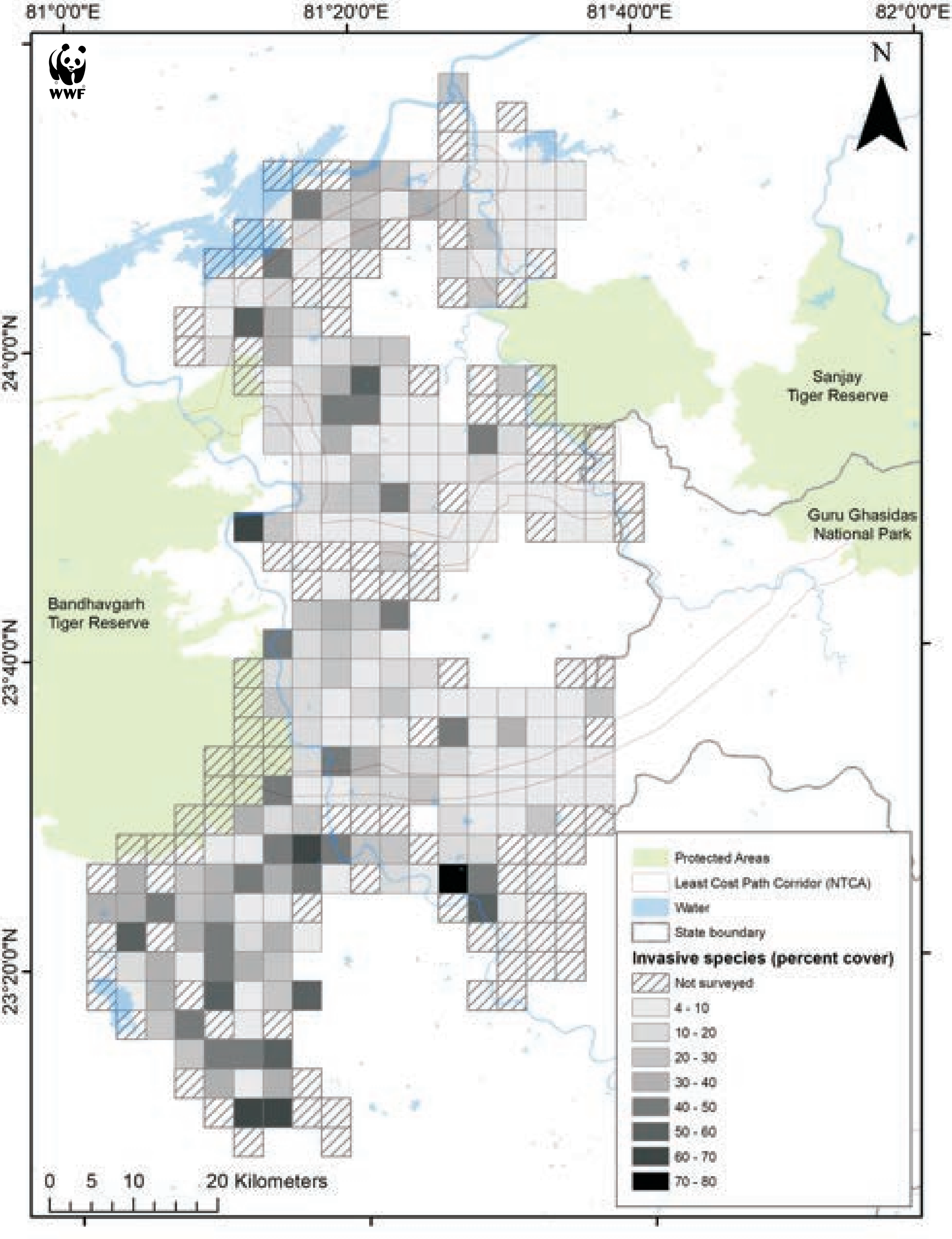

Fig 19b. Percent invasive species cover in the corridor study area grids.

4.5.2.3 Invasive species cover

Degraded areas of habitats are invaded by many alien species which severely affect the productivity of natural habitats (Roy & Singh, 2013). Invasive species ingression leads to shrinking of grassland habitat and negatively impacts the growth of palatable food plants in an area (Lele, 2013).

Among exotic species *Lantana camara* was dominant and found in 139 grids (Fig 19b). *Mesosphaerum suaveolens* (Van tulsi), *Phoenix acaulis* (Cheend) and *Parthenium hysterophorus* (Gajar ghas) were among the dominant invasive species reported in corridor areas.

Van tulsi (*Mesosphaerum suaveolens*) is a dominant invasive herbs in parts of the corridor area experiencing recurrent forest fires.

4.5.2.4 Grass species and legumes

Grasses are important group of plants when it comes to studying wildlife habitats; they constitute most favorable wildlife habitats such as grasslands and savannahs particularly for wild herbivores (Gibson, 2009). The productivity of an area and its suitability for wild herbivore can be defined by the growth of palatable grasses (*ibid*). A total of 41 grass species were recorded from the corridor study area. In terms of Forest Ranges, grass diversity was maximum in Ghunghuti and Pali (with 14 species each). Out of 41 species, only 4 were identified as highly palatable with palatability grade A whereas 19 were moderately palatable with grade B, 17 were less palatable with grade C and only one species was unpalatable for wild herbivores (Annexure D). Conversion of palatable to non-palatable species is an indicator of degrading habitat quality and makes it less suitable ecosystem for herbivores (Chandran, 2015). Availability of palatable and nutritious fodder species is preferred by grazing ungulates (Vasu & Singh, 2015) and affects the utilization of that habitat by wild herbivore species. The abundance of legumes also indicates the suitability of the habitat since most of the legumes are favoured by wild herbivores. A total of 65 species of herbaceous plants were identified of which eight species were legumes (Fabaceae).

Mixture of grasses and herbs in small open patches in corridor provides suitable habitat for wild herbivors

4.6 INFRASTRUCTURE

4.6.1 Linear infrastructure

There are five state highways (SH) and one national highway (NH) passing through the corridor (Annexure J). Of the several local roads, two of importance are Manpur-Beohari road, and Manpur-Shahdol road. Two major railway lines are the Shahdol-Katni double line and Singrauli-Katni single line. Of the total 386 grids, 61 grids had roads and 18 railways passing through (Fig 20). We did not see a significant correlation between presence of roads and railways that may influence habitat use by tigers, hence it was not used in the occupancy analysis.

Of the total reported incidences, cases of animal deaths due to vehicle hit ranked fourth (6.94%) and railway hit seventh (3.05%), however, they were higher in corridor areas than the entire forest complex; 13 of the 27 vehicle hits and 10 out of 11 railway hits were in corridor areas. Most cases of vehicle and train hits were reported from Umaria division (12 out of 27 vehicle hits, of which 11 were from Ghunghuti range on NH78 highway, two on SH9 and SH9A; and 10 out of 11 train hits of which 9 were from Ghunghuti range, between Pali-Birsinghpur and Ghunghuti stations) (Fig 15). This double-railway line connects two major railway junctions – Bilaspur and Katni, for passenger, freight, as well as coal transport.

4.6.2 Extractives

There is one thermal powerplant, Sanjay Gandhi Thermal Power Station of 1340 MW capacity close to Pali and Ghunghuti ranges of Umaria Forest Division (Fig 20). For the district of Shahdol, paper and tissue paper are the major exportable item, with the wood provisions largely coming from eucalyptus plantations, softwood trees, and cultivated or wild bamboo. There are a few stone quarries and sand mining sites in the corridor area.

The south-eastern part of this corridor has been identified under Sohagpur coalfield and the eastern part of Sanjay Tiger Reserve under Singrauli coalfield. There are approximately 69 coal blocks in this forest complex of which 24 fall within the corridor area. The nearest industry is the Amlai Paper Mill which is approximately 30 km from the southern part of the corridor. The region, particularly Shahdol district, has also been surveyed for gas and petroleum deposits (Madhya Pradesh State Agriculture Plan, n.d.), and iron ore deposits.

The corridor is a part of the districts of Shahdol and Umaria in Madhya Pradesh and Koriya in Chhattisgarh states. The major extractive industries here are tabulated below along with their production for the year 2011.

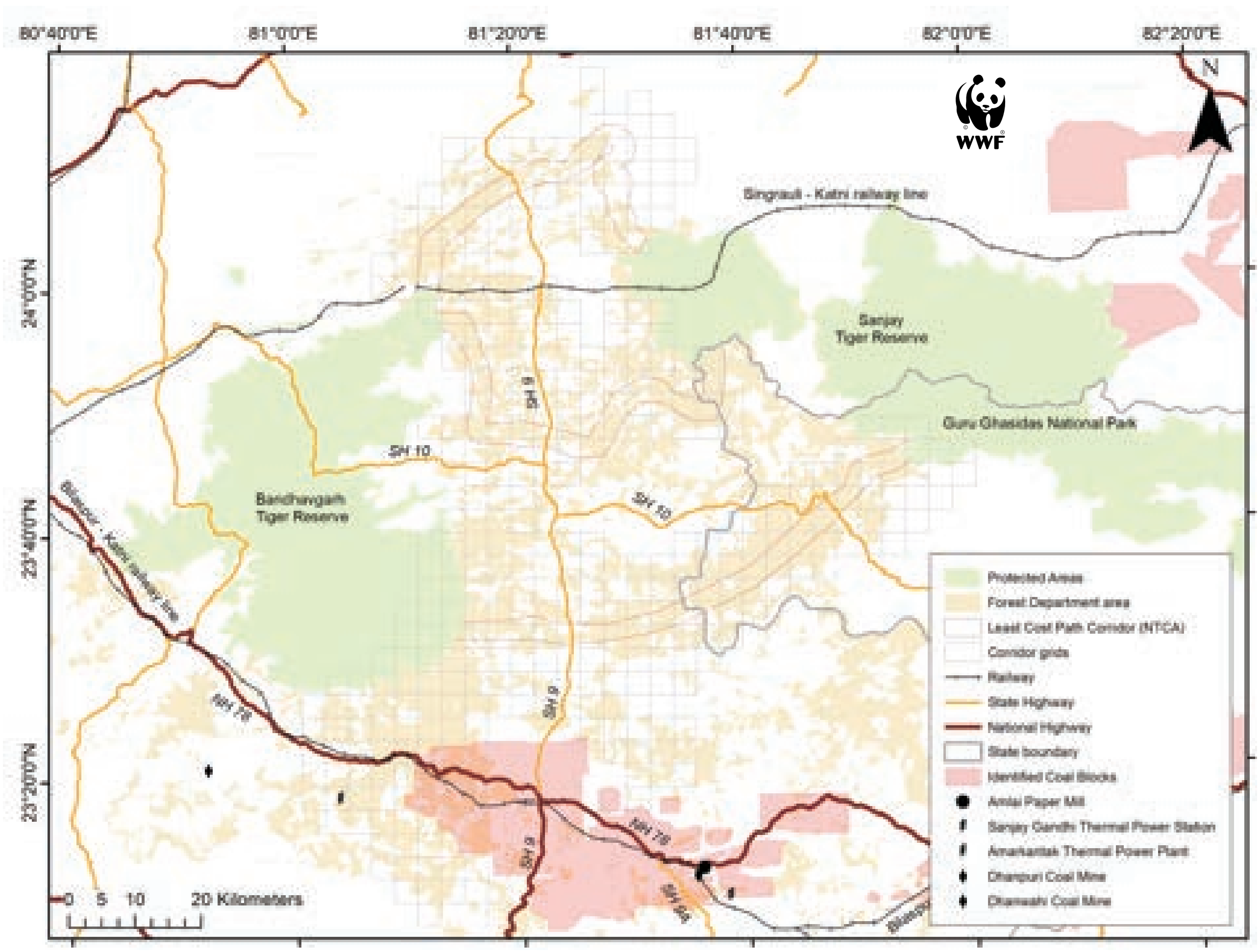

Fig 20. Linear infrastructure (major roadways and railways), extractive industries, and coal blocks in and around the corridor study area and the least cost path corridor between Bandhavgarh and Sanjay Tiger Reserves.

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High-voltage power transmission lines are a common linear-infrastructure feature of the corridor, supplying electricity not only to urban and rural settlements but also to extractive and productive industries of the region.

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Refurbishment and expansion of NH8 highway passing through the corridor observed in December-January 2019-2020.

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A double-line broad-gauge railway passes through the corridor, connecting Bilaspur Junction with Katni Junction, and one single-line broad-gauge from Singrauli to Katni Junction, both are active routes for coal-carrier trains

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Construction of one of the internal village roads through the corridor

Table 8. Summary of extractive industries and per tonne production for 2010-11 (Ministry of MSME, 2016a, 2016b, 2016c).

Sr. No.	Mineral	District	Type of industry	Production in tonnes
1	Coal	Shahdol	Major	4456590 MT
2		Umaria	Major	1830000 MT
3		Koriya	Major	6098074 MT
4	Fire clay	Umaria	Major	14470 MT
5	Okras/ white earth	Umaria	Major	3625 MT
6	Stone	Shahdol	Minor	171730 Cu M
7		Umaria	Minor	66338 Cu M
8		Koriya	Minor	165019 Cu M
9	Murrum soil	Shahdol	Minor	117771 Cu M
10		Umaria	Minor	130054 Cu M
11	Sand	Shahdol	Minor	72394 Cu M
12		Umaria	Minor	314671 Cu M
13	Marble	Shahdol	Minor	1000 Cu M
14	Clay	Umaria	Minor	741 Cu M

4.7 DEMOGRAPHY, OCCUPATIONS, AND MAJOR INDUSTRIES

The corridor study area spans five districts, majority of which falls in Shahdol, Umaria districts of the state of Madhya Pradesh, and Koriya district in the state of Chhattisgarh, and parts of Sidhi and Anuppur. The corridor study area comprises 514 villages with a population of 456,683. While some of the grids showed no village settlements (27.84%, n = 108), 117 girds (30.15%) showed presence of 214 villages with a population range between 1,000 to 2,500 persons, followed by 70 grids (18%) with 105 villages with a population range between 500 to 1,000 persons. There are 33 villages with population between 5,000 to 10,000 persons in 10 grids (2.58%) (Fig 21). Majority of the population in the corridor study area (29% of the district's population) is in Shahdol district including the majority of villages (63.65%, n = 338), followed by Umaria district (10.95% of district's population) including 17.33% villages, and in Koriya district (5.55% of the district population) including 10.92% villages.

We created a buffer of 5 km around the corridor study area to compare populations in the non-forest area. This buffer comprises 477 villages with a population of 479,217 persons. Most of the villages (33.75%, n = 161) in the buffer are in the 1,000 to 2,500 population range as well, followed by 120 villages (25.16%) in the 500 to 1,000 population range, and 94 villages (19.71%) in 250 to 500 population range. There are three villages with population between 5,000 to 7,500 persons (Annexure K).

The built-up area in the corridor grids has increased from 0.94 km^2 to 1.45 km^2 over the last decade. Only two study grids show this increase, one attributed to the Sanjay Gandhi Thermal Power Station and one to the Bansagar dam township at Khand.

The major corridor districts, Shahdol, Umaria, and Koriya, have three existing industrial areas, none of these in the corridor area. Major occupation is agriculture, the major crops include paddy and wheat. Other crops include maize, millets, pulses such as gram and pigeon peas, flaxseed and sorghum. Agro-based industries are the next major enterprise, followed by repairing and servicing, garments and embroidery, mineral based enterprises, wood and furniture enterprises, and metal-based enterprises (Ministry of MSME, 2016a, 2016b, 2016c). Major tourism area is restricted to the eastern part of the Buffer Zone of Bandhavgarh Tiger Reserve.

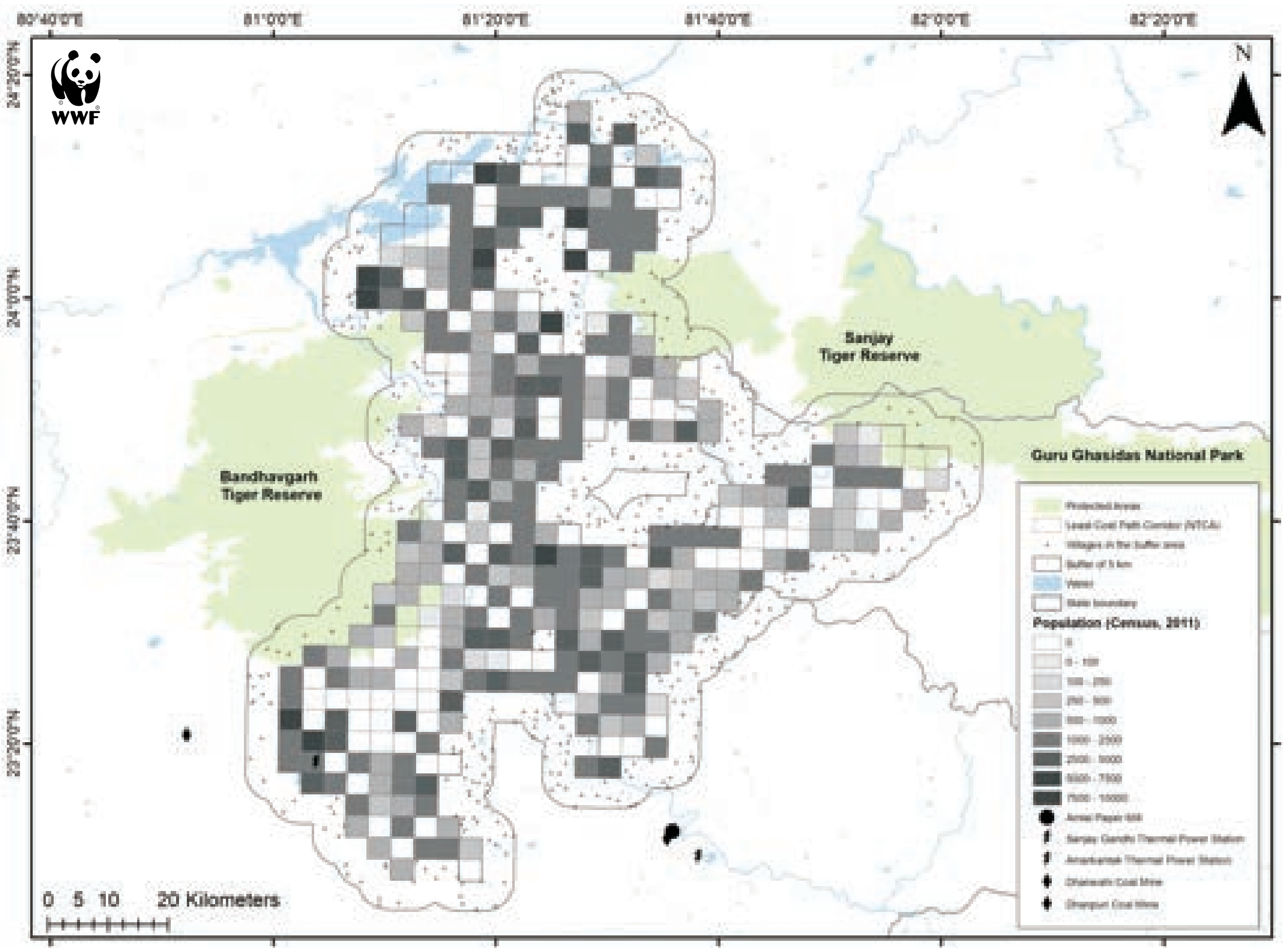

Fig 21. Human population per grid along with the approximate village distribution in 5 km buffer around the corridor study grids.

5. DISCUSSIONS

5.1 HABITAT USE BY TIGERS AND LEOPARDS

Both tiger and leopard habitat use was found to be influenced by the availability of wild ungulate prey and forest cover. We found that the habitat use extends well beyond the Least Cost Path of the corridor. The forest cover in the corridor, 1,882.31 km^2 (39.61% of surveyed corridor land cover) is 23% of the forest cover of the three major districts that comprise the corridor, Shahdol, Umaria and Koriya, it is imperative for protection and conservation of this entire corridor forest area which identifies area larger than the Least Cost Path corridor. The influence of livestock presence in the corridor could not be determined due to lack of fine-scale livestock density estimates. Livestock depredation cases attributed to tigers and leopards signifies that domestic ungulates are a part of the diet. We suggest further studies on the proportion of ungulate in tiger and leopard diet to understand prey preference and prey availability vis-à-vis prey occupancy and prey densities for wild and domestic ungulates. The multi-use areas of the corridor are influenced by complex socio-ecological dynamics, we postulate that several factors including high wild and domestic ungulate presence, contiguous forest patches, and resilience to human presence as key determinants for leopard and tiger habitat use in this shared space.

5.2 HUMAN-WILDLIFE CONFLICT

Nearly a quarter of cases (23.5%) are registered against the three large carnivores, sloth bear, leopard, and tiger, of which sloth bears are responsible for most injuries and loss of human life in this corridor and adjoining forest areas. Studies in central India have shown that there is a strong social dimension for direct interaction between humans and sloth bears (Dhamorikar et al., 2017; Akhtar & Chauhan, 2008; Bargali et al., 2005). While most encounters are per chance, studies have shown a significant proportion of incidents taking place when a person in engaged in a forest-based activity such as NTFP collection, livestock grazing, fuelwood collection, and open defecation.

We recognize that not all cases of conflict are registered. Considering the presented data as a subset of the actual incidences, we suggest that encounters with sloth bears and wild pig – (represented by 32.4% of all incidents), are attributed to forest-based livelihoods. Encounters with tigers and leopards were recorded in areas close to Bandhavgarh Tiger Reserve compared to sloth bears which were reported across the area irrespective of the distance from a tiger reserve. Prevention of encounters requires mass awareness for precautionary measures to take in the corridor and adjoining forest areas.

Livestock depredation in the corridor is primarily attributed to tigers and leopards (94.83%). We note a significant increase in livestock depredation cases. This could be due to a couple of factors: (I) an increase in carnivore population or movement in certain regions, as observed in the spatial increase in livestock depredation cases of 77.84% (Fig 10a & 10b); however, we also note that ranges of Ghunghuti and Pali, both in Umaria forest division, have a small population of tigers (est. 12 individuals, see Jhala et al., 2020), comprising 48.62% of all livestock depredation cases attributed to tigers.(ii) the increase may also be attributed to increased awareness about compensation process, increased governance through net-banking, an increase in compensation amount. The latest compensation amounts for milk-producing cow or buffalo is to ₹ 30,000 in compensation, bulls is up to ₹25,000, cattle calf up to ₹ 16,000,and goat, sheep, and pig up to ₹3,000 under the Madhya Pradesh Public Service Guarantee Act, 2010.

5.3 WILDLIFE CRIME

Cases of wildlife crime registered in the corridor largely fall under the 'unknown or not applicable and other' category (36.67%), this category limits understanding the volume of specific criminal offences. Of the remaining cases, most fall under poaching category (75.44%) followed by linear infrastructure (15.79%) and retaliatory killing (5.7%). We recognize that these are a subset of actual events, however, the data shows an increasing trend in certain types of cases such as train and vehicle collisions, wire and live wire snares. Some of these are geographically restricted to certain sections of the corridor area which have been identified under this study. For instance, vehicle collisions were common on NH78 in Ghunghuti Range of Umaria Forest Division although the cases show no temporal trend. The NH78 was upgraded from NH43 after asphalt road widening from single to double lane in 2011, following which it was upgraded to concrete road in 2019-20. We found no trend in train collisions either, with no cases reported between 2015 and 2019. The plan for doubling of railway line between Singrauli to Katni is of a concern for the northern portion of the corridor area. Although no cases are registered from this railway track, anecdotal evidences suggest that wild animal deaths have occurred in the past. We suggest a focused assessment on the impact of upgraded linear infrastructures and prior planning for mitigation measures in the corridor area.

Live wire snares are of a particular concern. During the fieldwork, two cases of jackal and sloth bear deaths due to live wire snares were recorded, one case of a person dying from this snare, and another of a Deputy Ranger suffering serious injuries from stepping onto a live wire snare during patrol. Live wire snares and wire snares are used for different purposes. While both are intended to capture wild animals, wire snares are an age-old method of hunting for bush meat. Live wire snares are sourced from nearby overhead electric lines (generally of 33V) and laid across forests or adjoining farmlands to prevent wild herbivores from damaging crops.

5.4 FOREST FIRE

Fire events are significantly more frequent in forests than in farmlands. The monthly-patterns of fire events show peaks in March and April months that coincide with forest floor burning for mahua flower collection, tendu shrub burning to promote new leaf growth, and for fodder grass growth. Fire is also used to clear shrubs and discourage wild animals from seeking shelter close to farmlands and settlements.

Agriculture in this region is primarily paddy during monsoon and wheat during winter. For paddy, the stubble burning season is in November and for wheat it is March. We did not find significant fire events in November but report that at least a portion of fire in farmland areas in months of March-April are contributed by stubble burning with a potential to spread to forest areas.

The entire corridor area is susceptible to fire events, with certain areas in the southern corridor showing higher intensity (Fig 22). We suggest strengthening fire prevention practices in the corridor forests on the lines of fire control measures in protected areas. Fire lines need to be identified, demarked, and maintained in at least the southern corridor area, in both, Madhya Pradesh and Chhattisgarh states.

5.5 LAND USE, LAND COVER AND VEGETATION COMPOSITION

We report insignificant land use/land cover changes in a majority of the corridor area between 2010 and 2019. The reported changes in land under agriculture and forest is under 1 km^2. We suggest further analysis of land use and land cover change in the corridor, especially with regards to conversion of cultivated area to fallow land, and vice versa.

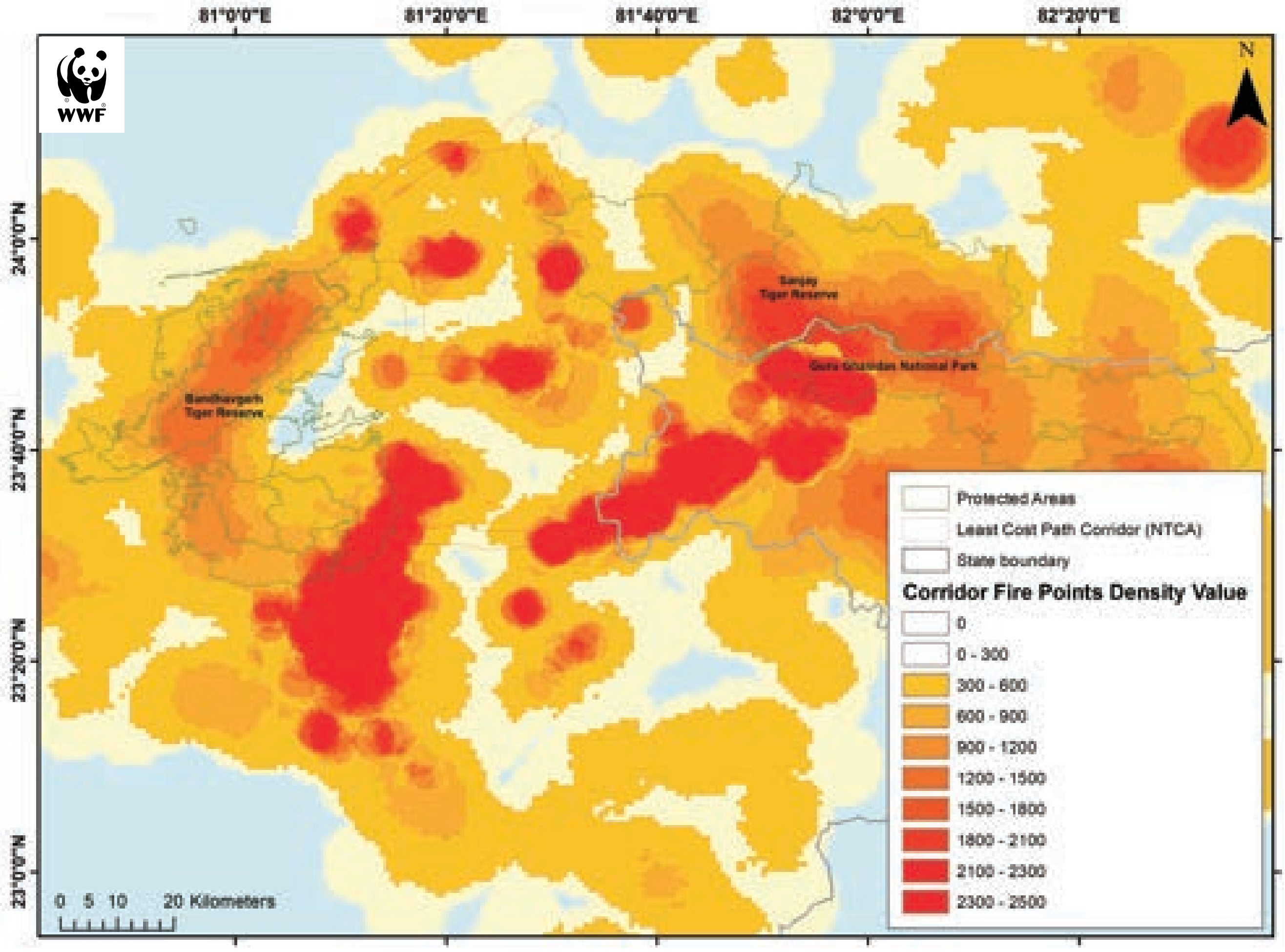

Fig 22. Density maps of fire events (2011-2019) in the Bandhavgarh-Sanjay corridor.

Vegetation profile such as floral composition, floral density and diversity is important for ecosystem restoration, here we presented indicative species composition surveyed in each grid to provide additional information to land cover (Fig 23; Annexure H). Maintaining and restoring degraded habitat patches are important for ensuring ecological connectivity because, as our results indicate, the habitat use by tigers and leopards is influenced by wild ungulate prey which are primarily grazers (preferring grasses) and browsers (preferring woody plants), both of which are integral to forest cover. Based on the vegetation profile for the corridor area and the information on reducing forest cover, we recommend that ecological restoration of the corridor be undertaken using native floral species keeping in mind the natural vegetation composition (Fig 19a and 19b; Annexure D)

5.6 INFRASTRUCTURE

There is a significant impact of linear infrastructure on wildlife in this corridor restricted at certain areas that needs to be studied in detail. The scope of our study limits understanding the impact of roads and railway on tiger and leopard habitat use, incidents indicate that developmental projects may hamper connectivity in the near future.

There is a potential for extractive industries in the southern corridor area for coal mining. While this does not directly impede connectivity for the Bandhavgarh-Sanjay corridor area for now, it covers an important area of Umaria Forest Division with an estimated 12 tigers (Jhala et al., 2020) and is likely to impact connectivity between the corridor identified between Bandhavgarh and Achanakmar Tiger Reserves. The expansion of area under mining and associated development resulting in land-use change, if unplanned, can result in a steep increase in the probability of extinction of the tiger populations in both the PAs, but especially Sanjay tiger reserve owing to the fewer number of tigers presently and the risk of being disconnected from the closest source population (Thatte et al. 2018). Two rail corridors, Bilaspur-Katni and Singrauli-Katni that pass through this corridor with high frequency of coal transport traffic needs to be studied for its impact on connectivity as well. Any plan for extractive industry should give priority consider this region's biodiversity, forest cover, water regime, and cultural and traditional livelihood values.

5.7 DEMOGRAPHY

With 514 villages in the corridor study area as per the 2011 census, the density is 96 persons per km^2, about 1.5 times lower than the average density of the three districts (143.33 persons per km^2). The least cost path corridor recognized by NTCA (2020) comprises 45 villages with a population of 31,274 persons. We identify grid-level populations in the corridor study area to chalk a plan for people participation based on detailed socio-economic and socio-ecological studies which will help identify key sectors of economic and ecological interventions in corridor areas aligning with livelihoods of the people. The potential service enterprises identified for these corridor districts are vehicle repair works, electronics repair works, printing works; agro-based enterprises for food processing mills, as well as chemical-based such as plastics and detergents, mechanical such as steel furniture, and packaging (Ministry of MSME, 2016a, 2016b, 2016c). Further study of people aspirations, educational qualifications, and needs, are required.

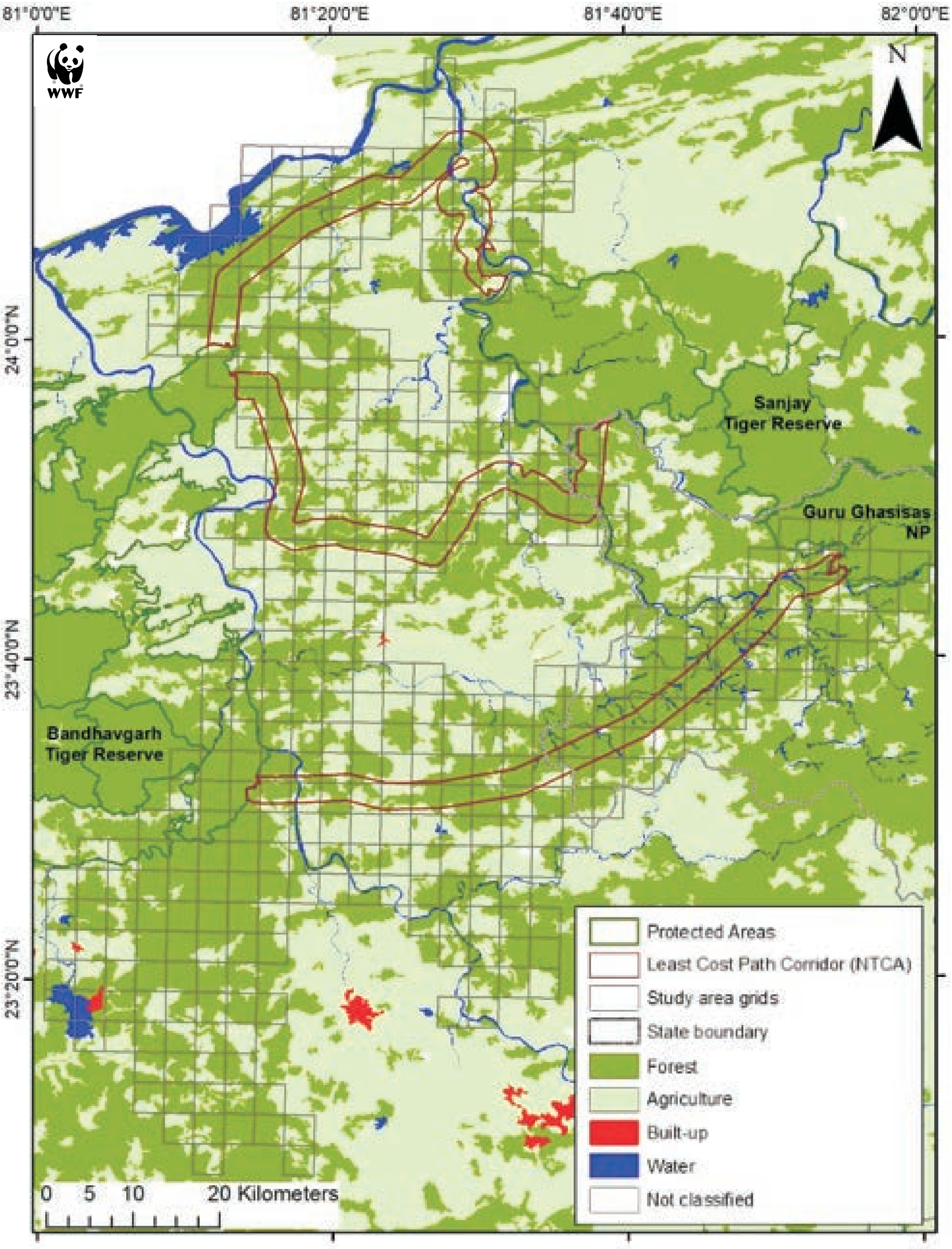

Fig 23. Land use and land cover map of the corridor (IGCMC, WWF-India).

5.8 LIMITATIONS OF THE STUDY

This study provides an overview of the Bandhavgarh-Sanjay corridor using single-season occupancy for tigers and leopards in areas governed by the state forest departments. We acknowledge the human error involved in identification of tiger and leopard signs. This analysis is conducted based on the consensus of multiple persons involved in the sign survey, including the experienced Forest Department personnel and the organisation's field staff, ensuring minimization of the human error. Due to paucity of time, only single-observer survey could be conducted. A concerted effort through camera trapping such as during All India Tiger Estimation would yield fine-scale information on the use of this corridor. We did not run occupancy analysis on sloth bears. Although they share the same habitat (incidental from 0.4 naïve occupancy), sloth bears are more tolerant of people than the large felids, however, factors that influence their habitat use go beyond forest cover and human disturbance. Based on human-sloth bear conflict cases, their presence in the corridor is documented, but we suggest further studies focusing on sloth bear habitat use vis-à-vis their interactions as evident from the highest number of cases of human-sloth bear conflict for the state of Madhya Pradesh reported in this corridor.

The snapshot of other incidents in the corridor at a time scale of nearly a decade (2011-2019) are represented such that management and cooperative interventions are planned appropriately. Such datasets are represented by registered cases, leaving out a gap in understanding the true severity of the problem. While infrastructures are represented by stable structures, events of wildlife crime and forest fires are dynamic, required a holistic approach towards reducing these incidents.

We presented limited information on the social component of corridor, focused only on the demography. This crucial component requires a focused approach to understand human-use of the corridors for livelihood and sustenance, through *nistar* rights, user-rights, ownership as per the Forest Rights Act, 2006, human-wildlife interaction, perceptions, as well as human-government interactions, which are crucial for a holistic overview of a corridor with fluid boundaries.

A pair of jackals along the farmlands adjoining forests in the corridor area.

6. CONCLUSIONS

Corridor connectivity is influenced by several ecological, social, and developmental factors, whereas a species' movement is determined by its life-history requirements. We determined tiger and leopard habitat use using single season occupancy modelling and utilized historic (9-10 year) data for other six elements to identify present-day habitat connectivity in the area between Bandhavgarh and Sanjay Tiger Reserves.

This area has historically maintained a tiger meta-population interacting with tigers from Bandhavgarh and Sanjay Tiger Reserves. Our study shows that to maintain the meta-population and connectivity, forest cover and wild prey abundances are important to be conserved. Pressures from wildlife crime, particularly poisoning, wire and live wire snares, and vehicular collisions are directly affecting tiger and leopard populations in this corridor, whereas the wild prey populations are largely affected – but not limited to – country-made guns and explosives, local weapons, wire and live wire snares, as well as vehicular collisions.

Our study focused on tiger and leopard habitat use on the Madhya Pradesh side of the corridor, leaving out a crucial connectivity area with Guru Ghasidas National Park via Koriya district in Chhattisgarh state, however, we provide ecological and demographic profile for the corridor area in Koriya district, but recommend that this area be monitored to understand large carnivore movement between the two states.

Although present infrastructure is unlikely to be a barrier to connectivity, further upgradation like the recent widening of NH78 should include mitigation structures such that connectivity is maintained. With the southern portion of this corridor and the main pathway of the corridor between Bandhavgarh and Achanakmar Tiger Reserves resting on coal blocks, future extractive prospects may hamper connectivity.
Given that this corridor is divided into three distinct arms connecting the two tiger reserves and one national park proposed to become a tiger reserve (Guru Ghasidas Naitonal Park), we identify the southern portion of Bandhavgarh Tiger Reserve, in Umaria Forest Division, comprising Ghunghuti and Pali Forest Ranges, as crucial area for protection which is not identified as a part of the Bandhavgarh-Sanjay corridor by NTCA.

The suggestions for maintaining connectivity of this corridor stretch beyond ensuring viability for large carnivores in the central India landscape. It also boasts among the highest population of several threatened vulture species nesting in areas identified for large carnivore habitat use. A large area of this region is fertile for two crop cycles with a fairly good water table and drainage of several major regional and national rivers. The cultural heritage is deeply rooted in the region symbolized by Lord Baghesur, the tiger deity said to maintain harmony between the peoples and the wildlife. Conservation of this corridor, therefore, must be a holistic approach translating this symbol into grassroots conservation efforts aiming to achieve harmony.

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ANNEXURE A

List of Forest Ranges which form a part of the Bandhavgarh-Sanjay corridor including parts of Chhattisgarh state connecting with Guru Ghasidas National Park.

Sr No	Forest Circle	Forest Division	Forest Range	Area
1	Shahdol	Umaria	Pali	All
2			Ghunghutti	All
3		Anuppur	Ahirgawa	Northern Beats
4		North Shahdol	Beohari East	All
5			Beohari West	All
6			Godawal	All
7			Jaisinghnagar	All
8			Amjhor	All
9		South Shahdol	Shahdol	Northern Beats
10			Gohparu	All
11			Khannoudi	All
12	Surguja	Manandragarh	Janakpur	All
13			Kuwarpur	All

ANNEUXRE B

WWF Sign Survey

वन्यप्राणियों के प्रत्यक्ष/अप्रत्यक्ष चिन्हों का सर्वेक्षण प्रपत्र

SIGN SURVEY IN BANDHAVGARH- SANJAY DUBRI CORRIDOR

वनमण्डल – परिक्षेत्र – बीट – दिनांक –

आरंभ समय – अंत समय – ग्रीड नं.

आरंभ अक्षांश N आरंभ देशांतर E मौसम– खुला/बादल मार्ग क्रं.–

अंत अक्षांश N अंत देशांतर E

पूर्ण तय की गई दुरी किमी विश्राम में बिताया गया समय –

निरीक्षणकर्ता	नाम	पद	फोन नं.

क्र.	समय	अक्षांश			देशांतर			चिन्ह के प्रकार	प्रजाति	चिन्ह की अवस्था **	चिन्ह की संख्या/प्रत्यक्ष दिखा	टिप्पणी
		डिग्री.	मि.	से.	डिग्री.	मि.	से.					
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

चिन्ह के प्रकार – विष्ठा/लेंडी/गोबर/पदचिन्ह/खुर के निशान/खरोंच/आवाज/कुरेदना/लोटना/खोदना/स्प्रे मार्क/गारा/विष्ठा व जमीन पर खरोंच

चिन्ह की अवस्था – बहुत ताजा/ताजा/पुराना/बहुत पुराना

मांसाहारी प्राणी – बाघ/तेंदुआ/भालू/सोनकुत्ता/लकड़बघ्घा/लोमड़ी/सियार/जंगली बिल्ली/मोर

शाकाहारी प्राणी४ – हाथी/गौर/सांभर/चीतल/नीलगाय/कोटरी/चौसिघा/चिंकारा/काला हिरण/मूषक हिरण/लंगूर (कालामुंह)/बंदर (कालामुंह)

टीप – वन्यप्राणियों का प्रत्यक्ष देखने पर उनकी संख्या, आयु, लिंग, का विवरण टिप्पणी में दर्ज करें।

WWF Forest Guard Interview

1. पिछले बारह महीने में बाघिन के बच्चों के होने का प्रमाण हाँ/नहीं

.बच्चों की संख्या .... अनुमानित आयु .... माह ....

क) वन कर्मचारी द्वारा देखा गया ( ), ख) पदचिन्ह पाये गये ( ),

ग) स्थानीय निवासी द्वारा सूचना ( ) घ) अधिकारी द्वारा देखे गए ( )।

(उपरोक्त उचित व्याख्या को √ करें)

2. अगर बाघ के होने के प्रमाण बीट में हो, परंतु खोज के दौरान कोई चिन्ह न मिला हो, तब किस आधार पर बाघ के होने को प्रमाणित किया गया

पदचिन्ह ( ), प्रत्यक्ष दर्शन ( ), विष्ठा ( ), अन्य चिन्ह

अनुमानित तिथि/माह .... लिखें ।

3. पिछले बारह महीने में तेन्दुआ के बच्चों के होने का प्रमाण, हाँ/नहीं .... बच्चों की संख्या ....

अनुमानित आयु ....माह ....

क) वन कर्मचारी द्वारा देखा गया ( ), ख) पदचिन्ह पाये गये ( ),

ग) स्थानीय निवासी द्वारा सूचना ( ) घ) अधिकारी द्वारा देखे गए ( )।

(उपरोक्त उचित व्याख्या को √ करें)

4. अगर तेन्दुआ के मौजूद होने के प्रमाण बीट में हो, परंतु खोज के दौरान कोई चिन्ह न मिला हो, तब किस आधार पर तेंदुआ के होने को प्रमाणित किया गया पदचिन्ह ( ), प्रत्यक्ष दर्शन ( ), विष्ठा ( ), अन्य चिन्ह

अनुमानित तिथि/माह .... लिखें।

5. इस बीट में पिछले 3 महीनों में पालतू जानवरों के शिकार की जानकारी, परभक्षियों द्वारा शिकार की संख्या, बाघ ....

तेन्दुआ............, जंगली कुत्ता............., और अन्य परभक्षी.. (परभक्षी का विवरण) घटनाओं की संख्याः ....

6. सुझाव एवं टिप्पणी– ....

....

प्रपत्र-३: वनस्पति, मानवीय व्यवधान एवं भू-आच्छादन का प्रारूप

संकलनकर्ता:	अक्षांश:N	देशांतर:E
दिनांक:	वनमंडल:	परिक्षेत्र:
बीट:	ट्रांसेक्ट आई.डी.:	प्लाट आई.डी.:
वन प्रकार*:	भौतिकी के प्रकार**:	

अ एवं स: वनस्पति का सर्वेक्षण

क्र.	वनस्पती प्रजाति (प्र.-३अ) (१५ मी. त्रिज्या के अर्ध व्यास में)		झाड़ी प्रजाति (प्र.-३अ) (५ मी. त्रिज्या के अर्ध व्यास में)		खर-पतवार प्रजाति (प्र.-३अ) (५ मी. त्रिज्या के अर्ध व्यास में)		शाकीय पौधे (प्र.-३स) (१ मी. त्रिज्या के अर्ध व्यास में(प्रचुरता के घटते क्रम में(3-1))	घास (प्र.-३स) (१ मी. त्रिज्या के अर्ध व्यास में) प्रचुरता के घटते क्रम में(3-1))
	प्रजाति	संख्या	प्रजाति	प्रतिशत आच्छादन	प्रजाति	प्रतिशत आच्छादन	प्रजाति	प्रजाति
१								
२								
३								
४								
५								
६								
७								
८								
९								
१०								
	छत्र घनत्व (०,०-१,०):							

* वन प्रकार इनमें से एक होना चाहिए: कृषि/वृक्षारोपण,अत्याधुन के घास का मैदान, बांस, बांझपत्ती जंगल, रेगिस्तान, पहाड़ी वन, रेतीले समतल, बीहड़, घाटी भूमि, हिमालयी चौड़ी पत्तियों के वन, होलोंग वन, मैंग्रोव वन, मिश्रित शुष्क, पर्णपाती वन, मिश्रित सदाबहार जंगल, मिश्रित नम पर्णपाती वन, मिश्रित अर्ध-सदाबहार जंगल, बगीचा, चरागाह, साल वन, क्षुपभूमि (झाड़ीदार जंगल), शोला घास का मैदान, छोटे घास का मैदान, बड़े घास का मैदान, सागौन वन , कंटीले वन, नदीय एवं आर्द्रभूमि।

** भौतिकी के प्रकार इनमें से एक होना चाहिए: पहाड़ी, समतल, ढलान, लहरदार, घाटी, तीव्र ढलान।

ब: मानवीय व्यवधान (१५ मी. के अर्ध व्यास में)

पेड़ों की कटाई की संख्या	शाखाओं की छटाई की संख्या	मनुष्य/ पालतू पशु द्वारा पगडंडियों की संख्या	मनुष्य की मौजूदगी की संख्या	पालतू पशु के मौजूदगी की संख्या	घास/बांबू की कटाई (हा/नहीं)

बीटगार्ड से मौखिक प्रश्नोंत्तरी

1. क्या इस बीट में मनुष्यों का स्थाई निवास स्थल है ? (हां /नही) --------------। यदि हां तो कितनी........................... उनकी अनुमानित संख्या......................।
2. पालतू जानवरों की संख्या मवेशी .... भेड़/बकरी...अन्य पशु...।
3. क्या इस बीट में एन. टी. एफ. टी. इकट्ठा की जाती है? हां/नहीं। यदि हां तो एन. टी. एफ. टी. का नाम..।
4. बीट में पिछले 12 माह में आग लगने की दर 0 से 4 की श्रेणी में लिखे (0 – नही और 4– बहुत अधिक)--।

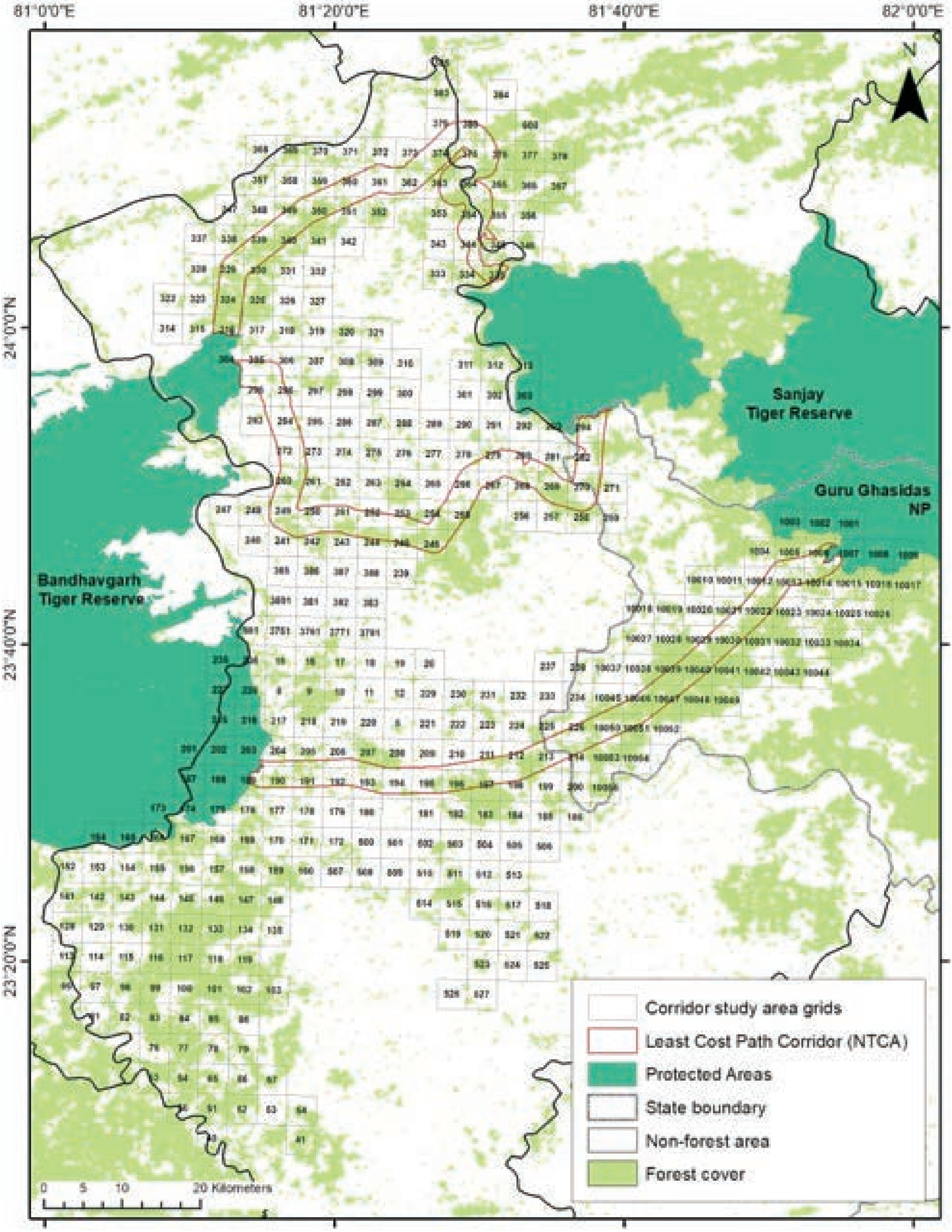
स. भू-आच्छादन सर्वेक्षण (१ मी. के अर्ध व्यास में)

सूखे पत्ते (%)	भू-आच्छादन (योग १०० % होना चाहिए)				
	सुखी घास (%)	हरी घास (%)	शाकीय पौधे (%)	खर-पतवार (%)	खाली भूमि (%)

निर्देश १. बॉस २ मी. की लंबाई से ज्यादा है तो उसे पेड़, और अगर २ मी. से कम है तो उसे झाड़ी में दर्ज करें।

ANNEXURE C

Labelled corridor study area grids.



ANNEXURE D

List of tree species documented during the survey

S.No.	Scientific Names	Local Name/ Common Name			
	Family- Anacardiaceae				
1	*Buchanania lanzan, var. cochinchinensis*	Aachar	Char	Chironji	Chaarbhata
2	*Lannea coromandelica*	Goonja	Gurjan	Moyan	Gharri
3	*Mangifera indica*	Aam	Aama	amb	amri
4	*Semecarpus anacardium*	Bhilma	Bhilava	Bhela	Kohaka
	Family- Annonaceae				
5	*Miliusa tomentosa*	Kari	Kurli	Kirva	Thoska
6	*Annona Squamosa*	Sitaphal	Shareefa		
	Family- Apocynaceae				
7	*Wrightia tinctoria*	Doodhi	Dudhaiya	Samoka	Balaiya
	Family- Bignoniaceae				
8	*Oroxylum indicum*	Sompadal	Sona Padar	Sona Padar	Phalgatetu
9	*Radermachera xylocarpa*	Jaimangal	Bhainspadal	Garun	Katori
	Family- Borginaceae				
10	*Cordia macleodii*	Dahman	Dhaman	Dahipalash	Dahgan
	Family- Burseraceae				
11	*Boswellia serrata*	Salai	Salaiyya	Saalhe	Sali
	Family- Caesalpinioideae				
12	*Bauhinia variegata*	Kachnaar	Mahul bela	Mohla	Kanchan
13	*Bauhinia purpurea*	Keolar	Keolari	Kudvari	Kiniar
14	*Cassia fistula*	Amaltas	Kirvara	Karkacha	Jhagadua
	Family- Celastraceae				
15	*Cassine glauca*	Jamrassi	Jamraas	Aran	Mamri
	Family- Combretaceae				
16	*Anogeissus latifolia*	Dhava	Dhavda	Dhokra	Dhauri
17	*Terminalia arjuna*	Arjun	Kouha	Koha	Kahu
18	*Terminalia bellirica*	Baheda	Baira	Thaka	
19	*Terminalia chebula*	Harra	Hirda	Hilla	Mahoka
20	*Terminalia tomentosa*	Saaj	Saja	Sadora	Barsaaj
	Family- Dilleniaceae				
21	*Dillenia pentagyna*	Suarukh	Kalle	Kotkut	Kohkut
	Family- Dipterocarpaceae				
22	*Shorea robusta*	Saal	Sarrai	Shaal	Rinjal
	Family- Ebenaceae				
23	*Diospyrus melanoxylon*	Tendu	Temru	Tumri	Timburni
24	*Diospyrus cordifolia*	Bistendu	basendu	Bhaktendu	lohari
25	*Diospyrus montana*	Patvan	Patohan	Poten	Timri

List of tree species documented during the survey

S.No.	Scientific Names	Local Name/ Common Name			
	Family- Euphorbiaceae				
26	*Euphorbia nivulia*	Thhooar	Thhooha	Thuar	Danda Thor
27	*Mallotus philippensis*	Sindoor	rori	Kamala	Kuku
	Family- Fabaceae				
28	*Butea monosperma*	Palash	Dhak	Cheola	Dhakda
29	*Dalbergia lanceolaria Paniculata*	Dhobhan	Phansi	Dhobin	Dhobina
30	*Dalbergia latifolia*	Pahadi Sheesham	Kala Sheesham	Sisaun	
31	*Dalbergia sissoo*	Sheesham	Sisso		
32	*Desmodium oojeinense*	Tinsa	Tinas	Tewas	Ruthu
33	*Erythrina stricta*	Gada Palash	Panjra		
34	*Erythrina suberosa*	Hadua	Haruwa	Gadhapalash	Nagthada
35	*Pongamia pinnata*	Karanj	Karji	Kanji	
36	*Pterocarpus marsupium*	Beeja	Beejasal	Beejo	Bula
	Family- Lamiaceae				
37	*Gmelina arborea*	Khamer	Kunar	Sevan	Shivan
38	*Tectona grandia*	Sagon	Sagvan	Segoo	Sagauna
	Family- Lecythidaceae				
39	*Careyaarborea*	Khumai	Kumhi	Kumbhi	Kumri
	Family- Lythraceae				
40	*Lagerstromia parviflora*	Seja	Lendia	Seina	Sijhva
	Family- Malvaceae				
41	*Bombax ceiba*	Semal	Semar	Simul	Sembhal
42	*Helicteres isora*	Aintthi	Marodfali	Aintthni	Baindi
43	*Grewia orbiculata*	Dhamna	Dhavan	Kala Dhaman	Begiya
44	*Sterculia urens*	Kulu	Kurlu	Karay	Karu
	Family- Meliaceae				
45	*Azadirachta indica*	Neem	Limbosi	Margosa	
46	*Soymida febrifuga*	Rohan	Rohani	Soimi	Arraun
	Family- Mimosoideae				
47	*Acacia catechu*	Khair	Khajra		
48	*Acacia leucophloea*	Reonjha	Raunjh	Ronjha	Rimjha
49	*Acacia nilotica*	Bamoora	Babool	Bambool	
50	*Albizia procera*	Safed sirish	Gurar	chichwi	Kinhi
51	*Albizia odoratissima*	Kala sirish	Basa	Bersa	Chichwa
	Family- Moraceae				
52	*Ficus arnottiana*	Paras peepal	Peepli	Kath peepal	
53	*Ficus benghalensis*	Bargad	Bor	Bad	Vaddh
54	*Ficus racemosa*	Gular	Doomer	Oomer	Toya
55	*Ficus religiosa*	Peepal	Pipal	Peepri	

List of tree species documented during the survey

S.No.	Scientific Names	Local Name/ Common Name			
56	*Ficus tinctoria*	Gacchi	Kama	Gasti	Majni
	Family- Moringaceae				
57	*Moringa concanesis*	Sahjan	Munga	Sohajna	Soajna
	Family- Myrtaceae				
58	*Syzygium salicifolium*	Kutjumni	katjaman	Jumkitni	Paniajam
59	*Psidium guajava*	Amrood	Bihi	Jaam	
60	*Syzygium cumini*	Jamun	Jambhul	Jamdi	Jam
	family- Oleaceae				
61	*Nyctanthes arbortritis*	Parijat	Shihari	Siharu	kharsali
	Family- Phyllanthaceae				
62	*Bridelia retusa*	Kasai	Khassi	Akaj	Kachmada
63	*Phyllanthus emblica*	Aamla	Aamra	Aonla	Aunra
	Family- Rhamnaceae				
64	*Ziziphus mauritiana*	Ber	Bor	Bardi	renga
65	*Ziziphus xylopyrus*	Ghont	Ghatol	Ghotiya	Ghoti
	Family- Rubaceae				
66	*Catunaregam spinosa*	Mainhar	Mainphal	Mannial	Manda
67	*Ceriscoides turgida*	Karhar	Kalhar	Phendra	Maniyari Kanta
68	*Gardenia latifolia*	Papda	Paphar	Ghogar	Gogal
69	*Haldina cordifolia*	Haldu	Hardu	Karam	Kaim
70	*Mitragyna parvifolia*	Kema	Kaim	Kallam	Mundi
	Family- Rutaceae				
71	*Aegle marmelos*	Beel	Bel	Mahaka	
72	*Bergera koenigii*	Karineem	Gorneem	Mitneem	Meethaneem
73	*Chloroxylon swietenia*	Bhirra	Ghiriya	Birohar	Haladbera
74	*Naringi crenulata*	Bilsena	Balsena	Bilsendha	Binaas
75	*Limonia acidissima*	Kaiththa	Katbel	Kauthh	Kabeet
	Family- Salicaceae				
76	*Casearia elliptica*	Tondari	Bheri	Bairi	Jhundri
77	*Flacourita indica*	Kakai	Kaanker	Kutian	Katai
78	**Family- Sapindaceae**				
79	*Schleichera oleosa*	Kosam	Kusim	Kusum	Pusku
	Family- Sapotaceae				
80	*Madhuca longifolia var. latifolia*	Mahua	Mohu	Maul	Mahula
	Family- Simaroubaceae				
81	*Ailanthus excelsa*	Maharukh	Mahaneem	Aral	
	Family- Ulmaceae				
82	*Holoptelea integrifolia*	Chirol	Karanji	Chilbil	Chilla
83	*Glochidion heyneanum*	Koria	Kolya	Khonda	Shivri

List of shrub species documented during the survey

S.No.	Shrub Species	Local Name or Common Names in Hindi			
	Famili- Apocynaceae				
1	*Carissa spinarum*	Jungli Karonda	Karounda	Chota Karonda	
	Family- Lamiaceae				
2	*Vitex negundo*	Nirgundi	Sindwar		
	Family- Lythraceae				
3	*Woodfordia fruticosa*	Dhawai			
	Family- Poaceae				
4	*Bambusa bambos*	Katila Bans	Baans		
5	*Dendrocalamus Strictus*	Baans			
	Family- Rhamnaceae				
6	*Ziziphus nummularia*	jharberi	Beri		
7	*Ziziphus oenoplia*	Makoi	Reni		
	Family- Verbenaceae				
8	*Lantana Camera*	Raimuniya	Barhamasi		
	Family- Tiliaceae				
9	*Grewia hirsuta*	Gudsakri	Kakarundah	Phrongli	Kukurbicha

List of herbs species documented during the survey

S. No.	Herbs	Local/ Common Name in Hindi				
	Family- Acanthaceae					
1	*Andrographis paniculata*	Chirayta	Kadwa Chirata			
2	*Peristrophe paniculata*	Atrilal	Kakajangha	Nasabhanga	Kakanadi	
3	*Rungia repens*	Kharmor				
	Family- Amaranthaceae					
4	*Achyranthes aspera*	Chhirchita	Lapti	Latjira	Bhuski	Bichu Kanta
5	*Alternanthera pungens*	Kanti				
6	*Alternanthera sessilis*	Garundi	Guroo	Gotewar		
7	*Celosia argentea*	Gadrya	Van Murga	Garkha		
	Family- Apiaceae					
8	*Centella asiatica*	Bheki	Ballari	Bramhamanduki	Manduki	Khulakhudi
	Family- Arecaceae					
9	*Phoenix acaulis*	Cheend				
	Family- Asclepiadaceae					
10	*Calotropis gigantea*	Safed Aak	Akoua			
11	*Calotropis procera*	Aak	Akoua			
12	*Hemidesmus indicus*	Doodhi bela				

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List of herbs species documented during the survey

S. No.	Herbs	Local/ Common Name in Hindi				
	Family- Asparagaceae					
13	*Urginea indica*	Van Pyaj				
	Family- Asteraceae					
14	*Ageratum conyzoides*	Ghamira	koomi	Ajavapan	Ajgandha	
15	*Cyanthillium cinereum*	Sahadevi				
16	*Echinops echinatus*	Ultakanta	Ghokhru	Onnt Kateri		
17	*EcliptaProstrata*	Bhringraj				
18	*Elephantopus scaber*	Samdudri	Vantambakhu			
19	*Parthenium hysterophorus*	Gajar Ghas				
20	*Tridax procumbens*	Kanphuli	Kumra			
21	*Vicoa indica*	Bhichloo				
22	*Xanthium strumarium*	Ghokhru	Ghaghra	Sankhauli		
	Family- Boraginaceae					
23	*Heliotropium indicum*	Hathajori				
	Family- Convolvulaceae					
24	*Evolvulus alsinoides*	Shankhpushpi	Visnukrantha	Shyamakrantha		
25	*Evolvulus nummularius*	Vishnukrantha				
	Family- Cyperaceae					
26	*Cyperus kyllingia*	Nirvishi				
27	*Cyperus rotundus*	Bara-nagar-motha	Korehi-jhar	Motha	Gondra	
	Family- Euphorbiaceae					
28	*Euphorbia hirta*	Bara dudhi				
29	*Phyllanthus amarus*	Bhui Aamla	Jar Aamla			
	Family- Fabaceae					
30	*Alysicarpus monilifer*	Murangi				
31	*Atylosia scarabaeoides*	Van Tuar	Jungli Arhar			
32	*Cassia occidentalis*	Kasunda	Badi Kasundi			
33	*Cassia tora*	Panwar	Chakunda	Chakvat	Punaar	Chakoda
34	*Crotalaria spectabilis*	Ghunghuniya	Ghunguna			
35	*Desmodium triflorum*	Kudaliya	Motha	TeenPania		
36	*Flemingia strobilifera*	Kanphuta				
37	*Tephrosia purpurea*	Sarphonk	Sarpunkha			
	Family- Hypoxidaceae					
38	*Curculigo orchioides*	Kaali Musli				
	Family- Lamiaceae					
39	*Hyptis suaveolens*	Jungli Tulsi				
40	*Leonitis nepetifolia*	Mahadrona	Lal guma	Bara guma		
41	*Leucas aspera*	Chhota halkusa	Gophaa			

List of herbs species documented during the survey

S. No.	Herbs	Local/ Common Name in Hindi				
	Family- Malvaceae					
42	*Abelmoschus fisculneus*	Van Bhindi	Amrai			
43	*Hibiscus sabdariffa*	Lal Ambari	Patwa			
44	*Malvastrum coromandelianum*	Kharenti				
45	*Sida acuta*	Aatibal	Baraira			
46	*Sida chordata*	Aatibal	Bhuinii			
47	*Urena lobata*	Vilaiti san	Bachita	Lapetua		
48	*Waltheria indica*					
	Family- Mimosaceae					
49	*Mimosa pudica*	Chuimui	Lajwanti			
	Family- Onagraceae					
50	*Ludwigia octovalvis*	Van Loung				
	Family- Oxalidaceae					
51	*Biophytum sensitivum*	Lajalu	Lajvanti			
52	*Oxalis corniculata*	Amrul				
	Familay- Papavaraceae					
53	*Argemone mexicana*	Pili Kateri	Katili	Bhatkatai		
	Family- Polygonaceae					
54	*Persicaria longiseta*					
	Family- Rubiaceae					
55	*Borreria pusilla*	Safed phooli				
	Family- Scrophulariaceae					
56	*Scoparia dulcis*	Chana Booti	Mithi patti	Ghoda Tulsi		
	Family- Solanaceae					
57	*Datura fistula*	Dhatura				
58	*Solanum indicum*	Van Bhata	Barhanta			
59	*Solanum virginianum*	Kanteli	Untkateli			
	Family- Hypoxidaceae					
60	*Curculigo orchioides*	Kali Musli				
	Family- Verbenaceae					
61	*Stachytarpheta indica*	Kariyartharani				
	Family- Cucurbitaceae					
62	*Coccinia grandis (Climber)*		Kundru			
	Family- Asparagaceae					
63	*Asparagus racemosus(Climber)*	Shatavari	Shatmuli	Satavar		
64	*Chlorophytum tuberosum*	Safed Musli				

List of herbs species documented during the survey

S. No.	Herbs	Local/ Common Name in Hindi				
	Family- Rhamnaceae					
65	*Ventilago denticulata (Climber)*	Kevti	Kevtibel			

List of grass species documented during the survey

S.No.	Grasses (family- Poaceae)	Local/ common Name in Hindi				
1	*Apluda mutica*	Phulera	Fulera	Phooli		
2	*Aristida adscensionis*	Lappa	Ful Bahari			
3	*Arthraxon hispidus*	-				
4	*Arundinella pumila*	Bhurbhusi				
5	*Cenchrus ciliaris*	Anjan	Dhaman	Baina	Kusa	Dhamanio
6	*Chloris barbeta*	Sikka Ghas	Gondali Ghas			
7	*Chloris dolichostachya*	Badi Sikkha				
8	*Chrysopogon fulvus*	Chikua	Chikwa			
9	*Cymbopogon martini*	Gandhabel	Gandhej-Ghas	Nakora	Mirchgandh	Motiya
10	*Cynodon barberi*	Badi Doob				
11	*Cynodon dactylon*	Choti doob				
12	*Dactyloctenium aegyptium*	-				
13	*Dichanthium annulatum*	Kandi				
14	*Digitaria ciliaris*	Raai Ghas				
15	*Dimeria ornithopoda*	-				
16	*Echinochloa colona*	Shama	Shami	Jhangara	Jharwa	
17	*Eleusine indica*	-				
18	*Eragrostis bifaria*					
19	*Eragrostis intermedia*	Bhurbhusi				
20	*Eragrostis tenella*	-				
21	*Eragrostis tenuifolia*					
22	*Eragrostis tremula*	Jhalar ghas				
23	*Eragrostis unioloides*	Van Poha				
24	*Eulaliopa binata*	Bagai				
25	*Heteropogon contortus*	Sukal	Sukra	Kural		
26	*Isachne globosa*					
27	*Ischaemum indicum*	Musel				
28	*Iseilema laxum*	Mosan				
29	*Leptochloa panicea*					
30	*Oplismenus burmannii*	Banshiya chara				
31	*Paspalidium flavidum*	-				
32	*Paspalum scrobiculatum*	Kodo				
33	*Pennisetum pedicellatum*	Deenanath				
34	*Perotis indica*					
35	*Sacherum spontaneum*	Kansh				
36	*Setaria intermedia*	latkan	Chipki			

List of grass species documented during the survey

S.No.	Grasses (family- Poaceae)	Local/ common Name in Hindi				
37	*Setaria pumila*	Ban Bajra				
38	*Setaria verticillata*	Latkan	Chipki			
39	*Thelepogon elegans*	Bangadi	Chagudi Ghas			
40	*Themeda quadrivalvis*	Badi Gunher	Bhond			
41	*Themeda triandra*	Choti Gunher				

List of grass palatability

S.No.	Palatability Grade	Grass Name
1	A	*Cenchrus ciliaris*
2	A	*Dichanthium annulatum*
3	A	*Iseilema laxum*
4	A	*Pennisetum pedicellatum*
5	B	*Apluda mutica*
6	B	*Arthraxon hispidus*
7	B	*Arundinella pumila*
8	B	*Cynodon barberi*
9	B	*Cynodon dactylon*
10	B	*Digitaria ciliaris*
11	B	*Dimeria ornithopoda*
12	B	*Echinochloa colona*
13	B	*Eleusine indica*
14	B	*Eragrostis bifaria*
15	B	*Eragrostis tenella*
16	B	*Eragrostis unioloides*
17	B	*Isachne globosa*
18	B	*Ischaemum indicum*
19	B	*Oplismenus burmannii*
20	B	*Paspalidium flavidum*
21	B	*Paspalum scrobiculatum*
22	B	*Perotis indica*
23	B	*Setaria pumila*
24	C	*Aristida adscensionis*
25	C	*Chloris barbeta*
26	C	*Chloris dolichostachya*
27	C	*Chrysopogon fulvus*
28	C	*Dactyloctenium aegyptium*
29	C	*Eragrostis intermedia*
30	C	*Eragrostis tenuifolia*
31	C	*Eragrostis tremula*
32	C	*Eulaliopa binata*
33	C	*Heteropogon contortus*

List of grass palatability

S.No.	Palatability Grade	Grass Name
34	C	*Leptochloa panicea*
35	C	*Sacherum spontaneum*
36	C	*Setaria intermedia*
37	C	*Setaria verticillata*
38	C	*Thelepogon elegans*
39	C	*Themeda quadrivalvis*
40	C	*Themeda triandra*
41	UP	*Cymbopogon martini*
		Gorade & Datar, 2014; Uikey, 2018; Panchal, 2018

List of all Families

S.No.	Plant Families
1	Poaceae
2	Acanthaceae
3	Amaranthaceae
4	Anacardiaceae
5	Annonaceae
6	Apiaceae
7	Apocynaceae
8	Arecaceae
9	Asclepiadaceae
10	Asparagaceae
11	Asteraceae
12	Bignoniaceae
13	Boraginaceae
14	Burseraceae
15	Caesalpinioideae
16	Celastraceae
17	Combretaceae
18	Convolvulaceae
19	Cucurbitaceae
20	Cyperaceae
21	Dilleniaceae
22	Dipterocarpaceae
23	Ebenaceae
24	Euphorbiaceae
25	Fabaceae
26	Hypoxidaceae
27	Lamiaceae
28	Lecythidaceae
29	Lythraceae

S.No.	Plant Families
30	Malvaceae
31	Meliaceae
32	Mimosaceae
33	Moraceae
34	Moringaceae
35	Myrtaceae
36	Oleaceae
37	Onagraceae
38	Oxalidaceae
39	Phyllanthaceae
40	Poaceae
41	Polygonaceae
42	Rhamnaceae
43	Rubiaceae
44	Rutaceae
45	Salicaceae
46	Sapindaceae
47	Sapotaceae
48	Scrophulariaceae
49	Simaroubaceae
50	Solanaceae
51	Tiliaceae
52	Ulmaceae
53	Verbenaceae
54	Verbenaceae

ANNEXURE E

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
5	0.86	0.83	0.57	1.34
8	1.00	1.00	0.85	6.75
9	1.00	1.00	0.85	11.74
10	1.00	1.00	1.33	3.66
11	0.04	0.04	0	0.25
12	0.40	0.37	0.33	0.59
15	0.78	0.83	0.28	8.53
16	1.00	1.00	0.85	9.89
17	0.86	0.85	0.5	3.58
18	0.04	0.05	0	0.78
19	0.92	0.90	0.66	1.06
51	0.49	0.64	0	12.33
52	0.48	0.63	0	12.22
64	0.96	0.98	0.33	14.25
65	1.00	1.00	1.14	12.92
66	1.00	1.00	1.33	11.95
76	0.44	0.58	0	11.59
77	0.56	0.71	0	13.38
78	0.45	0.60	0	11.81
79	0.95	0.97	0.4	11.33
82	0.23	0.31	0	7.96
83	0.58	0.73	0	13.71
85	0.41	0.54	0	11.06
97	0.99	0.99	0.8	5.4
98	1.00	1.00	1.2	13.24
100	0.84	0.88	0.28	10.01
101	0.93	0.95	0.4	9.91
102	0.99	0.99	0.57	11.61
103	0.39	0.53	0	10.87
114	0.10	0.12	0	4.08
115	0.84	0.87	0.33	8.24
116	0.96	0.97	0.33	14
117	0.60	0.75	0	14.01
118	0.99	0.99	0.57	11.42
119	0.82	0.86	0.28	9.42
129	0.99	0.98	0.85	1.46
131	1.00	1.00	2	13.64
132	1.00	1.00	0.85	14.27
133	0.78	0.82	0.28	8.42

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
134	0.42	0.55	0	11.22
135	0.70	0.74	0.28	6.79
141	0.99	0.99	0.85	3.63
142	0.84	0.88	0.28	10.03
143	0.84	0.88	0.28	9.83
144	0.99	0.99	0.57	10.61
145	0.99	1.00	0.57	13.42
146	0.99	1.00	0.57	14.13
147	0.99	1.00	0.57	14.45
153	1.00	1.00	1.14	9.03
155	0.41	0.54	0	11.08
156	0.99	0.99	0.57	10.37
157	0.93	0.96	0.28	13.49
158	0.57	0.72	0	13.51
159	1.00	1.00	1.14	12.64
160	0.14	0.18	0	5.62
167	1.00	1.00	0.85	14
168	1.00	1.00	0.85	12.59
169	1.00	1.00	2.28	13.63
170	0.86	0.90	0.28	10.54
171	0.97	0.96	0.66	4.55
172	0.10	0.12	0	4.12
175	0.96	0.97	0.4	11.97
176	0.55	0.71	0	13.32
177	0.80	0.83	0.33	7.33
178	0.05	0.05	0	1.22
181	0.04	0.04	0	0.34
182	0.10	0.11	0	3.98
183	0.83	0.84	0.4	5.92
184	0.07	0.08	0	2.54
189	1.00	1.00	0.85	13.32
190	1.00	1.00	2.28	6.8
191	0.09	0.11	0	3.68
192	1.00	1.00	2.4	7.25
193	0.99	0.99	0.85	5.24
194	1.00	1.00	1.42	2.74
195	1.00	1.00	0.85	8.51
196	0.99	0.99	0.57	12.35
197	0.93	0.96	0.28	13.42
198	0.30	0.40	0	9.21
199	0.24	0.32	0	8.15

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
200	0.32	0.43	0	9.68
204	1.00	1.00	2	11.93
205	1.00	1.00	1.14	6.57
206	0.10	0.13	0	4.35
207	0.49	0.64	0	12.39
208	0.07	0.08	0	2.61
209	1.00	1.00	1	3.16
210	1.00	1.00	1.42	9.5
211	0.98	0.99	0.57	10.06
212	0.91	0.94	0.28	12.24
213	1.00	1.00	1.14	7.06
214	0.35	0.48	0	10.22
217	1.00	1.00	1.42	7.59
218	0.21	0.28	0	7.51
219	0.99	0.99	0.8	6.48
220	0.07	0.08	0	2.71
221	1.00	1.00	1.66	0.68
222	0.05	0.05	0	1.16
223	1.00	1.00	1.5	4.49
224	0.86	0.89	0.33	8.97
225	1.00	1.00	1	11.65
228	0.59	0.61	0.28	4.95
229	0.43	0.40	0.33	0.92
230	0.95	0.94	0.57	5.27
231	1.00	1.00	1.6	4.59
232	0.41	0.40	0.28	2.26
233	1.00	1.00	1.14	4.75
234	1.00	1.00	0.85	9.1
236	0.94	0.94	0.57	4.87
239	0.14	0.18	0	5.6
244	0.07	0.08	0	2.74
246	0.99	1.00	0.66	11.41
247	1.00	1.00	2	0.43
248	1.00	1.00	2	7.88
249	0.98	0.99	0.57	9.92
250	0.18	0.24	0	6.78
251	1.00	1.00	1.71	11.8
252	0.58	0.60	0.28	4.8
253	0.98	0.98	0.57	9.11
254	1.00	1.00	1.5	9.48

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
255	1.00	1.00	1	12.15
257	0.93	0.93	0.57	4.51
258	1.00	1.00	1.6	3.63
260	0.05	0.06	0	1.42
261	0.96	0.96	0.57	6.2
262	0.49	0.49	0.28	3.45
263	1.00	1.00	1.14	3.25
264	1.00	1.00	1.14	6.02
266	0.28	0.38	0	8.98
267	0.55	0.57	0.28	4.39
268	1.00	1.00	1.66	5.97
269	0.46	0.60	0	11.82
270	1.00	1.00	1.14	11.72
272	0.04	0.04	0	0.35
273	0.87	0.84	0.57	1.53
274	0.06	0.06	0	1.88
275	0.08	0.09	0	3.18
276	0.05	0.05	0	1.31
277	1.00	1.00	1.14	5.14
278	0.50	0.49	0.33	2.12
279	0.07	0.08	0	2.72
283	0.04	0.05	0	0.82
284	0.17	0.22	0	6.47
285	0.99	0.98	0.85	1.78
286	0.57	0.53	0.4	0.85
287	0.05	0.06	0	1.58
288	0.47	0.47	0.28	3.19
289	0.05	0.06	0	1.48
290	0.09	0.11	0	3.84
291	0.96	0.96	0.57	6.49
295	0.10	0.12	0	4.08
296	0.70	0.74	0.28	6.86
297	0.49	0.50	0.28	3.56
298	1.00	1.00	1.14	0.61
299	0.04	0.04	0	0.57
300	0.04	0.04	0	0.39
305	0.68	0.72	0.28	6.47
306	1.00	1.00	0.85	6.62
307	0.98	0.99	0.57	9.93

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
308	1.00	1.00	1.14	6.67
309	0.09	0.10	0	3.53
312	0.21	0.28	0	7.43
315	0.12	0.15	0	4.92
317	0.60	0.63	0.28	5.18
318	0.99	0.99	0.85	4.2
319	0.60	0.63	0.28	5.25
320	0.96	0.96	0.57	6.52
321	1.00	1.00	2	5.73
323	1.00	1.00	1.14	8.74
324	1.00	1.00	1.14	12.7
325	0.61	0.64	0.28	5.37
326	0.67	0.65	0.4	2.55
328	1.00	1.00	0.85	9.53
329	0.59	0.74	0	13.82
330	0.98	0.99	0.57	10.11
334	1.00	1.00	0.85	9.38
339	1.00	1.00	1	10.96
340	0.83	0.87	0.28	9.56
343	1.00	1.00	1.14	6.59
344	0.95	0.95	0.57	5.78
345	0.60	0.63	0.28	5.23
349	0.90	0.93	0.28	11.76
350	0.99	0.99	0.57	12.17
351	0.08	0.10	0	3.41
354	1.00	1.00	1.2	3.45
355	0.46	0.46	0.28	2.97
356	1.00	1.00	1.14	4.73
358	0.09	0.11	0	3.68
359	0.83	0.87	0.28	9.6
360	0.69	0.73	0.28	6.63
361	0.68	0.71	0.28	6.45
362	0.97	0.97	0.57	7.29
363	0.98	0.98	0.66	5.95
364	1.00	0.30	4	7.82
365	0.22	0.30	0	7.79
366	0.27	0.36	0	8.67
367	0.26	0.35	0	8.56
371	0.58	0.61	0.28	4.91

Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Grid_ID	Tiger_psi	Leopard_psi	Prey ER	Forest_sqkm
372	0.09	0.11	0	3.9
373	1.00	1.00	1.5	2.65
374	0.89	0.93	0.28	11.62
375	0.99	0.99	0.8	6.72
376	0.41	0.55	0	11.19
377	1.00	1.00	0.85	9.56
380	0.18	0.23	0	6.68
381	0.99	0.99	1	0.61
382	0.99	0.99	1	0.64
383	0.39	0.38	0.28	1.95
385	0.14	0.18	0	5.77
386	0.87	0.85	0.57	1.76
500	0.52	0.54	0.28	3.97
502	0.09	0.11	0	3.82
503	0.06	0.06	0	1.94
508	0.10	0.13	0	4.31
509	0.06	0.07	0	2.08
510	0.97	0.98	0.57	8.08
511	0.85	0.89	0.28	10.32
515	0.08	0.09	0	3.26
600	0.95	0.94	0.57	5.32
881	0.46	0.46	0.28	3.07
3751	1.00	1.00	1	3.06
3761	0.99	0.99	0.8	5.99
3771	1.00	1.00	1.66	1.19
3781	1.00	1.00	2	0.16
3801	0.99	0.99	1	0.58

Table B. Model selection results for Ψ as a function of covariates, and associated coefficient estimates for all models.

Abbreviations: prey = prey encounter rate, forest = forest cover, water = waterbodies; perm_mean = mean value of landscape permeability for the grid, popdens = human population density (per grid), nlights = night lights; builtup = built-up area

Table 1. Occupancy models for Tigers

Model	**AICc**	**AICc wt**	**K**	**-2log (L)**	**Estimated β (SE)**						
					prey	**Forest**	**water**	**perm_mean**	**nlights**	**Pop dens**	**builtup**
Ψ(prey+forest) θ(.) θ'(.) p(.)}	663.41	0.2582	6	651.02	8.36 (4.06)	0.26 (0.18)					
Ψ(prey) θ(.) θ'(.) p(.)}	664.54	0.1466	5	654.27	7.8 (3.04)						
Ψ(forest+water+prey) θ(.) θ'(.) p(.)}	665.11	0.11005	7	650.6		0.21 (0.18)	-0.02				
Ψ(perm_mean+water+prey+forest) θ(.) θ'(.) p(.)}	665.12	0.1095	8	648.46	12.3788 (6.0157)	0.3643 (0.2364)	-0.1759(0.2218)	-0.4675 (0.3464)			
Ψ(popdens+perm_mean+prey) θ(.) θ'(.) p(.)}	665.49	0.0913	7	650.97	8.656(3.7212)			-0.1666 (0.2823)		-0.0063 (0.0043)	
Ψ(perm_mean+water+prey) θ(.) θ'(.) p(.)}	665.83	0.0770	7	651.31	14.951 (13.263)		-0.4194 (0.3653)	-0.3186 (0.3451)			
Ψ(forest+prey+nlights+builtup) θ(.) θ'(.) p(.)}	666.31	0.0605	8	649.64	8.0983 (4.083)	0.25 (0.184)			-0.0278 (0.0681)		-2.513 (6.7307)

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Table 1. Occupancy models for Tigers

Model	AICc	AICc wt	K	-2log (L)	Estimated β (SE)						
					prey	Forest	water	perm_mean	nlights	Pop dens	builtup
Ψ(popdens+builtup+nlights+prey) θ(.) θ'(.) p(.)}	667.50	0.0333	8	650.83	7.765 (3.238)				-0.007 (0.033)	-0.0051 (0.004)	-3.003 (3.506)
Ψ(forest+prey+popdens+builtup+nlights) θ(.) θ'(.) p(.)}	667.79	0.0289	9	648.95	8.309 (4.232)	0.2056 (0.1797)			-0.003 (0.0332)	-0.003 (0.004)	-3.358 (3.899)
{Ψ(prey+forest+builtup+perm_mean+water+nlights+popdens+forest*perm_mean) θ(.) θ'(.) p(.)}	669.05	0.0153	12	643.58	11.741 (4.927)	2.168 (1.531)	-0.068 (0.253)	1.267 (1.266)	-0.305 (0.222)	0.002 (0.006)	8.838 (9.243)
Ψ(forest+water+prey+perm_mean+nlights+popdens+builtup) θ(.) θ'(.) p(.)}	669.09	0.0151	11	645.85	14.224 (11.490)	0.342 (0.247)	-0.192 (0.368)	-0.629 (0.645)	-0.002 (0.007)	-0.035 (0.365)	-6.061 (18.04)
Ψ(forest+water) θ(.) θ'(.) p(.)}	679.18	0.0001	6	666.79		0.534 (0.251)	0.009 (0.152)				
Ψ(nlights+builtup) θ(.) θ'(.) p(.)}	680.005	0.00006	3	673.89					-3.4338 (988.8)		-307.9(85754.3)
Ψ(forest+water+nlights+builtup) θ(.) θ'(.) p(.)}	680.54	0.00005	8	663.88		0.617 (0.292)	0.004 (0.175)		-0.107 (0.114)		2.701(7.108)
Ψ(builtup) θ(.) θ'(.) p(.)}	680.71	0.00005	3	674.6							-160.05 (57380.8)

Table 1. Occupancy models for Tigers

Model	AICc	AICc wt	K	-2log (L)	Estimated β (SE)						
					prey	Forest	water	perm_mean	nlights	Pop dens	builtup
Ψ(popdens+builtup+nlights+forest+water) θ(.) θ'(.) p(.)}	682.37	0.00002	9	663.54		0.593 (0.294)	0.022 (0.173)		-0.096 (0.115)	-0.002 (0.004)	2.256(7.177)
Ψ(perm_mean) θ(.) θ'(.) p(.)}	682.99	0.00001	5	672.74				0.271 (0.155)			
Ψ(.) θ(.) θ'(.) p(.)}	683.33	0.00001	3	677.22							
Ψ(popdens+perm_mean) θ(.) θ'(.) p(.)}	683.65	0.00001	6	671.27				0.221 (0.148)		-0.002 (0.002)	
Ψ(forest) θ(.) θ'(.) p(.)}	677.07	0.0002	5	666.8		0.536 (0.250)					
Ψ(nlights) θ(.) θ'(.) p(.)}	677.58	0.0002	3	671.47					-22.77 (0)		
Ψ(popdens) θ(.) θ'(.) p(.)}	684.35	0.00001	5	674.08						-0.003(0.002)	
Ψ(perm_mean+water) θ(.) θ'(.) p(.)}	685.07	0.00001	6	672.69			-0.013(0.077)	0.267 (0.155)			
Ψ(nlights+popdens) θ(.) θ'(.) p(.)}	685.32	0	6	672.94					-0.021 (0.033)	-0.003(0.003)	
Ψ(popdens+builtup) θ(.) θ'(.) p(.)}	685.84	0	6	673.46							
Ψ(popdens+builtup+nlights+perm_mean) θ(.) θ'(.) p(.)}	687.29	0	8	670.63							

Table 1. Occupancy models for Tigers

Model	AICc	AICc wt	K	-2log (L)	Estimated β (SE)						
					prey	Forest	water	perm_mean	nlights	Pop dens	builtup
Ψ(water) θ(.) θ'(.) p(.)}	687.31	0	5	677.03							
Ψ(popdens+builtup+nlights) θ(.) θ'(.) p(.)}	687.37	0	7	672.85							
Ψ(popdens+builtup+nlights+water) θ(.) θ'(.) p(.)}	689.4	0	8	672.73							

Table A.Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Table 2. Occupancy models for Leopards.

Model	AICc	AICc Weights	k	-2log(L)	Estimated β (SE)						
					prey	forest	water	perm_mean	nlights	Pop	builtup
Ψ(prey+forest)θ(.) θ'(.)p(.)	666.1225	0.28818	6	653.7372	8.36(3.90)	0.21 (0.19)				dens	
Ψ(prey+forest+popde)nsθ(.) θ'(.)p(.)	666.7338	0.21229	7	652.2177	7.54 (4.06)	0.26 (0.18)				-0.003(0.003)	
Ψ(prey+forest+nlights)θ(.) θ'(.) p(.)5	666.938	0.19163	7	652.4224	7.2(3.77)	0.27(0.24)			-0.05 (0.04)		
Ψ(prey)θ(.) θ'(.)p(.)	667.6991	0.13101	5	657.4252	7.34(3.05)						
Ψ(prey+forest+nlights+water) θ(.)θ'(.)p(.)	668.8609	0.07329	8	652.1942	7.65(4.19)	0.33(0.40)	0.07 (0.16)		-0.06 (0.05)		
Ψ(prey+water+nlights)theta(.) theta'(.)p(.)	670.2572	0.03646	7	655.7411	7.06 (3.06)		-0.02(0.14)		-0.06 (0.04)		
Ψ(prey+forest+water+nlights+popdens)θ(.) θ'(.)p(.)	670.5181	0.032	9	651.6809	7.25 (3.92)	0.25 (0.23)	0.09 (0.15)		-0.05 (0.05)	-0.003 (0.004)	
Ψ(prey+forest+nlights+water+popdens)θ(.) θ'(.)p(.)	670.5181	0.032	9	651.6809	7.25 (3.92)	0.25 (0.23)	0.09 (0.15)		-0.05 (0.05)	-0.003 (0.004)	

Table A.Ψ (Psi) values for tiger and leopard and covariate values for the best fit model (forest cover and prey encounter rate). For details of covariate calculation.

Table 2. Occupancy models for Leopards.

					Estimated β (SE)						
Model	**AIC**	**AICc Weights**	**k**	**-2log(L)**	**prey**	**for**		**perm_**	**nlig**	**Po**	**builtu**
Ψ(forest)θ(.) θ'(.)p(.)	677.0741	0.00121	5	666.8002		0.53 (0.25)					
Ψ(forest+popdens)θ(.) θ'(.)p(.)	678.0827	0.00073	6	665.6974		0.52 (0.26)				-0.003 (0.003)	
Ψ(nlights+forest+popdens)θ(.) θ'(.)p(.)	678.1437	0.00071	7	663.6275		0.59 (0.29)			-0.07 (0.08)	-0.002 (0.004)	
Ψ(water+forest)θ(.) θ'(.)p(.)	679.1814	0.00042	6	666.7961		0.53 (0.25)	0.009 (0.15)				
Ψ(popdens)θ(.) θ'(.)p(.)	684.3547	0.00003	5	674.0807						-0.003 (0.02)	
Ψ(water+popdens)θ(.) θ'(.)p(.)	686.3077	0.00001	6	673.9224			-0.03 (0.08)			-0.003 (0.002)	
Ψ(water)θ(.) θ'(.)p(.)	687.3132	0.00001	5	677.0392			-0.053 (0.12)				

ANNEXURE F

Details of human-wildlife cases per year (2011 2019) for eight Forest Circles and six Tiger Reserves for human injury and loss of life and livestock depredation.
“Madhya Pradesh Forest Department n.d.”

1. Division and Tiger Reserve specific cases of human injury or loss of life (2011 - 2019)

Year	Chhatarpur	Hoshangabad	Chindwara	Shahdol	Balaghat	Seoni	Betul	Jabalpur	Kanha	Panna	Pench	Satpuda	Sanjay	Bandhavgarh
2011	68	83	44	513	28	57	6	232	23	21	0	52	8	4
2012	88	45	44	560	55	135	18	263	18	11	0	56	8	103
2013	112	56	56	477	56	90	6	202	14	12	2	52	16	63
2014	208	53	38	384	16	87	11	267	33	11	2	16	10	33
2015	243	56	31	148	29	81	7	142	20	27	9	38	4	49
2016	19	79	50	44	50	74	13	93	28	28	5	74	16	44
2017	226	62	23	27	24	83	4	71	11	19	3	51	11	15
2018	165	40	25	67	48	67	14	51	22	12	6	61	8	15
2019	87	53	18	124	47	42	13	30	7	16	7	48	13	6

2. Number of registered cases for 7 mammalian species and others.

Species	Chhatarpur	Panna TR	Hoshangabad	Chhindwara	Betul	Satpuda TR	Jabalpur	Balaghat	Seoni	Kanha TR	Pench TR	Shahdol	Sanjay TR	Bandhavgarh TR
Golden jackal	2479	116	755	112	1	1	934	75	927	12		1751	47	75
Wild pig	140	36	239	296	35	47	494	415	446	155	25	296	9	65
Sloth bear	232	52	227	124	82	99	41	273	166	83		593	103	51
Others	230	17	66	57	7	417	193	26	73	9	2	42	11	5
Leopard	43	10	12	49	2	1	31	29	39	26	1	20	15	5
Indian wolf	33		17	24		1	3	6	14			6	5	145
Tiger	5	2	2	8	1		19	2	22	105	3	32	1	33
Striped hyena	39	3	4	19		1	13	1	17			5		

3. Division and Tiger Reserve specific cases of livestock depredation (2011-2019)

Year	Chhatarpur	Hoshangabad	Chhindwara	Shahdol	Balaghat	Seoni	Betul	Jabalpur	Kanha	Panna	Pench	Satpuda	Sanjay	Bandhavgarh
2001	40	47	42	30	292	79	33	161	674	51	7	82	27	
2002	64	19	25	22	353	59	28	95	578	35	3	45	28	
2003	18	7	33	10	204	61	7	75	584	19		77	14	
2004	21	3	26	8	161	38	9	61	623	11		25	6	
2005	3	7	26	10	139	45	4	57	382	36		18	5	
2006	12	7	29	9	121	63	3	40	304	19		37	2	
2007	4	29	29	9	139	35	7	50	398	43	1	35	4	
2008	8	26	78	22	186	92	3	66	452	24		47	15	
2009	1	19	164	93	118	105		51	284	38		72	8	133
2010		**22**	**135**	**102**	**98**	**84**	**4**	**60**	**470**	**48**		**99**	**18**	**142**
2011		26	201	213	143	149	2	166	425	31	2	124	9	214
2012	6	76	208	824	167	288	14	223	365	57	1	87	153	371
2013	29	68	200	700	225	364	4	299	599	144	18	144	94	475
2014	60	53	231	967	246	203	25	342	490	149	124	143	248	551
2015	42	41	210	526	378	269	4	314	395	204	206	121	57	1230
2016	36	80	267	434	463	361	16	399	553	184	238	149	173	2033
2017	59	57	267	676	534	389	30	280	529	284	261	95	224	1079
2018	125	61	268	828	649	488	71	365	623	288	306	99	447	1500
2019	48	58	227	880	673	546	90	256	648	216	393	61	1084	410

4. Number of registered cases for tigers, leopards, wild canids, and other mammalian species attributed to livestock depredation incidents.

Species	Chhatarpur	Panna TR	Hoshangabad	Chhindwara	Betul	Satpuda TR	Jabalpur	Balaghat	Seoni	Kanha TR	Pench TR	Shahdol	Sanjay TR	Bandhavgarh TR
Tiger	252	1096	121	364	105	767	1708	2852	1865	5795	959	3570	976	5950
Leopard	168	726	496	1890	208	761	1539	2326	1551	3543	408	2464	1252	2147
Wild canids	124	33	68	191	10	18	35	76	274	33	175	270	335	130
Others	32	26	21	221	28	1	78	35	28	5	18	59	53	

5. Year-wise expansion of livestock depredation cases for tigers and leopards for total cases per grid (including seasonal changes).

Years	**Tiger grids**	**T_Summ**	**T_Mons**	**T_Wint**	**Leopard grids**	**L_Summ**	**L_Mons**	**L_Wint**
2011	37	14	22	16	87	62	47	39
2012	90	68	66	52	105	61	59	47
2013	59	53	22	48	103	74	41	54
2014	116	77	81	73	118	86	65	57
2015	116	83	57	87	138	80	64	83
2016	105	38	23	82	131	69	57	86
2017	129	87	74	105	156	119	56	82
2018	160	106	96	134	179	130	106	124
2019	167	130	110	131	188	127	103	149
All	**234**	**656**	**551**	**728**	**260**	**808**	**598**	**721**
Total grids	388				388			
Surveyed grids	225				225			
diff2011-19	77.84	89.23	80.00	87.79	53.72	51.18	54.37	73.83

ANNEXURE G

1. List of wildlife crime cases registered in Shahdol Circle. "Madhya Pradesh Forest Department n.d."

List of reasons of death	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**TOTAL**
Unknown/ not applicable	13	8	16	3	8	7	11	5	6	5	82
Other	6	13		4	7	9	7	10	8	5	69
Country-made bomb	2	1	1	2	3				1		10
Wire snare	5	3	3	4	4		3	2	4	7	35
Vehicle hit	2	4	3	8	1	3	5	1			27
Live wire snare	4	3	3	5	4	8	4	10	10	9	60
Local weapon (knife, spear, axe, etc.)	11	4	9	10	7	5	3	6	2	4	61
Gun		3	3	3	3	2	1	1	2	1	19
Poisoning	1	2		1				1		1	6
Railway hit		1	3	2	5						11
Dogs				1	2		2		2		7
Bones and other parts		1		1	7	2	4			1	16
Hide										1	1

2. List of mammalian species reported in wildlife crime cases.

Species	**TOTAL**
Wild pig	160
Chital	77
Slothbear	29
Attempt to kill	30
Leopard	18
Hyena	11
Nilgai	11
Tiger	11
Barking deer	10
Sambar	8
Hare	4
Langur	3
Chinkara	2
Porcupine	2
Black buck	1
Jackal	1
Jungle cat	1
Wolf	1

3. List of key wildlife species and reasons of death attributed to wildlife crime.

List of reasons of death	Unknown/ not applicable	Other	Country-made bomb	Wire snare	Vehicle hit	Live wire snare	Local weapon (knife, spear, axe, etc.)	Gun	Poisoning	Train hit	Dogs	Bones and other parts	Hide	TOTAL
Chital	15	18		2	12	4	10	4		5	6	1		77
%Chital	19.48	23.38	0.00	2.60	15.58	5.19	12.99	5.19	0.00	6.49	7.79	1.30	0.00	100.00
Leopard	1	3		2		9		1	1	1				18
%Leopard	5.56	16.67	0.00	11.11	0.00	50.00	0.00	5.56	5.56	5.56	0.00	0.00	0.00	100.00
Sloth bear	8	5		1	2	11	2							29
%Sloth bear	27.59	17.24	0.00	3.45	6.90	37.93	6.90	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Tiger						7			4					11
%Tiger						63.64			36.36					100.00
Wild pig	28	26	9	17	9	14	31	9	1	1	1	14		160
%Wild pig	17.50	16.25	5.63	10.63	5.63	8.75	19.38	5.63	0.63	0.63	0.63	8.75	0.00	100.00

ANNEXURE H

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
5	12.25	0	0	0	0	0	12.25	0	0	0	0	0
8	7.677816901	4.399647887	0	0	0	0.172535211	7.677816901	4.399647887	0	0	0	0.172535211
9	3.623239437	8.626760563	0	0	0	0	3.623239437	8.626760563	0	0	0	0
10	10.79370629	1.456293706	0	0	0	0	10.79370629	1.456293706	0	0	0	0
11	12.25	0	0	0	0	0	12.25	0	0	0	0	0
12	12.25	0	0	0	0	0	12.25	0	0	0	0	0
15	4.083333333	8.166666667	0	0	0	0	4.083333333	8.166666667	0	0	0	0
16	3.712121212	8.537878788	0	0	0	0	3.712121212	8.537878788	0	0	0	0
17	8.6625	3.5875	0	0	0	0	8.6625	3.5875	0	0	0	0
18	12.16778523	0.082214765	0	0	0	0	12.16778523	0.082214765	0	0	0	0
19	11.89233577	0.357664234	0	0	0	0	11.89233577	0.357664234	0	0	0	0
20	12.25	0	0	0	0	0	12.25	0	0	0	0	0
40	8.723484848	2.134469697	1.392045455	0	0	0	8.723484848	2.784090909	0.742424242	0	0	0
41	5.753787879	6.496212121	0	0	0	0	5.753787879	6.496212121	0	0	0	0
50	8.626760563	3.105633803	0.517605634	0	0	0	9.316901408	2.501760563	0.431338028	0	0	0
51	5.647163121	5.212765957	1.390070922	0	0	0	8.166666667	3.388297872	0.695035461	0	0	0
52	4.662313433	7.313432836	0.274253731	0	0	0	11.06156716	0.731343284	0.457089552	0	0	0
53	9.097426471	2.702205882	0.450367647	0	0	0	9.007352941	2.792279412	0.450367647	0	0	0
54	3.370805369	8.714765101	0.16442953	0	0	0	3.370805369	8.714765101	0.16442953	0	0	0
63	4.918560606	5.660984848	1.670454545	0	0	0	6.960227273	4.825757576	0.464015152	0	0	0
64	3.562056738	7.124113475	1.563829787	0	0	0	3.909574468	8.340425532	0	0	0	0
65	4.275167785	6.412751678	1.562080537	0	0	0	4.850671141	6.906040268	0.493288591	0	0	0
66	4.882246377	7.101449275	0.266304348	0	0	0	8.077898551	3.72826087	0.44384058	0	0	0
67	5.850746269	6.399253731	0	0	0	0	5.850746269	6.399253731	0	0	0	0
76	2.501760563	8.88556338	0.862676056	0	0	0	3.191901408	9.058098592	0	0	0	0
77	3.5875	7.9625	0.7	0	0	0	4.9	6.475	0.875	0	0	0
78	5.660984848	4.454545455	2.134469697	0	0	0	6.125	3.990530303	2.134469697	0	0	0
79	5.503623188	4.438405797	2.307971014	0	0	0	5.503623188	4.438405797	2.307971014	0	0	0
81	4.454545455	2.320075758	0.835227273	0	0	4.361742424	4.454545455	2.505681818	1.206439394	0	0	3.897727273
82	4.640151515	7.331439394	0.278409091	0	0	0	4.640151515	7.609848485	0	0	0	0
83	2.877516779	7.89261745	1.479865772	0	0	0	2.877516779	8.714765101	0.657718121	0	0	0
84	3.913194444	7.996527778	0.340277778	0	0	0	4.848958333	7.060763889	0.340277778	0	0	0
85	4.59375	7.386029412	0.270220588	0	0	0	4.59375	7.386029412	0.270220588	0	0	0
86	11.38732394	0.862676056	0	0	0	0	11.38732394	0.862676056	0	0	0	0
96	0.355072464	5.148550725	0.266304348	0	0	6.302536232	0.976 449275	4.527173913	0.177536232	0	0	6.302536232
97	0.765625	4.083333333	1.53125	0.935763889	0	4.763888889	0.850694444	4.168402778	1.786458333	0.510416667	0	4.678819444
98	1.903716216	9.435810811	0.910472973	0	0	0	2.234797297	9.601351351	0.413851351	0	0	0
99	4.918560606	7.053030303	0.278409091	0	0	0	6.21780303	5.846590909	0.185606061	0	0	0
100	2.784090909	9.465909091	0	0	0	0	2.876893939	9.373106061	0	0	0	0
101	5.166666667	7.083333333	0	0	0	0	5.083333333	7.166666667	0	0	0	0
102	3.972972973	8.277027027	0	0	0	0	4.386824324	7.863175676	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
103	3.712121212	8.537878788	0	0	0	0	3.712121212	8.537878788	0	0	0	0
113	7.145833333	3.804924242	0.371212121	0	0	0.835227273	7.331439394	3.619318182	0.371212121	0	0	0.835227273
114	7.226618705	4.230215827	0.352517986	0.176258993	0	0.264388489	7.402877698	4.053956835	0.352517986	0.176258993	0	0.264388489
115	4.848958333	7.401041667	0	0	0	0	4.168402778	8.081597222	0	0	0	0
116	0.510416667	11.22916667	0.510416667	0	0	0	0.510416667	11.31423611	0.425347222	0	0	0
117	0.810661765	11.43933824	0	0	0	0	0.540441176	11.70955882	0	0	0	0
118	3.9375	8.3125	0	0	0	0	4.2	8.05	0	0	0	0
119	5.526315789	6.723684211	0	0	0	0	5.25	7	0	0	0	0
128	8.083333333	3.583333333	0.583333333	0	0	0	8.083333333	3.583333333	0.583333333	0	0	0
129	9.834507042	2.156690141	0	0.258802817	0	0	9.834507042	2.156690141	0	0.258802817	0	0
130	9.651515152	2.598484848	0	0	0	0	9.651515152	2.598484848	0	0	0	0
131	0.556818182	11.69318182	0	0	0	0	0.556818182	11.69318182	0	0	0	
132	0.237096774	12.01290323	0	0	0	0	0.553225806	11.69677419	0	0	0	0
133	4.170212766	8.079787234	0	0	0	0	5.29964539	6.95035461	0	0	0	0
134	3.248106061	9.001893939	0	0	0	0	3.433712121	8.816287879	0	0	0	0
135	7.70979021	4.54020979	0	0	0	0	7.795454545	4.454545455	0	0	0	0
141	7.452797203	4.111888112	0.171328671	0	0	0.513986014	7.281468531	4.283216783	0.171328671	0	0	
142	5.482517483	6.767482517	0	0	0	0	5.225524476	7.024475524	0	0	0	0
143	5.348591549	6.901408451	0	0	0	0	5.348591549	6.901408451	0	0	0	0.513986014
144	3.940559441	8.309440559	0	0	0	0	3.940559441	8.309440559	0	0	0	0
145	1.948863636	10.30113636	0	0	0	0	1.856060606	10.39393939	0	0	0	0
146	0.362962963	11.88703704	0	0	0	0	0.362962963	11.88703704	0	0	0	0
147	0.160130719	12.08986928	0	0	0	0	0.160130719	12.08986928	0	0	0	0
148	8.575	3675	0	0	0	0	8.575	3.675	0	0	0	0
152	10.79814815	1.27037037	0.181481481	0	0	0	10.79814815	1.27037037	0.181481481	0	0	0
153	6.03219697	6.21780303	0	0	0	0	6.03219697	6.21780303	0	0	0	0
154	7.819148936	4.430851064	0	0	0	0	7.819148936	4.430851064	0	0	0	0
155	6.248322148	6.001677852	0	0	0	0	6.248322148	6.001677852	0	0	0	0
156	6.521582734	5.728417266	0	0	0	0	6.169064748	6.080935252	0	0	0	0
157	1.072992701	11.1770073	0	0	0	0	1.072992701	11.1770073	0	0	0	0
158	0.710144928	11.53985507	0	0	0	0	0.710144928	11.53985507	0	0	0	0
159	2.820143885	9.429856115	0	0	0	0	2.908273381	9.341726619	0	0	0	0
160	9.684121622	2.565878378	0	0	0	0	9.849662162	2.400337838	0	0	0	0
164	9.920774648	2.329225352	0	0	0	0	9.920774648	2.329225352	0	0	0	0
165	9.556737589	2.693262411	0	0	0	0	9.556737589	2.693262411	0	0	0	0
166	1.020833333	11.22916667	0	0	0	0	1.020833333	11.22916667	0	0	0	0
167	0.44384058	11.80615942	0	0	0	0	0.44384058	11.80615942	0	0	0	0
168	2.529032258	9.720967742	0	0	0	0	2.529032258	9.720967742	0	0	0	0
169	0	12.25	0	0	0	0	0	12.25	0	0	0	0
170	3.15530303	9.09469697	0	0	0	0	3.897727273	8.352272727	0	0	0	0
171	9.765734266	2.484265734	0	0	0	0	10.96503497	1.284965035	0	0	0	0
172	11.22916667	1.020833333	0	0	0	0	11.39930556	0.850694444	0	0	0	0
173	4.59375	7.65625	0	0	0	0	4.59375	7.65625	0	0	0	0
174	6.167832168	6.082167832	0	0	0	0	6.167832168	6.082167832	0	0	0	0
175	3.897727273	8.352272727	0	0	0	0	3.897727273	8.352272727	0	0	0	0
176	0.781914894	11.46808511	0	0	0	0	0.781914894	11.46808511	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
177	7	5.25	0	0	0	0	7	5.25	0	0	0	0
178	12.25	0	0	0	0	0	12.25	0	0	0	0	0
179	12.06439394	0.185606061	0	0	0	0	12.06439394	0.185606061	0	0	0	0
180	12.25	0	0	0	0	0	12.25	0	0	0	0	0
181	12.06716418	0.182835821	0	0	0	0	12.25	0	0	0	0	0
182	9.45	2.625	0.175	0	0	0	9.625	2.45	0.175	0	0	0
183	8.52173913	3.72826087	0	0	0	0	8.52173913	3.72826087	0	0	0	0
184	10.88888889	1.361111111	0	0	0	0	10.88888889	1.361111111	0	0	0	0
185	12.25	0	0	0	0	0	12.25	0	0	0	0	0
186	12.25	0	0	0	0	0	12.25	0	0	0	0	0
187	7.366554054	4.883445946	0	0	0	0	7.366554054	4.883445946	0	0	0	0
188	0.928030303	11.3219697	0	0	0	0	0.928030303	11.3219697	0	0	0	0
189	2.291366906	9.958633094	0	0	0	0	2.379496403	9.870503597	0	0	0	0
190	6.480072464	5.769927536	0	0	0	0	6.56884058	5.68115942	0	0	0	0
191	10.88888889	1.361111111	0	0	0	0	10.88888889	1.361111111	0	0	0	0
192	8.251736111	3.828125	0	0	0	0.170138889	8.251736111	3.828125	0	0	0	0.170138889
193	9.567518248	2.682481752	0	0	0	0	9.746350365	2.503649635	0	0	0	0
194	10.76515152	1.206439394	0.278409091	0	0	0	11.41477273	0.556818182	0.278409091	0	0	0
195	5.876689189	6.373310811	0	0	0	0	6.04222973	6.20777027	0	0	0	0
196	2.349315068	9.900684932	0	0	0	0	2.349315068	9.900684932	0	0	0	0
197	1.577651515	10.57954545	0.09280303	0	0	0	1.484848485	10.76515152	0	0	0	0
198	5.854779412	6.395220588	0	0	0	0	5.854779412	6.395220588	0	0	0	0
199	6.20777027	6.04222973	0	0	0	0	6.20777027	6.04222973	0	0	0	0
200	5.212765957	7.037234043	0	0	0	0	5.212765957	7.037234043	0	0	0	0
201	2.041666667	10.20833333	0	0	0	0	2.041666667	10.20833333	0	0	0	0
202	4.552364865	7.697635135	0	0	0	0	4.469594595	7.780405405	0	0	0	0
203	1.241554054	11.00844595	0	0	0	0	1.241554054	11.00844595	0	0	0	0
204	2.784090909	9.465909091	0	0	0	0	2.784090909	9.465909091	0	0	0	0
205	9.346296296	2.903703704	0	0	0	0	9.346296296	2.903703704	0	0	0	0
206	10.16666667	1.666666667	0	0	0.416666667	0	10.25	1.583333333	0	0	0.416666667	0
207	3.743055556	8.506944444	0	0	0	0	5.274305556	6.975694444	0	0	0	0
208	10.97962963	1.27037037	0	0	0	0	10.97962963	1.27037037	0	0	0	0
209	10.68617021	1.563829787	0	0	0	0	10.68617021	1.563829787	0	0	0	0
210	5.044117647	7.205882353	0	0	0	0	5.044117647	7.205882353	0	0	0	0
211	4.279109589	7.970890411	0	0	0	0	4.363013699	7.886986301	0	0	0	0
212	1.956597222	10.29340278	0	0	0	0	1.956597222	10.29340278	0	0	0	0
213	5.660984848	6.589015152	0	0	0	0	5.660984848	6.589015152	0	0	0	0
214	4.954044118	7.295955882	0	0	0	0	5.044117647	7.205882353	0	0	0	0
215	7.195804196	5.054195804	0	0	0	0	7.281468531	4.968531469	0	0	0	0
216	8.556985294	3.693014706	0	0	0	0	8.556985294	3.693014706	0	0	0	0
217	8.166666667	4.083333333	0	0	0	0	8.166666667	4.083333333	0	0	0	0
218	8.25	4	0	0	0	0	8.25	4	0	0	0	0
219	8.073863636	4.176136364	0	0	0	0	8.073863636	4.176136364	0	0	0	0
220	11.60037879	0.649621212	0	0	0	0	11.60037879	0.649621212	0	0	0	0
221	12.25	0	0	0	0	0	12.25	0	0	0	0	0
222	12.25	0	0	0	0	0	12.25	0	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
223	8.566433566	3.683566434	0	0	0	0	8.566433566	3.683566434	0	0	0	0
224	5.089788732	7.160211268	0	0	0	0	5.348591549	6.901408451	0	0	0	0
225	2.8875	9.3625	0	0	0	0	2.8875	9.362	0	0	0	0
226	3.083916084	9.166083916	0	0	0	0	3.16958042	9.08041958	0	0	0	0
227	7.2625	4.9875	0	0	0	0	7.175	5.075	0	0	0	0
228	10.30113636	1.948863636	0	0	0	0	10.30113636	1.948863636	0	0	0	0
229	12.16058394	0.089416058	0	0	0	0	12.16058394	0.089416058	0	0	0	0
230	9.958064516	2.291935484	0	0	0	0	9.958064516	2.291935484	0	0	0	0
231	10.78731343	1.462686567	0	0	0	0	10.78731343	1.462686567	0	0	0	0
232	11.69318182	0.464015152	0	0	0.09280303	0	11.78598485	0.464015152	0	0	0	0
233	11.16666667	1.083333333	0	0	0	0	11.16666667	1.083333333	0	0	0	0
234	5.237931034	7.012068966	0	0	0	0	5.237931034	7.012068966	0	0	0	0
235	7.545289855	4.704710145	0	0	0	0	7.367753623	4.882246377	0	0	0	0
236	8.680463576	3.569536424	0	0	0	0	8.680463576	3.569536424	0	0	0	0
237	12.25	0	0	0	0	0	12.25	0	0	0	0	0
238	12.25	0	0	0	0	0	12.25	0	0	0	0	0
239	10.86971831	1.38028169	0	0	0	0	10.86971831	1.38028169	0	0	0	0
240	12.25	0	0	0	0	0	12.25	0	0	0	0	0
241	11.30105634	0.948943662	0	0	0	0	11.30105634	0.948943662	0	0	0	0
242	5.614583333	6.635416667	0	0	0	0	5.614583333	6.635416667	0	0	0	0
243	11.64612676	0.603873239	0	0	0	0	11.64612676	0.603873239	0	0	0	0
244	11.07037037	1.17962963	0	0	0	0	11.07037037	1.17962963	0	0	0	0
245	9.507462687	2.742537313	0	0	0	0	9.507462687	2.742537313	0	0	0	0
246	3.181818182	9.068181818	0	0	0	0	3.261363636	8.988636364	0	0	0	0
247	12.08103448	0.084482759	0	0	0.084482759	0	12.16551724	0.084482759	0	0	0	0
248	10.18074324	2.069256757	0	0	0	0	10.18074324	2.069256757	0	0	0	0
249	8.352272727	3.897727273	0	0	0	0	27278.35227	3.897727273	0	0	0	0
250	7.746323529	4.503676471	0	0	0	0	7.746323529	4.503676471	0	0	0	0
251	4.328333333	7.921666667	0	0	0	0	4.328333333	7.921666667	0	0	0	0
252	9.643617021	2.606382979	0	0	0	0	9.643617021	2.606382979	0	0	0	0
253	6.923913043	5.326086957	0	0	0	0	6.923913043	5.326086957	0	0	0	0
254	5.186131387	7.063868613	0	0	0	0	5.186131387	7.063868613	0	0	0	0
255	3.9375	8.3125	0	0	0	0	4.2	8.05	0	0	0	0
256	11.25185185	0.998148148	0	0	0	0	11.25185185	0.998148148	0	0	0	0
257	9.929924242	2.320075758	0	0	0	0	10.48674242	1.763257576	0	0	0	0
258	9.086092715	3.163907285	0	0	0	0	9.086092715	3.163907285	0	0	0	0
259	7.591549296	4.658450704	0	0	0	0	7.591549296	4.658450704	0	0	0	0
260	11.22916667	1.020833333	0	0	0	0	11.22916667	1.020833333	0	0	0	0
261	6.295138889	5.954861111	0	0	0	0	6.295138889	5.954861111	0	0	0	0
262	8.723484848	3.526515152	0	0	0	0	8.723484848	3.526515152	0	0	0	0
263	9.835766423	2.414233577	0	0	0	0	9.835766423	2.414233577	0	0	0	0
264	9.306818182	2.704545455	0.238636364	0	0	0	9.306818182	2.704545455	0.238636364	0	0	0
265	9.890740741	2.359259259	0	0	0	0	9.890740741	2.359259259	0	0	0	0
266	5.633211679	6.616788321	0	0	0	0	5.633211679	6.616788321	0	0	0	0
267	9.1	3.15	0	0	0	0	9.1	3.15	0	0	0	0
268	7.741319444	4.508680556	0	0	0	0	7.741319444	4.508680556	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
269	2.227272727	10.02272727	0	0	0	0	2.227272727	10.02272727	0	0	0	0
270	3.512867647	8.737132353	0	0	0	0	3.512867647	8.737132353	0	0	0	0
271	7.622222222	4.627777778	0	0	0	0	7.622222222	4.627777778	0	0	0	0
272	10.17957746	2.070422535	0	0	0	0	10.17957746	2.070422535	0	0	0	0
273	8.363793103	3.886206897	0	0	0	0	8.363793103	3.886206897	0	0	0	0
274	8.81294964	3.43705036	0	0	0	0	8.81294964	3.43705036	0	0	0	0
275	9.765734266	2.484265734	0	0	0	0	9.765734266	2.484265734	0	0	0	0
276	10.57954545	1.670454545	0	0	0	0	10.57954545	1.670454545	0	0	0	0
277	7.11013986	5.13986014	0	0	0	0	7.11013986	5.13986014	0	0	0	0
278	6.733443709	5.516556291	0	0	0	0	6.733443709	5.516556291	0	0	0	0
279	7.238636364	5.011363636	0	0	0	0	7.238636364	5.011363636	0	0	0	0
280	9.367647059	2.882352941	0	0	0	0	9.367647059	2.882352941	0	0	0	0
281	5.048986486	7.201013514	0	0	0	0	5.048986486	7.201013514	0	0	0	0
282	4.865248227	7.384751773	0	0	0	0	4.95212766	7.29787234	0	0	0	0
283	10.51182432	1.738175676	0	0	0	0	10.51182432	1.738175676	0	0	0	0
284	7.456521739	4.615942029	0	0	0.177536232	0	7.456521739	4.615942029	0	0	0.177536232	0
285	10.20833333	1.856060606	0	0	0.185606061	0	10.20833333	1.856060606	0	0	0.185606061	0
286	11.15924658	0.755136986	0	0	0.335616438	0	11.15924658	0.755136986	0	0	0.335616438	0
287	10.83333333	1.416666667	0	0	0	0	10.83333333	1.416666667	0	0	0	0
288	9.964552239	2.285447761	0	0	0	0	9.964552239	2.285447761	0	0	0	0
289	10.27972028	1.97027972	0	0	0	0	10.27972028	1.97027972	0	0	0	0
290	7.712962963	.5370370374	0	0	0	0	7.712962963	4.537037037	0	0	0	0
291	7.012068966	5.237931034	0	0	0	0	7.012068966	5.237931034	0	0	0	0
292	8.279310345	3.970689655	0	0	0	0	8.279310345	3.970689655	0	0	0	0
293	7.517045455	4.732954545	0	0	0	0	8.166666667	4.083333333	0	0	0	0
294	2.820143885	9.429856115	0	0	0	0	2.908273381	9.341726619	0	0	0	0
295	5.660344828	6.589655172	0	0	0	0	5.660344828	6.589655172	0	0	0	0
296	5.529513889	6.720486111	0	0	0	0	5.614583333	6.635416667	0	0	0	0
297	9.058098592	3.191901408	0	0	0	0	9.920774648	2.329225352	0	0	0	0
298	11.36870504	0.528776978	0	0	0.352517986	0	11.54496403	0.352517986	0	0	0.352517986	0
299	11.69318182	0.556818182	0	0	0	0	11.69318182	0.556818182	0	0	0	0
300	10.70860927	0.081125828	0	0	1.460264901	0	12.16887417	0.081125828	0	0	0	0
301	10.67234848	1.392045455	0	0	0.185606061	0	10.85795455	1.392045455	0	0	0	0
302	10.87937063	1.370629371	0	0	0	0	10.87937063	1.370629371	0	0	0	0
303	9.48943662	2.76056338	0	0	0	0	9.48943662	2.76056338	0	0	0	0
304	2.417763158	9.832236842	0	0	0	0	2.417763158	9.832236842	0	0	0	0
305	5.660984848	6.589015152	0	0	0	0	5.660984848	6.589015152	0	0	0	0
306	4.732954545	7.517045455	0	0	0	0	4.732954545	7.517045455	0	0	0	0
307	4.981666667	7.268333333	0	0	0	0	4.981666667	7.268333333	0	0	0	0
308	7.996527778	4.253472222	0	0	0	0	7.996527778	4.253472222	0	0	0	0
309	10.17830882	1.891544118	0	0	0.180147059	0	10.26838235	1.891544118	0	0	0.090073529	0
310	10.75179856	0	0	0	1.498201439	0	12.07374101	0	0	0	0.176258993	0
311	10.72875817	1.52124183	0	0	0	0	10.72875817	1.52124183	0	0	0	0
312	9.457720588	2.792279412	0	0	0	0	9.457720588	2.792279412	0	0	0	0
313	10.02272727	2.227272727	0	0	0	0	10.02272727	2.227272727	0	0	0	0
314	11.50757576	0.742424242	0	0	0	0	11.50757576	0.742424242	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water 2010
315	9.746350365	2.503649635	0	0	0	0	9.746350365	2.503649635	0	0	0	0
316	7.850352113	4.399647887	0	0	0	0	8.626760563	3.623239437	0	0	0	0
317	5.614583333	6.635416667	0	0	0	0	5.614583333	6.635416667	0	0	0	0
318	8.474315068	3.523972603	0	0	0	0.251712329	8.474315068	3.523972603	0	0	0	0.251712329
319	7.184210526	5.065789474	0	0	0	0	7.184210526	5.065789474	0	0	0	0
320	10.02272727	2.227272727	0	0	0	0	10.02272727	2.227272727	0	0	0	0
321	9.501602564	2.434294872	0	0	0.314102564	0	9.501602564	2.434294872	0	0	0.314102564	0
322	12.25	0	0	0	0	0	12.25	0	0	0	0	0
323	7.023333333	5.226666667	0	0	0	6.86	0	5.39	0	0	0	0
324	2.598484848	9.651515152	0	0	0	0	2.784090909	9.465909091	0	0	0	0
325	8.941605839	3.308394161	0	0	0	0	8.941605839	3.308394161	0	0	0	0
326	11.75	0.333333333	0	0	0	0.166666667	11.75	0.333333333	0	0	0	0.166666667
327	11.13636364	1.113636364	0	0	0	0	11.13636364	1.113636364	0	0	0	0
328	4.230215827	6.257194245	0.088129496	0	0	1.674460432	6.521582734	5.728417266	0	0	0	0
329	1.956597222	10.29340278	0	0	0	0	1.701388889	10.54861111	0	0	0	0
330	4.815517241	7.434482759	0	0	0	0	4.815517241	7.434482759	0	0	0	0
331	10.30113636	1.948863636	0	0	0	0	10.30113636	1.948863636	0	0	0	0
332	12.07374101	0.176258993	0	0	0	0	12.1618705	0.088129496	0	0	0	0
333	10.39393939	0.185606061	0	0	1.484848485	0.1 85606061	10.39393939	0.185606061	0	0	1.484848485	0.185606061
334	7.434482759	4.815517241	0	0	0	0	7.434482759	4.815517241	0	0	0	0
335	7.366554054	4.883445946	0	0	0	0	7.366554054	4.883445946	0	0	0	0
337	0.556818182	0	0.185606061	0	0.09280303	10.95075758	3 .248106061	0	0.278409091	0	0.09280303	8.630681818
338	3.683566434	1.884615385	0	0	0	6.167832168	3.083916084	3.512237762	0.342657343	0	0	4.882867133
339	3.854895105	6.167832168	0.342657343	0	0	1.884615385	4.711538462	6.767482517	0.342657343	0	0	0.34265734
340	5.820921986	6.429078014	0	0	0	0	6.081560284	6.168439716	0	0	0	0
341	9.594405594	2.655594406	0	0	0	0	9.851398601	2.398601399	0	0	0	0
342	11.78598485	0.464015152	0	0	0	0	11.22916667	1.020833333	0	0	0	0
343	11.69318182	0.464015152	0	0	0.09280303	0	11.69318182	0.464015152	0	0	0.09280303	0
344	10.36538462	1.884615385	0	0	0	0	10.36538462	1.884615385	0	0	0	0
345	9.165467626	2.820143885	0	0	0.264388489	0	9.165467626	2.820143885	0	0	0.264388489	0
346	10.37847222	1.446180556	0	0	0.425347222	0	10.37847222	1.446180556	0	0	0.425347222	0
347	0.440647482	0	0	0	0	11.80935252	0.440647482	0	0	0	0	11.80935252
348	0.464015152	0.278409091	0	0	0	11.50757576	7.424242424	0.835227273	0.278409091	0	0	3.433712121
349	2.852739726	9.397260274	0	0	0	0	2.852739726	9.397260274	0	0	0	0
350	2.618965517	9.631034483	0	0	0	0	2.618965517	9.631034483	0	0	0	0
351	10.1040146	2.145985401	0	0	0	0	10.64051095	1.609489051	0	0	0	0
352	11.04225352	1.207746479	0	0	0	0	10.26584507	1.98415493	0	0	0	0
353	10.23519737	2.014802632	0	0	0	0	10.23519737	2.014802632	0	0	0	0
354	10.15	2.1	0	0	0	0	10.15	2.1	0	0	0	0
355	9.929924242	1.856060606	0	0	0.464015152	0	9.929924242	1.856060606	0	0	0.464015152	0
356	9.546551724	2.703448276	0	0	0	0	9.546551724	2.703448276	0	0	0	0
357	6.125	0.170138889	0.170138889	0	0	5.784722222	6.975694444	0.170138889	0.425347222	0	0.085069444	4.59375
358	10.20833333	2.041666667	0	0	0	0	10.82971014	1.420289855	0	0	0	0
359	5.475378788	6.774621212	0	0	0	0	5.660984848	6.589015152	0	0	0	0
360	7.978618421	4.110197368	0	0	0	0.161184211	8.139802632	3.949013158	0	0	0	0.161184211
361	9.058098592	3.191901408	0	0	0	0	9.316901408	2.933098592	0	0	0	0

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362	8.13619403	4.11380597	0	0	0	0	8.13619403	4.11380597	0	0	0	0
363	6.342198582	5.907801418	0	0	0	0	6.342198582	5.907801418	0	0	0	0
364	7.0875	5.1625	0	0	0	0	7.0875	5.1625	0	0	0	0
365	4.46192053	7.78807947	0	0	0	0	4.46192053	7.78807947	0	0	0	0
366	3.175925926	9.074074074	0	0	0	0	3.175925926	9.074074074	0	0	0	0
367	4.825757576	7.424242424	0	0	0	0	4.825757576	7.424242424	0	0	0	0
368	0.739932886	0	0.493288591	0	0	11.01677852	1.479865772	0	0.986577181	0	0	9.701342282
369	6.039930556	0	0.425347222	0.085069444	0	5.699652778	7.145833333	0	0.510416667	0	0	4.508680556
370	11.81560284	0.434397163	0	0	0	0	11.81560284	0.173758865	0	0	0	0
371	10.62867647	1.080882353	0	0	0	0.540441176	10.80882353	0.810661765	0	0	0	0.540441176
372	11.42723881	0.639925373	0	0	0	0.182835821	11.61007463	0.457089552	0	0	0	0.182835821
373	9.580128205	0.863782051	0	0	0.157051282	1.649038462	9.580128205	0.863782051	0	0	0.157051282	1.649038462
374	4.264814815	7.985185185	0	0	0	0	4.264814815	7.985185185	0	0	0	0
375	7.476102941	4.773897059	0	0	0	0	7.295955882	4.954044118	0	0	0	0
376	2.171985816	10.07801418	0	0	0	0	1.911347518	10.33865248	0	0	0	0
377	3.317708333	8.932291667	0	0	0	0	3.317708333	8.932291667	0	0	0	0
378	2.25	10	0	0	0	0	2.916666667	9.333333333	0	0	0	0
379	12.25	0	0	0	0	0	12.25	0	0	0	0	0
380	7.926470588	4.323529412	0	0	0	0	7.926470588	4.323529412	0	0	0	0
381	12.25	0	0	0	0	0	12.25	0	0	0	0	0
382	12.25	0	0	0	0	0	12.25	0	0	0	0	0
383	11.79963235	0.450367647	0	0	0	0	11.79963235	0.450367647	0	0	0	0
383	12.25	0	0	0	0	0	0	12.25	0	0		
384	10.08333333	2.166666667	0	0	0	0	10.08333333	2.166666667	0	0	0	0
385	11.84166667	0	0	0	0.408333333	0	11.84166667	0	0	0	0.408333333	0
385	11.66267123	0.251712329	0.167808219	0	0	0.167808219	11.66267123	0.251712329	0.167808219	0	0	0.167808219
386	11.51315789	0.736842105	0	0	0	0	11.51315789	0.736842105	0	0	0	0
387	11.69318182	0.556818182	0	0	0	0	11.69318182	0.556818182	0	0	0	0
388	11.60526316	0.644736842	0	0	0	0	11.60526316	0.644736842	0	0	0	0
500	8.75	3.5	0	0	0	0	8.75	3.5	0	0	0	0
501	9.337412587	2.912587413	0	0	0	0	9.68006993	2.398601399	0	0	0	0
502	9.558712121	2.320075758	0	0	0	0.371212121	9.837121212	2.041666667	0	0	0	0.371212121
503	8.687943262	3.475177305	0.086879433	0	0	0	8.774822695	3.214539007	0.086879433	0	0	0
504	11.04111842	1.047697368	0.161184211	0	0	0	11.04111842	1.208881579	0	0	0	0
505	11.42105263	0	0	0	0.828947368	0	11.78947368	0	0	0	0.460526316	0
506	1.78598485	0	0	0	0.464015152	0	12.06439394	0	0	0	0.185606061	0
507	11.8125	0.4375	0	0	0	0	11.8125	0.4375	0	0	0	0
508	11.04356061	1.206439394	0	0	0	0	11.04356061	1.206439394	0	0	0	0
509	12.25	0	0	0	0	0	12.25	0	0	0	0	0
510	7.903225806	3.714516129	0.632258065	0	0	0	8.298387097	3.003225806	0.948387097	0	0	0
511	2.087037037	6.714814815	3.448148148	0	0	0	4.627777778	4.537037037	2.994444444	0	0	0
512	7.517045455	4.454545455	0.278409091	0	0	0	7.795454545	4.176136364	0	0	0	0
513	10.56034483	1.605172414	0.084482759	0	0	0	10.56034483	1.605172414	0.084482759	0	0	0
514	9.164814815	3.085185185	0	0	0	0	9.255555556	2.994444444	0	0	0	0
515	10.5875	1.6625	0	0	0	0	11.9875	0.2625	0	0	0	0
516	9.958633094	2.291366906	0	0	0	0	10.22302158	2.026978417	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water 2010
517	8.677083333	3.402777778	0.170138889	0	0	0	8.677083333	3.402777778	0.170138889	0	0	0
518	8.626760563	3.623239437	0	0	0	0	8.626760563	3.623239437	0	0	0	0
519	11.35166667	0.898333333	0	0	0	0	11.35166667	0.898333333	0	0	0	0
520	10.53671329	1.713286713	0	0	0	0	10.53671329	1.713286713	0	0	0	0
521	4.083333333	8.166666667	0	0	0	0	4.083333333	8.166666667	0	0	0	0
522	1.633333333	10.61666667	0	0	0	0	1.633333333	10.61666667	0	0	0	0
523	9.975	2.275	0	0	0	0	9.975	2.275	0	0	0	0
524	9.904255319	2.345744681	0	0	0	0	199.9042553	2.345744681	0	0	0	0
525	10.54861111	1.701388889	0	0	0	0	10.54861111	1.701388889	0	0	0	0
526	11.78598485	0.464015152	0	0	0	0	11.78598485	0.464015152	0	0	0	0
527	11.90972222	0.340277778	0	0	0	0	11.90972222	0.170138889	0	0	0	0
600	8.019784173	4.053956835	0.176258993	0	0	0	8.019784173	4.053956835	0.176258993	0	0	0
881	11.03368794	1.216312057	0	0	0	0	11.03368794	1.216312057	0	0	0	0
1001	0	12.25	0		0		0	12.25	0	0	0	0
1002	0.419520548	11.83047945	0	0	0	0	0.419520548	11.83047945	0	0	0	0
1003	0.36567164	11.88432836	0	0	0	0	0.365671642	11.88432836	0	0	0	0
1004	7.226618705	4.847122302	0.176258993	0	0	0	7.226618705	4.847122302	0.176258993	0	0	0
1005	4.029605263	8.220394737	0	0	0	0	4.029605263	8.220394737	0	0	0	0
1006	2.134469697	10.1155303	0	0	0	0	2.134469697	10.1155303	0	0	0	0
1007	0	12.25	0	0	0	0	0	12.25	0	0	0	0
1008	0	12.25	0	0	0	0	0	12.25	0	0	0	0
1009	0.53649635	11.71350365	0	0	0	0	0.53649635	11.71350365	0	0	0	0
3751	9.251748252	2.998251748	0	0	0	0	9.251748252	2.998251748	0	0	0	0
3761	8.67708333	3.572916667	0	0	0	0	8.677083333	3.572916667	0	0	0	0
3771	11.8125	0.4375	0	0	0	0	11.8125	0.4375	0	0	0	0
3781	12.25	0	0	0	0	0	12.25	0	0	0	0	0
3801	11.50757576	0.742424242	0	0	0	0	11.50757576	0.742424242	0	0	0	0
10010	10.07222222	2.177777778	0	0	0	0	10.07222222	2.177777778	0	0	0	0
10011	9.555	2.695	0	0	0	0	9.555	2.695	0	0	0	0
10012	7.491007194	4.758992806	0	0	0	0	7.491007194	4.758992806	0	0	0	0
10013	6.305147059	5.944852941	0	0	0	0	6.395220588	5.854779412	0	0	0	0
10014	3.475177305	8.774822695	0	0	0	0	3.475177305	8.774822695	0	0	0	0
10015	4.678819444	7.571180556	0	0	0	0	4.678819444	7.571180556	0	0	0	0
10016	0.710144928	11.53985507	0	0	0	0	0.710144928	11.53985507	0	0	0	0
10017	1.762589928	10.48741007	0	0	0	0	1.762589928	10.48741007	0	0	0	0
10018	9.1875	3.0625	0	0	0	0	9.1875	3.0625	0	0	0	0
10019	7.819148936	4.430851064	0	0	0	0	7.819148936	4.430851064	0	0	0	0
10020	5.104166667	7.145833333	0	0	0	0	5.104166667	7.145833333	0	0	0	0
10021	2.291366906	9.958633094	0	0	0	0	2.291366906	9.958633094	0	0	0	0
10022	1.23381295	11.01618705	0	0	0	0	1.23381295	11.01618705	0	0	0	0
10023	3.487226277	8.762773723	0	0	0	0	3.487226277	8.762773723	0	0	0	0
10024	1.986486486	10.26351351	0	0	0	0	1.986486486	10.26351351	0	0	0	0
10025	0.798913043	11.45108696	0	0	0	0	0.798913043	11.45108696	0	0	0	0
10026	1.763257576	10.48674242	0	0	0	0	1.763257576	10.48674242	0	0	0	0
10027	8.372302158	3.877697842	0	0	0	0	8.372302158	3.877697842	0	0	0	0

Grid-wise land use/land cover categorised into six classes for the years 2019 and 2010 (*Buchhorn et al., 2020)*

Grid_ID	Agri_ 2019	Forest_ 2019	Grass_ 2019	Urban_ 2019	Shrub_ 2019	Water_ 2019	Agri_ 2010	Forest_ 2010	Grass_ 2010	Urban_ 2010	Shrub_ 2010	Water_ 2010
10028	0	12.25	0	0	0	0	0	12.25	0	0	0	0
10029	0.804744526	11.44525547	0	0	0	0	0.804744526	11.44525547	0	0	0	0
10030	1.299242424	10.95075758	0	0	0	0	1.299242424	10.95075758	0	0	0	0
10031	8.608108108	3.641891892	0	0	0	0	8.608108108	3.641891892	0	0	0	0
10032	2.041666667	10.20833333	0	0	0	0	2.041666667	10.20833333	0	0	0	0
10033	2.227272727	10.02272727	0	0	0	0	2.227272727	10.02272727	0	0	0	0
10034	2.555755396	9.694244604	0	0	0	0	2.555755396	9.694244604	0	0	0	0
10037	10.62748344	1.622516556	0	0	0	0	10.62748344	1.622516556	0	0	0	0
10038	3.388297872	8.861702128	0	0	0	0	3.388297872	8.861702128	0	0	0	0
10039	0.185606061	12.06439394	0	0	0	0	0.185606061	12.06439394	0	0	0	0
10040	0.086879433	12.16312057	0	0	0	0	0.086879433	12.16312057	0	0	0	0
10041	2.731418919	9.518581081	0	0	0	0	2.731418919	9.518581081	0	0	0	0
10042	6.17037037	6.07962963	0	0	0	0	6.17037037	6.07962963	0	0	0	0
10043	3.85	8.4	0	0	0	0	3.85	8.4	0	0	0	0
10044	7.175	5.075	0	0	0	0	7.175	5.075	0	0	0	0
10045	1.565789474	10.68421053	0	0	0	0	1.565789474	10.68421053	0	0	0	0
10046	1.639084507	10.61091549	0	0	0	0	1.639084507	10.61091549	0	0	0	0
10047	0.528776978	11.72122302	0	0	0	0	0.528776978	11.72122302	0	0	0	0
10048	3.940559441	8.309440559	0	0	0	0	3.940559441	8.309440559	0	0	0	0
10049	5.473404255	6.776595745	0	0	0	0	5.473404255	6.776595745	0	0	0	0
10050	4.268939394	7.795454545	0.185606061	0	0	0	4.268939394	7.795454545	0.185606061	0	0	0
10051	4.454545455	7.624125874	0	0	0.171328671	0	4.454545455	7.624125874	0	0	0.171328671	0
10052	11.18833333	0.898333333	0	0	0.163333333	0	11.18833333	0.898333333	0	0	0.163333333	0
10053	4.9	7.35	0	0	0	0	4.9	7.35	0	0	0	0
10054	10.40789474	1.842105263	0	0	0	0	10.40789474	1.842105263	0	0	0	0
10055	8.711111111	3.538888889	0	0	0	0	8.711111111	3.357407407	0	0	0	0
388	2737.998605	1882.316414	31.67473502	1.455895143	10.30076574	87.55669585	2795.314791	1853.01	25.62938245	0.945478476	6.503832319	68.41490766
%cover	57.62630449	39.61687148	0.666654074	0.030642038	0.216798892	1.842794516		5438				
Dist cover		8089										
		23.27007559										

ANNEXURE I

Grid-wise tree density, invasive species cover, tree species richness, and forest type.

Grid_ID	tree_den (in ha)	inv_spe (in %)	spe_richness	Forest_type
8	148.48	12.50	11	Mixed deciduous
9	212.12	10.00	12	Sal
10	247.47	17.50	16	Mixed deciduous
11	98.99	25.00	6	Dry deciduous
12	162.63	7.50	2	Open/Plantation
15	296.97	18.75	14	Mixed deciduous
16	268.69	25.00	20	Sal
17	254.55	10.00	19	Mixed deciduous
18	212.12	17.50	13	Mixed deciduous
19	77.78	20.00	9	Open/Plantation
51	113.13	61.25	7	Mixed deciduous
52	113.13	61.25	5	Mixed deciduous
64	233.33	35.00	7	Mixed deciduous
65	197.98	5.00	10	Mixed deciduous
66	91.92	35.00	16	Mixed deciduous
76	339.39	27.50	18	Mixed deciduous
77	197.98	50.00	24	Mixed deciduous
78	169.70	50.00	14	Open
79	162.63	52.50	21	Mixed deciduous
82	261.62	30.00	15	Mixed deciduous
83	190.91	47.50	18	Mixed deciduous
85	0.10	4.99	0	Open
97	332.32	5.00	14	Mixed deciduous
98	296.97	40.00	14	Mixed deciduous
100	282.83	55.00	13	Mixed deciduous
101	120.20	4.99	13	Mixed deciduous
102	91.92	25.00	12	Mixed deciduous
103	176.77	52.50	10	Mixed deciduous
114	494.95	18.75	18	Mixed deciduous
115	254.55	40.00	21	Mixed deciduous
116	367.68	4.99	19	Mixed deciduous
117	636.36	41.25	14	Mixed deciduous
118	395.96	37.50	24	Mixed deciduous
119	183.84	27.50	12	Mixed deciduous
129	381.82	57.50	17	Mixed deciduous
131	311.11	40.00	14	Mixed deciduous
132	664.65	45.00	17	Mixed deciduous
133	551.52	20.00	13	Mixed deciduous
134	98.99	40.00	13	Mixed deciduous
135	190.91	10.00	14	Mixed deciduous
141	261.62	40.00	13	Bamboo

Grid-wise tree density, invasive species cover, tree species richness, and forest type.

Grid_ID	tree_den (in ha)	inv_spe (in %)	spe_richness	Forest_type
142	551.52	37.50	12	Mixed deciduous
143	197.98	50.00	17	Mixed deciduous
144	304.04	25.00	18	Mixed deciduous
145	219.19	35.00	29	Mixed deciduous
146	431.31	5.00	13	Mixed deciduous
147	233.33	5.00	19	Mixed deciduous
153	148.48	35.00	14	Sal
155	332.32	25.00	12	Mixed deciduous
156	183.84	40.00	21	Mixed deciduous
157	360.61	45.00	17	Mixed deciduous
158	353.54	35.00	17	Mixed deciduous
159	487.88	42.50	16	Mixed deciduous
160	226.26	10.00	14	Mixed deciduous
167	530.30	5.00	17	Mixed deciduous
168	296.97	4.99	22	Mixed deciduous
169	205.05	42.50	22	Mixed deciduous
170	763.64	67.50	22	Mixed deciduous
171	275.76	50.00	14	Mixed deciduous
172	42.42	25.00	5	Open
175	197.98	35.00	18	Mixed deciduous
176	0.10	20.00	9	Open
177	106.06	27.50	10	Sal/Mixed
181	91.92	15.00	7	Sal
183	296.97	4.99	14	Mixed deciduous
184	445.45	25.00	13	Mixed deciduous
189	282.83	45.00	13	Mixed deciduous
190	226.26	5.00	16	Sal
191	162.63	10.00	10	Mixed deciduous
192	56.57	15.00	5	Open
193	261.62	15.00	9	Mixed deciduous
194	346.46	30.00	13	Mixed deciduous
195	162.63	7.50	9	Mixed deciduous
196	360.61	7.50	12	Mixed deciduous
197	431.31	10.00	20	Mixed deciduous
198	318.18	4.99	10	Mixed deciduous
199	268.69	4.99	14	Mixed deciduous
200	42.42	4.99	4	Open
204	608.08	18.75	17	Mixed deciduous
205	516.16	50.00	19	Mixed deciduous
206	98.99	35.00	6	Open
207	113.13	15.00	8	Mixed deciduous
208	155.56	20.00	5	Sal
209	134.34	15.00	5	Open
210	325.25	4.99	11	Mixed deciduous
211	403.03	4.99	20	Mixed deciduous

Grid-wise tree density, invasive species cover, tree species richness, and forest type.

Grid_ID	tree_den (in ha)	inv_spe (in %)	spe_richness	Forest_type
212	353.54	10.00	18	Mixed deciduous
213	282.83	10.00	15	Sal
214	0.10	4.99	0	Open
217	148.48	17.50	6	Open
218	226.26	10.00	6	Sal
219	148.48	4.99	10	Mixed deciduous
220	318.18	4.99	12	Mixed deciduous
221	70.71	50.00	9	Open
222	134.34	10.00	6	Mixed deciduous
223	275.76	35.00	17	Mixed deciduous
224	91.92	4.99	12	Sal
225	91.92	4.99	7	Sal
228	35.35	25.00	8	Open
229	155.56	5.00	8	Open
230	155.56	10.00	9	Sal
231	318.18	10.00	21	Sal
232	502.02	4.99	14	Mixed deciduous
233	1279.80	4.99	11	Sal
234	1548.48	25.00	15	Sal
236	622.22	12.50	15	Mixed deciduous
244	113.13	22.50	7	Mixed deciduous
246	212.12	4.99	12	Mixed deciduous
247	1435.35	70.00	10	Mixed deciduous
248	1958.59	28.75	17	Mixed deciduous
249	84.85	4.99	6	Open
250	42.42	4.99	3	Open
251	219.19	5.00	9	Sal
252	98.99	4.99	4	Open
253	134.34	4.99	7	Sal
254	360.61	4.99	7	Sal
255	141.41	4.99	2	Sal
257	169.70	4.99	6	Sal
258	565.66	4.99	13	Mixed deciduous
260	233.33	20.00	13	Mixed deciduous
261	318.18	30.00	14	Mixed deciduous
262	49.49	25.00	1	Open
263	410.10	50.00	18	Mixed deciduous
264	162.63	15.00	6	Mixed deciduous
266	162.63	4.99	5	Sal
267	197.98	4.99	9	Sal
268	339.39	5.00	8	Sal
269	275.76	10.00	7	Open
270	565.66	4.99	12	Mixed deciduous
272	226.26	4.99	9	Mixed deciduous
273	254.55	8.75	9	Mixed deciduous

Grid-wise tree density, invasive species cover, tree species richness, and forest type.

Grid_ID	tree_den (in ha)	inv_spe (in %)	spe_richness	Forest_type
274	70.71	22.50	5	Open
275	374.75	4.99	12	Sal
276	240.40	4.99	12	Sal
277	219.19	5.00	15	Sal
278	268.69	12.50	13	Sal
279	261.62	5.00	11	Mixed deciduous
283	141.41	15.00	5	Open
284	134.34	5.00	9	Sal
285	141.41	35.00	10	Mixed deciduous
286	141.41	10.00	11	Mixed deciduous
287	49.49	4.99	2	Open
288	77.78	4.99	6	Sal
290	113.13	45.00	6	Mixed deciduous
291	98.99	15.00	6	Open
295	98.99	17.50	9	Mixed deciduous
296	197.98	12.50	9	Mixed deciduous
297	205.05	47.50	9	Sal
298	254.55	50.00	12	Mixed deciduous
299	63.64	4.99	4	Open
300	63.64	4.99	3	Open
305	162.63	5.00	10	Sal
306	134.34	12.50	11	Mixed deciduous
307	141.41	37.50	9	Mixed deciduous
308	332.32	55.00	13	Mixed deciduous
309	176.77	20.00	7	Open
312	304.04	25.00	6	Sal
315	176.77	15.00	18	Mixed deciduous
317	120.20	35.00	11	Mixed deciduous
318	233.33	4.99	14	Mixed deciduous
319	296.97	20.00	11	Mixed deciduous
320	346.46	25.00	15	Mixed deciduous
321	438.38	30.00	13	Mixed deciduous
323	98.99	4.99	19	Mixed deciduous
324	353.54	52.50	30	Mixed deciduous
325	282.83	40.00	26	Mixed deciduous
326	197.98	12.50	14	Mixed deciduous
328	721.21	4.99	22	Mixed deciduous
329	205.05	4.99	8	Mixed deciduous
330	190.91	17.50	13	Mixed deciduous
334	282.83	30.00	6	Sal
339	742.42	50.00	21	Sal
340	0.10	4.99	0	Open
343	134.34	12.50	8	Open
344	254.55	10.00	10	Sal
345	212.12	4.99	7	Sal

Grid-wise tree density, invasive species cover, tree species richness, and forest type.

Grid_ID	tree_den (in ha)	inv_spe (in %)	spe_richness	Forest_type
349	282.83	15.00	13	Open
350	212.12	4.99	6	Mixed deciduous
351	219.19	37.50	4	Open
354	289.90	25.00	11	Sal
355	480.81	4.99	7	Sal
356	296.97	4.99	7	Mixed deciduous
357	183.84	4.99	6	Open
358	70.71	50.00	8	Open
359	63.64	25.00	7	Open
360	162.63	30.00	11	Mixed deciduous
361	219.19	4.99	17	Mixed deciduous
362	353.54	32.50	17	Mixed deciduous
363	629.29	25.00	18	Mixed deciduous
364	1053.54	4.99	21	Mixed deciduous
365	593.94	5.00	15	Mixed deciduous
366	749.49	4.99	23	Mixed deciduous
367	572.73	7.50	23	Mixed deciduous
371	190.91	32.50	5	Mixed deciduous
372	106.06	25.00	5	Open
373	304.04	5.00	15	Mixed deciduous
374	452.53	4.99	18	Mixed deciduous
375	212.12	4.99	11	Mixed deciduous
376	353.54	4.99	11	Mixed deciduous
377	438.38	4.99	17	Mixed deciduous
378	127.27	4.99	8	Open
380	275.76	4.99	4	Mixed deciduous
381	806.06	31.00	15	Mixed deciduous
382	516.16	30.00	15	Mixed deciduous
383	395.96	45.00	8	Mixed deciduous
385	141.41	22.50	2	Open
386	339.39	4.99	6	Dry deciduous
500	480.81	23.75	17	Mixed deciduous
502	162.63	20.00	9	Mixed deciduous
503	91.92	20.00	8	Mixed deciduous
508	261.62	16.25	17	Mixed deciduous
509	311.11	10.00	10	Mixed deciduous
510	261.62	71.25	13	Mixed deciduous
511	360.61	42.50	12	Mixed deciduous
515	190.91	60.00	11	Mixed deciduous
516	77.78	4.99	14	Open
600	487.88	4.99	21	Mixed deciduous
3751	91.92	15.00	9	Mixed deciduous
3761	551.51	30.00	12	Mixed deciduous
3771	289.90	20.00	19	Mixed deciduous
3801	35.35	22.50	8	Open

ANNEXURE J

1. List of key linear infrastructures (roadways and railways), extractives, and coal blocks.

Corridor Divisions	Corridor Forest Ranges	Vehicle hit case	Train hit case	Roadways	Extractives	Comments	Railways
Anuppur	Ahirgawa			SH9A		Southern boundary	N/A
North Shahdol	Amjhor			SH10			N/A
	East Beohari			SH9A, SH55		Shahdol to Rewa via Beohari; Beohari to Sidhi	Singrauli to Katni - single lane - proposal for double lane accepted
	Godaval			Manpur-Beohari road		Single lane, concritized	Singrauli to Katni - single lane - proposal for double lane accepted
	Jaisinghnagar			SH9, SH10			N/A
	West Beohari	1		SH9A	Jamodi (sand or stone)	Shahdol to Rewa via Beohari	Singrauli to Katni - single lane - proposal for double lane accepted
South Shahdol	Gohparu			SH9		Shahdol to Beohari	N/A
	Khanoudi			SH9		Shahdol to Beohari	N/A
	Shahdol	1		SH9	Coalblocks ID: Mithuari, Kelmania UG, Singpur, Devanitola GSI, Pachri, Shahpur GSI, Shahpur East, Shahpur West Bicharpur GSI, Bicharpur South GSI, Singpur North UG, Singpur North (GSI Part), Jamui (GSI), UB8, Maiki North GSI	Gadasarai to Shahdol to Beohari	Bilaspur-Anuppur-Shahdol-Katni - double lane
Umaria	Ghunghuti	11	9	NH78/ NH43	Coalblocks ID: Ghunghuti, Pawari, Marwatola, Malachua, Marwatola South, Pachri, Patnar (Pathora), Arjuni, West of Shahdol	Shahdol to Umaria	Bilaspur-Anuppur-Shahdol-Katni - double lane
	Pali			NH78/ NH43	Amarkantak Thermal Powerstation closeby; close to Ghunghuti, Panwari, Patnar coal blocks	Shahdol to Umaria	Bilaspur-Anuppur-Shahdol-Katni - double lane
	Umaria		1	NH78/ NH43	Umaria Coalfield	Shahdol to Umaria	Bilaspur-Anuppur-Shahdol-Katni - double lane
Bandhavgarh	Panpatha						
	Khitauli						
	Tala	1					
	Pataur						
	Kallwah						
Sanjay	Bagdara						N/A
	Bastuwa	2					Singrauli to Katni - single lane - proposal for double lane accepted
	Beohari						N/A
	Dubri	2					Singrauli to Katni - single lane - proposal for double lane accepted
	Madwas						N/A
	Mohan						N/A
	Pondi						N/A

ANNEXURE K

Villages and population statistics in the corridor study area.

Population range	Grids	Percent grids	Villages	%villages
0	108	27.84	0	0.00
1 - 100	5	1.29	5	0.97
100 - 250	8	2.06	8	1.56
250 - 500	29	7.47	32	6.23
500 - 1000	70	18.04	105	20.43
1000 - 2500	117	30.15	214	41.63
2500 - 5000	41	10.57	117	22.76
5000 - 7500	7	1.80	21	4.09
7500 - 10000	3	0.77	12	2.33
	388	100	514	

Villages and population statistics in the 5 km buffer around the corridor study area.

Population range	Villages	%villages
0	5	1.05
1 - 100	25	5.24
100 - 250	45	9.43
250 - 500	94	19.71
500 - 1000	120	25.16
1000 - 2500	161	33.75
2500 - 5000	24	5.03
5000 - 7500	3	0.63
7500 - 10000	0	0.00

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
5	MP	Shahdol	Sohagpur	4	1524
8	MP	Shahdol	Sohagpur	3	2516
9	NA	NA	NA	0	0
10	MP	Shahdol	Sohagpur	2	3389
11	MP	Shahdol	Sohagpur	4	2134
12	MP	Shahdol	Sohagpur	3	5283
15	NA	NA	NA	0	0
16	MP	Shahdol	Sohagpur	1	330
17	NA	NA	NA	0	0
18	MP	Shahdol	Sohagpur	1	1431
19	MP	Shahdol	Jaisinghnagar	1	816
20	NA	NA	NA	0	0

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
40	MP	Anuppur	Pushparajgarh	2	824
41	NA	NA	NA	0	0
50	MP	Anuppur	Pushparajgarh	2	872
51	NA	NA	NA	0	0
52	MP	Anuppur	Pushparajgarh	2	1126
53	MP	Anuppur	Pushparajgarh	3	1262
54	MP	Anuppur	Pushparajgarh	1	483
63	MP	Dindori, Anuppur	Dindori, Pushparajgarh	2	875
64	NA	NA	NA	0	0
65	MP	Anuppur	Pushparajgarh	2	1459
66	NA	NA	NA	0	0
67	MP	Anuppur	Pushparajgarh	1	981
76	MP	Umaria, Anuppur	Pali, Pushparajgarh	3	1697
77	MP	Anuppur	Pushparajgarh	1	329
78	MP	Anuppur	Pushparajgarh	2	723
79	MP	Umaria	Pali	1	1173
81	MP	Umaria	Nowrozabad, Pali	4	2804
82	MP	Umaria	Pali	3	1969
83	NA	NA	NA	0	0
84	MP	Anuppur	Pushparajgarh	2	779
85	MP	Anuppur, Umaria	Pushparajgarh, Pali	2	1768
86	MP	Umaria	Pali	3	2660
96	MP	Umaria	Nowrozabad	2	1801
97	MP	Umaria	Nowrozabad, Pali	2	1168
98	NA	NA	NA	0	0
99	MP	Umaria	Pali	1	1066
100	MP	Anuppur	Pushparajgarh	1	909
101	MP	Umaria	Pali	3	1181
102	NA	NA	NA	0	0
103	NA	NA	NA	0	0
113	MP	Umaria	Nowrozabad	2	2427
114	MP	Umaria	Pali	2	9226
115	MP	Umaria	Pali	2	2713
116	NA	NA	NA	0	0
117	NA	NA	NA	0	0
118	NA	NA	NA	0	0
119	MP	Umaria	Pali	2	1128
128	MP	Umaria	Pali	2	5426
129	NA	NA	NA	0	0
130	MP	Umaria	Pali	4	3120
131	NA	NA	NA	0	0
132	NA	NA	NA	0	0

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
133	MP	Umaria	Pali	3	2517
134	NA	NA	NA	0	0
135	MP	Umaria	Pali	1	688
141	MP	Umaria	Nowrozabad, Pali	2	1843
142	NA	NA	NA	0	0
143	NA	NA	NA	0	0
144	NA	NA	NA	0	0
145	NA	NA	NA	0	0
146	NA	NA	NA	0	0
147	NA	NA	NA	0	0
148	MP	Umaria	Pali	5	2671
152	MP	Umaria	Pali	3	1654
153	NA	NA	NA	0	0
154	MP	Umaria	Pali	3	2452
155	MP	Umaria	Pali	1	965
156	MP	Umaria	Pali	2	548
157	MP	Umaria	Pali	1	0
158	NA	NA	NA	0	0
159	MP	Umaria	Pali	1	327
160	MP	Umaria	Pali	2	1833
164	MP	Umaria	Pali, Manpur	2	1281
165	MP	Umaria	Manpur	1	732
166	NA	NA	NA	0	0
167	NA	NA	NA	0	0
168	MP	Umaria	Pali	2	870
169	NA	NA	NA	0	0
170	MP	Umaria	Pali	2	1446
171	MP	Umaria	Pali	1	219
172	MP	Shahdol	Sohagpur	1	6
173	MP	Umaria	Manpur	3	642
174	MP	Umaria	Pali	1	312
175	NA	NA	NA	0	0
176	NA	NA	NA	0	0
177	MP	Umaria	Pali	1	826
178	MP	Shahdol, Umaria	Sohagpur, Pali	4	3401
179	MP	Shahdol	Sohagpur	2	3286
180	MP	Shahdol	Sohagpur	2	2205
181	MP	Shahdol	Sohagpur	2	3560
182	MP	Shahdol	Sohagpur	1	684
183	MP	Shahdol	Sohagpur	3	3028
184	MP	Shahdol	Sohagpur	2	1132
185	MP	Shahdol	Sohagpur	1	1615
186	MP	Shahdol	Sohagpur	2	897
187	MP	Shahdol,	Manpur, Pali	2	1934

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
		Umaria			
188	NA	NA	NA	0	0
189	MP	Umaria	Pali	1	62
190	MP	Umaria	Pali	2	773
191	MP	Shahdol, Umaria	Sohagpur, Pali	3	1727
192	NA	NA	NA	0	0
193	MP	Shahdol	Sohagpur	2	1317
194	MP	Shahdol	Sohagpur	2	816
195	MP	Shahdol	Sohagpur	2	1472
196	MP	Shahdol	Sohagpur	1	421
197	MP	Shahdol	Sohagpur	1	0
198	MP	Shahdol	Sohagpur	2	1157
199	MP	Shahdol	Sohagpur	1	417
200	MP	Shahdol	Sohagpur	1	543
201	MP	Umaria	Manpur	1	301
202	MP	Umaria	Pali	2	512
203	NA	NA	NA	0	0
204	MP	Umaria	Pali	1	213
205	NA	NA	NA	0	0
206	MP	Shahdol	Sohagpur	3	1942
207	NA	NA	NA	0	0
208	MP	Shahdol	Sohagpur	3	1320
209	MP	Shahdol	Sohagpur	2	1487
210	MP	Shahdol	Sohagpur	2	744
211	MP	Shahdol	Sohagpur	3	1000
212	NA	NA	NA	0	0
213	MP	Shahdol	Sohagpur	2	1941
214	MP	Shahdol	Sohagpur	2	928
215	MP	Umaria	Manpur	1	759
216	MP	Umaria	Pali	1	726
217	NA	NA	NA	0	0
218	MP	Shahdol	Sohagpur	3	2227
219	MP	Shahdol	Sohagpur	1	465
220	MP	Shahdol	Sohagpur	2	899
221	MP	Shahdol	Sohagpur	3	1762
222	MP	Shahdol	Sohagpur	3	3037
223	MP	Shahdol	Sohagpur	3	852
224	MP	Shahdol	Sohagpur	1	750
225	MP	Shahdol	Sohagpur	1	197
226	CG	Koriya	Bharatpur	1	370
227	MP	Umaria	Pali	1	318
228	MP	Umaria	Pali	2	659
229	MP	Shahdol	Sohagpur	1	1888
230	MP	Shahdol	Sohagpur	3	2596

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
231	MP	Shahdol	Sohagpur	1	1923
232	NA	NA	NA	0	0
233	MP	Shahdol	Sohagpur, Jaisinghnagar	3	2952
234	CG	Koriya	Bharatpur	1	951
235	MP	Umaria	Manpur	2	1307
236	MP	Shahdol, Umaria	Sohagpur, Manpur	2	893
237	MP	Shahdol	Jaisinghnagar	2	1745
238	MP	Shahdol	Jaisinghnagar	2	1412
239	MP	Shahdol	Jaisinghnagar	3	1902
240	MP	Shahdol	Jaisinghnagar	1	1544
241	MP	Shahdol	Jaisinghnagar	4	3281
242	MP	Shahdol	Jaisinghnagar	1	282
243	MP	Shahdol	Jaisinghnagar	3	4616
244	MP	Shahdol	Jaisinghnagar	1	1686
245	MP	Shahdol	Jaisinghnagar	1	1043
246	MP	Shahdol	Jaisinghnagar	1	1930
247	MP	Shahdol	Jaisinghnagar	1	829
248	MP	Shahdol	Jaisinghnagar	1	222
249	NA	NA	NA	0	0
250	MP	Shahdol	Jaisinghnagar	1	1039
251	MP	Shahdol	Jaisinghnagar	1	138
252	MP	Shahdol	Jaisinghnagar	2	3047
253	NA	NA	NA	0	0
254	MP	Shahdol	Jaisinghnagar	2	1075
255	NA	NA	NA	0	0
256	MP	Shahdol	Jaisinghnagar	2	1847
257	MP	Shahdol	Jaisinghnagar	1	660
258	MP	Shahdol	Jaisinghnagar	2	2885
259	CG	Koriya	Bharatpur	1	904
260	MP	Shahdol	Jaisinghnagar	2	920
261	MP	Shahdol	Jaisinghnagar	2	580
262	MP	Shahdol	Jaisinghnagar	2	677
263	MP	Shahdol	Jaisinghnagar	1	1678
264	NA	NA	NA	0	0
265	MP	Shahdol	Jaisinghnagar	2	2227
266	MP	Shahdol	Jaisinghnagar	1	706
267	MP	Shahdol	Jaisinghnagar	2	2076
268	NA	NA	NA	0	0
269	NA	NA	NA	0	0
270	NA	NA	NA	0	0
271	CG	Koriya	Bharatpur	1	719
272	MP	Shahdol	Jaisinghnagar	0	0
273	MP	Shahdol	Jaisinghnagar	1	984

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
274	MP	Shahdol	Jaisinghnagar	3	1466
275	MP	Shahdol	Jaisinghnagar	3	3167
276	MP	Shahdol	Jaisinghnagar	3	3085
277	MP	Shahdol	Jaisinghnagar	1	1840
278	MP	Shahdol	Jaisinghnagar	1	559
279	MP	Shahdol	Jaisinghnagar	2	1387
280	NA	NA	NA	0	0
281	MP	Shahdol	Jaisinghnagar	1	806
282	CG	Koriya	Bharatpur	1	348
283	NA	NA	NA	0	0
284	NA	NA	NA	0	0
285	MP	Shahdol	Jaisinghnagar	2	760
286	MP	Shahdol	Jaisinghnagar	2	1099
287	MP	Shahdol	Jaisinghnagar	2	539
288	MP	Shahdol	Jaisinghnagar	1	1235
289	MP	Shahdol	Jaisinghnagar	2	1160
290	NA	NA	NA	0	0
291	MP	Shahdol	Jaisinghnagar	2	260
292	MP	Shahdol	Jaisinghnagar	1	1416
293	MP	Shahdol	Jaisinghnagar	1	661
294	NA	NA	NA	0	0
295	MP	Shahdol	Jaisinghnagar	3	1904
296	MP	Shahdol	Jaisinghnagar	1	1090
297	MP	Shahdol	Jaisinghnagar	1	959
298	NA	NA	NA	0	0
299	MP	Shahdol	Jaisinghnagar	3	3114
300	NA	NA	NA	0	0
301	MP	Shahdol	Jaisinghnagar	2	1830
302	MP	Shahdol	Jaisinghnagar	2	1784
303	MP	Shahdol	Jaisinghnagar	1	524
304	MP	Shahdol	Beohari	1	455
305	MP	Shahdol	Jaisinghnagar	1	1881
306	NA	NA	NA	0	0
307	MP	Shahdol	Jaisinghnagar	1	819
308	MP	Shahdol	Jaisinghnagar	1	1209
309	MP	Shahdol	Jaisinghnagar	1	373
310	MP	Shahdol	Jaisinghnagar	2	7100
311	MP	Shahdol	Jaisinghnagar	1	23
312	MP	Shahdol	Jaisinghnagar	1	1022
313	NA	NA	NA	0	0
314	MP	Shahdol	Beohari	2	5506
315	MP	Shahdol	Beohari	1	1188
316	MP	Shahdol	Beohari	2	3029
317	NA	NA	NA	0	0
318	MP	Shahdol	Jaisinghnagar	1	1778

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
319	NA	NA	NA	0	0
320	MP	Shahdol	Beohari	1	881
321	NA	NA	NA	0	0
322	MP	Shahdol	Beohari	6	8069
323	MP	Shahdol	Beohari	4	3016
324	MP	Shahdol	Beohari	1	0
325	MP	Shahdol	Beohari	1	967
326	MP	Shahdol	Beohari	1	1718
327	MP	Shahdol	Beohari	2	3046
328	MP	Shahdol	Beohari	1	130
329	MP	Shahdol	Beohari	1	425
330	MP	Shahdol	Beohari	1	569
331	MP	Shahdol	Beohari	2	1820
332	MP	Shahdol	Beohari	6	7499
333	MP	Shahdol	Beohari	2	5880
334	NA	NA	NA	0	0
335	MP	Shahdol, Sidhi	Beohari, Kusmi	2	1867
337	NA	NA	NA	0	0
338	MP	Shahdol	Beohari	1	0
339	MP	Shahdol	Beohari	1	0
340	MP	Shahdol	Beohari	1	1041
341	MP	Shahdol	Beohari	2	2663
342	MP	Shahdol	Beohari	1	1344
343	NA	NA	NA	0	0
344	MP	Shahdol	Beohari	1	1214
345	MP	Sidhi	Majhauli	1	1868
346	MP	Sidhi	Majhauli	1	1616
347	NA	NA	NA	0	0
348	MP	Shahdol	Beohari	0	0
349	MP	Shahdol	Beohari	1	1004
350	MP	Shahdol	Beohari	0	0
351	MP	Shahdol	Beohari	4	4359
352	MP	Shahdol	Beohari	1	2819
353	MP	Shahdol	Beohari	4	5887
354	MP	Shahdol	Beohari	1	1133
355	MP	Shahdol	Beohari	1	2354
356	MP	Shahdol	Beohari	2	1834
357	MP	Shahdol	Beohari	1	1135
358	MP	Shahdol	Beohari	1	1340
359	MP	Shahdol	Beohari	0	0
360	MP	Shahdol	Beohari	1	1110
361	MP	Shahdol	Beohari	1	1453
362	MP	Shahdol	Beohari	1	1482
363	MP	Shahdol	Beohari	2	2308
364	MP	Shahdol	Beohari	1	660

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
365	MP	Sidhi	Majhauli	1	1329
366	NA	NA	NA	0	0
367	NA	NA	NA	0	0
368	NA	NA	NA	0	0
369	NA	NA	NA	0	0
370	MP	Shahdol,Satna	Beohari, Ramnagar	4	8557
371	MP	Shahdol,Satna	Beohari, Ramnagar	4	2679
372	NA	NA	NA	0	0
373	NA	NA	NA	0	0
374	MP	Shahdol	Beohari	1	0
375	MP	Sidhi	Majhauli	1	3970
376	NA	NA	NA	0	0
377	MP	Sidhi	Majhauli	1	3514
378	MP	Sidhi	Majhauli	1	1317
379	NA	NA	NA	0	0
380	MP	Shahdol, Sidhi	Beohari, Majhauli	2	1992
381	MP	Shahdol	Jaisinghnagar	5	3612
382	MP	Shahdol	Jaisinghnagar	2	981
383	MP	Shahdol	Beohari	5	4836
383	MP	Shahdol	Jaisinghnagar	2	1578
384	MP	Sidhi	Rampur Naikin	3	4045
385	MP	Shahdol	Jaisinghnagar	2	3507
385	MP	Shahdol	Jaisinghnagar	1	707
386	MP	Shahdol	Jaisinghnagar	2	395
387	MP	Shahdol	Jaisinghnagar	1	2143
388	MP	Shahdol	Jaisinghnagar	1	624
500	NA	NA	NA	0	0
501	NA	NA	NA	0	0
502	MP	Shahdol	Sohagpur	3	2395
503	MP	Shahdol	Sohagpur	2	3089
504	MP	Shahdol	Sohagpur	3	2061
505	MP	Shahdol	Sohagpur	4	3603
506	MP	Shahdol	Sohagpur	1	952
507	MP	Shahdol	Sohagpur	4	3771
508	MP	Shahdol	Sohagpur	1	1618
509	MP	Shahdol	Sohagpur	2	2011
510	MP	Shahdol	Sohagpur	2	1134
511	NA	NA	NA	0	0
512	MP	Shahdol	Jaitpur	1	949
513	MP	Shahdol	Jaitpur	2	2960
514	NA	NA	NA	0	0
515	MP	Shahdol	Sohagpur	1	277
516	MP	Shahdol	Jaitpur	2	1855
517	MP	Shahdol	Jaitpur	3	2209
518	MP	Shahdol	Jaitpur	1	249

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
519	MP	Shahdol	Sohagpur	2	1863
520	MP	Shahdol	Jaitpur	1	455
521	MP	Shahdol	Jaitpur	2	849
522	NA	NA	NA	0	0
523	NA	NA	NA	0	0
524	NA	NA	NA	0	0
525	MP	Shahdol	Sohagpur, Jaitpur	3	1674
526	MP	Shahdol	Sohagpur	1	1909
527	MP	Shahdol	Jaitpur	2	4822
600	MP	Sidhi	Majhauli	1	358
881	NA	NA	NA	0	0
1001	NA	NA	NA	0	0
1002	CG	Koriya	Bharatpur	1	43
1003	CG	Koriya	Bharatpur	1	292
1004	CG	Koriya	Bharatpur	1	1104
1005	CG	Koriya	Bharatpur	2	649
1006	CG	Koriya	Bharatpur	1	476
1007	NA	NA	NA	0	0
1008	NA	NA	NA	0	0
1009	NA	NA	NA	0	0
3751	MP	Shahdol	Jaisinghnagar	2	1987
3761	MP	Shahdol	Jaisinghnagar	1	90
3771	MP	Shahdol	Jaisinghnagar	1	1302
3781	MP	Shahdol	Jaisinghnagar	2	1762
3801	MP	Shahdol	Jaisinghnagar	1	1300
10010	CG	Koriya	Bharatpur	2	1456
10011	CG	Koriya	Bharatpur	1	1052
10012	NA	NA	NA	0	0
10013	CG	Koriya	Bharatpur	2	2187
10014	CG	Koriya	Bharatpur	1	1196
10015	CG	Koriya	Bharatpur	3	1470
10016	NA	NA	NA	0	0
10017	CG	Koriya	Bharatpur	1	140
10018	CG	Koriya	Bharatpur	2	481
10019	CG	Koriya	Bharatpur	1	793
10020	CG	Koriya	Bharatpur	2	747
10021	CG	Koriya	Bharatpur	1	4849
10022	NA	NA	NA	0	0
10023	CG	Koriya	Bharatpur	1	402
10024	NA	NA	NA	0	0
10025	NA	NA	NA	0	0
10026	CG	Koriya	Bharatpur	1	676
10027	NA	NA	NA	0	0
10028	NA	NA	NA	0	0
10029	CG	Koriya	Bharatpur	1	324

List of villages per grid and population (Census of India, 2011)

Grid_ID	State	District	Sub district	No. of villages	Population
10030	NA	NA	NA	0	0
10031	CG	Koriya	Bharatpur	2	987
10032	CG	Koriya	Bharatpur	1	391
10033	NA	NA	NA	0	0
10034	CG	Koriya	Bharatpur	2	971
10037	CG	Koriya	Bharatpur	2	1644
10038	CG	Koriya	Bharatpur	1	1365
10039	NA	NA	NA	0	0
10040	NA	NA	NA	0	0
10041	NA	NA	NA	0	0
10042	CG	Koriya	Bharatpur	2	807
10043	CG	Koriya	Bharatpur	1	278
10044	CG	Koriya	Bharatpur	1	596
10045	NA	NA	NA	0	0
10046	NA	NA	NA	0	0
10047	NA	NA	NA	0	0
10048	CG	Koriya	Bharatpur	2	942
10049	CG	Koriya	Bharatpur	2	1411
10050	CG	Koriya	Bharatpur	1	643
10051	CG	Koriya	Bharatpur	1	734
10052	CG	Koriya	Bharatpur	4	1805
10053	CG	Koriya	Bharatpur	1	277
10054	CG	Koriya	Bharatpur	3	861
10055	CG	Koriya	Bharatpur	2	1233

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Sohagpur	Kushhai	0
MADHYA PRADESH	Umaria	Nowrozabad	Chitauha	0
MADHYA PRADESH	Sidhi	Kusmi	Dokarbandh	0
MADHYA PRADESH	Shahdol	Beohari	Beohari Khurd	0
MADHYA PRADESH	Shahdol	Beohari	Majhigawan	0
MADHYA PRADESH	Sidhi	Rampur Naikin	Beldahi	1
MADHYA PRADESH	Shahdol	Beohari	Belbahra	4
MADHYA PRADESH	Sidhi	Rampur Naikin	Bhitri	15
MADHYA PRADESH	Sidhi	Kusmi	Kanjra	18
MADHYA PRADESH	Shahdol	Beohari	Nipaniya 341	22
MADHYA PRADESH	Sidhi	Kusmi	Sarsai	23
MADHYA PRADESH	Shahdol	Sohagpur	Hardiha Khurd	33
MADHYA PRADESH	Sidhi	Rampur Naikin	Kehjua Block	35
MADHYA PRADESH	Sidhi	Kusmi	Baherwar	50
MADHYA PRADESH	Umaria	Manpur	Harrai	51
MADHYA PRADESH	Dindori	Dindori	Ramguda Ryt.	53
MADHYA PRADESH	Shahdol	Jaisinghnagar	Matohar	57

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Beohari	Dadar	62
MADHYA PRADESH	Shahdol	Beohari	Amilgarh	69
MADHYA PRADESH	Sidhi	Kusmi	Badiya	80
MADHYA PRADESH	Umaria	Pali	Bargawan	82
MADHYA PRADESH	Shahdol	Beohari	Indwar	92
MADHYA PRADESH	Shahdol	Jaitpur	Dudhariya	121
MADHYA PRADESH	Shahdol	Jaisinghnagar	Ramsohra	134
MADHYA PRADESH	Umaria	Pali	Itaur	136
MADHYA PRADESH	Shahdol	Jaisinghnagar	Basohara	137
MADHYA PRADESH	Sidhi	Rampur Naikin	Jamuniha No.1	141
MADHYA PRADESH	Shahdol	Jaisinghnagar	Sattidol	146
MADHYA PRADESH	Shahdol	Beohari	Chhiraha	151
MADHYA PRADESH	Dindori	Dindori	Duniya Mal.	153
MADHYA PRADESH	Umaria	Manpur	Badwahi	155
MADHYA PRADESH	Umaria	Manpur	Mohbala	159
MADHYA PRADESH	Dindori	Dindori	Parasi Ryt.	162
MADHYA PRADESH	Shahdol	Sohagpur	Chhatarpur	164
MADHYA PRADESH	Umaria	Manpur	Mainwah	164
MADHYA PRADESH	Umaria	Nowrozabad	Tenduha	175
MADHYA PRADESH	Satna	Ramnagar	Rojhauha	176
MADHYA PRADESH	Sidhi	Rampur Naikin	Dhanesar	183
MADHYA PRADESH	Shahdol	Sohagpur	Hadha	184
MADHYA PRADESH	Umaria	Nowrozabad	Jhima	188
MADHYA PRADESH	Shahdol	Jaisinghnagar	Hardua	188
MADHYA PRADESH	Anuppur	Pushparajgarh	Daldali	197
MADHYA PRADESH	Shahdol	Sohagpur	Padri	200
MADHYA PRADESH	Umaria	Manpur	Bharmila	200
MADHYA PRADESH	Dindori	Dindori	Akhdar (Akhrad) Mal.	201
MADHYA PRADESH	Anuppur	Pushparajgarh	Ramna Sarkari-2	203
MADHYA PRADESH	Sidhi	Majhauli	Pidratal	204
MADHYA PRADESH	Shahdol	Sohagpur	Birhuliya	205
MADHYA PRADESH	Shahdol	Sohagpur	Semariha	207
MADHYA PRADESH	Umaria	Manpur	Chechpur	217
MADHYA PRADESH	Shahdol	Sohagpur	Maika	220
MADHYA PRADESH	Shahdol	Beohari	Khari Chhot	223
MADHYA PRADESH	Shahdol	Beohari	Nipaniya 340	223
MADHYA PRADESH	Shahdol	Jaisinghnagar	Bartua	224
MADHYA PRADESH	Anuppur	Pushparajgarh	Ramna Sarkari-1	225
MADHYA PRADESH	Sidhi	Rampur Naikin	Mauhariya	228
MADHYA PRADESH	Shahdol	Sohagpur	Khouhai	230
MADHYA PRADESH	Shahdol	Jaisinghnagar	Mair Tola	246
MADHYA PRADESH	Umaria	Nowrozabad	Mahobadadar	247
MADHYA PRADESH	Umaria	Pali	Blockpadri	251
MADHYA PRADESH	Satna	Ramnagar	Dhawarai	251
MADHYA PRADESH	Sidhi	Kusmi	Goindwar	264

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Sidhi	Majhauli	Shankarpur	265
MADHYA PRADESH	Sidhi	Rampur Naikin	Khairi	269
MADHYA PRADESH	Shahdol	Sohagpur	Chandaniya Badi	270
MADHYA PRADESH	Sidhi	Kusmi	Dubari Khurd	273
MADHYA PRADESH	Sidhi	Rampur Naikin	Gadhwa	273
MADHYA PRADESH	Sidhi	Rampur Naikin	Agahar Jaikaransingh	273
MADHYA PRADESH	Shahdol	Sohagpur	Sonwarsha	288
MADHYA PRADESH	Sidhi	Rampur Naikin	Amaha Tola	292
MADHYA PRADESH	Shahdol	Jaisinghnagar	Puraina	293
MADHYA PRADESH	Shahdol	Jaisinghnagar	Ratga	298
MADHYA PRADESH	Shahdol	Beohari	Jamuniha	302
MADHYA PRADESH	Shahdol	Jaitpur	Bairiha	310
MADHYA PRADESH	Shahdol	Jaitpur	Bodila	310
MADHYA PRADESH	Shahdol	Jaisinghnagar	Hartala	319
MADHYA PRADESH	Sidhi	Rampur Naikin	Chobhara Vinayaksingh	320
MADHYA PRADESH	Sidhi	Rampur Naikin	Agahar Bhimsingh	320
MADHYA PRADESH	Dindori	Dindori	Parasi Mal.	324
MADHYA PRADESH	Sidhi	Kusmi	Kanchanpur	326
MADHYA PRADESH	Dindori	Dindori	Pondi Ryt.	327
MADHYA PRADESH	Umaria	Pali	Majhigawan	327
MADHYA PRADESH	Shahdol	Jaitpur	Semariha	327
MADHYA PRADESH	Shahdol	Jaisinghnagar	Nakti Tola	332
MADHYA PRADESH	Satna	Ramnagar	Bansi	338
MADHYA PRADESH	Sidhi	Rampur Naikin	Barha Tola	338
MADHYA PRADESH	Shahdol	Jaitpur	Dongaritola	342
MADHYA PRADESH	Umaria	Manpur	Marai Kala	344
MADHYA PRADESH	Umaria	Manpur	Gobratal	345
MADHYA PRADESH	Shahdol	Jaisinghnagar	Rampur	347
MADHYA PRADESH	Shahdol	Beohari	Bairihai	351
MADHYA PRADESH	Shahdol	Sohagpur	Jarha	354
MADHYA PRADESH	Umaria	Nowrozabad	Akmaniha	355
MADHYA PRADESH	Shahdol	Beohari	Bijahi	359
MADHYA PRADESH	Shahdol	Sohagpur	Badkhera	360
MADHYA PRADESH	Umaria	Manpur	Pipari Tola	360
MADHYA PRADESH	Shahdol	Jaisinghnagar	Patharwar	361
MADHYA PRADESH	Shahdol	Jaisinghnagar	Mair Tola	369
MADHYA PRADESH	Umaria	Manpur	Dongari Tola	374
MADHYA PRADESH	Shahdol	Jaitpur	Marjad	376
MADHYA PRADESH	Shahdol	Jaitpur	Lukampur	388
MADHYA PRADESH	Shahdol	Jaitpur	Harraha Tola	392
MADHYA PRADESH	Shahdol	Jaitpur	Nand Tola	392
MADHYA PRADESH	Umaria	Manpur	Harchauta	394
MADHYA PRADESH	Sidhi	Rampur Naikin	Chobhara	395

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
			Jaikaransingh	
MADHYA PRADESH	Shahdol	Jaitpur	Harrha Tola	402
MADHYA PRADESH	Umaria	Manpur	Kumharra	402
MADHYA PRADESH	Satna	Ramnagar	Jarauha	405
MADHYA PRADESH	Shahdol	Jaitpur	Dongariya Tola	412
MADHYA PRADESH	Anuppur	Pushparajgarh	Chatuwa	415
MADHYA PRADESH	Umaria	Pali	Kusmaha Kalan	426
MADHYA PRADESH	Umaria	Pali	Marwa Tola	429
MADHYA PRADESH	Shahdol	Sohagpur	Raipur	432
MADHYA PRADESH	Umaria	Pali	Mahroai	434
MADHYA PRADESH	Umaria	Pali	Didwariya	439
MADHYA PRADESH	Shahdol	Jaitpur	Sagara Tola	452
MADHYA PRADESH	Umaria	Manpur	Malhara	457
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kusmi	462
MADHYA PRADESH	Sidhi	Rampur Naikin	Baghad Khas	462
MADHYA PRADESH	Shahdol	Sohagpur	Chandaniya Khurd	471
MADHYA PRADESH	Shahdol	Sohagpur	Barhai	471
MADHYA PRADESH	Shahdol	Jaitpur	Naugai	471
MADHYA PRADESH	Umaria	Manpur	Samar Kaini	477
MADHYA PRADESH	Anuppur	Pushparajgarh	Sital Pani	478
MADHYA PRADESH	Umaria	Pali	Chandaniya	486
MADHYA PRADESH	Shahdol	Beohari	Sapta	486
MADHYA PRADESH	Anuppur	Pushparajgarh	Tanki Tola	488
MADHYA PRADESH	Umaria	Manpur	Majh Tola	489
MADHYA PRADESH	Shahdol	Jaitpur	Boda Tola	494
MADHYA PRADESH	Shahdol	Jaitpur	Badaudi	497
MADHYA PRADESH	Sidhi	Rampur Naikin	Majhiyar	497
MADHYA PRADESH	Umaria	Pali	Budhana	515
MADHYA PRADESH	Shahdol	Sohagpur	Padkher	515
MADHYA PRADESH	Umaria	Pali	Khamhariya Khurd	525
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kharika Tola	526
MADHYA PRADESH	Shahdol	Jaisinghnagar	Thutha Tola	527
MADHYA PRADESH	Umaria	Pali	Bandhawa Bada	535
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kudra Tola	539
MADHYA PRADESH	Shahdol	Jaisinghnagar	Lakhnoti	541
MADHYA PRADESH	Shahdol	Jaisinghnagar	Datari	548
MADHYA PRADESH	Shahdol	Sohagpur	Katahari	551
MADHYA PRADESH	Umaria	Pali	Kannabahara	552
MADHYA PRADESH	Shahdol	Jaitpur	Naugawan	552
MADHYA PRADESH	Umaria	Pali	Semariha	556
MADHYA PRADESH	Shahdol	Jaitpur	Bhikhampur	558
MADHYA PRADESH	Umaria	Nowrozabad	Uchehara	566
MADHYA PRADESH	Umaria	Manpur	Badari	567
MADHYA PRADESH	Sidhi	Rampur Naikin	Rehuta	568
MADHYA PRADESH	Shahdol	Jaisinghnagar	Chhapra Tola	575

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Jaisinghnagar	Dongarsarwar	582
MADHYA PRADESH	Shahdol	Jaitpur	Padkhuri	584
MADHYA PRADESH	Sidhi	Rampur Naikin	Koniya	586
MADHYA PRADESH	Sidhi	Rampur Naikin	Chauganha	587
MADHYA PRADESH	Shahdol	Jaisinghnagar	Chhuihai Tola	588
MADHYA PRADESH	Shahdol	Beohari	Akauri	596
MADHYA PRADESH	Umaria	Nowrozabad	Machheha	602
MADHYA PRADESH	Shahdol	Beohari	Banasi	611
MADHYA PRADESH	Sidhi	Rampur Naikin	Raiduariya Khurd	613
MADHYA PRADESH	Umaria	Pali	Bandhawa Khurd	622
MADHYA PRADESH	Umaria	Pali	Bhadra	627
MADHYA PRADESH	Anuppur	Pushparajgarh	Tarera	636
MADHYA PRADESH	Shahdol	Jaisinghnagar	Saristal	636
MADHYA PRADESH	Satna	Ramnagar	Sonwarsha	640
MADHYA PRADESH	Anuppur	Pushparajgarh	Kumhani	643
MADHYA PRADESH	Anuppur	Pushparajgarh	Dongariya	649
MADHYA PRADESH	Sidhi	Majhauli	Rupaidol	652
MADHYA PRADESH	Shahdol	Sohagpur	Jarwahi	675
MADHYA PRADESH	Umaria	Pali	Narbar	677
MADHYA PRADESH	Shahdol	Jaisinghnagar	Bhatgawan Kalan	682
MADHYA PRADESH	Anuppur	Pushparajgarh	Ahirgawan	686
MADHYA PRADESH	Shahdol	Sohagpur	Nandana	686
MADHYA PRADESH	Satna	Ramnagar	Khairhani	698
MADHYA PRADESH	Sidhi	Rampur Naikin	Lehchua(Lehsua)	699
MADHYA PRADESH	Umaria	Manpur	Goraiya	700
MADHYA PRADESH	Sidhi	Kusmi	Deomath	707
MADHYA PRADESH	Sidhi	Rampur Naikin	Chobhara Digvijaysingh	718
MADHYA PRADESH	Umaria	Pali	Kholkhamhra	732
MADHYA PRADESH	Shahdol	Sohagpur	Deogawan	736
MADHYA PRADESH	Shahdol	Beohari	Raspur	738
MADHYA PRADESH	Shahdol	Jaisinghnagar	Keet	743
MADHYA PRADESH	Shahdol	Beohari	Dalko Jagir 289	743
MADHYA PRADESH	Umaria	Pali	Chaka	756
MADHYA PRADESH	Umaria	Pali	Mohtarai	756
MADHYA PRADESH	Satna	Ramnagar	Kubari	758
MADHYA PRADESH	Umaria	Pali	Deogawan	761
MADHYA PRADESH	Shahdol	Jaitpur	Mauhar Tola	763
MADHYA PRADESH	Dindori	Dindori	Kui Mal.	764
MADHYA PRADESH	Satna	Ramnagar	Majhatolwa	770
MADHYA PRADESH	Shahdol	Jaisinghnagar	Gajani	792
MADHYA PRADESH	Shahdol	Jaisinghnagar	Bhatgawan Khurd	792
MADHYA PRADESH	Shahdol	Jaisinghnagar	Charkwah	794
MADHYA PRADESH	Shahdol	Jaisinghnagar	Tendudol	798
MADHYA PRADESH	Shahdol	Jaisinghnagar	Gajwahi	808

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Umaria	Pali	Pahadiya	810
MADHYA PRADESH	Shahdol	Beohari	Padri	811
MADHYA PRADESH	Umaria	Pali	Bhimmadongri	812
MADHYA PRADESH	Sidhi	Kusmi	Kharwar	817
MADHYA PRADESH	Satna	Ramnagar	Maryadpur	818
MADHYA PRADESH	Shahdol	Jaisinghnagar	Duari	831
MADHYA PRADESH	Sidhi	Kusmi	Dubari Kalan	831
MADHYA PRADESH	Dindori	Dindori	Narayandih Ryt.	834
MADHYA PRADESH	Shahdol	Sohagpur	Pachdi	841
MADHYA PRADESH	Shahdol	Sohagpur	Atariya Tola	843
MADHYA PRADESH	Shahdol	Jaisinghnagar	Reusa	849
MADHYA PRADESH	Shahdol	Beohari	Khari Badi	853
MADHYA PRADESH	Umaria	Manpur	Marai Khurd	856
MADHYA PRADESH	Shahdol	Jaitpur	Bhogda	857
MADHYA PRADESH	Shahdol	Jaitpur	Madsa	862
MADHYA PRADESH	Umaria	Nowrozabad	Changera	869
MADHYA PRADESH	Shahdol	Jaisinghnagar	Jagra Tola (Jagda)	869
MADHYA PRADESH	Sidhi	Rampur Naikin	Itaha	870
MADHYA PRADESH	Shahdol	Jaisinghnagar	Budhsar	872
MADHYA PRADESH	Umaria	Pali	Kusmaha Khurd	874
MADHYA PRADESH	Satna	Ramnagar	Uchehara	880
MADHYA PRADESH	Umaria	Manpur	Hardi	891
MADHYA PRADESH	Shahdol	Jaisinghnagar	Bharri	892
MADHYA PRADESH	Satna	Ramnagar	Jhinna	899
MADHYA PRADESH	Shahdol	Jaitpur	Mohtara	906
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kudra Tola	906
MADHYA PRADESH	Shahdol	Sohagpur	Son Tola	918
MADHYA PRADESH	Sidhi	Majhauli	Tenkar	922
MADHYA PRADESH	Umaria	Manpur	Baskuta	944
MADHYA PRADESH	Shahdol	Beohari	Nimiha	945
MADHYA PRADESH	Umaria	Nowrozabad	Bichhiya	947
MADHYA PRADESH	Shahdol	Jaitpur	Ghoghri	953
MADHYA PRADESH	Sidhi	Kusmi	Bitkhuri	953
MADHYA PRADESH	Shahdol	Jaitpur	Bhamala	970
MADHYA PRADESH	Shahdol	Jaisinghnagar	Uchehara (Abad)	974
MADHYA PRADESH	Umaria	Manpur	Kachhara Tola	976
MADHYA PRADESH	Shahdol	Jaisinghnagar	Karpa	983
MADHYA PRADESH	Dindori	Dindori	Ramguda Mal.	988
MADHYA PRADESH	Shahdol	Sohagpur	Jalli Tola	988
MADHYA PRADESH	Shahdol	Jaisinghnagar	Masiyari	989
MADHYA PRADESH	Shahdol	Beohari	Mair Tola	1018
MADHYA PRADESH	Shahdol	Sohagpur	Chapa	1030
MADHYA PRADESH	Umaria	Pali	Raugarh	1048
MADHYA PRADESH	Shahdol	Sohagpur	Khamhariya Kalan	1051
MADHYA PRADESH	Satna	Ramnagar	Kua	1055

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Beohari	Bilkuda	1065
MADHYA PRADESH	Shahdol	Beohari	Deogaon	1080
MADHYA PRADESH	Sidhi	Majhauli	Khamchaura	1087
MADHYA PRADESH	Satna	Ramnagar	Paip Khara	1101
MADHYA PRADESH	Sidhi	Rampur Naikin	Bardaila	1108
MADHYA PRADESH	Shahdol	Beohari	Dhari No 1	1116
MADHYA PRADESH	Shahdol	Jaisinghnagar	Darain	1118
MADHYA PRADESH	Sidhi	Rampur Naikin	Bhuiya Dol	1123
MADHYA PRADESH	Shahdol	Jaitpur	Pairibahara	1133
MADHYA PRADESH	Sidhi	Majhauli	Chunguna	1135
MADHYA PRADESH	Sidhi	Rampur Naikin	Rimari	1137
MADHYA PRADESH	Umaria	Manpur	Deori	1140
MADHYA PRADESH	Shahdol	Sohagpur	Samda Tola	1142
MADHYA PRADESH	Sidhi	Kusmi	Deua	1143
MADHYA PRADESH	Shahdol	Beohari	Jharaunsi	1155
MADHYA PRADESH	Shahdol	Beohari	Hinauta	1156
MADHYA PRADESH	Shahdol	Sohagpur	Nipaniya	1170
MADHYA PRADESH	Shahdol	Sohagpur	Lamro	1175
MADHYA PRADESH	Shahdol	Beohari	Baraha Tola	1177
MADHYA PRADESH	Shahdol	Jaisinghnagar	Chhapra Tola	1195
MADHYA PRADESH	Umaria	Manpur	Amiliya	1197
MADHYA PRADESH	Shahdol	Beohari	Duara	1201
MADHYA PRADESH	Shahdol	Beohari	Sukha	1206
MADHYA PRADESH	Shahdol	Jaisinghnagar	Semar Pakha	1211
MADHYA PRADESH	Umaria	Manpur	Karaundi Tola	1225
MADHYA PRADESH	Shahdol	Sohagpur	Naugai	1227
MADHYA PRADESH	Shahdol	Jaisinghnagar	Dholar	1228
MADHYA PRADESH	Sidhi	Majhauli	Bagaiha	1228
MADHYA PRADESH	Sidhi	Rampur Naikin	Bajranggarh	1233
MADHYA PRADESH	Shahdol	Jaitpur	Bharuha	1234
MADHYA PRADESH	Shahdol	Sohagpur	Chagera	1242
MADHYA PRADESH	Sidhi	Kusmi	Chinagwah	1242
MADHYA PRADESH	Umaria	Manpur	Chitraw	1249
MADHYA PRADESH	Umaria	Manpur	Baigaon	1254
MADHYA PRADESH	Umaria	Nowrozabad	Kalda	1258
MADHYA PRADESH	Shahdol	Sohagpur	Kathautiya	1259
MADHYA PRADESH	Shahdol	Beohari	Uksa	1259
MADHYA PRADESH	Sidhi	Majhauli	Mendra	1269
MADHYA PRADESH	Shahdol	Jaitpur	Titara	1281
MADHYA PRADESH	Anuppur	Pushparajgarh	Khamraudh	1284
MADHYA PRADESH	Shahdol	Jaitpur	Koluha	1298
MADHYA PRADESH	Shahdol	Beohari	Mahdeva	1299
MADHYA PRADESH	Shahdol	Beohari	Bara Baghelaha	1300
MADHYA PRADESH	Sidhi	Majhauli	Pondi	1305
MADHYA PRADESH	Sidhi	Rampur Naikin	Agdal	1334

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Sidhi	Majhauli	Banjari	1338
MADHYA PRADESH	Shahdol	Jaisinghnagar	Dadar	1348
MADHYA PRADESH	Umaria	Pali	Shahpur	1350
MADHYA PRADESH	Anuppur	Pushparajgarh	Tarang	1355
MADHYA PRADESH	Shahdol	Sohagpur	Baruka	1372
MADHYA PRADESH	Shahdol	Jaitpur	Khairhani	1372
MADHYA PRADESH	Shahdol	Jaisinghnagar	Masira	1380
MADHYA PRADESH	Sidhi	Majhauli	Sendhwa	1384
MADHYA PRADESH	Umaria	Manpur	Parasi	1393
MADHYA PRADESH	Shahdol	Sohagpur	Birhuli	1417
MADHYA PRADESH	Umaria	Nowrozabad	Patapara	1421
MADHYA PRADESH	Shahdol	Beohari	Sukhad	1424
MADHYA PRADESH	Satna	Ramnagar	Chaudharan Tola	1432
MADHYA PRADESH	Shahdol	Jaitpur	Nebuha	1437
MADHYA PRADESH	Umaria	Nowrozabad	Dewgawa Khurd	1442
MADHYA PRADESH	Shahdol	Sohagpur	Hardi	1448
MADHYA PRADESH	Satna	Ramnagar	Budhabaur	1453
MADHYA PRADESH	Shahdol	Jaisinghnagar	Mahua Tola	1478
MADHYA PRADESH	Shahdol	Beohari	Bijaha	1482
MADHYA PRADESH	Shahdol	Sohagpur	Chhanta Alias Nawatola	1496
MADHYA PRADESH	Umaria	Manpur	Rohaniya	1497
MADHYA PRADESH	Sidhi	Rampur Naikin	Mohani	1501
MADHYA PRADESH	Umaria	Manpur	Sehra Tola	1507
MADHYA PRADESH	Shahdol	Jaisinghnagar	Sarwari	1507
MADHYA PRADESH	Shahdol	Sohagpur	Majhagawan	1533
MADHYA PRADESH	Shahdol	Beohari	Hirwar	1537
MADHYA PRADESH	Shahdol	Jaitpur	Bargawan	1547
MADHYA PRADESH	Shahdol	Jaitpur	Sakhi	1555
MADHYA PRADESH	Shahdol	Jaitpur	Tikuri	1556
MADHYA PRADESH	Shahdol	Jaisinghnagar	Daraudi	1564
MADHYA PRADESH	Shahdol	Sohagpur	Gohparu	1569
MADHYA PRADESH	Shahdol	Sohagpur	Patasi	1571
MADHYA PRADESH	Shahdol	Jaitpur	Amha	1586
MADHYA PRADESH	Shahdol	Jaitpur	Channaudi	1608
MADHYA PRADESH	Sidhi	Rampur Naikin	Ghunghuta	1613
MADHYA PRADESH	Umaria	Manpur	Raksha	1619
MADHYA PRADESH	Umaria	Nowrozabad	Maradari	1652
MADHYA PRADESH	Shahdol	Jaisinghnagar	Gandhiya	1660
MADHYA PRADESH	Shahdol	Jaisinghnagar	Chandela	1664
MADHYA PRADESH	Umaria	Manpur	Badar	1673
MADHYA PRADESH	Sidhi	Rampur Naikin	Shikargang	1676
MADHYA PRADESH	Shahdol	Jaitpur	Kharla	1688
MADHYA PRADESH	Shahdol	Beohari	Magardaha	1688
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kunda Tola	1695

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Beohari	Tenduha	1719
MADHYA PRADESH	Umaria	Manpur	Khutar	1720
MADHYA PRADESH	Shahdol	Sohagpur	Harri	1741
MADHYA PRADESH	Shahdol	Sohagpur	Karua	1742
MADHYA PRADESH	Shahdol	Beohari	Tikura Tola	1764
MADHYA PRADESH	Sidhi	Majhauli	Amedhiya	1771
MADHYA PRADESH	Sidhi	Rampur Naikin	Khaddi Kalan	1783
MADHYA PRADESH	Shahdol	Beohari	Gopalpur	1786
MADHYA PRADESH	Shahdol	Jaitpur	Rasmohani	1787
MADHYA PRADESH	Umaria	Pali	Amiliha	1791
MADHYA PRADESH	Sidhi	Rampur Naikin	Baghad Dhabaiya(Tola)	1808
MADHYA PRADESH	Shahdol	Beohari	Jhiriya	1813
MADHYA PRADESH	Shahdol	Jaisinghnagar	Sannausi	1816
MADHYA PRADESH	Sidhi	Rampur Naikin	Chandreh	1823
MADHYA PRADESH	Shahdol	Jaisinghnagar	Sidhi	1827
MADHYA PRADESH	Sidhi	Kusmi	Kundaur	1830
MADHYA PRADESH	Shahdol	Sohagpur	Patkhai	1834
MADHYA PRADESH	Shahdol	Beohari	Rampurwa	1851
MADHYA PRADESH	Sidhi	Rampur Naikin	Amilaha	1853
MADHYA PRADESH	Shahdol	Sohagpur	Aswari	1860
MADHYA PRADESH	Shahdol	Jaisinghnagar	Tenduadh	1861
MADHYA PRADESH	Shahdol	Beohari	Chhataina	1876
MADHYA PRADESH	Shahdol	Sohagpur	Bandhawa Bada	1878
MADHYA PRADESH	Sidhi	Rampur Naikin	Jamuniha No.2	1878
MADHYA PRADESH	Shahdol	Sohagpur	Jugwari	1886
MADHYA PRADESH	Shahdol	Beohari	Kharapa	1903
MADHYA PRADESH	Shahdol	Jaitpur	Biraudi	1909
MADHYA PRADESH	Sidhi	Majhauli	Dhanauli	1912
MADHYA PRADESH	Umaria	Nowrozabad	Pathari	1915
MADHYA PRADESH	Umaria	Manpur	Dodka	1917
MADHYA PRADESH	Shahdol	Beohari	Charkhari	1917
MADHYA PRADESH	Shahdol	Beohari	Kumhiya	1952
MADHYA PRADESH	Umaria	Nowrozabad	Sastra	1961
MADHYA PRADESH	Sidhi	Rampur Naikin	Ratwar	1961
MADHYA PRADESH	Umaria	Pali	Badwahi	1963
MADHYA PRADESH	Sidhi	Majhauli	Khantara	1970
MADHYA PRADESH	Sidhi	Rampur Naikin	Barau	1985
MADHYA PRADESH	Shahdol	Jaisinghnagar	Pondi	1995
MADHYA PRADESH	Shahdol	Sohagpur	Udhiya	2013
MADHYA PRADESH	Shahdol	Sohagpur	Kelmaniya	2021
MADHYA PRADESH	Shahdol	Jaisinghnagar	Charhet	2023
MADHYA PRADESH	Umaria	Nowrozabad	Nipaniya	2029
MADHYA PRADESH	Shahdol	Jaisinghnagar	Mohni	2031
MADHYA PRADESH	Umaria	Manpur	Bhamraha	2077

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
CHATTISGARH	Koriya	Bharatpur	Rajrawal	96
CHATTISGARH	Koriya	Bharatpur	Thorgi	97
CHATTISGARH	Koriya	Bharatpur	Balauda	108
CHATTISGARH	Koriya	Bharatpur	Parewadol	118
CHATTISGARH	Koriya	Bharatpur	Deogarhkhoh	122
CHATTISGARH	Koriya	Bharatpur	Kudra	136
CHATTISGARH	Koriya	Bharatpur	Barchha	142
CHATTISGARH	Koriya	Bharatpur	Khohra	233
CHATTISGARH	Koriya	Bharatpur	Benipura	242
CHATTISGARH	Koriya	Bharatpur	Pichhaura Bandh	249
CHATTISGARH	Koriya	Bharatpur	Potta Jhorki	259
CHATTISGARH	Koriya	Bharatpur	Harri	287
CHATTISGARH	Koriya	Bharatpur	Bhawarkhoh	291
CHATTISGARH	Koriya	Bharatpur	Chutki	294
CHATTISGARH	Koriya	Bharatpur	Girwani	307
CHATTISGARH	Koriya	Bharatpur	Dhanauli	313
CHATTISGARH	Koriya	Bharatpur	Barauta	337
CHATTISGARH	Koriya	Bharatpur	Amaradandi	343
CHATTISGARH	Koriya	Bharatpur	Padauli	354
CHATTISGARH	Koriya	Bharatpur	Ghughari	357
CHATTISGARH	Koriya	Bharatpur	Larghadandi	371
CHATTISGARH	Koriya	Bharatpur	Markhohi	385
CHATTISGARH	Koriya	Bharatpur	Kaklendi	389
CHATTISGARH	Koriya	Bharatpur	Umarwah	402
CHATTISGARH	Koriya	Bharatpur	Jawaritola	410
CHATTISGARH	Koriya	Bharatpur	Karri	410
CHATTISGARH	Koriya	Bharatpur	Bhumka	412
CHATTISGARH	Koriya	Bharatpur	Khetauli	428
CHATTISGARH	Koriya	Bharatpur	Pandri	444
CHATTISGARH	Koriya	Bharatpur	Toja	456
CHATTISGARH	Koriya	Bharatpur	Kannoj	488
CHATTISGARH	Koriya	Bharatpur	Sagra	497
CHATTISGARH	Koriya	Bharatpur	Chhirhatola	504
CHATTISGARH	Koriya	Bharatpur	Pondi	505
CHATTISGARH	Koriya	Bharatpur	Kashitola	513
CHATTISGARH	Koriya	Bharatpur	Ohaniya	530
CHATTISGARH	Koriya	Bharatpur	Badkadol	561
CHATTISGARH	Koriya	Bharatpur	Harrai	564
CHATTISGARH	Koriya	Bharatpur	Jaiti	583
CHATTISGARH	Koriya	Bharatpur	Bhusaha	616
CHATTISGARH	Koriya	Bharatpur	Dongritola	619
CHATTISGARH	Koriya	Bharatpur	Poonji	640
CHATTISGARH	Koriya	Bharatpur	Neruwa	718
CHATTISGARH	Koriya	Bharatpur	Juili	728
CHATTISGARH	Koriya	Bharatpur	Dundhasi	771

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
MADHYA PRADESH	Shahdol	Jaisinghnagar	Rimar	2103
MADHYA PRADESH	Sidhi	Majhauli	Nebuha	2137
MADHYA PRADESH	Shahdol	Beohari	Papodh	2141
MADHYA PRADESH	Shahdol	Jaisinghnagar	Nagnaudi	2155
MADHYA PRADESH	Shahdol	Sohagpur	Pogri	2176
MADHYA PRADESH	Umaria	Manpur	Tikuri Tola	2199
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kudari	2200
MADHYA PRADESH	Shahdol	Sohagpur	Senduri	2229
MADHYA PRADESH	Sidhi	Rampur Naikin	Badesar	2258
MADHYA PRADESH	Shahdol	Sohagpur	Semra	2292
MADHYA PRADESH	Shahdol	Beohari	Khamdand	2295
MADHYA PRADESH	Sidhi	Rampur Naikin	Gujred	2323
MADHYA PRADESH	Shahdol	Sohagpur	Maiki	2505
MADHYA PRADESH	Shahdol	Beohari	Bhamraha	2507
MADHYA PRADESH	Shahdol	Sohagpur	Dhurwar	2509
MADHYA PRADESH	Sidhi	Rampur Naikin	Raghunathpur	2598
MADHYA PRADESH	Shahdol	Sohagpur	Kanchanpur	2616
MADHYA PRADESH	Sidhi	Majhauli	Chhuhi	2649
MADHYA PRADESH	Shahdol	Sohagpur	Jamui	2765
MADHYA PRADESH	Shahdol	Jaisinghnagar	Amjhor	3014
MADHYA PRADESH	Shahdol	Beohari	Dhari No 2	3058
MADHYA PRADESH	Shahdol	Beohari	Budwa	3123
MADHYA PRADESH	Shahdol	Beohari	Jamuni	3184
MADHYA PRADESH	Umaria	Pali	Bakeli	3245
MADHYA PRADESH	Sidhi	Majhauli	Pand	3469
MADHYA PRADESH	Satna	Ramnagar	Gulwar Gujara	3478
MADHYA PRADESH	Shahdol	Jaisinghnagar	Kuwara	3559
MADHYA PRADESH	Umaria	Manpur	Bijauri	3615
MADHYA PRADESH	Umaria	Manpur	Govarde	3626
MADHYA PRADESH	Shahdol	Beohari	Khadda	3665
MADHYA PRADESH	Umaria	Manpur	Balhaud	3792
MADHYA PRADESH	Sidhi	Rampur Naikin	Khaddi Khurd	3820
MADHYA PRADESH	Shahdol	Beohari	Sakhi	4090
MADHYA PRADESH	Shahdol	Jaisinghnagar	Pondi Kalan	4123
MADHYA PRADESH	Shahdol	Beohari	Saman	4582
MADHYA PRADESH	Shahdol	Beohari	Papaundh	4860
MADHYA PRADESH	Shahdol	Beohari	Mau	5154
MADHYA PRADESH	Sidhi	Majhauli	Tala	5994
MADHYA PRADESH	Shahdol	Sohagpur	Lalpur	6013
CHATTISGARH	Koriya	Bharatpur	Patparha	18
CHATTISGARH	Koriya	Bharatpur	Dulari	39
CHATTISGARH	Koriya	Bharatpur	Dhummadol	50
CHATTISGARH	Koriya	Bharatpur	Dhab	76
CHATTISGARH	Koriya	Bharatpur	Karimati	94
CHATTISGARH	Koriya	Bharatpur	Katrengi	94

4. List of villages in 5 km buffer around corridor study area.

State	District	Subdistrict	Village	Population
CHATTISGARH	Koriya	Bharatpur	Mehdauli	771
CHATTISGARH	Koriya	Bharatpur	Mohantola	814
CHATTISGARH	Koriya	Bharatpur	Barhori	817
CHATTISGARH	Koriya	Bharatpur	Chidaula	863
CHATTISGARH	Koriya	Bharatpur	Domhara	997
CHATTISGARH	Koriya	Bharatpur	Khamraudh	1004
CHATTISGARH	Koriya	Bharatpur	Janua	1015
CHATTISGARH	Koriya	Bharatpur	Harchoka	1025
CHATTISGARH	Koriya	Bharatpur	Bahrasi	1037
CHATTISGARH	Koriya	Bharatpur	Singrauli	1078
CHATTISGARH	Koriya	Bharatpur	Madisarai	1225
CHATTISGARH	Koriya	Bharatpur	Ramgarh	1245
CHATTISGARH	Koriya	Bharatpur	Badwahi	1448
CHATTISGARH	Koriya	Bharatpur	Naudhiya	1541
CHATTISGARH	Koriya	Bharatpur	Deogarh	1552
CHATTISGARH	Koriya	Bharatpur	Kanjia	1802

5. List of villages in least cost path corridor (NTCA, 2020).

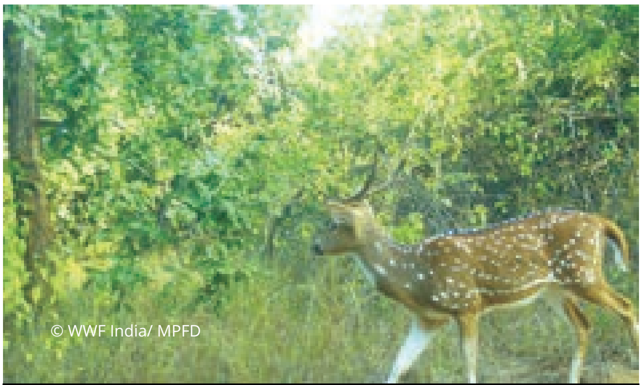
State	District	Sub district	Village	Population
MADHYA PRADESH	Shahdol	Sohagpur	Bochaki	1153
MADHYA PRADESH	Umaria	Pali	Madhi	257
MADHYA PRADESH	Shahdol	Sohagpur	Patori	569
MADHYA PRADESH	Shahdol	Sohagpur	Mehrauda	317
MADHYA PRADESH	Shahdol	Sohagpur	Lamar	467
MADHYA PRADESH	Shahdol	Sohagpur	Amjhar	748
MADHYA PRADESH	Shahdol	Sohagpur	Semra	774
MADHYA PRADESH	Shahdol	Sohagpur	Harri Dol	444
MADHYA PRADESH	Umaria	Pali	Gajwahi	240
MADHYA PRADESH	Shahdol	Sohagpur	Bela	1166
MADHYA PRADESH	Shahdol	Sohagpur	Pondi	451
MADHYA PRADESH	Shahdol	Sohagpur	Chandela	571
MADHYA PRADESH	Shahdol	Jaisinghnagar	Basnagri	1043
MADHYA PRADESH	Shahdol	Jaisinghnagar	Ghiyar	582
MADHYA PRADESH	Shahdol	Jaisinghnagar	Tali Kalan	1080
MADHYA PRADESH	Shahdol	Jaisinghnagar	Malauti	706
MADHYA PRADESH	Shahdol	Jaisinghnagar	Thadi Pathar	338
MADHYA PRADESH	Shahdol	Jaisinghnagar	Umarkhohi	622
MADHYA PRADESH	Shahdol	Jaisinghnagar	Pipari	765
MADHYA PRADESH	Shahdol	Jaisinghnagar	Jhalra	0
MADHYA PRADESH	Shahdol	Jaisinghnagar	Dhaneda	933
MADHYA PRADESH	Shahdol	Beohari	Davraunha	547
MADHYA PRADESH	Shahdol	Beohari	Tikhawa	2482
MADHYA PRADESH	Shahdol	Beohari	Padui	0
MADHYA PRADESH	Shahdol	Beohari	Parsel	0

5. List of villages in least cost path corridor (NTCA, 2020).

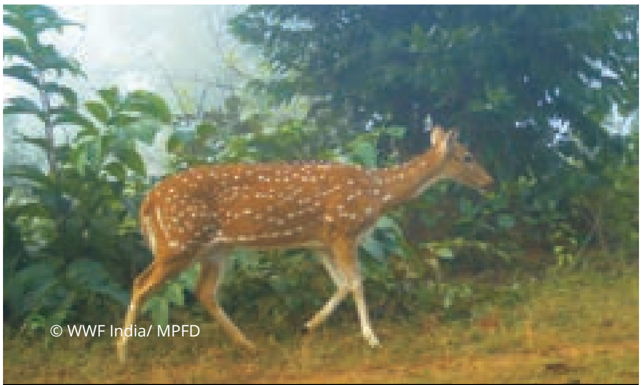
State	District	Sub district	Village	Population
MADHYA PRADESH	Shahdol	Beohari	Bocharo	1606
MADHYA PRADESH	Shahdol	Beohari	Mair	569
MADHYA PRADESH	Shahdol	Beohari	Kharhara	425
MADHYA PRADESH	Shahdol	Beohari	Sarwahi Kalan	1214
MADHYA PRADESH	Shahdol	Beohari	Newari	0
MADHYA PRADESH	Shahdol	Beohari	Boddiha	1133
MADHYA PRADESH	Shahdol	Beohari	Sejhari	273
MADHYA PRADESH	Shahdol	Beohari	Karaundiya	851
MADHYA PRADESH	Shahdol	Beohari	Bhainstal	0
MADHYA PRADESH	Shahdol	Beohari	Hathwar	660
MADHYA PRADESH	Shahdol	Beohari	Jagmal	1110
MADHYA PRADESH	Shahdol	Beohari	Nakuni	1482
MADHYA PRADESH	Shahdol	Beohari	Chandrmadol	0
MADHYA PRADESH	Shahdol	Beohari	Sathni	1654
CHATTISGARH	Koriya	Bharatpur	Mannodh	643
CHATTISGARH	Koriya	Bharatpur	Gadhaura	734
CHATTISGARH	Koriya	Bharatpur	Bhagwanpur	2101
CHATTISGARH	Koriya	Bharatpur	Baghwar	86
CHATTISGARH	Koriya	Bharatpur	Katharradol	130
CHATTISGARH	Koriya	Bharatpur	Satkyari	348

CAMERA TRAP PICTURES

Camera trap images of wild animals photographed in the corridor area



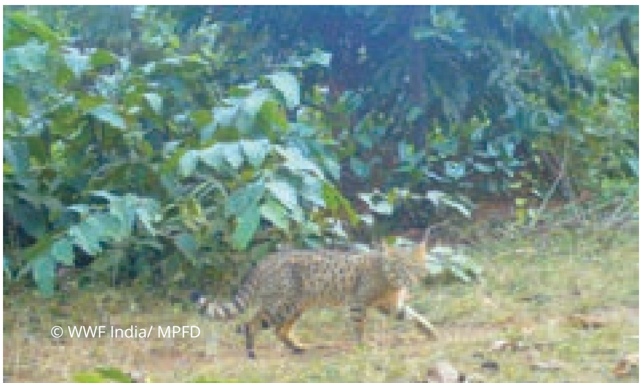
Camera trap photographs of chital (*Axis axis*) using the corridor.



Camera trap photographs of chital (*Axis axis*) using the corridor.

Camera trap photographs of Asiatic wildcat (*Felis lybica ornata*) using the corridor.

Camera trap photographs of Asiatic wildcat (*Felis lybica ornata*) using the corridor.



Camera trap photographs of Asiatic wildcat (*Felis lybica ornata*) using the corridor.

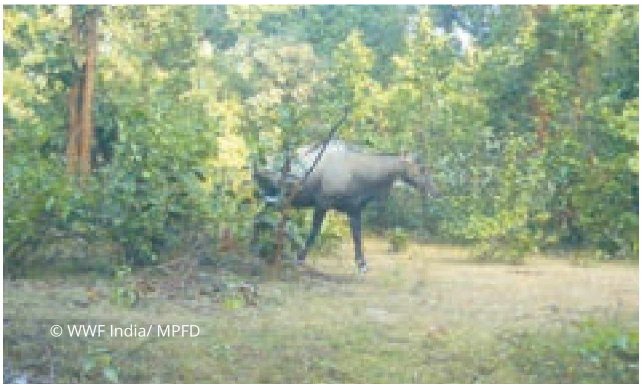
Camera trap photograph of a Honey Badger (*Mellivora capensis*) using the corridor.

Camera trap images of wild animals photographed in the corridor area

Camera trap photographs of Indian fox (*Vulpes bengalensis*) using the corridor.

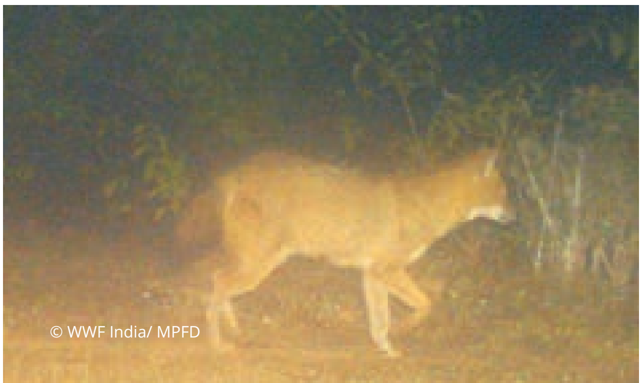
Camera trap photographs of Indian fox (*Vulpes bengalensis*) using the corridor.

Camera trap photograph of Indian Hare (*Lepus nigricollis*) using the corridor.



Camera trap photograph of Nilgai (*Boselaphus tragocamelus*) using the corridor.

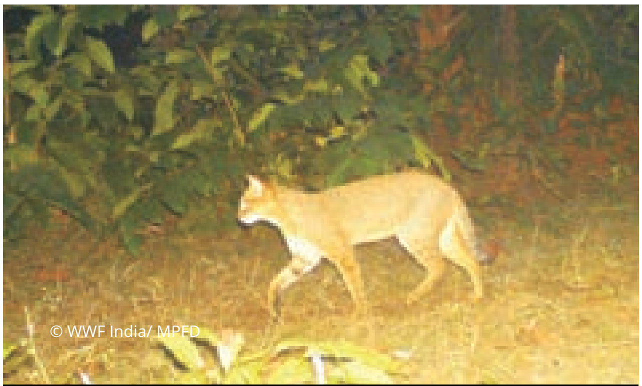
Camera trap photographs of Indian Jackal (*Canis aureus*) using the corridor.



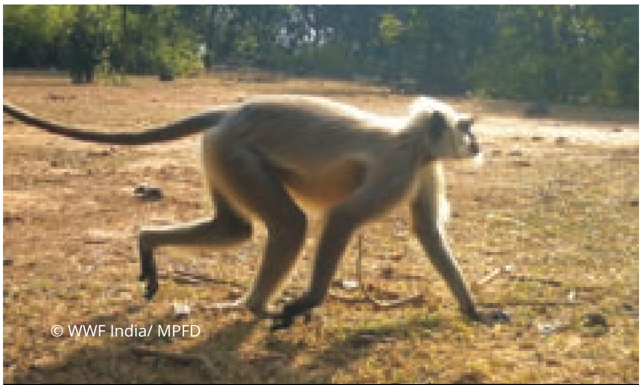
Camera trap photographs of Indian Jackal (*Canis aureus*) using the corridor.

Camera trap images of wild animals photographed in the corridor area

Camera trap photographs of Jungle Cat (*Felis chaus*) using the corridor.



Camera trap photographs of Jungle Cat (*Felis chaus*) using the corridor.

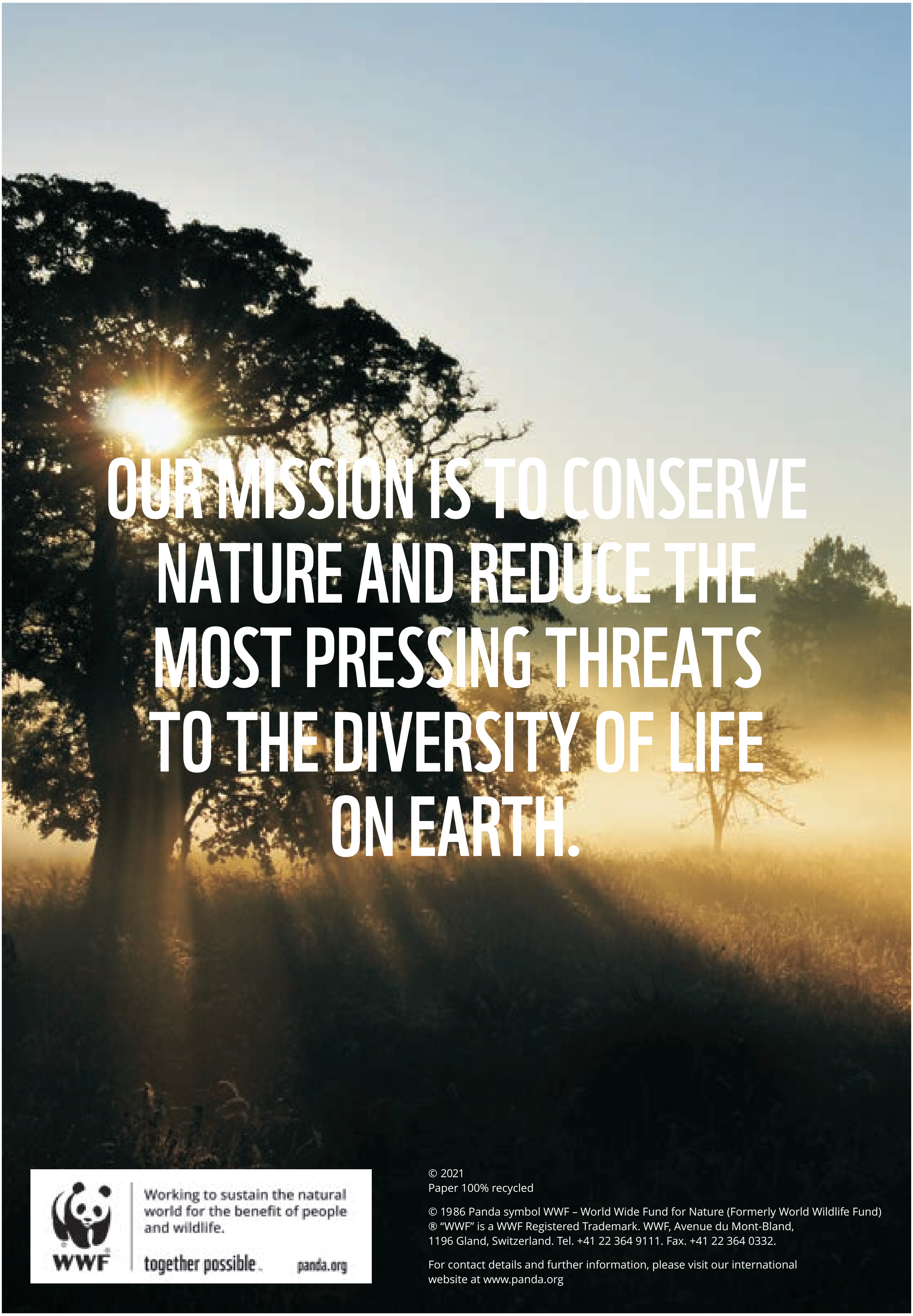


Camera trap photograph of the Northern Plains Gray Langur (*Semnopithecus entellus*) using the corridor.

Camera trap photographs of tiger (*Panthera tigris*) using the corridor.

Camera trap photographs of tiger (*Panthera tigris*) using the corridor.

Camera trap photographs of tiger (*Panthera tigris*) using the corridor.



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