

WATER SOURCE ATLAS OF TIGER RESERVES

NATIONAL TIGER CONSERVATION AUTHORITY, NEW DELHI



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Ministry of Environment, Forest
& Climate Change



सत्यमेव जयते



PREFACE

India is successfully striding towards tiger conservation through its scientific strategies and management efforts. India with 51 tiger reserves across 18 states with 2967 tigers as per 2018 estimation, not only securing the big cats but also holistically preserving the forested ecosystem, ensuring the water availability and serving as natural water purification systems. Tiger reserves are valuable in protecting the watersheds and water bodies present inside them and can safeguard long-term water security in the country as these forests are managed efficiently.

This report is designed in the atlas format to provide spatial maps showing water sources in the tiger reserves. This water source atlas based on the available remotely sensed data analysed in GIS platform, provides a first cut information on the existing water bodies in the tiger reserves. The atlas would serve as a tool in planning protection of tiger forests, its management and for the provision of securing the natural water sources.



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I. Introduction

Tiger is one of the charismatic specie leading conservation of forested ecosystems of Indian subcontinent. Government of India in 1972 with the launch of tiger project laid a strong foundation to protect tigers and their habitat. The project with its holistic approach also focused to conserve biodiversity, ecosystem functions, goods and services for the humankind (Jhala et al. 2020). The country now has 52 tiger reserves holding around 70 % of tiger population and protecting one third of India's forest and several water bodies. Tiger reserves are effective tools of conservation of natural forest and wilderness areas. Besides conserving tigers, they are vital to ensure perpetuity of natural evolutionary processes and also support ecological processes responsible for providing a range of various associated economic, social, cultural and spiritual benefits. Forests contribute significantly in balancing the hydrological balancing of watershed ecosystem and maintain high quality water (Hamilton 2008). These reserves have many important rivers, streams and natural wetlands. Forests and water bodies capture water during monsoon and can be a source of water throughout the year (Dudley and Stolton 2003). These reserves play critical role in not only regulating and ensuring water security but mechanism to provide natural water purification systems and enhance watershed functions. The reserves have many reservoirs, important for irrigation and power supply. A recent study based on VALUE+ approach indicated that monetary value for provisioning of water from ten Tiger Reserves varied in between Rs. 38.19 crores to Rs. 7,033.05 crores annually (Verma et al. 2019). Therefore, it is needless to mention that maintenance and protection of these natural water sources and their catchment areas are of paramount management importance to ensure water security in the country.

Water sources in the tiger reserves generally feature in their respective conservation management plans. Considering the global and national level significance of the tiger reserves, it is pertinent to have a consolidated document mapping the water sources in tiger bearing forested areas of the country. This water atlas is thus prepared using the freely available remote sensing data and Geographic Information System (GIS) to map all the water bodies within tiger reserves to provide a baseline information for the forest managers to have a synoptic view of water sources present in the region to further plan on ground management and conservation strategies. The document will be updated after the ground verification/information.

II. Material and Methods

The water sources available inside each tiger reserve were mapped using the data from global surface water and open street maps available freely over the internet. Global surface water data (1984-2020) is a collection of high resolution water maps prepared under Copernicus programme by Pekel, JF., Cottam, A., Gorelick, N. *et al.* The data was prepared using different Landsat products available for different time periods (Landsat 5, thematic mapper (TM), Landsat 7 Enhanced Thematic Mapper-(ETM+) and Landsat 8 operational land imager (OLI). The dataset information on different spatial and temporal distribution of surface water over the period of last 35 years from 1984 to 2020. This is one of the finest raster data available at 30 m resolution until date. Around six mapped products are available to download namely occurrence, change, seasonality, recurrence, transitions and maximum extent of water. Out of these available datasets, seasonality data provides inter-annual behaviour of water bodies for a single year and demonstrates permanent and seasonal occurrence of water on the surface (number of months water was detected on the surface). Therefore, the seasonality data was chosen to map the perennial and seasonal water bodies in the tiger reserves.

The information was further enhanced using the Open street map (OSM), an editable database created and maintained by volunteers and is freely available for non-commercial purpose. The OSM provide information in shapefile format on different geographical attributes, data on water feature was downloaded and used for the current document.

The information on water bodies and rivers was also verified and checked using India -WRIS web portal.



Dhikala range, Corbett Tiger Reserve -Uttarakhand

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III. Shivalik Hills and Gangetic plain Landscape

The landscape comprises of three parallel geological zones, the Shivalik Hills, the bhabhar tract and the terai plains spanning across three states: Uttarakhand, Uttar Pradesh and Bihar. Landscape has 5 tiger reserves in the Upper Ganga watershed region, the major rivers present in the area are Ganga, Sharda and Narayani from Nepal. There are two major dams located in the tiger reserves of this landscape.

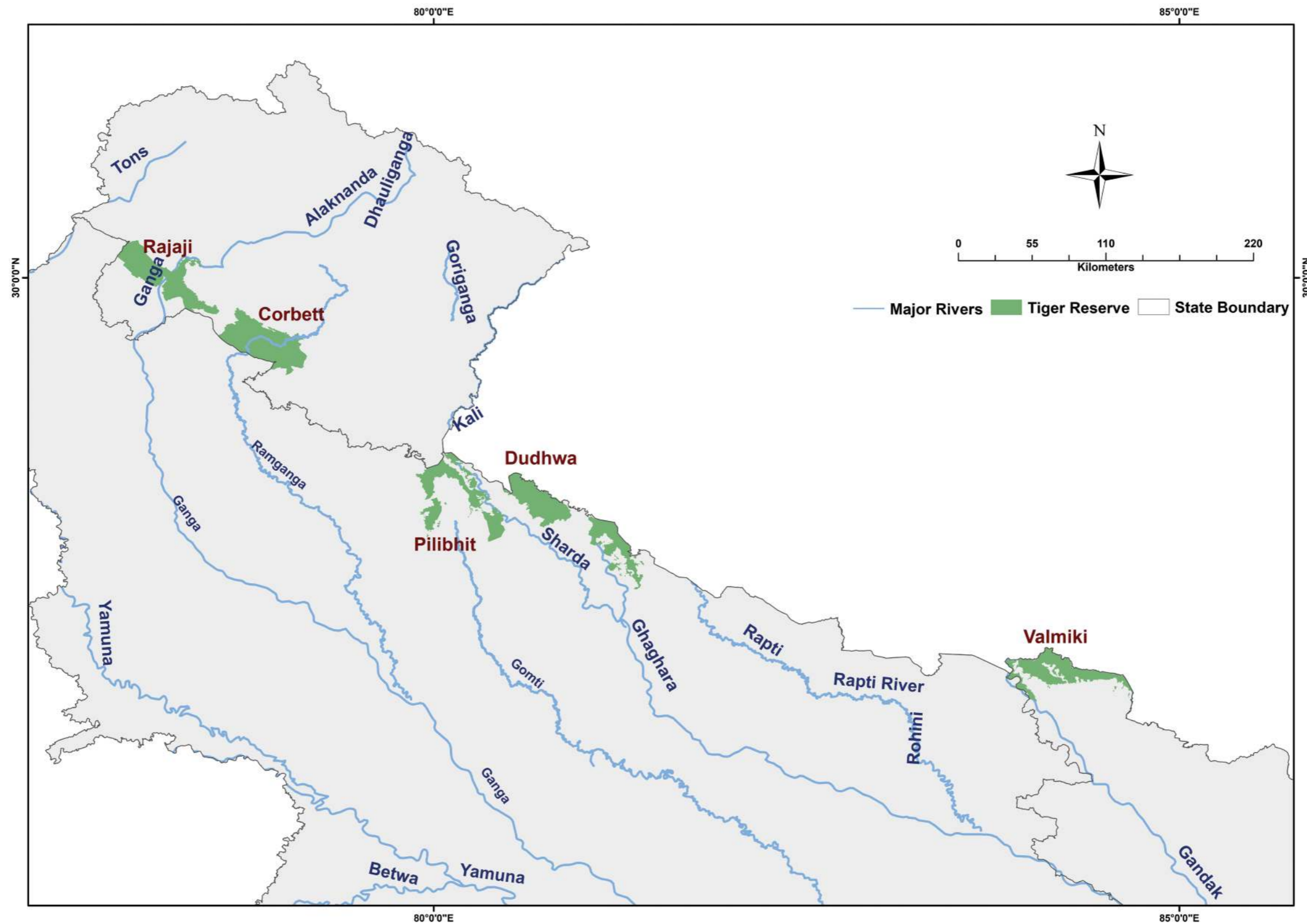


Figure 1 Map showing major rivers in the Shivalik Hills and Gangetic plain landscape

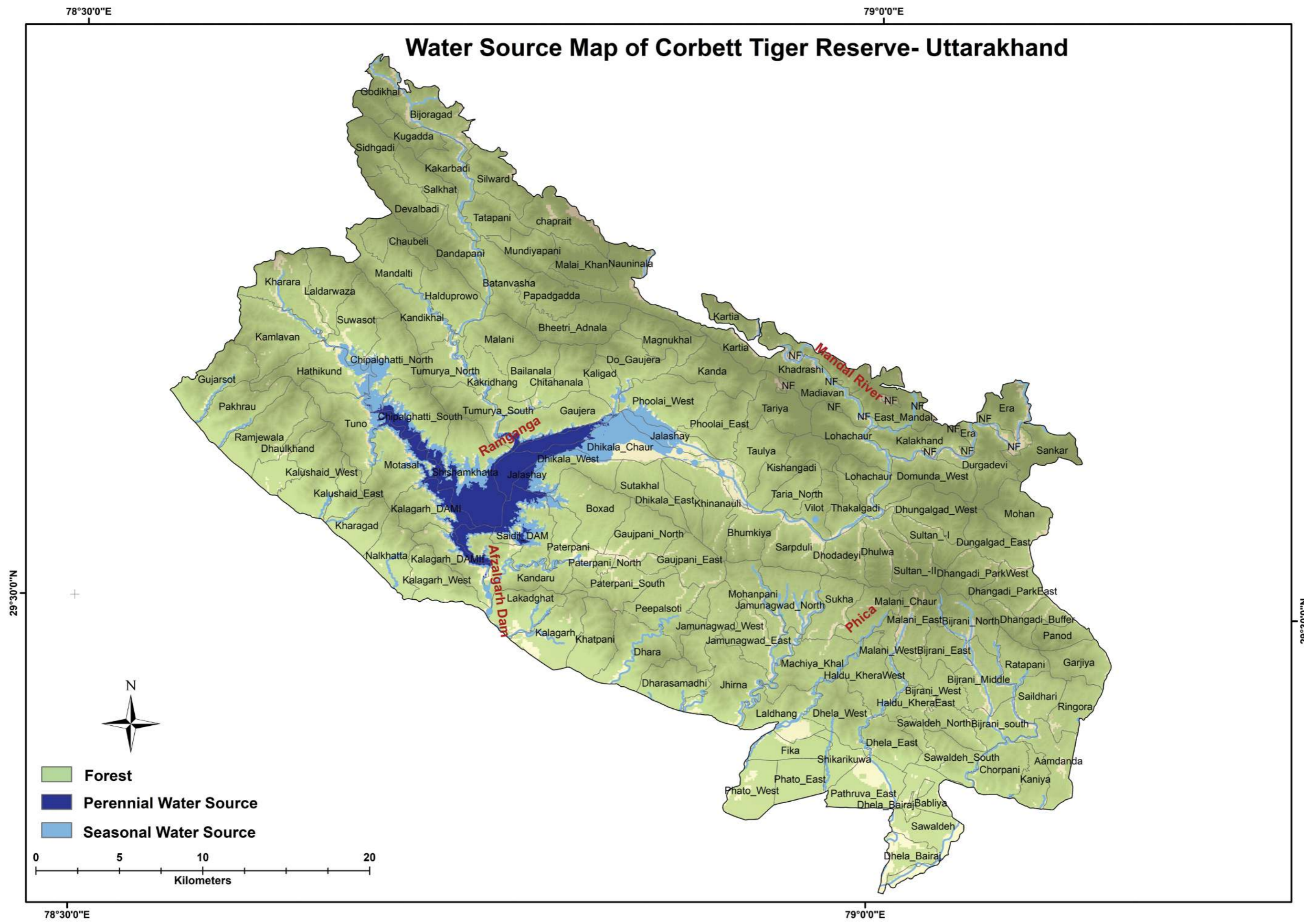


Figure 2 Water source map of Corbett tiger reserve



Figure -3 Water source map of Rajaji tiger reserve

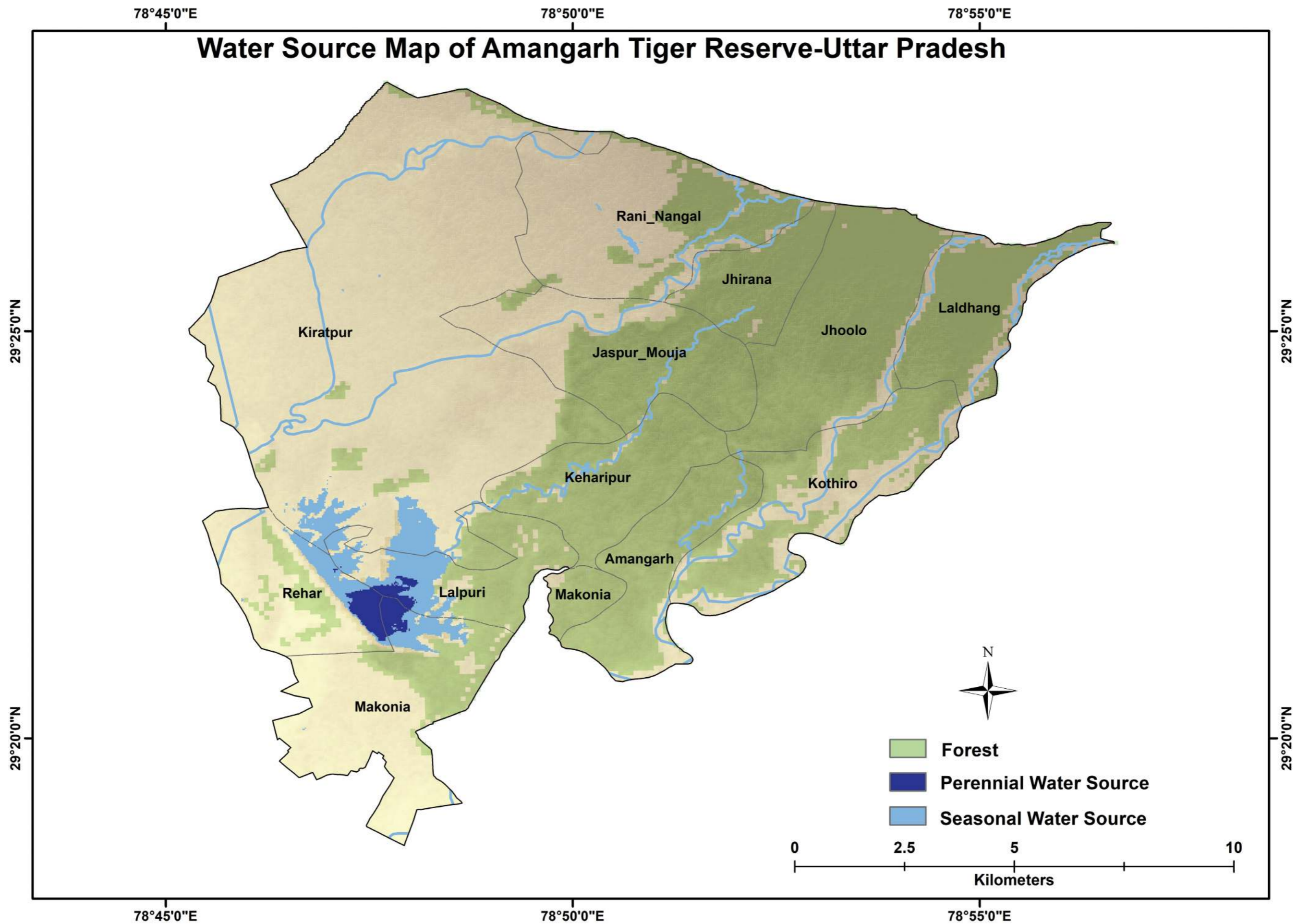


Figure 4 Water source map of Amangarh tiger reserve

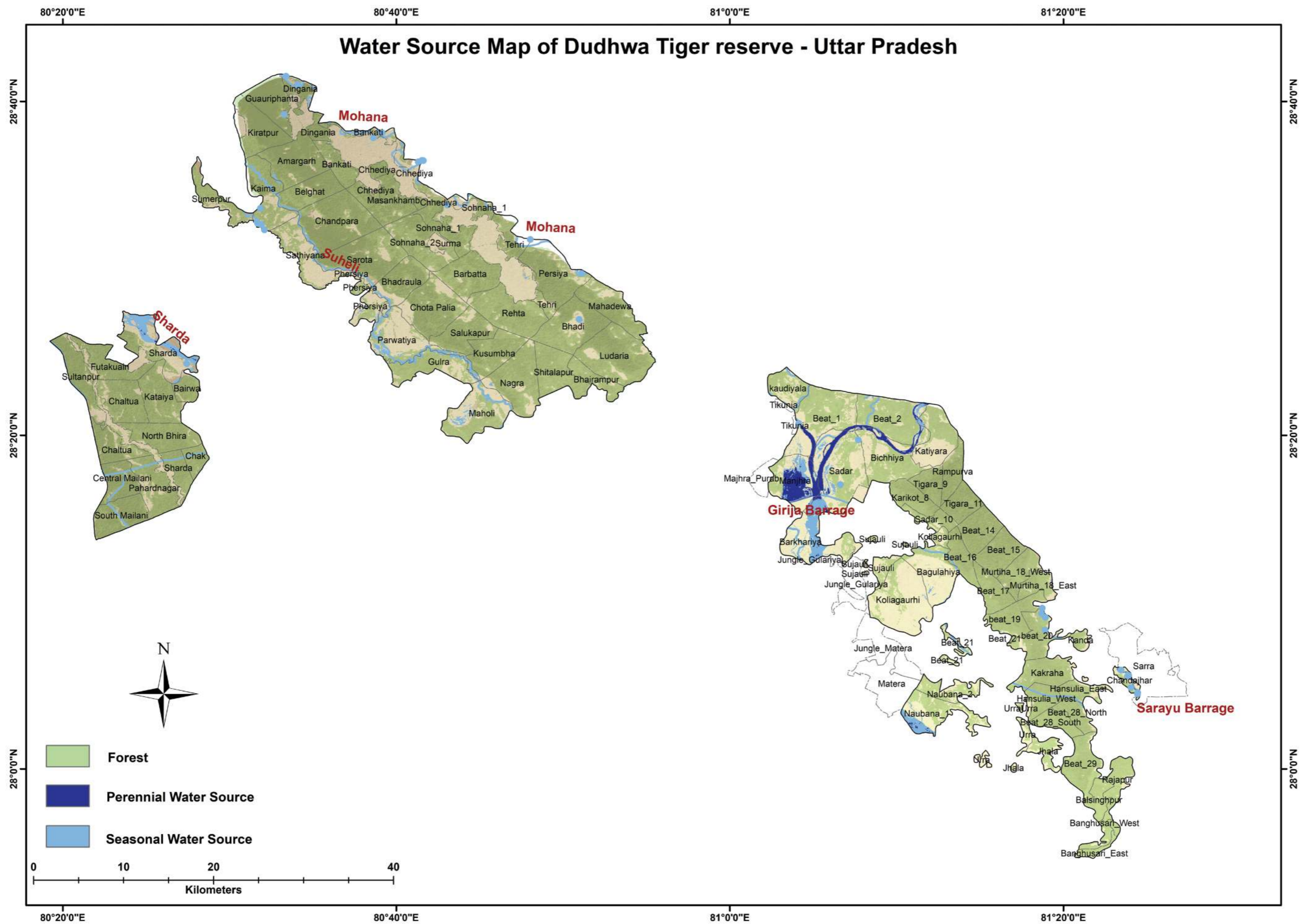


Figure 5 Water source map of Dudhwa tiger reserve

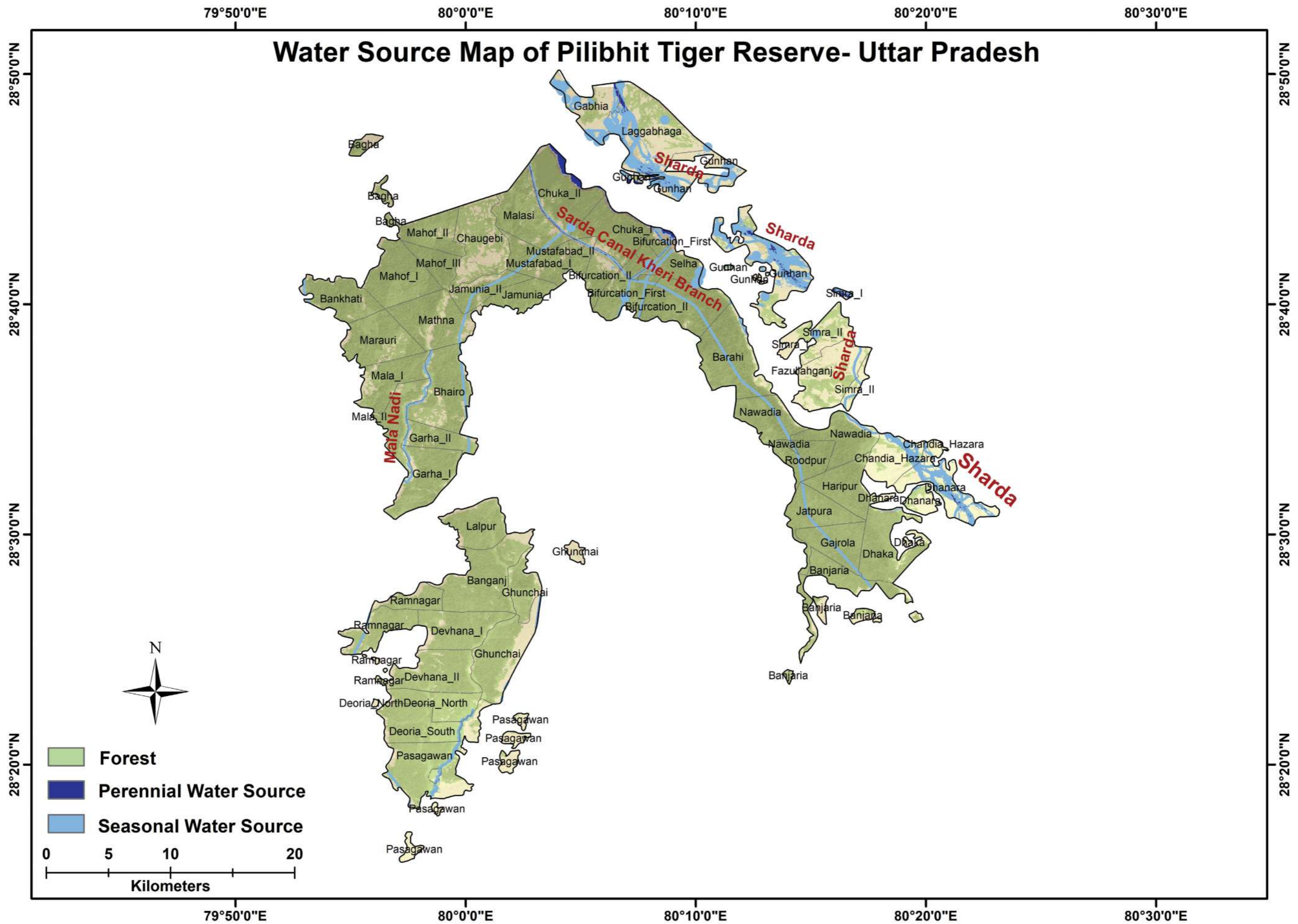


Figure 6 Water source map of Pilibhit tiger reserve

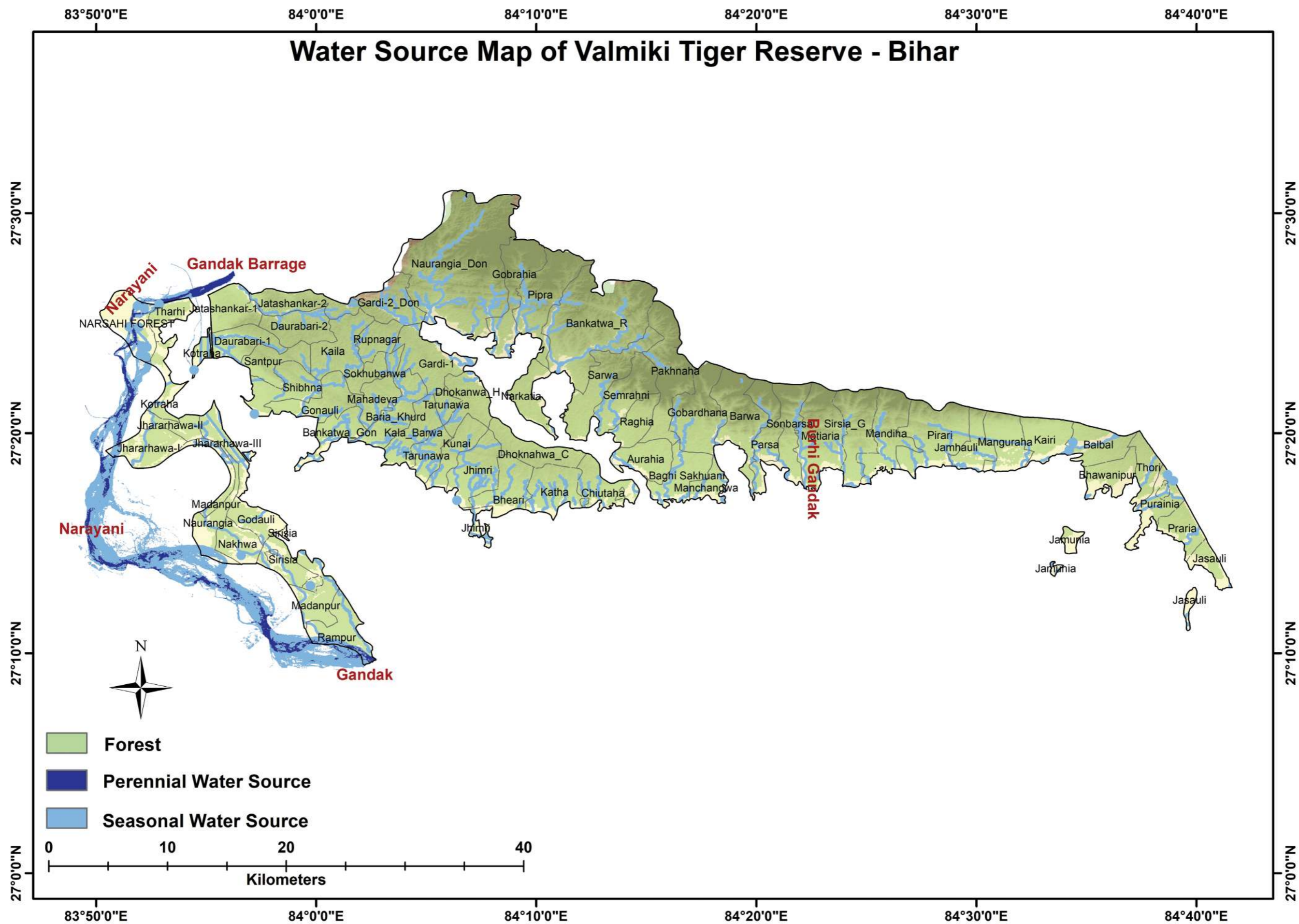


Figure 7 Water source map of Valmiki tiger reserve



Kanha tiger reserve, Madhya Pradesh

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IV. Central Indian Landscape and Eastern Ghats:

The landscape comprises of the semi-arid zone of Rajasthan, central Indian plateau and includes parts of Eastern Ghats across seven states namely Andhra Pradesh, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Telangana. There are 25 tiger reserves in the watershed region of Chambal, Godavari, Ken, koel, Krishna, Mahanadi, Narmada, Son River, Tapi, and Wainganga rivers in the landscape. Around 22 dams are located in the tiger reserves in this landscape.

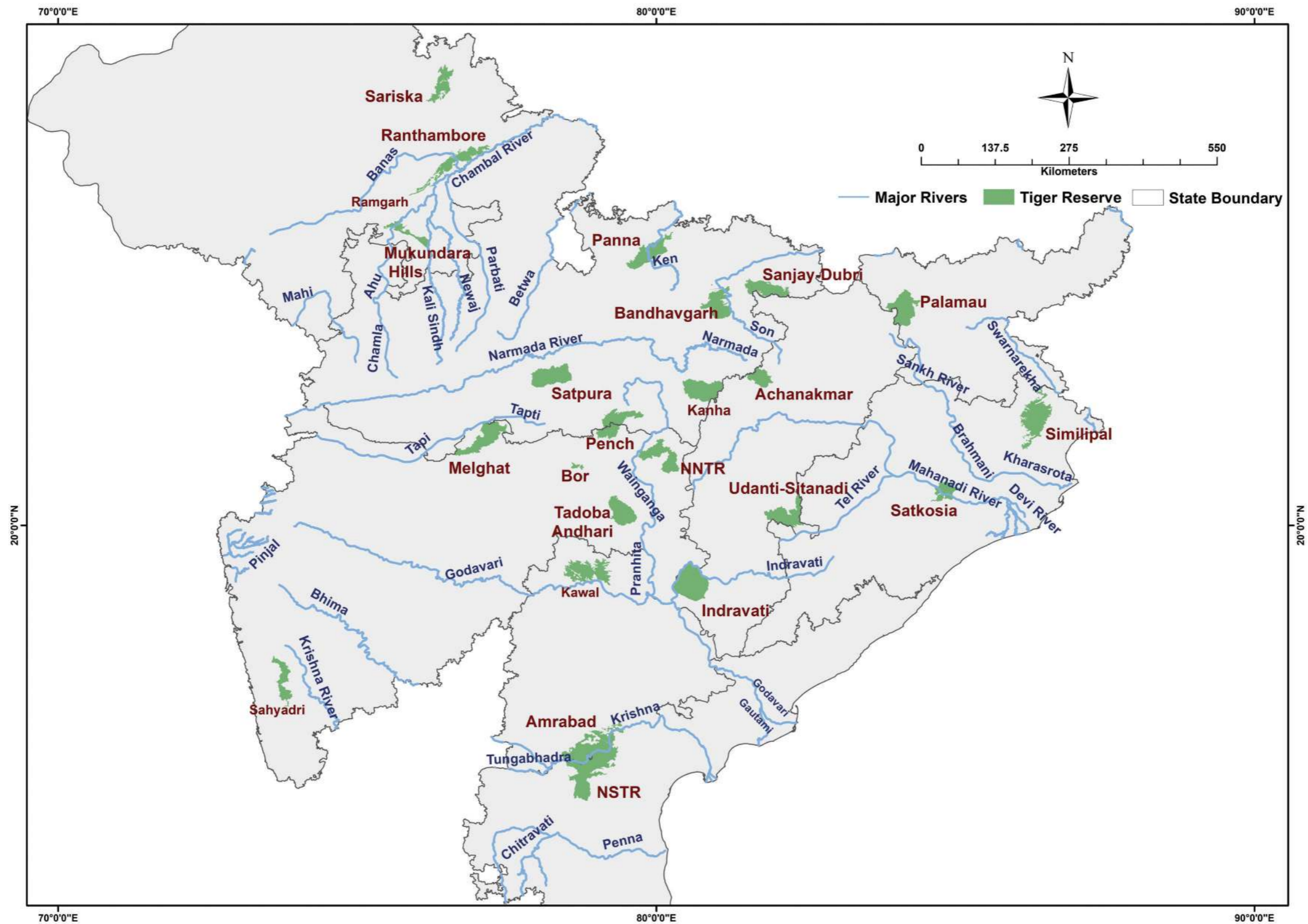


Figure 8 Map showing major rivers in the Central Indian landscape

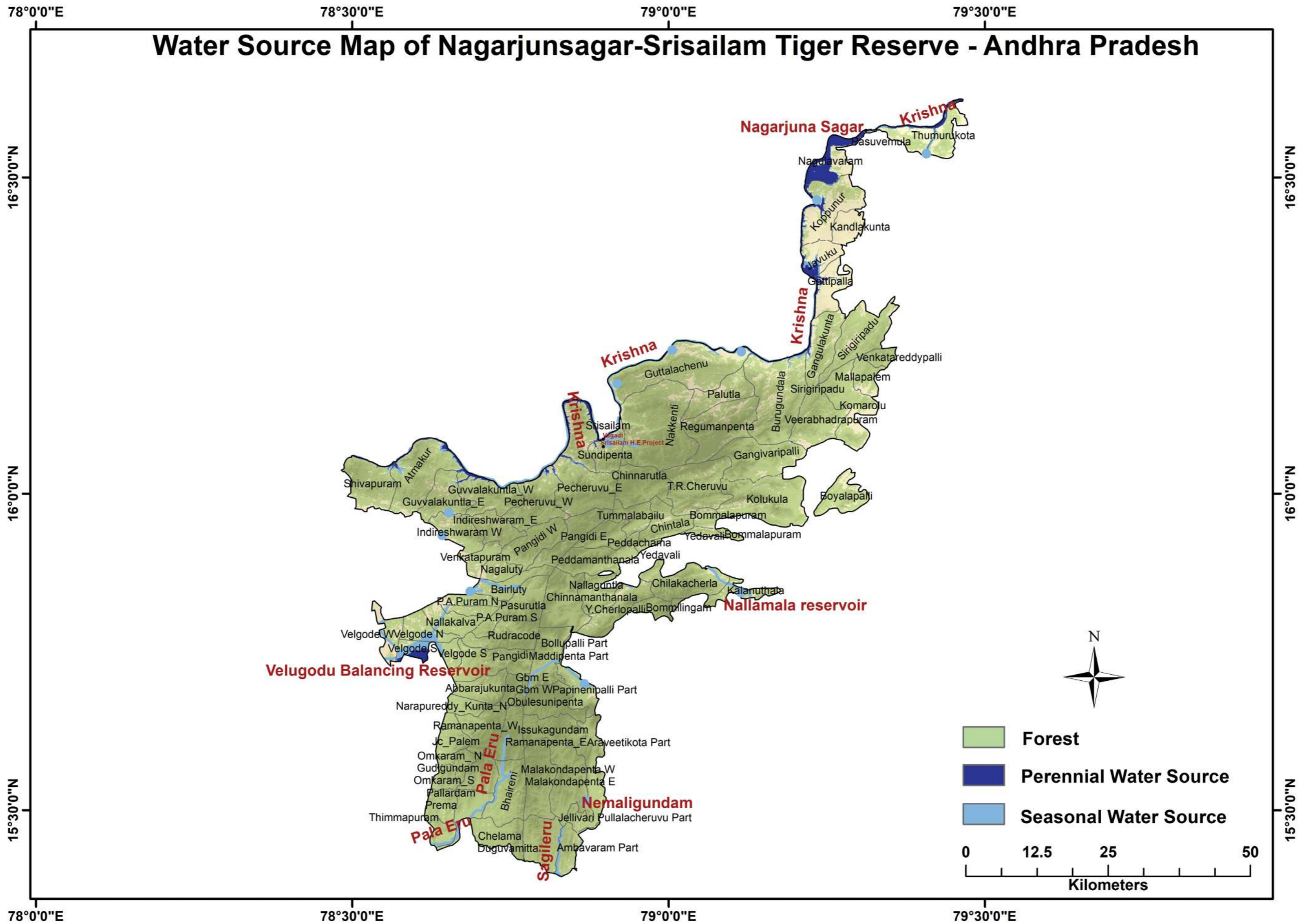


Figure 9 Water source map of Nagarjunsagar-Srisailam tiger reserve

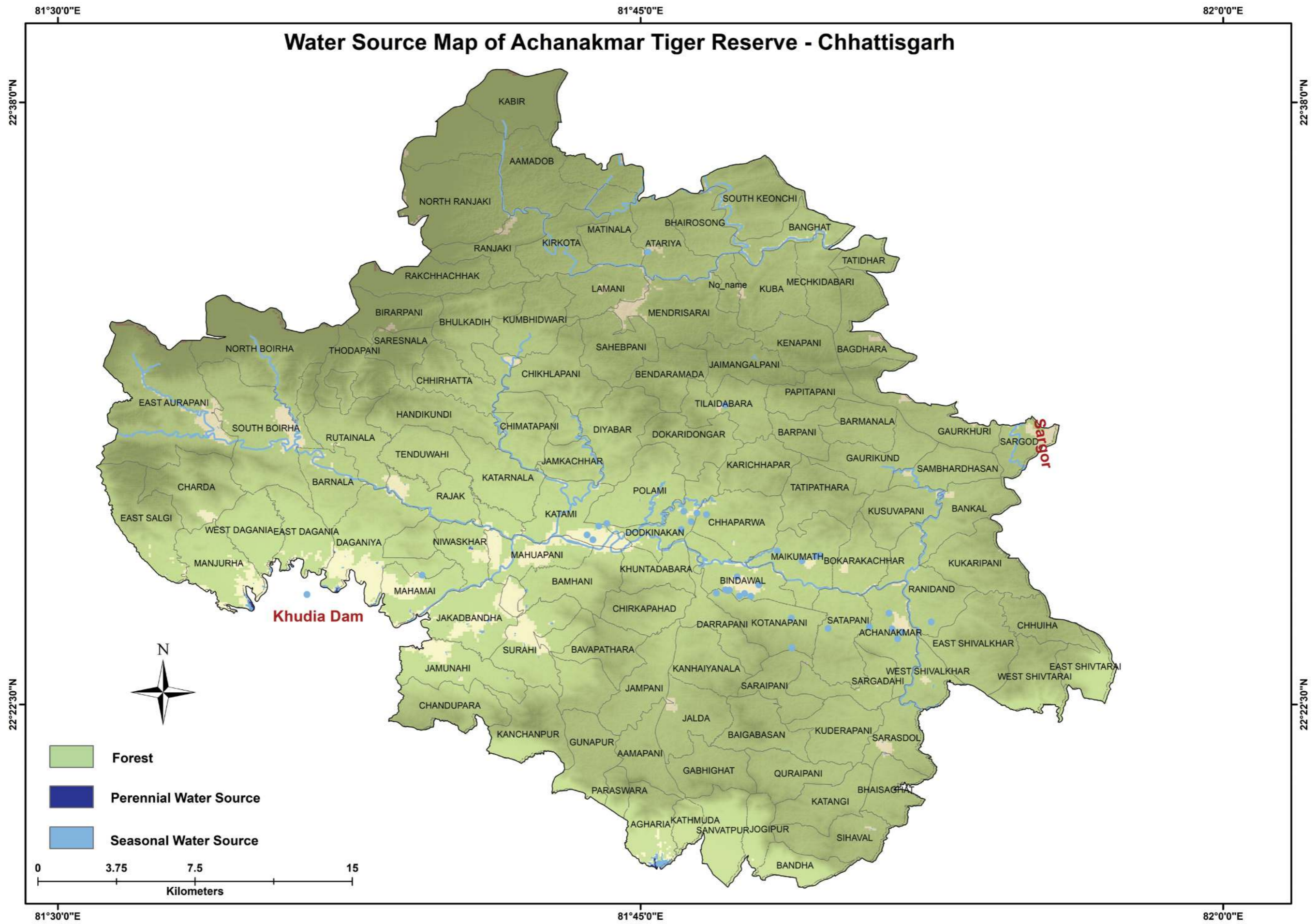


Figure 10 Water source map of Achanakmar tiger reserve

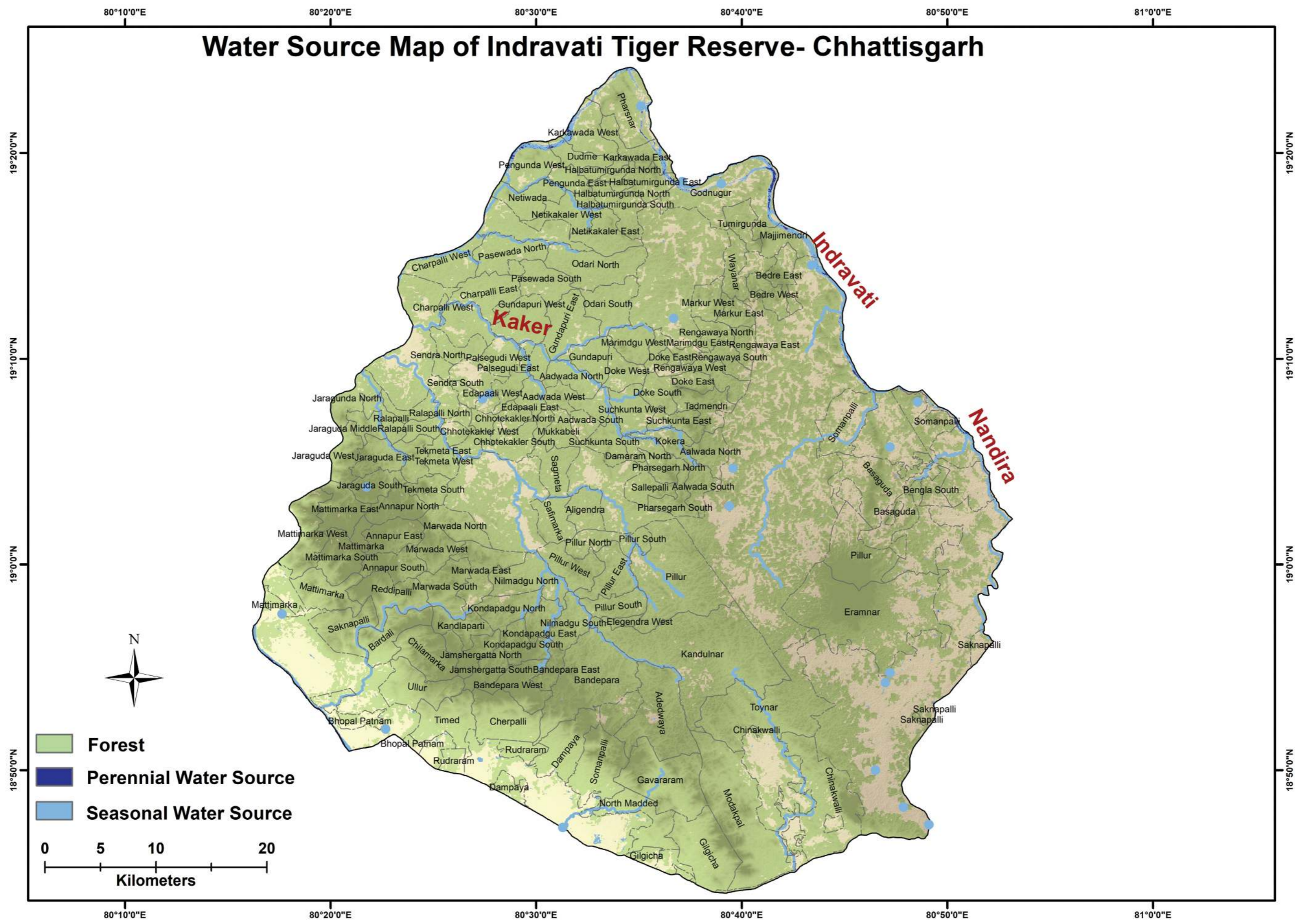


Figure 11 Water source map of Indravati tiger reserve

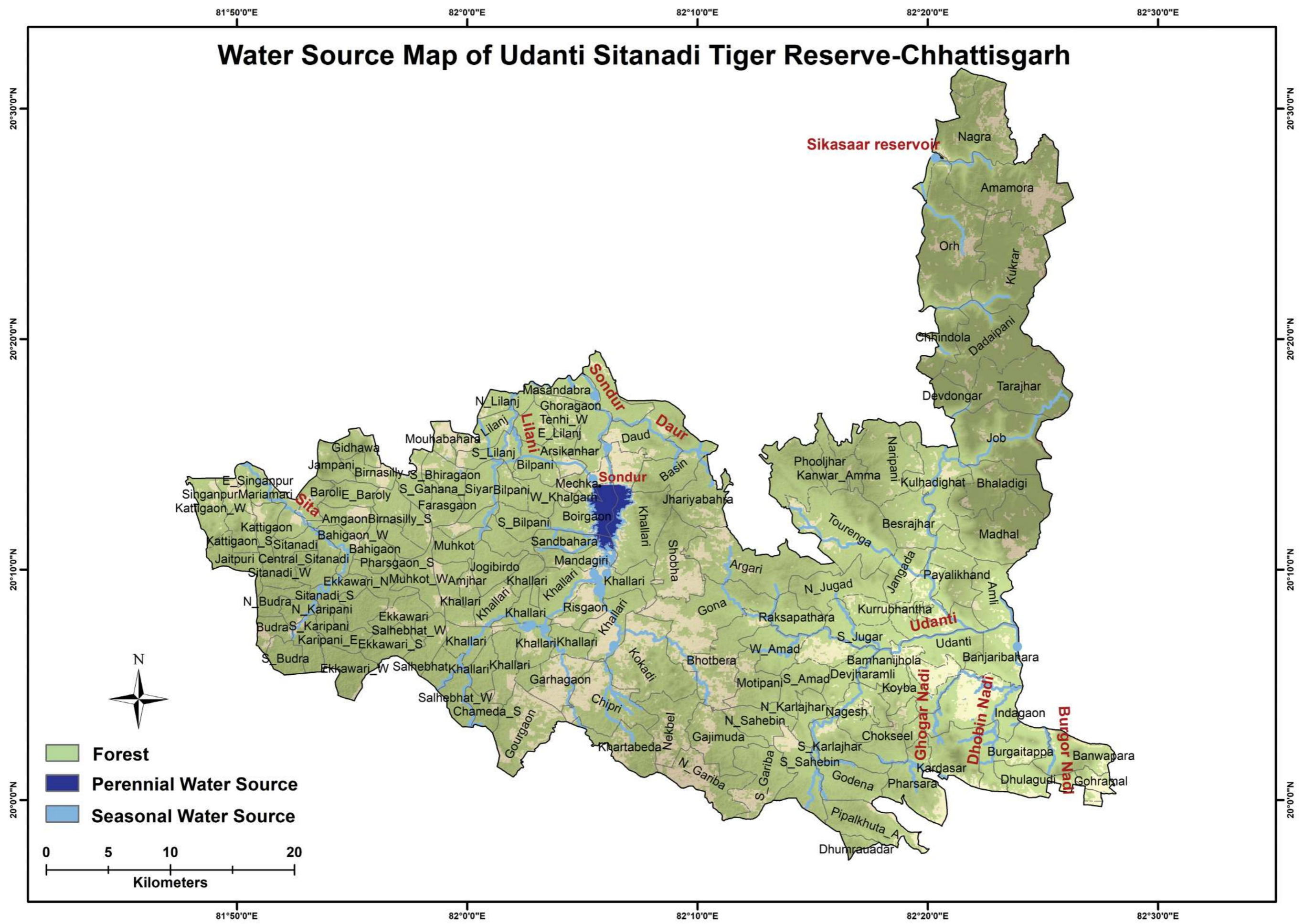


Figure 12 Water source map of Udanti-Sitanadi tiger reserve

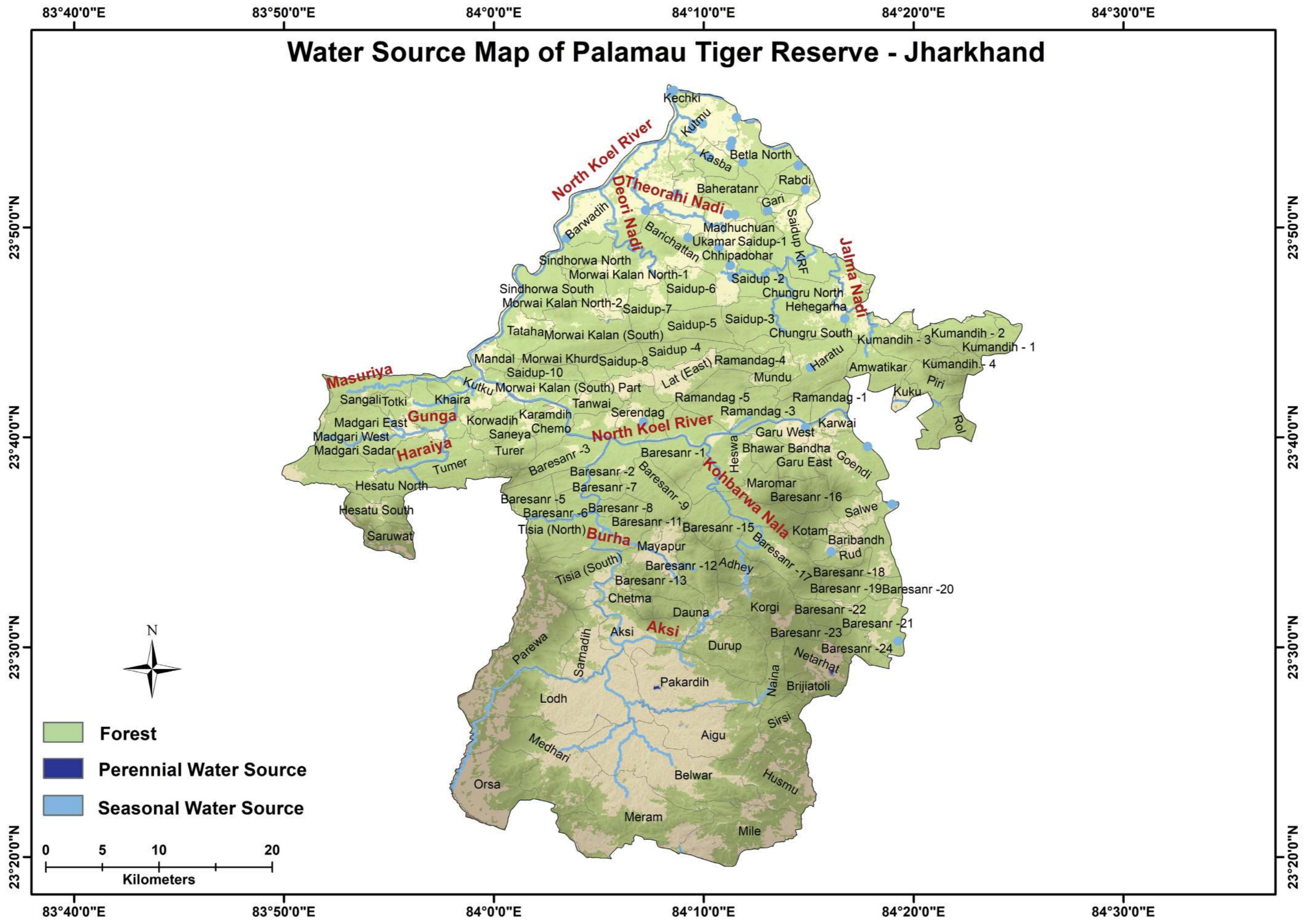


Figure 13 Water source map of Palamau tiger reserve

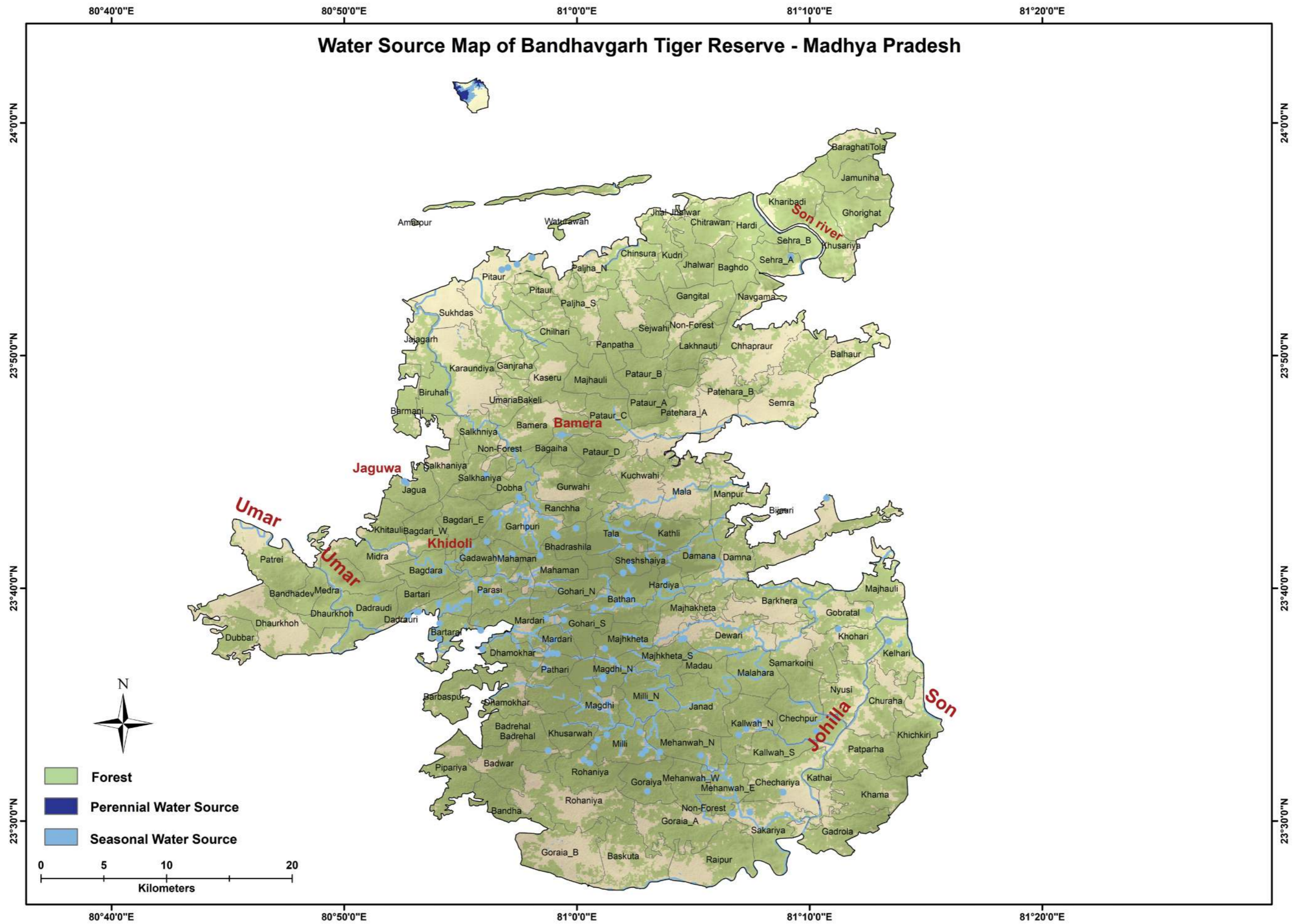


Figure 14 Water source map of Bandhavgarh tiger reserve

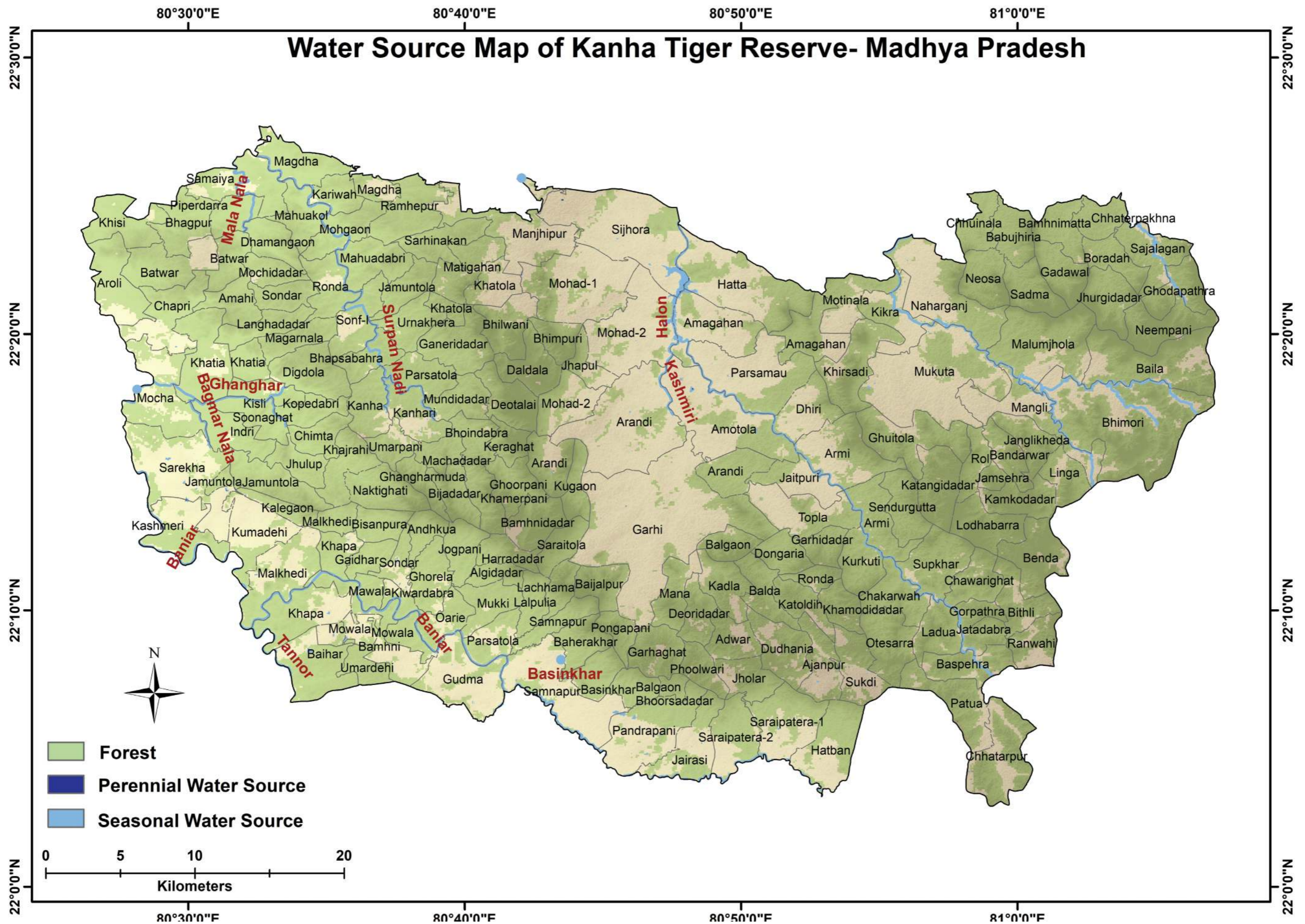


Figure 15 Water source map of Kanha tiger reserve

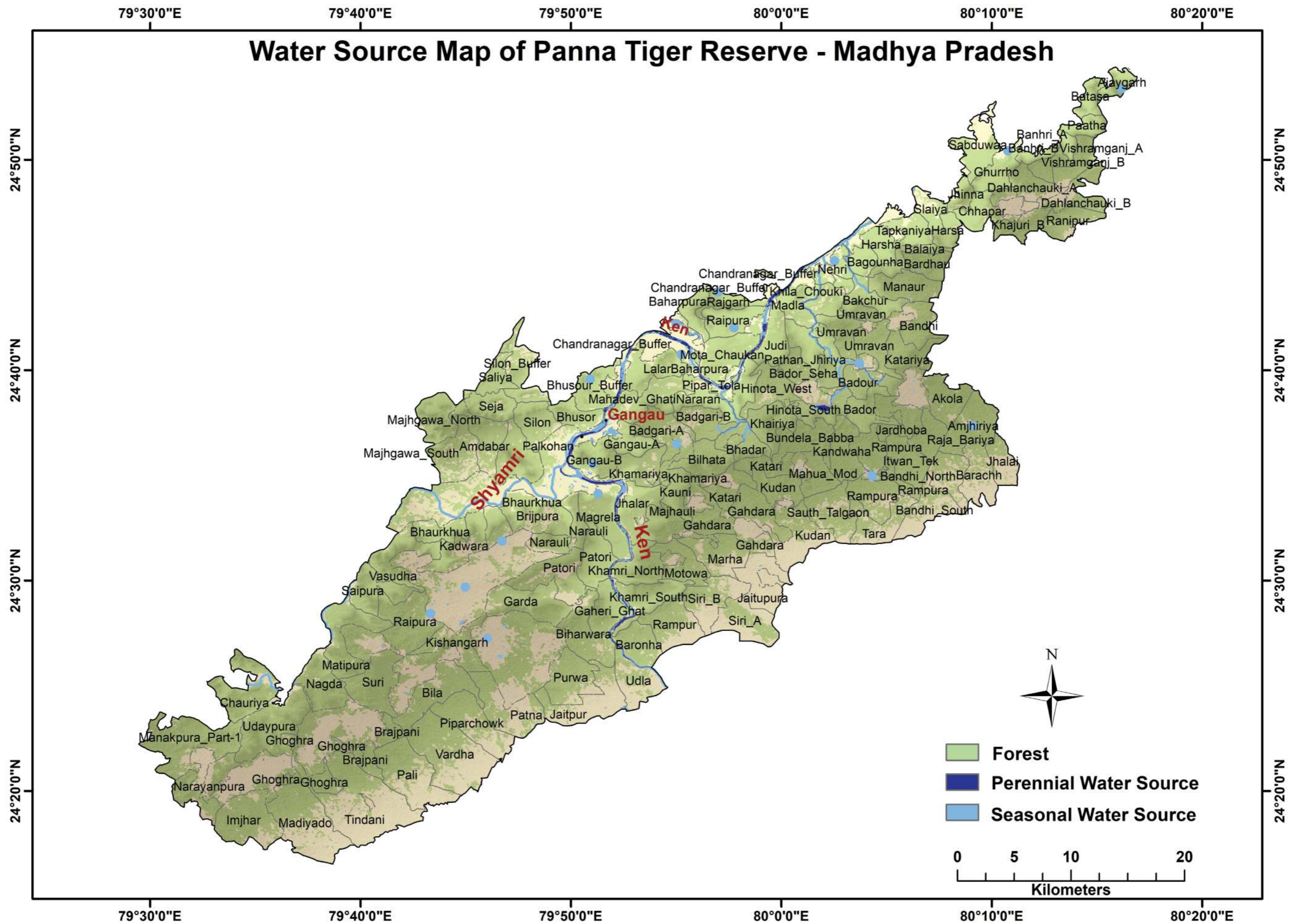


Figure 16 Water source map of Panna tiger reserve

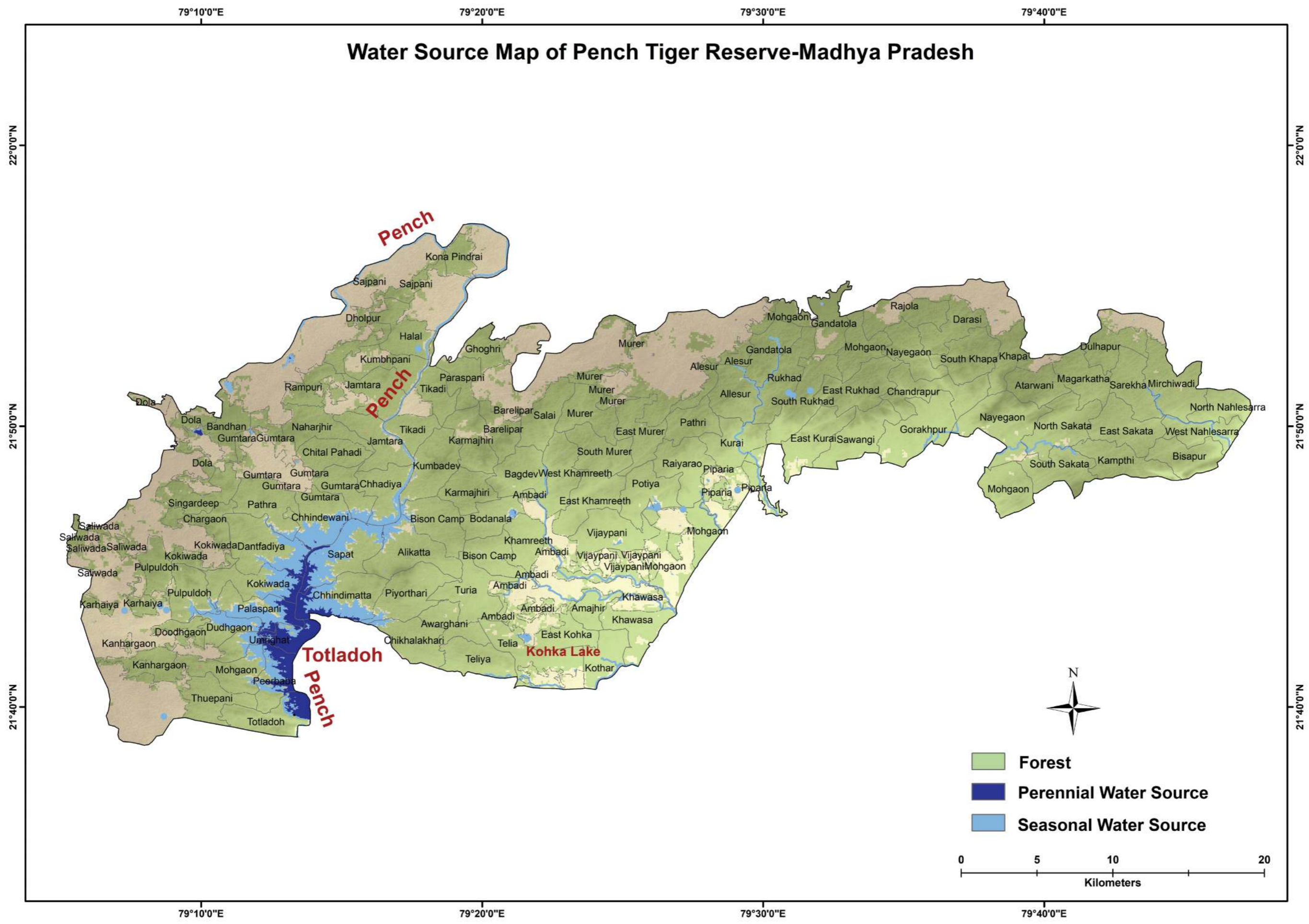


Figure 17 Water source map of PENCH tiger reserve

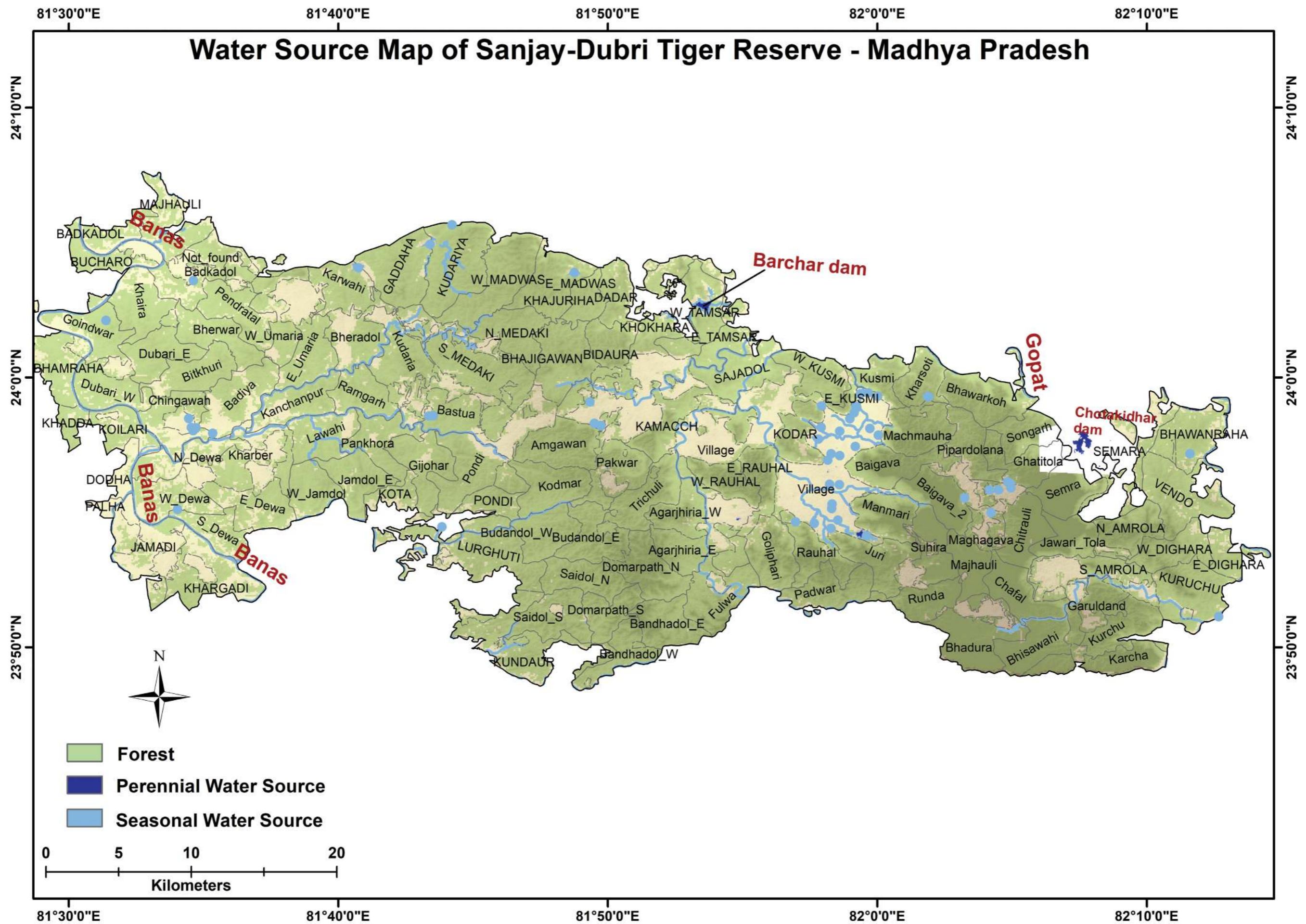


Figure 18 Water source map of Sanjay-Dubri tiger reserve

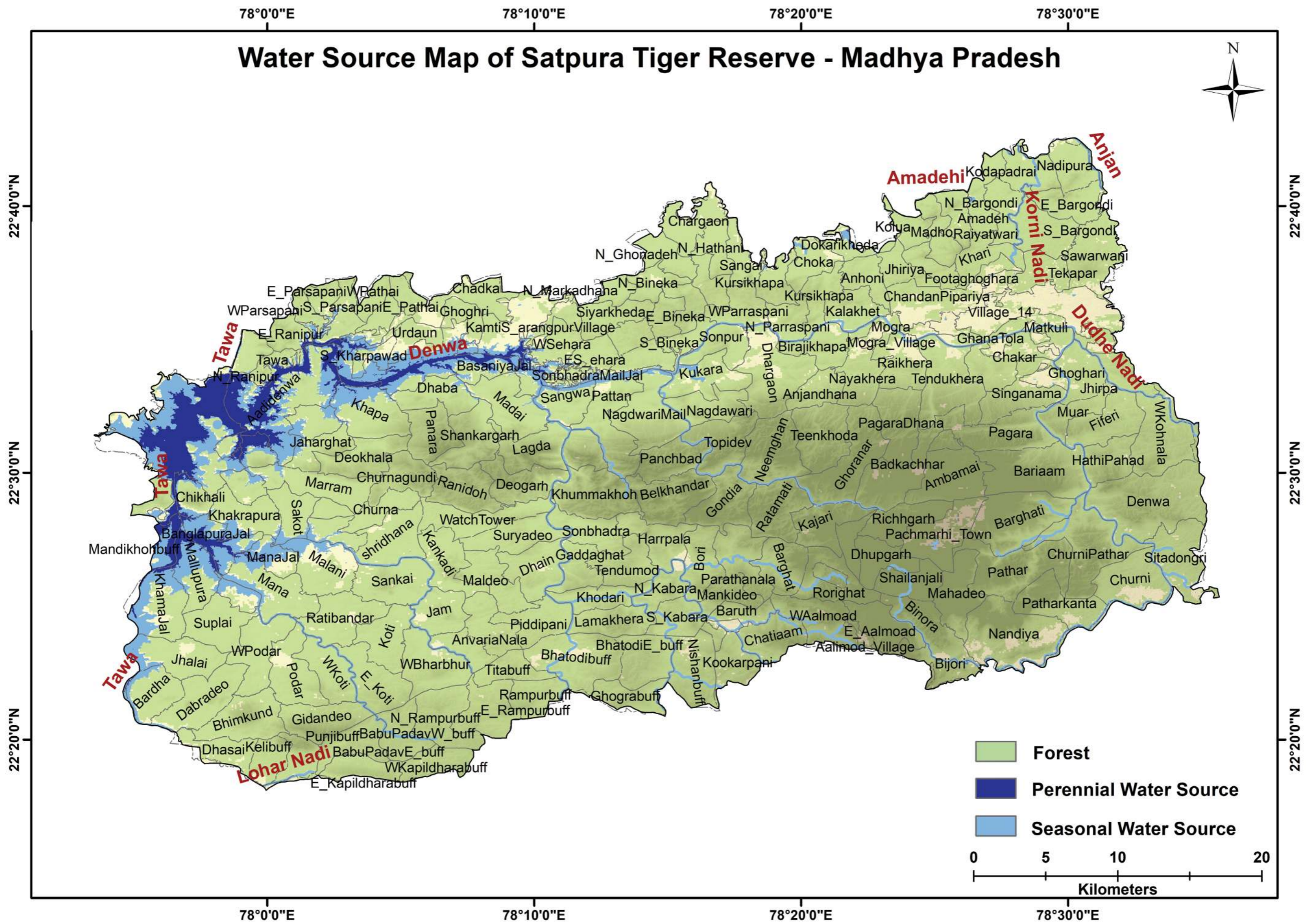


Figure 19 Water source map of Satpura tiger reserve

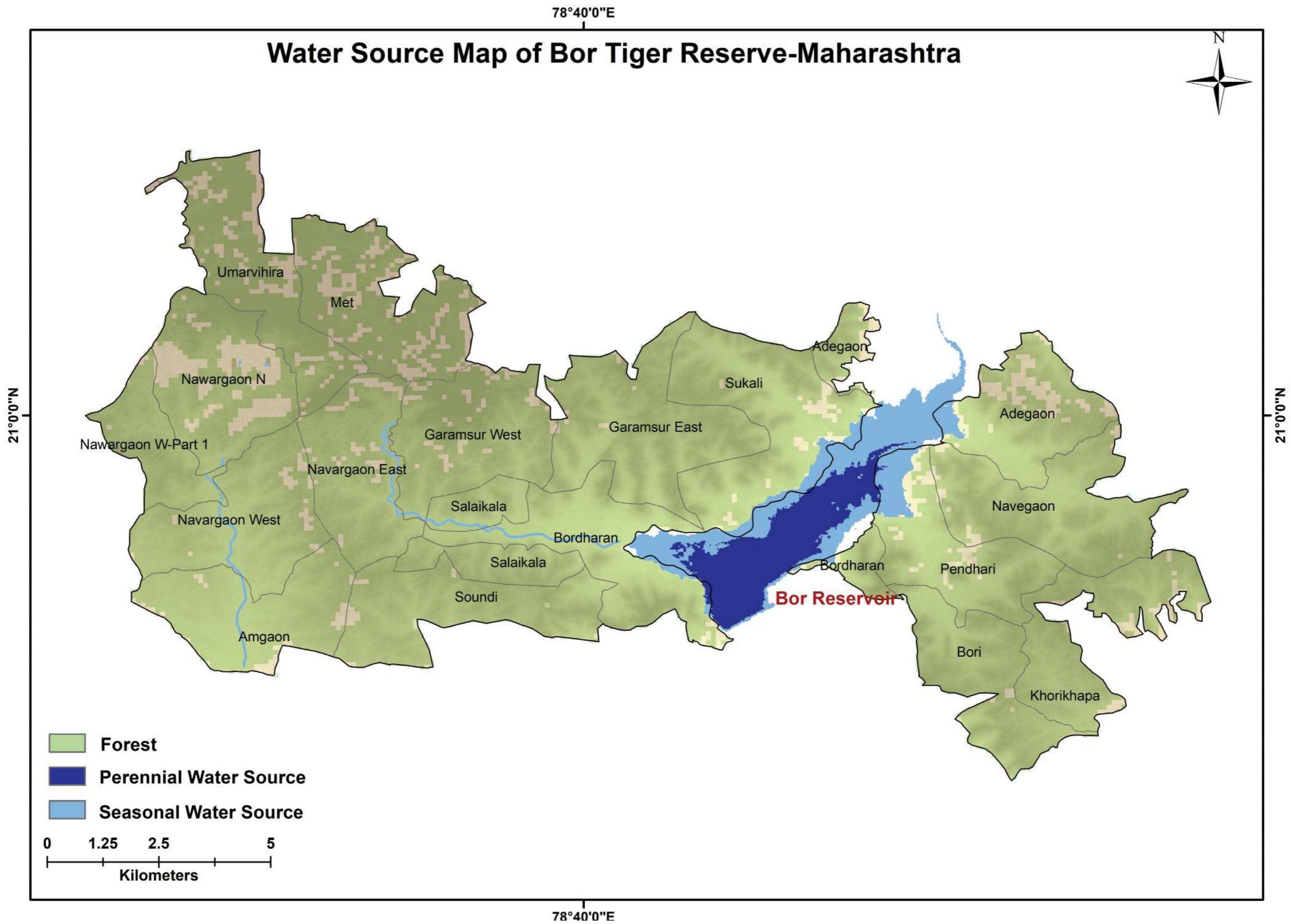


Figure 20 Water source map of Bor tiger reserve

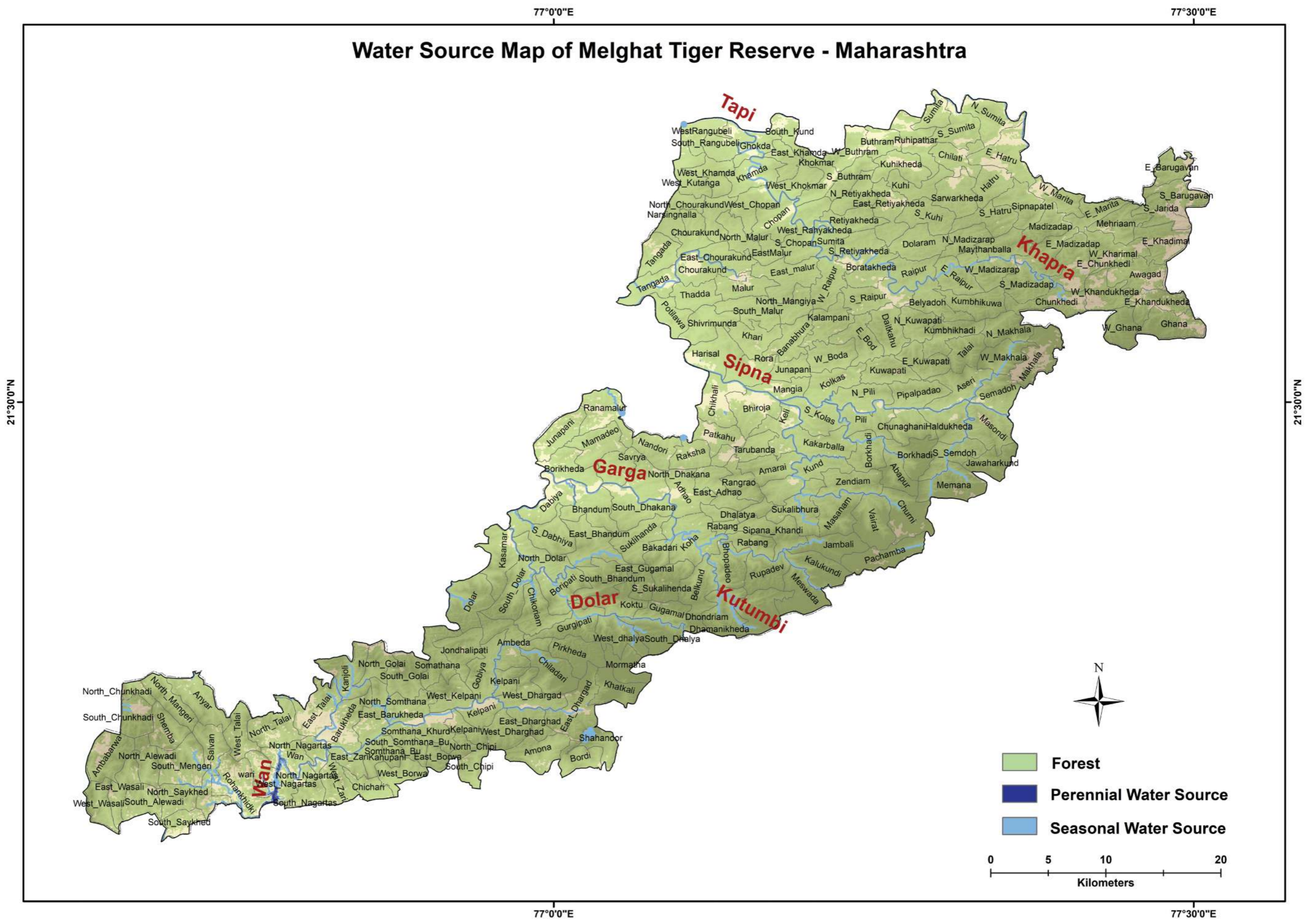


Figure 21 Water source map of Melghat tiger reserve

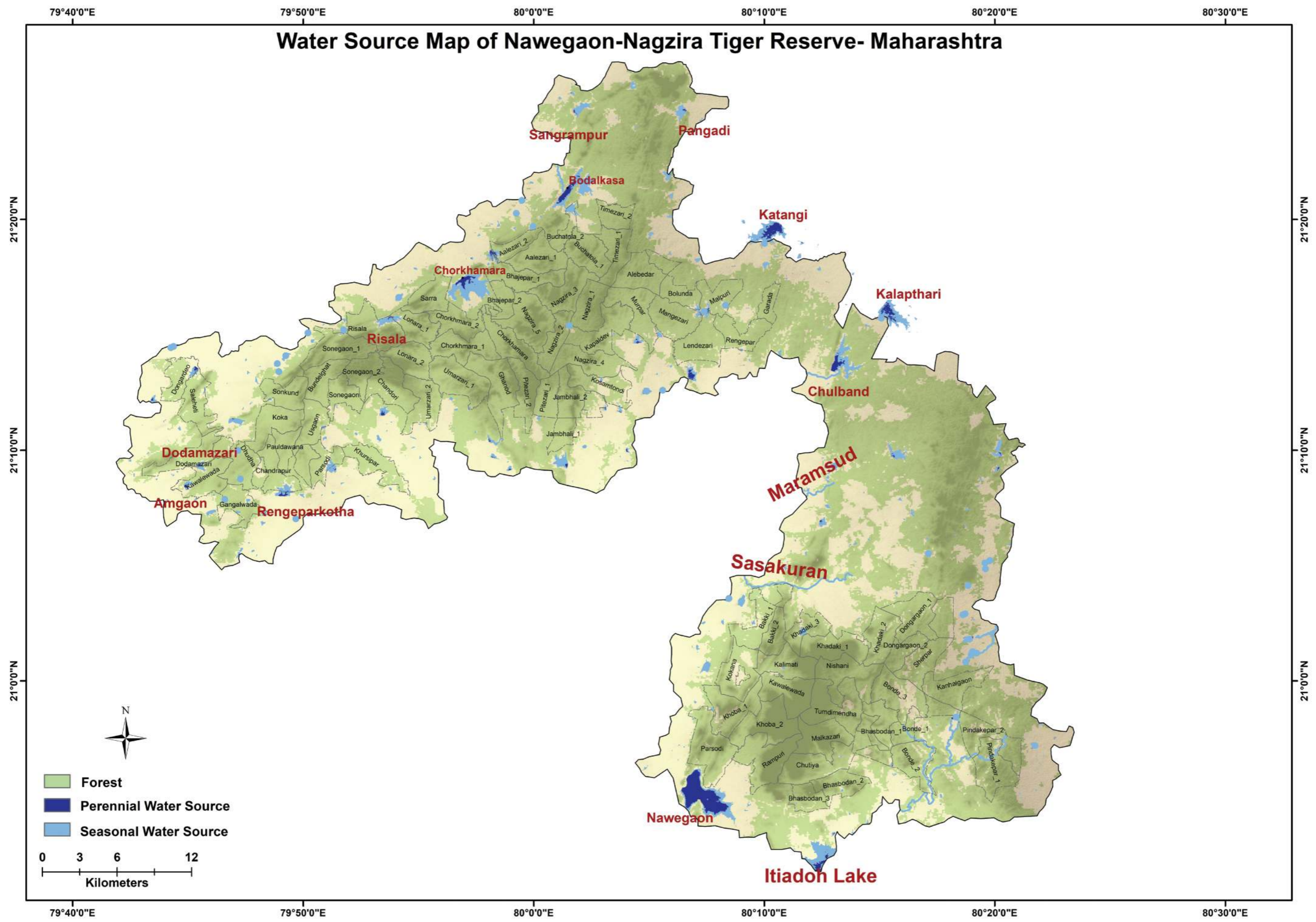


Figure 22 Water source map of Nawegaon-Nagzira tiger reserve

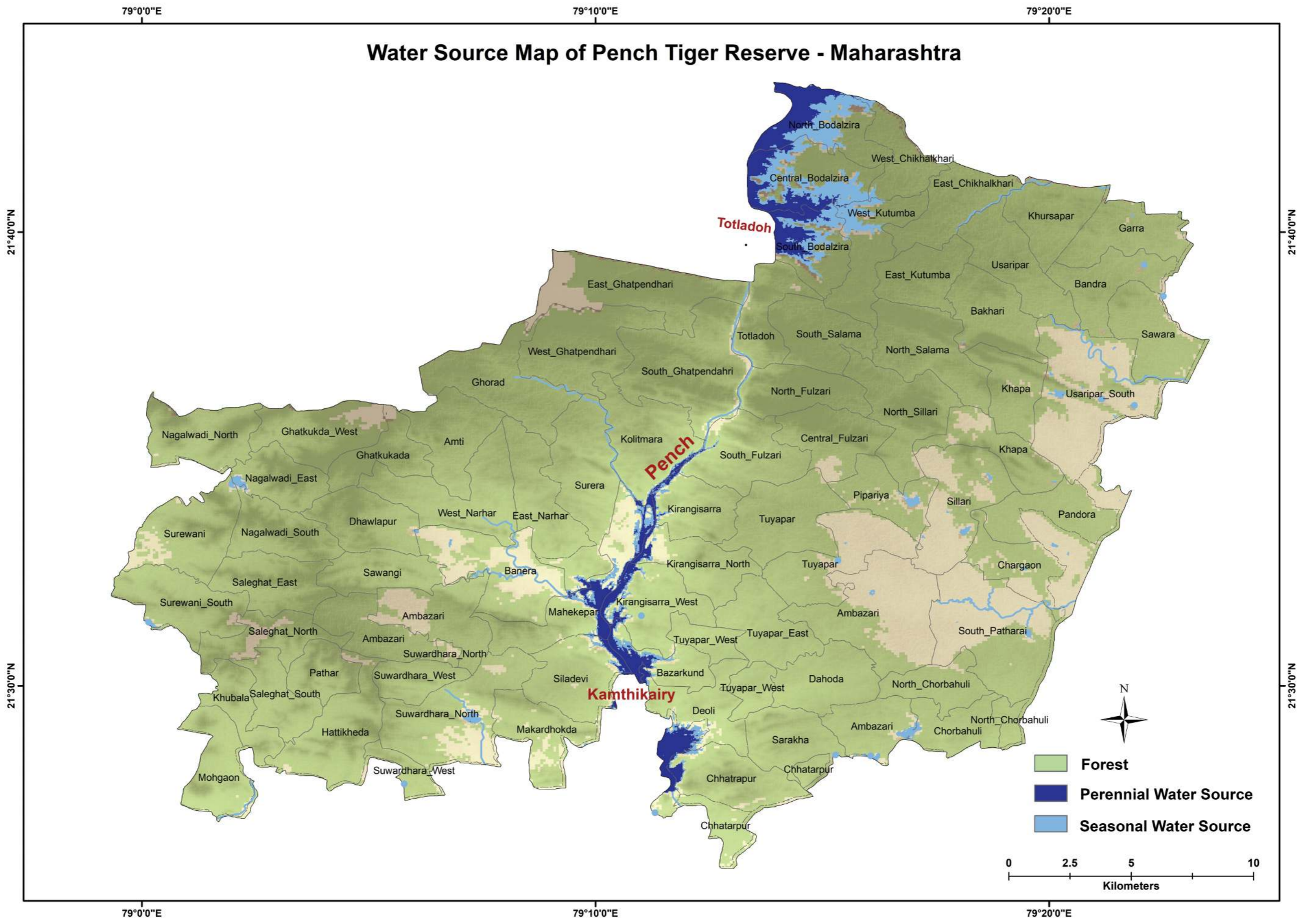


Figure 23 Water source map of Pench tiger reserve

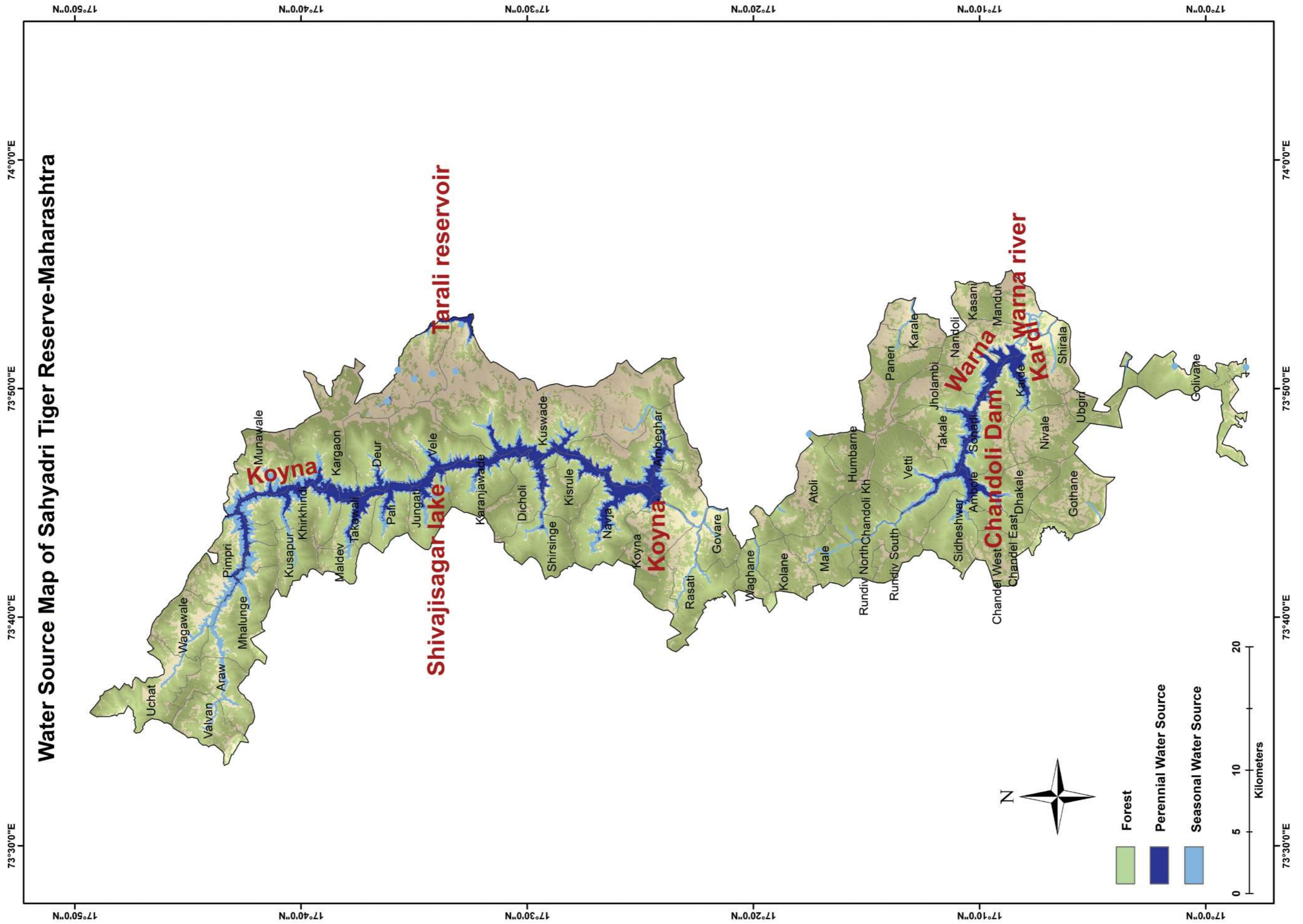


Figure 24 Water source map of Sahyadri tiger reserve

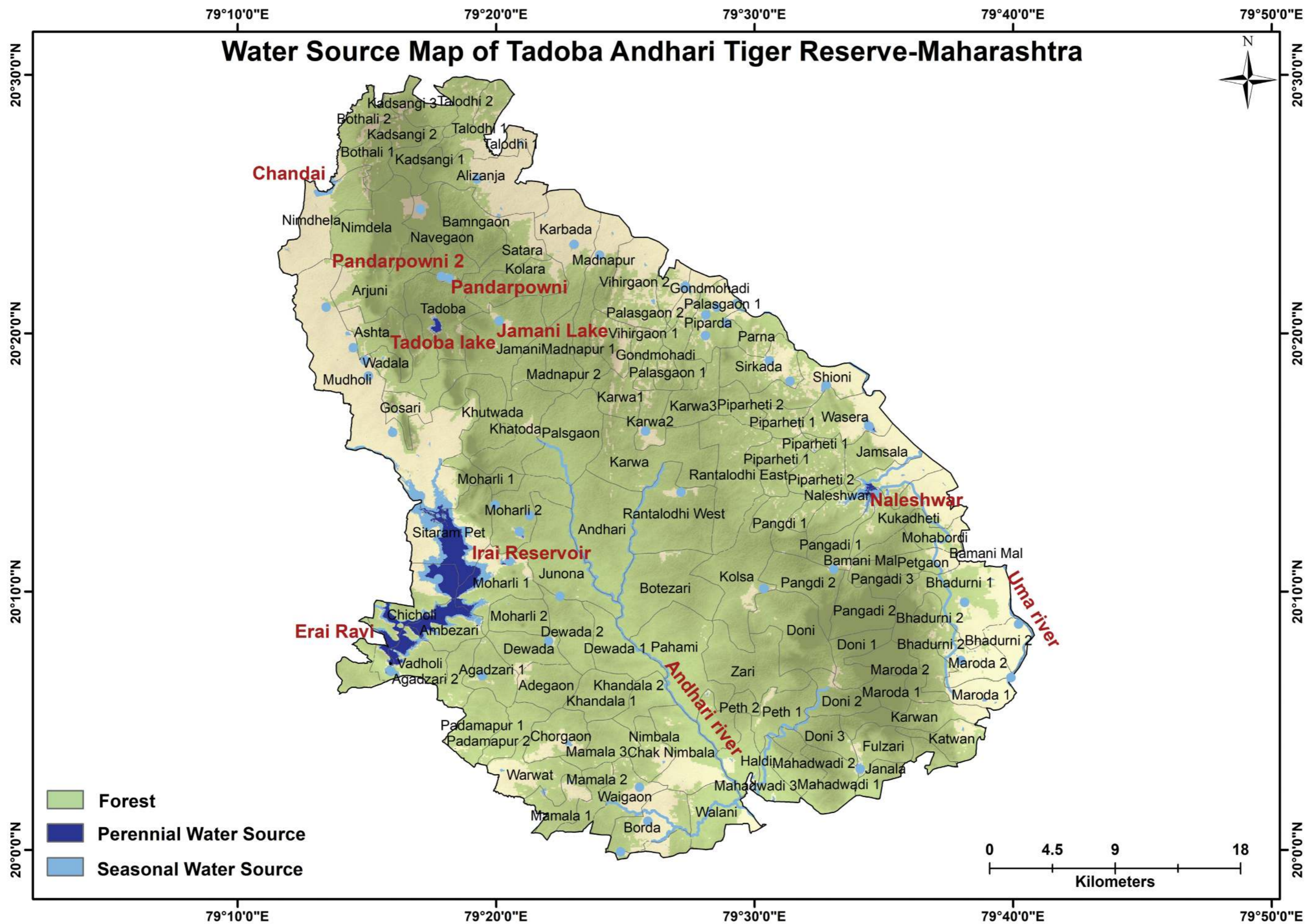


Figure 25 Water source map of Tadoba-Andhari tiger reserve

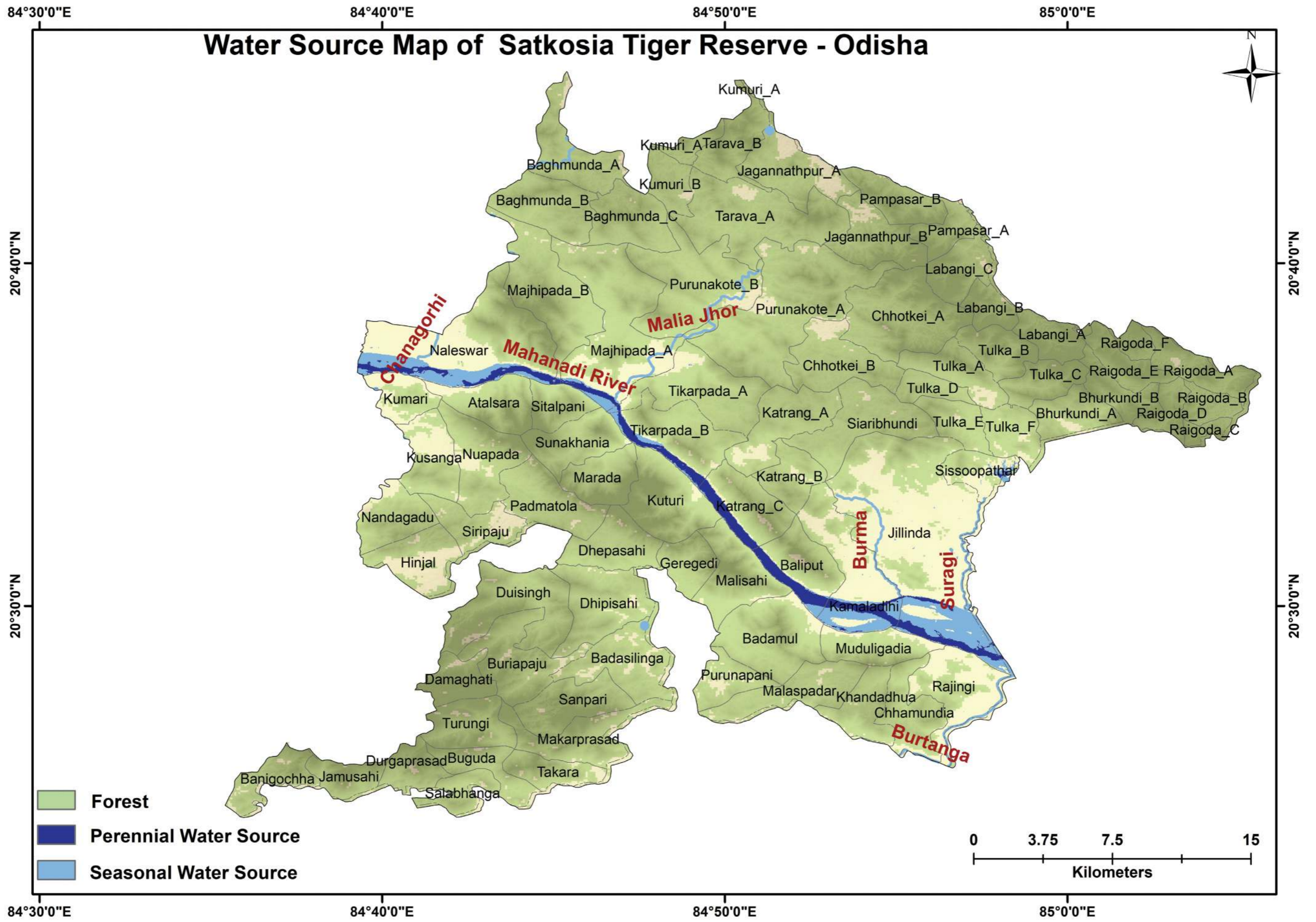


Figure 26 Water source map of Satkosia tiger reserve

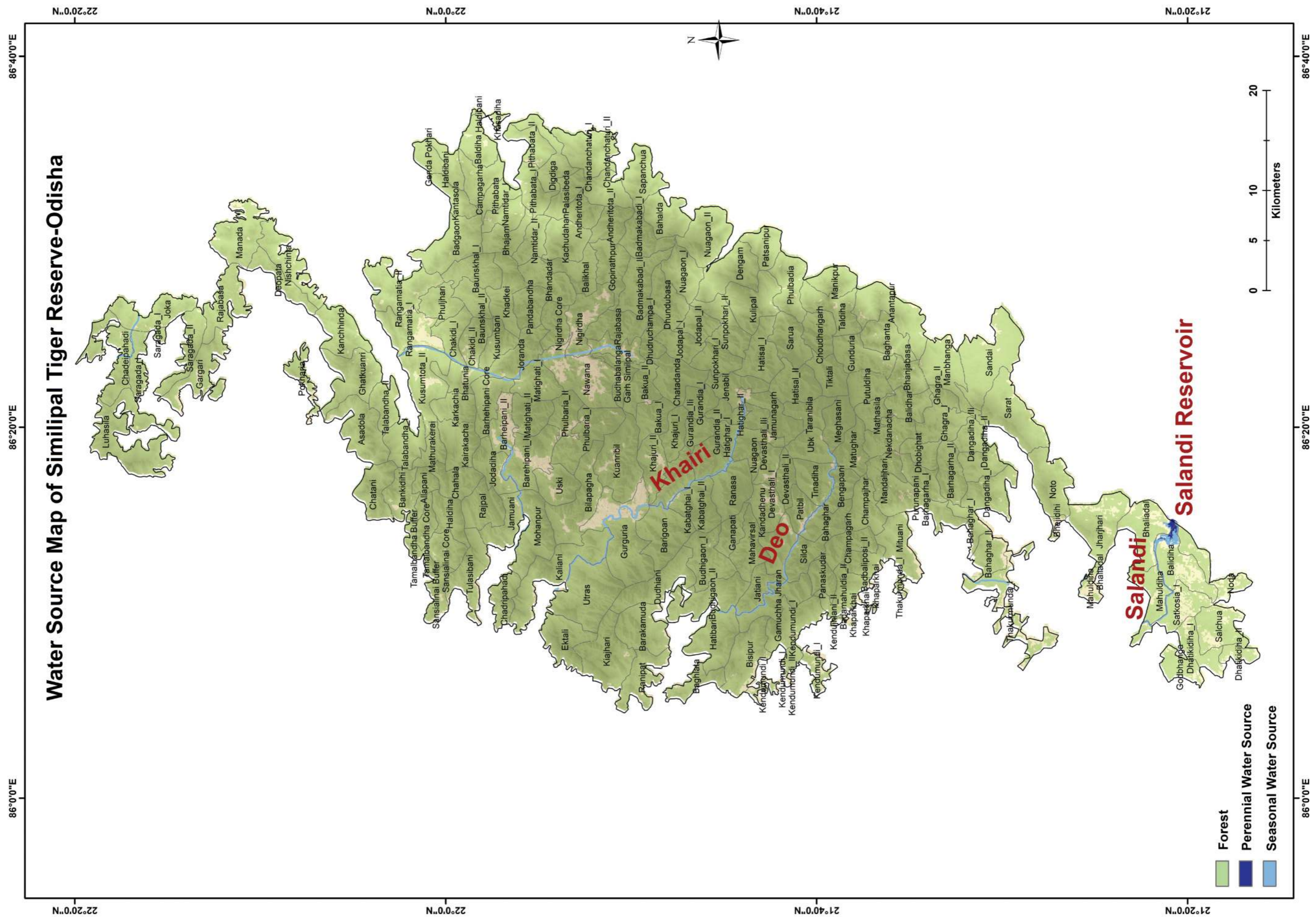


Figure 27 Water source map of Similipal tiger reserve

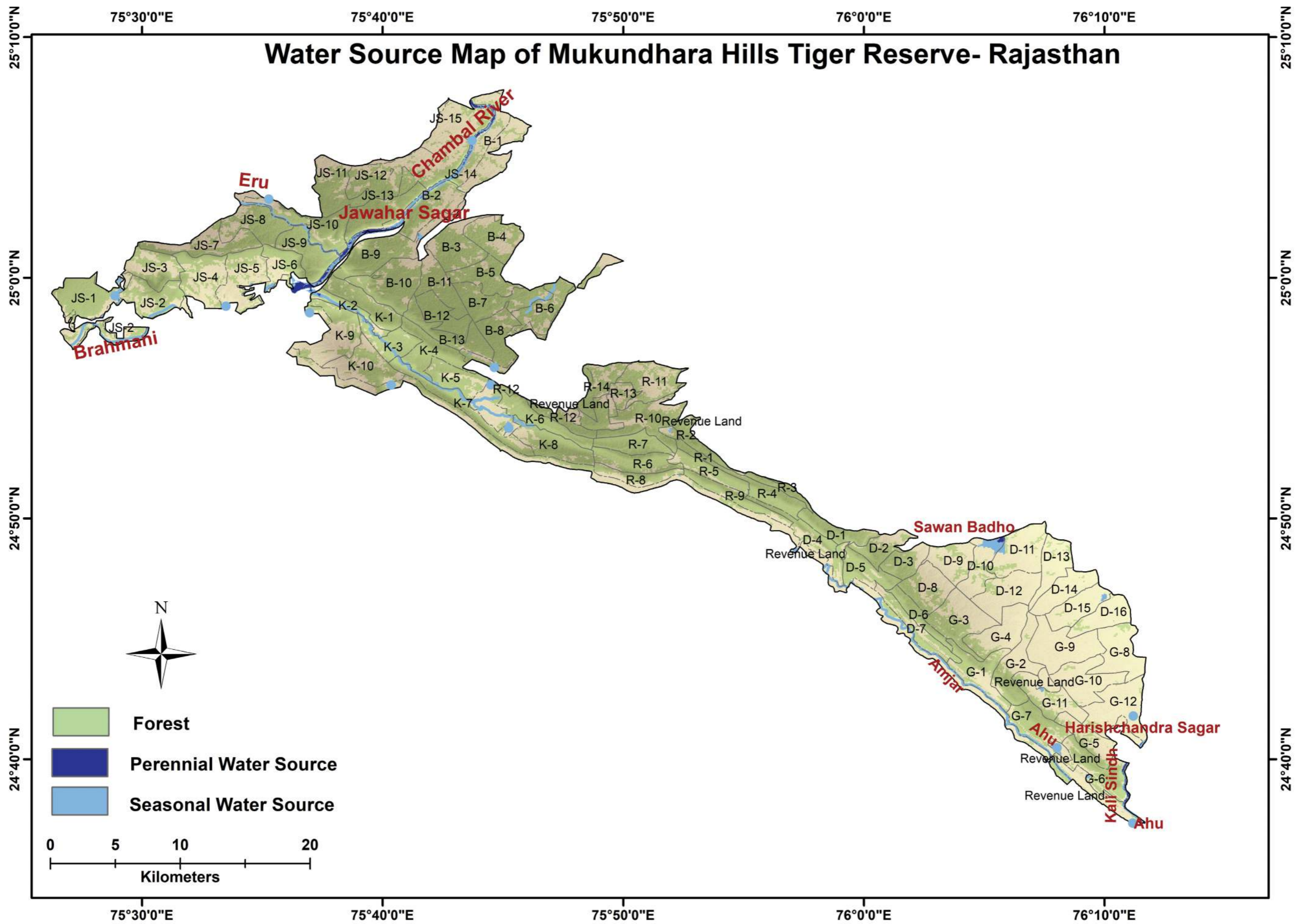


Figure 28 Water source map of Mukundhara Hills tiger reserve

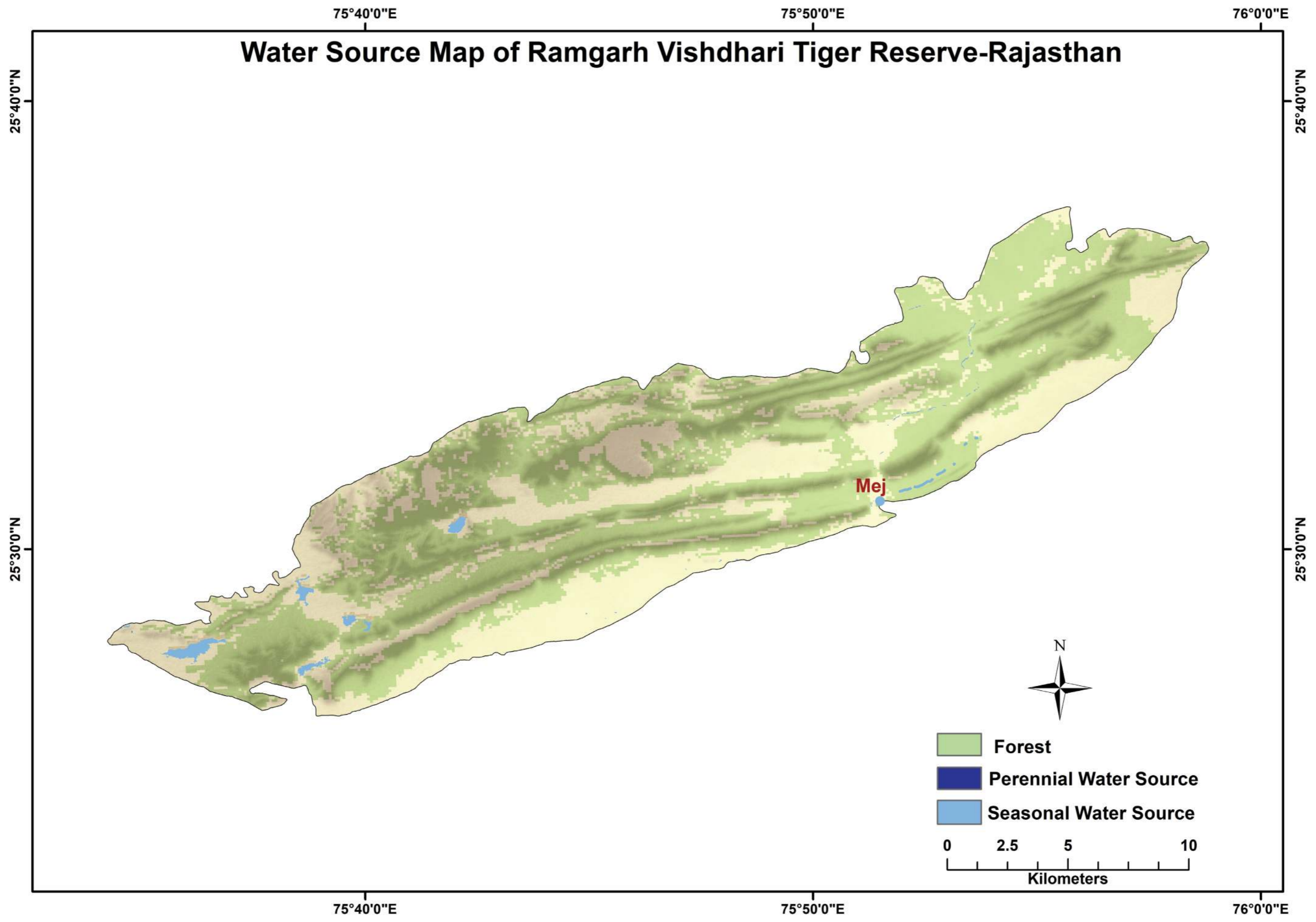


Figure 29 Water source map of Ramgarh Vishdhari tiger reserve

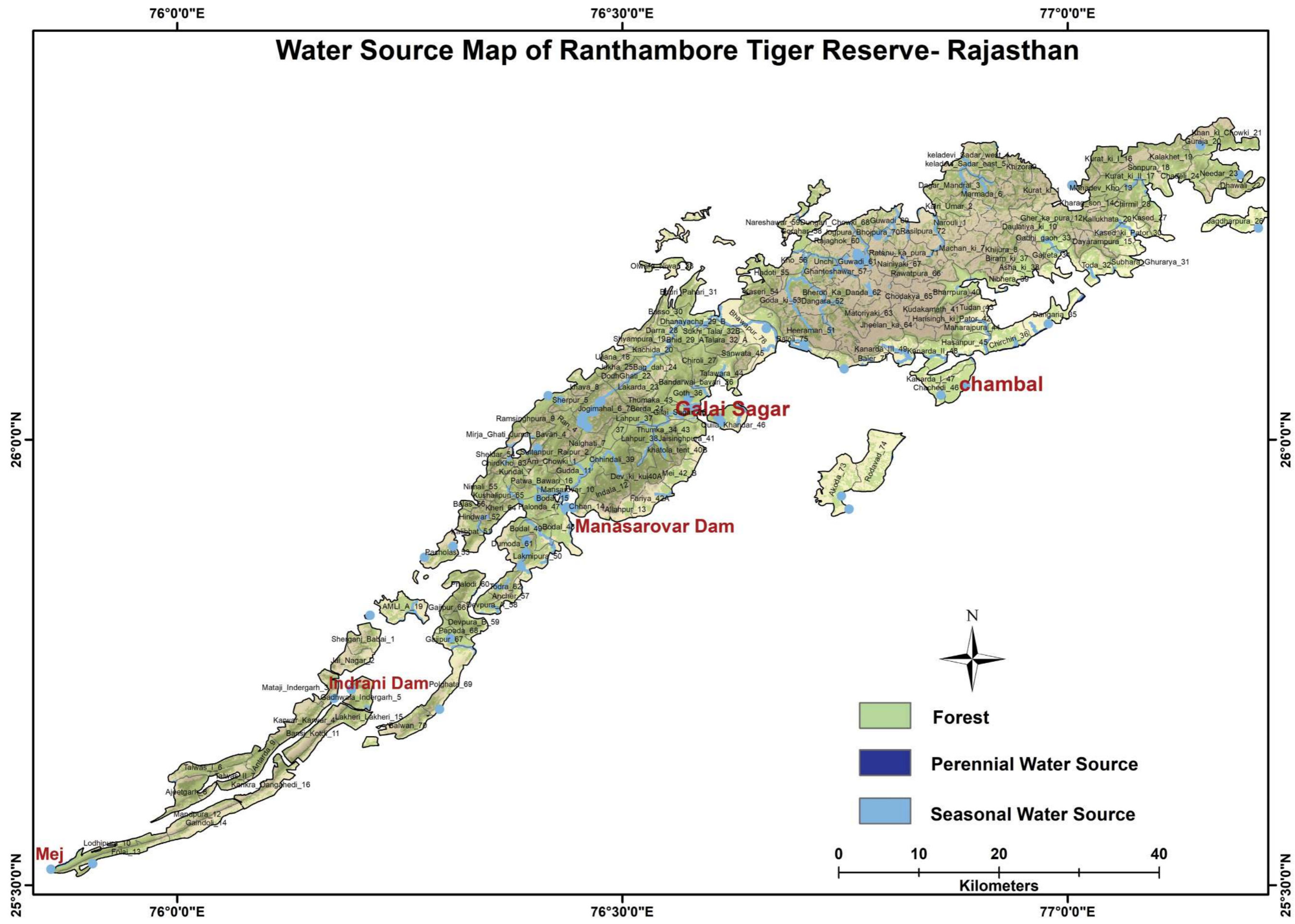


Figure 30 Water source map of Ranthambore tiger reserve

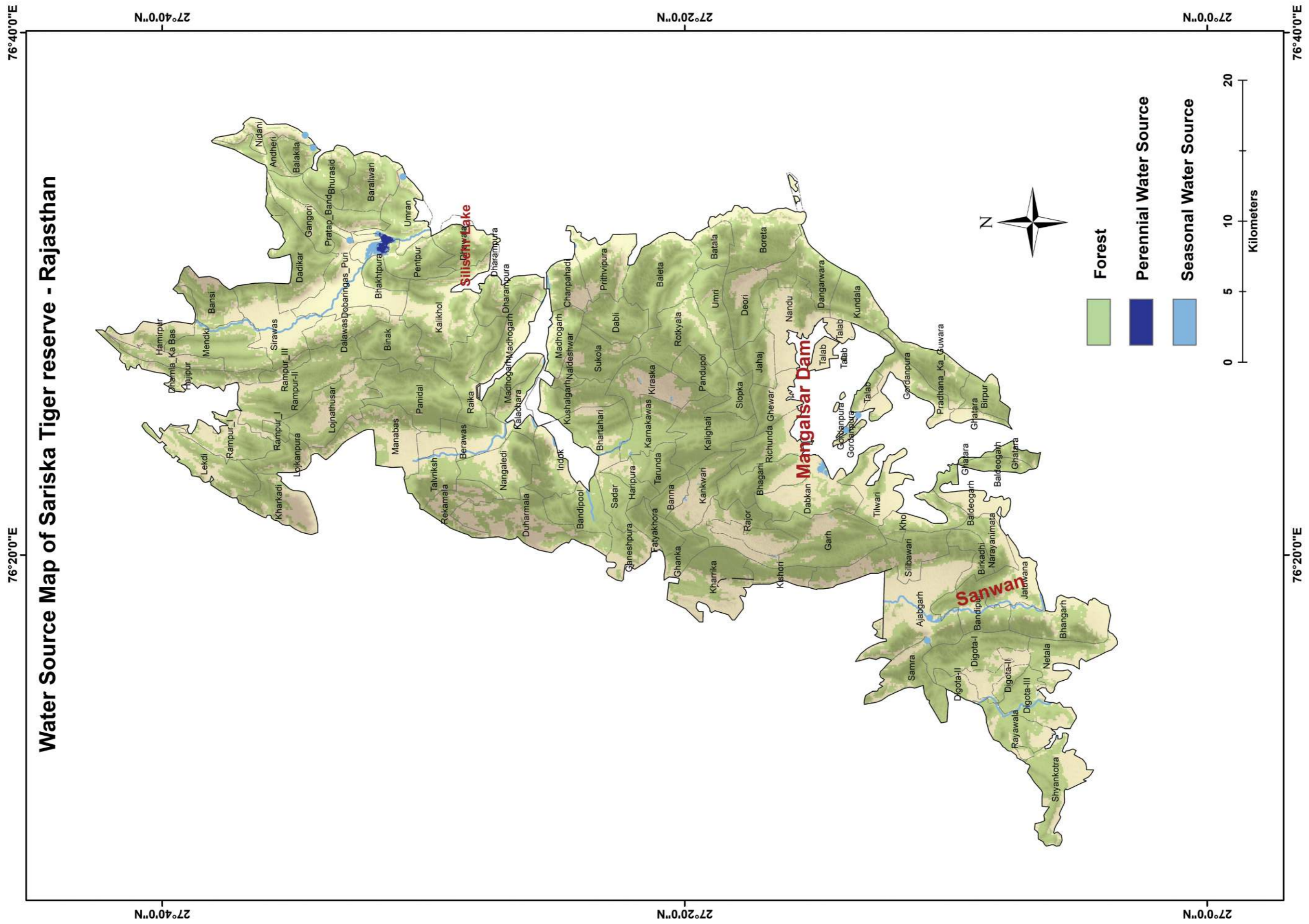


Figure 31 Water source map of Sariska tiger reserve

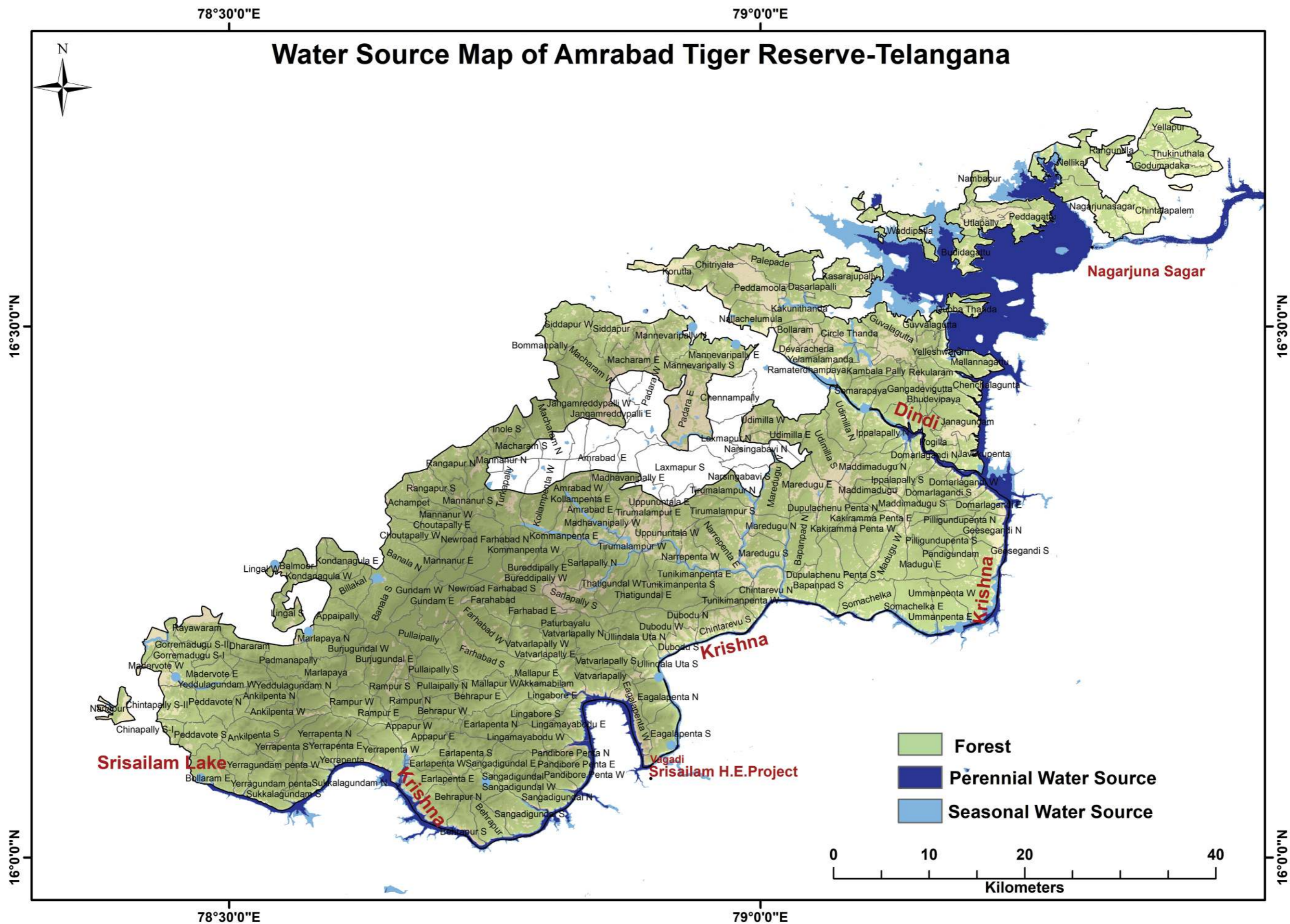


Figure 32 Water source map of Amrabad tiger reserve

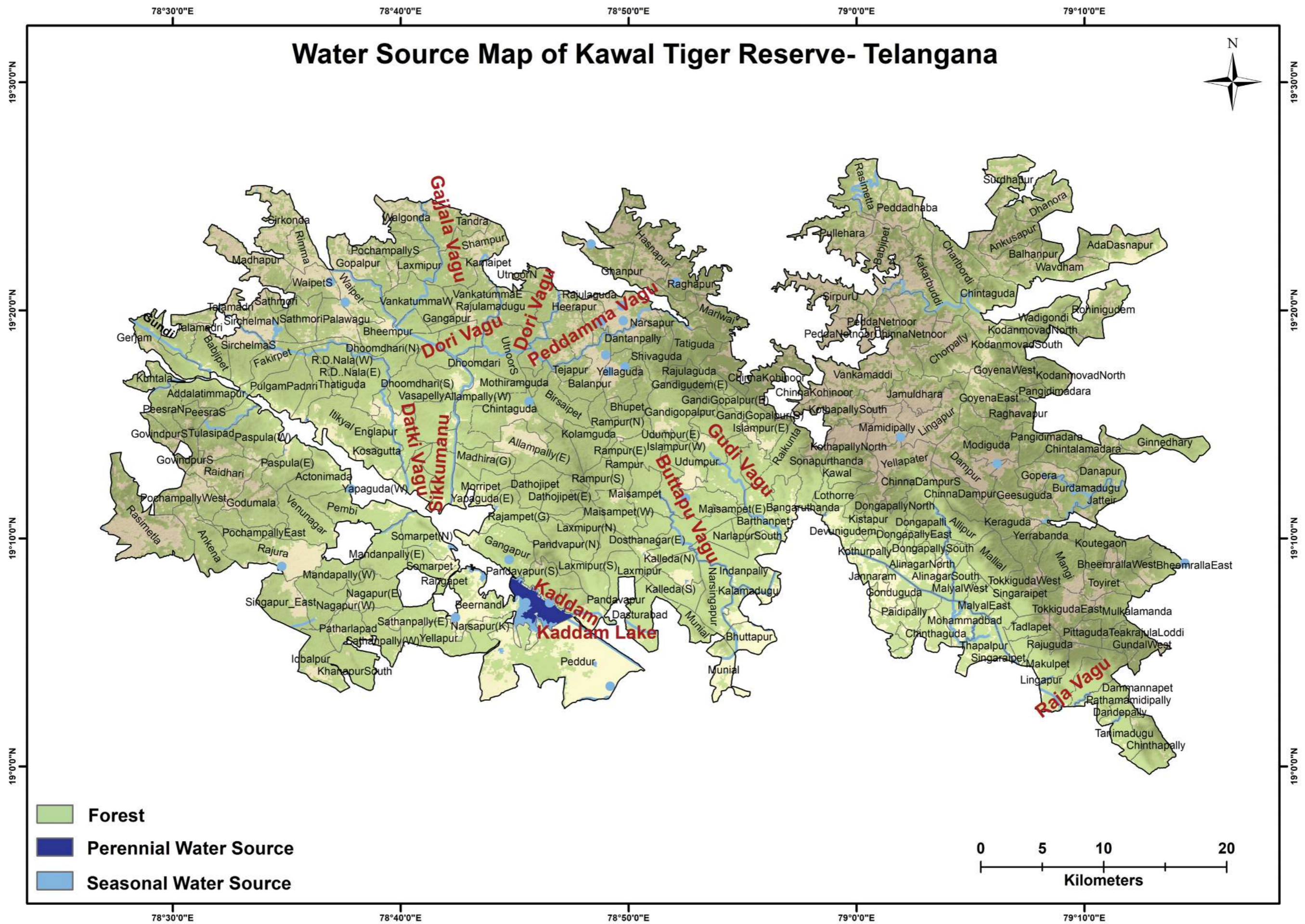


Figure 33 Water source map of Kawal tiger reserve



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Parambikulam tiger reserve, Kerala

V. Western Ghats Landscape

The landscape comprises of mountain range traversing the states of Karnataka, Kerala, Tamil Nadu and Goa. There are 12 tiger reserve in the states of Karnataka, Kerala and Tamil Nadu; Goa does not have a tiger reserve until now. The tiger reserves are in the major watersheds of the rivers Bhatsoi, Cauvery, Krishna, Periyar, Tungabhadra and Vaipar rivers. Tiger reserves in this landscape have around 26 major dams.

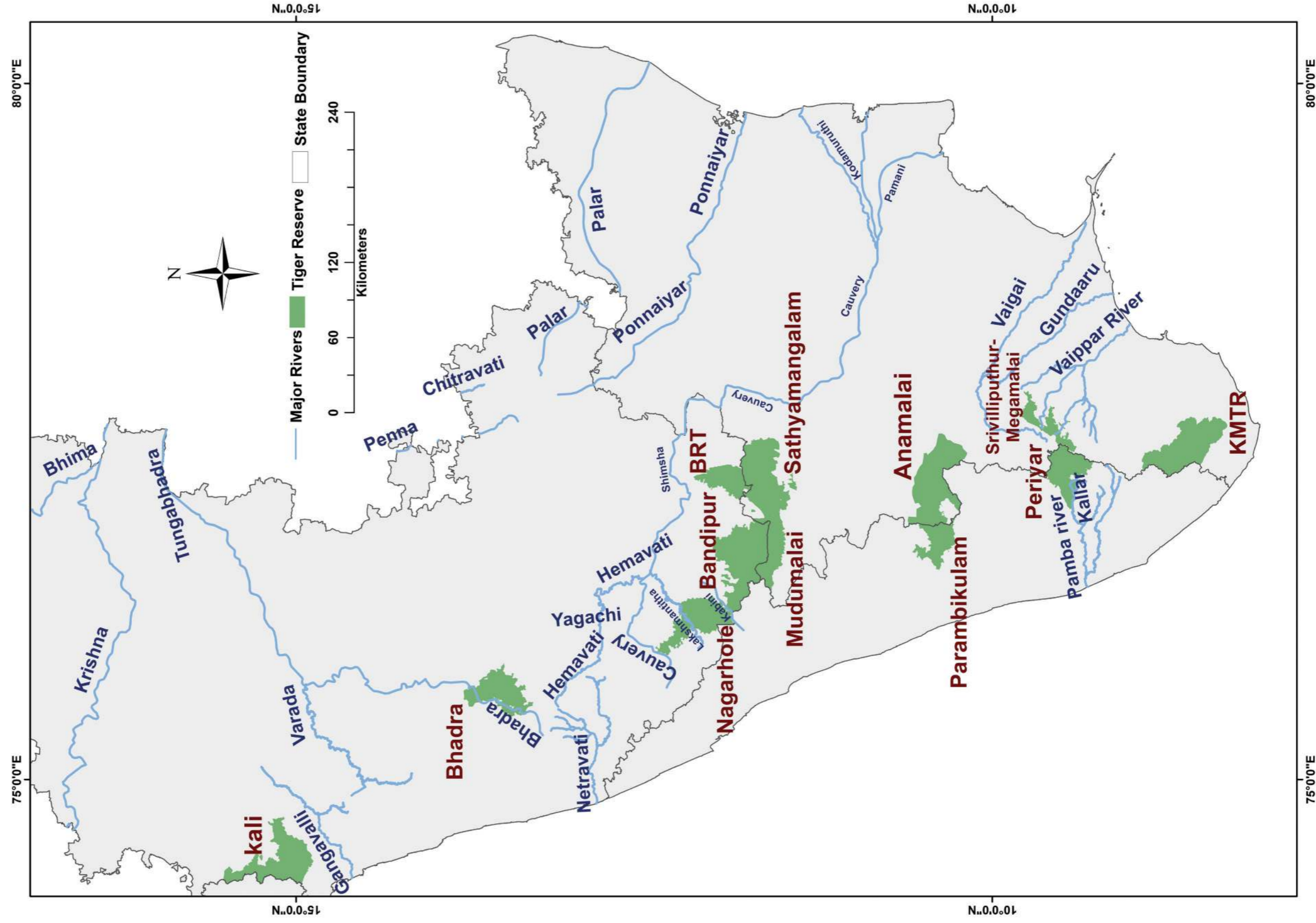


Figure 34 Map showing major rivers in Western ghats landscape

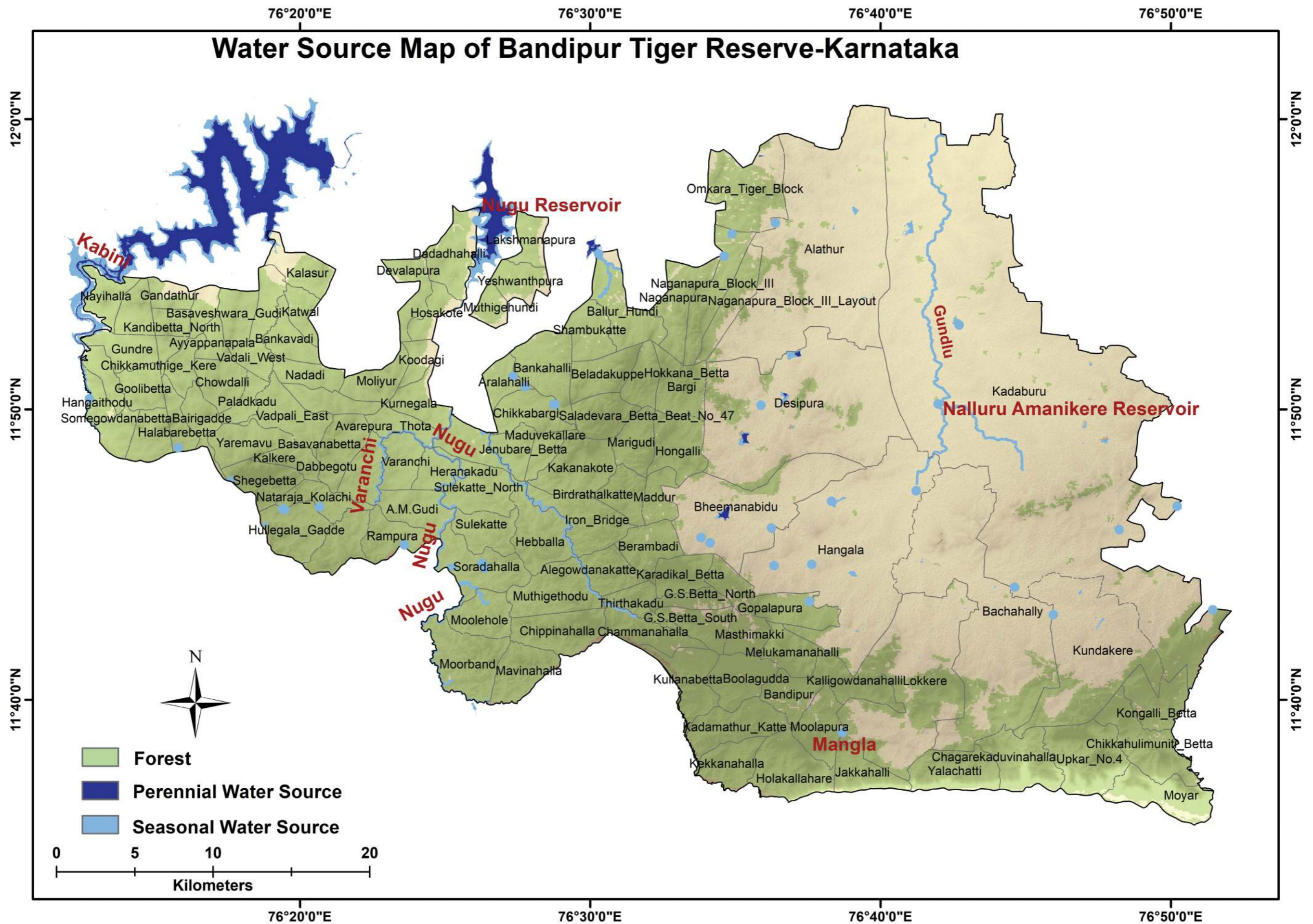


Figure 35 Water source map of Bandipur tiger reserve

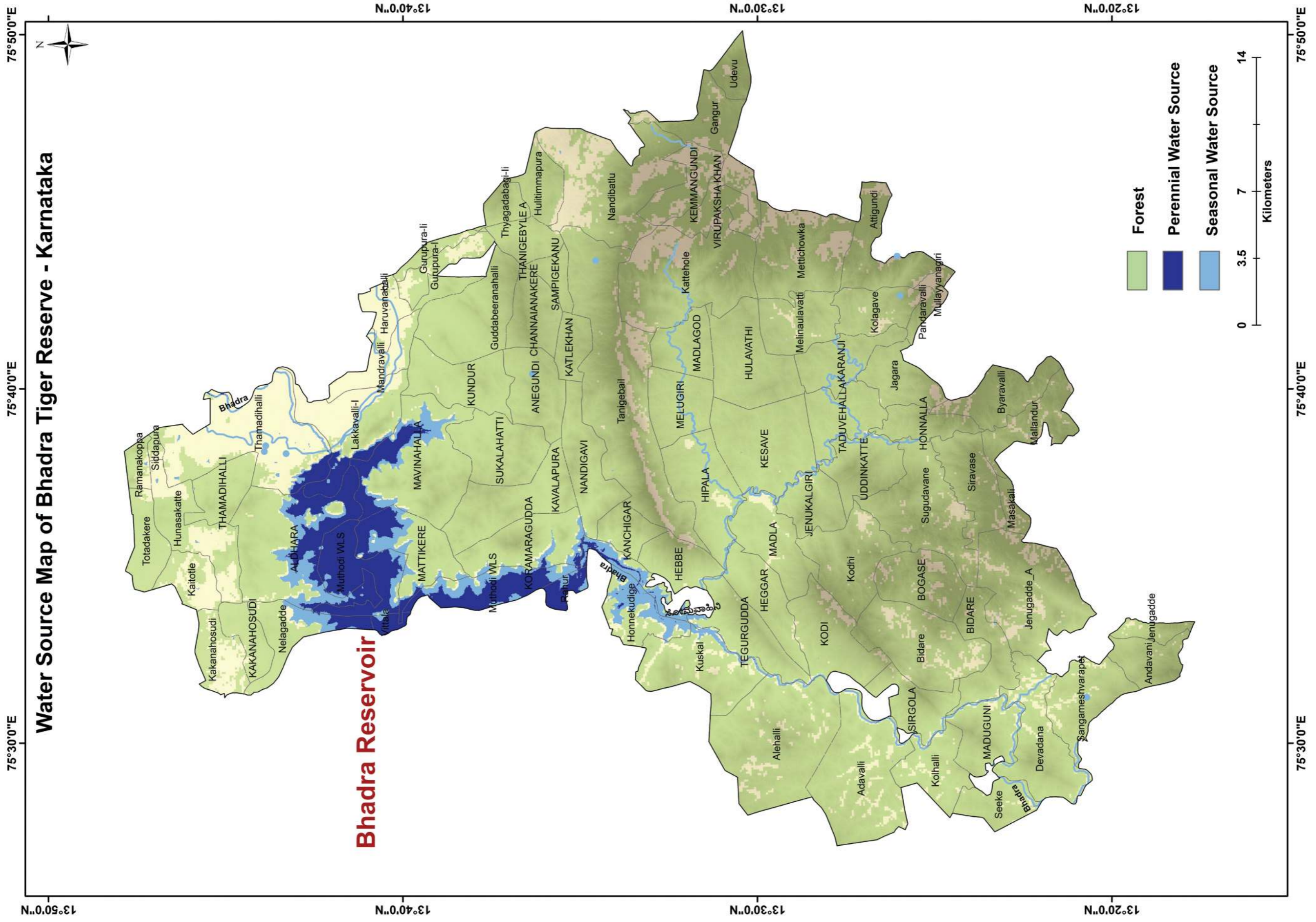


Figure 36 Water source map of Bhadra tiger reserve

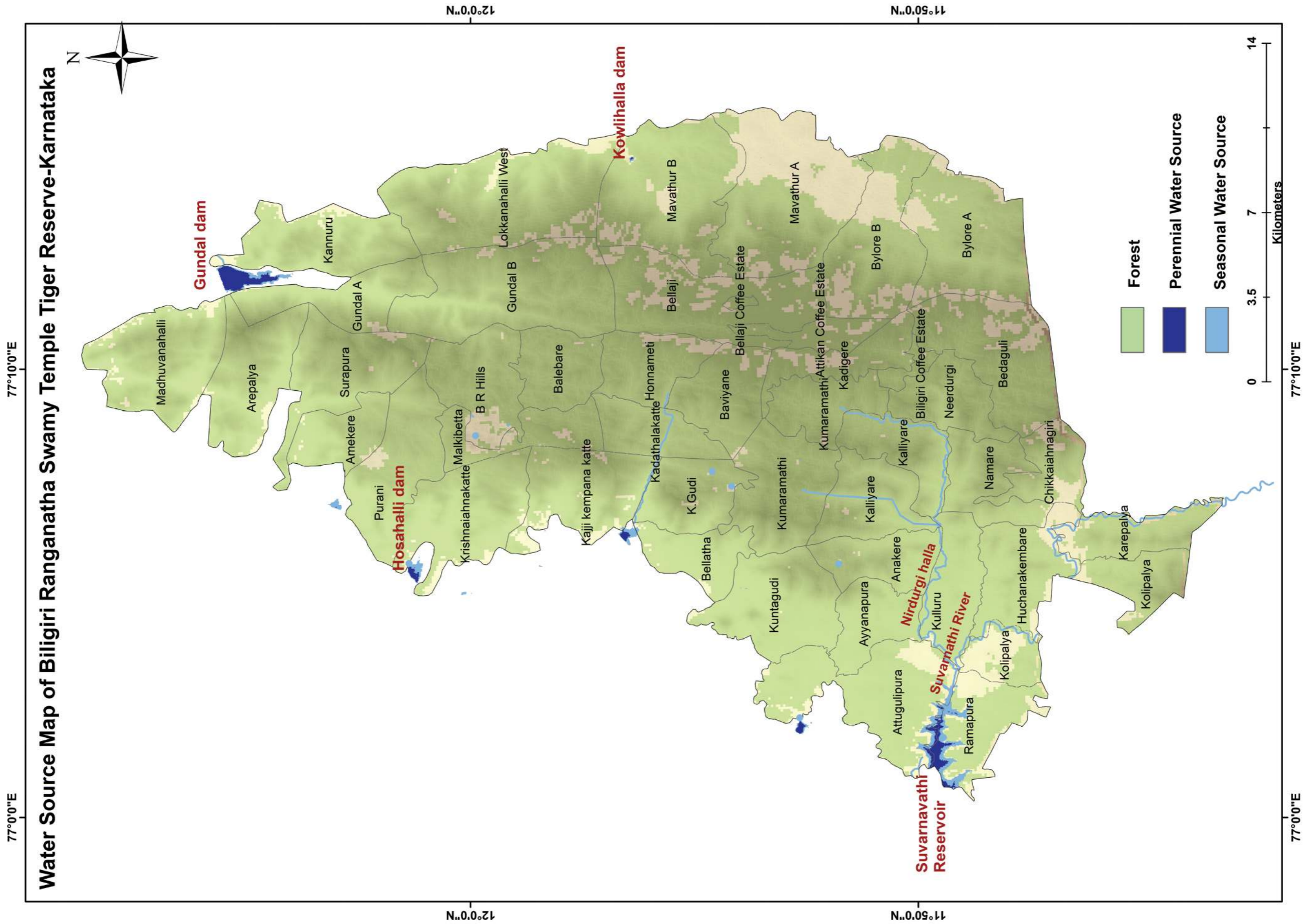


Figure 37 Water source map of Biligiri Ranganatha Swamy Temple tiger reserve

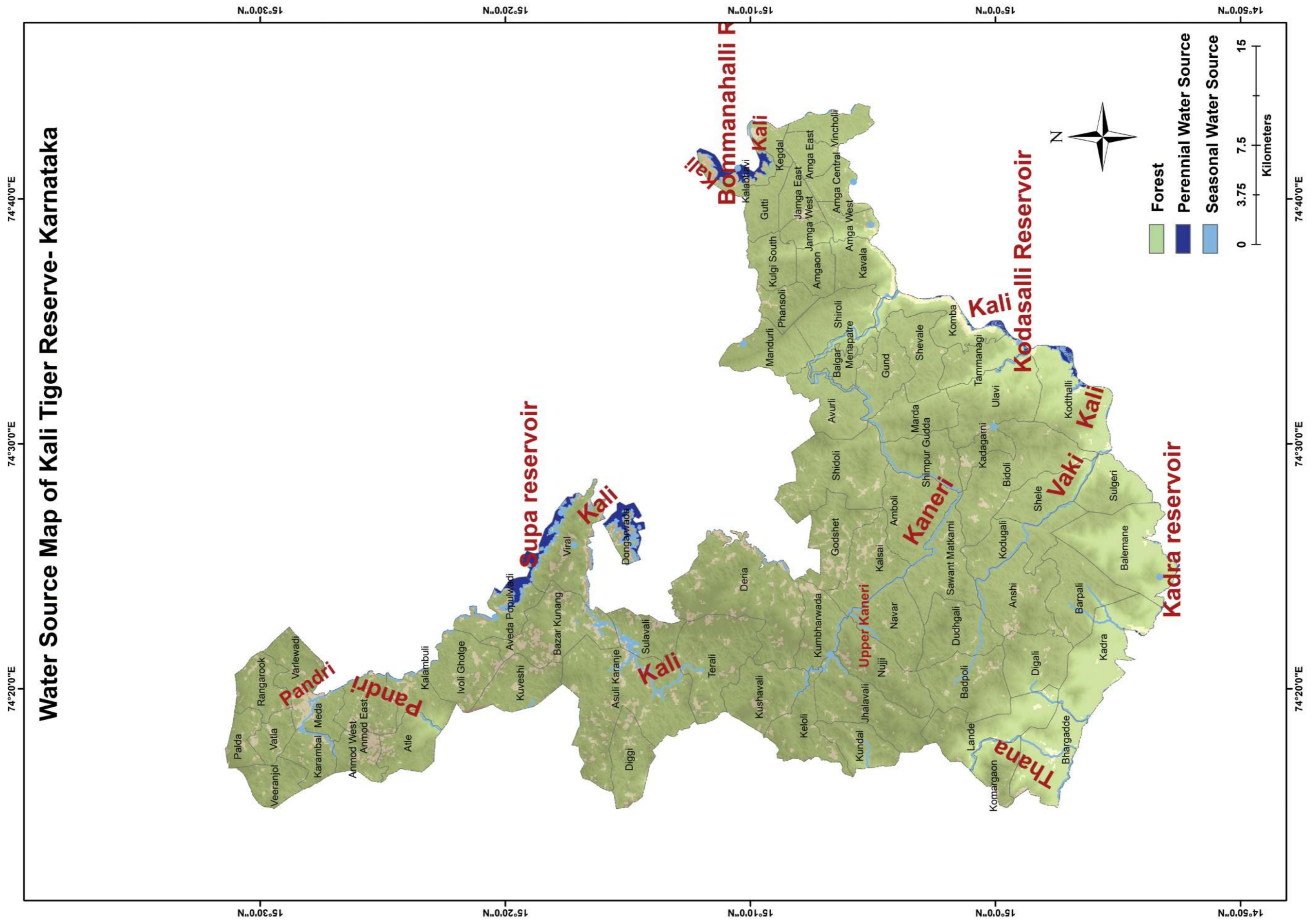


Figure 38 Water source map of Kali tiger reserve

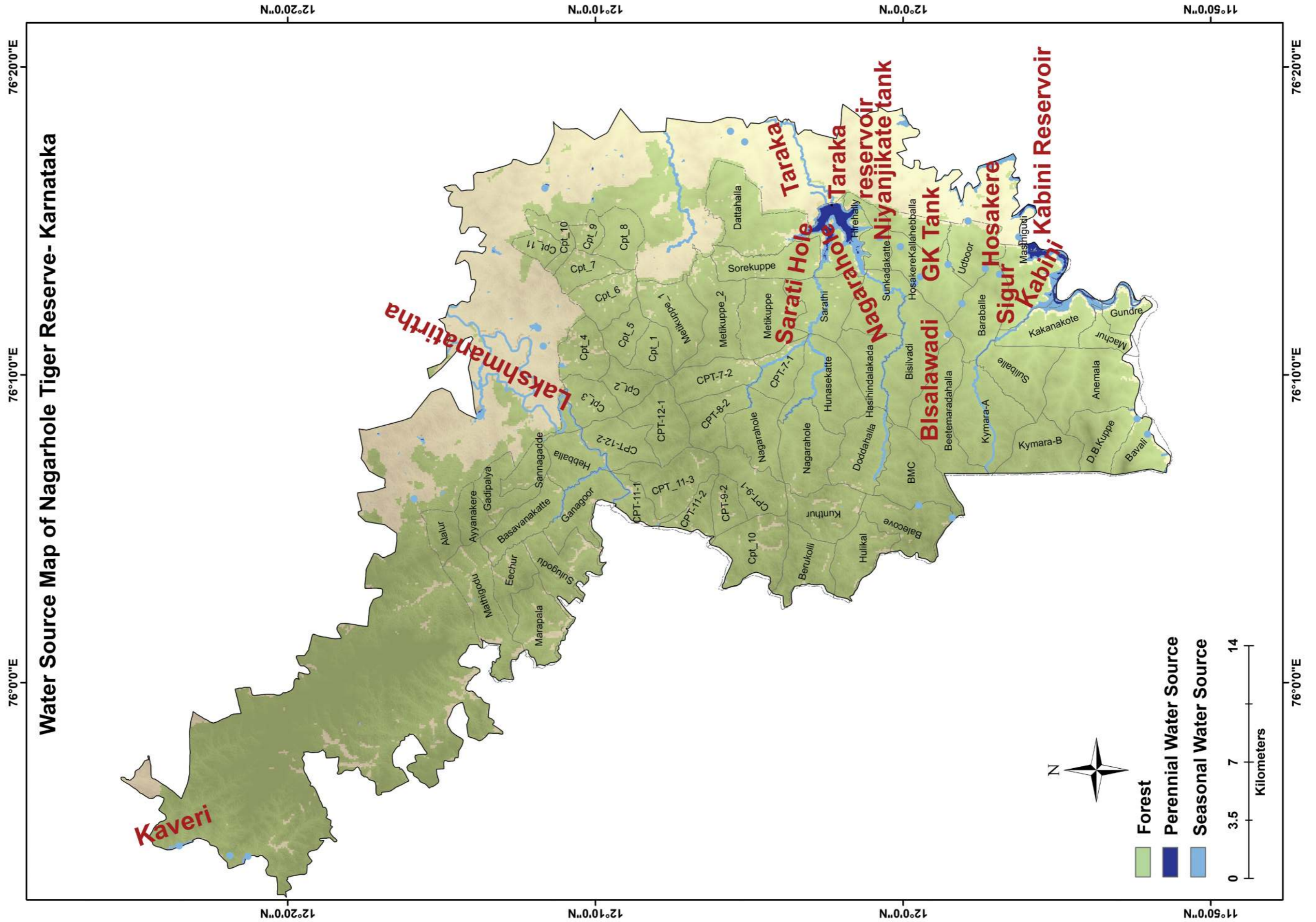


Figure 39 Water source map of Nagarhole tiger reserve

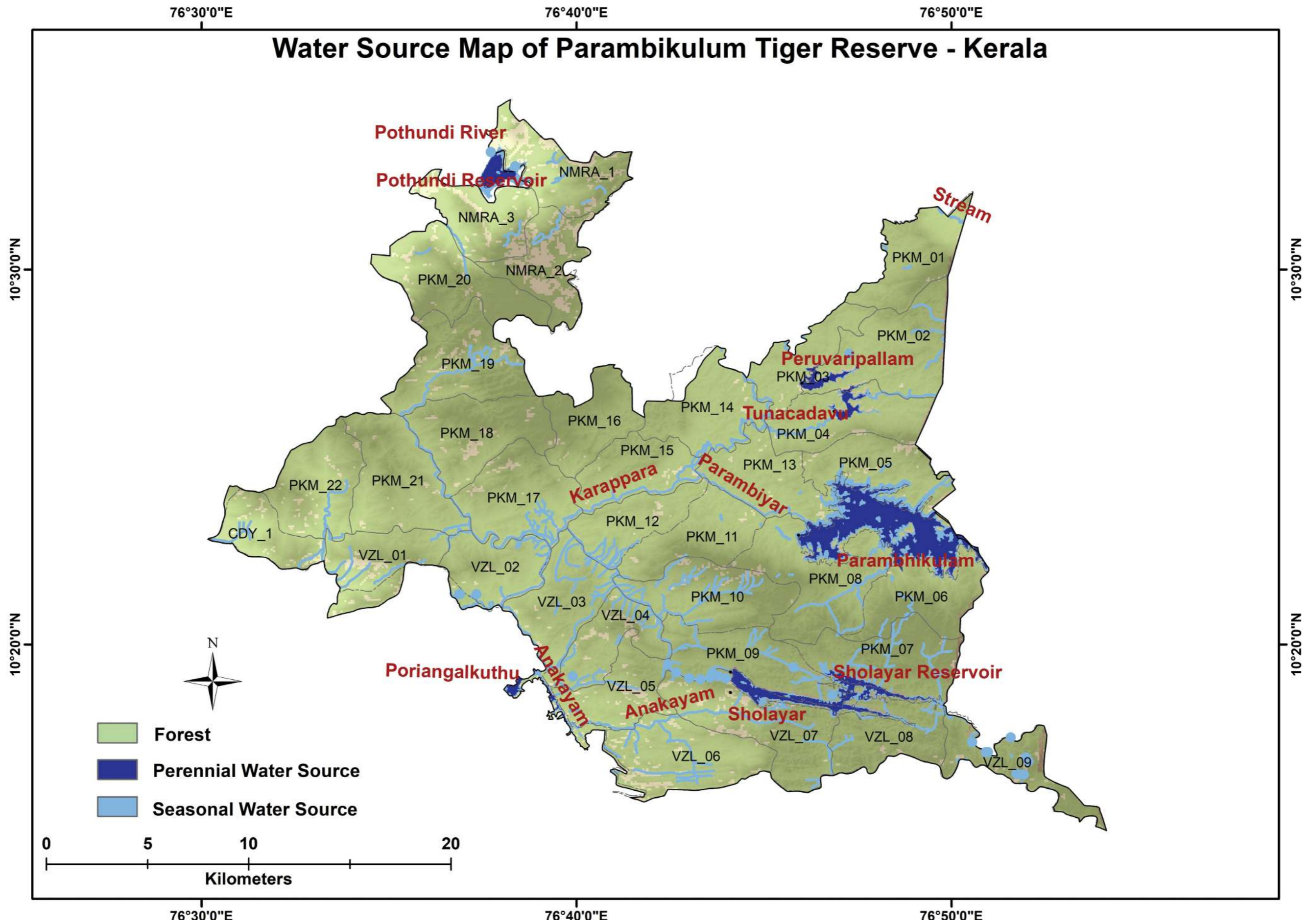


Figure 40 Water source map of Parambikulam tiger reserve

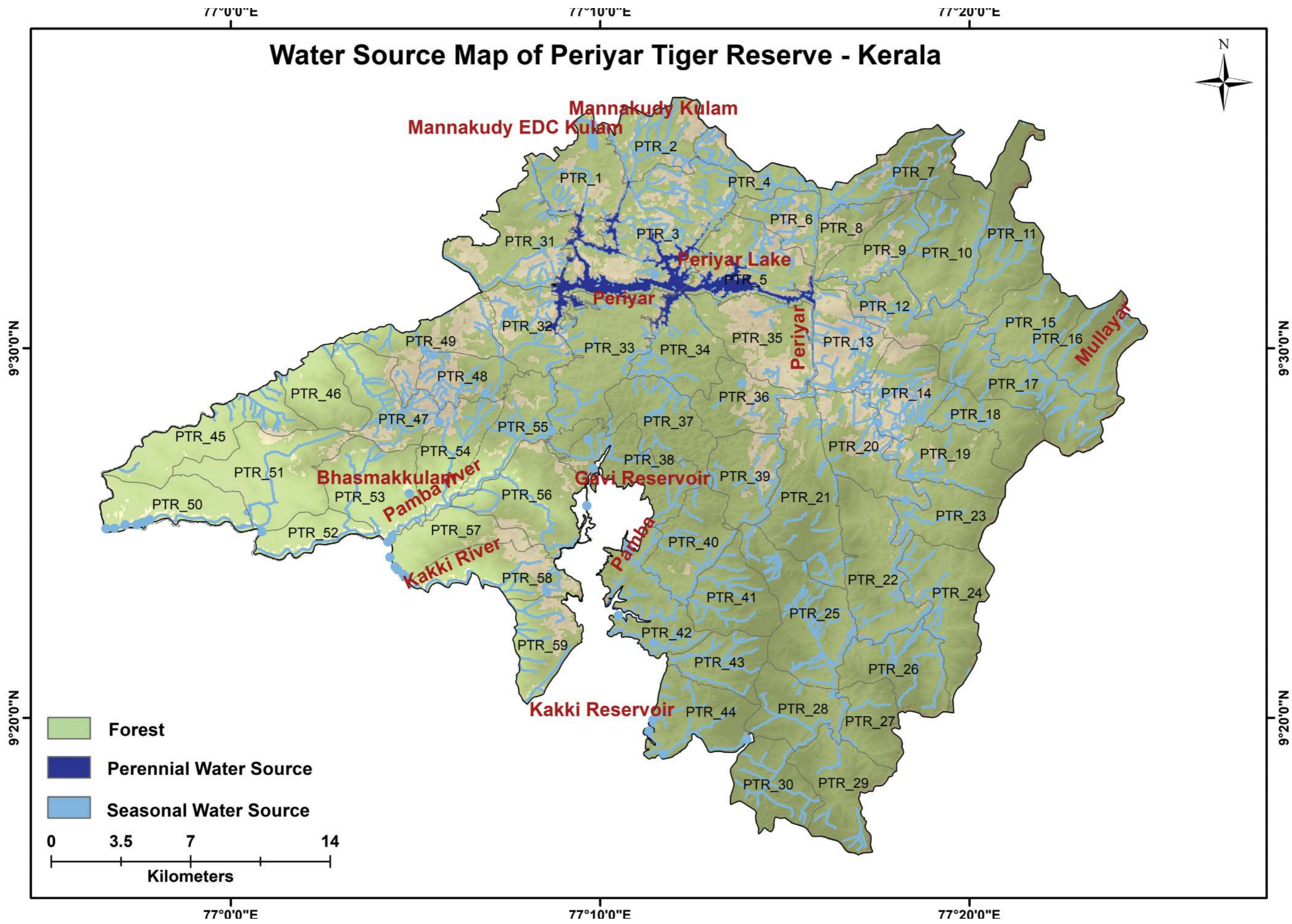


Figure 41 Water source map of Periyar tiger reserve

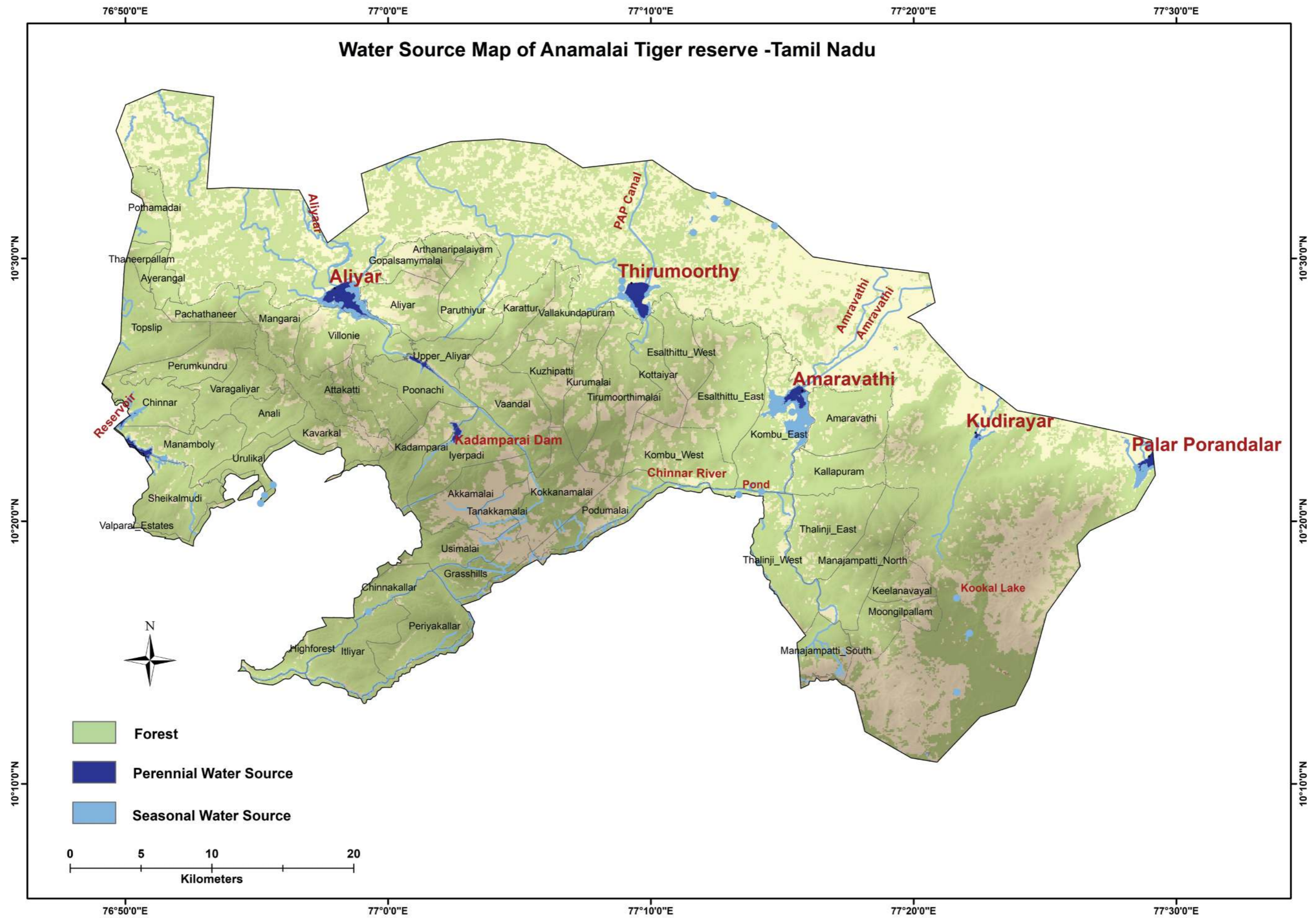


Figure 42 Water source map of Anamalai tiger reserve

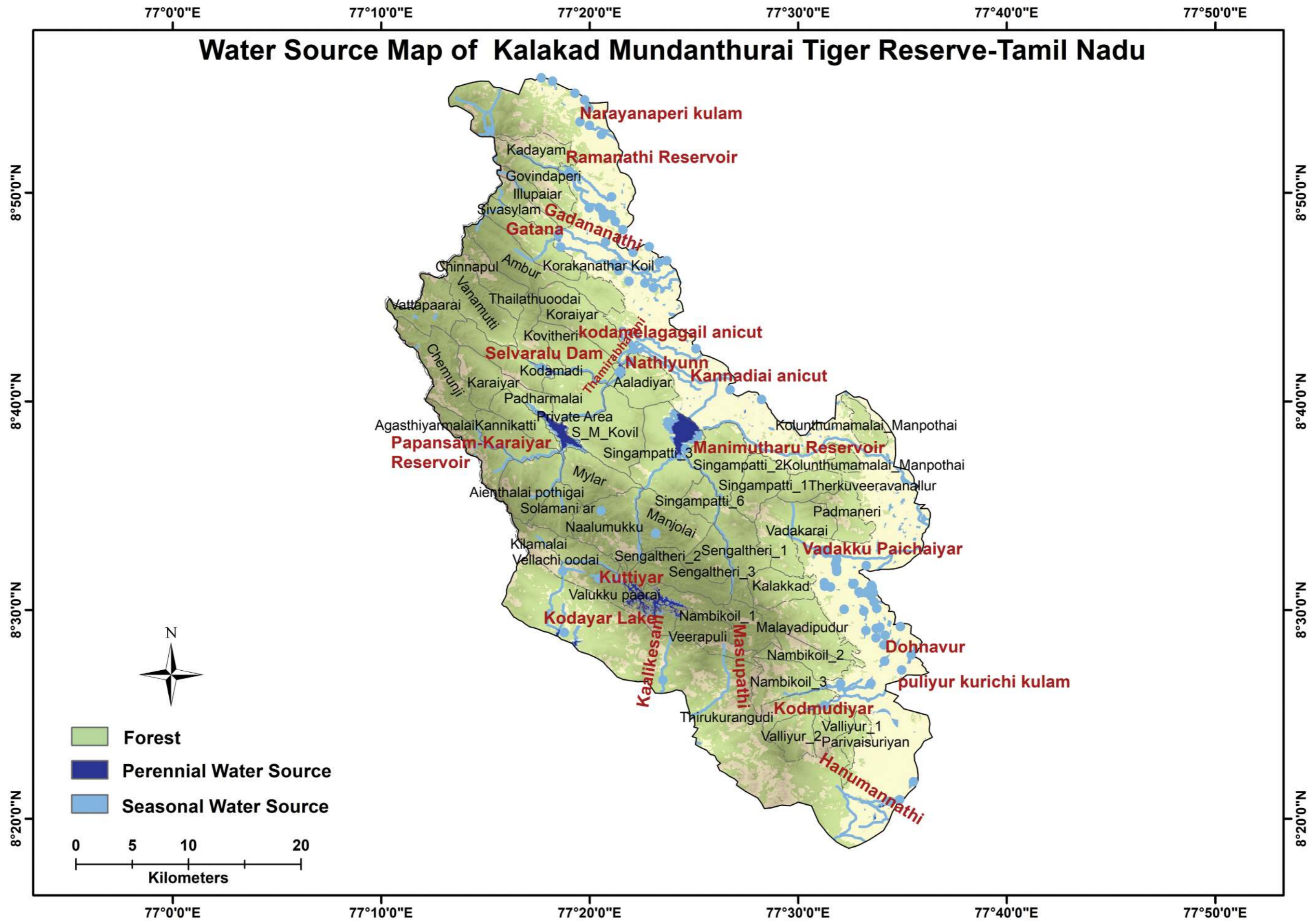


Figure 43 Water source map of Kalakad Mundanthurai tiger reserve

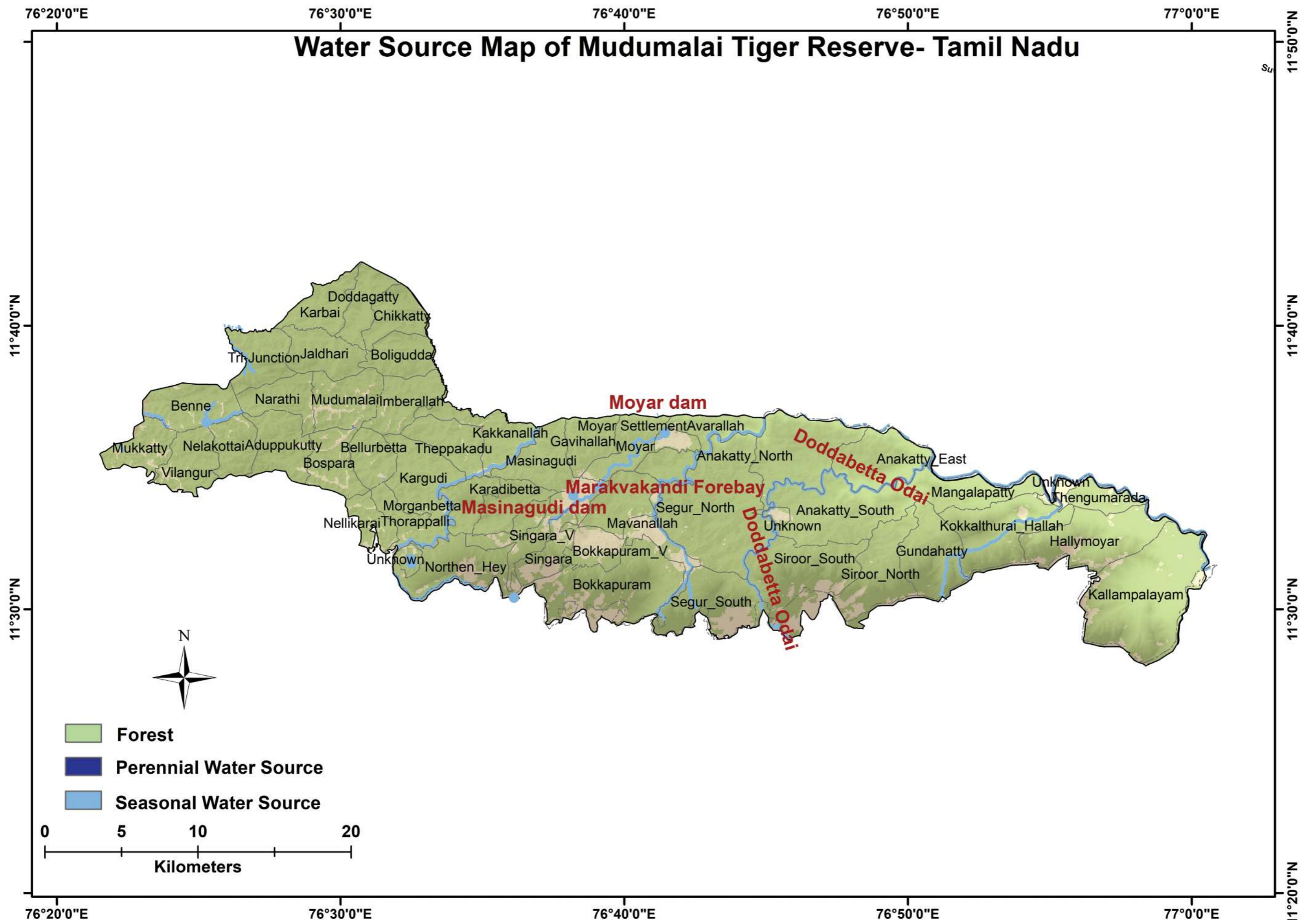


Figure 44 Water source map of Mudumalai tiger reserve

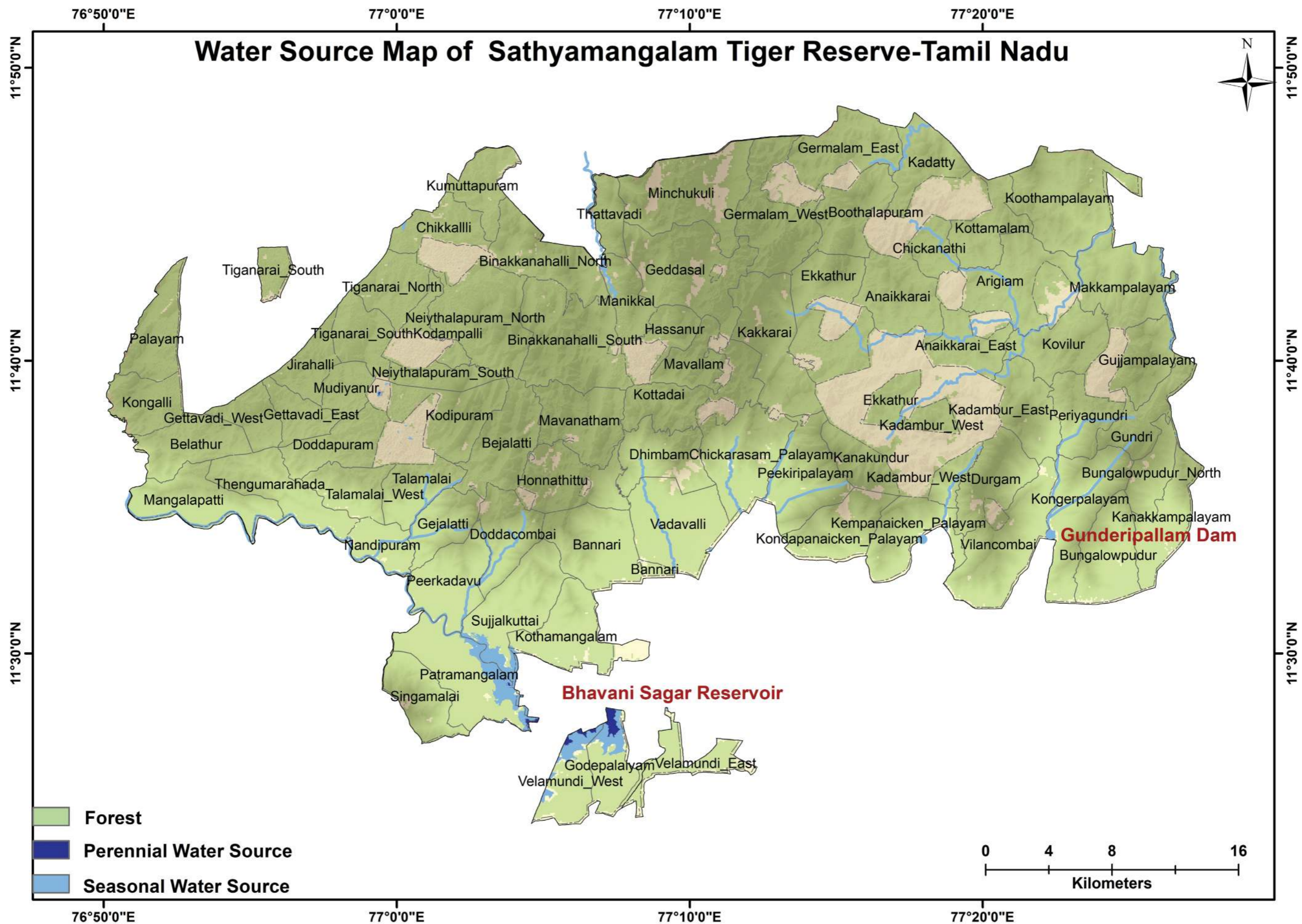


Figure 45 Water source map of Sathyamangalam tiger reserve

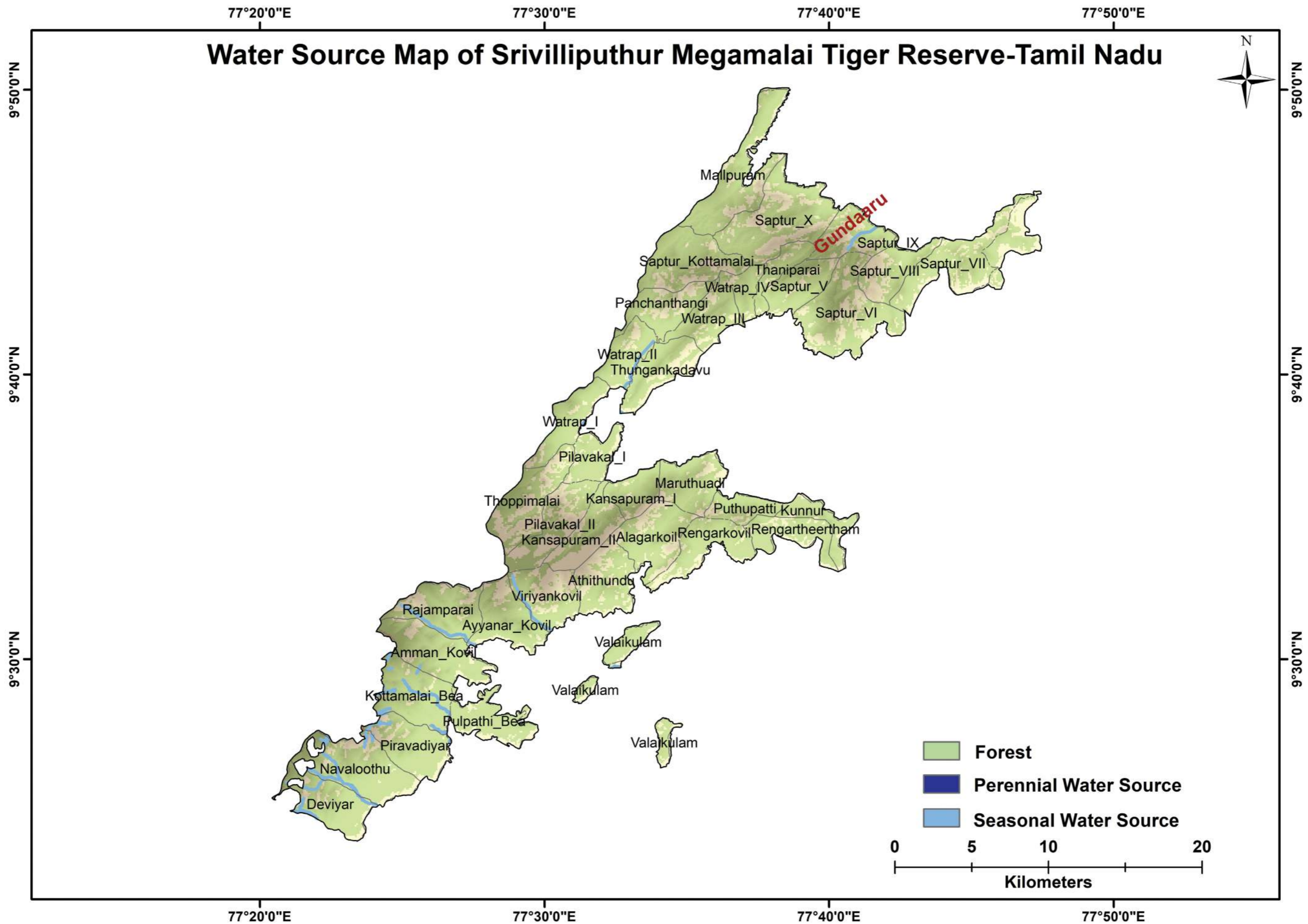


Figure 46 Water source map of Srivilliputhur Megamalai tiger reserve



Kaziranga Tiger Reserve, Assam

© Deb Ranjan Laha

VI. North Eastern Hills and Brahmaputra Flood Plains

The landscape comprises of three zones: the Upper Bengal Doars, the Brahmaputra flood plains and northeastern hill region. The landscape has 8 tiger reserves, mainly in the states of Assam, Arunachal Pradesh, Mizoram and West Bengal. These parks are in the watersheds region of rivers Lower Ganga, and Brahmaputra.

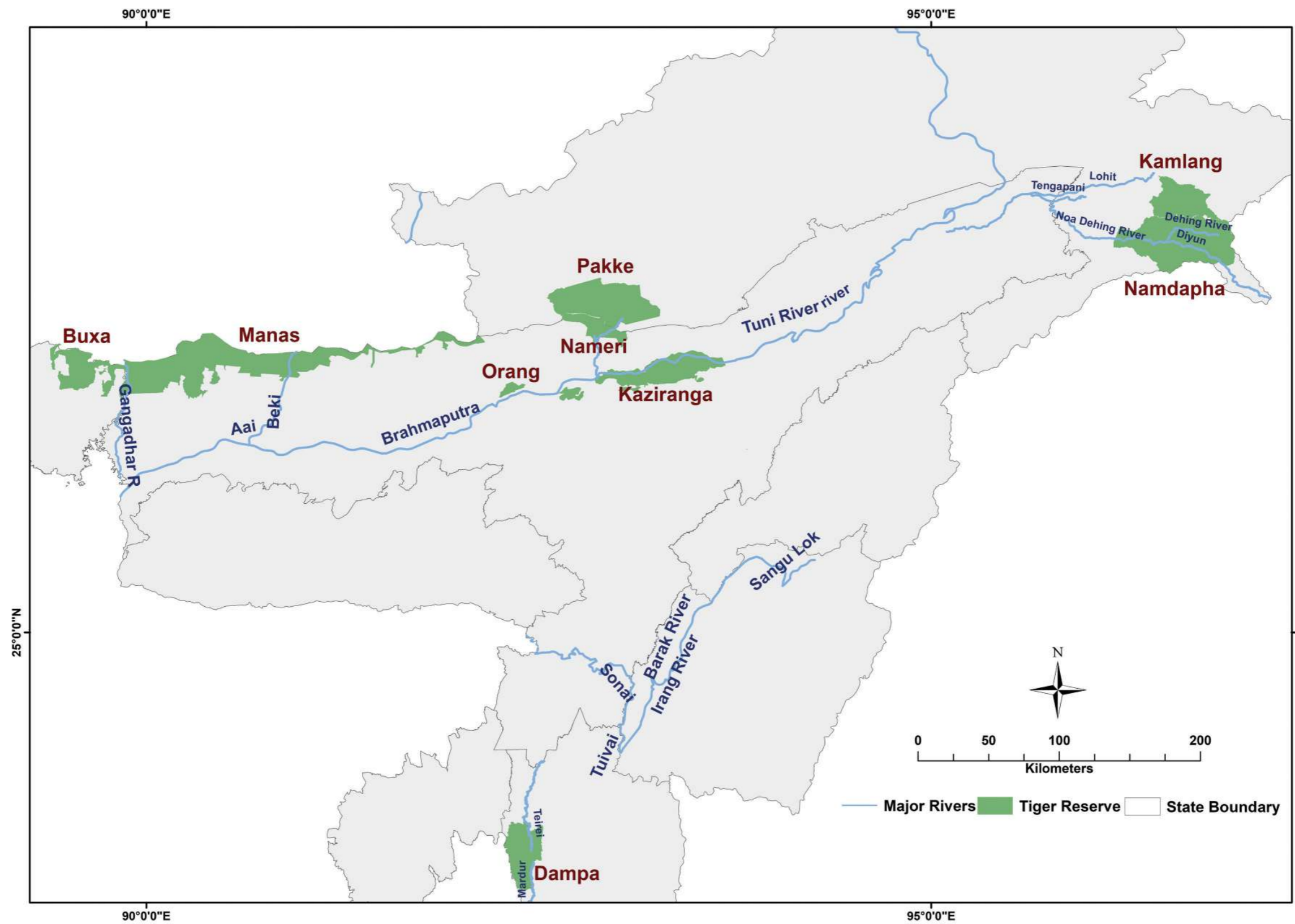


Figure 47 Map showing major rivers in North Eastern landscape

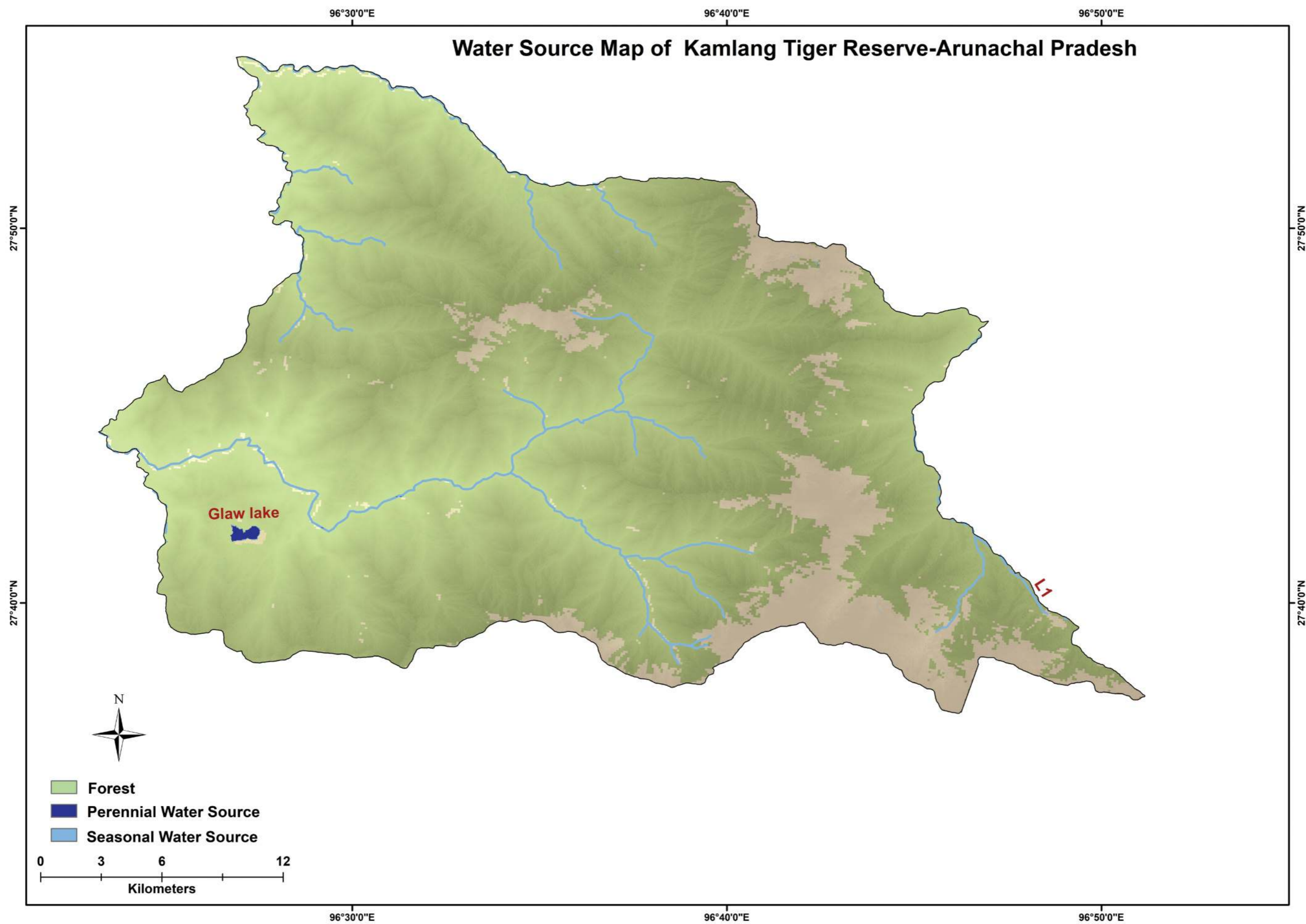


Figure 48 Water source map of Kamlang tiger reserve

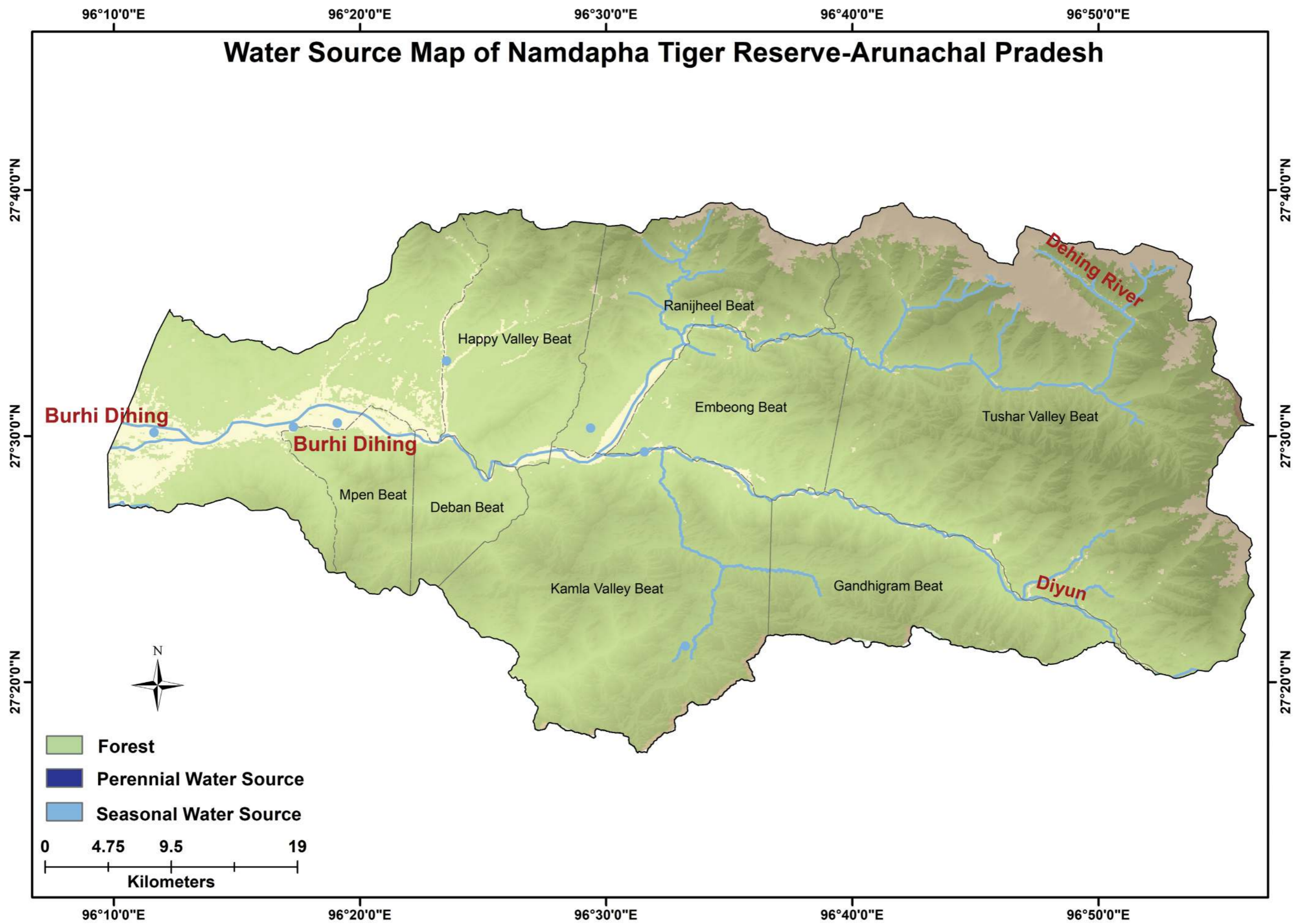


Figure 49 Water source map of Namdapha tiger reserve

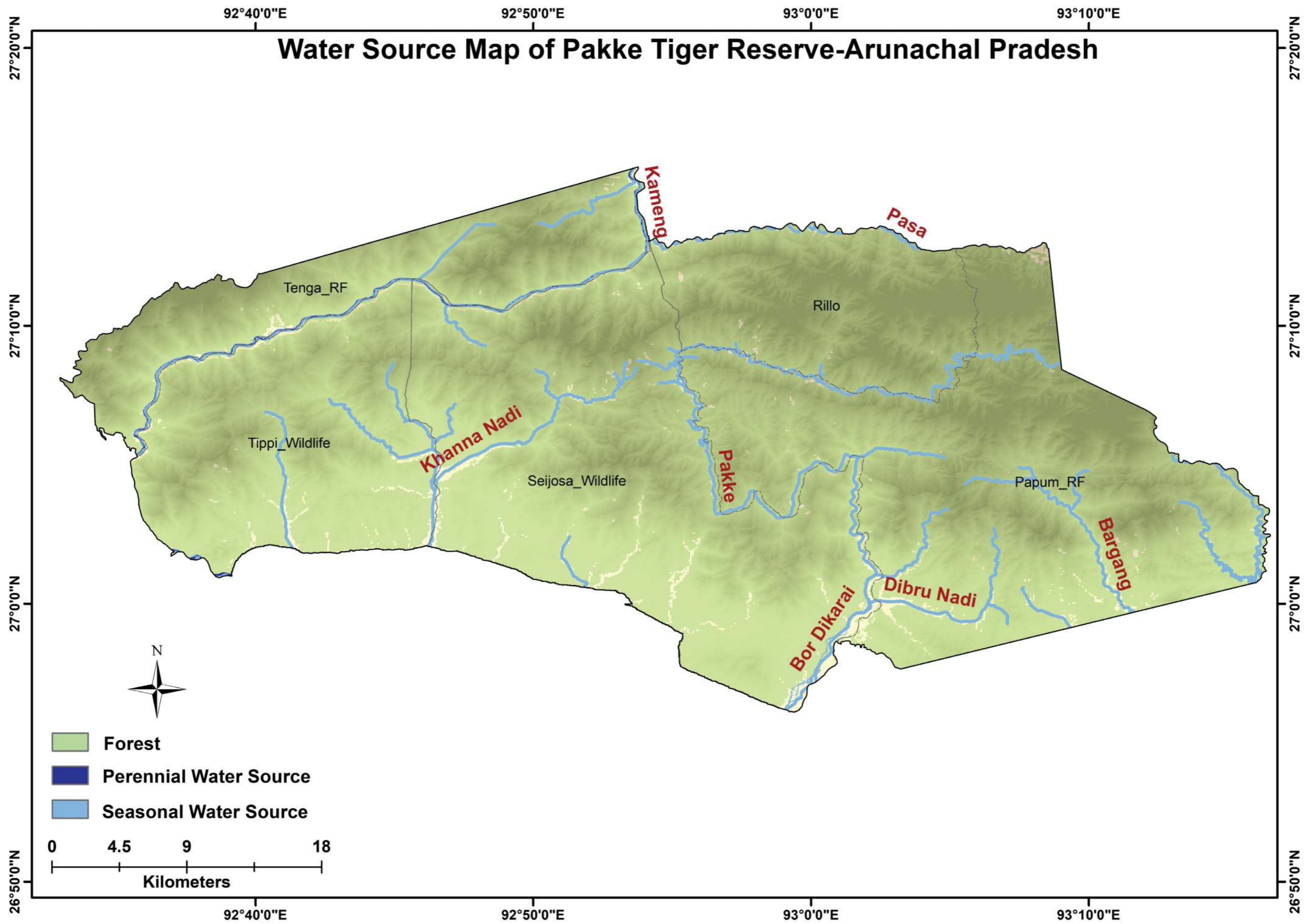


Figure 50 Water source map of Pakke tiger reserve

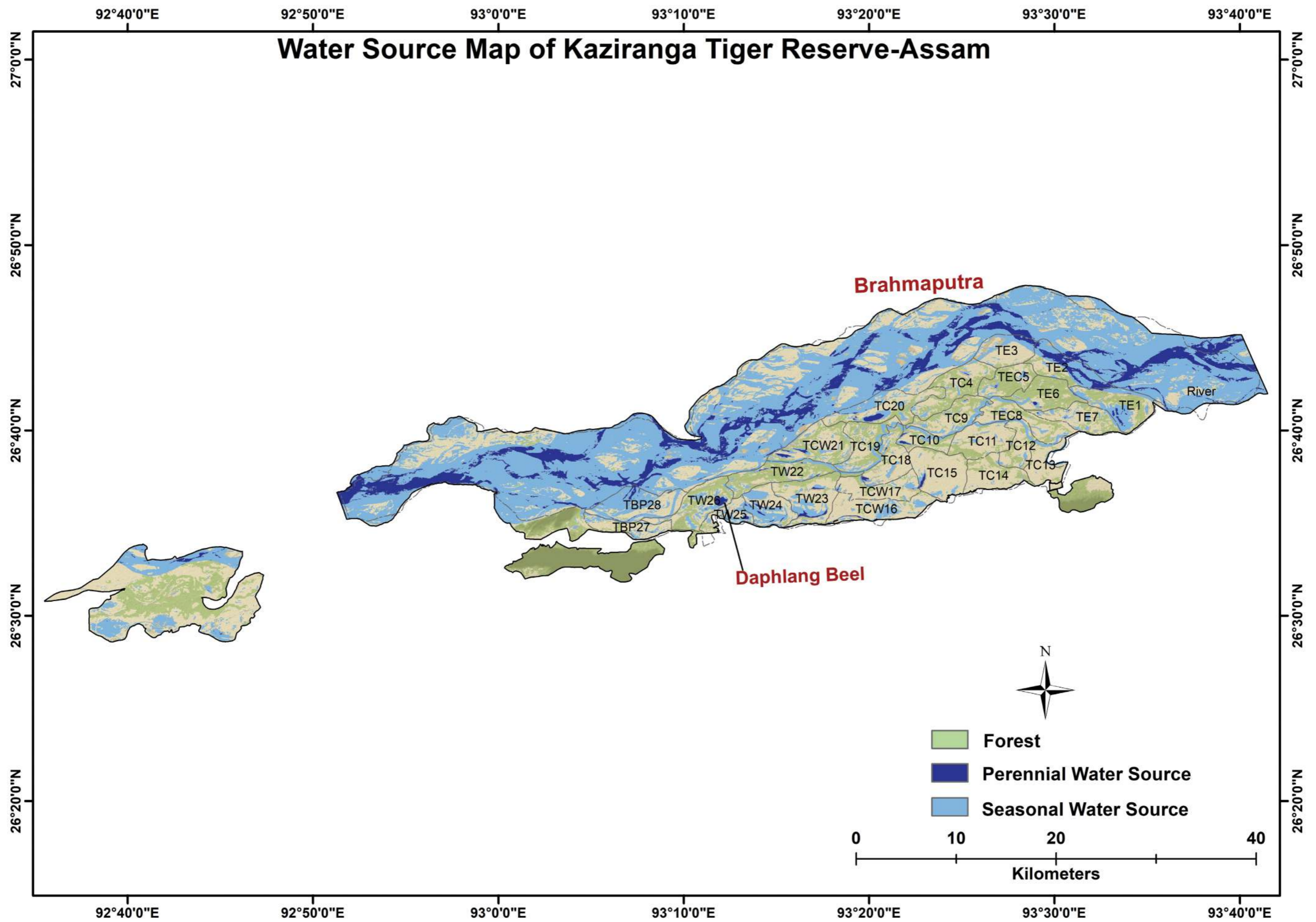


Figure 51 Water source map of Kaziranga tiger reserve

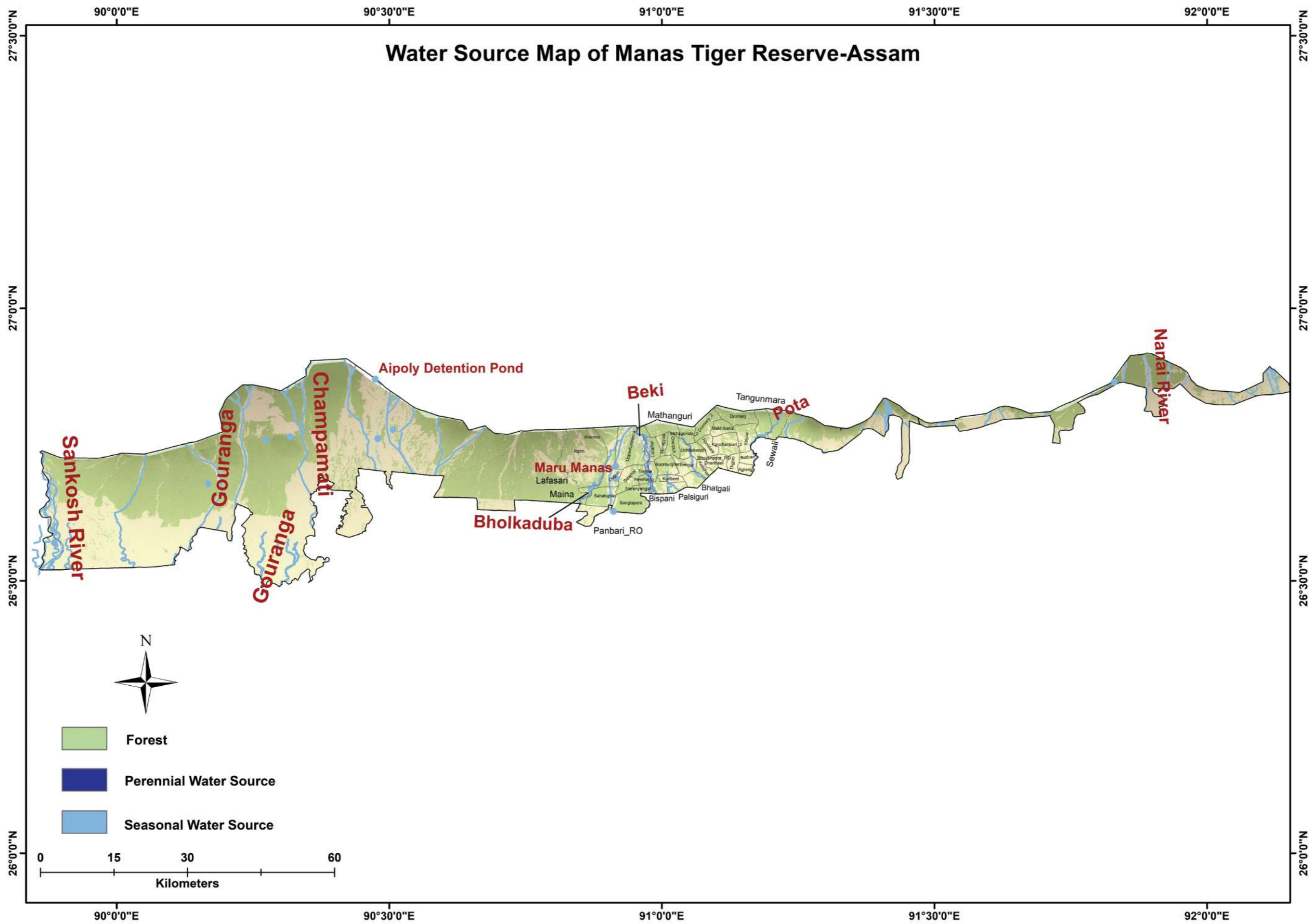


Figure 52 Water source map of Manas tiger reserve

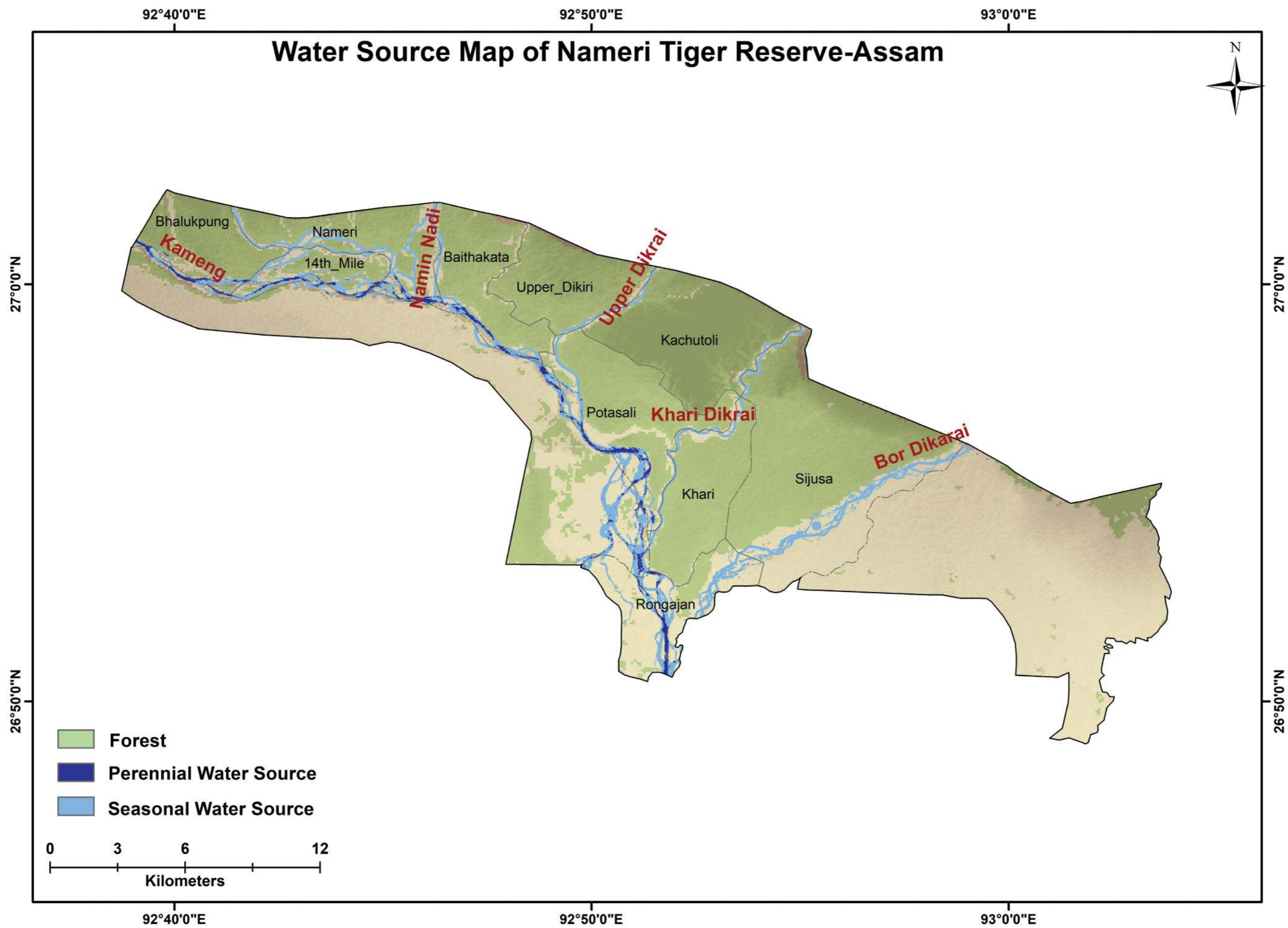


Figure 53 Water source map of Nameri tiger reserve

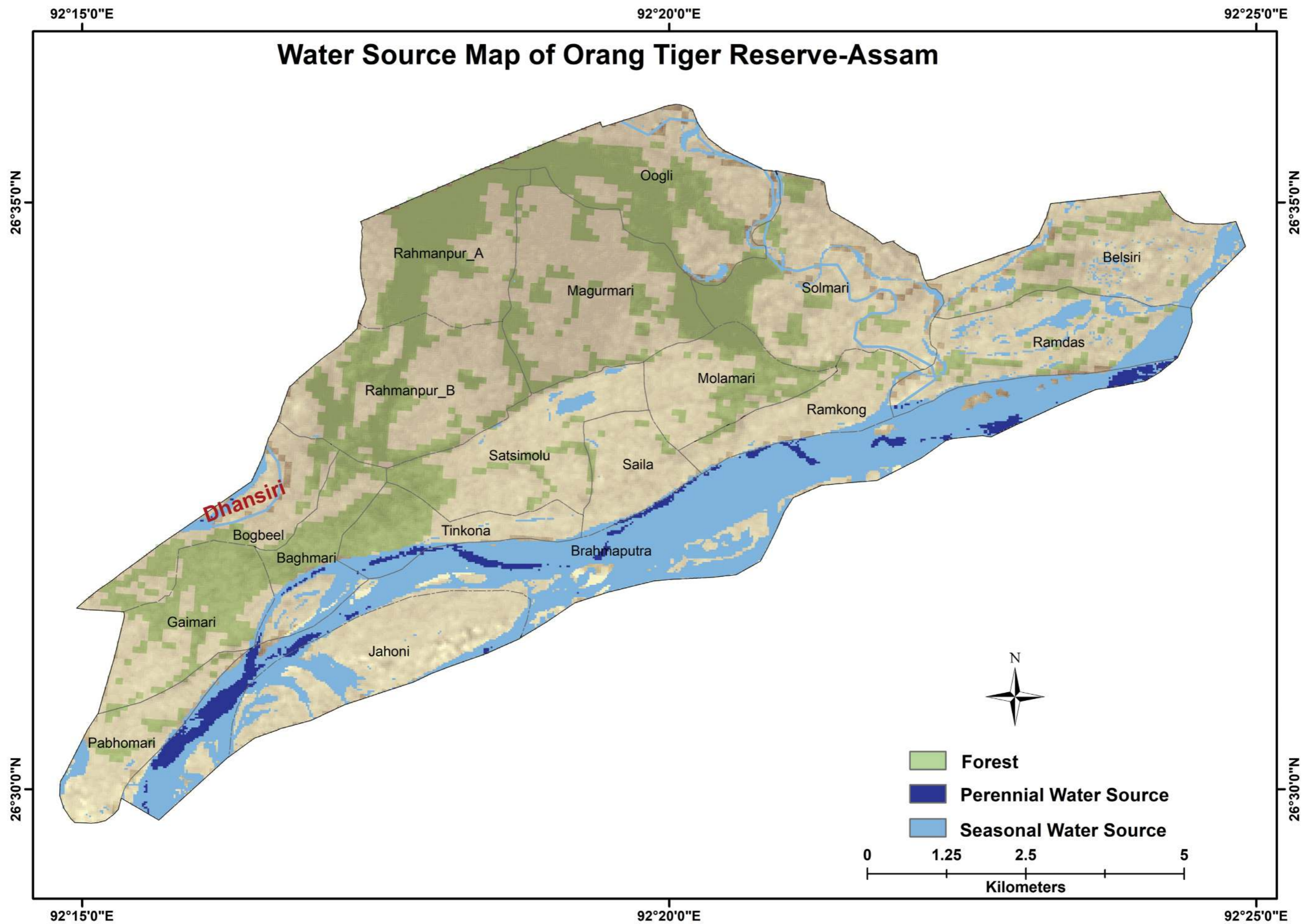


Figure 54 Water source map of Orang tiger reserve

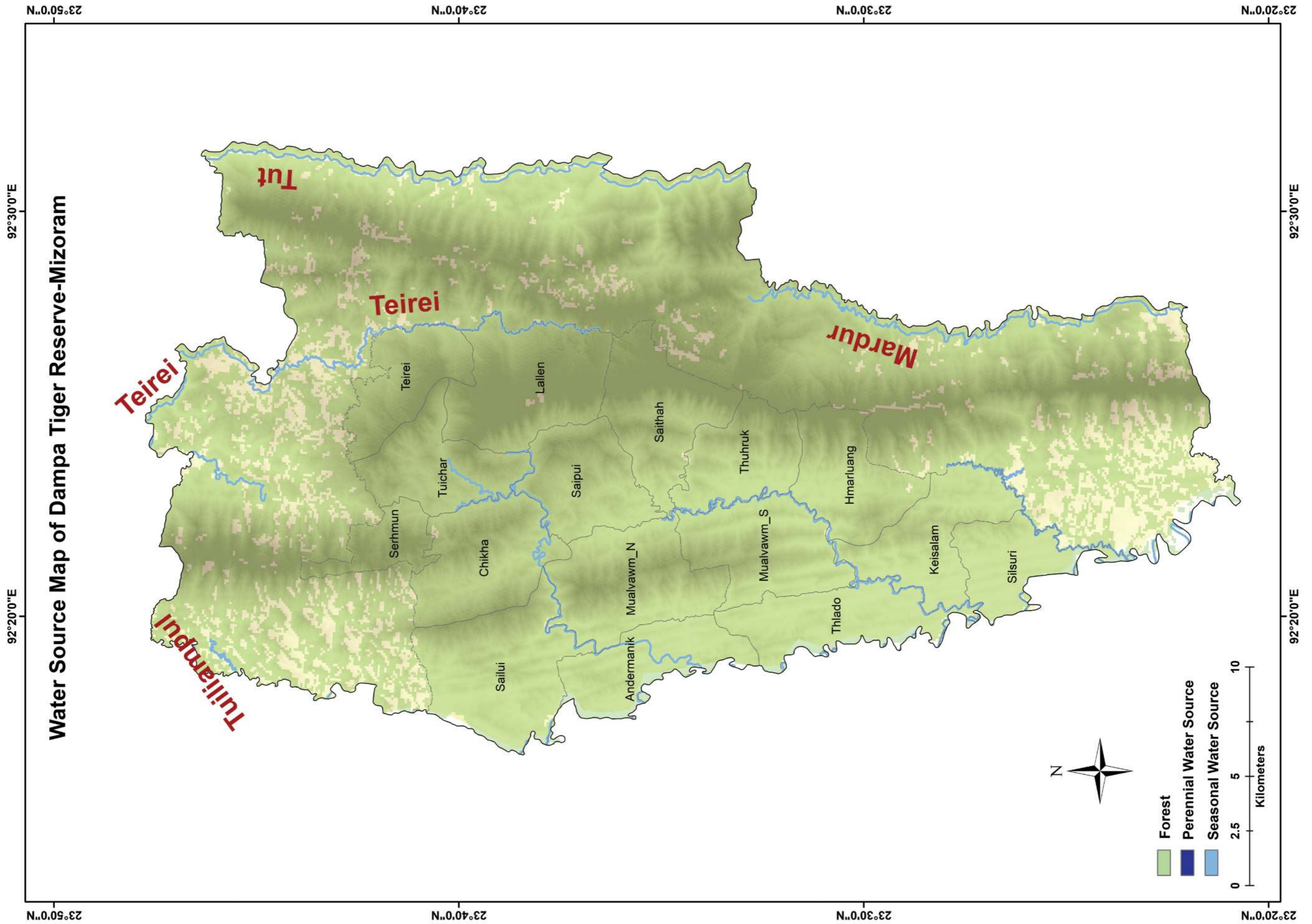


Figure 55 Water source map of Dampa tiger reserve

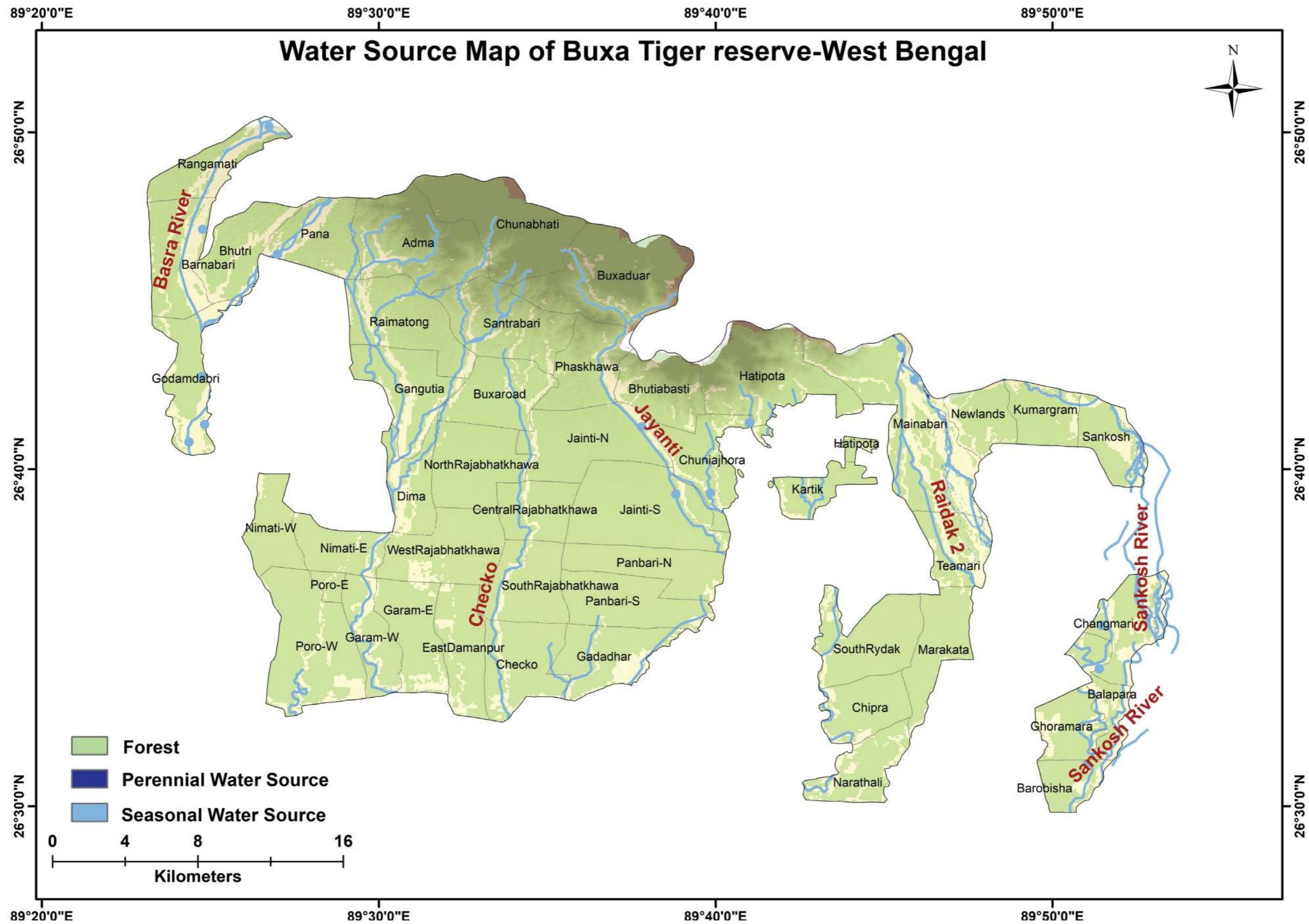


Figure 56 Water source map of Buxa tiger reserve



Sundarbans, West Bengal

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Water Source Atlas
of Tiger Reserves

VII. Sundarbans

Sundarbans is the world's largest mangrove forested tiger habitat located at the estuarine phase of river Ganges and Brahmaputra spreading across India and Bangladesh.



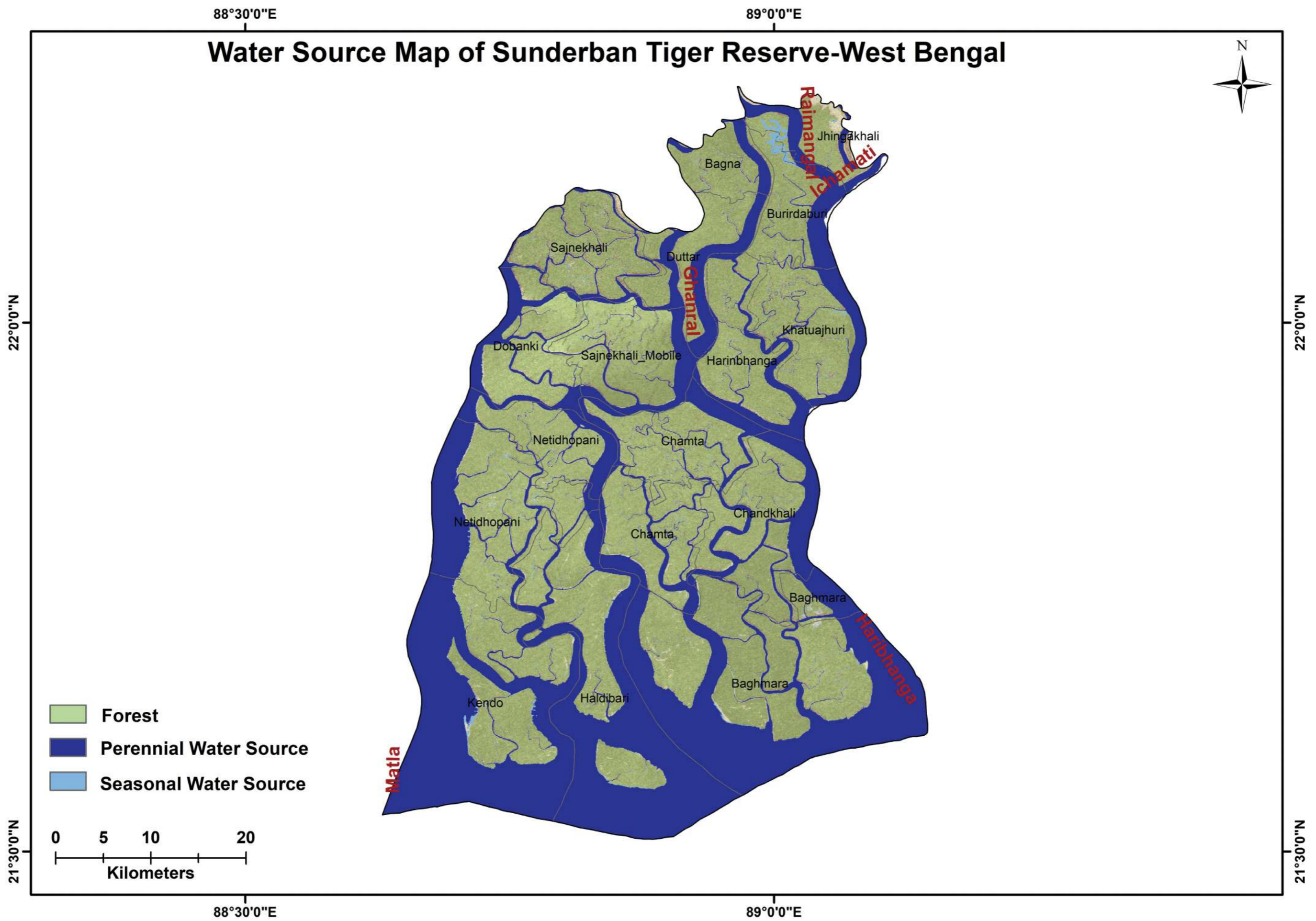


Figure 57 Water source map of Sundarbans tiger reserve

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Ministry of Environment, Forest
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