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KARNATAKA TIGER CONSERVATION PROJECT

FINAL REPORT BY THE WILDLIFE CONSERVATION SOCIETY

K. Ullas Karanth, Ph.D.

Wildlife Conservation Society- India Program / Centre for Wildlife Studies
Bangalore
INDIA

Praveen Bhargav

CENTRE FOR WILDLIFE STUDIES
BANGALORE
INDIA

N. Samba Kumar

CENTRE FOR WILDLIFE STUDIES
BANGALORE
INDIA

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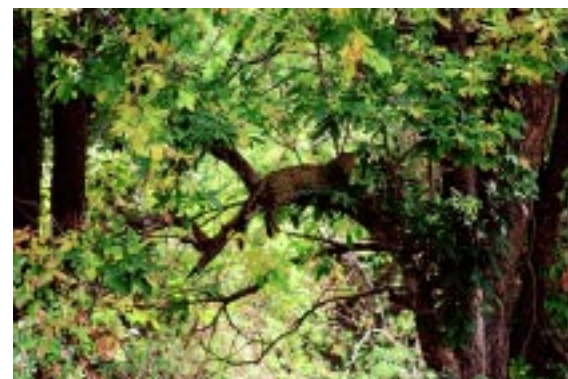
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..... **Karnataka Tiger Conservation Project**



Pic: K.U. Karanth

A tigress Scent marking.



Pic: K.U. Karanth

Tiger habitat's also harbour rich bio-diversity.



Pic: K.U. Karanth

A pack of Dhole.



Pic: K.U. Karanth

A Tusker.

EXECUTIVE SUMMARY

The precarious conservation status of the tiger (*Panthera tigris*) has aroused worldwide concern in recent years. Tigers are under threat from several factors: depletion of their prey base, direct killing and, the shrinkage, fragmentation and degradation of their habitat. These pressures result from a diversity of proximate causes that are ultimately driven by demographic and economic growth, as well as by changing cultures and social attitudes.

Wildlife Conservation Society (WCS) has initiated several projects in the tiger range countries. These projects aim at obtaining a clear understanding of tiger ecology in specific contexts, identifying the major threats to tigers, and then, attempt to address these threats. Karnataka Tiger Conservation Project (KTCP), supported by Save the Tiger Fund of the National Fish and Wildlife Foundation and Exxon Corporation, the 21st Century Tiger Fund and several other WCS donors, was implemented from January 1998 to June 2001. It was executed in the State of Karnataka, India, in association with the local government and local conservation partners.

KTCP evolved on a foundation of WCS-supported tiger research and conservation work in India since 1988 in collaboration with a network of local conservation partners led by Centre for Wildlife Studies, and Wildlife First. The project sites comprised four large blocks of tiger habitat, located in the Western Ghats (recognized as one among the world's 18 biodiversity hotspots). Administratively, these sites covered an area of 2600 km² in the State of Karnataka and formed a part of the Level-1 Tiger Conservation Unit (TCU-55) identified earlier under the WCS-WWF (USA) priority setting exercise. These four sites covered the designated nature reserves of Nagarahole, Bandipur, Bhadra and Kudremukh that harbor some of the best breeding habitats for tigers. These sites provided opportunities for conserving viable tiger populations, within a larger landscape matrix

under multiple uses such as forestry and agriculture.

KTCP was driven by the WCS conservation philosophy of seeking innovative and practical solutions for wildlife conservation problems within the framework of sound science rather than mere passion for tigers. Initially, based on past research, field surveys, and, consultations with the staff of the State Forest Department as well as with local conservation partners, the project identified the following critical tiger conservation needs:

1. Lack of necessary baseline data on tigers, their prey and habitats as well as on human impacts on tigers, to establish reliable benchmarks and evaluate tiger conservation efforts.
2. Inadequate protective capacity in the Forest Department, particularly in terms of lack of patrol vehicles, communication equipment and essential field-gear for protective staff.
3. Improving the morale of the frontline staff by providing them with insurance cover, rewards for meritorious performance and improving their capacity for law enforcement and monitoring activities through specifically tailored training programs.
4. Increasing public support for the effective enforcement of wildlife protection laws, and enhancing the awareness of tiger conservation values in the local communities around the project sites through conservation education programs.
5. Building a cadre of local community leaders who support tiger conservation for scientific and cultural reasons. Building capacity among such local conservationists to scientifically monitor tiger conservation and address threats to tigers arising from human impacts.
6. Consolidating tiger habitats in the long-term by reducing fragmentation and mitigating



human-tiger conflicts by actively promoting voluntary resettlement of human populations currently occupying critical tiger habitats within the project reserves.

The total investment in the project was 17,000,000 rupees (US \$ 375,000). Out of this, a total of 90,50,000 rupees (US \$ 210,000) was provided by the project in the form of equipment and other support and services directly to the Karnataka State Forest Department, which is the government agency in charge of managing the four project sites. The balance amount was invested in research, training, conservation monitoring, conservation education and community interfacing activities taken up by WCS conservation partners.

Under the research and monitoring component of the project, accurate baseline maps depicting essential ecological and management-related features were prepared from field surveys using Global Positioning Systems and Geographic Information Systems for all the four sites. Baseline estimates of densities of prey species were generated using line transect sampling at three of the four sites (Nagarahole, Bhadra and Bandipur). Densities of tigers were also estimated using camera traps within the rigorous framework of capture recapture sampling. The densities of tigers recorded at these three sites ranged: 3.4 tigers/100 km² in Bhadra Reserve, 12.0 tigers/100 km² in Bandipur and 11.5 - 15.2 tigers/100 km² at Nagarahole. At the fourth site, Kudremukh, due to sampling and logistical challenges, these advanced techniques could not be readily used, and only simple encounter rate based indices were developed.

Fifteen 4-wheel drive patrol vehicles, 2 high-speed patrol boats, 15 wireless stations, 8 vehicle based wireless sets and 35 hand-held sets were donated to the Karnataka Forest Department to improve the protective infrastructure at the four reserves. 1746 field kits, each consisting of a set of uniforms, field boots, and raingear were provided to frontline staff in the four reserves. Among these

staff members, 280 persons who were not covered by official insurance schemes were provided with insurance cover of 150,000 rupees each against accidental death or disablement. In addition, six state level Tiger Conservation awards and 30 local awards were given out to staff members who performed meritorious tiger protection activities. Some rewards were also provided to members of the public who assisted tiger conservation efforts.

Six training camps were conducted by project personnel for the frontline field staff to improve their skills in carrying out anti-poaching patrols, apprehending poachers, effective handling of fire arms and other forms of field craft and enforcement. In addition, three workshops were conducted for senior and junior reserve personnel to improve their skills in applying the forest and wildlife protection laws during prosecution of wildlife crimes.

Five training workshops were conducted for 10 forest department personnel and 85 local naturalist volunteers, to teach them rigorous sampling-based methods for monitoring tiger and prey populations. Training was imparted in line transect and dung count survey methods for estimating absolute and relative abundances of ungulate prey species and camera trap sample surveys of tigers. In addition simple quantitative techniques for carrying out encounter rate surveys of animal signs to estimate spatial distribution and population trend indices were also taught in these workshops.

The project squarely addressed the much-neglected issue of enhancing field protection for tigers by actively assisting in improving law enforcement. The patrol vehicles provided under the project logged about 60,000 to 85,000 kilometers each during the project period. The forest department staff managed to detect 746 cases of law breaking (including some cases of poaching of prey species) in Nagarahole, 588 cases in Bhadra, 179 cases in Bandipur and 34 cases in Kudremukh. No case of tiger poaching was detected in any of the reserves. Although the results of improved field



protection are hard to quantify in the short run, we believe that, overall, tiger protection improved by deterring potential offenders.

Conservation education activities under this project included 152 slide-talks, 43 field nature camps and 86 public contact campaigns in and around the four sites. We estimate that a total of about 150,000 local people living in proximity to wild tigers, mainly youth, students and teachers were targeted under these educational activities. A Kannada language version of a 45-minute 'Discovery' documentary on Nagarahole as well as a 12-minute video titled "Wildlife Crisis" were produced and exhibited. A Kannada newsletter titled "Nisarga" was also produced as an educational activity. The impact of such educational activities is of a long-term nature and difficult to evaluate immediately. However, the widespread, enthusiastic local participation and the scale of project activities suggest that the educational work resulted in increased public support for tiger conservation in and around the reserves. These, a total of 266 news stories were generated in the print media on conservation issues at the project sites and 38 news stories that covered the project itself, are also measures of the outreach achieved under this project.

WCS conservation partners worked in close cooperation with people living inside the reserves in both Nagarahole and Bhadra, and played a crucial catalytic role in initiating the voluntary resettlement projects funded by the Indian government's Project Tiger at these two sites. The thrust of these activities was to redefine 'community-based conservation'. This was achieved by resolving human-tiger conflicts in a manner that benefited tigers by enhancing the long-term viability of their habitats while also benefiting the people volunteering to resettle, by improving their lives. The fact that over 200 families have already moved out of Nagarahole and 435 families have accepted the resettlement package in Bhadra, as well as the fact that most of the remaining people in these two reserves are now willing to

move out, are testimonies to the effectiveness of these initiatives.

Although the project was successful overall, we noted some shortcomings in its design and implementation. We believe these arose from the following factors: deficiencies in the government's administrative structure and its internal dynamics; weaknesses among WCS conservation partners because of the non-professional, voluntary nature of their participation, and, the collateral effects of the simultaneous implementation of a large internationally aided, poorly designed conservation project at one of the project sites. WCS conservation partners are now continuing the long-term tiger conservation process evolved under this project at three sites: Nagarahole, Bhadra and Kudremukh.



ACKNOWLEDGEMENTS

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Centre for Wildlife Studies, Bangalore: Scientific research, Project planning and Biological monitoring

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Nagarahole Wildlife Conservation Education Project (NAWICOED): Conservation Education

Green Watchers, Tumkur: Project Coordination and Official Liaison

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The Karnataka Tiger Conservation Project NGO Team.

Standing from left: Javaji Amarnath, Jeevan Rao, Praveen Bhargav, P. K. Dinesh, T. S. Gopal, M. K. Appachu, Ullas Karanth, Thamoo Poovaiah, K. M. Chinnappa, V. T. Ravindra & V. Krishna Prasad
Sitting from left: V. Srinivas, G. R. Sanath Kumar, N. Samba Kumar, K. A. Vasudeva, Sanjay Gubbi, Arun Patel, Niren Jain, D. V. Girish & Surya Adoor



INSTITUTIONAL PARTNERS AND PERSONNEL

Institutions

The State Forest Department, Government of Karnataka, is the statutory agency responsible for the administration and management of all Wildlife reserves in Karnataka. Therefore, this department was the major implementing partner for this project. The Forest Department was the recipient of most of the equipment donated under the project.

The Directorate of Project Tiger, Government of India and the Directorate of Wildlife Preservation in the Ministry of Environment and Forests, New Delhi also facilitated the implementation of this project.

Centre for Wildlife Studies, a Bangalore based not-for-profit trust was responsible for the overall coordination of the project.

Project Personnel

K. Ullas Karanth, Country Director-WCS India Program and Director, Centre for Wildlife Studies designed and initiated the project. K.M. Chinnappa, President, Wildlife First was the Chief Project Advisor. Praveen Bhargav coordinated the conservation activities and N. Samba Kumar coordinated the research activities. The field coordinators at the four project sites were:

- Nagarahole: M. K. Appachu and T. S.Gopal
- Bhadra: D. V Girish
- Kudremukh: Niren Jain and Surya Addoor
- Bandipur: V. Krishna Prasad, G.R. Sanath Kumar and Javaji Amarnath

Project Investments

The total investment in the project was Rupees 17,000,000 (US \$ 375,000). Out of this amount, a total of Rupees 90,50,000 (US \$ 210,000) was

in the form of equipment and other support and services provided directly to the forest department. The balance investment covered the research, training, conservation monitoring, conservation education and community interfacing activities taken up by WCS conservation partners working in collaboration with the government. The duration of the project was from January 1998 to June 2001.



INTRODUCTION

Over the last century, the habitat of wild tigers has seen dramatic declines the world over. Burgeoning human populations have exerted an ever-increasing pressure on the tiger, its prey, and their habitat. Indeed, the decline of the tiger over the last century has been so dramatic that the species presently occupies a distributional range that is believed to be less than 5% of its historical extent. Even today, several factors continue to work in collusion, precipitating a further decline of the tiger. Agricultural expansion, commercial logging, road building, dams, and other developmental projects have severely reduced and fragmented the tiger's habitat. What remains is swiftly being degraded by pervasive influences such as intense livestock grazing, man-made forest fires, and an over-harvest of timber, fuel wood,

Pic: S. Gubbi



Over-exploitation of forests.

and non-timber forest products (NTFP). The tiger's prey species are extensively hunted by people, leaving the remaining habitats devoid of food for the predator. Further, tigers themselves are directly persecuted, either in retaliation against livestock depredation, or to cater to demands from high-value markets for their bones, skin, and other body parts. Over the last decade, these impacts have accelerated, generating serious concern over the continued existence of the tiger.

India has always been a traditional stronghold of the tiger, and is still believed to hold over half the world's wild tigers. Starting from the colonial times through the post-independence years, the tiger population in India dwindled rapidly in the

face of bounty hunting, agricultural expansions, decimation of prey species, and intensifying human biomass demands on its habitat. WCS biologist George Schaller initiated the first scientific study of tigers at Kanha National Park during the early 1960's. His study drew the world's attention to the critical endangerment of wild tiger populations while providing pioneering insights into the species' biology.

In the 1970's the Indian Government, recognizing the imminent threats to the tiger, joined hands with international donors in an effort to pull the tiger back from the brink. The launch of Project Tiger in 1972 was a clear demonstration of India's political will to save tigers and their habitat. Project Tiger focused on setting up special reserves, initiating anti-poaching measures, stopping timber exploitation and placing restrictions on activities such as livestock grazing and collection of non-timber forest products. From the start, this project was seen as a way of protecting a wide range of habitats and wildlife by keeping the tiger as a flagship species. Project Tiger was hailed as an international success story with increasing tiger numbers being reported from periodic government censuses. The problems of poaching and hunting were believed to have virtually stopped due to new legislation, better enforcement, and a decrease in the demand for tiger skins. Reserves were set up with core areas and buffer zones and field protection formed an important component in this effort, which included anti-poaching patrols, encroachment prevention, control of livestock entry and fire prevention within the designated reserves. In some cases, to reduce human impact on wildlife as well as minimize damage to human life and property from wildlife, villages were relocated out of

Pic: K.U. Karanth



Overgrazing by livestock.



reserves. However, the few signs of sporadic initial success of Project Tiger seemed to have hidden from its administrators a number of serious problems that were building up.

Identifying the Current Issues: Why KTCP?

In the early 1990s, even as demographic and social pressures mounted on Indian tiger reserves and the international trade in endangered species products boomed, the wildlife protection mechanisms went into serious neglect and decline. This posed a major challenge to the conservation of the tiger and the ecosystems where it occurred. A survey carried out by a Government Panel into the conservation capabilities of India's wildlife reserves indicated that the protection system was in sore need of revitalization in the form of better equipment, training, manpower, and improvement of declining staff morale. Freeze on new staff recruitment and other economy measures were

Pic: K.U. Karanth



Wildlife Staff on Patrol.

crippling the implementation of tiger conservation efforts. The protective capacity also needed to be strengthened through training in legal and enforcement skills to deal effectively with wildlife offenders. Moreover, there was an urgent need to augment the scientific capability of protected area staff and local conservationists to monitor tiger and prey populations using reliable methods. Conflict between humans and tigers was assuming

serious dimensions due to human overexploitation of wildlife habitat. Effective community education on the benefits of tiger conservation and on-the-ground mitigation of such conflicts were also largely lacking.

Therefore, WCS visualized the implementation of a comprehensive tiger conservation project that addressed these multifarious needs as essential to consolidate the future of the tiger. The Karnataka Tiger Conservation Project was a product of this vision.

KTCP: Its Philosophical and Practical Basis

The project first chose the primary landscapes to work on, based on both tiger ecology and practical conservation considerations.

Four large forest blocks of tiger habitat, located in the Western Ghat region of southern India recognized as one of the world's 18 biodiversity hotspots, were selected as project sites. Administratively, the four forest blocks identified for project activities lay within the State of Karnataka, and were a part of the high-priority Level-1 Tiger Conservation Unit (TCU-55) identified by the joint WCS-World Wildlife Fund (USA) priority setting exercise executed in 1997. These four sites included prime breeding habitats for tigers that provide a potential opportunity to save the tiger populations on a long-term basis by meeting site-specific conservation needs.

Within Karnataka, the base conditions were favorable to KTCP's implementation. It was possible to draw on the extensive empirical experience of various institutional partners to identify landscape units within which a program could be implemented to conserve breeding populations of tigers. It was also possible to choose a reasonable range of representative habitats wherein tigers occurred: from the rainforests of



Kudremukh and moist forests of Bhadra and Nagarhole, to the open deciduous forests of Bandipur. Furthermore, Karnataka State has an established wildlife protection tradition and infrastructure. A protected area system of nineteen wildlife sanctuaries and five national parks covering an area of more than 6,600 km², and protecting approximately 3.5% of the state's land wild tigers occurred in 14 of the state's 24 wildlife reserves.

The Karnataka Tiger Conservation Project (KTCP) was envisioned as an innovative model of tiger conservation that attempted to conserve four critical breeding populations of tigers in an important and progressive state in India. The project was conceived as a model to test some potentially useful approaches to address problems of conserving tigers in India. The approach adopted by KTCP was to forge a constructive collaboration between Indian non-governmental organizations and the State Forest Department, backed by international donor support. The primary objective was to use supportive interventions to strengthen official conservation efforts through the active involvement of local volunteer partners who truly cared for the long-term persistence of India's wild tigers.

The presence of several local conservation partners of WCS with proven track records, around the project sites facilitated the testing of this conservation model in Karnataka. These partners also possessed social contacts and the skills needed to mobilize action on-the-ground through interactions with local officials and communities. Their long-term interest and involvement in the chosen localities provided original insights into the site-specific problems and conservation issues.

However, WCS recognized the importance of seeking innovative and practical solutions for these problems under the rubric of sound science. Thus, another important objective of the KTCP was to inculcate among all the partners, the need for using

sound science in the conception, implementation, and evaluation of the project. Here too, Karnataka seemed ideally suited for the stated purpose. Since 1986, WCS Conservation Scientist, Ullas Karanth, had executed an effective research program on tiger ecology through the Centre for Wildlife Studies and in collaboration with the Karnataka State Forest Department. Because Nagarhole Reserve, one of the sites of KTCP, had been the focus of these long-term scientific studies on tigers and their prey species, the knowledge and methods generated from the research there provided reliable tools to assess tiger habitats like Bhadra, Bandipur and Kudremukh Reserves.

Furthermore, in Karnataka – as elsewhere in India — lack of sufficient financial support had significantly reduced the protection capacities of its reserves. Most reserves needed their vehicles and communication facilities upgraded, and the staff needed to be equipped with field gear that would allow them to function better and with greater efficiency in remote areas. In addition, the biomass resources of the State's wildlife reserves were under continuous pressure from people residing in and around them, as well as from distant market forces. Thus, the KTCP was designed and conceived in consultation with Karnataka State Forest Department and WCS conservation partners to address site-specific tiger conservation needs.

In this report, we first outline the original objectives with which the KTCP was begun. We then briefly describe each of the four sites where the project was implemented. The next section chronicles the activities undertaken by the KTCP at the various project sites. The final section presents and discusses the specific achievements of the project. The report concludes with a brief analysis and discussion of how an effort of this kind can be improved and sustained in order to meet the long-term goals of tiger conservation in India.



KARNATAKA TIGER CONSERVATION PROJECT

The Objectives

The KTCP aimed to achieve the following specific objectives:

1. Identify critical needs and opportunities related to the following aspects of tiger conservation: Improving tiger protection; Enhancing the ungulate prey-base; Consolidation of tiger habitats; Establishing research, training and educational programs at the project sites and in the surrounding communities.
2. Strengthen the wildlife protection capability of the Karnataka Forest Department by providing anti-poaching vehicles, field gear, communication equipment and other material support.
3. Upgrade the professional capacities of protected area staff through programs to provide law enforcement training and incentives to improve job performance, skills and morale.
4. Establish and execute a rigorous, scientific, sampling-based monitoring program for both tiger and prey populations in the four focal protected areas as a means of measuring the impact of conservation programs.
5. Establish and train a cadre of local conservationists and build capacity among them for monitoring tiger conservation activities at the project sites.
6. Establish conservation education and community-interface activities around project sites to improve local support for park protection and extend public awareness about tiger conservation.

7. Assist in the leveraging of funds from other sources, including national and regional governments to facilitate voluntary resettlement projects at the project sites to solve the problem of human-tiger conflict and reduce fragmentation of tiger habitats on a long-term basis.

Project Sites

The project sites comprised four large blocks of tiger habitat, located in the Western Ghats (recognized as one among the world's 18 biodiversity hotspots). Administratively, these sites covered an area of 2600 km² in the State of Karnataka and formed a part of the Level-1 Tiger Conservation Unit (TCU-55) identified earlier under the WCS-WWF (USA) global priority setting exercise. These four sites covered the designated nature reserves of Nagarahole, Bandipur, Bhadra and Kudremukh described below. The following four sites provide excellent opportunities for conserving viable tiger populations within a larger landscape matrix under multiple uses such as forestry and agriculture.



FIGURE 1: LOCATION OF STUDY SITES IN KARNATAKA

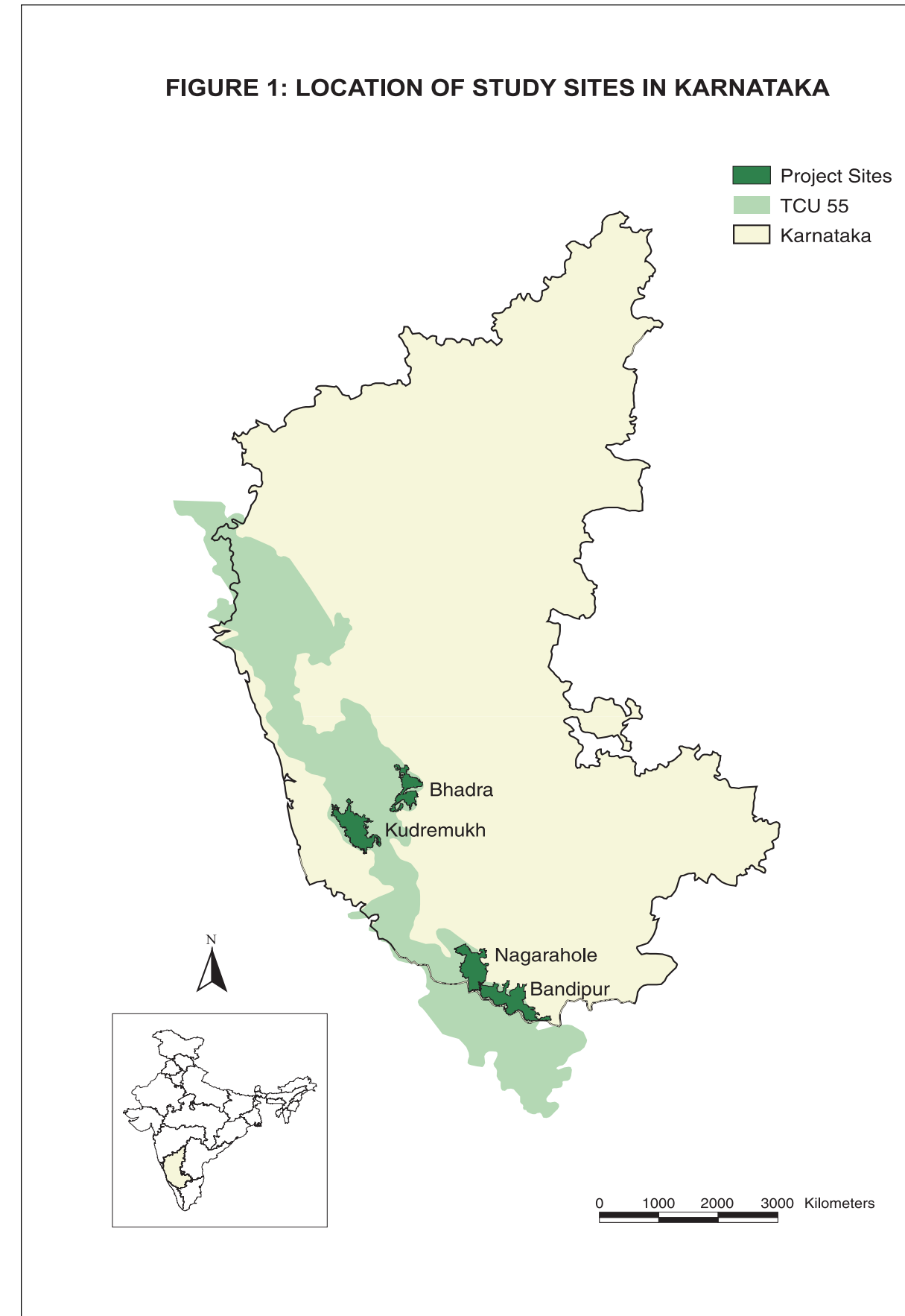
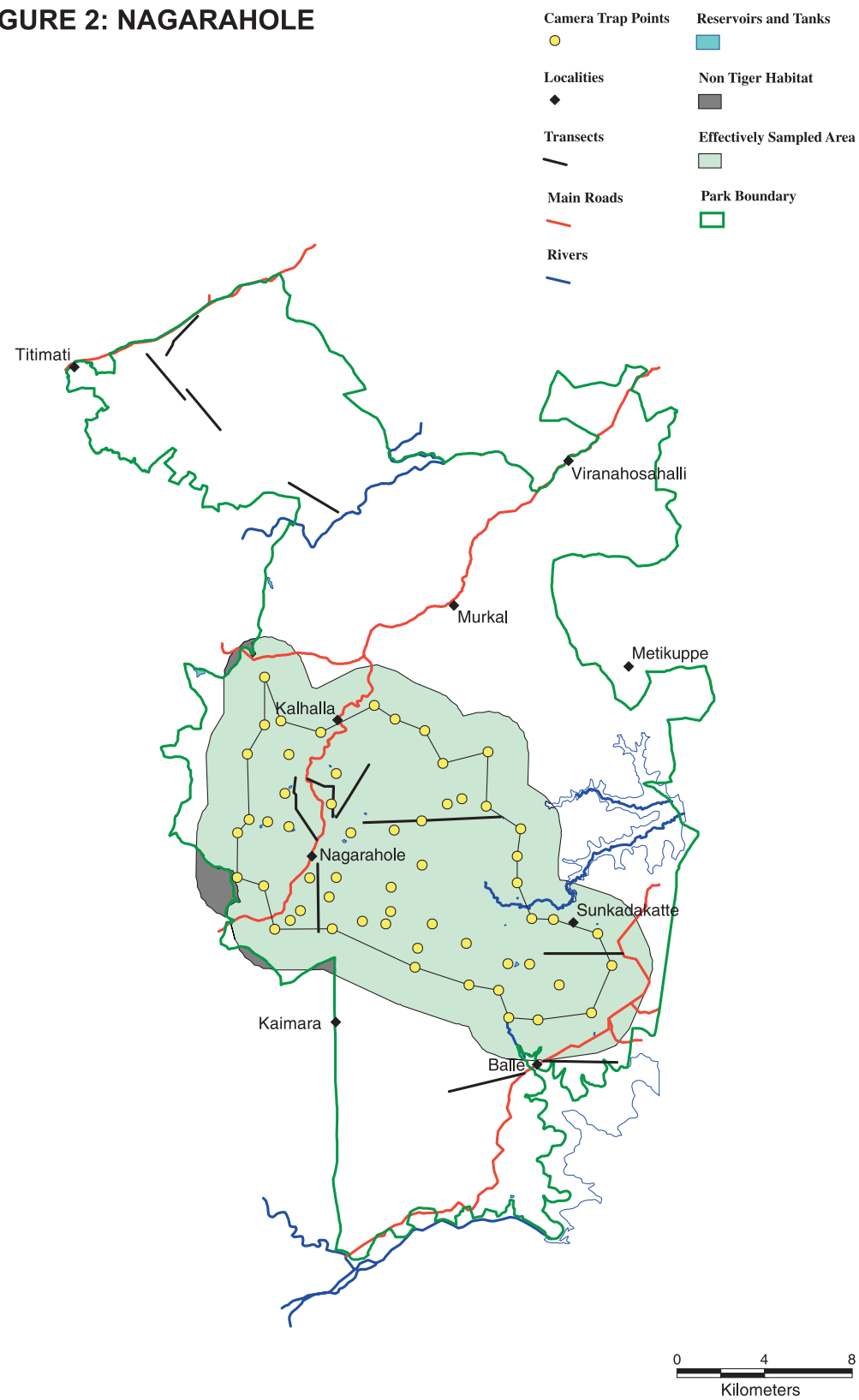




FIGURE 2: NAGARAHOLE



Nagarahole Reserve

Nagarahole was originally established in 1955 as a Game Reserve of 288 km². In 1974, it was expanded to become the Nagarahole National Park (Area: 644 km²), now officially renamed “Rajiv Gandhi National Park, Nagarahole” but commonly referred to as Nagarahole. The reserve is located in Kodagu and Mysore districts (76° 00' -76° 15' E - 11° 15'-12° 15' N) at altitudes of 700-960 m. Nagarahole is contiguous with Bandipur Reserve to the southeast and the Wayanad reserve to the southwest (Map 1). The reserve receives an average annual rainfall between 1000 – 1500 mm. The terrain is gently undulating and drained by several perennial streams and three large rivers: Kabini, Taraka and Lakshmanateertha. An irrigation dam built in 1974 forms the Kabini reservoir that flanks the southern boundary of the reserve.

Two types of tropical, mixed deciduous forests clothe the region. The northwestern areas of the

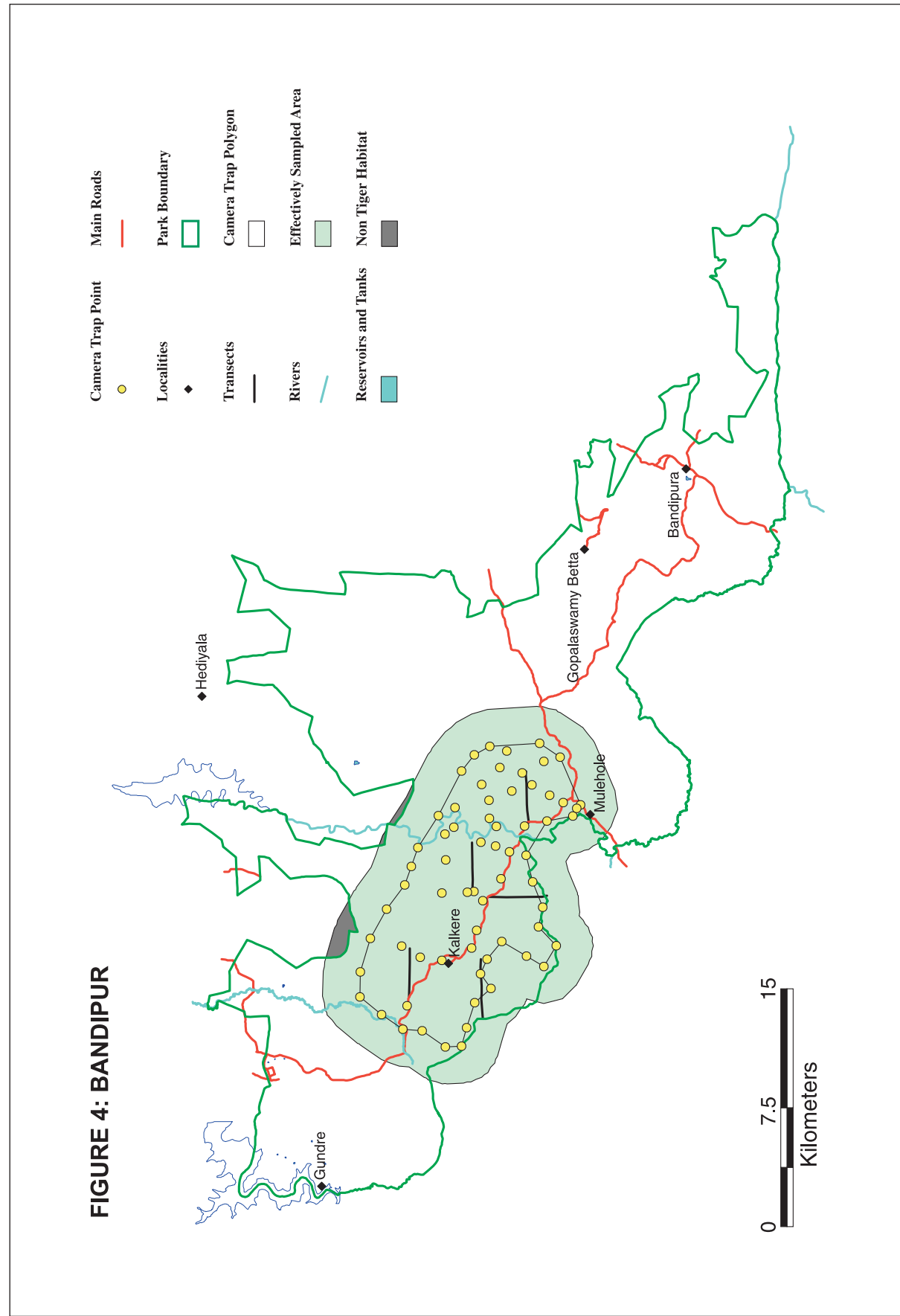
reserve that receive higher rainfall support moist deciduous forests of the *Tectona-Dillenia-Lagerstroemia* series. The dry deciduous forests of the *Terminalia-Anogeissus-Tectona* series occur in the southeastern areas with less than 1000 mm of rainfall. A unique feature of this site is the presence of open grassy swamps in moist areas locally called *hadlus*, where the soil is clayey, perennially moist and supports the luxuriant growth of sedges and grasses year round.

Nagarahole supports an impressive assemblage of herbivorous prey species: elephant, gaur, sambar, chital, muntjac, chousingha, wild pig, hanuman langur and bonnet macaque. The tiger, leopard, Asiatic wild dog, or dhole, and sloth bear are the large carnivores. Apart from the impressive mammalian fauna (Appendix 1), Nagarahole is rich in avifauna, with more than 270 species of birds. The herpetofauna includes a variety of snakes, lizards, turtles and frogs. Among the larger reptiles, the marsh crocodile, monitor lizard and the rock python occur in Nagarahole.



Forest Canopy in Nagarahole.

Pic: K.U. Karanth



Bandipur Reserve

The Maharaja of Mysore originally established Bandipur as a hunting reserve in 1931. It was expanded after 1974 to become the Bandipur National Park and Tiger Reserve (Area: 874 km²). It is one among the nine tiger reserves created under Project Tiger. Bandipur is located in Mysore and Chamarajanagar Districts (76° 12' -76° 46' E - 11° 37'-11° 57' N) at an altitude of 680-1454 m. It is the oldest protected area in Karnataka. Bandipur is contiguous with Nagarahole on the northwest, Wayanad reserve to the southwest and Mudumalai reserve to the south (Map 1). The terrain is undulating, and the reserve is bounded

by the Moyar River to the south and Kabini Reservoir to the northwest.

Bandipur Reserve receives an annual rainfall of 625-1250 mm. The forests are mostly of the mixed dry deciduous forest series of *Terminalia-Anogeissus-Tectona* type. In the northwestern parts where the rainfall is higher, moist deciduous forests of the *Tectona-Dillenia-Lagerstroemia* series occur. The wildlife of Bandipur is similar to that of Nagarahole, however, three additional large mammal species, blackbuck antelope, striped hyena, and the Indian wolf, occur occasionally on its eastern fringes (Appendix 1). The bird life and herpetofauna are similar to Nagarahole.

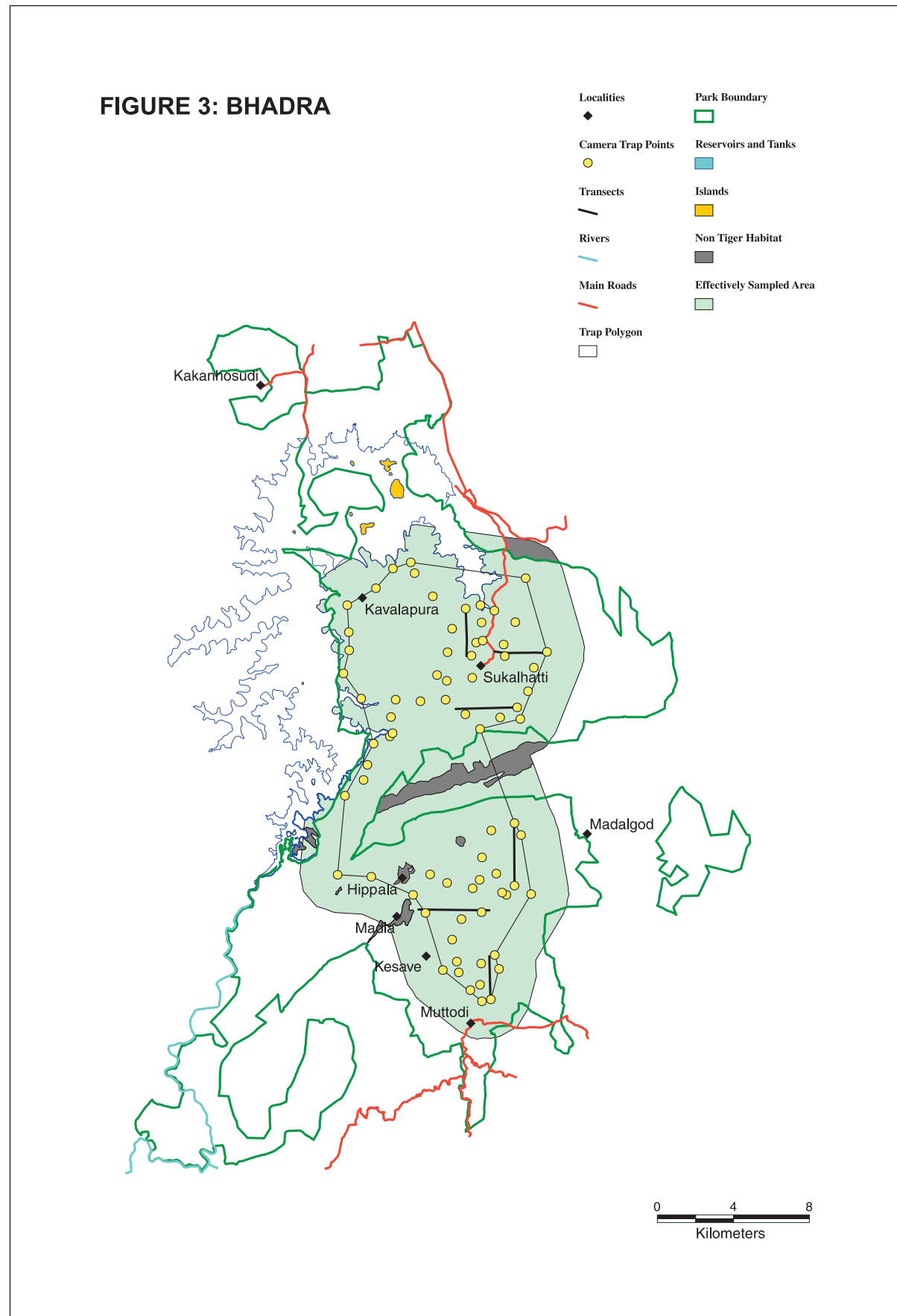


Forest Canopy in Bandipur.

Pic: P. Bhargav



FIGURE 3: BHADRA

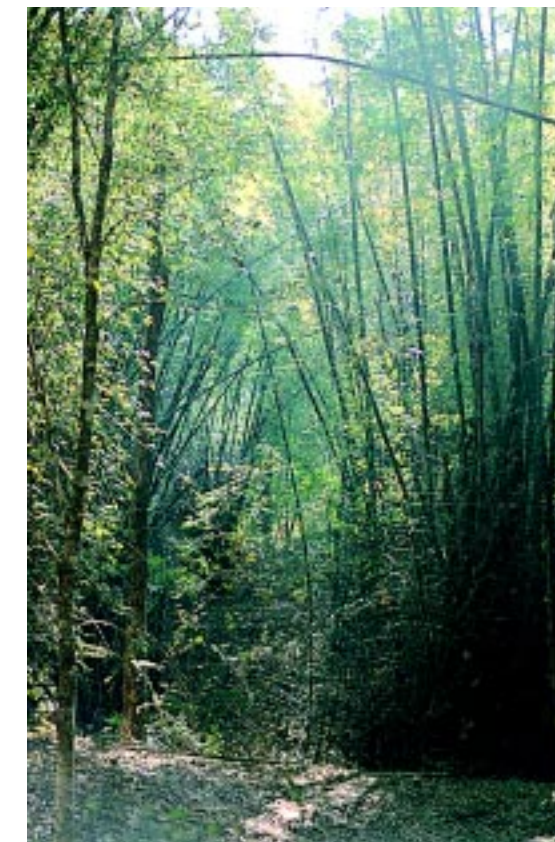


Bhadra Reserve

A part of the present Bhadra Reserve was originally established as Jagara Valley game sanctuary in 1955, and expanded into the present wildlife sanctuary covering an area of 492 km² in 1974. In 1998, it was designated as the 25th tiger reserve within the Project Tiger network. Bhadra Reserve is located in Chikmagalur and Shimoga districts (75° 29' -75° 47' E - 13° 22'-13° 47' N) with the altitude ranging from 670 m to 1870 m at higher elevations. Though the terrain in the reserve is gently rolling, there is an imposing outspur of the Western Ghats, called the Bababudangiri range, that rises abruptly from the surrounding plateau to form a crescent-shaped crater, a part of which is included in the reserve.

Bhadra receives an annual rainfall of 2000-2540 mm. Its drainage joins the Bhadra River, which is dammed at Lakkavalli, forming a vast irrigation

reservoir whose backwaters extend into the reserve. (Map 1). The vegetation in Bhadra Reserve is primarily moist deciduous forest of the *Tectona-Dillenia-Lagerstroemia* series with patches of dry deciduous *Anogeissus-Tectona-Terminalia* type forests occurring on the northern fringes. At the higher altitudes in Bababudangiri, a third type of forest known as the tropical wet evergreen forests of the *Schefflera-Gordonia-Melliosma* type occur. A key ecological feature of Bhadra is the presence of five species of bamboos, three of which dominate the forest. Like Nagarahole, Bhadra too has extensive *hadlus*. However, most of these are currently under paddy cultivation as parts of village settlements. The assemblage of large mammals in Bhadra is similar to that in Nagarahole (Appendix 1). However, the bird life is richer. The herpetofauna is also similar to Nagarahole, but with the addition of the rare king cobra snake.

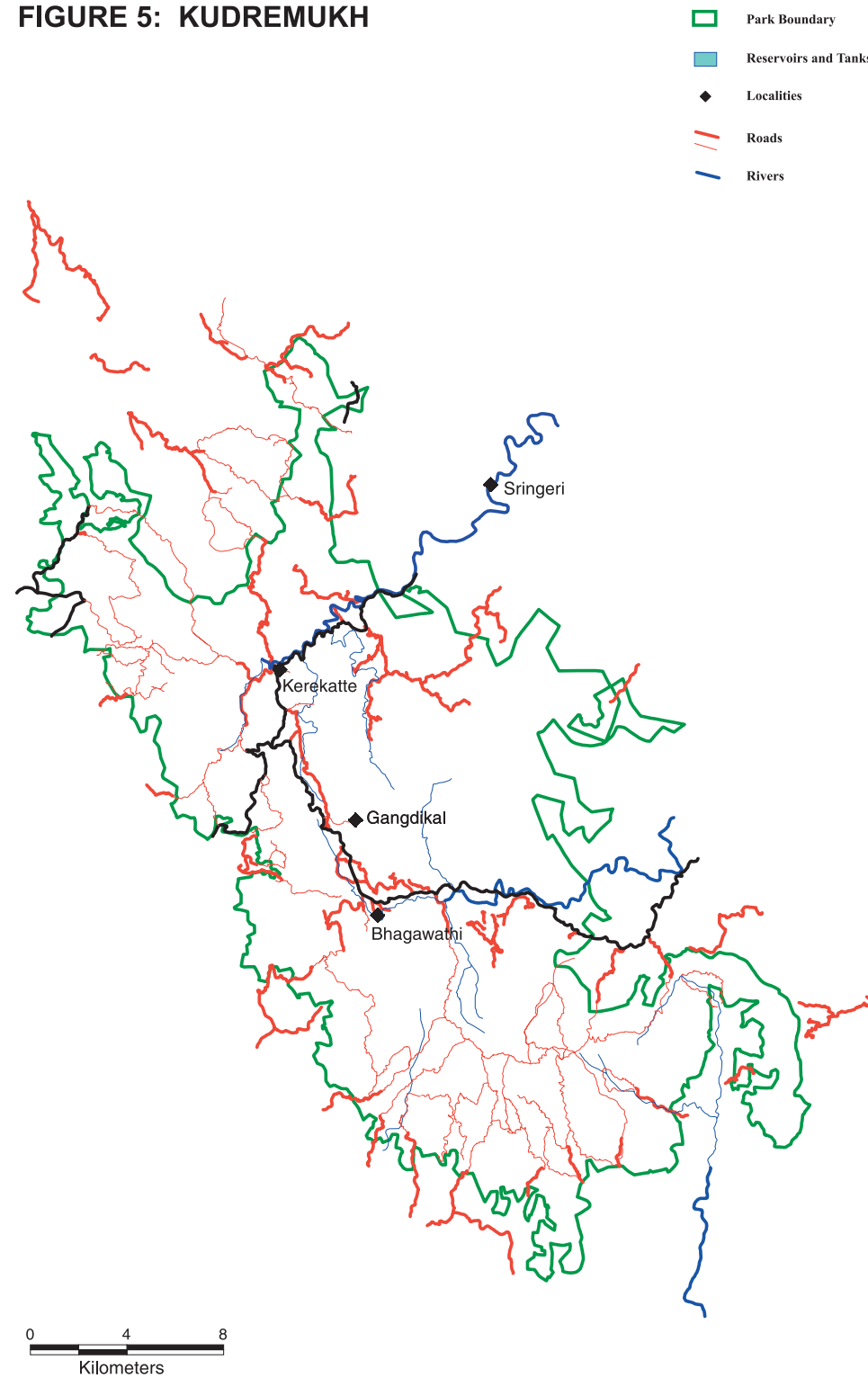


Bamboo forest in Bhadra.

Pic: K.U. Karanth



FIGURE 5: KUDREMU KH



Kudremukh Reserve

Kudremukh National Park was initially notified in 1987, based on recommendations from field surveys by Ullas Karanth in 1983-84. These surveys recorded the presence of the highly endangered Malabar civet and Liontailed macaque in the area. Kudremukh Reserve (area: 600 km²) is spread over Chikmagalur, Udipi and Dakshina Kannada districts (75° 00' -75° 25' E - 13° 01' -13° 29' N) at an altitudinal range of 100-1840 m. This is the largest reserve of a tropical wet evergreen forest type in Karnataka. Kudremukh is contiguous with Someshwara Wildlife Sanctuary in the north and other reserve forests to the south. It receives an annual rainfall of approximately 3000-7000mm, with a recorded maximum rainfall of 10,000 mm in 1994. The topography is mountainous with a central ridge running north to south. Three major rivers—Tunga, Bhadra and Netravathi—originate in the watersheds within this reserve.

Several wet evergreen forest types occur in Kudremukh Reserve. At elevations above 1400 m, montane grasslands and short-stature

shola forest of the *Schefflera-Gordonia-Meliosma* series occur. At lower elevations, tall dipterocarp dominant evergreen forests characterized by the *Palaquium-Poeciloneuron-Hopea* and the *Poeciloneuron-Dipterocarpus-Kingidendron-Humboldtia* series are predominant.

The large mammal fauna of Kudremukh (Appendix 1) is conspicuous by the absence of some of the species typical of the plains, such as the Chital and Chowsingha. However, it has several other unique species that are not found in the other three reserves: the Lion-tailed macaque, Malabar civet, Small flying squirrel and possibly the Nilgiri marten. The avifauna includes more than 180 species of birds, of which eight species are endemic to the Western Ghats. About 54 species of reptiles and 34 species of amphibians are known to occur in this reserve, including highly endangered species like the flying lizard, flying snake, king cobra, shield tail snakes, Travancore tortoise, forest cane turtle and several endemic frogs. The aquatic insect species richness in this reserve is the highest recorded in the Western Ghats.



Tropical evergreen forest at Kudremukh.

Pic: K. U. Karanth





ACTIVITIES UNDER KARNATAKA TIGER CONSERVATION PROJECT

Identifying conservation priorities at the project sites

The first step of the project formulation identified the critical tiger conservation needs in each area where the project was to be implemented. WCS partners then prioritised tiger conservation needs for each site by consolidating existing ecological data and prior knowledge about the sites using a combination of methods, including questionnaire surveys, consultations with senior officials of the Forest Department, and detailed discussions with field protection staff and reserve wardens. This interactive, iterative planning process identified the following major conservation needs.

Establishing Ecological Baselines and Monitoring

Judging the success of any tiger conservation activity is nearly impossible in the absence of reliable information on the size and dynamics of the populations of both tigers and their principal prey. Therefore, scientific investigations directed at collecting such baseline ecological and demographic data were identified as a critical need. However, the project sites differed considerably in terms of their research history. While Nagarahole had the benefit of fifteen years of sustained WCS-supported research on large carnivores and their prey, even the most elementary baseline of ecological information did not exist for Kudremukh. Thus, while it was necessary to build on existing programs of scientific monitoring in a site like Nagarahole, a different approach was required in the other reserves, where monitoring activities had to be built from the ground up.

We also found that the reserve managers were handicapped in the absence of good reliable maps

with details such as interior forest roads and trails, water sources, illegal encroachments, checking gates, anti-poaching camps, patrol routes, etc. The project was to address this critical need by carrying out intensive field surveys using Global Positioning Systems (GPS), establishing a GIS database for spatial and other data, and then generating detailed maps.

Enhancement of enforcement capability

Although India has fairly strong wildlife protection laws, there is an urgent need to improve their implementation. We observed a lack of critical protection infrastructure at the project sites, especially in terms of equipment like patrol jeeps, boats and wireless communication. This factor was seriously compromising the effectiveness of reserve staff in anti-poaching and fire control activities.

Potential poachers and smugglers vastly outnumber protection staff, and additionally have the element of surprise as a major advantage. It is crucial to neutralize these advantages by providing the protection staff with rapid response capability in the form of speedy transportation and wireless communication capabilities that the illegal intruders do not possess.

Within the existing administrative structure for wildlife protection (Appendix-2), the Forest Range, headed by a Range Forest Officer, is the most crucial component of the system. The protective infrastructure that was available at the beginning of the project at all four sites is shown in Table-1. In several forest ranges, the number of patrol vehicles available was inadequate to combat illegal activities and pressures. Therefore the provision of vehicles was identified as a priority need for all sites with the exception of Bhadra Reserve that had received a donation of three vehicles under an earlier grant from Wildlife First/Global Tiger Patrol in 1996.

Three of the four project sites - Nagarahole, Bhadra, and Bandipur – are bordered by large reservoirs which are used by timber smugglers, poachers and fishermen to gain easy access into the interiors of these reserves. Also, during monsoon (June-September), some forest roads get flooded and render many areas inaccessible to patrol vehicles. Therefore, patrol boats were identified as an urgent need at these sites.

Wireless communication sets were inadequate to meet the requirements of the reserve staff. Particularly in areas like Kudremukh and Bhadra, where the terrain is hilly, the provision of repeater stations and handsets were a priority need, whereas in areas like Bandipur and Nagarahole, more base stations were needed.

Table 1: Protection Infrastructure Initially Available

Equipment	NH	BD	BP	KM
Jeeps	4	3	4	1
Wireless Sets	36	18	20	10
Boats	2	1	1	-

NH - Nagarahole, BD - Bhadra
BP - Bandipur, KM - Kudremukh

Motivation and Capacity Building Programs for Reserve Staff

In the final reckoning, it is the protection staff deployed at the project sites (Table 2) who serve as “trench warriors” battling the various pressures on wildlife and their habitats. Sites like Bandipur and Nagarahole had a long tradition of game protection and management, having been established rather early in history as game reserves under the control of the erstwhile Maharaja of Mysore. Subsequently, under energetic officers and focused programs such as Project Tiger, they had benefited from a tradition of establishment of anti-poaching camps and patrolling schedules.

Such traditions were virtually absent at sites like Bhadra and Kudremukh. This needed correction.

In addition, we also found an urgent need to improve reserve staff morale and capacity by providing them with proper field gear, training, incentives, and provisioning insurance to cover injuries or death suffered in the course of their hazardous duties. Further, surveys at all the project sites suggested that training the staff in simple but robust methods of monitoring animal populations was also a desirable goal.

Table 2: Numbers of Protective Staff Deployed

Category	NH	BD	BP	KM
Range Officers	6	4	8	4
Foresters	25	11	20	6
Forest Guards	59	22	59	14
Watchers	159	64	58	26

Enlarging the Constituency for Wildlife Conservation

A lack of understanding of the value of the tiger reserves among most local people and their consequent hostility towards reserve protection and law enforcement were identified as major problems to be addressed at all the project sites. Arson by local people was a frequent form of backlash against law enforcement by park staff in all the reserves. Such hostility made law enforcement difficult and often rendered the reserve staff ineffective. Therefore, at each of the project sites, educating local people through outreach activities



Niren Jain addressing a nature camp.

Pic: T.S. Gopal



was identified as a key strategic component of the project. Such conservation education efforts, modeled on the successful efforts previously undertaken by the WCS-supported Nagarahole Wildlife and Conservation Education Project (NAWICOED), were needed at all project sites.

Long-term Needs: Consolidation of Tiger Habitats and Reducing Human-Tiger Conflicts

The most serious threat to tiger habitats (and other biodiversity) is the fragmentation of reserves caused by human settlements, roads and other development projects. Although the deleterious consequences of habitat fragmentation on tigers, prey and other wildlife are well documented, conservation models that actually address these threats have been scarce. Furthermore, fragmentation caused by the interspersed incompatible human activities in critical tiger habitats is also a leading cause of human-tiger conflicts.

Because wild tigers and their prey must be conserved wherever they occur, human settlements and the infrastructures that cause fragmentation in the interiors of critical tiger habitats need to be relocated to evolve lasting solutions to these problems. At the project outset, we recognized that relocating human settlements and related infrastructure out of critical tiger habitats within the reserves would be a major issue. Therefore, developing models of voluntary resettlement schemes that reduce fragmentation and human pressures, while at the same time improving the living conditions of the people involved, was identified as a critical long term tiger conservation need.

The local communities residing within Nagarahole did not possess land-ownership rights. Therefore their development prospects within the park were rather bleak. By facilitating their relocation and development, in lands available on the periphery of the reserve, the government hoped to achieve

the twin goals of community development and consolidation of tiger habitats. In order for the resettlement project to be funded by Project Tiger to move forward, the lack of trust between the government and the people living inside Nagarahole needed to be changed by the active intervention of our conservation partners.

At Bhadra, the presence of legal agricultural settlements as well as illegal encroachments posed long-term threats. There was a need to revive a voluntary resettlement plan that had been stalled for over a decade. The plan could facilitate the relocation of over 700 families. Partial financial commitment and alternate lands were earmarked for the effort by the government, but the requisite political will to catalyze implementation had been lacking.

In Kudremukh, extensive tracts of tiger habitat needed to be protected from further exploitation by an iron ore company whose mining lease was coming up for renewal. This would involve intensive educational efforts directed at local people about the consequence of such mining on biodiversity and ecological values of the region.

In Bandipur reserve, unlike at the other three sites, there were no human settlements inside. Therefore, no resettlement project was necessary. However, the long and narrow spatial configuration of the reserve rendered it vulnerable to intensive biomass exploitation from the 180 or so villages that lined its northern boundary.

Addressing the Threats to Tigers Through On-ground Action

After the specific conservation needs of each project site were identified, the project's focus shifted to mobilizing appropriate action in each of the field sites. These project activities were of two kinds. Firstly, activities directly implemented by WCS conservation partners, such as conservation education, interfacing with local communities, research and monitoring, and

training and capacity building of forest staff. Secondly, activities that were actually carried out by the government agencies such as enforcing protection laws, managing habitats and implementing the voluntary resettlement project. The activities of WCS conservation partners included playing a catalytic role in these intensive interactions, and generally monitoring the effectiveness of the interventions. Therefore, a crucial component of the project was the choice of conservation partners.

WCS conservation partners and designated field coordinators visited all the four reserves regularly and actively monitored the protection efforts. They periodically furnished written and verbal reports, based on which this report was compiled. The following tiger conservation activities were implemented during the project period from January 1998 to June 2001.

Research and Monitoring Activities

The primary goals of the Karnataka Tiger Conservation Project were to undertake activities that would contribute to the maintenance or increase of tiger and prey populations at the project sites. However, apart from Nagarahole, where WCS supported research on the tiger has been going on for several years, even the most basic information in the form of habitat maps, ecological data on habitat parameters, and distribution and density of tigers or prey species was lacking at the other three project sites. Therefore, priority was given to establishing a reliable baseline of data at all sites on habitats, prey species and tigers using rigorous and current techniques of population and habitat assessments.

Preparation of Maps

Preparation of detailed maps of the four reserves was recognized as urgent for effective management and the establishment of other biological baselines. Most of the available maps were outdated and

thematically important conservation data lacking. For instance, the existing maps did not accurately represent many of the interior forest roads, check gates, wireless stations, anti-poaching camps, water sources, trails, etc. To meet this critical need, detailed field mapping of all the reserves was carried out using Global Positioning Systems (GPS). The GPS position fixes of all the roads, trails, water sources, anti-poaching camps, wireless stations, human settlements and other features obtained from field surveys were overlaid on 1:50,000 scale topographic map using the Geographical Information System software package MAPINFO™ (MapInfo Corporation, Troy, New York, USA).

Animal Population Monitoring

One of the first questions that managers need to address is whether the size of the populations of tigers and prey species being protected in a given area is declining, stable or increasing. In addition, managers need to assess the distribution of the populations. This project tried to answer these questions by carrying out intensive field studies using population sampling methods.

To derive absolute densities of tiger populations, we deployed cameras triggered by infrared motion detectors to obtain photographic records of the tigers. We adopted the capture-recapture sampling procedure to estimate tiger densities.



Ullas Karanth and Samba Kumar setting a Camera Trap.

Photo: K.U. Karanth





In addition, systematic line transect sampling was carried out to obtain estimates of prey density. While collecting these data, we trained local wildlife staff and volunteer naturalists from partner organizations in the application of line transect survey methods.

Pic: K.U. Karanth



Ullas Karanth and Samba Kumar on a Transect.

This project generally followed the field protocols developed in earlier research by Ullas Karanth at Nagarahole. The tiger photo-capture data were analyzed using the program CAPTURE, and the line transect data on prey species using the program DISTANCE.

Improving Protection Infrastructure

The project reinforced the basic protection mechanisms employed by the State Forest Department in these reserves. These protection methods comprised of foot patrols during the day, vehicular night patrols, patrolling on boats along rivers, and establishing a network of strategically located anti-poaching camps to ambush poachers. The project comprehensively reinforced each of these core protection mechanisms through improving mobility, communication systems and the physical effectiveness and morale of ground level protection staff. To meet this goal, the KTCP

provided the following assistance to the Karnataka State Forest Department through their existing administrative structure (Appendix 2).

Patrol Vehicles

Fifteen off-road vehicles (4'4 Mahindra Jeeps equipped with 2.5 liter, 55 HP direct injection diesel engines) were donated to the Forest Department. The Forest Department agreed to deploy these vehicles strictly for wildlife protection duties. The patrol jeeps were assigned to 15 vulnerable Forest Ranges that had been initially identified during the interactive planning process, and that were typically of about 100-150 km² in area. (Table 3).



Pic: S. Gubbi

Jeeps donated under KTCP.

Table 3: Deployment of New Jeeps

Reserve	Ranges where Jeeps were deployed (One vehicle per range)	
Nagarahole	Kallahalla Metikuppe Hunsur Wildlife Sub-division	Anechowkur DB Kuppe
Bhadra	Lakkavalli	Tanigebyle
Bandipur	Maddur Moliyur Moyar	AM-Gudi N-Begur
Kudremukh	Karkala Belthangady	Sringeri



at the boundary of Bandipur and Nagarahole reserves.

Wireless Communication Equipment

Swift and coordinated communication is essential for effective patrolling and forest fire control, and immediate response is the key to successful countering of poachers and forest fires. A detailed analysis of the existing wireless network in the project areas was undertaken. It was found that due to the rugged terrain, the reach of the existing wireless network was insufficient. Automatic wireless repeater stations were also installed at strategic locations to improve the range of hand-held sets (walkie-talkies).

The existing wireless infrastructure was enhanced with the donation of new equipment, as well as by providing improvements to the network design through technical support and maintenance. Solar panels for charging the batteries and spare batteries were also provided to keep the system active at all times. This system enables protection staff and wildlife reserve wardens to be in continuous contact with each other. Because Nagarahole reserve had received substantial funding under a separate World Bank-GEF project to upgrade its wireless equipment, this project concentrated on improving the communication

Pic: S. Gubbi



Inaugural function of KTCP.

The vehicles were provided in three phases. In January 1998, nine jeeps were donated to Nagarahole, Bhadra and Kudremukh Reserves. At an inaugural function held at the state headquarters of the Forest Department at Bangalore. The Hon. Forest Minister of Karnataka received the jeeps on behalf of the Government. Senior officials of the Forest Department, conservationists and the media were present at this function. During the second phase in February 1999, five jeeps were donated – four to Bandipur Reserve and one to Nagarahole Reserve in a similar function held at the State Forest Headquarters in Bangalore. In September 2000, one more jeep was handed over to the Chief Wildlife Warden in Bandipur Reserve.

High-speed Patrol Boats

During February 1999 two high-speed patrol boats (equipped with petrol/ kerosene 25 HP Mariner outboard motors) with capacity for seating eight fully armed patrol staff were provided. These boats had specially reinforced hulls designed to negotiate reservoirs with hidden tree-stumps. To ensure the safety of staff using these boats, 15 life jackets were also donated. The boats were deployed at Lakkavalli Range in Bhadra reserve and Nisana Begur Range



Pic: S. Gubbi

Ullas Karanth with Hon. Minister & Senior forest department functionaries.



facilities only in the other three reserves as described below (Table 4).

Table 4: Provision of Wireless Equipment

	BD	BP	KM
Base Stations	08	04	-
Vehicle based Sets	04	-	04
Repeater Stations	01	01	01
Hand-held Sets	10	15	10

BD - Bhadra, BP - Bandipur, KM - Kudremukh

The project implemented another innovative system to improve communication among remote anti-poaching camps. The camps were provided with a ground plane antenna and a co-axial cable linked to a multi-connect box. Such use of walkie-talkies with a ground plane antenna greatly improved their range.

Caring for the Protectors

The on-ground protection staff (foresters, guards and watchers: Appendix 2) is the frontline defense against poachers and other threats to tigers. Theirs is often a thankless job, entailing great risk, meager pay and not even the security of tenure in the case of watchers. We recognized early on in the planning process that enhancing the protection staff's physical capabilities, recognizing good performance and providing good leadership to these field staff can improve law enforcement work dramatically. To improve the morale and motivate staff at the project sites, several incentives and rewards were instituted under the project. These schemes included provision of field gear, insurance coverage, recognition of meritorious performance while on duty, advanced professional training in

law enforcement and animal population monitoring.

Provision of Field Kits

To improve motivation and enforcement capability among staff, a total of 1746 field kits were provided. Each field kit comprised of a set of uniforms, a pair of jungle boots, rain-gear and a flashlight. Field kits were provided to all frontline staff at all the four project areas, twice during the three-year project (Table 5).

Table 5: Numbers of Field Kits Donated to Protection Staff

Year	NH	BD	BP	KM
1998	381	105	-	85
1999	20	-	255	-
2000	375	155	305	65

These field kits were distributed to individual staff members by the project field coordinators. The kits were handed over at functions organized specially for this purpose. Reserve wardens and other senior officials of the government, and important political leaders including State Ministers, participated in these functions. Some details of these formal functions are provided below:

Nagarahole: During May 1998, field kits were presented to the Deputy Wildlife Warden by Joshua Ginsberg of the Wildlife Conservation Society who was visiting the project. Again in December 2000, kits were donated in the presence of the Principal Secretary of Forests, Government of Karnataka, to the Deputy Wildlife Warden. Several local conservationists and leaders were present at the event.

Bhadra: Two major functions were organized during the project period. In April 1998, field kits were received by the Deputy Wildlife Warden



from D.V. Girish. During October 2000, Sageer Ahmed, Honorable Minister, Government of Karnataka, Deputy Commissioner, and the Deputy Wildlife Warden participated in the function to distribute field kits in the presence of K. M. Chinnappa. The function was organized by conservation partners Nature Conservation Guild and Wildcat-C, and was attended by several conservationists and local leaders.

Table 6: The Numbers of Field Staff Covered by Insurance

Year	NH	BD	BP	KM
1998	163	58	36	32
1999	155	57	36	32
2000	166	57	36	32

NH - Nagarahole, BD - Bhadra
BP - Bandipur, KM - Kudremukh

Awards and Incentives for Protection Staff

Despite protecting tigers and other valuable public resources at great personal risk, the achievements acts of protection staff go almost unnoticed by the public at large. Therefore, we realized that giving awards for meritorious service would provide encouragement and generate enthusiasm among field staff, thereby increase their commitment. Therefore, under this project, several awards were instituted to recognize outstanding contribution of individual staff members to field protection.

These Tiger Protection awards were widely announced at the beginning of the project. The process of identifying meritorious staff was based on joint evaluations by reserve wardens and the project field coordinators. Local level awards were presented for individual acts of courage or good work in a particular situation. A few State level awards were given for sustained long-term performance and an exemplary track record in protection even prior to the project.

Six "Huli Samrakshaka" ('Protector of the Tiger') State level awards were presented to staff in February 1999. The then Honorable Minister of



Forests, D. Manjunath, presented these awards at a function organized at the Bangalore headquarters of the Karnataka Forest Department. The Principal Chief Conservator of Forests, Chief Wildlife Warden and other senior officials participated in this function. The following staff members were recognized through these six awards:

- A. T. Poovaiah,
Range Wildlife Warden, Nagarahole
- A. T. Venkate Gowda,
Range Wildlife Warden, Bandipur
- Narayana Sherigar, Forester, Kudremukh
- Syed Nizamuddin, Forester, Bhadra
- P. S. Nanjunda, Forester, Nagarahole
- C. H. Shankar, Forest Guard, Bhadra

Each award included a reward of ten thousand rupees, a citation and a commemorative plaque.

In addition to the above State level awards, 30 local level awards were presented in consultation with the reserve officials, to frontline staff who effectively worked in specific cases. Funds were also provided to members of the public for intelligence gathering leading to detection of some poaching cases. These disbursements were done in consultation with the wildlife wardens of the range concerned.

Training and Capacity Building

Training of wildlife reserve staff was recognized as a key component for improving their effectiveness. Under this project, we conducted several training programs covering identified needs: anti-poaching action; follow up on legal procedures and enforcement, and, monitoring of tigers and prey populations on ground.

Ideally, anti-poaching work and law enforcement comprise a bulk of the day-to-day duties of the staff. The interaction between the conservation partners and the reserve staff at the training

workshops helped in both improving the staff's skills and increasing external appreciation of their problems. The importance of their jobs was re-emphasized to the protection staff. The goal was to make them feel that they were not alone in their difficult task of protecting tigers. Their views and opinions on crucial protection issues were sought in interactive sessions to develop site-specific solutions to law enforcement problems.

Training in Anti-Poaching Measures

Six training camps, each of one-day duration, were held for Foresters, Forest Guards and Watchers. Two camps were held in Bandipur, Kudremukh and Bhadra. The content included basic training to improve field craft and tracking skills; anti-poaching techniques demonstrated by mock drills;



Fire arms training by Praveen Bhargav.

handling and effective use of firearms, including maintenance and safety measures; wireless equipment handling and communication skills; and simple guidelines on legal procedures for proper follow up and prosecution of wildlife cases. A total of 200 Foresters, Forest Guards and Forest Watchers were trained in these camps. Team volunteers from conservation partners Wildlife First, Nature Conservation Guild, Green Watchers and Kudremukh Wildlife Foundation, conducted the training programs under the direction of K. M. Chinnappa, who is a specialist in this arena.

Pic: S. Gubbi



Training in Legal Procedures

Although the wardens who manage the reserves and ranges are trained in law enforcement, our planning process identified a need for improving their understanding of legal procedures. The main focus of the legal training workshops was to enable forest officers to interact with some of India's leading lawyers specializing in laws related to wildlife crimes. The purpose was to refresh the knowledge of the staff about the complex Indian laws such as the Wildlife Protection Act, Indian Forest Act, the Code of Criminal Procedure, and the Arms Act. Three workshops were conducted by conservation partner Wildlife First in association with the Delhi-based NGO partner, Legal Action for Wildlife and Environment (LAW-E). Specialist lawyers Mahendra Vyas and Satish Tamta were resource persons in these workshops coordinated by Praveen Bhargav.

Forty-five forest officers including the Deputy Wildlife Wardens, Assistant Wildlife Wardens and Range Officers from Kudremukh, Bhadra, Bandipur, participated in the two workshops organized at Chikmagalur and Bandipur during June 1999. The topics covered in the workshop included detailed discussion on the effective processing of cases using the Code of Criminal Procedures, under the Wildlife (Protection) Act, 1972, the Forest (Conservation) Act, 1980 and the National Forest Policy of 1988. Various interim orders and decisions by the higher courts in India, as well as field problems encountered in the implementation of these orders, were discussed.

In the interactive sessions at the workshops, the resource persons from LAW-E answered questions on specific cases raised by the participants. A user-friendly enforcement handbook and compilations of various Supreme Court orders, both produced by LAW-E, were distributed to the staff and other participants.

Training in Monitoring Tiger and Prey Populations

The project personnel conducted three field-training workshops in Nagarahole and one workshop each in Bhadra and Bandipur for Forest Department personnel, volunteer conservationists and young

wildlife biologists in the application of sampling-based techniques for monitoring large mammal populations. These workshops covered both theoretical and practical



Ullas Karanth training Volunteer naturalists.

aspects of line transect surveys of ungulates and primates, dung surveys of ungulates and camera trap surveys of tigers. They also covered simple but robust sign encounter surveys for monitoring tiger and prey population trends. Ten officers from the Forest Department and 85 non-governmental volunteers were trained during these workshops. Ullas Karanth and N. Samba Kumar conducted these training programs

Community Education

We recognized early on that short-term protection measures described above need to be backed up by appreciation and support for such protection among people living in and around the four reserves. By virtue of the fact that these communities resided in close proximity to tiger habitat, they were as much a part of the tiger conservation process as any government agency. Only when there is local support for wildlife protection can we meet the long-term goals of tiger conservation.

In this task of changing local attitudes,

Pic: K.U. Karanth



conservation education is a powerful tool. Therefore a community conservation education campaign, modeled after the successful Nagarahole Wildlife Conservation Education Project (NAWICOED) initiated in 1993 with support from WCS, was initiated at the other three project sites. These outreach efforts emphasized sensitizing the local communities to the ecological,



School Children with Chinnappa.

utilitarian and aesthetic value of tigers and the forests that sheltered them. The education efforts emphasized the fact that 'tiger forests' provide long-term ecological security to local communities, and their unbridled exploitation for meeting short-term benefits is unwise.

Site-specific education programs (Table 7) designed by conservation partners formed the core of this outreach program. A unique feature of these programs was to target local political leaders, officials, opinion makers, journalists, teachers and students through nature camps, workshops, slide shows and public contact programs.

In addition, KTCP also used the increasingly powerful electronic media in order to interest and motivate a larger constituency of

Pic: P. Bhargav



D.V. Girish conducting a field nature camp.

people in support of tiger conservation. A 12-minute film "Wildlife Crisis" was made in Kannada and English languages in partnership with renowned wildlife filmmaker, Shekar Dattatri, and his Trust for Environmental Education. Recognising the paucity of readable and factually correct information on wildlife in the regional language Kannada, KTCP facilitated the production of a newsletter on wildlife and conservation, titled "Nisarga" (Nature). This newsletter was edited by T. S. Gopal, and distributed widely, and during contact programs involving students and the public.

Table 7: Conservation Education activities conducted

	NH	BD	BP	KM
Slide Shows/Talks	107	23	-	22
Nature Camps/Workshops	29	5	4	5
Public Contact Campaigns	73	9	-	4

NH - Nagarahole, BD - Bhadra
BP - Bandipur, KM - Kudremukh

Under the umbrella of the conservation education effort described above, an estimated total of over 150,000 local people living adjacent to the four reserves were targeted during the project period of three years.

The following individual conservation partners assisted in carrying out the field activities:

K. M. Chinnappa, T. S. Gopal, Sanjay Gubbi, Thamoopooiah, M. K. Appachu, C.G. Kushalappa, G. Satish, Surya Addoor, Niren Jain, Devu Hanehalli, Krishna Mohan Prabhu, G.N.Ashokavardhana, D. V.Girish, Girija Shankar, G. R. Sanath Kumar and V. T. Ravindra.



Voluntary Resettlement Programs: Redefining Community Based Conservation

affected people, and at the same time, reducing habitat fragmentation and the perennial human-tiger conflicts in crucial tiger reserves. We believe this strategy holds promise for a positive resolution

Pic: P. Bhargav



A tribal house inside Nagarahole.

Our basic approach to long-term problem of conserving tigers and their habitats was rooted in the idea that overall, the landscapes in and around tiger reserves have to be sustained. This necessarily meant that incompatible human activities that aggravated human-tiger conflicts and increase habitat fragmentation needed to be eliminated in the long run.

We noted with concern that although conservationists are often very vocal about the ill effects of reserve fragmentation, they have offered few solutions to this problem. The WCS Tiger Conservation Policy of 1995 on the other hand, clearly identified that voluntary, incentive-driven resettlement of people was an appropriate policy relevant for critical tiger habitats harboring breeding populations of tigers. Therefore, in this project, voluntary resettlement was actively pursued as a permanent solution to resolve human-wildlife conflicts and to reduce habitat fragmentation.

Our tiger conservation model envisages that human settlements and tiger habitats should be spatially separated - to the extent possible - by providing a better quality of life for the people who voluntarily decide to move out of critical tiger habitats. This tiger conservation strategy targets the twin goals of delivering social justice to the

Pic: P. Bhargav



A new house for resettlers outside Nagarahole.

to human-wildlife conflicts in many other places in southern Asia.

Voluntary resettlement was identified as an immediate need in two of the project areas: Nagarahole and Bhadra. KTCP addressed this issue with utmost care and sensitivity, emphasizing the voluntary, incentive-driven nature of the resettlement process. Intensive, long term interactions of our conservation partners, Wildlife First, Living Inspiration for Tribals (LIFT), and Nature Conservation Guild, with each of the individual families volunteering to resettle, were critical to the process. These interactions, begun in 1995, revealed that many of the forest dwellers aspired to have access to the benefits of the modern world, such as improved agricultural facilities, access to employment, schools, hospitals, transportation and other livelihood opportunities. This basic reality made it easier for our conservation partners to convince the people involved about the benefits of relocation.

Pic: P. Bhargav



M.K. Appachu (Right) consulting a tribal beneficiary.



In the process of facilitating this resettlement process, Wildlife First and LIFT effectively countered the negative campaigns by a few other NGOs, contributing substantially to the success of this effort. These conservation partners, who are continuously monitoring the progress of the project, have also ensured that the new homes, land-right allotment certificates and other social security measures that are meant to support the beneficiaries actually reach them. Towards this end, Wildlife First and LIFT provided critical linkages between various government departments and the resettled families. Members of LIFT also provided critical liaison between the volunteering tribal people in Nagarahole and the agencies involved in the relocation program, and facilitated greater participation by local people in the process of relocation. Out of the 1500 landless families living inside or on the peripheries of Nagarahole, about 50% located in the deep interiors were identified as potential candidates for voluntary resettlement.

In Bhadra, WCS conservation partners, Wildlife First and Nature Conservation Guild, and a highly

effective reserve warden, worked together as a team to swiftly push through an even larger proposal for voluntary resettlement. This proposal had been pending with the Government for over a decade. Because of this delay, a great deal of resentment had built up among the villagers against the Reserve. This resentment manifested itself in the form of retaliatory poaching of large mammals and incidents of deliberate arson in the forest.

About 750 landless and landed families reside within Bhadra's larger forested landscape in sixteen agricultural hamlets, cultivating some 350 hectares of agricultural land. The resettlement project provides compensation for the lands acquired as well as alternate land outside the reserve. A total of 130 million rupees have been budgeted by the Government for acquiring lands, and another 80 million rupees earmarked for the resettlement and rehabilitation of the volunteering families. In this case too, conservation partners of WCS facilitated the liaison between the local villagers and the government departments involved in the program.



A tube well in the resettlement colony.

Pic: P. Bhargav



RESULTS AND EVALUATION

The ideal measure of the true effectiveness for a project like this would undoubtedly be in terms of significant consolidation of tiger habitat at the project sites, and an appreciation (or at least stabilization) of population trends for tigers and their prey species. However, demonstrating these ecological changes requires that scientific monitoring must be initiated from a reliable baseline and must be sustained over the long term to detect changes against that base line.

Firstly, it must be borne in mind that prior to the commencement of the KTCP, the four sites varied considerably in terms of the baseline ecological data against which change could be examined. For instance, Nagarahole had a strong prior scientific presence, and hence, reliable baseline of ecological data on tigers and prey on which KTCP could build. At the other extreme, in Kudremukh the monitoring effort had to be initiated from scratch, starting with the preparation of elementary maps for the site as a major part of establishing the necessary baseline. Therefore, although we believe that significant gains were made in terms of tiger conservation at each of the sites, the progress was by no means uniformly measured.

Secondly, as an effort to improve the conservation outlook for the tiger, KTCP has been a unique project due to the fact that it recognized – and attempted to remedy – several qualitative problems that have beset tiger conservation at the project sites. The flagging morale of wildlife protection staff, the animosity of local villagers to conservation efforts, and the epidemic lack of public awareness about wildlife conservation, are all problems that have severe consequences for tiger conservation. However, the remedies to these problems are clearly qualitative, and their very nature precludes a rigorous quantification of the successes achieved. But from the experience of WCS and its partners, we do know that their effectiveness is lasting and operates on a larger

scale, even if it is somewhat slow in producing the desired changes in quantitative, measurable units.

Thus organization of the following section reflects the nature of the changes that resulted from the implementation of the KTCP: the first subsection documents proximate but clearly quantifiable accomplishments, followed by a subsection that deals with results that were essentially long-term and qualitative in their nature. The third and final sub-section addresses some of the shortcomings of the project, and discusses ways in which these can be addressed in the future.

Accomplishments of the KTCP

Mapping of Project Sites

Maps represent a basic template on which changes in habitat and animal abundance can be documented clearly. In the course of KTCP, maps of all project sites were prepared and updated to include data on broad habitat features, and important logistical features like roads and anti-poaching camps. These maps have been made available to all KTCP partners for use in their work. These maps also include details of line transect placement and camera trap locations for the four reserves and have been prepared at a scale of 1: 50,000. Representations of these maps, at reduced scale are provided in this report (Figures 2, 3, 4 and 5).

Establishing Ecological Benchmarks: Long Term Monitoring of Tiger Ecology and Human Impacts

This project established baseline, benchmark estimates of tiger and prey densities, and potential carrying capacities for tigers and prey at Nagarahole, Bandipur and Bhadra Reserves. In an ecological scenario where protected habitats harboring breeding tiger populations are islands within human-dominated landscape matrices, these data clearly show the importance of



protecting such critical core tiger populations by buffering them against human impacts from outside and within. However, to objectively evaluate the ecological effectiveness of conservation interventions it is absolutely essential to put in place rigorous, long term monitoring of tigers, prey and their habitats in all the protected areas where major conservation investments are being made. Thus, this project constitutes the move to initiate long-term ecological monitoring of tigers at these reserves. It has made available powerful methodological tools for the management of other tiger reserves in the future.

The population sampling and estimation methods and protocols were based on the earlier work carried out in Nagarahole and other reserves in India by Ullas Karanth and James D. Nichols with support from US Fish and Wildlife Service (Division of International Conservation).

Following is a summary of the preliminary results obtained from the population monitoring efforts at the various project sites. The mean values and standard errors (within parentheses) of the density estimates are reported. However, we emphasize that the following estimates will be improved further based on more refined analyses currently under way. They will be eventually published in peer-reviewed scientific journals:

Nagarahole: The field surveys in Nagarahole

were part of a long-term study for monitoring tiger and prey populations conducted by the Centre for Wildlife Studies, with support from WCS and other agencies since 1986. We carried out camera trapping and line-transect surveys for three consecutive years during this project: December 1997-May 1998; December 1998-May 1999; and April-May 2000. The results of the camera-trap capture recapture surveys are provided in Table 8 while the results from line transect surveys are available in Table 9.

Table 8: Estimated Densities of Tigers in Nagarahole

	1998	1999	2000
Trap Points	58	58	60
Sample Efforts (trap nights)	695	868	928
Sample Area (km ²)	243.4	243.4	243.4
Number of Identified Tigers	16	24	26
Number of Tigers in Sample Area	19 (3.4)	32 (4.7)	37 (5.7)
Density of Tigers/ 100 km ²	7.8 (1.48)	13.2 (2.09)	15.2 (2.53)



Identified tiger NHT - 130, Nagarahole.



Table 9: Estimated Prey Densities in Nagarahole

Species	Density (animals/km ²)		
	1998	1999	2000
Chital	36.1 (3.46)	28.0 (3.07)	42.8 (4.05)
Sambar	4.1 (0.59)	5.5 (0.65)	5.3 (0.69)
Muntjac	5.2 (0.55)	2.6 (0.38)	3.2 (0.45)
Gaur	11.3 (2.06)	9.6 (1.51)	4.2 (0.77)
Wild Pig	2.8 (0.52)	3.6 (0.62)	4.5 (1.03)
Langur	32.1 (2.49)	39.8 (3.01)	33.4 (1.79)
Bonnet Monkey	4.3 (0.89)	6.0 (1.15)	4.5 (0.68)
All Prey	95.9	95.1	97.9

Pic: K.U. Karanth



A herd of Gaur.

Pic: K.U. Karanth



Chital Stag and does.

Bhadra: Camera trap field surveys were conducted from April-May 1997 and again from February-April 1998. However, the camera trap surveys in 1998 had to be abandoned for logistical reasons. The results of these surveys are given in Table 10. NE indicates that densities were not estimated.

Table 10: Estimated Density of Tigers in Bhadra



Identified tiger BDT - 103, Bhadra.

Year	1997	1998
Trap Points	77	78
Sample Efforts (trap nights)	587	152
Estimated Sample Area (km ²)	263	NE
Number of Identified Tigers	7	7
Number of Tigers in the Sample Area	9 (1.93)	NE
Density of Tigers/ 100 km ²	3.4	NE



The line transect surveys conducted in 1998 provided the first-ever scientific estimates of densities of prey species in Bhadra. A total sampling effort of 728 km was made, using six representative transect lines to yield density estimates for principal prey species (Table 11). Transect surveys were again carried out in November 2000.

Table 11: Estimated Prey Densities in Bhadra

Species	Density (animals/km ²)	
	1998	2000
Chital	2.3 (0.78)	4.5 (1.40)
Sambar	5.8 (1.08)	0.9 (0.36)
Muntjac	5.4 (0.52)	3.0 (0.76)
Gaur	0.7 (0.32)	1.5 (0.82)
Wild Pig	2.6 (0.95)	NE
Langur	30.2 (2.16)	21.4(2.44)
Bonnet Monkey	3.6 (0.75)	5.0(1.48)
All prey	50.6	36.3



Grassland recovery following village relocation.

Bandipur: We carried out line transect surveys in May-June 1999 and camera trap field surveys in October-December 1999. We used theft-proof metal shells, for the first time in the camera trap operations. The results of the camera trap surveys are in Table 12.

Table 12: Estimated Density of Tigers in Bandipur

Year	1999
Trap Points	63
Sample Efforts (trap nights)	946
Estimated Sample Area (km ²)	284
Number of identified Tigers	16
Number of Tigers in Sample Area	34 (9.9)
Density of tigers/100 km ²	12.0 (3.7)



Identified tiger BPT - 113, Bandipur.

Line transect surveys in Bandipur involved a sampling effort of 475 km using five permanent transects. The estimated densities of different species of prey are reported in Table 13. These are also the first-ever estimates of tiger and prey densities derived for Bandipur using rigorous sampling based approaches.



Wild pigs.

Table 13: Estimated Prey Densities in Bandipur

Species	Density(1999)
Chital	20.1 (6.75)
Sambar	5.6 (1.35)
Muntjac	0.7 (0.27)
Gaur	7.0 (2.96)
Wild Pig	0.7 (0.32)
Chowsingha	1.1(0.79)
Langur	16.4 (3.00)
Bonnet monkey	NE
All prey	51.6



Sambar stag and hind.

Kudremukh: Because of low animal densities, rugged terrain and the potential for theft of camera traps, the field sample surveys employing the approaches used in the other three sites and described above were not feasible in Kudremukh. Therefore, only preliminary reconnaissance surveys of animal distribution were carried out to develop field protocols appropriate for future monitoring efforts in Kudremukh for tigers and their prey. Field surveys were carried out along animal trails as well as paths and forest roads to record encounters with animal sign such as tiger scats, prey dung and evidence of human disturbances. The results of these surveys showed that tiger occurred at very low density at this time in Kudremukh. From a 622 km sampling effort

along trails and roads, only eight scats of tigers were encountered and only 50 prey animals were sighted. However, the field survey confirmed the existence of a breeding tiger population based on observation of sign indicating the presence of cubs. To estimate the absolute densities of tigers and their prey, more intensive sampling is required in the future.

The above results indicate that potentially all the four KTCP sites are prime tiger habitats capable of supporting high densities of tigers and prey. However, at present only some parts of Nagarhole and Bandipur have actually received adequate protection to enable them to support tigers and prey densities close to their potential carrying capacities. It is therefore necessary to carry out population monitoring activities on a regular basis in the future to monitor the effectiveness of the various conservation initiatives currently underway in all four areas.

Improvement in Reserve Protection

Unfortunately, the role of active protection and enforcement in tiger conservation has been greatly underplayed in recent years by most conservation agencies. However, given the explosion of high value trade in tigers and other wildlife, and the pervasive activities of illegal biomass removal from wildlife reserves, it has been our experience that these enforcement measures are necessary and must now be the most important component of any tiger conservation effort.

Although achievements of improved protection were hard to quantify, this was an important aspect that the project addressed. Despite challenges encountered during implementation, we believe substantial gains were made for tiger conservation at all the four sites.

The project's effort in bolstering the protection capability of the Forest Department contributed significantly to their efforts in apprehending cases of illicit activity within the project sites (Table 14).





Table 14: Number of Cases of Forest Offenses Registered

Years	NH	BD	BP	KM
1998	208	244	179	18
1999	227	173		12
2000	311	171		4

Fig: P. Bhargava



A poacher arrested in Bhadra.

Importantly, although difficult to document quantitatively, it was our experience that better-equipped and better-trained staff served as more effective deterrents against poaching and other illegal activity within the project sites. The fact that the vehicles provided under KTCP gave patrolling staff greater mobility and were used intensively is supported by the substantial mileage logged while on protection duties (Table 15).

Table 15: Average Distances Logged by Patrol Vehicles

	NH	BH	BP	KM
Average Distance (kms) logged per vehicle	80,000	85,000	75,000	60,000

NH - Nagarahole, BD - Bhadra
BP - Bandipur, KM - Kudremukh

The positive impacts of improved protection efforts on populations of tigers and their prey are unlikely to emerge within the short span of time wherein monitoring of wildlife abundances was carried out. The availability of better transport and communication facilities also aided in better control and management of problems such as man-made fires during the dry-season. Bhadra was an excellent example of how project assistance in the form of communication, transport, and training was utilized effectively by a motivated and energetic staff. With the close involvement of WCS partners, Bhadra staff effectively prevented extensive forest fires, which had earlier been a regular feature in this area.

Local Community Involvement and Conservation Education

The impact of the conservation education campaigns has helped to reduce the incidence of man-made fires in and around Bhadra reserve, particularly when the forests were vulnerable during the copious flowering of bamboos.

After the incidence of large-scale forest fires and timber smuggling in Nagarahole during 1999, vigorous efforts of WCS conservation partners to address these problems contributed substantially to their remediation in the subsequent years. At Nagarahole, the education program has significantly reduced social support to poaching, with no incidences of local

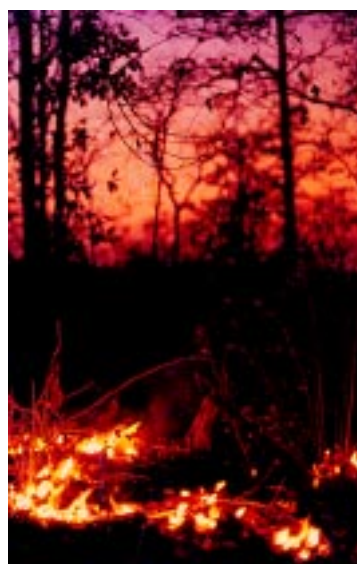


Fig: S. Gubbi

Forest fire.



championing of arrested poachers, unlike in the past. However, it should be noted that this is a cumulative effect of education activities conducted since 1993.

The education efforts around Kudremukh and Bandipur are relatively new, and visible gains will accumulate as these efforts are sustained over the future.

The conservation education products of the project have an impact extending well beyond the mandate of the KTCP. For instance films, books, newsletters, and manuals produced by NAWICOED and other KTCP partners have made highly relevant information written lucidly in the local language available to local people. The impact of such products will serve important tiger conservation needs beyond the 3-year time frame of the project.

Similarly, mobilizing greater news and features coverage of tiger and wildlife conservation issues at the four project sites as a result of project activities has arguably made wildlife conservation more of a topical issue than it has been in the past (Table 16).

Table 16: Media Coverage of Project Sites and Activities

	News Reports on Wildlife Conservation	Reports on KTCP
1998	21	19
1999	101	16
2000	144	03

Long-Term Consolidation of Tiger Habitats

In Nagarahole, around 600 tribal families lived within the interior part of the reserve without legal land holding or rights. With the successful

initiation of the voluntary resettlement project, more than 200 tribal families among these have so far volunteered to resettle on the reserve boundary in Nagapura. The Directorate of Project Tiger, Government of India, provided a total funding of 20 million rupees (450,000 US \$) for the resettlement project under its Beneficiary Oriented Tribal Development (BOTD) scheme. The Karnataka State Government provided 700 hectares of land and other infrastructure support such as tube wells, agricultural and agro-forestry support. Sustained efforts of WCS partners, Living Inspiration for Tribals (LIFT) and Wildlife First, played a critical catalytic role in motivating the tribal people inside the park to accept the resettlement package offered by the Government. These two organizations acted as effective links between the beneficiaries, the government and local social leadership of the area.

The voluntary village relocation project at Bhadra also progressed significantly, with necessary political commitments and approvals of the State and Federal Governments materializing during the project period. The release of necessary funds from these governments for the first phase land acquisition and resettlement of three villages also materialized.

The above progress in Nagarahole and Bhadra has set the stage for significant reductions in the fragmentation of prime tiger habitats in both these reserves. In addition to improving habitat quality, these projects are significantly improving the quality of life of the people who were hitherto marooned inside wildlife reserves without access to livelihood opportunities.

While government departments implemented the process of relocation, WCS conservation partners provided leadership and moral support to the volunteering people. They liaised with government departments and made the process of resettlement more participatory. Considerable political will and monetary investments were essential to set the process in motion. Conservation partners provided



a vital catalytic influence at times when the process lost momentum.

Overall the successful initiation of the voluntary resettlement efforts at Nagarahole and Bhadra synergised by this project are contributing greatly to generating positive political will to promote voluntary resettlement as a conservation strategy by the State and Federal Governments.

One of the major goals of the project was to leverage the assistance provided under the project. Activities of KTCP conservation partners succeeded in catalyzing investments of around Rupees 230 million (5 million US \$) from Government of India and Government of Karnataka, thus showing significant amount of leveraging of investments made under this project.

We also note that Rajendra Singh - one of India's respected leaders in the arena of human rights and



Rajendra Singh with KTCP team and resettlement beneficiaries.

rural development visited Nagarahole and Bhadra, interacted with the people, and publicly endorsed the resettlement efforts. We consider his testimony to be a measure of the sincerity with which WCS conservation partners have pursued the difficult goal of reconciling the conflicting interests of local people with the survival needs of wild tigers.

Nurturing Community Leadership for Tiger Conservation

KTCP field coordinators and other conservation partners actively helped the reserve protection staff

by sharing information about conservation and law-enforcement needs. Thus they continually monitored the protection efforts. The fact that more than 900 formal and informal interactions were held with the Forest Department at various levels – from the Chief Wildlife Warden to the local forest guards – is a clear testimony to the intensity and uniqueness of monitoring under this project. Such deep involvement of WCS conservation partners also meant that protection staff positioned even in the most remote corners of the reserves realized that their work was indeed valued by the outside community.

WCS conservation partners, mostly volunteers who freely invested time and energy in this project, brought to bear their considerable social and managerial skills, as well as political and official contacts to help strengthen the project activities. More than anything else, it is the spirit of this voluntarism that made it possible for the project to achieve what it did. The role of WCS in the project was largely intellectual in providing scientific knowledge and overall direction, while Save the Tiger Fund and other WCS donors provided the material means of making this vision a reality. All of these roles were critical to making the project work, but in the end, it was the interventions of the dedicated local conservationists who were committed to long-term on ground action that mattered the most.

KTCP: A Critique of Some Short Comings

Although the project achieved success overall, there were a few shortcomings in the project design and implementation that need to be recorded. We provide the following critique so that future projects of this kind make an effort to address them:

1. Although about 60% of the investments made under the project were outright grants of equipment and services provided to Karnataka Forest Department, the effectiveness with which

this assistance was used, varied widely between reserves and over the project duration. The primary factor that mattered in the effective utilization of the equipment and other assistance provided by the project appeared to be the quality of the individual range and reserve wardens in place at the time. The administrative structure and dynamics of the Forest Department (Annexure-2) is based on an annual turnover of personnel – with the usual tenure of an individual official being about 3 years. Furthermore, as in all administrative structures, the caliber and motivation levels of the individuals varied greatly. In some cases, this factor led to poor or ineffective use of the assistance provided under KTCP.

We note that most conservation agencies that try to work with the government simply 'go with the flow' and ride out such situations without trying to remedy them. In the case of KTCP however, many of our conservation partners, being dedicated and strong-willed conservationists, tried to remedy such situations by intervening strictly according to Indian laws. Such interventions led to negative interactions in a few cases. However, in a majority of the situations, the officials welcomed and effectively used the assistance provided under KTCP, working closely with WCS conservation partners.

2. Most WCS conservation partners worked on this project on a voluntary basis without remuneration, with the project assistance covering only the reimbursement of expenses incurred. This spirit of voluntarism permeating through the project kept the costs low, achieving more conservation gains for every dollar spent. However, while such volunteer conservation partners were extremely effective in dealing with the complex tiger conservation challenges on ground, their ability to systematically maintain either written or photographic records of their activities, and to present the information coherently in a non-verbal format, was

inadequate. This failure in recording critical activities and interventions was subsequently reflected in inadequate reporting from the field. As a result, the authors of this report have found it extremely difficult to collate, synthesize and adequately present the achievements of the project here. Unfortunately, this lacuna makes it difficult to evaluate and present this project clearly to an outside audience.

We believe that in future conservation projects of this nature it is necessary to build in a component of professional project staff capable of recording and reporting field activities in a detailed and analytical manner. However, bringing in such professionals will necessarily increase the non-productive costs of such tiger conservation projects significantly.

3. During the first two years, ironically, the support provided under this project appeared to be relatively less effective in Nagarahole, where WCS had the strongest prior involvement, compared to the other three sites. This was because the staff in Nagarahole, particularly the Range wardens, Assistant wardens and the Reserve warden, appeared to be continually distracted by multifarious non-protective duties that they had to undertake on account of the concurrent implementation of the 10 million dollar World Bank-GEF India Eco Development Project (IED). The planning, consultations, meetings and rural development activities taken up under IED appeared to take staff's attention away from hardcore protective duties. The concerns related to the same project also appeared to significantly retard the progress of the Project Tiger sponsored voluntary resettlement project titled Beneficiary Oriented Scheme for Tribal Development (BOTD), that WCS conservation partners were actively involved in assisting.





CONCLUSIONS

Karnataka Tiger Conservation Project was one of the earliest projects in India that recognized the critical need to actively strengthen the protection and law enforcement efforts in tiger reserves. It was also one of the few projects that actually tried to integrate rigorous research and science as an integral part of project implementation. It is very satisfying to note that many other tiger conservation projects are trying to follow this model now.

KTCP was a discrete 3-year long 'project.' However, as far as tiger conservation in Karnataka is concerned, it is a process that must continue in order to be truly successful in the long run. KTCP was built on 14 years of prior research work and conservation networking by WCS partners. Most of the conservation activities developed under KTCP (except for the one-time infrastructure inputs provided to the government) continued by WCS conservation partners under a new project titled are being 'Community Leadership for Tiger Conservation' (CLTC).

This project was subsequently funded by 21st Century Tiger and Save the Tiger Fund. Building local community support to tiger conservation, promoting long-term consolidation of tiger habitats through voluntary resettlements/land acquisition and continued monitoring of tiger conservation at three of the four KTCP sites – Nagarahole, Bhadra and Kudremukh – form the core of the new project.

KTCP has helped to establish and strengthen several local conservation organizations/projects built around strong and effective individuals who are deeply rooted in the social context around these three reserves. K. M. Chinnappa, T. S. Gopal and M. K. Appachu continue the work around Nagarahole. D. V. Girish leads conservation activities at Bhadra, and Niren Jain does the same at Kudremukh. Another new WCS supported initiative has been the Wildlife First Outreach - a new project being led by Praveen Bhargav with

assistance from Sanjay Gubbi, that aims at synthesizing the experience gained by all these field projects and sharing it with a wider popular audience.

Overall, the Karnataka Tiger Conservation Project attempted to implement a comprehensive conservation strategy using an innovative combination of sustained tiger protection efforts coupled with scientific monitoring, community education, conflict reduction and habitat consolidation through voluntary resettlements. The project tried to build a model for active collaboration between non-governmental organizations and government departments in charge of tiger protection. The project has demonstrated that forging such critical partnerships between the government, local conservation partners and international donors can work effectively to change the situation on ground in favor of wild tigers.

Developing and mentoring individual community leaders who truly care for tigers so that they can effectively translate their concern into ground-level action that is based on sound science rather than emotion and rhetoric, has been a major long-term gain from this project. WCS believes that this model of site-based tiger conservation practiced in a landscape context holds considerable promise for replication at many other sites across the tiger's range in tropical Asia. WCS also plans to critically evaluate KTCP and other tiger conservation models in peer-reviewed scientific publications in the future. This report is seen as an initial step in that direction.



A tiger in Nagarahole.

Photo: K. U. Karanth



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APPENDIX – 1: SPECIES OF LARGE MAMMALS OCCURRING AT THE PROJECT SITES

P = Species Present ND = Possibly Present, No Data A=Species Absent

S.No	Common Name	Scientific Name	NH	BD	BP	KM
1	Bonnet Macaque	<i>Macaca radiata</i>	P	P	P	P
2	Lion Tailed Macaque	<i>Macaca silenus</i>	A	A	A	P
3	Hanuman Langur	<i>Presbytis entellus</i>	P	P	P	P
4	Tiger	<i>Panthera tigris</i>	P	P	P	P
5	Leopard	<i>Panthera pardus</i>	P	P	P	P
6	Leopard Cat	<i>Felis bengalensis</i>	P	P	P	P
7	Rusty Spotted Cat	<i>Felis rubiginosa</i>	P	ND	P	ND
8	Jungle Cat	<i>Felis chaus</i>	P	P	P	P
9	Malabar Civet	<i>Viverra megaspila</i>	ND	ND	A	P
10	Small Indian Civet	<i>Viverricula indica</i>	P	P	P	P
11	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>	P	P	P	P
12	Brown Palm Civet	<i>Paradoxurus jerdoni</i>	ND	ND	A	P
13	Common Mongoose	<i>Herpestes edwardsi</i>	P	P	P	P
14	Ruddy Mongoose	<i>Herpestes smithi</i>	P	P	P	P
15	Stripe-necked Mongoose	<i>Herpestes vitticollis</i>	P	P	P	P
16	Brown Mongoose	<i>Herpestes fuscus</i>	ND	ND	A	P
17	Striped Hyena	<i>Hyaena hyaena</i>	A	P	P	A
18	Jackal	<i>Canis aureus</i>	P	P	P	P
19	Wolf	<i>Canis lupus</i>	A	A	P	A
20	Dhole	<i>Cuon alpinus</i>	P	P	P	P
21	Sloth Bear	<i>Melursus ursinus</i>	P	P	P	P
22	Common Otter	<i>Lutra lutra</i>	P	P	P	P
23	Clawless Otter	<i>Aonyx cinerea</i>	A	A	ND	P
24	Smooth Indian Otter	<i>Lutra perspicillata</i>	P	ND	P	P
25	Ratel	<i>Mellivora capensis</i>	A	A	ND	A
26	Nilgiri Marten	<i>Martes gwatkinsi</i>	A	A	A	ND
27	Large Flying Squirrel	<i>Petaurista petaurista</i>	P	P	P	P
28	Small Flying Squirrel	<i>Petinomys fuscocapillus</i>	ND	ND	A	P

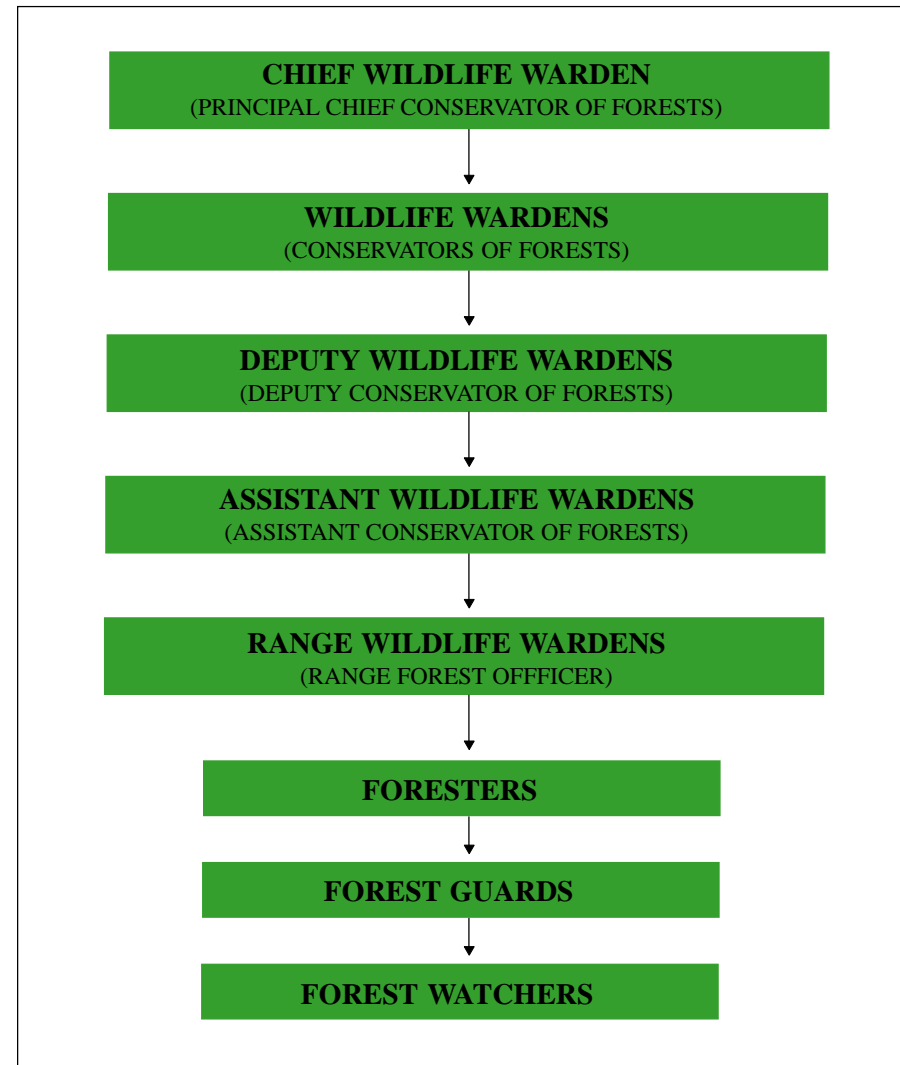


29	Indian Giant Squirrel	<i>Ratufa indica</i>	P	P	P	P
30	Indian Porcupine	<i>Hystrix indica</i>	P	P	P	P
31	Blacknaped Hare	<i>Lepus nigricollis</i>	P	P	P	P
32	Asian Elephant	<i>Elephas maximus</i>	P	P	P	P
33	Gaur	<i>Bos gaurus</i>	P	P	P	P
34	Chowsingha	<i>Tetracerus quadricornis</i>	P	A	P	A
35	Blackbuck Antelope	<i>Antelope cervicapra</i>	A	A	P	A
36	Sambar	<i>Cervus unicolor</i>	P	P	P	P
37	Chital	<i>Axis axis</i>	P	P	P	A
38	Muntjac	<i>Muntiacus muntjak</i>	P	P	P	P
39	Indian chevrotain	<i>Tragulus meminna</i>	P	P	P	P
40	Wild Pig	<i>Sus scrofa</i>	P	P	P	P
41	Indian Pangolin	<i>Manis crassicaudata</i>	P	P	P	P

NH - Nagarahole, BD - Bhadra, BP - Bandipur, KM - Kudremukh



**APPENDIX – 2: ADMINISTRATIVE STRUCTURE OF
KARNATAKA FOREST DEPARTMENT
(WILDLIFE WING)**



INSIDE
COVER
BLANK