CEPF SMALL GRANT FINAL PROJECT COMPLETION REPORT

Organization Legal Name:	-
Project Title:	Ecological and Anthropogenic Correlates influencing Large Carnivore Occupancy and Distribution in the Sahyadri – Konkan Corridor
Date of Report:	2nd March 2014
Report Author and Contact Information	Advait Edgaonkar, Indian Institute of Forest Management Bhopal

CEPF Region: Western Ghats and Srilanka Biodiversity Hotspot

Strategic Direction: Strategic Direction 2. Improve the conservation of globally threatened species through systematic conservation planning and action

Grant Amount: $19,721

Project Dates: August 2009-July 2011

Implementation Partners for this Project (please explain the level of involvement for each partner):

Center for Wildlife Studies, Bangalore:- provided logistics support, including support for research permission, library facilities and desk space for Principal Investigator

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile.

The distribution and occurrence of the tiger, dhole, sloth bear and leopard in the North Western Ghats and adjoining low elevation forests of the Konkan region in the state of Maharashtra, part of the Sahyadri - Konkan corridor (Critical Ecosystem Partnership Fund) was investigated and ecological and anthropogenic factors influencing this distribution and occurrence was quantified. As a result of the survey, six key areas of importance to the conservation of large carnivores were identified (See Annexure 1)

Since this was a research project without an implementation component, the primary output was a recommendation for strengthening of conservation action in specific areas (given in Annexure 1). Locations (with geographical coordinates) have been provided where necessary action can be taken to allow potential movement of carnivores between protected areas and strengthen connectivity.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal.

We found proximity to a potential 'source population' with known tiger presence to be the most influential factor determining tiger occupancy in our project area. Such source populations reproducing above 'replacement levels' linked with natural habitat corridors could potentially permit dispersal of tigers to *prima facie* low tiger density landscapes. This result highlights the importance of strict preservation of source sites of tigers which could then contribute to larger landscapes connected by habitat corridors. In the context of the Sahyadri Tiger Reserve, this means that given adequate protection the reserve could potentially become a source site for tigers in the future. But, it is vitally important that forest connectivity with other 'source' reserves is maintained in order for possible migration of tigers to occur within the Sahyadri Konkan corridor.

Although prey densities and anthropogenic disturbances have been shown to have strong influences on tiger occupancy, they did not show up strongly in our study. But this is possibly because we used indices, such as encounter rate of prey signs and disturbance categories along survey trails, which may not appropriately represent prey densities and negative anthropogenic influences within sampling units. Nevertheless for rapid, sign-based landscape-level studies, such indices offer a logistically convenient way of sampling and measuring potential covariates influencing species' occupancy and detection probabilities.

For the dhole, sloth bear and leopard we found the presence of protected area (PA) to be the most important effect influencing occupancy. Such strong selection of PAs by the three carnivores at the landscape-scale may possibly be attributed to higher human densities outside PAs. Human densities have been shown to strongly correlate with extinction risk in carnivores, even though adaptable species may be less sensitive to human influences. However, our results show a strong influence of the presence of PAs even on adaptable species such as the leopard, highlighting the importance of 'zoning' for large carnivore conservation. Percentage forest cover was included in the top models for all four carnivores, but it weakly influenced occupancy.

It may be important to note in the case of sloth bear, even though disturbance index had weak CIs it was still an important variable in the model confidence set. In our study area, we did not record any occurrence of bear attacks during the study period. Bears were also largely detected in protected areas which may correlate to ample availability of food for the myrmecophagous species.

Detection probability for the tiger, sloth bear and leopard was negatively influenced by the presence of livestock. Free grazing by livestock in forests is a prevalent practice in India and deleterious effects of livestock grazing on large herbivores have been documented. In our study, we found that livestock presence in forests considerably influenced detection probabilities of large carnivores.

Please provide the following information where relevant:

Hectares Protected: NIL

Species Conserved: NIL

Corridors Created: NIL

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.

The project was primarily implemented on the ground by numerous volunteers aided by villagers from the local survey sites. Success of the project can be classified into two kinds.

- The first is identification of areas with carnivore occupancy to generate base line information which can be used for further monitoring, and as also the highlighting of key areas within the landscape in need of conservation attention with respect to large carnivore connectivity.–
- Secondly increase in knowledge about the ecological factors governing the distribution of large carnivores in the area.

Challenges faced by the project were that the area was physically difficult to survey, and that field work was physically grueling. A lot of terrain had to be covered in a limited time and with a small number of staff.

There was delay in obtaining permission from the Goa Forest Department and so the study area was confined to Maharashtra state.

Were there any unexpected impacts (positive or negative)?

We learnt that tiger occupancy is primarily confined to protected areas in the southern portions of the Sahyadri Konkar corridor, whereas leopard occupancy still extends throughout the landscape.

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

Project Design Process: (aspects of the project design that contributed to its success/shortcomings)

This research project followed a standardized design that is globally well accepted. The technical details (see Annexure 1) of grid cell size, survey effort in within each cell, ecological variables measured, the statistical methods of analysis and the software and models used have been vetted by the scientific community even if they are not very old. This aspect of the design meant that there were no analytical challenges on obtaining of the data.

Because it was a small grant for an individual-based project, the shortcomings were primarily that it was short-term in temporal scope and confined to one state. This is however not a major drawback as other projects have been taken up across the Western Ghats and so continuity of data, both temporal and spatial is being obtained by other researchers. The All India tiger estimation project by the government will also obtain similar data in the landscape at 4 year intervals, for which the present study can be used as a baseline.

Project Implementation: (aspects of the project execution that contributed to its success/shortcomings)

Because the survey was done primarily by volunteers, it could be done relatively cheaply.
Primary staff were all from within the state and familiar with Marathi, the local language, thus enabling a lot of cooperation from the local staff of the protected areas and from the villagers from near the sampling sites.
The physically grueling nature of the survey resulted in the first researcher dropping out causing some delays.
Sampling could have been further intensified if greater number of volunteers could have been found.

Other lessons learned relevant to conservation community:

Protected areas are very important for maintaining a source population for tigers, the greater the distance away from Anshi-Dandeli Tiger Reserve, the lower was the occupancy for tigers.

Feral cattle in this landscape were found to be influencing detectability of tigers and leopards negatively, though not for dholes.

Chandoli National park has free living feral cattle, which need to be removed.

ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes
Center for Wildlife Studies	Project Co-financing	Non-monetary support	Logistics, permissions support, library facilities, technical consultations and desk space

Additional funding should be reported using the following categories:

A *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*

B *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)*

C *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

Summarize any unplanned sustainability or replicability achieved.

This study can be considered part of the nation-wide effort to arrest the decline of large carnivores and is one of a series of studies being carried out to investigate carnivore occupancy in the country. Further research on occupancy of large carnivores has been carried out by CWS in this region as also in the southern Western Ghats, which together form the biodiversity hotspot.
Large carnivores in India are amongst the most threatened taxa and government agencies have adopted the similar methodologies to this study with similar different grid sizes to investigate occupancy in many Tiger Reserves and corridors connecting protected areas around the country. There is now increased baseline information available to monitor the success or failure of conservation policies at both the protected area and the landscape scale.

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

Not applicable

Performance Tracking Report Addendum

CEPF Global Targets

(Enter Grant Term) August 2009- July 2011

Provide a numerical amount and brief description of the results achieved by your grant.
Please respond to only those questions that are relevant to your project.

Project Results	Is this question relevant?	If yes, provide your numerical response for results achieved during the annual period.	Provide your numerical response for project from inception of CEPF support to date.	Describe the principal results achieved from Aug 1, 2009 to June 30, 2011. (Attach annexes if necessary)
1. Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.	No			.
2. How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?	No			Please also include name of the protected area. If more than one, please include the number of hectares strengthened for each one.
3. Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.	No			Information provided to forest management authorities about key areas that are vulnerable in the Northern Western Ghats outside the 3 protected areas will help maintain connectivity for large carnivores between these areas.
4. Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.	No			The principal result was a recommendation on which are the key areas to maintain connectivity for large carnivores within the Sahyadri Konkan Corridor
5. If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits? Please complete Table 1below.	No			

If you answered yes to question 5, please complete the following table.

Table 1. Socioeconomic Benefits to Target Communities

Please complete this table if your project provided concrete socioeconomic benefits to local communities. List the name of each community in column one. In the subsequent columns under Community Characteristics and Nature of Socioeconomic Benefit, place an X in all relevant boxes. In the bottom row, provide the totals of the Xs for each column.

Name of Community	Community Characteristics								Nature of Socioeconomic Benefit												
									Increased Income due to:												
	Small landowners	Subsistence economy	Indigenous/ ethnic peoples	Pastoralists/nomadic peoples	Recent migrants	Urban communities	Communities falling below the poverty rate	Other	Adoption of sustainable natural resources management practices	Ecotourism revenues	Park management activities	Payment for environmental services	Increased food security due to the adoption of sustainable fishing, hunting, or agricultural practices	More secure access to water resources	Improved tenure in land or other natural resource due to titling, reduction of colonization, etc.	Reduced risk of natural disasters (fires, landslides, flooding, etc)	More secure sources of energy	Increased access to public services, such as education, health, or credit	Improved use of traditional knowledge for environmental management	More participatory decision-making due to strengthened civil society and governance.	Other
Not applicable- This was not a socioeconomic study																					
Total																					

If you marked "Other", please provide detail on the nature of the Community Characteristic and Socioeconomic Benefit:

Additional Comments/Recommendations

See Annexure 2

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our Web site, www.cepf.net, and publicized in our newsletter and other communications.

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List of Appendices:
Annexure 1. Identifying key areas for intervention
Annexure 2. Additional Comments and Recommendations

Annexure 1

Identifying key areas for intervention:

To direct conservation action meaningfully, we have highlighted a few key areas for intervention based on our observations, surveys and analyses. (See Figure 1). These key areas have been identified using ecological and anthropogenic criteria based on sampled grid cells from our study and NOT based on range divisions made by the Maharashtra State Forest Department.

Figure 1a : Highlighted key areas for intervention

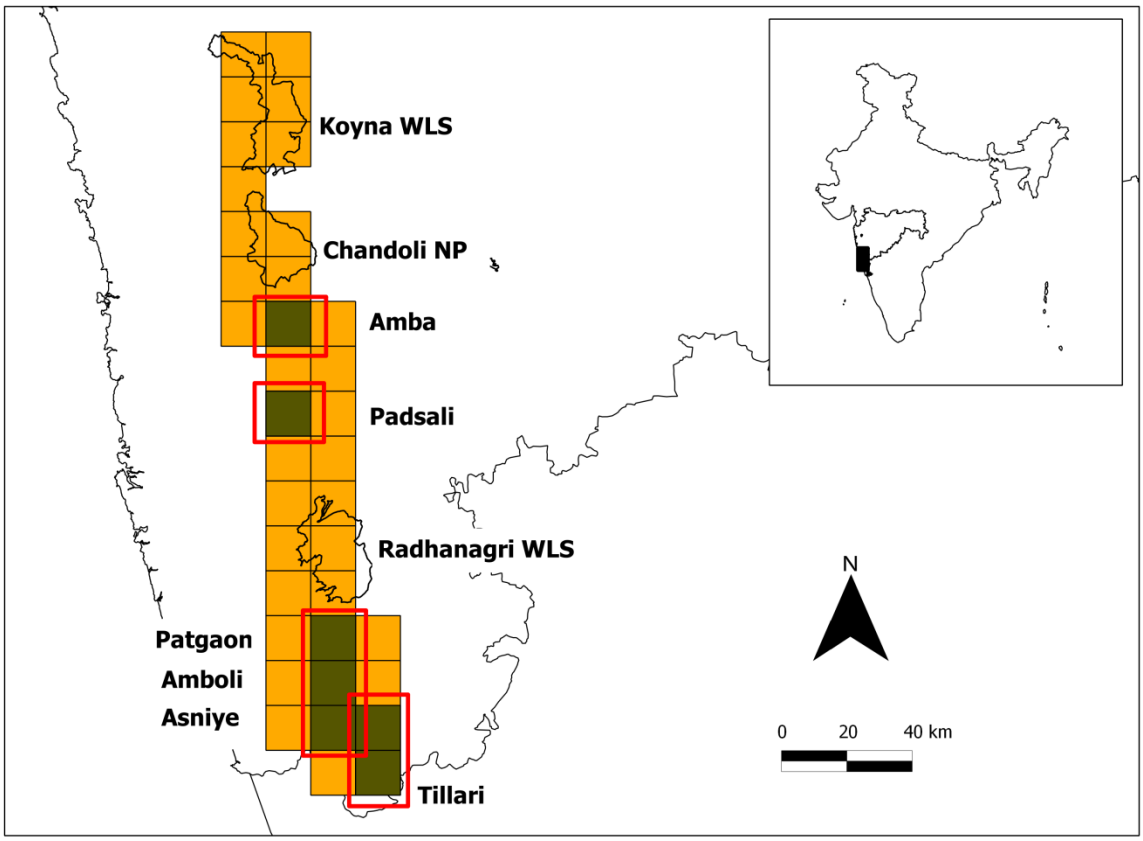

Figure 1b : Google Earth image of Supercells (188 sq. Km) and sub-cells (11.7 sq km) for Koyna WLS.

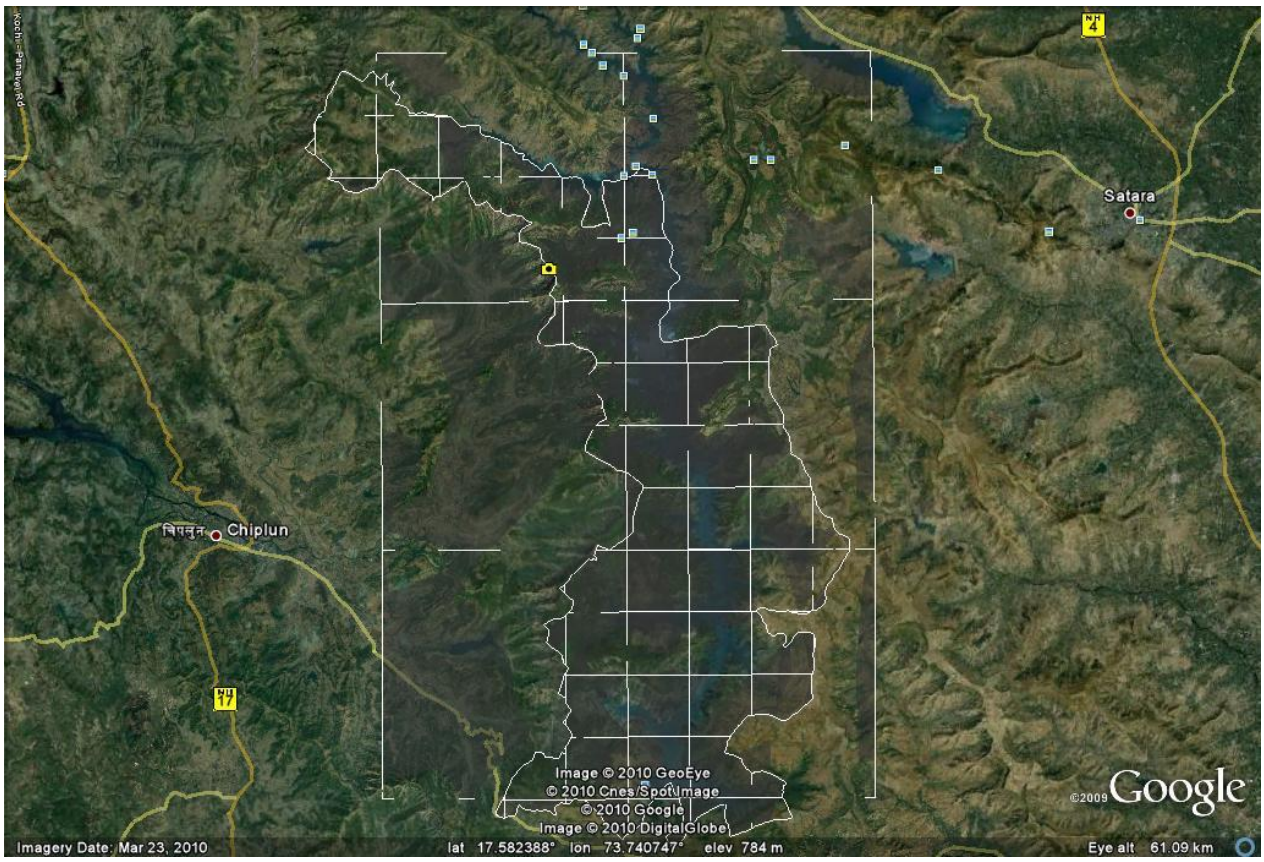

Figure 1c : Google Earth image of GPS track in grid-cells (11.7 sq km) of Chandoli National Park.

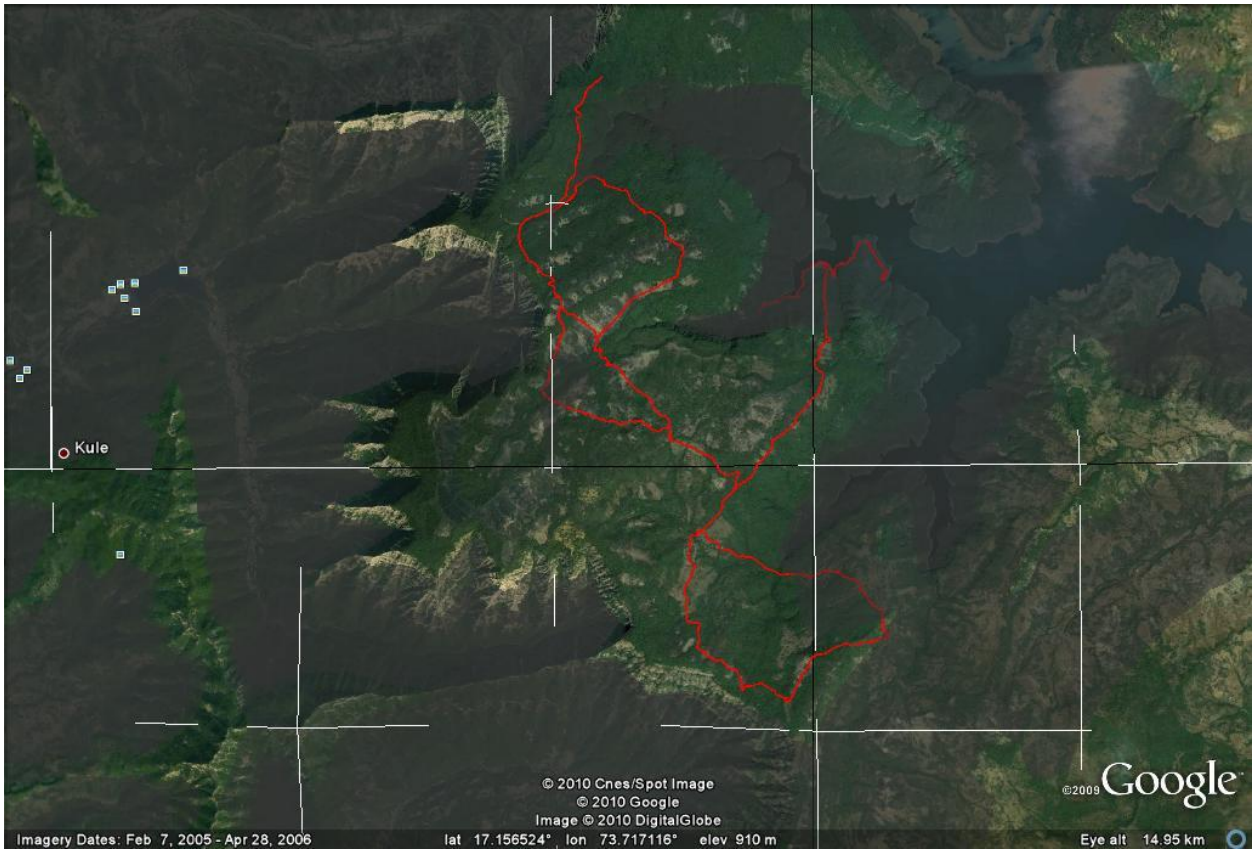

Table 1: Key Areas identified for intervention.

Site	Administrative Location	Geographical Coordinates	Comments
1. Gothna, Ambaghat toVishalgad	2. Shahuwadi taluka, Kolhapur district 3. Sangmeshwar taluka, Ratnagiri distric	17°01'44"N, 73°49'48"E to 16°54'11"N, 73°47'45"E	1. Important for maintaining contiguity of Chandoli National Park to areas further south. 2. Conserving the forest around Ambaghat as well on the plateau extending till Vishalgad is critical.
2. Padsali, Barki plateau and Pombre	4. Panhala taluka, Kolhapur district	16°46'40"N, 73°49'44"E to 16°39'32"N, 73°53'33"E	1. Critical for connecting RadhanagariWildlife Sanctuary to Chandoli National Park. 2. Possibly support a good population of gaur.
3. Rangana, Patgaon dam and Gangotri	5. Kudal taluka, Sindhudurg district 6. Bhudargad taluka, Kolhapur district	16°09'30"N, 73°50'29"E to 16°02'45"N, 74°00'22"E	1. Connects Radhanagari Wildlife Sanctuary to forest areas in and around Amboli. 2. Signs of tiger found here. 3. Some areas recommended for inclusion into Radhanagari Wildlife Sanctuary.
4. Amboli, Parpoli, Verle to Ambegaon	7. Sawantwadi taluka, Sindhudurg district	16°02'11"N, 73°57'31"E to 15°54'47"N, 73°56'36"E	1. A number of private land holdings need meaningful interventions and conservation action. 2. Tiger, leopard, sloth bear and dhole signs seen 3. Mining in nearby areas possibly a serious threat to wildlife and forests
5. Asaniye, Phukeri, Kesari - Phansawde and Zolambe	8. Sawantwadi and Dodamarg talukas, Sindhudurg district)	15°54'19"N, 73°56'19"E to 15°48'14"N, 73°59'21"E	1. Large number of private forest land holdings. 2. Conservation action needs community involvement and education, 3. Conversion of private forests cashew and rubber is a matter of concern.
6. Tillarighat, Ramghat, Ker – Bhekurli and Mangeli	9. Dodamarg taluka, Sindhudurg district 10. Chandgad taluka, Kolhapur district	15°50'16"N, 74°1'19"E to 15°41'14"N, 74°6'47"E	1. Only contiguous patches of forest linking forests of the Western Ghats from Karnataka and Maharashtra 2. Tiger, leopard and dhole signs seen 3. Potential corridor for elephants also

Annexure 2

Additional Comments and Recommendations

1. Our study reinforces the importance of using approaches that explicitly account for detection probability in monitoring of large carnivores within large landscapes. Systematic monitoring would enable in evaluation of management actions in smaller reserves as well as large landscapes.

2. Our study shows that Protected Areas influence distribution and occurrence of large carnivores in the North Western Ghats. We recommend strict preservation of these sites to ensure long-term persistence of large carnivores in the landscape.

3. We also highlight the need for conservation intervention in preserving a permeable movement corridor with a known tiger conservation unit (Dandeli-AnshiTiger Reserve), facilitating natural dispersal of tigers to occur within the North Western Ghats. This mayespecially be important in the context of persistence of tigers in the newly formed SahyadriTiger Reserve, where probability of tiger occupancy was found to be much lower than landscape units closer to the source.

4. Presence of free-grazing livestock in forests may negatively influence detections of carnivore signs. Therefore, we recommend that these feral herds be removed from these protected reserves since livestock compete directly with herbivores for food and are also carriers of potentially harmful diseases.

5. Due to their wide-ranging habits, large carnivores occur in low densities and require large zones than any other terrestrial assemblage; therefore a long-term conservation strategy

needs to include protected enclaves connected by natural habitat corridors for movement. But, since most natural corridors would be multi-use landscapes, large carnivore conservation would need to focus partly on conserving permeability within these human-modified land uses as well. Indeed, conservation of top carnivores within larger landscapes would largely benefit other land mammals as well.