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Wildlife Institute of India

COLLARS & CROSSING ZONES

HIGHWAY CROSSING ZONES IDENTIFIED USING TELEMETRY DATA OF TIGERS IN THE EASTERN VIDARBHA LANDSCAPE, MAHARASHTRA, INDIA

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India harbors 57% of the world's tiger population in 7% of their historic global range. At the same time, India has 1.25 billion people growing at a rate of 1.7% per year. Protected tiger habitats in India are geographically isolated and collectively holds this tiger population under tremendous anthropogenic pressure. These protected lands are in itself not enough to sustain the growing tiger population, intensifying human-tiger conflict as dispersing individuals enter human occupied areas. These factors—isolation and inadequate size of the protected lands harbouring tiger meta-populations, highlight the need to connect tiger habitats and the importance of corridors beyond protected lands. However, a great part of these corridors lies outside the protected area (PA) network and under different land ownership tenures. It is in such areas that the challenge of building roads and nature conservation become most daunting. Many high-traffic highways crisscross the few remaining forested landscapes of the country and cause an array of short- and long-term ecological impacts.

The objective of this short report is to highlight the importance of radio-collars for effective conservation and management of tigers beyond PA system. Using radio-collars, we have identified road-crossing zones, which need immediate attention for long-term conservation of tigers in Eastern Vidarbha Landscape, Maharashtra, India.

Pic: Vinit Arora

HIGHWAY CROSSING ZONES IDENTIFIED USING TELEMETRY DATA OF TIGERS IN THE EASTERN VIDARBHA LANDSCAPE (EVL), MAHARASHTRA, INDIA

Transportation infrastructure is an artefact of culture that interacts with the surrounding landscape (Coffin 2007). In India, roads facilitate movement of goods, passengers and services catering to 80% of the passenger traffic and 65% of its freight. India also has the second highest road density in the world (NHAI, 2014). Several of these linear developments pass through protected areas and the forest patches connecting these areas, dissecting previously contiguous landscapes into smaller patches thus causing habitat fragmentation. Fragmentation of the landscape adversely affects large mammals such as tigers that have large area requirements for maintaining viable populations, in addition to other direct and indirect impacts on other flora and fauna (Maehr et al., 1991; Brandenburg, 1996; Kerley et al., 2002; Forman et al., 2003; Donaldson and Bennett, 2004; Blom et al., 2005). The impact of roads on the surrounding landscape extends far beyond the roads themselves (Ibisch et al., 2016). The length of roads is projected to increase by >60% globally from 2010 to 2050 (Dulac, 2013). Possible consequences to wildlife have been recognised and there is evidence of direct and indirect effects at both species and ecosystem level (Forman & Alexander, 1998).

The Eastern Vidarbha Landscape (EVL) (Figure 1) which is a part of the Central Indian Tiger Landscape, is a highly biodiverse region facing tremendous human pressure. The analogy of this landscape being a matrix of tiger habitat islands in a sea of human settlements is an old one, yet, cannot be understated. In the recent past, the Government expended a lot of effort for the long-term conservation of the tiger, its habitat, and associated species. From the launch of the Project Tiger in 1973, the formation of the National Tiger Conservation Authority in 2005, amendment of the Wildlife (Protection) Act (1972) to the delineation of inviolate critical core areas in existing tiger reserves, declaration of new tiger reserves, incentivising voluntary relocation programs and identification of critical corridor areas connecting major tiger landscapes for long term conservation planning. These initiatives have led to an increase in tiger population from 1708 in 2010 to 2226 in 2014 (Jhala et al., 2015) and have saved not only the tiger from possible extinction, but have also insured the continuous provision of innumerable vital ecosystem services that core tiger habitats provide like carbon sequestration, maintenance of hydrological cycle, protection of genetic diversity of economically important plant and animal species etc. The monetary value of these services translates into Rs. 50,000 to Rs. 1,90,000 per hectare, as estimated by a recent study of 25 ecosystem services from select tiger reserves in India (Verma et al., 2015). Additionally, tourism activities in these areas generate revenue for local and state governments and provide livelihood to many local people.

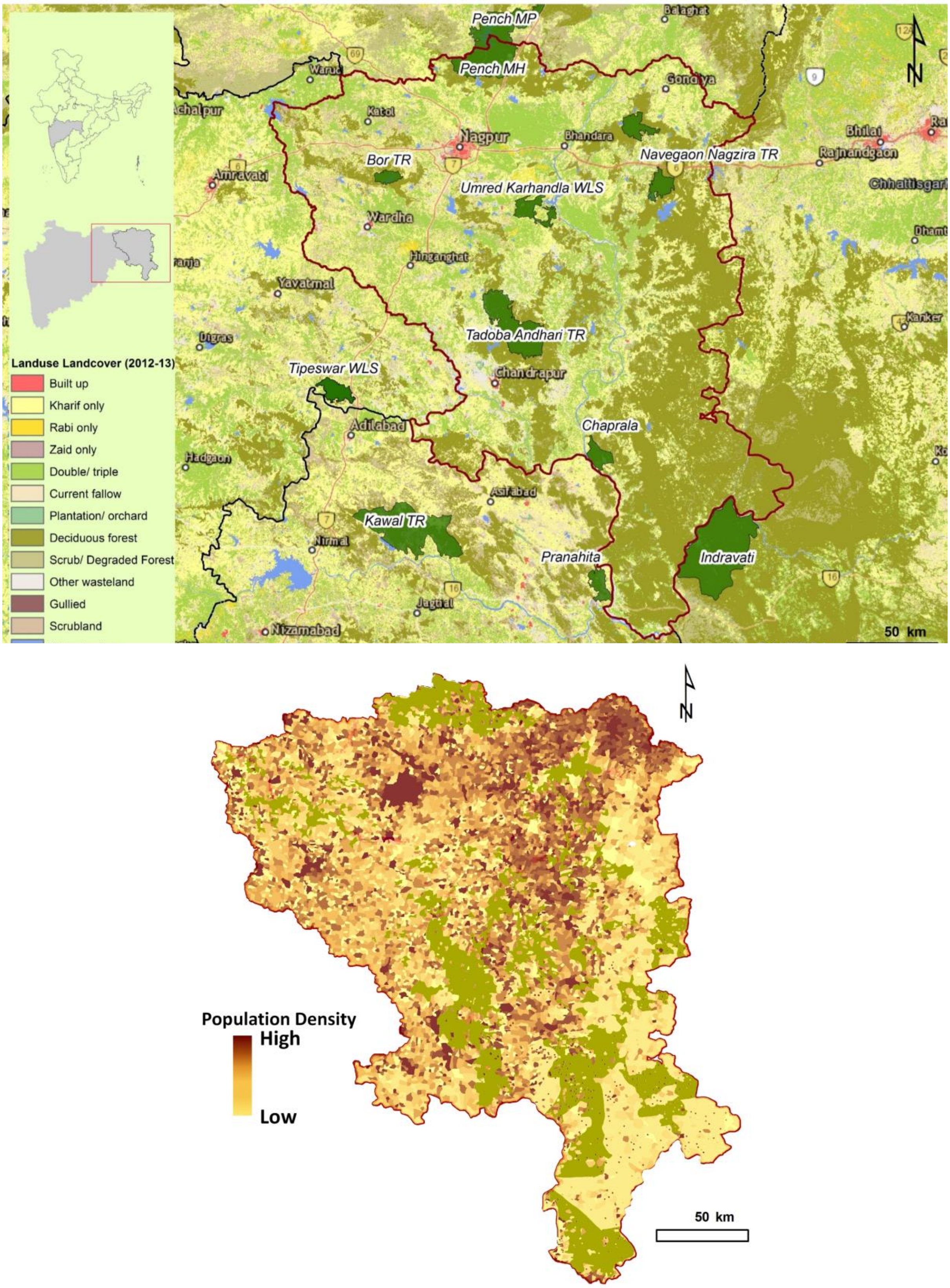


Figure 1: Eastern Vidarbha Landscape, Maharashtra India – Protected Areas, Forest Cover and Human Density

These initiatives and their implementation by respective State Governments have been critical in securing the survival of key tiger populations, the biodiversity and the ecosystem services of the forests they inhabit. However, as tiger numbers rise, we face a new challenge. The natural habitats continue to shrink and the forests boundaries become "harder" with abrupt transition into human settlements or agricultural land. A network of these protected areas connected by forested areas together are important for the ecological integrity of the landscape as a large connected ecological unit for the conservation of wide-ranging animals such as the tiger. A breakdown in the connectivity within these landscapes may endanger the ecosystem and gravely affect the landscape and population dynamics.

In such a scenario, facilitating the movement of tigers across the fragmented forested areas to maintain a healthy gene flow becomes critical. Studies related to the identification and conservation of 'functional corridors' became the new trend in tiger conservation in the recent past (Wikramanayake et al., 2011; Sharma et al., 2013; Dutta et al., 2015, Mondal et al., 2016). The Wildlife Institute of India in collaboration with the Maharashtra Forest Department, to understand tiger movement- outside the Protected Areas envisaged the project titled ***"Studying dispersal of tigers across the Eastern Vidarbha Landscape, Maharashtra, India".*** In the first phase of the project, two tigers were collared in Umred-Karandhla Wildlife Sanctuary in March 2016, followed by two in Bharamapuri and 2 in Tadoba. Two sub-adult male tigers collared in UKWLS started dispersal in due course of time and used an extensive area of more than 3000 sq. km. All four types of linear infrastructures viz., roads, railway line, canals and transmission lines which dispersing individuals have to negotiate while traversing/dispersing through, intersect the landscape. Tigers with established home ranges in this landscape have to negotiate these threats on daily basis.

Pic: Nilanjan Chatterjee

The primary aim of the project is to validate the modelled corridors and identify new probable corridor habitats in a highly dynamic landscape. Additionally, one of the aims of the project was to use the intensive radio collaring data for identifying sensitive areas or "pinch points" in the landscape where tigers are expected to face pressure due to any form of human disturbance or linear infrastructure. The physical presence of roads, railways, transmission lines and canals in the landscape dissects habitats, disrupts natural processes, alters microclimate and groundwater flow. Using radio collar data from the 06-collared individuals along with data from a previously collared adult individual in the same landscape, we identify and report stretches of roads used intensively by tigers for crossing over between two forested areas. Along with the GPS locations. These stretches have also been verified by using camera traps. Considering the fact that there are no checks on speed nor any signage which informs commuters about animal movement on these roads (State Highways) which pass along or through forest patches, we have identified four road stretches which are critical for animal movement across the landscape and need immediate attention.

The following maps (Figure 2- 4) show 4 sensitive zones in Eastern Vidarbha Landscape on the state highways used by collared tigers to cross on daily basis identified using radio collaring data on forest cover, google imagery and landuse/cover map.

Pic: Bilal Habib

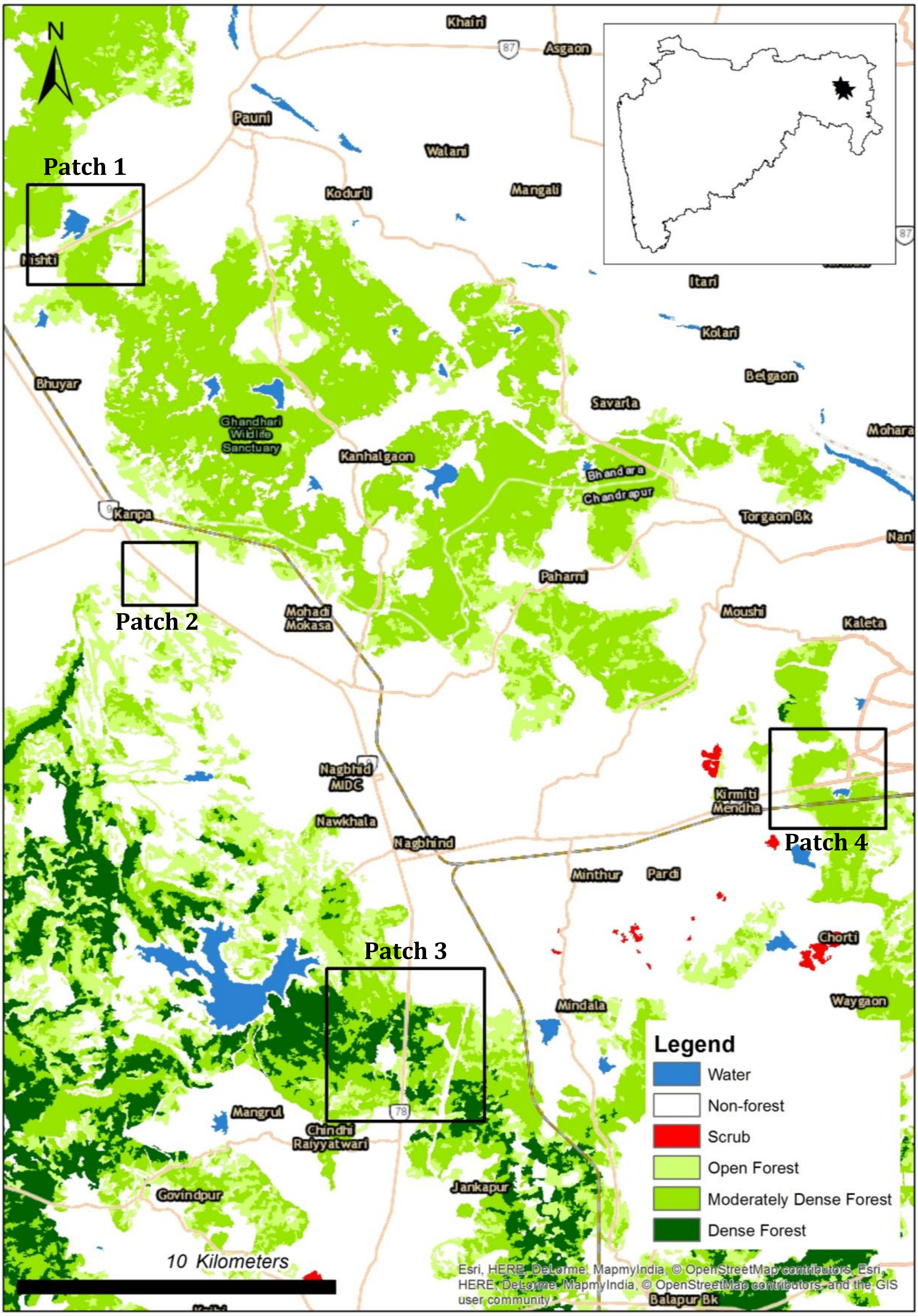


Figure 2: Location of 4 Crossing Zones used by Collared Tigers on Forest Cover Map

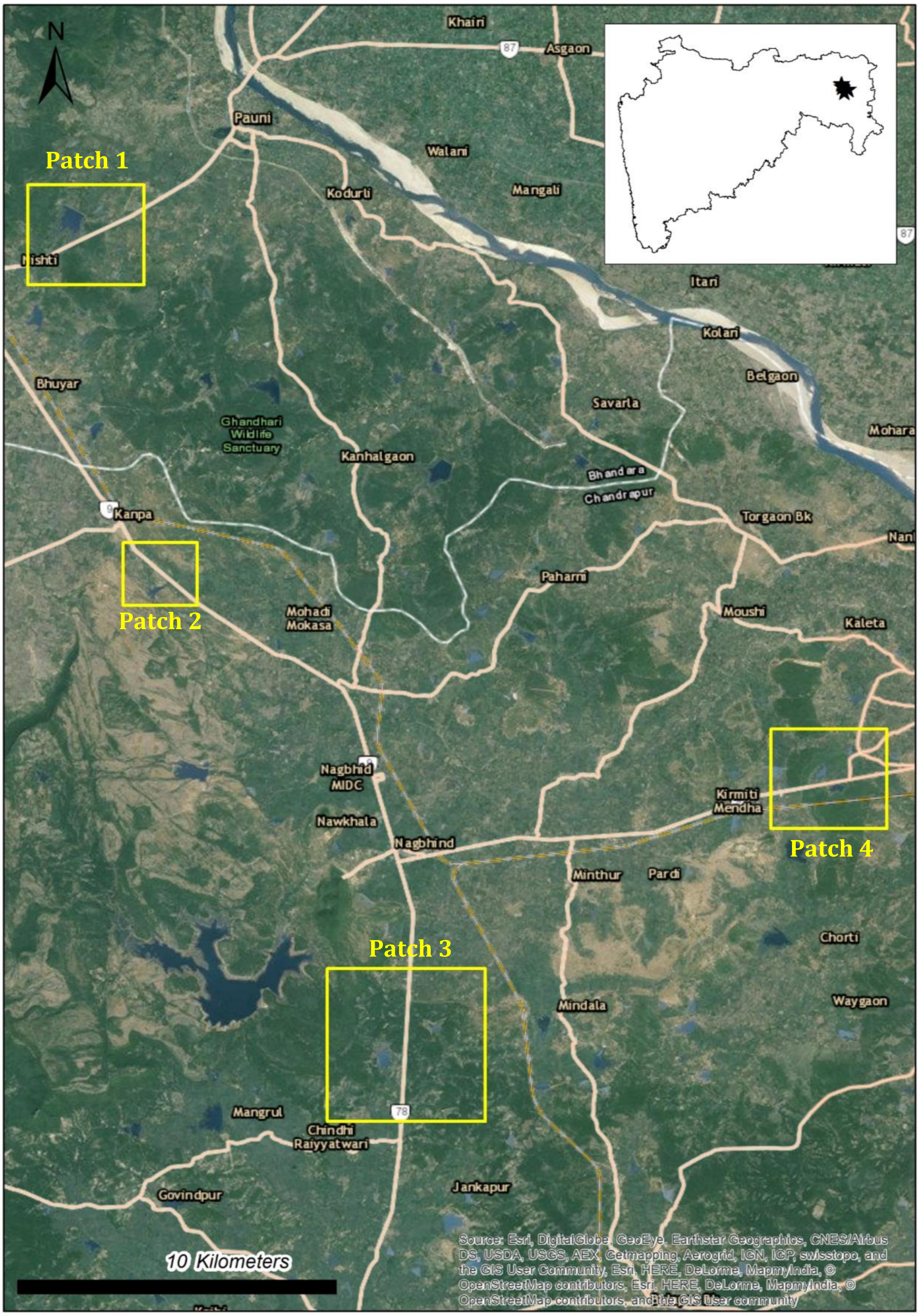


Figure 3: Location of 4 Crossing Zones used by Collared Tigers on Google Imagery

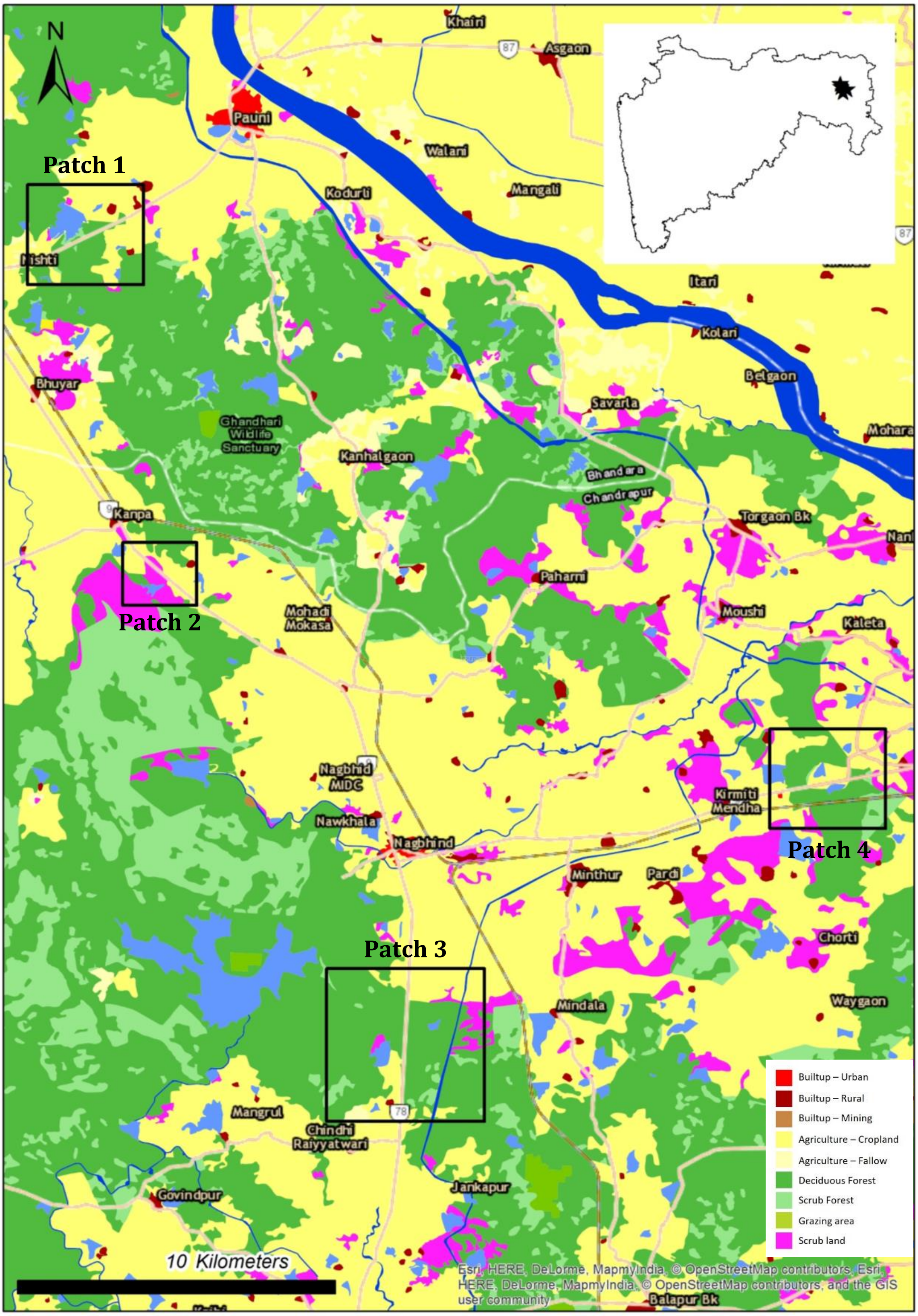
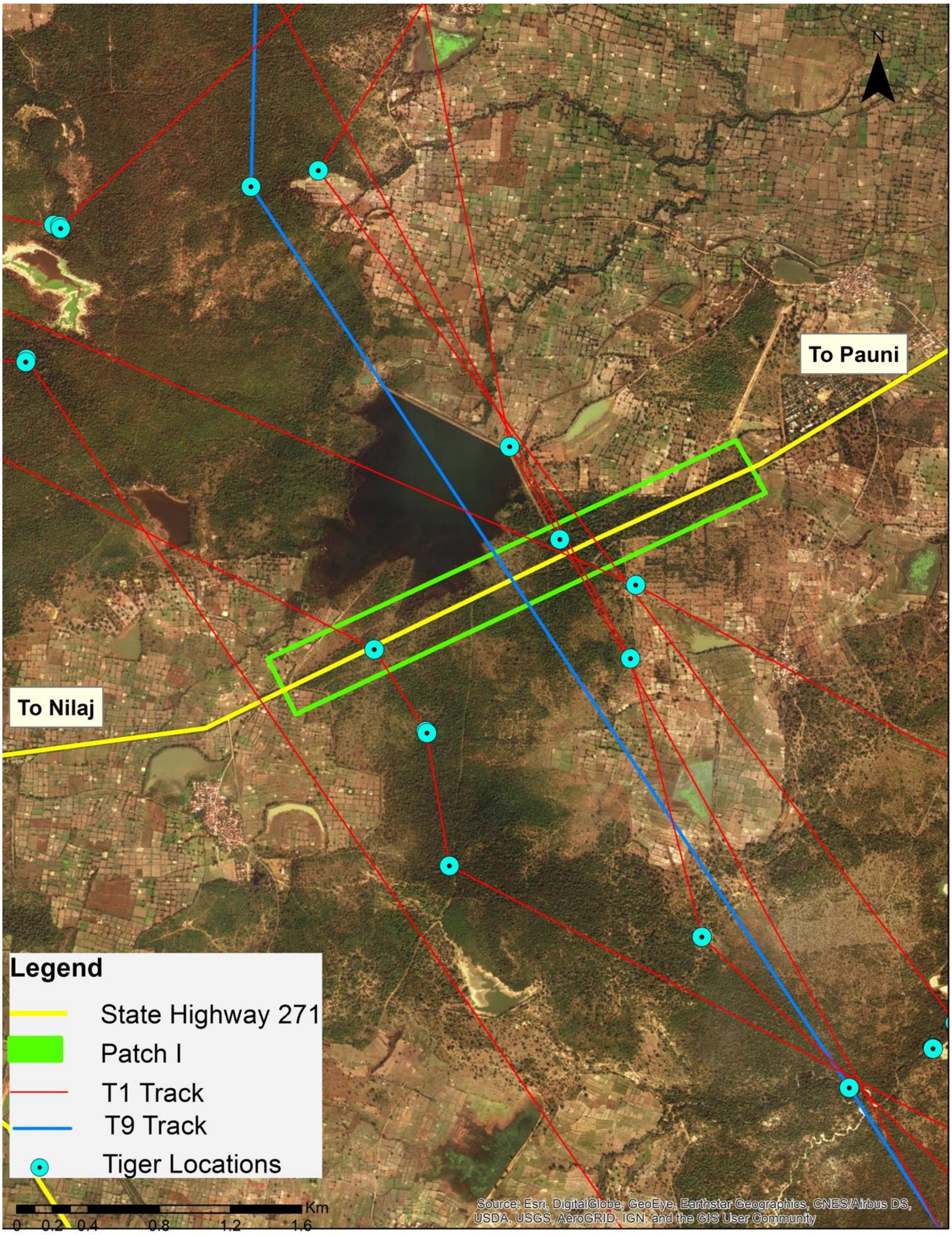


Figure 4: Location of 4 Crossing Zones used by Collared Tigers on Landuse/Landcover Map

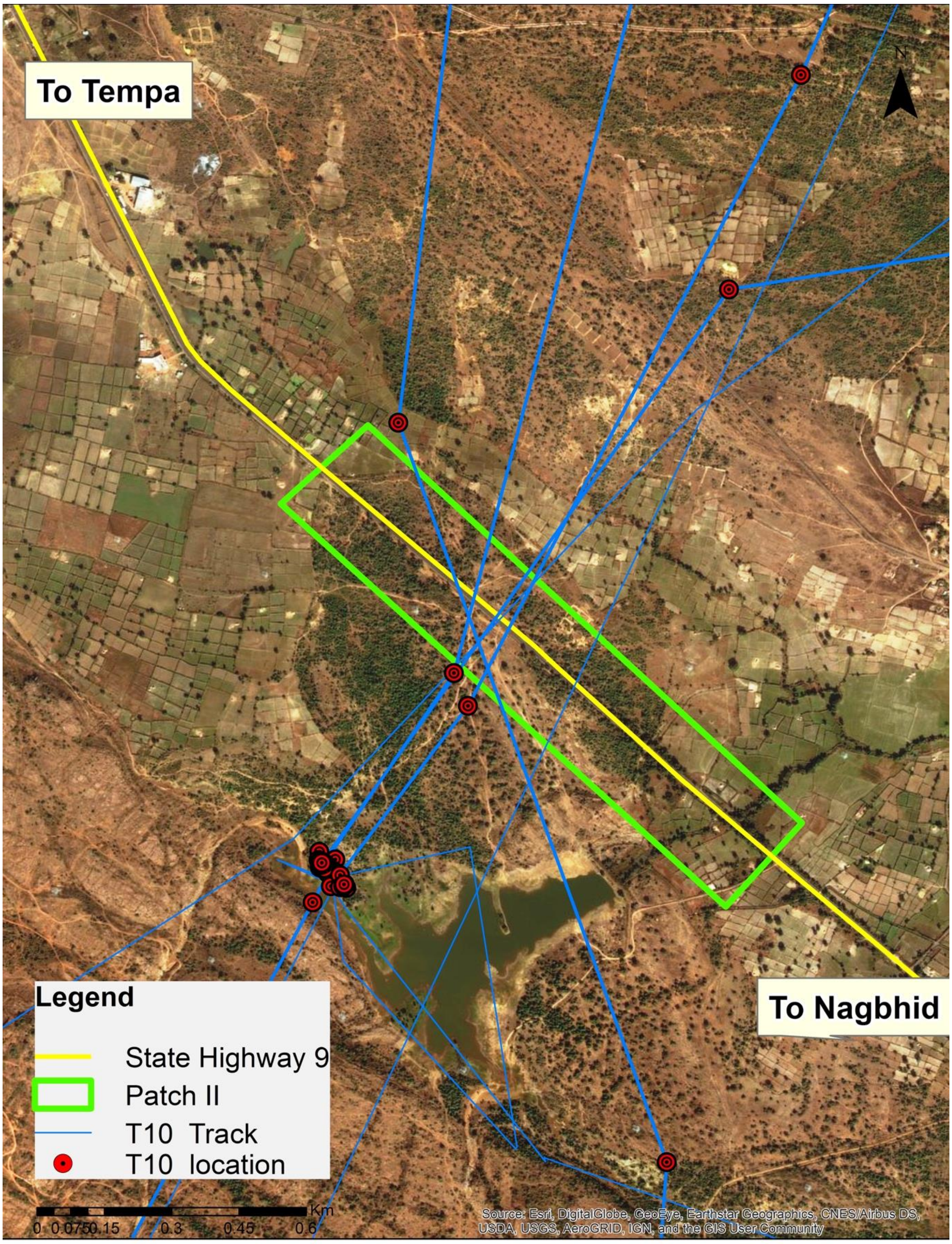
Patch 1:

Patch 1 is situated between N20°45'5.70"/E79°34'47.20" and N20°45'45.56" /E79°36'11.48". This patch was seen to be used intensively by two of the collared tigers represented in the figure by different coloured lines.



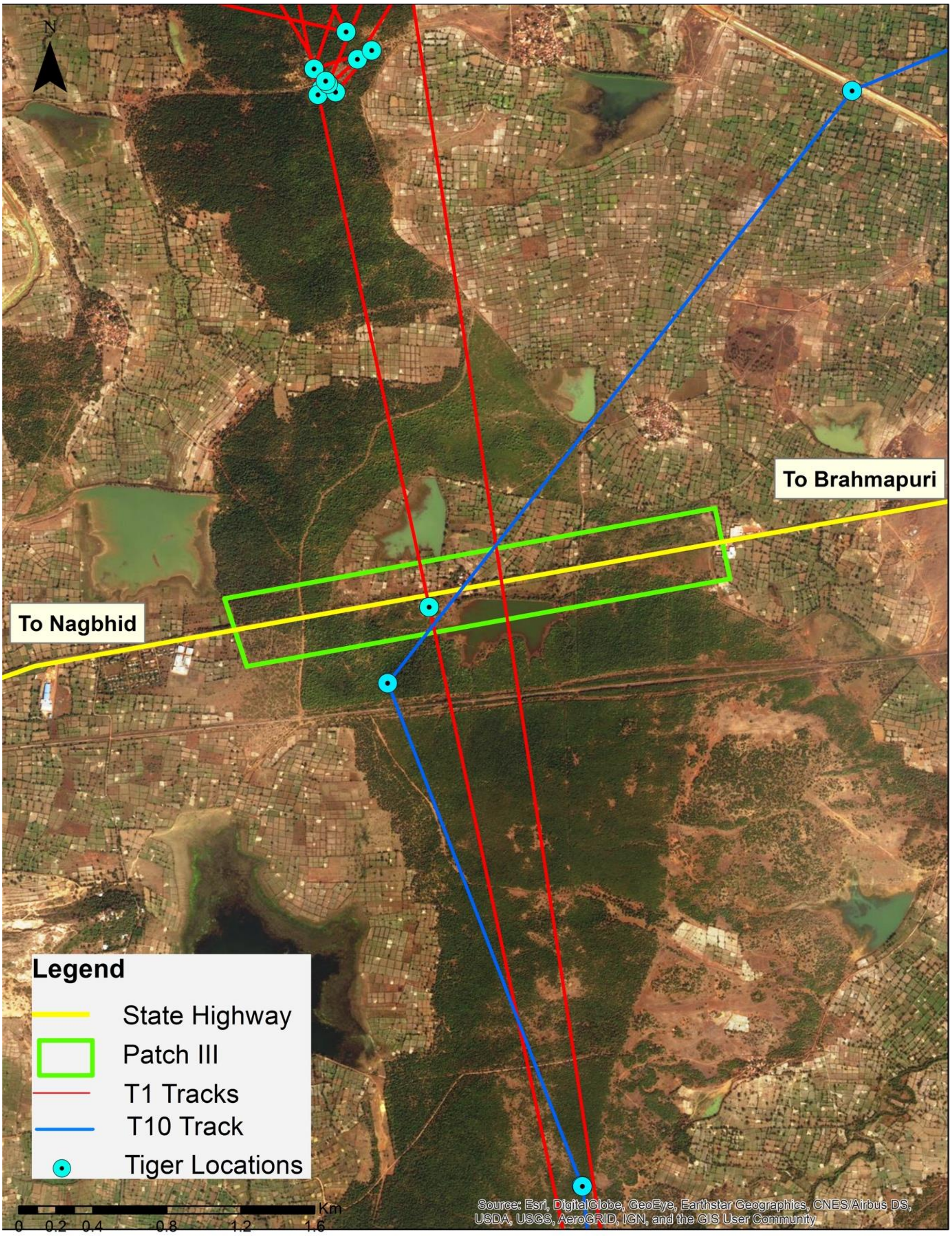
Patch 2

Patch 2 is situated between N20°39'58.10"/E79°36'28.00" and N20°39'30.60"/E79°37'0.10". One of the collared tigers uses this patch intensively. The red dots represent the GPS locations acquired from the radio collar. The first time this tiger crossed the highway, it waited 24 hours before it decided to cross the road. Using this data, we also investigated a cluster of locations and found a kill at merely 500 meters from the state highway.



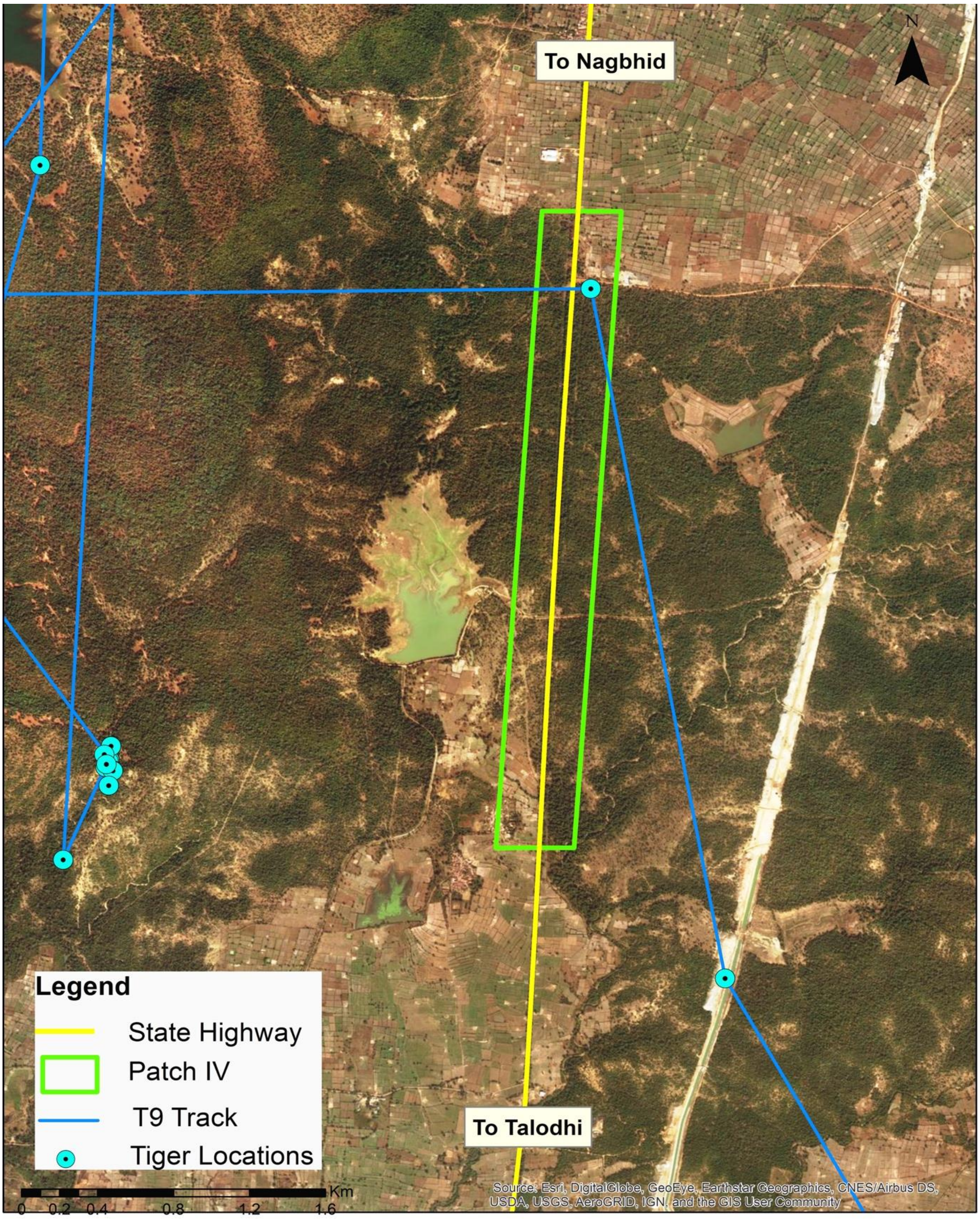
Patch 3

Patch 3 is situated between N20°36'1.90"/E79°47'25.40" and N20°36'6.70"/E79°47'52.10". This patch was seen to be used intensively by two of the collared tigers represented in the figure by different coloured lines.



Patch 4:

Patch 4 is situated between N20°32'36.70"/E79°40'56.50" and N20°30'55.40"/E79°40'50.70". This patch was seen to be used intensively by one of the collared tigers. However, this patch is intensively used by a variety of animals to cross/move between the dense forest patches on either side of the road according to the records of the Forest Department (Brahmapuri Forest Division).



Short Term Measures:

- Set up signage indicating animal movement or animal crossing at regular intervals on the road stretch.

- Construct rumble strips or speed breakers in the intensive use patches. This measure is temporary and the traffic volume will determine the efficacy of this mitigation measure. At higher traffic volumes (5000 vehicle/24 h) this mitigation measure will be counterproductive, by enhancing time spent by vehicle at the crossing zone thus creating barrier effect.

- Control feeding of wild animals on the road

- Regular monitoring of all the crossing zones by staff with an advice to move road kills (if any) of prey species from road to forest to minimize use/stay of predators on road.

- Reduce livestock grazing in the crossing zones.

Long Term Measures:

- Since these crossing zones are critical in the landscape to maintain connectivity between Tadoba, NNTR, Umred and Bor Tiger Reserve with rest of the tiger bearing areas in the Central Indian Landscape complex, it is recommended to have animal under passes. The animal underpasses can be of varied length depending on the size of the forest patches at identified crossing zone. The underpasses should have both light and sound barriers.

Pic: Bilal Habib

Conclusion:

This brief report is intended to highlight the sensitive crossing zones of tigers and the importance of radio telemetry as a tool in aiding management and long-term conservation. Though tigers and other wide-ranging animals in this landscape extensively use nallahs for crossing over, the four stretches, which have been identified, are indeed critical. In addition to the GPS locations and other signs of tiger use, presence of other animals like leopards, jungle cats, civets, langurs, etc. also were recorded on the trails adjoining the patches during field observations. This brief report is an effort to highlight radio telemetry as a fine tool to aid management of wildlife outside Protected Areas.

Pic: Nilanjan Chatterjee

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