CRITICAL ECOSYSTEM PARTNERSHIP FUND

Ecosystem Profile

WESTERN GHATS & SRI LANKA BIODIVERSITY HOTSPOT

WESTERN GHATS REGION

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INTRODUCTION

The Critical Ecosystem Partnership Fund (CEPF) is a joint initiative of Conservation International (CI), l'Agence Française de Développement, the Global Environment Facility (GEF), the Government of Japan, the John D. and Catherine T. MacArthur Foundation, and the World Bank designed to help safeguard the world's biodiversity hotspots. Conservation International administers the global program through a CEPF Secretariat.

The Western Ghats and Sri Lanka biodiversity hotspot, with its unique assemblages of plant and animal communities and endemic species, is globally important for conserving representative areas of the Earth's biodiversity, making it worthy of international attention and CEPF funding.

A fundamental purpose of CEPF is to engage civil society, such as community groups, nongovernmental organizations (NGOs), and private enterprises, in biodiversity conservation in the hotspots. To guarantee their success, these efforts must complement existing strategies and frameworks established by national governments in the region. CEPF promotes a coordinated approach to conservation by facilitating working alliances among diverse groups and eliminating duplication of efforts.

CEPF focuses on biological areas rather than political boundaries and also examines conservation threats on a corridor or landscape-scale basis.

THE ECOSYSTEM PROFILE

The Western Ghats, extending along the west coast of India, covers an area of 180,000 square kilometers (Figure 1). The Western Ghats comprises the major portion of the Western Ghats and Sri Lanka Hotspot, one of 34 global biodiversity hotspots for conservation and one of the two on the Indian subcontinent. The area is extraordinarily rich in biodiversity. Although the total area is less than 6 percent of the land area of India, the Western Ghats contains more than 30 percent of all plant, fish, herpetofauna, bird, and mammal species found in India. Like other hotspots, the Western Ghats has a high proportion of endemic species. The region also has a spectacular assemblage of large mammals and is home to several nationally significant wildlife sanctuaries, tiger reserves, and national parks. The Western Ghats contains numerous medicinal plants and important genetic resources such as the wild relatives of grains (rice, barley, *Eleucine coracana*), fruits (mango**,** garcinias, banana, jackfruit), and spices (black pepper, cinnamon, cardamom, and nutmeg).

In addition to rich biodiversity, the Western Ghats is home to diverse social, religious, and linguistic groups. The high cultural diversity of rituals, customs, and lifestyles has led to the establishment of several religious institutions that strongly influence public opinion and the political decision-making process. Conservation challenges lie in engaging these heterogeneous social groups and involving them in community efforts aimed at biodiversity conservation and consolidation of fragmented habitats in the hotspot.

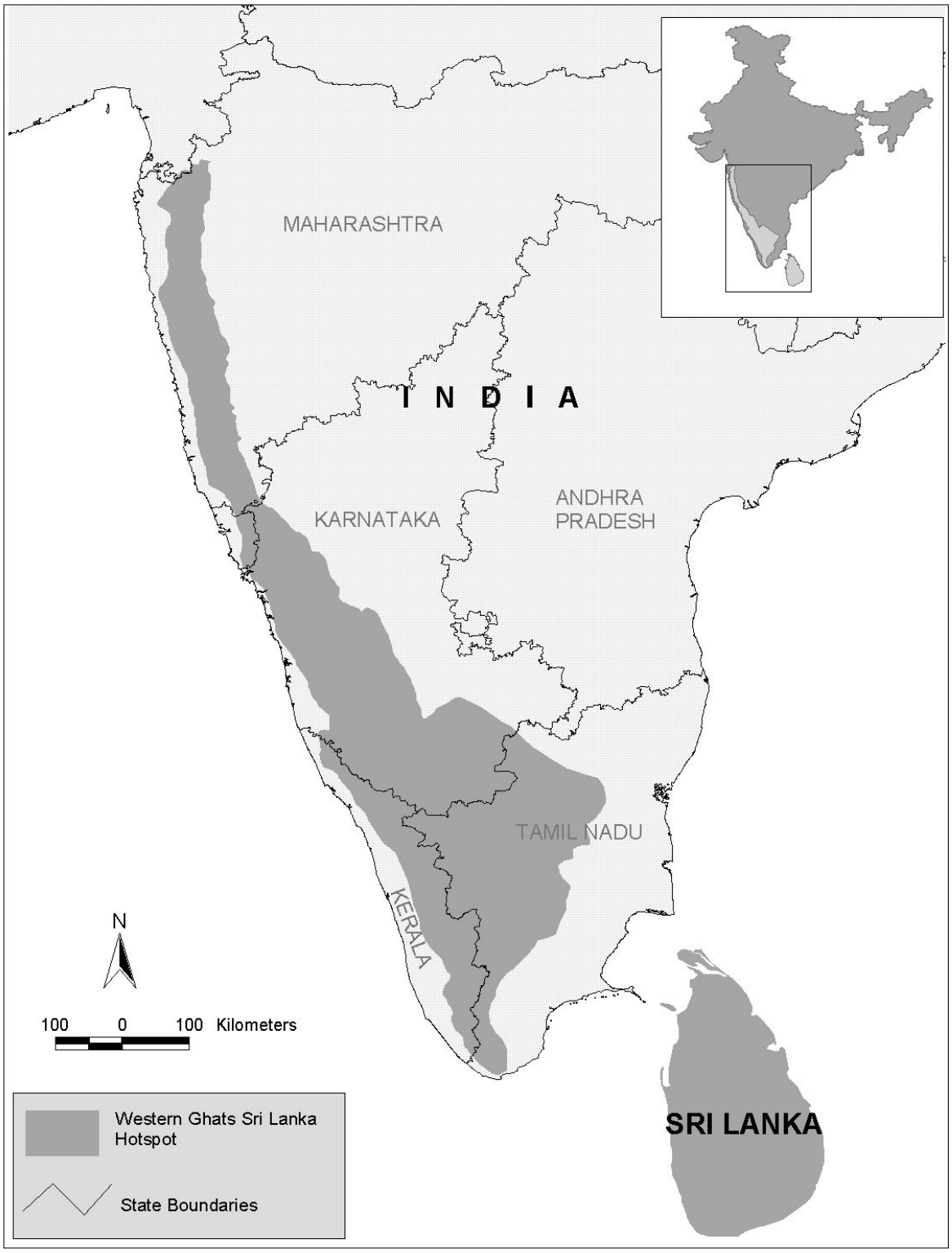
Because it is a largely montane area that receives between 2,000 and 8,000 millimeters of annual rainfall within a short span of three to four months, the Western Ghats performs important hydrological and watershed functions. Approximately 245 million people live in the peninsular Indian states that receive most of their water supply from rivers originating in the Western Ghats. Thus, the soils and waters of this region sustain the livelihoods of millions of people. With the possible exception of the Indo-Malayan region, no other hotspot impacts the lives of so many people.

Biodiversity in the Western Ghats is threatened by a variety of human pressures. Of the approximately 180,000-square-kilometer area in the Western Ghats region, only one-third is under natural vegetation. Moreover, the existing forests are highly fragmented and facing the prospect of increasing degradation.

This ecosystem profile provides an overview of the causes of biodiversity loss, describes current institutional frameworks and investments for conservation, and outlines strategic directions that can be implemented by civil society to contribute to the conservation of biodiversity in the hotspot. Applicants will propose specific projects consistent with these broad directions and criteria. The ecosystem profile does not define the specific activities that prospective implementers may propose in the region, but outlines the strategy that will guide those activities.

The strategic directions seek to capitalize on the tremendous social and human resources of the region. The Western Ghats is home to a number of outstanding civil society organizations. Human capital in the Western Ghats is huge and extraordinarily well equipped, in terms of education and motivation, to undertake conservation action. CEPF investments will strengthen the fledgling participation of civil society in biodiversity conservation and provide resources to a range of civil society actors who seek to catalyze change and undertake innovative and effective approaches to conservation.

Figure 1. Map of the Western Ghats and Sri Lanka Hotspot



Source: Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

BACKGROUND

The ecosystem profile and five-year investment strategy for the Western Ghats region was developed from an analysis of primary and secondary data, consultation with experts, and stakeholder workshops. The preparation of the profile was coordinated by the Ashoka Trust for Research in Ecology and Environment (ATREE) in collaboration with the Wildlife Conservation Society (WCS) – India Programme and the University of Agricultural Sciences (UAS), Bangalore. Many experts participated in preparation of the Western Ghats Ecosystem Profile. A stakeholder workshop was held in Bangalore, India, to allow broader input from the conservation community and to provide inputs toward the formulation of a niche and investment strategy for CEPF in the region. Drafts of the profile were also reviewed by the CEPF Working Group and other representatives of the CEPF donor institutions. The profile was modified to incorporate comments and recommendations from both the stakeholders and donor representatives.

The profile includes a description of the biological importance of the Western Ghats, the socioeconomic features (including land use), conservation legislation, threats to biodiversity, current investments in conservation, and the CEPF niche for investment in the region.

Definition of targets for achieving quantifiable, justifiable, and globally consistent conservation outcomes constitutes a critical component of the profile. Conservation outcomes represent the scientific basis for determining CEPF's geographic and thematic focus in the ecosystem profiles. Conservation outcomes are defined at three scales - species, sites, and landscapes – and can be characterized as "Extinctions Avoided" (species level), "Areas Protected" (site level), and "Corridors Consolidated" (landscape level). These outcomes, as defined in the ecosystem profile, represent all the species, sites, and landscapes that must be conserved by the global conservation community in order to halt biodiversity loss. While CEPF may not achieve all of the outcomes for a hotspot on its own, it seeks to ensure that its investments prevent biodiversity loss and that the success toward this goal is monitored and measured. Species, site, and corridor outcomes for the Western Ghats Ecosystem Profile were defined in cooperation with scientists at CI's Center for Applied Biodiversity Science (CABS).

BIOLOGICAL IMPORTANCE

The forests of the Western Ghats are some of the best representatives of non-equatorial tropical evergreen forests in the world. The Western Ghats have evolved into one of the richest centers of endemism owing to their isolation from other moist areas. The hills of the Western Ghats are embedded in a landscape that has much drier climatic conditions (Ramesh *et al*. 1997). South of Kodagu district in Karnataka, elevation increases. The topography creates several enclaves that have acted as refugia for species over the years as surrounding areas have steadily grown drier. Variation in the degree of endemism in the Western Ghats depends on both the latitudinal length-of–dry season gradient as well as the temperature-elevation gradient, with a greater number of endemics found in areas with a short dry season and higher altitudes (Ramesh *et al*. 1997).

Vegetation in the Western Ghats

According to a recent study conducted by the Indian Institute of Remote Sensing (IIRS), incorporating both field-based analysis of vegetation communities as well as satellite image interpretation, there are four major forest types in the Western Ghats: evergreen, semi-evergreen, moist deciduous, and dry deciduous. Together the forests cover approximately 20 percent of the total area of the Western Ghats. Among the four broad vegetation types, moist deciduous forests occupy the largest area followed by semi-evergreen, dry deciduous, and finally evergreen.

The majority of the area under moist forest types falls within the southern states of Kerala and Karnataka. Together they account for 80 percent of the evergreen forest and 66 percent of the moist deciduous forests in the Western Ghats (IIRS 2002).

Evergreen forests

The highest levels of endemism are found in the evergreen forests. These forests occur within a 200-1,500-meter elevational range and 2,500- to 5,000-millimeter rainfall range. They vary widely along the length and breadth of the Western Ghats. A broad distinction can be made between the northern evergreen forests and the southern evergreen forests. The Wayanad evergreen forests of Kerala represent a transition zone from the moist *Cullenia*-dominated forests in the south Western Ghats to the northern drier dipterocarp forests (Rodgers and Panwar 1988).

The habitat types of the southern Western Ghats tropical evergreen forests also include the wet montane evergreen forests and *shola*-grassland complexes in the higher elevations (1,900-2,200 meters). The montane evergreen forests are diverse, multistoried and rich in epiphytes, with a low canopy at 15 to 20 meters (Puri et al. 1989; Ganesh et al. 1996). More than half the tree species found in these forests are endemic, especially among the families Dipterocarpaceae and Ebenaceae. The majority of the fifty endemic plant genera are also monotypic. The distribution of richness and endemism is not uniform within this forest type, with some areas having higher concentrations of endemics than others.

Semi-evergreen forests

Semi-evergreen forests occur primarily in the states of Maharashtra, Goa, and Karnataka in the Western Ghats, within an elevational range of about 300-900 meters (IIRS 2002). This forest type includes secondary evergreen dipterocarp forests, lateritic semi-evergreen forests, bamboo brakes, and riparian forests as described by Champion and Seth (1968). The structure and composition of these forests varies widely from north to south and especially from east to west. The dominant species include: *Terminalia paniculata, Aporusa lindleyana, Olea dioica, Syzygium* spp*, Mesua ferrea, Vateria indica, Elaeocarpus tuberculatus, Celtis timorensis, Hopea parviflora, Lagerstroemia microcarpa, Holigarna arnottiana, Hydnocarpus laurina, Memcylon umbellatum,* and *Careya arborea*. These forests also tend to have high levels of tree diversity and endemism (IIRS 2002).

Moist deciduous forests
The moist deciduous forest type occupies the largest area within the Western Ghats. It occurs within an elevational range of 500-900 meters in areas with mean annual rainfall of 2,500-3,500 millimeters. The swath of moist deciduous forests is very narrow on the steeper, windward side of the mountain range, where the southwest monsoon rains promote wet evergreen forests. On the less steep leeward side, the drier conditions caused by the rain shadow result in a broader, uneven swath of moist deciduous forests that extend further into the Deccan Plateau. Rainfall on the leeward side is influenced by complex landforms, with some areas receiving less than one-fifth of the 3,000 millimeters or more of annual precipitation that is deposited higher in the mountains.

Dry deciduous forests
The dry deciduous forests occur on the leeward side of the Western Ghats Mountain Range within an elevational range of 300-900 meters in areas of 900-2,000 millimeters mean annual rainfall. They extend across the southern Indian states of Karnataka and Tamil Nadu. The tall Western Ghats mountain range intercepts the moisture from the southwest monsoon, so that the eastern slopes and the Deccan Plateau receive relatively little rainfall, from 900 to 1,500 millimeters. The undulating hillsides have very shallow soils. Thorny plants become more common in areas where grazing pressure is high.

Although not exceptionally outstanding for biological richness or endemism by itself, the dry deciduous forests are contiguous with the moist deciduous forests that lie along the foothills of the southern extent of the Western Ghats mountains and provide valuable wildlife habitat. Two of India's most important elephant conservation areas, the Nilgiris-Eastern Ghats and the Anamalais-Nelliampathis (Sukumar 1989) and one of the most essential landscapes for global tiger conservation (Wikramanayake et al. 1999) extend across this region. Hence, these forests together with the moist deciduous forests and montane evergreen forests provide important, contiguous habitat landscape for conservation of Asia's largest terrestrial herbivore and predator.

Other vegetation types
Other vegetation types that occur in the Western Ghats include:

- Scrub jungles located in areas 200-500 meters in elevation with 300-600 millimeters of annual rainfall. This vegetation type is dominated by short trees (15-20 meters high). The dominant genera are *Actinodaphne, Elaeocarpus, Eunymus, Michelia, Rhodomyrtus, Schefflera and Symplocos,* among others (Nair and Daniel 1986).
- Savannas located in areas 1,700-1,900 meters in elevation with medium to high rainfall. The dominant genera are-*Chrysopogon, Arundinella, Eulalia, and Heteropogon*, among others (Nair and Daniels 1986).
- High rainfall savannas located in montane areas. The vegetation consists of herbaceous to shrubby cover: *Ligustrum, Rhododendron, Anaphalis, and Phlebophyllum,* among others (Nair and Daniel 1986).
- Peat bogs located above 2,000 meters in high rainfall areas. Vegetation consists of grasses, sedges and mosses: *Carex, Cyanotis, Cyperus, and Eriocaulon*, among others (Nair and Daniel 1986).

- *Myristica* swamps, which are a unique vegetation type in the Western Ghats occurring from sea level to around 600 meters in elevation in areas with medium to high rainfall. The dominant genera are *Myristica, Knema, Hydnocarpus, and Lophopetalum* (Nair and Daniel 1986).

The ecoregions of the Western Ghats broadly correspond to the distribution of the major vegetation types. According to World Wide Fund for Nature (WWF 2001), there are five major ecoregions in the Western Ghats: the North Western Ghats Montane Rain Forests, the Southern Western Ghats Montane Rain Forests, the Northern Western Ghats Moist Deciduous forests, the Southern Western Ghats Moist Deciduous Forests, and the South Deccan Plateau Dry Deciduous Forests.

Biological Richness

The remarkable biological richness and endemism of the Western Ghats region is inherent in its inclusion among the 34 global hotspots. The recent discovery of a new family of frogs, the first in the last 77 years, bears testimony to the uniqueness of the region, where many species of higher plants and vertebrates are still being discovered. Furthermore, the region is the center of diversity for some of the world's most economically significant plants such as mango, banana, black pepper, and nutmeg. Superimposed on this biological diversity is the human diversity in the form of richness of cultures, ethnicity, and traditional knowledge systems.

Plants

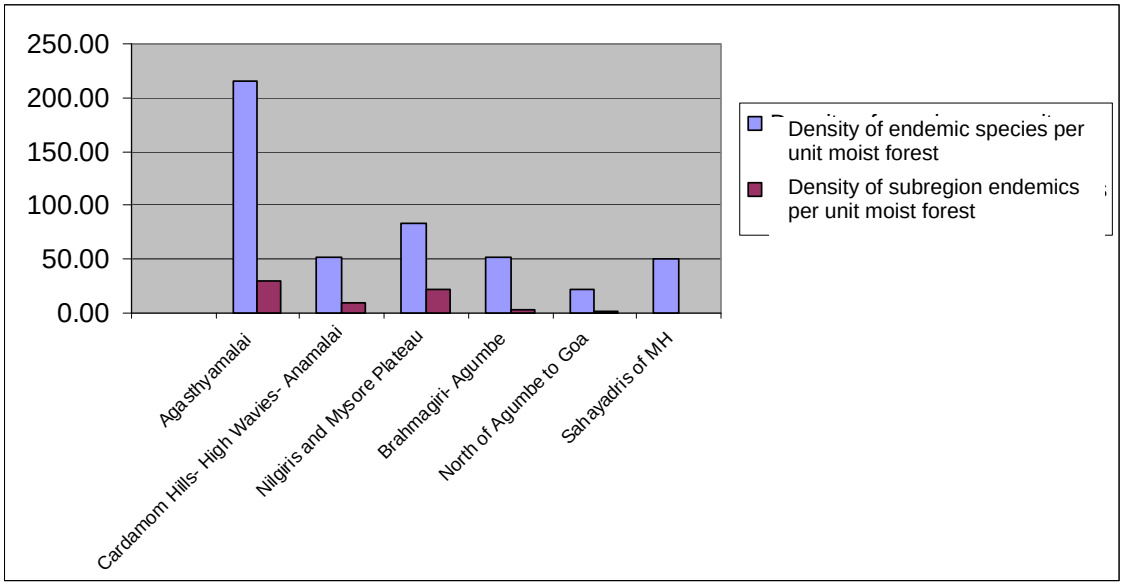
It is estimated that there are four thousand species of flowering plants known from the Western Ghats and 1,500 (nearly 38 percent) of these are endemic (Nair and Daniel 1986). Approximately 63 percent of India's woody evergreen taxa are endemic to the Western Ghats (Johnsingh 2001). Of the nearly 650 tree species found in the Western Ghats, 352 (54 percent) are endemic (Daniels, 2001). The tree genera endemic to the Western Ghats include *Blepharistemma*, *Erinocarpus*, *Meteromyrtus*, *Otenophelium*, *Poeciloneuron*, and *Pseudoglochidion*. Other plant genera endemic to the Western Ghats include *Adenoon, Griffithella, Willisia, Meineckia, Baeolepis, Nanothamnus, Wagatea, Campbellia*, and *Calacanthus* (Nair 1991). The grass family Gramineae (Poaceae) has the highest number of endemic genera and the genus *Nilgirianthus* has the maximum number of endemic species (20) across all genera in this family (Nair 1991).

There are several centers of plant endemism and species richness within the Western Ghats. For instance, of the 280 woody endemic species found south of Karnataka, 70 species are endemic to the southernmost Travancore region (Nair 1991). Herbaceous species richness is the highest in the stretch of hills to the south of Kodagu district in Karnataka (Nair 1991). The Nilgiri Mountains are one of the most important centers of speciation for flowering plants in the Western Ghats, with 82 species restricted to this area alone (Daniels 2001).

Several species are endemic to the Agastyamalai-Nilgiri Hills and the Sri Lankan highlands, including *Abarema subcoriacea, Biophytum nudum, Chrysoglossum maculatum, Eugenia rotundata, Fahrenheitia zeylanica, Filicium decipens* or fern tree,

Pavetta zeylanica, and *Rubus micropetalus or* wild aspberry. The flora of the Agastyamalai Hills bears a remarkable similarity to that of Sri Lanka's southwestern wet zone not just in terms of shared taxa, but also with respect to the remarkably high incidence of highly localized "point" endemics (Nayar, 1996; Ramesh & Pascal, 1997). Tree species endemism is the highest in the southern Western Ghats (Figure 2), while herb species endemism appears to be highest in the north (Daniels 2001).

Figure 2. Subregional Distribution of Tree Species Endemic to the Semi-Evergreen and Evergreen Forests of the Western Ghats



Fauna

The Western Ghats supports a diverse fauna. Among the vertebrates, birds represent the largest number of known species (508 species), followed by fishes (218), reptiles (157), mammals (137), and amphibians (126). Many of these species are endemic to the Western Ghats region. The greatest number of endemics is found among the amphibians (78 percent) followed by reptiles (62 percent), fish (53 percent), mammals (12 percent), and birds (4 percent).

Fish

Daniels (2001) reports around 218 species of fish from primary and secondary freshwaters in the Western Ghats, of which 116 (53 percent, representing 51 genera) are endemic to the region. Streams and rivers in the southern parts of the Western Ghats tend to support greater diversity than those in the north and east-flowing streams and rivers have richer fish faunas than west-flowing ones. High levels of endemism are also associated with the ichthyofauna of the southern Western Ghats, which includes several endemic genera (*Brachydanio, Lepidopygopsis, Bhavania, Travancoria, Horabagrus, Horaglanis, Horaichthys*). Several other freshwater-fish genera occurring in the southern Western Ghats are not recorded from Sri Lanka, including *Gonoproktopterus,*

Neolissochilus, Salmostoma, Barilius, Balitora, Batasio, Silurus, Glyptothorax, Pristolepis, and *Osteochilichthys.* The highest diversity of freshwater fishes is in deep, slow-moving waters. The species composition of many freshwater fish assemblages has been extensively modified by the introduction of invasive alien species, which are now naturalized. The distribution of many species is also adversely affected by the construction of dams to create artificial lakes and reservoirs (Daniels, 2001).

Amphibians

Approximately 126 species of amphibians from 24 genera are known from the region, with new species being frequently added to the list (Daniels 2001). The Western Ghats has the highest levels of amphibian endemicity in India. The largest family is Ranidae (49 species) followed by Rhacophoridae (30 species). The Western Ghats also harbor a remarkable number of caecilians (Families Ichthyophidae and Caeciliidae)—16 species, all of them endemic to the region. Distribution within the region varies from extremely widespread e.g. black-spined toad *(Bufo melanostictus),* skittering frog *(Euphlyctis cyanophlyctis),* Indian bullfrog (*Hoplobatrachus tigerinus*, to highly restricted (e.g., Malabar torrent toad (*Ansonia ornata*), *Indirana gundia and Micrixalus kottigeharensis*), with species occurring south of *ca.* 13°N latitude tending to have patchy distributions (Nair 1991, Daniels 1992).

Reptiles

Approximately 157 species of reptiles are reported from the Western Ghats, representing 36 genera: 2 genera of turtles/tortoises, 14 genera of lizards, and 20 genera of snakes (Ishwar, unpublished information). Of these, nearly 50 percent are endemic. Among the different habitats of the Western Ghats, the evergreen forests alone are known to support approximately 130 species of reptiles. Certain groups of reptiles have a very high proportion of endemic species; for example, about 70 percent of the Uropeltid snakes are endemic to the Western Ghats. Endemism is also high among lizards (65 percent). Many of the rare and endemic reptiles are known only from single locality records. A major challenge to conservation efforts in this region is the lack of a complete understanding of the distributional patterns, habitat requirements, and conservation status of reptiles in the Western Ghats.

Birds

The status and distributions of bird species in the Western Ghats are relatively well known. A total of 508 species have been recorded in the region, including 324 resident species (64 percent). This figure also includes 144 (28 percent) species of aquatic birds, many of them from the western coastline. The central parts of the region (especially Uttara Kannada district) harbor the highest diversity of bird species. Due to the interspersion and juxtaposition of different habitat types in secondary and disturbed evergreen and moist deciduous forests, these forests have the highest number of bird species occurring in them (including many habitat generalists and migrants in addition to resident and endemic species). Sixteen species are endemic to the Western Ghats region (Daniels, 2001), most of them occurring in the areas southwards of Goa. Many of the endemics are obligates of evergreen forests and *shola*-grassland systems.

Mammals
Of the 137 species of mammals recorded in the Western Ghats, the largest representation is from the orders Chiroptera (41 species), Rodentia (27 species) and Insectivora (11 species). Of the 127 species, 14 are endemic (Daniels, 2001) and three are listed as Critically Endangered. One of the Critically Endangered species, Wroughton's free-tailed bat (*Otomops wroughtonii*), is restricted to a single cave within the Western Ghats and has been recently discovered in Cambodia and Northeastern India (Walston & Bates 2001; Thabah & Bates 2002). Wide-ranging and flagship mammal species such as the tiger and elephant have attracted significant conservation efforts, both by the Indian government as well as by several conservation NGOs, but relatively little is known about the distribution and conservation status of the smaller mammals, particularly small carnivores and rodents.

A total of six species of mammals are endemic to the southern Western Ghats and Sri Lanka as a unit: the mountain shrew (*Suncus montanus),* slender loris (*Loris tardigradus*), stripe-necked mongoose (*Herpestes vitticollis),* Sri Lankan giant squirrel or grizzled giant squirrel (*Ratufa macroura),* Layard's striped squirrel (*Funambulus layardi),* dusky striped squirrel (*Funambulus sublineatus),* and the Travancore flying squirrel (*Petinomys fuscocapillus).*

Insects
Much of the research on invertebrates in the Western Ghats has focused on butterflies and ants. Very little is known about other groups of insects. In addition much of the research is of a taxonomic nature; very few studies address questions of ecology and biodiversity (Daniels 2001).

Butterflies in the Western Ghats belong to five families, 166 genera, and 330 species, of which 37 species are endemic (Gaonkar 1996). The southern Western Ghats extending from Agasthyamalai to the Palghat Gap holds the highest diversity of butterfly species with the most number of endemics (Gaonkar 1996). Goa and Uttara Kannada are other regions within the Western Ghats with high levels of butterfly diversity. According to a recent study, there are at least 200 species of spiders in the Western Ghats. The dominant families are Argyopidae, Salticidae, Thomisidae, Oxyopidae, Lyniphidae, and Hersilidae (Rajashekhar and Raghavendra 2001, cited in Daniels 2001).

Studies have indicated that there have been declines in the diversity of aquatic insects in some areas of the Western Ghats due to anthropogenic interference leading to habitat loss and pollution (Daniels 2001).

Protected Areas
A total of 58 protected areas consisting of 14 National Parks (NP) and 44 Wildlife Sanctuaries (WLS) fall within the boundaries of the Western Ghats. The total area covered by these protected areas is 13,595 square kilometers representing 9.06 percent of the Western Ghats. Although protected area planning and design have not been based on biogeographic principles, the Western Ghats is one of two biogeographic zones (the other

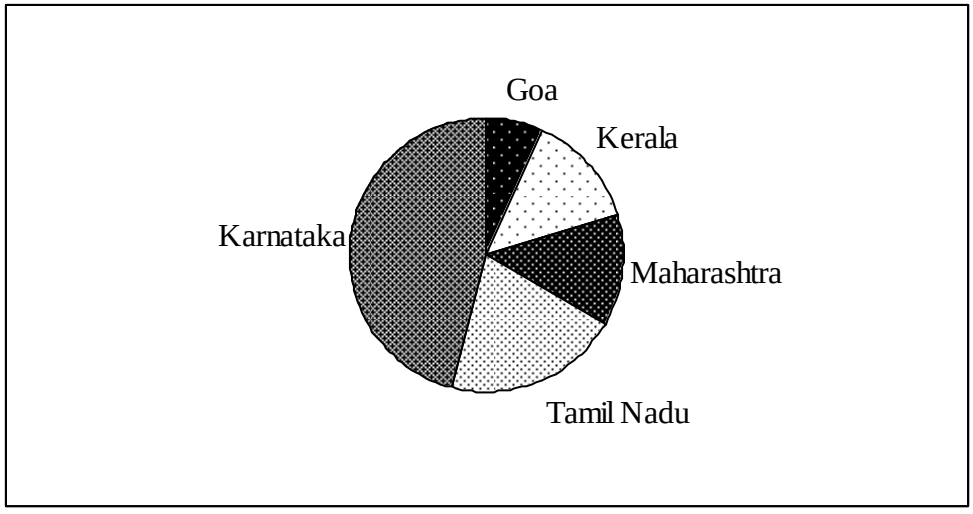
being the Andaman and Nicobar Islands) with the highest level of coverage by protected areas (Rodgers & Panwar 1988).

Analysis done for this profile indicates that of the major vegetation types in the Western Ghats, high altitude grasslands are the best represented, with 61 percent of their area falling within the protected area network. Twenty-nine percent of the area of evergreen forests in the Western Ghats and 25 percent of the area covered by moist deciduous forests are represented within the protected area network. Dry deciduous and scrub forests are represented by 14 percent and 26 percent respectively. Areas above 2,500 meters elevation are the best represented (27 percent) by the distribution of the current protected area network, followed by areas between 1,000-1,500 meters. Areas at or below 500 meters are the least represented (12 percent) within the current protected area network in the Western Ghats.

The legal notification status is preliminary and final for 19 and 29 protected areas, respectively. [The preliminary notification is a notification of intent to constitute a protected area; the final notification is issued following the completion of the rights settlement process]. Although protected area establishment dates back to 1942, most of the protected areas in the Western Ghats were notified in the 1980s.

The Western Ghats ranges north to south across the states of Goa, Maharashtra, Karnataka, Tamil Nadu and Kerala. The largest proportion (45 percent) of the area protected in the Western Ghats (13,465 square kilometers) lies within 19 protected areas in the state of Karnataka (Figure 3).

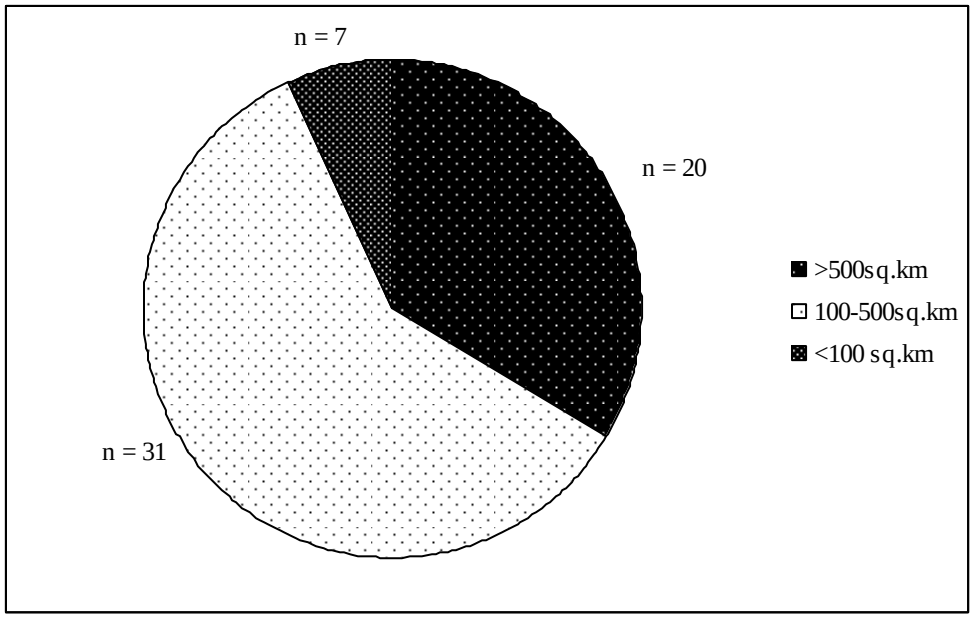
Figure 3. Area Distribution of the Protected Areas of the Western Ghats by State



Protected areas span a wide range of sizes with the largest protected area being Indira Gandhi Wildlife Sanctuary and National Park at 850 square kilometers in Tamil Nadu and the smallest being Gudavi Bird sanctuary at 0.74 square kilometers in Karnataka. Fifty-nine percent of the protected area network is represented in 31 protected areas

ranging from 100 to 500 square kilometers in area. The remaining area includes seven protected areas of greater than 500 square kilometers each (34 percent) and 20 protected areas less than 100 square kilometers (7 percent) (Figure 4). Bird sanctuaries are relatively smaller in size; Thattekad Bird Sanctuary in Kerala, with an area of 25 square kilometers, is the largest of four bird sanctuaries with the remaining three sanctuaries each less than 5 square kilometers in area. In certain cases several of these smaller individual protected areas lie adjacent to one another, in neighboring states, thereby effectively increasing the contiguous area under protection.

Figure 4. Size Distribution of Protected Areas in the Western Ghats



Protected areas in the Western Ghats are embedded in a human-dominated landscape and hence are subject to intense land-use conflicts. Although the region has had human influence for several millennia, the most significant ecological changes occurred from the early 19th century onwards, following British colonization and the ensuing exploitation of forests with increasing populations and changing technologies playing a significant role in intensifying human impacts (Chandran 1997; Gadgil and Guha 1992; Raman, 2001).

The 58 protected areas (national parks and sanctuaries) contained within the boundaries of the Western Ghats were analyzed for local-level threats such as extraction of minor forest produce (MFP) and nontimber forest products (NTFPs), livestock grazing, and hunting, and landscape-level threats such as mining and development projects.

Ninety percent of all protected areas surveyed (n = 58) were recorded with more than 12 types of threats, with four protected areas recording 20 out of the 23 types of threats. Bird sanctuaries appear to have relatively fewer types of threats compared to other wildlife sanctuaries and national parks. Local hunting emerged as the most common type of threat

occurring in 57 out of the 58 protected areas. Illegal timber felling, presence of exotic and invasive species, fuelwood and fodder removal and human-wildlife conflicts were found to occur in 97 percent of the protected areas surveyed. In general, local level threats such as hunting, fuelwood and fodder collection and livestock grazing appear to be more common than landscape level threats such as mining, railways and pipelines. Livestock grazing, MFP/NTFP collection, tourism, fire, and illegal encroachments occur in more than 90 percent of protected areas and are indicative of the impacts of growing human populations both within and outside protected areas. Threat occurrence is independent of age and size of protected areas.

There are large gaps in information on biological richness of protected areas in the Western Ghats. Consistent presence/absence data on endemic mammals and birds is lacking for most protected areas independent of their size. Complete species lists are not available for most protected areas including those less than 10 square kilometers in area. However, 41 out of the 58 protected areas were recorded as having 6-8 widely known and easily identified species such as tigers (*Panthera tigris*), leopards (*Panthera pardus*), elephants (*Elephas maximus*), gaur (*Bos gaurus*), hornbills (*Buceros bicornis*), wild dogs (*Cuon alpinus*), sambhar (*Cervus unicolor*), and king cobra (*Ophiophagus hannah*). Information on species richness of protected areas among other taxa such as vascular plants, trees, shrubs, grasses, butterflies, fishes, reptiles, amphibians, and birds is sparse.

CONSERVATION OUTCOMES

Biological diversity cannot be saved by *ad hoc* actions (Pressey 1994). In order to support the delivery of coordinated conservation action, a core part of the profiling process includes defining "conservation outcomes." By presenting quantitative and justifiable targets against which the success of investments can be measured, conservation outcomes allow the limited resources available for conservation to be targeted more effectively and their impacts to be monitored at the global scale. Therefore, conservation outcomes form the basis for identifying biological priorities for CEPF investment in the Western Ghats.

Biodiversity is not measured in any single unit but, rather, is distributed across a hierarchical continuum of ecological scales (Wilson 1992). This continuum can be condensed into three levels: species, sites, and landscapes. These three levels interlock geographically, through the occurrence of species at sites and of species and sites in landscapes, but are nonetheless identifiable. Quantifiable targets for conservation can be set in terms of "Extinctions Avoided" (species outcomes), "Areas Protected" (site outcomes), and "Corridors Consolidated" (corridor outcomes).

Defining targets for achieving conservation outcomes is data driven and employs a set of quantitative criteria. Therefore, the process is dependent upon the availability of data on globally significant biodiversity. In the Western Ghats, because data on global threat status are only available for mammals, birds, amphibians, plants, and to a lesser degree, reptiles and fish, conservation outcomes were only defined for these groups. Defining conservation outcomes is a fluid process and, as data become available, species-level

outcomes will be expanded to include other taxonomic groups that previously had not been assessed, as well as restricted-range species.

Conservation outcomes are defined sequentially, with species outcomes defined first, then site outcomes and, finally, corridor outcomes. It is a bottom-up process both ecologically and institutionally. The work to define conservation outcomes, as described in this document, uses standards and procedures set by CABS as well as additional methods and tools developed at ATREE and WCS, data synthesis and analysis on outcomes was also conducted at UAS. Information gathered was presented to and refined by experts at the Western Ghats CEPF Stakeholder Workshop.

Species Outcomes

The principle underlying the definition of species outcomes is to avoid extinctions at the global level. Because of its mandate to conserve biodiversity globally, it is crucial that the process used to derive conservation targets for CEPF should be based on a global standard. The basis for defining species outcomes were the global threat assessments contained within *The 2002 IUCN Red List of Threatened Species* (IUCN 2002), which represented the best available data source on the global conservation status of species at the time the outcome definition process took place. The Western Ghats species listed as Critically Endangered, Endangered, and Vulnerable in the IUCN Red List were considered as conservation targets. This definition excluded Data Deficient species, which were considered to be priorities for further research not conservation action *per se*, as well as species threatened locally but of lower conservation concern globally, which were considered to be national or regional conservation priorities but not global priorities. Species outcomes are achieved when a species' global threat status improves or, ideally, when it is removed from the Red List.

Data were compiled for each target species on its conservation status, threats, and known distribution. In the case of amphibians, the results of the Global Amphibian Assessment (IUCN-SSC and CI-CABS 2003), which completed threat assessments and prepared distribution maps for most Old World amphibian species were used in addition to the IUCN Red List.

Adequate information on the Western Ghats freshwater fish and invertebrates has not been compiled into the IUCN Red List. Reptiles, fish, invertebrates, and vascular plants other than trees have not been comprehensively assessed and consequently, the number of globally threatened species on the IUCN Red List is considered to be a gross underestimate. There are several endemics in all taxa from the Western Ghats that are not represented in the IUCN Red List and it is a major priority to work toward getting these groups assessed.

The initial results of the species outcome definition indicate that 332 globally threatened species occur in the Western Ghats (Table 1). The globally threatened flora and fauna in the Western Ghats are represented by 229 plant species, 31 mammal species, 15 bird species, 52 amphibian species, four reptile species, and one fish species. Of the total of 332 globally threatened species in the Western Ghats, 55 are Critically Endangered, 148

are Endangered, and 129 are Vulnerable. The full list of species outcomes is given in Appendix 1.

Table 1. Summary of Species Outcomes for the Western Ghats

Taxonomic Group	Critically Endangered	Endangered	Vulnerable	Total
Mammals	3	7	21	**31**
Birds	2	1	12	**15**
Reptiles	0	1	3	**4**
Amphibians	11	28	13	**52**
Fish*	-	-	1	**1**
Plants	39	111	79	**229**
Total	**55**	**148**	**129**	**332**

The sole freshwater fish listed as a species outcome—the blind catfish (*Horaglanis krishnai)*—is found in wells of the Kottayam district of Kerala. Twenty-two of the globally threatened amphibian species in this hotspot have highly restricted distributions. They are known only from one or two sites. Other species with a very restricted distribution in the Western Ghats are the Wroughton's free tailed bat (*Otomops wroughtonii*) known only within the Western Ghats from Barpede cave in Khanapur taluk in Karnataka and the Kondana field rat (*Millardia kondana*) known only from its type locality Sinhgarh in Marahrashtra. A total of 18 species outcomes are shared between the Western Ghats and Sri Lanka. These consist of eight mammals, three birds, one reptile, and six plants.

In addition to identifying the globally threatened species that occur in the Western Ghats, participants at the CEPF Western Ghats stakeholder workshop identified species or groups of animal species that, while not assessed as globally threatened, were considered to be of global conservation concern. They were, therefore, included on a list of provisional species outcomes, which may become eligible for CEPF investment if their conservation status is reassessed as globally threatened during the investment period (Appendix 2)**.**

Site Outcomes

Given that many species are best conserved through the protection of a network of sites at which they occur, a set of targets for achieving site outcomes, or "key biodiversity areas," were defined according to a number of criteria. Key biodiversity areas are defined using a

set of quantitative, globally consistent criteria: the regular occurrence of significant numbers of one or more globally threatened species, restricted-range species, or globally significant congregations. Sites are delineated as physically and/or socioeconomically discrete areas that could potentially be managed for conservation. Sites can be protected areas, other governmental lands such as reserved forests, community lands, or private farms or plantations. Site outcomes are met when a key biodiversity area is protected, through improved management or expansion of an existing conservation area, or creation of a new conservation area.

In the Western Ghats information on the sites in which globally threatened and restricted range species occurred was gathered from published literature as well as consultation with experts and field experience of the team. The globally threatened species criteria for defining key biodiversity areas was applied to all taxa; the criteria on restricted-range species and congregations was applied only comprehensively for birds using the Important Bird Area (IBA) data, as compiled by BirdLife International and its Indian partner- the Indian Bird Conservation Network (IBCN) of the Bombay Natural History Society (BNHS). The administrative boundaries of protected area categories such as National Parks and Wildlife Sanctuaries as well as Reserved Forests and Forest Divisions were used to delineate polygons in a GIS within which presence of species could be located based on the above sources of information.

A total of 126 key biodiversity areas were identified for the Western Ghats (Table 2, Figures 5 and 6). These sites occur throughout the Western Ghats across all the major vegetation types. Most of the site outcomes were identified based on mammal and bird information. Forty-seven sites were identified for amphibians and 24 sites were identified for reptile species. Sites could not be identified for the one freshwater fish species occurring in the Western Ghats due to lack of information. Sites were identified for 64 percent of the globally threatened plant species. Site outcomes were not identified for the remaining 36 percent of globally threatened plant species because the data were not available at the appropriate scale during the time in which this analysis was conducted. The integration of these data is a priority for the future.

Ten of the site outcomes, or key biodiversity areas, are considered to be wholly irreplaceable on a global scale, because they contain the only known populations of a globally threatened animal species (Table 3). Since the sites are irreplaceable for Critically Endangered and Endangered species, they qualify as Alliance for Zero Extinction (AZE) sites, which are the most urgent site-level conservation priorities on a global scale. Sixty-three of the 126 sites (50 percent) have been provisionally designated as IBAs (as per information provided by the IBCN). Fifty-four of the sites (approximately 43 percent) are within the protected area network. The remaining 72 sites consist of a range of landscape and administrative units of varying scales, from reserve forests to forest divisions to private lands and even a single cave. The full list of site outcomes, including information on their protected status, is presented in Appendix 3.

Table 2. Summary of Site Outcomes for the Western Ghats

No. of sites identified for species outcomes per taxonomic group	
Mammals	100
Birds	68
Reptiles	24
Amphibians	47
Fish-	-
Plants[†]	53
Total Site Outcomes	**126**

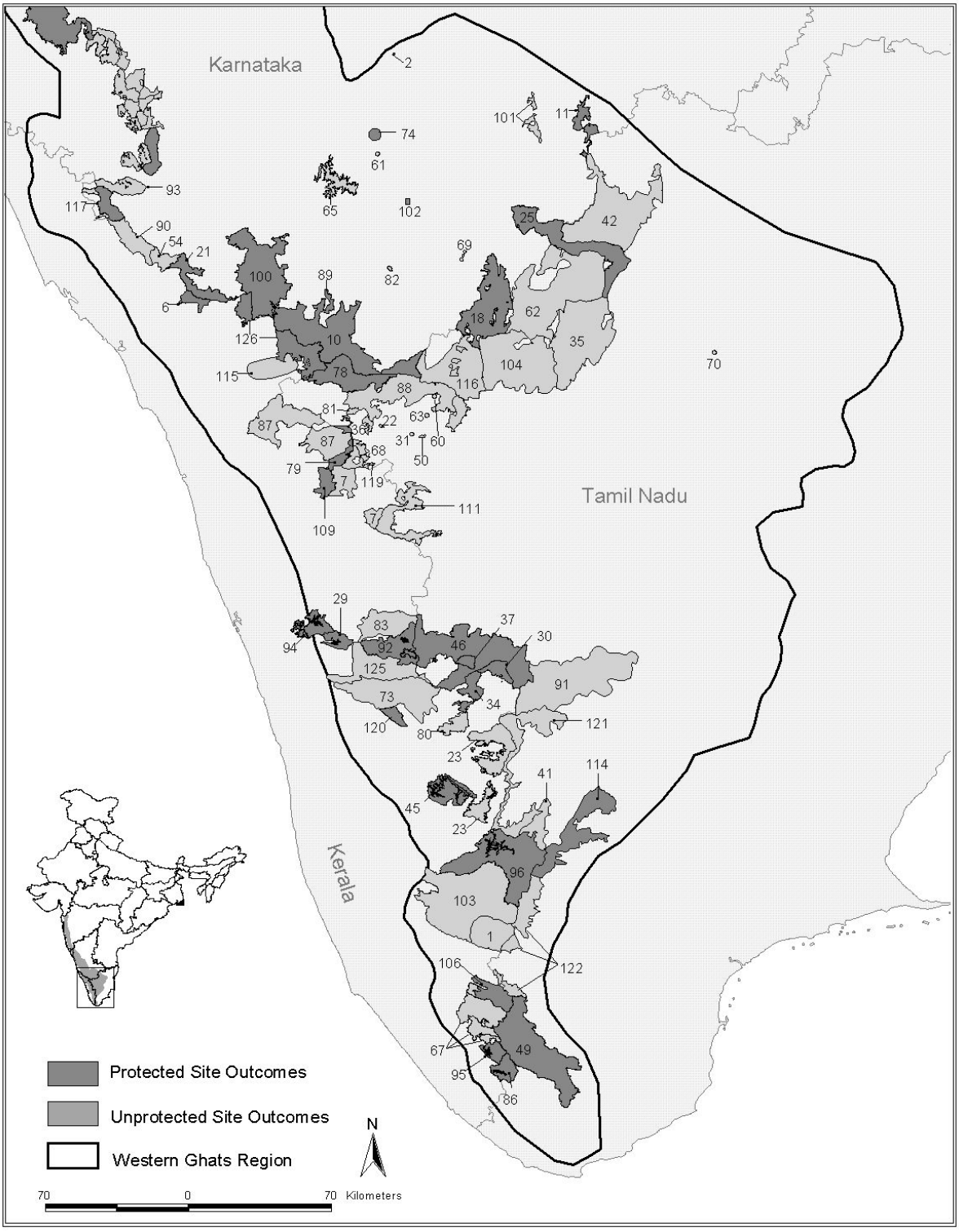
[†] Key biodiversity areas, or site outcomes, were not identified for 36 percent of globally threatened plant species because the data were not available at the appropriate scale during the time in which this analysis was conducted.

Table 3. Wholly Irreplaceable Sites in the Western Ghats

Site Name	**Species for which the site is wholly irreplaceable**	**Class**	**IUCN Status**
1. Bhadra TR	*Micrixalus kottigeharensis*	Amphibia	CR
2. Forests of Gundia-KN	*Minervarya sahyadris*	Amphibia	EN
3. Indira Gandhi WLS & NP / Annamalai / Top Slip	*Indirana phrynoderma* *Rhacophorus pseudomalabaricus*	Amphibia Amphibia	CR CR
4. Kalakkad- Mundunthurai TR	*Nyctibatrachus vasanthi*	Amphibia	EN
5. Mukurthi NP	*Philautus tinniens*	Amphibia	EN
6. Sinhagad –MH	*Millardia kondana*	Mammalia	EN
7. Amboli	Philautus “Amboli forest”	Amphibia	CR
8. Kemphole RF	*Indirana gundia*	Amphibia	CR
9. Munnar area	*Philautus griet* *Philautus chalazodes*	Amphibia Amphibia	CR CR

Site outcomes could not be identified for the small mammals *Hemiechinus nudiventris, Prionailurus viverrinus, Rattus ranjiniae, Hipposideros hypophyllus,* and the fish species, *Horaglanis krishnai,* because information on their localities could not be obtained during the time this profile was being developed. Two species of mammals, *Loris tardigradus* and *Melursus ursinus,* occur in nearly all of the sites.

Figure 5: Full Set of Site Outcomes for the Southern Western Ghats



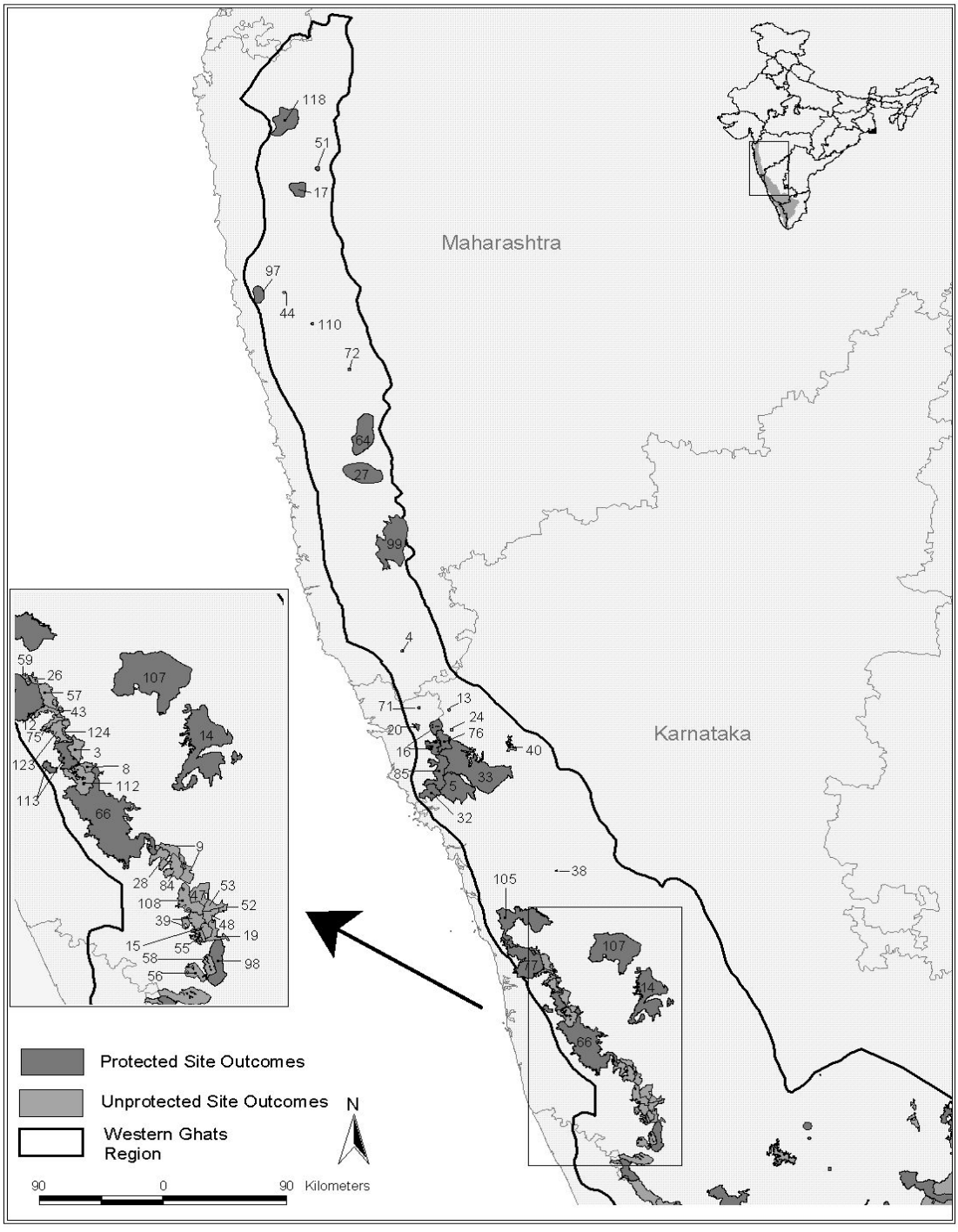
Source: Reserve Forest boundaries from French Institute Forest Maps of South India: (Ramesh et al. 1997b, Franceschi et al. 2002, Pascal et al. 1992, Pascal et al. 1982a). Forest Division boundaries from the GIS database of the Asian Elephant Research and Conservation Centre, Bangalore (www.asiannature.org/home.html). Protected Area boundaries from Indian Institute of Public Administration,

New Delhi (www.iipaindia.org). Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

Extended legend for Figure 5. Site Outcomes for the Southern Western Ghats

1. Achankovil FD	78. Mudumalai WLS
2. Adichunchungiri Bird Sanctuary	79. Mukurthi NP
6. Aralam WLS	80. Munnar area
7. Attapadi RF	81. Naduvattam RF in Niligiris South FD
10. Bandipur NP/TR	82. Narasimabuddhi Lake
11. Bannerghatta NP	83. Nemmara FD
18. BRT WLS	86. Neyyar WLS
21. Brahmagiri WLS	87. Nilambur FD - Nilambur North & New Amarambalam RF
22. Cairnhill RF	88. Nilgiris North FD
23. Cardamom Hills RF	89. Nugu WLS
25. Cauvery WLS	90. Padinalknad RF
29. Chimmony WLS	91. Palni Hills
30. Chinnar WLS	92. Parambikulam WLS
31. Conoor	93. Pattighat RF
34. Eravikulam NP	94. Peechi -Vazhani WLS
35. Erode FD	95. Peppara WLS
36. Governor's Shola RF	96. Periyar TR
37. Grass Hills NP	100. Rajiv Gandhi NP
41. High Wavies	101. Ramanagara SF
42. Hosur FD	102. Ranganthitoo Bird Sanctuary
45. Idukki WLS	103. Ranni FD
46. Indira Gandhi WLS	104. Satyamangalam FD*
49. Kalakkad-Mundunthurai TR	106. Shendurney WLS
50. Kallar RF	109. Silent Valley NP
54. Kerti RF	111. Siruvani Foothills
60. Kodanad	114. Srivilliputtur WLS
61. Kokkre-Bellur	115. Kalpetta- forest coffee complex
62. Kollegal FD	116. Talaimalai RF
63. Kotagiri – Longwood Shola	117. Talakaveri WLS
65. Krishana Rajasagar Reservoir	119. Thai Shola RF
67. Kulathapuzha-Palode RFs	120. Thattekad Bird Sanctuary
68. Kundah RF- Avalanche, Bison Swamp	121. Theni FD
69. Kunthur-Kallur lakes	122. Tirunelveli FD
70. Kurumbapatti	125. Vazhachal FD
73. Malayattur FD	126. Wayanad WLS
74. Melkote Temple WLS	

Figure 6. Full Set of Site Outcomes for the Northern Western Ghats



Source: Reserve Forest boundaries from French Institute Forest Maps of South India: (Pascal et al. 1982a, Pascal et al. 1982b, Pascal et al. 1984). Protected Area boundaries from Indian Institute of Public Administration, New Delhi (www.iipaindia.org). Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

Extended Legend for Figure 6. Site Outcomes for the Northern Western Ghats

3. Agumbe RF	53. Kemphole RF
4. Amboli	55. Kiddu RF
5. Anshi NP	56. Kilarmale RF
8. Balahalli RF	57. Killandur RF
9. Balur RF	58. Kiribag RF
12. Baregundi RF	59. Kodachadri RF
13. Barpede Cave	64. Koyna WLS
14. Bhadra WLS	66. Kudremukh NP
15. Bhagimalai RF	71. Madei WLS
16. Bhagwan Mahaveer WLS	72. Mahabaleshwar
17. Bhimashankar WLS	75. Metkalgudde RF
19. Bisale RF	76. Molem NP
20. Bondla WLS	77. Mookambika WLS
24. Castle Rock - Bhimgad forests	84. Neriya RF
26. Chakra RF	85. Netravalli WLS
27. Chandoli WLS	97. Phansad WLS
28. Charmadi RF	98. Pushpagiri WLS
32. Cotigao WLS	99. Radhanagari WLS
33. Dandeli WLS	105. Sharavathi WLS
38. Gudavi WLS	107. Shettihally WLS
39. Forests of Gundia-KN	108. Shiradi Shisale RF
40. Haliyal RF	110. Sinhgarh
43. Hulikal RF	112. Someshawara RF
44. INS Shivaji- Lonavala	113. Someshwara WLS
47. Kabbinale RF	118. Tansa WLS
48. Kagneri RF	123. Tombattu RF
51. Kalsubai-Harishchandragarh WLS	124. Varahi RF
52. Kanchankumari RF	

Corridor Outcomes

Targets for achieving corridor-level conservation outcomes are focused on landscapes that need to be conserved in order to allow the persistence of biodiversity over time. Species and site outcomes are nested within corridors. The goal of corridors is to preserve ecological and evolutionary processes, as well as enhance connectivity between important conservation sites by effectively increasing the amount of habitat with biodiversity value near them. Unlike species and site outcomes, the criteria for determining corridor outcomes are not well defined as this is presently a subject of ongoing research.

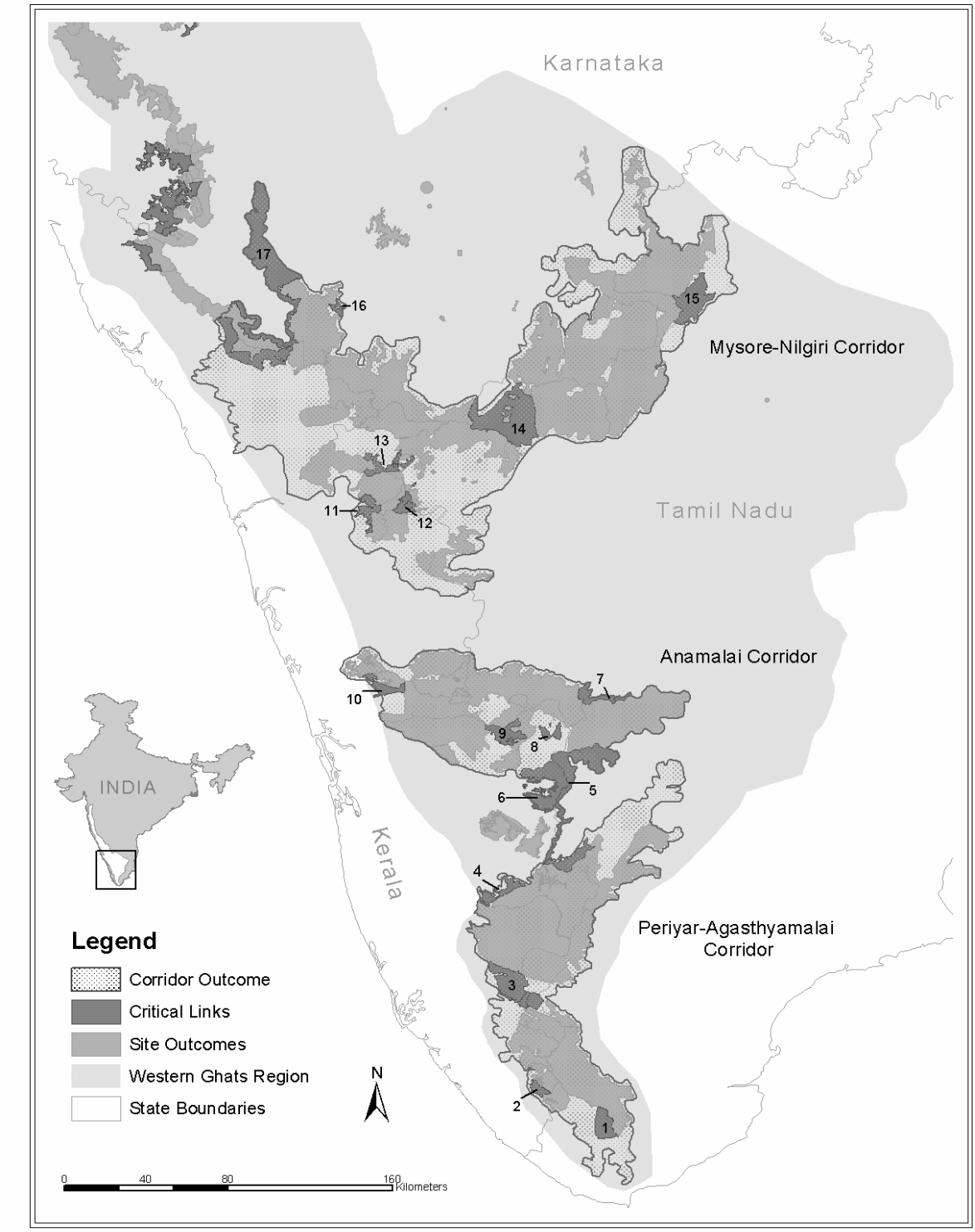
The wide-ranging or "landscape" species identified in the Western Ghats are the Asian elephant, the tiger, the Asiatic wild dog, the greater spotted eagle, the white-backed vulture, and the long-billed vulture. The conservation of these species cannot depend upon a site-based approach alone and requires the protection of larger landscapes. Thus, for the purposes of this profile, some of the considerations that were taken into account when identifying corridors were: areas that provide connectivity for movement of wide-ranging species such as elephants and areas that provide buffers of suitable habitat types to existing protected areas. Results of landscape level analyses done for this profile as well as previous assessments and prioritization studies conducted in the Western Ghats were taken into account while defining corridor outcomes.

The definition of corridors in the Western Ghats was done at two levels. Larger landscape units were defined as corridors on the basis of available information on wide-ranging species' movements, distribution of site outcomes, and connectivity of suitable habitats. The wide-ranging species for which there was a good range of information were tiger and elephant (Wickramanayake et al. 1999, Venkatraman et al. 2002). The connectivity of suitable habitats was assessed by using a vegetation map. Within these larger landscapes, critical links or patches of relatively unfragmented natural habitat that provide crucial connectivity between sites or buffer existing sites, especially protected areas, were then defined at a finer scale (Figures 7 and 8). The definition of these critical links was based on the distribution of intact forest habitat and presence of unique and threatened ecosystems. The latter range from wet evergreen forest communities with *Myristica* swamps or *Ochlandra* reeds in the southernmost subregion, dry scrub, and open deciduous forests in the Mysore plateau-Kaveri subregion to high elevation grasslands and associated s*hola* ecosystems in the central Western Ghats and moist deciduous forests in the northern regions.

In effect, critical links represent priority areas that are essential to the consolidation of corridors. None of the critical links defined currently fall within the protected area network.

Five landscape-scale corridor outcomes were defined for the Western Ghats by analyzing the distribution of the site outcomes, existing and potential forest connectivity, ranges of landscape species, and topography (Table 4, Figures 7 and 8). Moving from south to north, these corridors are Periyar-Agasthyamalai, Anamalai, Mysore-Nilgiri, Malnad-Kodagu, Sahyadri-Konkan. Nineteen site outcomes do not occur within any of the corridors and would need to be targeted additionally.

Figure 7. Corridor Outcomes and Critical Links in the Southern Western Ghats



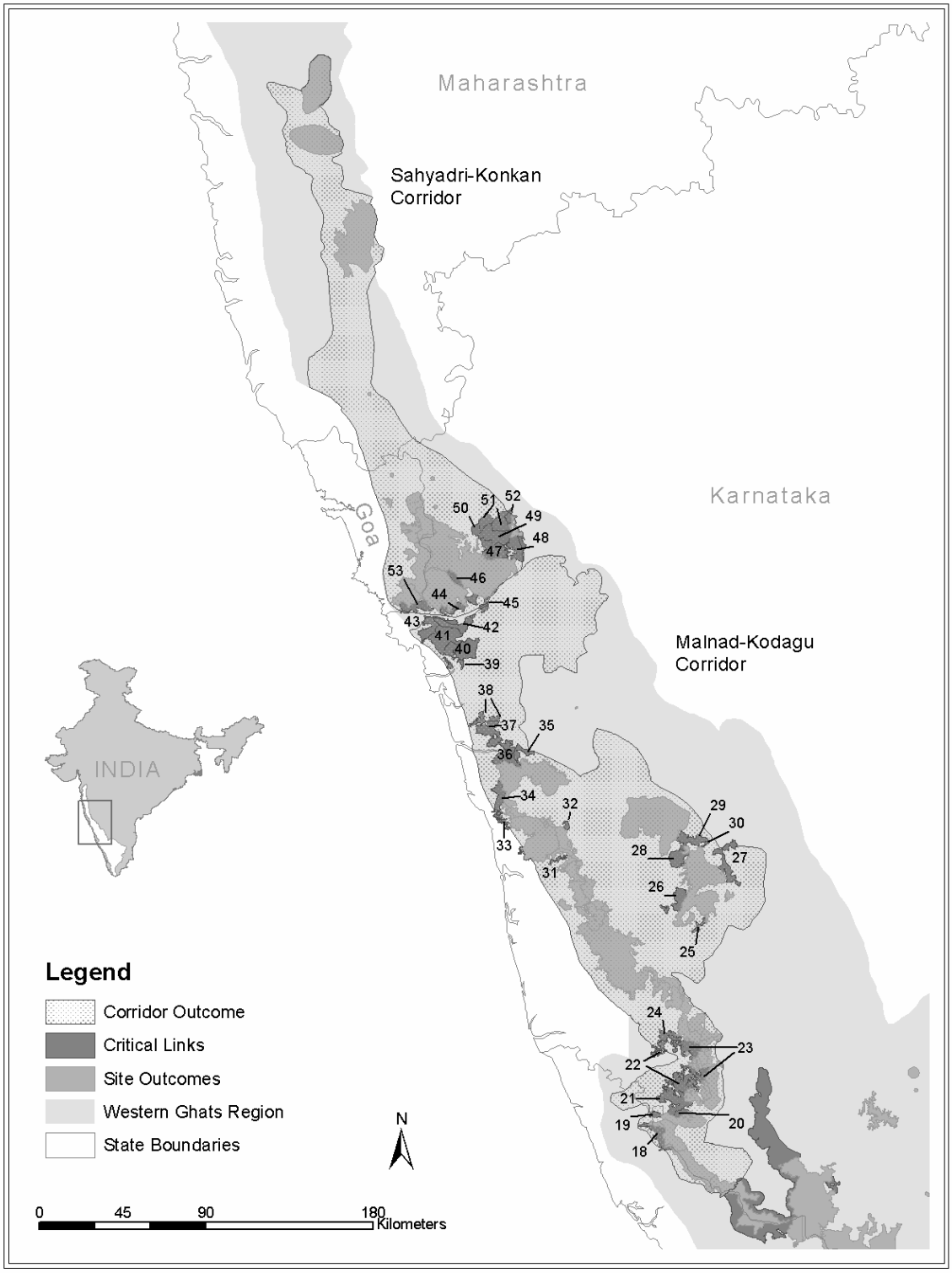
Source: Reserve Forest boundaries from French Institute Forest Maps of South India: (Ramesh et al. 1997b, Franceschi et al. 2002, Pascal et al. 1992, Pascal et al. 1982a). Forest Division boundaries from the GIS database of the Asian Elephant Research and Conservation Centre, Bangalore (www.asiannature.org/home.html). Protected area boundaries from the Indian Institute of Public Administration, New Delhi (www.iipaindia.org). Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

Extended Legend for Figure 7. Corridor Outcomes and Critical Links in the Southern Western Ghats

Critical Links	
Periyar-Agasthyamalai Corridor	1. Northern Virapuli RF
	2. Agasthyavanam Biological Park
	3. Secondary moist deciduous forests of Ariankavu and Achankovil RFs
	4. Ranni RF* - Kottayam FD
Anamalai Corridor	5. Theni FD+
	6. Northern Cardamom Hills RF+
	7. Andipatti RF, P.V. Valley RF (Northern part) and Oliyanutti Odai RF (Northern part)
	8. Pullardi Shola, Idivara Shola and Tirthalar RF
	9. Anaimudi RF
	10. Kodasseri RF – Chalakudi FD
Mysore-Nilgiri Corridor	11. Old Amarambalam RF
	12. Kundah RF+
	13. Niligiri Peak RF, Mukurthi Lake RF and evergreen and moist deciduous forests on adjoining private lands to the north and west.
	14. Talaimalai RF+
	15. Bevanurmalai RF and extensions, Pennagram RF and extensions, Guttirayan RF and Voddapatti RF
	16. Sollepur RF
	17. Brahmagiri-Nagarhole link

* Only part of this forest administrative unit was identified as a critical link, due primarily to the presence of human settlements within the area.
+ Also a site outcome

Figure 8. Corridor Outcomes and Critical Links in the Northern Western Ghats



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Extended Legend for Figure 8. Corridor Outcomes and Critical Links in the Northern Western Ghats

Critical Links:

Critical Links	
Malnad- Kodagu Corridor	18. Padinalknad RF west of Talakaveri WLS
	19. Panathadi RF
	20. RF south of Sampaji
	21. Sulya Forest Range – Sampaji,Todikana & Pumale RFs
	22. Panja Forest Range – Devchalla, Balpa & Extn.,Yenakal, Aranthakallu, Kunthuru & Padnuru RFs
	23. Subrahmanya Forest Range – Nalkur, Subrahmanya, Kombar^{+}, Mujur*$^{+}$ & Konaje RFs
	24. Uppinangadi Forest Range – Porkal & Kodimbala RFs
	25. Masakali RF
	26. Kuskal & Megaramakki RFs
	27. Tarikere Forest Range – Timmapura, Tyagadabaji, Gurupura, Karkuchi & Hadikere West RFs
	28. Northern Cardamom Hills RF^{+}
	29. Umblibail Forest Range – Umblibail, Choranayedahalli & Kakanhosudi RFs
	30. Tamadihalli RF
	31. Doddinamane RF
	32. Kodasseri RF – Chalakudi FD
	33. Baindur Forest Range – Guruvanakote, Baindur, Kadike & Karnigadde RFs
	34. Bhatkal Forest Range – RF numbers 164-166-184^
	35. Jog RF
	36. Gersoppa Forest Range – RF numbers- 152, 153, 175, 176,177, 178, 179^
	37. Honavar Forest Range – RF numbers- 148, 149, 150, 172, 173, 174^
	38. Kumta Forest Range – RF numbers- 147, 149^
	39. Hiregutti Forest Range – RF number – 167^
	40. Mastikatte Forest Range – RF numbers- 24, 132, 133, 159^
	41. Ankola Forest Range – RF numbers- 137, 140, 157, 158, 165,166^
	42. Kadra Forest Range – RF numbers- 115, 116, 117, 138, 139^
	43. Karwar Forest Range – RF numbers- 117, 118, 119, 139, 140^
Sahyadri-Konkan Corridor	44. Kadra Forest Range – RF numbers- 89, 114, 143^
	45. Vajralli Forest Range – RF number- 26 (southern part)^
	46. Kumabharwada Forest Range - RF number- 35^
	47. Virnolli Forest Range - RF numbers- 2 (northern part), 3^
	48. Sambrani Forest Range - RF numbers – 9,

	101^
	49. Dandeli Forest Range - RF numbers – 5,6^
	50. Jagalbet Forest Range - RF number – 37^
	51. Barchi Forest Range - RF numbers- 6, 7^
	52. Haliyal Forest Range - RF number- 105A^
	53. Gopshitta Forest Range - RF numbers – 109, 110, 111, 113, 142^

+ Also a site outcome
^ As represented in the French Institute Forest Maps of South India –Shimoga (Pascal et al. 1982b) and Belgaum-Dharwad Sheets (Pascal et al.1984).
** Only part of this forest administrative unit was identified as a critical link, due primarily to the presence of human settlements within the area.*

Table 4. Summary of Corridor Outcomes

Corridor Outcome	Region	Area (km^2)	No. of Site Outcomes Represented*	No. of Species Outcomes Represented
Periyar-Agasthyamalai	Western Ghats	7,734km^2	11	158
Annamalai	Western Ghats	6,014 km^2	14	90
Mysore-Nilgiri	Western Ghats	19,153 km^2	31	102
Malnad-Kodagu	Western Ghats	21,345 km^2	36	59
Sahyadri-Konkan	Western Ghats	10,489 km^2	15	26

* Nineteen sites fall outside corridors in Western Ghats.

Periyar-Agasthyamalai Corridor

This corridor covers an area of 7,734 square kilometers (4.3 percent of the total Western Ghats area) in two states, Tamil Nadu and Kerala. It contains 11 site outcomes (9 percent) and 51 of the faunal species outcomes (50 percent). This is the highest number of species outcomes captured among the corridors. Among the site outcomes represented in this corridor, six are protected areas covering a total area of approximately 2,010 square kilometers (15 percent of the Western Ghats protected area network) or about 30 percent of the corridor. Approximately 30 percent of the area of this corridor is covered by areas containing globally threatened species that are outside the protected area network such as Ranni Forest Division and Kulathapuzha Forest range in Kerala. The site Tirunelveli FD, which is outside the existing protected area network, is among the richest areas in globally threatened and endemic plant species in the Western Ghats (Ganeshaiah 2003), in addition to being provisionally designated an IBA. Some of the other non-protected areas in this corridor are also very significant from a conservation perspective as they contain unique ecosystems such as the *Myristica* swamps found in Kulathapuzha and Palode Forest Ranges in Kerala.

There are large areas within this corridor under plantations, some of which, cardamom in particular, provide habitat outside protected areas for globally threatened and endemic species. The forest types in this corridor are predominantly wet evergreen with high levels of endemism across all taxa. There are significant areas of dry evergreen and dry

deciduous forests on the eastern side of this corridor. This corridor ranks the highest in terms of Western Ghats endemic tree species of evergreen and semi-evergreen forest types. It also contains very important areas for the conservation of endemic herpetofauna in the Western Ghats. In addition, it has one of the most important populations of the lion tailed macaque.

Anamalai Corridor

This corridor covers an area of 6,014 square kilometers (3.3 percent of the total Western Ghats area) in two states Kerala and Tamil Nadu. It contains 14 of the site outcomes (11 percent) and 40 (or 39 percent) of the species outcomes for animal taxa. Among the site outcomes represented, 10 are protected areas covering a total of 1,717 square kilometers (12.5 percent of the Western Ghats protected area network), which is about 29 percent of the corridor. Approximately 40 percent of this corridor is comprised of non-protected areas of conservation significance, such as the Palni Hills. The latter is an important area for the conservation of the Endangered and endemic Nilgiri tahr (*Hemitragus hylocrius*). This region as a whole contains sites that hold the largest viable populations of tahr remaining in the Western Ghats, mostly within the existing protected area network. The corridor is also important for the conservation of landscape species such as elephants, tigers, and wild dogs. The Anamalai corridor contains some of the best and largest areas of *shola* grasslands in the Western Ghats. Other major vegetation types found within this corridor are wet evergreen, moist deciduous forest to the west and southwest, and dry deciduous forest on the northeastern side. Of the five Western Ghats corridors, this area ranks third in the number of tree species endemic to evergreen and semi-evergreen forests in the Western Ghats (Ramesh et al. 1997). It also contains one of the richest non-protected areas for the conservation of endemic plants in the Western Ghats – Mankulam Forest Range in Kerala (B.R. Ramesh pers. comm.). There are large areas under tea plantations in the central and southern parts of this corridor, in the Valparai plateau and the Munnar area respectively. Reservoirs are a major source of fragmentation in this landscape corridor.

Mysore-Nilgiri Corridor

This corridor covers an area of 19,153 square kilometers (10.6 percent of the total Western Ghats area), making it the second largest of the five Western Ghats corridors. It is the widest corridor covering three states: Karnataka, Kerala, and Tamil Nadu. Thirty-one (25 percent) of the site outcomes for the Western Ghats are contained within this corridor. Of all five corridors, this one covers the largest number of animal species outcomes (57 in total or about 55 percent). Among the site outcomes represented in this corridor, 12 are protected areas covering a total of 3,806 square kilometers (or 27.6 percent of the Western Ghats protected area network). The protected areas cover 18.6 percent of the corridor. Approximately 28 percent of this corridor is occupied by unprotected areas with globally threatened species. This corridor also contains some of the best habitats and populations for the conservation of landscape species such as elephant, tiger, and wild dog in the Western Ghats. The largest population of Asian elephants is found within this corridor (Sukumar 1989).The areas falling in the Nilgiri Biosphere Reserve area are especially significant for the conservation of these species. There are a great variety of habitat types in this corridor. They range from some of the

best examples and largest contiguous stretches of dry deciduous and scrub forests in the Western Ghats towards the east, to wet evergreen forests towards the western side. There are also some important hotspots of endemism in this corridor such as the Silent Valley National Park. This protected area and its surrounding forests are among the most important sites for the conservation of the lion-tailed macaque. This landscape is second only to the Agasthyamalai region in its richness of semi-evergreen and evergreen tree species (Ramesh et al 1997). Large portions of this corridor are occupied by tea and coffee plantations in the mid to upper elevations besides exotic tree plantations in the Nilgiris. There is one critical link between this corridor and the Malnad-Kodagu corridor that is crucial for movement of landscape species such as elephants and tigers.

Malnad-Kodagu Corridor

This corridor covers an area of about 21,345 square kilometers (11.9 percent of the total Western Ghats area), making it the largest corridor in the Western Ghats. Unlike the other corridors, this one is contained within a single state: Karnataka. Thirty-six (29 percent) of the site outcomes for the Western Ghats are contained within this corridor. The number of animal species outcomes covered in this corridor is 36 or about 35 percent of the total. Among the site outcomes represented in this corridor, there are seven protected areas covering a total area of 2,463.52 square kilometers (about 18 percent of the Western Ghats protected area network). This accounts for 11.5 percent of the total corridor area. The non-protected areas containing globally threatened and endemic animal species account for about 5 percent of the corridor. These areas lie primarily along the main ridge of the Western Ghats and provide relatively good connectivity between existing protected areas, particularly for tropical wet evergreen forest species such as the lion-tailed macaque. The protected areas in this corridor are important for the conservation of tigers and wild dogs in the Western Ghats. There are also some hotspots of herpetofaunal diversity within this corridor. The area between Pushpagiri WLS, Kudremukh NP, and Bhadra TR is particularly rich in endemic and globally threatened amphibian species. The stretch of forest between Brahmagiri WLS and Agumbe RF ranks fourth in terms of richness of tree species endemic to evergreen and semi-evergreen forests in the Western Ghats. The areas east of Bhadra Tiger reserve such as parts of the Bababudan hills and Yemmadoddi are potentially important for maintaining a meta-population of tigers in this landscape. The main vegetation types in this corridor include tropical wet evergreen forests, moist deciduous forests, dry deciduous forests, grasslands, and scrub. There is high degree of fragmentation in this corridor along an east-west axis. Coffee plantation is a major land use type in the southern region of this corridor and exotic tree-species plantations have been established over large areas. This corridor also has the unique depauperate and simplified “Soppina-Betta” lands which are former moist forests areas which were selectively logged and later managed for leaf manure production by local farmers

Sahyadri-Konkan Corridor

This corridor covers an area of about 10,489 square kilometers (5.8 percent of the total Western Ghats area) across 3 states: Karnataka and Maharashtra and one Union Territory – Goa. It contains 15 or about 12 percent of the site outcomes and 21 or 18 percent of the species outcomes for animal taxa. Among the site outcomes represented in this corridor,

11 are protected areas covering a total area of 2,862 square kilometers (about 21 percent of the Western Ghats protected area network). This accounts for 27 percent of the total corridor area. Dandeli has a large population of hornbills and Anshi and other evergreen forests further south could be potential sites for the reintroduction of the lion tailed macaque since it is locally extinct. There is a potential for supporting a metapopulation of tigers in the central and northern part of this corridor from Anshi to Radhanagari WLS. There are very few sites in this corridor outside the protected area network which contain globally threatened animal species. One of the non-protected sites in this corridor is irreplaceable for certain globally threatened and highly endemic species: Amboli – for *Bufo koynayensis, Ramanella mormorata,* and *Philautus* "Amboli forest." The major vegetation types in this corridor are moist deciduous and evergreen. The evergreen forests of this area are relatively poor in tree endemicity compared to the evergreen forests of the southern Western Ghats. The forests within this corridor are more fragmented than those of the other four corridors. In the northern part of this corridor, reservoirs are a major landscape feature.

SOCIOECONOMIC FEATURES

India represents an ancient civilization with a long history of reverence for nature. The oldest nature reserves date back to around 200 BC. The presence of hundreds of sacred groves and sacred landscapes in the region bears testimony to the society's commitment to conservation.

There are number of government and civil society organizations active in conservation in India. These organizations have played a critical role in conserving biodiversity and bringing a large area under protection despite pressures exerted by more than 300 million people in the region. The success is largely due to society's respect for nature, the strong democratic traditions and appropriate institutions and policies. The challenge is to strengthen conservation efforts in the face of expanding population, increasing demand for wild biological resources and strong economic growth. Success in conserving biodiversity in the region can serve as a model for other hotspots around the globe that will inevitably encounter similar pressures.

Institutional Framework

Conservation in the Western Ghats occurs within a highly diverse and complex institutional landscape. Civil society institutions comprise one among several types of institutions that influence conservation in the region. The most powerful institutions that control land use through land ownership include the State Forest Departments and associated development corporations, Government institutions such as the Public Works, Electricity, Irrigation and Revenue departments, private plantation (tea, coffee, rubber, cardamom) companies, and individual landowners controlling the use of large tracts of land including forests within the Western Ghats. Creative engagement of these institutions is critical to achieve effective conservation across the hotspot.

The Union of India is a sovereign democratic republic with a parliamentary form of government. Legislative and executive powers of federal and state governments have been detailed in three lists of the constitution - the Union list which empowers the

Federal Government, the State list which empowers the State Governments and the concurrent list by which both the Union and State Governments could legislate, although federal legislation has dominance over state legislation. The directive principles of state policy in the constitution mandate that the state shall endeavor to protect and improve the environment and safeguard the forests and wildlife of the country.

Federal Government Institutions

The Ministry of Environment and Forests (MoEF), based in New Delhi, is the authority vested with the task of formulating legislation, policy and other statutory functions under various environmental, forest and wildlife laws. A Directorate of Wildlife Preservation in the MoEF oversees all matters concerning wildlife. While the Federal Government has the mandate to legislate and evolve policy guidelines, the State Governments, which have exclusive administrative control over the forest area within the Western Ghats, bear the responsibility of implementation. In general, the MoEF has limited direct power over state governments, except notably through the Forest Conservation Act (see below).

The MoEF formulated the National Forest Policy in 1988, the National Conservation Strategy and Policy Statement on Environment and Development in 1992 and the revised National Wildlife Action Plan in 2002. In addition to legislation and policy, the MoEF performs several statutory functions to enforce provisions of the Forest (Conservation) Act, the Wildlife (Protection) Act, 1972 as amended by the Wildlife (Protection) Act, 2002 and the Environment (Protection) Act, 1986. Some of these important functions include the approval (or otherwise) of proposals from state governments to divert forest lands for non-forestry activities, approval of working plans that enable commercial logging by State Forest Departments and environmental clearance based on impact assessments for establishing industries.

With a view to ensure focus on conservation of flagship species, the MoEF launched special conservation projects such as Project Tiger and Project Elephant. The MoEF has constituted “Steering Committees” for Project Tiger and Project Elephant that advise the Government on a range of policy, management and funding issues relevant to designated Project Tiger/Elephant reserves.

Several institutions of the Federal Government relevant to the Western Ghats fall under the purview of the MoEF. A partial list includes the Wildlife Institute of India (WII), Indian Council of Forestry Research and Education (IFCRE), Botanical Survey of India (BSI), Zoological Survey of India (ZSI), Forest Survey of India (FSI), and Indira Gandhi National Forest Academy. These institutions are primarily involved in research, training and documentation activities. Other independent federal government institutions include the Indian Defense forces, Port Authority of India, Central Police organizations like the Border Security Force, the Indo Tibetan Border Police etc., Customs Bureau, Narcotics Control Bureau, and investigation agencies like the Central Bureau of Investigation (CBI) etc. These agencies perform various roles in investigation and control of forest and wildlife offences.

State Government Institutions

State governments exercise complete administrative control over all statutorily recognized forests and other government-owned lands in the Western Ghats. The state government's power to constitute reserved forests, national parks and wildlife sanctuaries is absolute but it has to seek prior approval of the Union Government for de-reservation, diversion, logging, or leasing of forests for non-forestry activities. The Forest Minister of the State is in charge of all matters concerning forests and wildlife and is assisted by a Principal Secretary along with a full-fledged forest secretariat which is in charge of all statutory and policy matters. The State Forest Department is vested with the task of administration and management of forests, including protected areas.

State forest departments are headed by Principal Chief Conservators of Forests, officers of the Indian Forest Service. The Chief Wildlife Warden is the statutorily recognized authority, under the Wildlife Protection Act, who heads the Wildlife Wing of the department and exercises complete administrative control over protected areas within a state. Every protected area is typically classified as a Wildlife Division headed by the Deputy Conservator of Forests.

The Forest Department is charged with the tasks of protection and law enforcement within forest areas through the prevention, detection, investigation, and prosecution of all forest and wildlife offences. Certain officers are also vested with quasi-judicial powers to deal with cases of encroachment, seizures of illegal wildlife produce, and specific forest offences.

In addition to the Forest Department, various other government departments that make up the broader administrative structure of the state government play significant roles in the administration of land within the Western Ghats. These include the Revenue Department, which controls public lands including thickly wooded areas and grasslands not statutorily designated as forests; the Police Department, whose responsibilities include maintenance of law and order which is critical to enforcing forest laws, addressing the illegal trade in forest and wildlife products; the Irrigation/Water Resources Department which plans and manages dams, reservoirs, barrages, and canals; and lastly, the Public Works Department which maintains all state highways and roads.

There are major conflicts of interest between central and state governments as forests represent a major source of non-tax revenue for the latter (World Bank 1993; Vira 1995). Thus, while recent forest policy has tended to emphasize environmental and social values, state governments are often faced with competing demands on forests from various, powerful interest groups, including the state treasury and forest-based industries. The main focus of the Forest Department, which is revenue generation through extraction of forest products, directly conflicts with conservation objectives. Furthermore, conservation management objectives of the department are not clearly formulated, projects are often poorly funded, equipped and staffed and ongoing efforts rarely monitored. Consequently, there are no significant efforts made towards acquisition of enclosures, resettlement programs, managing invasive species, reforestation of degraded lands and controlling felling in plantations. The lack of transparency and accountability, in combination with the lack of sufficient financial resources, are significant constraints

to effective implementation of conservation**.** A radical restructuring of the forest sector through a clear separation of protective and productive functions is proposed under the National Forestry Action Programme (prepared with funding from the United Nations Development Programme (UNDP).

Other Democratic Institutions

Panchayati Raj institutions, comprising the Gram Panchayats at village level, the Taluk Panchayats at Taluk level, and the Zilla Panchayats at the district level, form a three-tier system of decentralized, democratic local self-governance. State legislatures can legislate and devolve certain powers to the Panchayats under the Panchyat Raj Act on matters concerning agriculture, animal husbandry, fisheries, rural housing, electrification, roads and water management, social welfare etc.

Statutorily Constituted Bodies

Several statutory bodies have been constituted at the federal and state levels with varying mandates to enforce, advise, and monitor a wide range of issues concerning forests, wildlife and environment. Some of the key bodies include the following:

(a) The National Board for Wildlife constituted under the Wildlife Protection Act, 2002 (formerly the Indian Board for Wildlife) advises the federal and state governments in matters concerning wildlife conservation policy, illegal trade and poaching, management of national parks and sanctuaries, impact assessments of projects on wildlife, and other related issues.

(b) State Boards for Wildlife at the state level similarly advise the state governments in selection and management of protected areas and other matters connected with the protection of wildlife.

(c) The Biodiversity Act, 2002 mandates the constitution of a National Biodiversity Authority which, among other responsibilities, advises the Union and state governments on matters relating to biodiversity conservation, equitable sharing of benefits arising out of biological resource utilization; regulating access to biodiversity and initiating measures to oppose the granting of Intellectual Property Rights on any biological resource obtained from India.

(d) Central and State Pollution Control Boards have been constituted under the Environment Protection Act, 1986 with wide-ranging powers to regulate any person from setting up industries in ecologically sensitive areas and to inspect and prosecute individuals or industries who violate specified pollution control norms.

(e) The Central Empowered Committee constituted under the Environment Protection Act, 1986 for a period of five years starting September 2002, monitors and ensures compliance of the orders of the Supreme Court in the major public interest litigation (Writ Petition (Civil) 202/1995 - Godavarman Tirumalpad v/s Union of India & others) concerning protection of forests, wildlife, and related issues.

Civil Society Institutions (NGOs)

There are numerous civil society organizations active in conservation and development projects in the Western Ghats. Institutions falling into this category include those involved in research, conservation, education, and activism and those whose activities directly influence protected areas. Overall, there is tremendous variation in the intensity of NGO involvement in protected area issues with some regions better represented than others. Although NGOs play a major role in advocacy, activism, education, and rural development, they are rarely involved in monitoring implementation of conservation management activities within protected areas. Analysis of shortcomings of such institutions reveals poor networking and coordination, with social and conservation NGOs often working at cross purposes with each other. Moreover, many NGOs appear to be opportunistic, lacking clear strategies or long-term commitment and tending to be driven by international donor priorities rather than by local needs for intervention. NGOs are also limited by financial constraints, have poor institutional linkages, and find their effectiveness hindered by the lack of support and cooperation from the forest departments. Lack of transparency and high levels of bureaucracy within NGOs frequently undermine their credibility and consequently their effectiveness in achieving conservation goals. Many NGOs are run by volunteers who lack the necessary time, financial resources, and technical capacity to effectively achieve organizational goals. Many NGOs lack clear institutional focus and opportunistically attempt to address issues of biodiversity conservation while pursuing social welfare goals that negatively affect biodiversity. Furthermore, a large number of NGOs believe that government policies need to be opposed, thus foreclosing options of potential public-private partnerships.

Corporations, Businesses, and Cooperative Societies

Forest Development Corporations, independent of state forest departments but staffed by forest department officials exist in most states in the Western Ghats. A portion of the sales from logging operations and sales of certain forest products are channeled through Forest Development Corporations. In certain states, the Forest Development Corporations also control public lands that are developed as plantations to meet the demands for commercial timber. In the State of Kerala, although tree felling in protected areas is illegal, the Forest Development Corporation, a government institution, still converts forestland to plantations.

All aspects of wildlife tourism within the Western Ghats were, until recently, controlled mostly by the Forest Department. Growing demand for higher standards has resulted in the establishment of several private tourism resorts around wildlife reserves. The forest departments control the entry of tourists by enforcing a system of permits, which tour operators have to follow. There is a clear shift towards private enterprise but this is restricted to high-end tourism.

Cooperative societies such as the Large Area Multi Purpose Societies, Forest Labour Cooperative Societies that act as agencies involved in extraction and marketing of timber products, and NTFPs from individuals/small groups of collectors, exist across the Western Ghats.

Corporate business interests in mining, timber products, and NTFPs have significant impacts on biodiversity conservation primarily due to procurement of mining permits, leases through bureaucratic and political patronage. The category includes public and private sector industries, plantation companies, and forest-based industries. The primary mandate of these industries is revenue maximization and thus directly conflicts with the conservation of biodiversity. There are no incentives for such organizations to adopt pro-conservation activities. Hence, such organizations are sympathetic to the conservation cause but not committed to specific issues and often lack conservation awareness. However, these institutions are able to successfully interface with traditional/local use in order to further commercial extraction with little emphasis on sustainability issues. Plantation companies have not adopted effective eco-friendly activities and continue to exploit resources without appropriate land-management practices. Forest cooperatives involved in minor forest product extraction are largely unregulated and weakly monitored resulting in extraction that is rarely sustainable.

Scientific Research Institutions

Institutions such as the National Institute of Oceanography, Centre for Ecological Sciences, Indian Institute of Science, WII, French Institute in Pondicherry, Salim Ali Centre for Ornithology and Natural History (SACON), BNHS, Kerala Forest Research Institute (KFRI), Salim Ali School of Ecology, Mangalore University, Mysore University, UAS, etc. are involved in scientific research and training activities in the Western Ghats.

Media

The media in India is independent and not fettered by governmental controls. The Prasar Bharathi is the only federal government-owned media corporation, which has separate television broadcasting services: the Doordarshan and All India Radio. Coverage of English media is restricted geographically to large cities and towns with very limited circulation that is largely insignificant in the rural areas. The vernacular media is active in both urban and rural areas. Both the English and the vernacular media consider forest and biodiversity conservation to be important issues.

Legal Framework for Conservation in Western Ghats

The government of India introduced various types of legislation in response to growing destruction of wildlife and forests by anthropogenic pressures. Conservation policies in post-independent India are rooted in the forest management legislation enacted by the British colonial administration.

Federal and State Legislation

The Wildlife (Protection) Act (WPA), 1972 as amended by WPA, 2002. The WPA is an important statute that provides a powerful legal framework for protection of wildlife, establishment of protected areas, management of habitats, regulation and control of hunting and trade in parts and products derived from wildlife. The WPA provides for four categories of protected areas: National Parks, Wildlife Sanctuaries, Conservation Reserves, and Community Reserves. National parks are by law more strictly protected, allowing virtually no human activity except that which is in the interest of wildlife

conservation. Grazing, private tenurial rights are disallowed in parks but can be allowed in wildlife sanctuaries at the discretion of the Chief Wildlife Warden. The amended WPA does not allow for any commercial exploitation of forest produce in both national parks and wildlife sanctuaries and local communities can collect forest produce only for their bona fide needs. No wild mammal, bird, amphibian, reptile, fish, crustacean, insects, or coelentrates listed in four schedules of the WPA can be hunted either within or outside protected areas. On conviction, the penalty for hunting is imprisonment for a period ranging from a minimum of three to a maximum of seven years with fines not less than 10,000 rupees.

Community reserves and conservation reserves are two new categories of protected areas that have been included under the WPA. These two categories provide a greater role for local communities, stakeholders and civil society as well as the opportunity to protect many areas of conservation value that cannot be designated under the strict categories wildlife sanctuaries or national parks.

The statute prohibits the destruction or diversion of wildlife and its habitat by any method unless it is for improvement or better management and this is decided by the state government in consultation the national and state boards for wildlife for parks and sanctuaries respectively. The WPA contains elaborate procedures for dealing with legal rights in proposed protected areas and acquisition of any land or interest under this law is deemed as an acquisition for a public purpose.

Apart from protected area establishment, other important aspects of the WPA include procedures for the appointment of state wildlife authorities and wildlife advisory boards, the regulation of trade in wildlife products and the prevention, detection and punishment of violations of the WPA. The procedure for all complaints filed under the WPA is governed by the Code of Criminal Procedure (1973) which is a general procedure common to all criminal trials and which provides for investigation, inquiry and trial of cases by criminal courts of various designations.

The Indian Forest Act, 1927 and Forest Acts of States within the Western Ghats
The main objective of the Indian Forest Act (1927) was to secure exclusive state control over forests to secure the demand for timber. Most of these untitled lands had traditionally belonged to the forest dwelling communities. The Act defined state ownership, regulated its use, and appropriated the power to substitute or extinguish customary rights. The Act facilitates three categories of forests, namely “reserved forests,” “village forests,” and “protected forests.” Reserved forests are the most protected within these categories. No rights can be acquired in reserved forests except by succession or under a grant or contract with the government. Felling trees, grazing cattle, removing forest products, quarrying, fishing, and hunting are punishable with a fine or imprisonment. Although the Indian Forest Act is a federal act, many states have enacted similar forest acts but with some modifications.

The Forest (Conservation) Act, 1980
In order to check rapid deforestation due to forestlands being released by state governments for agriculture, industry and other development projects (allowed under the Indian Forest Act) the federal government enacted the Forest Conservation Act in 1980 with an amendment in 1988. The Act made the prior approval of the federal government necessary for de-reservation of reserved forests, logging and for use of forestland for non-forest purposes.

This powerful legislation has to a large extent, curtailed the indiscriminate logging and release of forestland for non-forestry purposes by state governments. While the federal government imposed such strict restrictions, it did not simultaneously evolve a mechanism to compensate state governments for loss of timber logging revenues. This anomaly coupled with increasing pressure for land due to a burgeoning population has generated considerable resentment within state governments resulting in growing pressure to dilute the restrictive provisions of the Act. The Supreme Court of India has currently imposed a complete ban on the release of forestland for non-forestry activities without the prior approval of the federal government.

The Environment (Protection) Act, 1986
The Environment (Protection) Act, 1986 is an important legislation that provides for coordination of activities of the various regulatory agencies, creation of authorities with adequate powers for environmental protection, regulation of the discharge of environmental pollutants, handling of hazardous substances, etc. The Act provided an opportunity to extend legal protection to non-forest habitats such as wetlands and coastal zones.

The Biological Diversity Act, 2002
India is a party to the United Nations Convention on Biological Diversity. The provisions of the Biological Diversity Act are in addition to and not in derogation of the provisions in any other law relating to forests or wildlife.

National Policies and Plans
National Wildlife Action Plan 2002-2016. The Action Plan replaces the earlier Plan adopted in 1983 and was introduced in response to the need for a change in priorities given increased commercial use of natural resources, continued growth of human and livestock populations, and changes in consumption patterns. The Plan most closely represents an actual policy on protection of wildlife. It focuses on strengthening and enhancing the protected area network, on the conservation of Endangered wildlife and their habitats, on controlling trade in wildlife products and on research, education, and training. The Plan endorses two new protected area categories: “conservation reserves,” referring to corridors connecting protected areas, and “community reserves,” which will allow greater participation of local communities in protected area management through traditional or cultural conservation practices. These new categories of protected areas are likely to bring in corridor areas under protection. The Plan contains various recommendations to address the needs of local communities living outside protected areas and outlines the need for voluntary relocation and rehabilitation of villages within

protected areas. The Plan recognizes the need to reduce human-wildlife conflict and emphasizes the establishment of effective compensation mechanisms. It includes the restoration of degraded habitats outside protected areas as a key objective.

National Forest Policy 1988
The National Forest Policy, 1988 (NFP) is primarily concerned with the sustainable use and conservation of forests and further strengthens the Forest Conservation Act (1980). It marked a significant departure from earlier forest policies, which gave primacy to meeting government interests and industrial requirements for forest products at the expense of local subsistence requirements (Khare et al. 2000). The NFP prioritizes the maintenance of ecological balance through the conservation of biological diversity, soil and water management, increase of tree cover, efficient use of forest produce, substitution of wood, and ensuring peoples' involvement in achieving these objectives. It also includes meeting the natural resource requirements of rural communities as a major objective. The NFP legitimizes the customary rights and concessions of communities living in and around forests, stating that the domestic requirements of the rural poor should take precedence over industrial and commercial demands for forest products (GOI 1988).

Economic Situation

The Planning Commission in India is responsible for making an assessment of all resources of the country, augmenting deficient resources, and formulating plans for the most effective and balanced utilization of resources and determining priorities. For the first eight plans the emphasis was on a growing public sector with massive investments in basic and heavy industries, but since the launch of the Ninth Plan in 1997, the emphasis on the public sector has become less pronounced and the current thinking on planning in the country, in general, is that it should increasingly be of an indicative nature.

The Tenth Plan (2002-2007) aims at a GDP growth rate of 8 percent over the period, with the agriculture and allied sectors contributing to 22 percent, trade 13 percent, and 16 percent from other services. The agriculture sector in the country employs more than 69 percent of the population. It is, accordingly, an important sector of the economy that has a direct bearing on the overall growth, income levels, and wellbeing of the people. Nationally, the annual growth rate of the gross domestic product (GDP) per capita increased from 3.3 between 1975 and 2003 to 4.0 between 1990 and 2003 (UNDP 2005).

The economy of all the states has been experiencing major structural changes as would be expected in the structure of a developing country. There has been a shift from the primary sector to the secondary to the tertiary sectors. Figures for all 23 states taken together suggest major structural changes away from the predominantly agriculture-based economy that India has traditionally had. Employment trends are consistent with the structural trends in income.

Infrastructure and Regional Development

The infrastructure in the states of the Western Ghats is reasonably well developed. The infrastructure index brings out a composite comparative profile of the availability of the

physical, social, and institutional infrastructures in all the Indian states for 1999. Goa was ranked the best. The states of Western Ghats were among the top 10 for the infrastructure index.

The proportion of households with electricity in 2001 was as high as 93.6 percent in Goa, 78.5 percent in Karnataka, 78.20 percent in TamilNadu, 77.5 percent in Maharashtra, and 70.20 percent in Kerala.

On a national level, households with sustainable access to an improved water source increased from 68 percent in 1990 to 86 percent in 2002 (UNDP 2005). The proportion of households with a drinking water source within the premises in 2001 varies from 71.6 percent in Kerala to 27.1 percent in TamilNadu (Census of India 2001). The Tenth Plan is declared as the water plan for focused attention on the integrated development of water resources in the country.

The proportion of households living in permanent structures in 2001 ranged from 69.9 percent in Goa to 54.9 percent in Karnataka (Census of India 2001).

The 1990s witnessed a phenomenal growth in the telecommunications sector. On a national level, the number of people per 1,000 who had telephone mainlines increased from 6 in 1990 to 46 in 2003 (UNDP 2005). The proportion of households with a telephone in 2001 ranged from 11.2 percent in Tamil Nadu to 29.10 percent in Goa.

The states of the Western Ghats have a reasonably satisfactory road network. The availability of roads (road length per thousand square kilometers) is above the national average for the five States - ranging from 3,749 in Kerala to 751 in Karnataka). The infrastructure facility in the protected areas is reasonably good.

Demography and Social Trends

India is the second largest country in the world, after China, to cross the billion mark in population. The population of India has more than tripled since 1941. The annual average growth in population declined to 1.9 percent in 2003 (UNDP 2005). States like Kerala, Tamil Nadu, and Goa have registered a substantial decline in the growth rate in the decade 1991/2001 lower than the national average. The lowest rate was that of Kerala at 0.90 percent, followed by Tamil Nadu at 1.06 percent.

The high rate of economic growth in India has been accompanied by a reduction in poverty. There has been appreciable decline in the percent of population below the poverty line from over 50 percent in the 1970s to less than 30 percent in the late 1990s. The percentage of Indian population below the poverty line in 2002 was 28.1 percent (UNDP 2005). All five states within the Western Ghats had values in 2000/2001 that were below the national average with as low as 4.4 percent for Goa and as high as 25.02 percent for Maharashtra. Noteworthy is the case of Kerala, which, from an initial position amongst the high poverty ratio states, has recorded a steep decline to be amongst the states with very low percentage of population below the poverty line. Significant declines

in rural poverty as a whole have been recorded in the period from 1973/74 to 1999/2000 by the faster growing states of TamilNadu, Karnataka, and Maharashtra.

India has shown substantial improvement in the fields of education and health. According to the UNDP Human Development Report 2005, India has been moving up steadily in the international comparative ranking of human development.

Results from the 2001 Census (the most recent available) show the highest jump in literacy rate from 52.21 percent in 1991 to 64.8 percent in 2001. In 2001, Kerala had the highest literacy rate of 90.02 in the country and among the Western Ghats, it is followed closely by Goa at 82.32. Karnataka, Tamil Nadu, Maharashtra also have literacy rates higher than the national average. In India, the male literacy rate is 75.3 and the female literacy rate is 53.7[1]. Higher female literacy is also associated with lower fertility levels. In Kerala, 94 percent of the total rural population was served by primary schools in a 1993 survey. Kerala is widely acknowledged as a success story of human development. The priorities that have guided public policy in the state have led to expansion in social opportunities and a high level of human development in relation to the rest of the country.

SYNOPSIS OF CURRENT THREATS

Transformation of the Western Ghats landscape is believed to date back to the 1800s accelerating through the early twentieth century and continuing today. In the Western Ghats of Karnataka alone, nearly 12 percent of the forests have been completely lost in the past two decades (Ramesh 2001). Of the 62,000 square kilometers of potential area of evergreen forests in the Western Ghats, Gadgil and Meher-Homji (1986) estimated that only between 5,288 square kilometers (8.5 percent) and 21,515 square kilometers (34.7 percent) remained in the mid 1980s along the ranges. A more recent assessment by Myers et al. (2000) estimates that of the 182,500 square kilometers of primary vegetation that was estimated to have existed in the Western Ghats and Sri Lanka, only some 12,450 square kilometers (6.8 percent) remain today. Menon and Bawa (1997) estimated that, between 1920 and 1990, 40 percent of the original natural vegetation of the Western Ghats was lost or converted to open/cultivated lands, coffee plantations, tea plantations, and hydroelectric reservoirs. Open/cultivated lands accounted for 76 percent and coffee plantations for 16 percent of the conversion respectively.

Proximate Threats to Biodiversity in the Region

The remnant natural ecosystems of the Western Ghats are currently subject to a plethora of threats that vary widely in the nature and intensity of their impacts on biodiversity. Proximate threats fall into two broad categories: localized threats such as illegal hunting, extraction of NTFPs, livestock grazing, and forest fires, and landscape-level threats such as mining, roads, large and micro-hydel power projects, wind farms, large-scale agricultural expansion, and creation of monoculture plantations. All these threats either independently or synergistically influence biodiversity in the hotspot. Very often, threats are intricately meshed together in complex and myriad ways making it a difficult

[1] www.censusindia.net/t_00_006.html

challenge to tease apart their impacts. The following is a description of the most prevalent forms of proximate threats to the biodiversity of the Western Ghats.

Livestock Grazing
Livestock grazing within and bordering protected areas by high densities of livestock (cattle and goats) is a serious problem causing habitat degradation across the Western Ghats. Growth in livestock densities often accompanying human population growth inevitably results in serious conflicts between villagers and forest department officials. The problem is pervasive across the Western Ghats.

Illegal Hunting
Illegal local hunting driven by tradition or demand for wild meat is pervasive across the Western Ghats. Hunters employ guns as well as a wide array of ingenious traditional methods such as poisoning, snaring and trapping (Karanth 1986, Madhusudan and Karanth 2002). This threat is largely under-appreciated in terms of its intensity, extant, and impacts on wildlife. Wild meat is a nonessential part of the diet of hunters who frequently have access to alternative sources of animal protein. Recent sociocultural changes have had a profound influence on patterns and intensity of hunting.

Conflict with Large Wildlife/Retaliation
Given that the Western Ghats exists within an intensely human-dominated landscape, human-wildlife conflicts are a common phenomenon. Very high human population densities in several parts of the hotspot further exacerbate the intensity of conflict. For example, villagers living close to Bhadra Wildlife Sanctuary in the State of Karnataka, lose approximately 11 percent of their annual grain production to raiding elephants every year. Marauding leopards and tigers annually devour some 12 percent of their livestock holdings (Madhusudhan 2003). Compensation schemes are often inefficient and largely fail to achieve their objectives of alleviating livestock and crop losses.

Extraction of Forest Products
Human communities living within and adjacent to protected areas in the Western Ghats hotspot are frequently dependent on the extraction of NTFPs to meet a diversity of subsistence and commercial needs. For example, in the Western Ghats region of Karnataka, out of the 310 NTFP species extracted for various purposes, 40 species are collected for regional and global markets and 110 species are collected for consumption (Hegde et al 2000). Sustainability of NTFP extraction in the wake of expanding human populations and changing consumption patterns are critical issues that need urgent attention.

Fuelwood and Fodder Extraction
The extraction of fuelwood and fodder constitutes a significant and pervasive consumptive use within the Western Ghats. Overall, extraction of wood from both live and dead plants represents a serious threat negatively affecting canopy gaps, regeneration (lower fruit and seed production), stand density, basal area, and population structure and frequently resulting in the local extinction of overharvested preferred species. There is

significant habitat degradation for the first several hundred meters into most forest fragments.

Plantations

Hill agroecosystems in the Western Ghats are today dominated by tea, coffee, rubber, and monocultures of various species including the recently introduced oil palm. Nair and Daniel (1986) report estimates of; 750 square kilometers of tea plantations above an elevation of 1,500 meters, at least 1,500 square kilometers of coffee plantations, and 825 square kilometers of cardamom estates. Large-scale planting of coffee in the Western Ghats began in 1854 when the British established themselves in Kodagu. Over the years, tea, coffee, eucalyptus, cinchona, wattle, rubber, cloves etc. have displaced extensive patches of natural forests throughout the Western Ghats and are frequently associated with encroachment of surrounding forest areas. Plantations owned by private individuals and corporate sector continue to grow in the Western Ghats and constitute an important source of fragmentation of natural habitat within the hotspot. They also represent potentially important corridor areas for certain wildlife species.

Human Settlements/Encroachments

Human settlements where legal and/or traditional rights of land ownership occur both within and outside protected areas all across the Western Ghats and represent a significant landscape level threat. In the mountainous regions of Western Ghats, the human population density varied between 100 and 300 habitants per square kilometer and only at a few places was lower than 100 (Pascal 1988). Growing populations within these settlements, in addition to changing lifestyles and consumption patterns are associated with intensifying impacts of human activities in surrounding forest areas.

Pollution

The unrestricted use of agrochemicals in the vicinity of forests, particularly in tea and coffee estates, causes serious damage to forest ecosystems. Pesticide threats to amphibians, even in concentrations as low as a few ppm (parts per million). Thus, threat to the aquatic biota from the pollution of aquatic systems from agrochemicals and sediment loads is a very serious problem.

Public Behaviors and Attitudes

Despite rich biodiversity-related cultural practices and traditions, there is clearly a lack of appreciation of the need to conserve biodiversity among the broad mass of the people in India. Many people realize the importance of trees and there is universal recognition of the need to conserve forests; this does not extend however, to the *diversity* forests contain. Likewise, most Indians abhor killing (including hunting), but few recognize the distinction between the slaughter of domestic animals and the hunting of game. Building broad public awareness of the biological wealth of the Western Ghats and the need to conserve it is therefore of paramount importance.

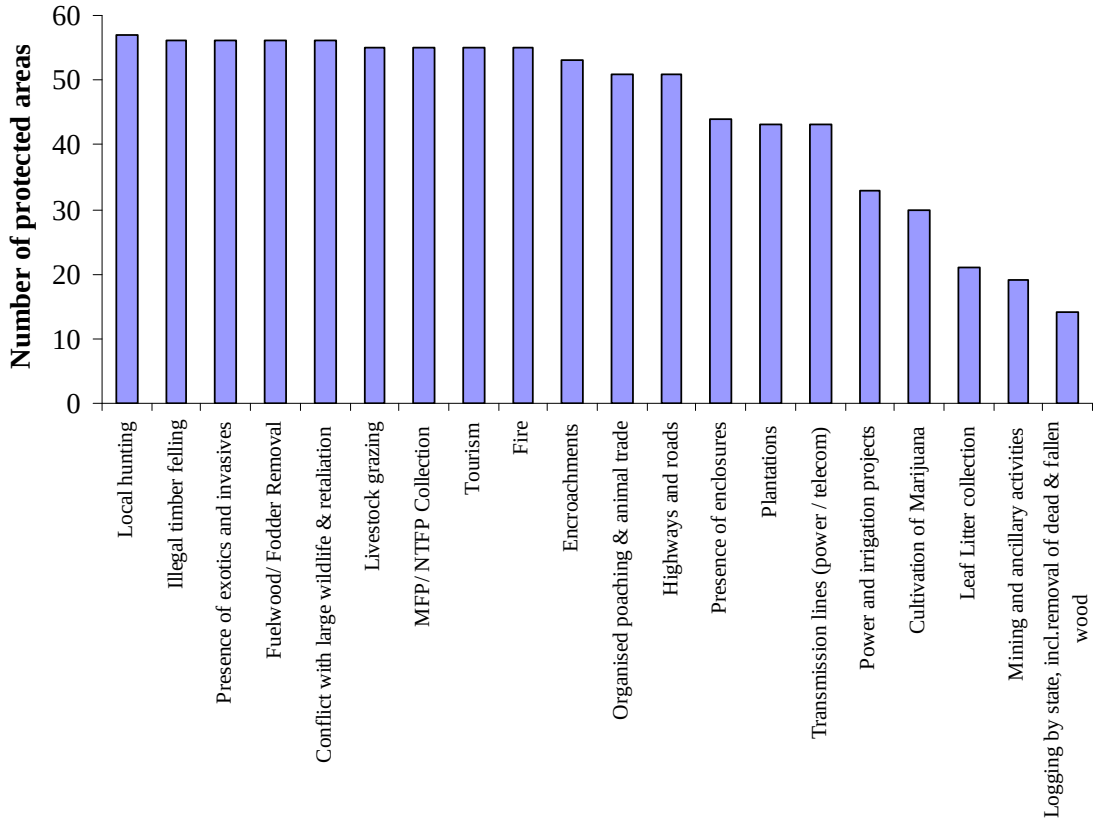
Legal and Illegal Logging

Although revenue generation is not a stated management or policy objective of protected areas or other forest types, generally, forests represent a major source of revenue for the

State. Until the ban on green felling in early 1980 in India, logging was a significant factor in degradation of biodiversity. Even now, legal logging activities authorized by State forest departments that include the extraction of bamboo and cane, thinning of teak plantations and removal of dead and fallen trees, probably have significant negative effects on biodiversity. In addition to legal extraction, both selective and large-scale illegal felling of trees occurs within protected areas.

In addition to the threats described above, other major local level proximate threats to biodiversity within the Western Ghats include fire, poaching for the commercial wildlife trade, illegal quarrying, presence of invasive plant species and mini and micro-hydel projects as well as larger irrigation, hydel, wind energy, pipeline projects, power and telecom lines, roads and railroads. Figure 9 below shows the distribution of proximate threats to protected areas in the Western Ghats.

Figure 9. Frequency Distribution of Threats to Protected Areas in the Western Ghats (Total number of protected areas surveyed = 58)



Relative Importance of Proximate Threats

Analysis of distribution patterns of proximate threats (local and landscape level) in the Western Ghats describes the relative importance of these threats. The term "threat" is used to represent factors affecting biodiversity. These factors vary in the degree to which they actually represent "threats." For this analysis, The Western Ghats was divided into one degree grids that were further divided into 15-minute grids. A total of 249 fifteen-minute grids were scored for the presence or absence of six landscape level threats: that included the following: reservoirs built for irrigation and hydel projects, wind energy farms, mining, roads/highways/power/telecom lines, pipeline projects, and railroads. Predominantly human-modified landscapes were eliminated from the analyses using LandScan Global database (LandScan 2001 Global Population Database, Oakridge, TN: OakRidge National Laboratory). Of these threats, roads, highways, power, and telecom lines were found to occur in all grid cells without human settlements thus ranking highest in terms of frequency of occurrence across the hotspot. In addition, the following local level threats were identified: leaf litter collection, logging by state, quarrying, fodder removal, fire, hunting, livestock grazing, illegal logging, invasives and exotics, NTFP extraction, and fuelwood collection. Of these, illegal logging, hunting, exotics and invasives, fuelwood collection, and livestock grazing were found to be most widespread across the hotspot occurring in all grid cells excluding human settlements. Overall, local level threats such as hunting, livestock grazing, etc. are far more widespread than landscape-level threats associated with large-scale changes in land use. Threats differ significantly in the nature and intensity of their impacts. The analysis measured the frequency of threat occurrence and not the actual impacts of threats.

Macro-Level Analysis of Root Causes of Biodiversity Loss in the Western Ghats

Underlying the proximate threats are demographic and macroeconomic factors that ultimately drive the loss of biodiversity. The distinction between proximate and ultimate or the root causes of biodiversity loss is often based on arbitrary criteria. Nevertheless it is obvious that many of the proximate factors such as extraction of resources, hunting or human settlements can be directly traced to population pressures, macroeconomic factors, poverty, or poor governance.

Population Growth

The population of India has almost doubled during the last forty years, and assuming 1 percent annual deforestation rate, the forest area has been roughly reduced by one-half during the same period. Expanding populations place a high demand on cultivated land and push the agricultural frontier to remote forested lands. Between the 1920s and 1980s, conversions of forest into agricultural land or open areas accounted for 40 percent of the deforestation in the Western Ghats (Menon and Bawa, 1997). In the 1950s and 1960s, expanding populations and the famine-driven Grow More Food campaign led to state-supported clearing of forests for agriculture. This led to an increased demand for forest products as well as increased pressure on forests.

Enhanced demand for forest products is a function of both population trends and **changing consumption patterns**. The pharmaceutical industry, for example, is

manufacturing more numerous and a more diverse array of drugs and health related products that are based on wild plants than any time in the past. The growing middle class is using more forest products such as rattan, timber, paper, incense-sticks, gooseberry, shampoos, coffee, tea, and spices. Demand for products that grow best in habitats where forests are undisturbed is increasing as a result.

Macroeconomic Policies

Macroeconomic policies that affect biodiversity cover a range of assumptions and actions on the part of the government as well as civil society.

Undervaluation of forests or natural ecosystems is assumed to be a major factor responsible for loss of biodiversity. From the 1960s to 1980s forests were largely valued in terms of the amount of timber they contained and not for goods such as NTFPs and genetic resources, nor for ecosystem services. The government agencies assumed that larger returns could be obtained from clearing natural forests and replacing these forests with plantations, often of exotic species, to yield timber and wood for industrial purposes. There was large-scale deforestation as a result. Many of the cleared areas could not be adequately planted with native or even exotic species. In addition, many of these areas lost natural habitats yet remain classified as “forests” under the land-use categorization adopted by the state departments.

Another manifestation of undervaluation is the construction of a large number of hydroelectric and irrigation projects in the Western Ghats. These projects not only submerge forests, but the infrastructure such as roads and power transmission lines needed to support them as well as the human settlements that are created to house employees continue to degrade the surrounding biodiversity in natural habitats. Out of the 52 dams built across the rivers from southern Western Ghats before 1990, 28 were located in the wet evergreen forest zone (Nair, 1991).

Undervaluation of biodiversity indirectly continues even after the construction of the hydroelectric dams. Electric power and water for irrigation derived from the rivers in the Western Ghats and throughout India are highly under-priced and the provision of such services that are derived from natural capital are highly subsidized. Underpricing and subsidies result in increased consumption and waste. Technical inefficiency in power transmission and pilferage of electric power, common in India, further contribute to increased pressure on natural resources.

International trade regulations, particularly the removal of tariffs, make it easy for forest products to move from one country to another. The availability of cheap products from natural forests anywhere in the world prevents investments in local plantations and indirectly increases pressures on local forests as well. In the Western Ghats, trade in cash crops such as coffee, tea and spices have been a major driver for encroachments by the plantation sector. High prices combined with weak protection of wild biodiversity by the state have led farmers and owners of large plantation estates to clear adjoining forests.

Property Rights

Ownership and operational rights attached to forests can, both positively and negatively, affect biodiversity. Increased stake of communities in natural ecosystems either through participatory management or tenurial control is widely assumed to result in more effective conservation than without such management in control. Indeed in some parts of India, commonly managed forests are better stocked than other forests (Ghate, 2000), whereas over a much wider area community owned forests have totally degraded (Shyam Sundar and Parameshwarappa 1982). The negative effects were evident in the 1960s, when in anticipation of the naturalization of forestland in many parts of the Western Ghats, owners of the private forests started to clear land to sell timber and maximize their returns from the land.

Poverty

Poverty is assumed to be a major factor leading to the loss of biodiversity. Although quantitative data are lacking, biodiversity rich areas in the Western Ghats have a mixed high concentration of communities with low and middle-income levels. Expenditures in health, education and agriculture by government agencies are also generally higher especially in Kerala and Karnataka. In general, compared to the eastern plains of Southern India wages and social services in the Western Ghats are better. Indigenous groups and migrants from other areas largely populate forests in the Western Ghats. The indigenous groups had practiced shifting agriculture, but with the appropriation of their lands into forest reserves and protected areas, shifting cultivation in the remnant forest areas agriculture is no longer feasible or sustainable. Thus, access to land for settled agriculture is limited. Moreover, the poor lack financial capital and skills to enhance outputs from their limited physical assets. Thus they have no alternative to sustaining their livelihoods from logging labor and harvesting wild biodiversity that ironically provides long-term economic security. The extent to which degradation of habitats itself contributes to increase in poverty is less understood than the reverse linkage between poverty and environmental degradation.

Governance

Poor governance includes ineffective management plans, lack of inter-sectoral cooperation and centralized bureaucracies with outmoded rules of service. Management plans often are not scientifically developed, lack scientific inputs and are not faithfully implemented. Moreover, management plans do not recognize the stake of local communities and the civil society in the maintenance and use of biodiversity. Thus, rarely does management involve stakeholders other than the state agencies. Consequently, local communities are often in conflict with the state agencies and thus conflict results in hostility to and alienation from the state agencies. Natural ecosystems resources in India are managed on a sectoral basis. First, there are a plethora of organizations that manage forests, wetlands, soils, watersheds, livestock, water and mining. All these resources or activities are linked with biodiversity. Yet there is very little coordination of activities among the various agencies managing different resources. Second, even within the forest department there are wildlife wings, territorial wings and forest development corporations, again, with little coordination for managing and conserving biodiversity although the creation of separate wildlife wings has definitely shifted emphasis from

logging, plantations and silviculture to protection of wildlife, especially within protected areas.

Centralized bureaucracies lack transparency and accountability, both of which are necessary to inhibit poor management and/or corruption. As a result, there are few incentives for strong administrative performance, nor are there significant consequences for officials who do not adequately administer conservation policies. Centralization of decision-making and lack of specialized knowledge also contributes to ineffective and unscientific management. Such lack of accountability and training is exacerbated by the short tenure of forest officials in a particular position, which prevents implementation of plans requiring long-term leadership. The underlying problem is the absence of an institutionalized framework where management is professionalized and the latest scientific tools and concepts are integrated with the active collaboration of civil society.

In summary, biodiversity loss can be traced to a number of factors. The importance of different factors varies in time and space. There have been no serious attempts to analyze factors underlying biodiversity loss in the Western Ghats. Policy interventions to stem degradation of biodiversity or to achieve desired conservation outcomes would have limited success in the absence of quantitative analyses of the relative magnitude of various factors responsible for habitat loss and degradation. Mitigation of threats requires greater involvement of civil society that must understand the true value of biodiversity and consequences of its degradation.

SYNOPSIS OF CURRENT INVESTMENTS

The central and state governments (in India) provide the bulk of support for investments in biodiversity conservation-related activities in the Western Ghats. Multilateral and bilateral donor agencies, research institutes as well as international conservation NGOs also provide substantial support. The funds from multi-lateral donors are largely channeled through the government. Universities and research institutes obtain grants from both governmental agencies and international organizations. Domestic NGOs are primarily funded by international NGOs as well as bilateral and multilateral donor agencies. Information on these current investments is presented below, including projects undertaken in the region since 1997 to ongoing projects.

Government Agencies

The Indian government is the largest investor in conservation related activities in the Western Ghats. The Planning Commission and the MoEF are the main funding sources within the central government. At the state level, the state planning boards and commissions and the state forest departments are the main agencies investing in conservation-related activities. State forest departments are vested with the task of administration and management of forests, including protected areas and are charged with the tasks of protection and law enforcement within forest areas through the prevention, detection, investigation and prosecution of all forest and wildlife offences. Other agencies such as the Public Works, Electricity, Irrigation, Rural Development, Tribal Welfare, and

Revenue Departments own significant amounts of land within the hotspot but are not mandated to work towards biodiversity conservation.

Among the Central government agencies, the MoEF, which allocated Rs 5945 crores (approx. $1.3 billion) for the tenth five-year plan (2002-2007) for spending nationwide, is the largest spender. In addition to receiving money from the government of India, the MoEF also receives grants from various external aid organizations.

The MoEF serves as a source of funds to numerous institutions as well as non-governmental organizations. It has sanctioned more than 100 projects in the last 10 years in the Western Ghats region. The Eastern and Western Ghats Program, functioning through the MoEF, has a total budget of about $1 million per year.

Other Central Government Departments
The Department of Science and Technology and the Department of Biotechnology spend approximately $100,000 and $60,000 per year respectively for conservation research in the Western Ghats.

State Forest Departments
The main activities of the State Forest Departments are management of the forests, conservation of wildlife, reforestation of degraded forests, afforestation of barren areas, social forestry, soil conservation by afforestation, protection of forest from pilferage, meeting demands of the local population for timber, firewood and NTFPs from Forest Department lands. Karnataka State Forest Department (KFD) is presented as a case study to demonstrate the scale and types of investments made by this sector. Approximately 38 percent of the Western Ghats falls within the state of Karnataka. This state also has the largest proportion (45 percent) of the total protected area in the hotspot. From 2004-2005, KFD's budget was Rs 19 crore (approx. $4.1 million).

KFD received a grant from the Department for International Development (DFID) U.K. for implementation of the **Western Ghats Forestry and Environmental Project**. A total expenditure of $45.77 million between 1992 and 2000 was incurred on the project, with expenditure from 1999 - 2003 totaling $6.5 billion. The project aimed to protect and develop ecologically sensitive and biodiversity-rich forests in the Western Ghats districts of Shimoga and Uttara Kannada. Development of degraded forests was to be achieved through natural regeneration coupled with gap planting, involving local people, through a process of joint planning and management. Research training and establishment of GIS, MIS Systems were also important activities of the project.

The **India Ecodevelopment Project** was implemented across seven protected areas nationwide with assistance from the International Development Agency and GEF, from 1996 - 2004. Two of these protected areas, Rajiv Gandhi National Park in Karnataka and Periyar Tiger Reserve in Kerala, are within the Western Ghats. The main objective of this project was to improve the capacity of Protected Area management to conserve biodiversity. The total project expenditure within the Western Ghats areas throughout the course of the project was $6.63 million.

With a view to ensure focus on conservation of flagship species, the MoEF launched special conservation projects such as **Project Tiger** and **Project Elephant**. The total expenditure for Project Tiger in Karnataka, 1997 – 2002, was $2.27 million. The total expenditure for Project Elephant in Karnataka from 1991 to 2006 is Rs 1295.21 lakh (approx. $2.8 million).

With a view to generate greater participation of people in forest regeneration and sustainable use, the MoEF launched a national program in the 1990s called **Joint Forest Management** (JFM). The focus of this program is to involve village communities and voluntary agencies in regeneration of degraded forests (other than reserved forests and protected areas).

While the mandate of the state forest departments and the scope of their activities are vast, there are some severe limitations to their ability to implement projects on the ground as they were originally envisioned. One problem is that the conservation management objectives of the Forest Department are not clearly formulated and ongoing efforts are rarely monitored. They also suffer from a shortage of field staff: 40-70 percent of posts remain unfilled and existing staff have low morale/motivation as they are poorly equipped in terms of available infrastructure and technical capacity to effectively fulfill their responsibilities. In certain areas, the Forest Department is viewed as being excessively occupied with large ecodevelopment and afforestation schemes (which heavily favor monoculture plantations of exotics), thus neglecting primary park management responsibilities relating to protection. Additionally, a lack of transparency and accountability, in combination with insufficient financial resources, creates a significant constraint to effective implementation of conservation**.** The active involvement of civil society could greatly improve the forest departments' ability to monitor and protect biodiversity. However, NGO involvement in field monitoring that leads to information in the public domain on the status of protection and management is largely discouraged. The focus of fresh investment in the biodiversity sector should be on supporting civil society initiatives in biodiversity conservation and monitoring.

Bilateral and Multilateral Agencies

Major banks and donors involved in environmental activities in India have included The World Bank Group, GEF, Asian Development Bank, Australian Agency for International Development, Japanese Bank of International Corporation (JBIC), UNDP, Canadian International Development Agency, The Royal Netherlands Embassy, Norwegian Agency for Development Corporation, Swedish International Development Agency, Danish International Development Agency, DFID, U.S. Agency for International Development,, U.S. Fish and Wildlife Service, and Swiss Agency for Development Corporation. The funds from these agencies come in various forms of assistance, including loans, soft loans, credits, and grants.

The nature of external assistance provided by external donor agencies has been constantly changing to accommodate changing priorities and concerns. For example, in recent years, more emphasis has been laid on strengthening institutional set up, governance and

participatory processes rather than on infrastructure projects in industries, dams, irrigation and urban development- as was the case in the 1980s.

The World Bank will implement the Biodiversity Conservation and Rural Livelihoods Project, which was approved in August 2006 with a GEF contribution of $11.8 million and a total project budget of $51 million. The project aims to enhance conservation of globally significant biodiversity and ensure its long-term sustainability by promoting participatory conservation mechanisms in biodiversity-rich landscapes. It builds on past participatory conservation successes, including the concluded GEF/IDA Ecodevelopment project by expanding conservation efforts to the landscape level, and integrating rural livelihoods with strengthened protected area management and more biodiversity-friendly development in the surrounding production landscapes. The project includes an explicit component for promoting learning networks, distilling and disseminating lessons learned, and encouraging replication of successful participatory conservation management to other protected areas and biodiversity-rich landscapes elsewhere in India. The project focuses on eight landscape sites in India, and two of these occur in the Western Ghats, overlapping with the Periyar-Agasthyamalai Corridor (7,700 square kilometers) that is proposed as a priority for CEPF investment. This project provides an excellent opportunity for collaboration and complementarity of effort in this small but extremely important corridor.

In the Western Ghats, in addition to its role in the India Ecodevelopment Project, the World Bank invested about $45 million on the Kerala Forestry Project implemented through the IDA, a soft loan affiliate of the Bank, which ran from 1998 to 2003.

The MoEF was given an amount of $986,200 for the preparation of a National Biodiversity Strategy and Action Plan (NBSAP) from the GEF in 1997/98. The NBSAP was aimed at promoting the conservation and sustainable use of biodiversity and was to be developed through a broad-based participatory planning process. Biodiversity Strategy Action plans have been compiled for each state as well as the Western Ghats region.

Projects are regularly funded through the GEF-Small Grants Program, which is implemented by UNDP. Funds totaling $99,281.20 were awarded to a range of biodiversity projects working in the Western Ghats from 1999 – 2006, with an additional $25,842 committed to a project running from 2005 to 2008.

The indicative allocation for biodiversity projects in India as part of the recently authorized fourth phase of GEF is $29.6 million over the next four years. This amount, calculated under the new Resource Allocation Framework for GEF spending, is not guaranteed, but it is a good indication of what is likely to be committed to the Indian government. The actual amount would be applied to priority regions throughout Indian territory, but the Western Ghats is bound to receive a significant fraction. The potential for these funds supporting the conservation work of civil society organizations, however, is likely to be small.

Japan is one of the largest donors to India. JBIC is the official assistance provider, but other development agencies provide a significant part of the aid to the environment sector. In May 2005, JBIC approved two new projects in the Western Ghats. An afforestation project in Tamil Nadu, originally funded from 1996 to 2001 at $107 million, was funded for a second phase, along with the Karnataka Sustainable Forest Management and Biodiversity Conservation Project. The total for these new projects, both scheduled through 2012, is 25,027 million JPY (approx. $213 million).

Research Institutions

Research institutions in India play a major role in biodiversity conservation in the country. The interests and thrust areas of the various institutions cover a wide range of issues related to biodiversity conservation, from the surveys of flora and fauna to protection and management and participatory resource management.

Several institutions active in the Western Ghats are supported by the MoEF. A partial list includes the Tropical Botanic Garden And Research Institute, Palode, Kerala; WII, Dehradun; ICFRE, Deharadun; BSI, Calcutta; ZSI, Calcutta; FSI, Deharadun; Center for Ecological Sciences, Indian Institute of Science, Bangalore; KFRI, Peechi, Kerala; SACON, Coimbatore; and BNHS, Mumbai. These institutions are primarily involved in conservation research, training, and documentation activities. Each of these organizations spends approximately $300,000 per year on research and training.

Major universities active in conservation research include UAS, Bangalore; Madurai University, Mangalore University, Mysore University, Mysore and Pune University, Pune; Pondicherry University, Pondicherry; and Calicut University, Calicut.

NGOs

International NGOs

There are relatively few international NGOs supporting conservation work in the Western Ghats. These include the Ford Foundation, WCS, BirdLife International, and The National Fish and Wildlife Foundation. Among these, the Ford Foundation has been one of the largest international donors, though it does not have a specific program targeted to biodiversity conservation.

National and Regional NGOs

Civil society in India plays an important role in the agenda on biodiversity conservation in the country. There are a number of NGOs in the country involved in conservation activities in the Western Ghats region. Many have their own research projects, but most are involved in conservation strategies with respect to the local communities. One of the main areas of civil society involvement is to work with local communities in an attempt to further sustainable utilization of natural resources.

The major NGOs active in the Western Ghats biodiversity hotspot include the Ecological Society, Research and Action in Natural Wealth Administration, Kalpavriksh, Goa Foundation, Botanical Society of Goa, Palni Hills Conservation Council, Asian Nature

Conservation Foundation, Keystone Foundation, Foundation for Ecological Research, Advocacy And Learning, Center for Wildlife Studies, Nature Conservation Foundation, ATREE, Foundation for Revitalization of Local Health Traditions (FRLHT), IBCN, Wildcat-C, Wildlife First, Wildlife Trust of India, and Zoo Outreach Organization.

These NGOs are involved in projects ranging from advocacy and education to community-based participatory management and applied research. Total investments made by these NGOs in the Western Ghats range from $3.5 to 4.5 million. Of these, ATREE and FRLHT are the largest contributors, having spent more than $1 million each over the last five years. Approximately 54 percent of the total investments made by NGOs have supported community-based natural resource management programs, 23 percent for research, 13 percent for protection and management of biodiversity and about 10 percent for raising education and awareness levels.

Indian Foundations

Only a few Indian foundations have made meaningful investments in the Western Ghats region. One of these, the Sir Dorabji Tata Trust, Mumbai, invested Rs 47.6 million (approx. $1.03 million) in biodiversity conservation activities in the Western Ghats from 2005-2006. Other Indian foundations that have invested in the region include the Ratan Tata Trust, Mumbai, and the Sehgal Family Foundation, New Delhi.

The analysis of conservation investments in India reveals several trends. First, overall investments in biodiversity conservation have been relatively small. Second, although conservation investments by governmental agencies, the state forest departments, and the MoEF are large when compared to research institutions and NGOs, much of government investment has been on infrastructure. Third, investments made by NGOs and research institutes play an important role in filling investment gaps in biodiversity conservation research and action. Fourth, there is very little evaluation or monitoring of the effectiveness of these investments both in the government and nongovernmental sectors. Finally, many important issues such as the status, distribution, and monitoring of biodiversity, fragmentation of habitats, drivers of biodiversity change, and societal and scientific responses to these changes are not being adequately addressed.

CEPF NICHE FOR INVESTMENT

The CEPF niche for investment is based on analyses of conservation outcomes, threats to biodiversity, current conservation investments in the region, and stakeholder consultations. Throughout the hotspot, unique habitats rich in biodiversity in both protected and unprotected areas intersect with a highly fragmented, human-dominated landscape. Conservation activities within protected areas need to be strengthened and the substantial biodiversity in the adjoining unprotected areas must be conserved. Because these areas face a complex array of threats, biodiversity conservation within this landscape can only be effective with the active involvement of civil society in protecting and restoring biodiversity in public as well as private lands. The timing of such efforts is critical, as demographic and economic pressures on the landscape continue to mount.

CEPF's niche in the Western Ghats will be to provide incremental support to existing protected area efforts and generate momentum for biodiversity conservation around protected areas to enhance habitat connectivity and enable greater civil society participation in conservation efforts.

To refine the CEPF niche, CEPF investment will focus on 80 key biodiversity areas predominately located within the five corridors identified (the Anamalai, Malnad-Kodagu, Mysore-Nilgiri, Periyar-Agasthyamalai, and Sahyadri-Konkan corridors). CEPF will provide incremental support to the 37 (46 percent) sites within the existing protected area network. The remaining 54 percent of the sites consist of reserved forests and private lands such as plantation estates. These areas are significant for biodiversity conservation in the Western Ghats as: i) some globally threatened species are found only in these lands, ii) significant populations of Endangered species occur in these lands, and iii) several landscape species such as tigers use these areas for feeding or transit.

Priority corridors are indicated for some of the investment priorities based on ecological and socioeconomic processes within the corridors that were deemed likely to influence the success or failure of conservation activities. This prioritization was based on expert knowledge and threat assessments conducted during the ecosystem profiling process.

CEPF PROGRAM FOCUS AND INVESTMENT STRATEGY

Priority Outcomes for CEPF Investment

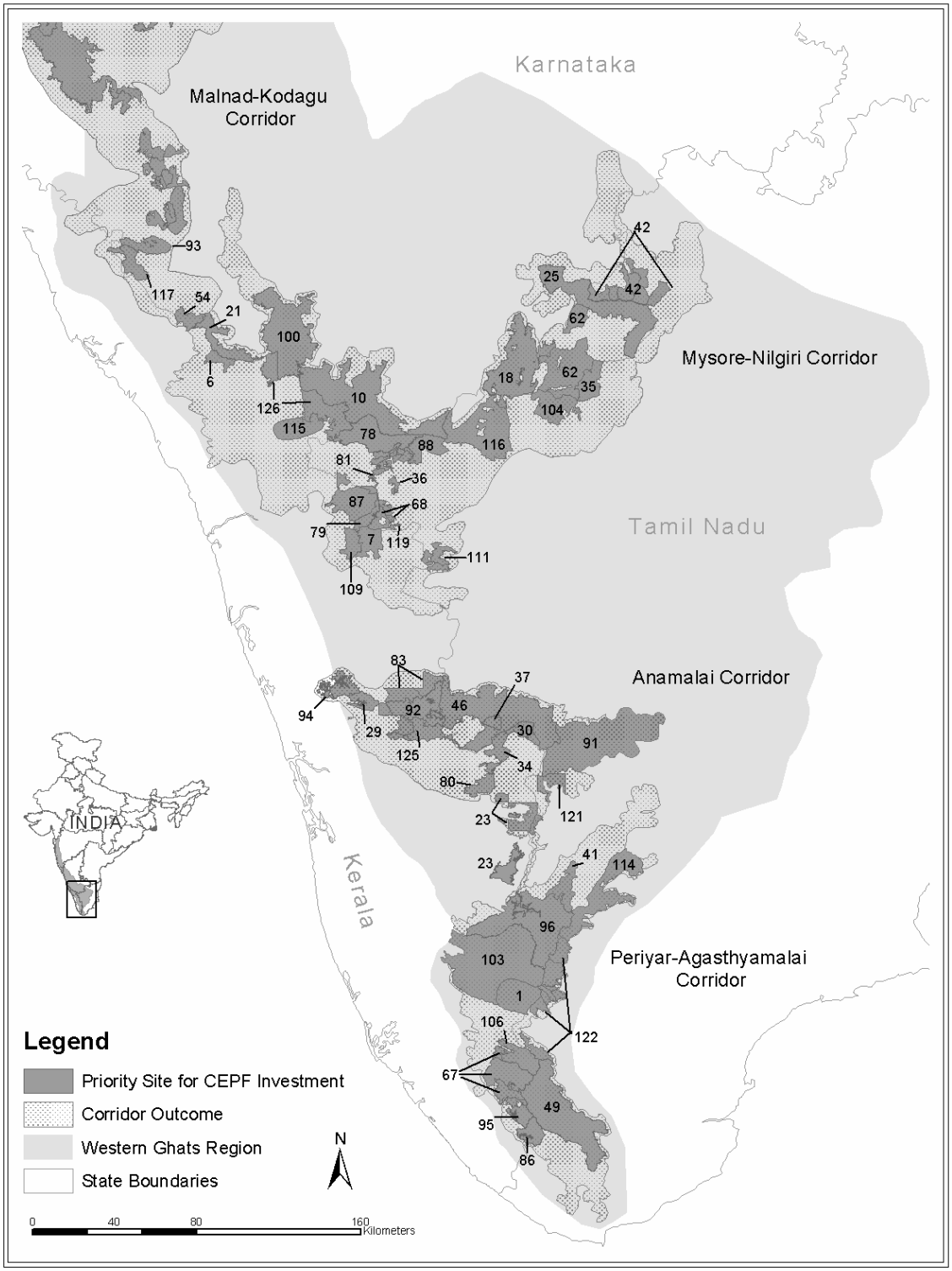
To focus CEPF investment in the Western Ghats, a prioritization of the 126 site outcomes was undertaken. Sites that are wholly irreplaceable because one or more species they contain are found nowhere else will be among the priorities for CEPF investment at the site level. In an attempt to objectively prioritize the remaining sites, a grid-based analysis of conservation value was undertaken (see Appendix 4 for details). A cumulative conservation value index was calculated for each grid. Criteria that were considered in the conservation value index included the number of globally threatened species, presence of regionally rare vegetation types and unique ecosystems such as *Myristica* swamps and the availability of relatively unfragmented forest and other natural habitats.

The area within the hotspot boundary that can be considered to have natural vegetation and biodiversity attributes and for which spatial data and remotely sensed data were available was defined as the area of analysis for this exercise (Appendix 5). The unique habitats were identified on the basis of the index of evergreenness. The wettest and most evergreen sites which are closely associated with presence of closed canopy evergreen forest or unique evergreen communities such as the *Myristica* swamps were identified in each subregion. The rarest vegetation type in each subregion was identified using a current vegetation map. The quality of the forest cover was based on an "edginess" factor derived from analyses of remotely sensed data and the top 25 percent on this index was considered high quality. Numbers of globally threatened mammal, bird and amphibian species were considered, because data in the other taxonomic groups was considered not comprehensive enough to permit a region-wide analysis.

The results of the conservation value index calculation revealed that substantial biodiversity at the species and site levels occur outside protected areas. We identified the grids falling in the upper quartile or the top 25 percent of the conservation value index as being high priority. These were overlaid on our site outcome boundaries to identify the 80 sites for CEPF funding (Figures 10 and 11). The results of the prioritization indicate that 80 percent of the high conservation value areas lie in and around (or adjacent to) existing protected areas, with the high conservation value of some of these neighboring unprotected areas resulting from factors such as intact forest cover or the presence – in relatively high densities – of unique and threatened vegetation types. Furthermore, 3,600 square kilometers of high-priority area was not contained within the existing protected area network. Priority sites are represented in each of the five corridors, with the Sahyadri-Konkan corridor having nine priority sites.

Another significant finding of the landscape-level analysis was the highly fragmented nature of high-priority areas. Only 24.8 percent of the total area of moist evergreen forests (15,057 square kilometers) of the Western Ghats was found to be relatively unfragmented and with low degree of edge. Seventy-four percent of these forests lie outside the protected area system.

Figure 10. Priority Site Outcomes for CEPF Investment in the Southern Western Ghats



Source: Reserve Forest boundaries from French Institute Forest Maps of South India: (Ramesh et al. 1997b, Franceschi et al. 2002, Pascal et al. 1992, Pascal et al. 1982a). Forest Division boundaries from the GIS database of the Asian Elephant Research and Conservation Centre, Bangalore (www.asiannature.org/home.html). Protected Area boundaries from Indian Institute of Public

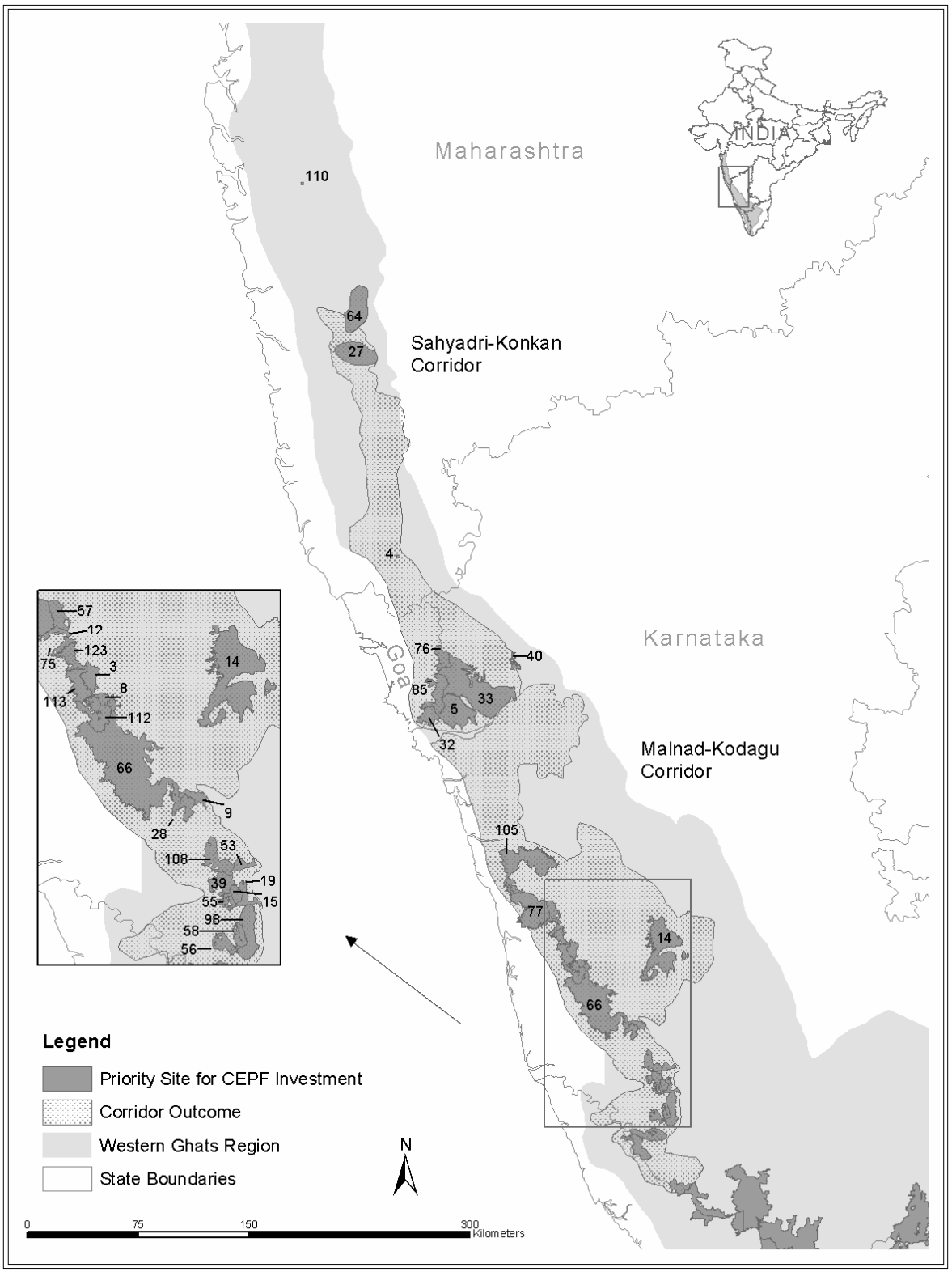
Administration, New Delhi (www.iipaindia.org). Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

Extended Legend for Figure 10: Priority Sites in the Southern Western Ghats

6. Aarlam WLS	81. Naduvattam RF in Niligiri South FD
7. Attapadi RF (western section)	83. Nemmara FD - i. Kundali RF area falling within SOI Topo sheet quad numbers: 58 B/14/SW, 58 B/15/NW & 58 B/11/NE ii. Nelliampathi RF area falling within SOI Topo sheet quad numbers: 58 B/11/NE & 58 B/11/NW
10. Bandipur NP/TR	86. Neyyar WLS
18. BRT WLS	87. Nilambur FD - i. Forests north of Palunda ii. New Amarambalam RF
21. Brahmagiri WLS	88. Nilgiri North FD - i. Bokkapuram RF ii. Gundar Valley RF iii. Kalhatti Slopes RF iv. Masinigudi v. Naduvattam RF vi. Naduvattam Extn. vii. Northern Hay RF viii. Singara RF ix. Sigur RF area falling within SOI Topo sheet quad number: 58 A/10/SE
23. Cardamom Hills RF*- area falling within Survey of India (SOI) Topo sheet quad numbers: 58 G/2/NW, 58 G/1/NE & 58 F/4/SW	91. Palni Hills
25. Cauvery WLS	92. Parambikulam WLS
29. Chimmony WLS	93. Pattighat RF
30. Chinnar WLS	94. Peechi -Vazhani WLS
34. Eravikulam NP	95. Peppara WLS
35. Erode FD - i. North Bargur RF area falling within SOI Topo sheet quad number: 58 E/5/SE	96. Periyar TR
36. Governor's Shola	100. Rajiv Gandhi NP
37. Grass Hills NP	103. Ranni FD*
41. High Wavies	104. Satyamangalam FD - i. Guttiyalattur RF area falling within SOI Topo sheet quad number: 58 E/5/SW
42. Hosur FD - i. Biligundlu RF ii. Bilikal RF iii. Kestur RF iv. Mallahalli RF v. Natrapalaiyam RF vi. Taggatti RF vii. Ubbarani RF viii. Ulibanda RF ix. Urigam RF area falling within SOI Topo sheet quad number: 57 H/11/SE	106. Shendurney WLS
46. Indira Gandhi WLS	109. Silent Valley NP
49. Kalakkad- Mundunthurai TR	111. Siruvani Foothills - i. Anaikatti South RF ii. Anaikatti South Extn. iii. Bolampatti III RF

	iv. Tadagam RF area falling within SOI Topo sheet quad number: 58 A/16/SW.
54. Kerti RF	114. Srivilliputtur WLS
62. Kollegal FD - i. Edayarahalli RF ii. Hanur RF area falling within SOI Topo sheet quad number: 58 E/5/NW iii. Kaudalli RF forested area falling within SOI Topo sheet quad number: 57 H/8/NE	116. Talaimalai RF forested area falling within SOI Topo sheet quad number: 58 E/2/NW
67. Kulathapuzha-Palode RFs	117. Talakaveri WLS
68. Kundah RF- Avalanche	121. Theni FD - i. Teveram RF area falling within SOI Topo sheet quad number: 58 G/1/NE ii. Theni Forest Range area falling within SOI Topo sheet quad number: 58 F/8/SW
78. Mudumalai WLS	122. Tirunelveli FD - i. Chokkampatti RF ii. Kadaiyanallur RF iii. Krishnapuram RF iv. Kuttalam RF & Extn. v. Sivagiri RF vi. T.N. Pudukudi RF vii. Vairavankulam RF viii. Vasudevanallur RF
79. Mukurthi NP	125. Vazhachal FD - i. Adirapalli RF ii. Kodasseri RF area falling within SOI Topo sheet quad number: 58 B/11/NW
80. Munnar area	126. Wayanad WLS

Figure 11. Priority Site Outcomes for CEPF Investment in the Northern Western Ghats



Extended Legend for Figure 11: Priority Sites in the Northern Western Ghats

3. Agumbe RF	56. Kilarmale RF
4. Amboli	57. Killandur RF
5. Anshi NP	58. Kiribag RF
8. Balahalli RF	64. Koyna WLS
9. Balur RF	66. Kudremukh NP
12. Baregundi RF	75. Metkalgudde RF
14. Bhadra WLS	76. Molem NP
15. Bhagimalai RF	77. Mookambika WLS
19. Bisale RF	85. Netravalli WLS
27. Chandoli WLS	98. Pushpagiri WLS
28. Charmadi RF	105. Sharavathi WLS
32. Cotigao WLS	108. Shiradi Shisale RF
33. Dandeli WLS	112. Someshawara RF
39. Forests of Gundia-KN	113. Someshwara WLS
40. Haliyal RF	110. Sinhgarh
53. Kemphole RF	123. Tombattu RF

Identification of priority corridors for some of the investment priorities was based on a consultative process with partners using all available information including spatial data on forest cover type distribution, topography, protected area and reserve forest boundaries, movement of wide-ranging species, and levels of fragmentation and contiguity, as well as site-based conservation value. In terms of threat information, the expertise available within the team as well as the map generated from the threat analysis was used as inputs to the selection of certain corridors for specified investment priorities. Some of these investment priorities originally emerged from the knowledge on the ecological and socioeconomic processes within these corridors that are likely to influence the success or failure of the suggested activities.

CEPF investment is designed to meet specific conservation targets resulting from analyses of conservation outcomes, assessment of threats and the analysis of current investments. These analyses indicate that: a) new partnerships must be created and new models of co-management developed to conserve and manage biodiversity within and outside protected areas and to enhance connectivity among highly fragmented habitats of the Western Ghats, b) civil society organizations independently and in partnership with government organizations must play an important role in conservation and building awareness about the importance of biodiversity and c) current scientific knowledge about the status and distribution of species and biodiversity-rich areas is inadequate for systematic conservation planning and protection of globally threatened species and their habitats. By emphasizing these three focal areas, CEPF can accelerate efforts that will curtail loss of biodiversity. This expanded three-dimensional niche then provides strategic directions, which in turn determine funding priorities (Table 5).

Table 5: CEPF Strategic Directions and Investment Priorities

CEPF STRATEGIC DIRECTIONS	CEPF INVESTMENT PRIORITIES
1. Enable action by diverse communities and partnerships to ensure conservation of key biodiversity areas and enhance connectivity in the corridors	1.1. Test pilot models of community and private reserves to achieve conservation outcomes at priority sites and critical links in unprotected areas of the Anamalai and Malnad-Kodagu corridors as well as the Brahmagiri-Nagarhole critical link in the Mysore-Nilgiri corridor 1.2. Promote partnerships to identify, evaluate, and advocate for suitable mechanisms that incorporate critical links (biological corridors) into the protected area network in the Periyar-Agastyamalai, Mysore-Nilgiri, and Malnad-Kodagu corridors 1.3. Support civil society to establish partnerships with state agencies to implement science-based management and conservation of priority sites in the Mysore-Hilgiri corridor
2. Improve the conservation of globally threatened species through systematic conservation planning and action	2.1 Monitor and assess the conservation status of globally threatened species with an emphasis on lesser-known organisms such as reptiles and fish 2.2 Support efforts to conserve Critically Endangered and Endangered species through the creation and implementation of species recovery and management plans 2.3 Evaluate the existing protected area network for adequate globally threatened species representation and assess effectiveness of protected area types in biodiversity conservation 2.4 Support interdisciplinary efforts to analyze and disseminate biodiversity data
3. Provide strategic leadership and effective coordination of CEPF investment through a regional implementation team	3.1 Build a broad constituency of civil society groups working across institutional and political boundaries toward achieving the shared conservation goals described in the ecosystem profile

Strategic Direction 1: Enable action by diverse communities and partnerships to ensure conservation of key biodiversity areas and enhance connectivity in the corridors

The Western Ghats region forms a part of one of the most densely populated global hotspots. Much of the biodiversity on the subcontinent is on public lands that abut and even contain human settlements. Rural communities in these settlements impact biodiversity through consumptive and commercial use. Conserving biodiversity on public lands in the Western Ghats without active participation of local communities in protecting and managing biodiversity would be a difficult task. Effective institutions are key to the success of community-based initiatives. Fortunately the institutional framework exists for implementation of improvised or new models of conservation that involve local communities. There are three policy instruments that can be used to enhance conservation and restoration. First is the Joint Forest Management program that offers fiscal incentives to local communities to protect and manage regenerating forests. The inadequacy of Joint Forest Management programs largely stems from ineffective and undemocratic institutions that implement these programs. A second policy instrument that allows the transfer of power to manage natural resources to democratically elected village level institutions under the Panchayati Raj offers another option. Finally, there are new provisions contained within the Wildlife Amendment Act to create conservation and community reserves that for the first time provide legal recognition for the participation of communities and private landowners in conservation.

A number of other agencies in India, such as UNDP, the Ford Foundation, and Sir Dorabji Tata Trust are interested in developing and promoting community-based conservation models. The CEPF investments in this particular area, if coordinated with investments from these agencies, could be minimal but highly productive in terms of effectiveness. However, it is critically important that CEPF-supported activities be focused on high priority sites within corridor outcomes identified in the profile and involve comprehensive monitoring and adaptive management systems.

The engagement of civil society may also be critical in enhancing the connectivity of highly fragmented forests of the Western Ghats. Increased fragmentation poses several threats to biodiversity (Laurance et al. 2002). Connectivity among fragmented habitats can increase the ecological integrity of natural ecosystems. Corridors among fragments, or buffers of suitable habitat around biodiversity-rich areas, could potentially reduce human-wildlife conflicts that are common in this densely populated hotspot. Many protected areas are still surrounded by natural and near-natural habitats. There is thus considerable potential to enlarge existing protected areas and to restore connectivity among isolated ecological communities. Because the potential corridors are largely human dominated landscapes and in some cases privately owned, active participation of local communities and private landowners will be essential for the success of efforts designed to promote connectivity. Under CEPF, such efforts should be undertaken within the areas defined as critical links (as in Figures 6 and 7) in the Western Ghats.

Finally, new partnerships are needed to conserve and monitor biodiversity in protected areas. The management of protected areas can greatly benefit from modern concepts of

conservation science that are not fully taken into account in the development of management plans. Monitoring of biodiversity in managed areas is almost non-existent. Several civil society organizations, including research institutes, have considerable expertise in concepts of conservation biology and natural resource management. Inputs provided by these organizations to the work of government agencies can greatly enhance the prospect for conservation.

1.1 Test pilot models of community and private reserves to achieve conservation outcomes at priority sites and critical links in unprotected areas of the Anamalai and Malnad-Kodagu corridors as well as the Brahmagiri-Nagarhole critical link in the Mysore-Nilgiri corridors

Many biodiversity-rich areas both inside and outside protected areas are located next to reserved forests, exotic tree plantations, private estates of coffee, tea and cardamom, or degraded habitats including abandoned mines. Some reserved forests are highly degraded and others are subject to continuous extraction of forest products and biomass. Plans to manage and restore such ecosystems for maintenance of biodiversity are generally lacking or deficient. Because these ecosystems contain substantial human populations, conservation and restoration of these ecosystems would require partnerships among government agencies and civil society, including the private sector and community-based organizations. As mentioned above, policy instruments to create such partnerships exist though lessons learned from analyses of the effectiveness of Joint Forest Management need to be adapted while developing new and more effective models.

The relatively large extent of land under coffee and tea plantations in the Malnad-Kodagu and Mysore-Nilgiri corridor areas, make them good candidates for the focus of this investment priority. Several of these plantations have remnant forest patches with considerable biodiversity value (Ajith Kumar Pers. Comm). There is also a long history of interest and involvement on the part of estate owners and companies in wildlife conservation in these areas. There is also an opportunity to link activities such as ecotourism and marketing of biodiversity/eco-friendly products originating from these regions.

Examples of the priority sites for involvement of local communities and private landowners include high conservation value reserved forest areas or private lands under plantation crops such as tea, coffee and cardamom in the Palni Hills in the Anamalai corridor. The Palni hills have several IBAs that are located outside the protected area network. In addition, there are many riparian and river stretches on private and public lands that are critical for effective conservation of aquatic fauna such as fish and amphibians. Priority sites for restoration include abandoned mine areas in Kudremukh National Park and the Bababudans as well as large areas under exotic tree plantations.

Many protected areas also have unprotected enclosures that contain human settlements. People in these settlements have a range of interactions with wild biodiversity in surrounding ecosystems. The fate of biodiversity and habitat connectivity in the Western Ghats will ultimately depend on reducing dependence on near-natural forests by increasing alternative sources of biomass on non-forest land/highly degraded lands or

enabling people to develop alternate livelihoods that are not dependent upon the overharvesting of local biodiversity. New models or strengthening of existing models of participatory management must take into account lessons learnt from past experiences that have addressed incentives, social and gender equity and participatory approaches. Evaluation, monitoring and adaptive management should be an integral and critical component of such models.

Priority sites include protected areas with enclosures and resident human populations such as the Biligirirangaswamy Temple Wildlife Sanctuary, Indira Gandhi Wildlife Sanctuary, and Wayanad Wildlife Sanctuary.

1.2 Promote partnerships to identify, evaluate and advocate for suitable mechanisms that incorporate critical links (biological corridors) into the protected area network in the Periyar-Agastyamalai, Mysore-Nilgiri, and Malnad-Kodagu corridors
Delineation of the existing protected areas in the Western Ghats has been conducted on an ad-hoc basis and not based on systematic conservation planning. Systematic conservation planning takes into account the representative, complementary and irreplaceable nature of habitats (Margules and Pressey, 2000). Analysis conducted for this profile indicates that many areas with significantly high levels of biodiversity lie outside the protected areas.

Although Figures 5 and 6 highlight the potential of enlarging the protected area network through acquisition or incorporation of additional land into the protected areas, detailed information about land use, including ownership, in the areas targeted as corridors is lacking. Moreover, other constraints, administrative as well as legal, to the expansion of the protected areas need to be reviewed. Fortunately, the amendment to the WPA of 1972 provides a policy framework for acquisition of some lands as corridors. WPA, 2002 calls for the creation of two new types of reserves: Conservation Reserves and Community Reserves. Conservation reserves are areas owned by the state governments adjacent to national parks and sanctuaries for the purpose of protecting the landscape. Further, it is also proposed to empower the state governments to notify any community-owned or private land as community reserves provided that the members of that community or individuals concerned are agreeable to offer such areas for protecting the fauna and flora, as well as their traditions, cultures, and practices.

Acquisition of private land for corridors will take several years. Moreover, not all habitats that can potentially enhance connectivity can be acquired. Thus immediate steps should be taken to maintain or enhance biodiversity in areas identified as corridors. In some areas in the Western Ghats, global and local market conditions have made some private estates of tea and coffee financially unviable. This process is already creating pockets of abandoned land around biodiversity-rich areas. It is essential to discourage or inhibit incompatible land-uses or conversion of these estates.

Areas that warrant immediate attention in terms of setting up mechanisms for their incorporation into the protected area network are the Kulathapuzha and Palode forest ranges, parts of the Ranni, Konni and Achankovil forest divisions, and Meghamalai in the

Periyar-Agasthyamalai corridor; New Amarambalam forest range in the Mysore-Nilgiri corridor; and Kerti, Padinalknad, Pattighat, Agumbe, Someshwara and Balahalli forest ranges in the Malnad-Kodagu corridor. Some of these areas contain highly threatened and unique communities and habitats such as the *Myristica* swamp forests.

Maintaining and enhancing connectivity through the establishment of reserves is important in all landscape units, especially in the Periyar-Agasthyamalai landscape, across the Shencottah Gap (Periyar-Agasthyamalai corridor) as well as from Periyar to Palni Hills (between the Periyar-Agasthyamalai corridor and the Anamalai corridor). In the Mysore-Nilgiri landscape, the corridor linking Mudumalai and Bandipur with BRT Wildlife Sanctuary-Cauvery Wildlife Sanctuary-Bannerghetta National Park is very important for the long-term viability of elephant populations. This landscape is also the most important area for the long-term conservation of dry forest plants and animals in the entire Western Ghats.

The Malnad-Kodagu landscape has several critical links. These include the reserve forests between Brahmagiri WLS, Pushpagiri, and Talacauvery WLS and in the central part there are critical links between Bhadra Tiger reserve, Bababudans, and Yemmododdi. In the northern part of this landscape there are a series of reserved forests along the ridge between Pushpagiri and Mookambika WLS. There is also a patch of relatively intact forest south of the Kali River, which is just across the river from the northernmost landscape corridor, the Sahyadri-Konkan.

1.3 Support civil society to establish partnerships with state agencies to implement science-based management and conservation of priority sites in the Mysore-Hilgiri corridor

The analysis of conservation outcomes indicates that there is a considerable amount of biodiversity outside protected areas, particularly in the Mysore-Nilgiri corridor. The protected areas in this corridor contain the largest viable population of the Asian elephant in the world, besides having the largest populations of other flagship species such as the tiger and the wild dog. The corridor also contains the largest extent of good deciduous forests in the Western Ghats and Sri Lanka Hotspot. This corridor has a relatively long history of high quality wildlife and NTFP research. However, there is an unfulfilled potential of applying this rich body of knowledge to the management of species and ecosystems in this region. The priority sites within this corridor also have a long tradition of involvement of local communities in participatory resource monitoring.

Many areas outside protected areas have almost as high a concentration of biodiversity as habitats inside protected areas; for instance, several IBAs have been identified outside the current protected area network in the Nilgiris. Efforts to incorporate such habitats into the protected area network should receive high priority. However, those areas that cannot be brought under protection in the foreseeable future should also be managed for enhancement or the maintenance of biodiversity. Such areas are currently subject to extensive use by civil society. Civil society organizations either independently or in partnership with government agencies should be encouraged to assume stewardship of these areas. For effective conservation of biodiversity within protected areas, civil society

organizations (conservation organizations, research institutions) must work in collaboration with government agencies. A key area for collaboration is in bolstering technical capacity of government organizations to enable scientific planning and management using both traditional and current biodiversity knowledge. The best scientific and research expertise available in civil society should contribute to the management plans of biodiversity rich areas. Civil society organizations can also enhance the technical capacity of government agencies to enforce conservation laws. Moreover, NGOs can assist government agencies in developing new models for co-management.

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

A key problem in the region is inadequate knowledge about the distribution and status of biodiversity to effectively conserve threatened species, habitats, and ecosystems. The deficiency of information is evident from discussions regarding the IUCN Red Lists. Experts consistently pointed out during the stakeholder workshops that certain species, which merit inclusion, are not included in the list. The absence of population-level data for critically endangered species is one of the primary reasons for the lack of reliability of the IUCN list for this list.

Inadequacy of knowledge, however, does not imply that conservation actions cannot be undertaken unless and until the necessary knowledge has been documented. For example, the presence of large areas with high concentration of biodiversity outside the protected area network indicates that conservation planning has not been based on the distribution of biological diversity. Knowledge of specific ecosystem processes or species biology is not required to make important conservation decisions in such cases; the more immediate need is to identify these critical gaps in the protected area network and include them within the network. Once protection for high-biodiversity zones are in place, the in-depth examination of species and habitats can follow. Furthermore, it is important to monitor the effectiveness of the existing protected area system. There has been no systematic assessment of protected areas to determine their effectiveness in conserving species, habitats and maintaining key ecosystem processes. Degraded protected areas need to be either restored or denotified depending on their status. Assessment of the status of protected areas will provide valuable insights for conservation planning.

2.1 Monitor and assess the conservation status of globally threatened species with an emphasis on lesser-known organisms such as reptiles and fish

The IUCN list of globally threatened species forms the basis of conservation outcomes outlined in this profile. Although this list provides a starting point and constitutes an important source of information, it needs to be updated by experts on the basis of primary data collected in the field. Updating the list, however, would require a coordinated effort that should involve experts in plants, herpetofauna, fish, and invertebrates. Coordination would ensure that standardized and quantitative criteria are used. This activity should be undertaken throughout the Western Ghats.

A primary reason for the inadequacy of the IUCN list is that the population status of many species on the list has not been determined. It is important to assess the status of

two Critically Endangered groups of organisms: 1) the medicinal plants that face heavy pressure from extraction and 2) the group of organisms that inhabit the forest canopy and soils. The latter includes epiphytes, amphibians, reptiles and invertebrates. A species-level or taxa-based approach may not be as efficient as a habitat-based approach by a group of botanists, herpetologists and entomologists. Freshwater fish is another group that requires urgent action. This activity should be undertaken in the Periyar-Agasthyamalai corridor, the Anamalai corridor, the Mysore-Nilgiri corridor, the Malnad-Kodagu corridor, and the Sahyadri-Konkan corridor, in that order of priority, both within and outside protected areas.

Population assessments for economically useful plants must include surveys of genetic diversity. This group again covers a number of medicinal plant species and several non-timber forest product species. There are at least 100 species of medicinal plants listed as Critically Endangered by the Foundation for the Revitalization of Local Health Traditions. The NTFP species form the core of local economies for many, generally impoverished communities. NTFP species in India have a long history of heavy extraction. The impact of this extraction on genetic diversity of populations remains largely unexplored. An assessment of the spatial distribution of genetic diversity of key species with different life history attributes is urgently required with a view to incorporate population-genetic data into conservation planning.

Funding for genetic surveys should focus on the following globally endangered and vulnerable species of trees and medicinal plants: *Ampelocissus araneosa, Artocarpus hirsutus, Calophyllum apetalum, Cinnamomum macrocarpum, Cinnamomum sulphuratum, Curcuma pseudomontana, Diospyros candolleana, Diospyros paniculata, Dysoxylum malabaricum Garcinia indica, Garcinia gummifera, Hydnocarpus pentandra, Kingiodendron pinnatum, Michelia nilagirica, Myristica malabarica, Ochreinauclea missionis, Pterocarpus santalinius, Swertia lawii* and *Vateria indica*.

2.2 Support efforts to conserve Critically Endangered and Endangered species through the creation and implementation of species recovery and management plans
There are 203 species in the Western Ghats that are listed as Critically Endangered or Endangered by IUCN. The populations of such species have declined considerably and there is a real possibility that many of these species will become extinct unless adequate conservation measures are taken. Such conservation measures would include the development of species recovery and management plans. The work supported under 3.1 would also produce a list of species that require immediate attention. CEPF investments could support further work on the recovery and management plans for these species as well.

2.3 Evaluate the existing protected area network for adequate globally threatened species representation and assess the effectiveness of types of protected areas in biodiversity conservation
Delineation of the existing protected areas in the Western Ghats has not been based on systematic conservation planning. Many of the protected areas have been so designated on an ad hoc basis. Systematic conservation planning takes into account the

representativeness, complementarity and irreplaceability of habitats. Analysis conducted for this profile indicates that many areas with significantly high levels of biodiversity lie outside the protected area network. The representativeness of the protected area network within the Western Ghats should therefore be quantitatively assessed. This would necessitate an analysis of the distribution of species and ecosystems throughout the Western Ghats. Gap analysis should be coupled with a feasibility study to examine the possibility of incorporating additional areas into the protected areas network. Analysis conducted for this profile has already identified certain landscapes that warrant immediate attention in terms of protection. These are: the Kulathapuzha-Palode Forest Ranges, parts of the Ranni, Konni and Achankovil Forest Divisions and proposed Meghamalai Wildlife Sanctuary in the Periyar-Agasthyamalai corridor; Palni Hills and part of Mankulam range in the Anamalai corridor; New Amarambalam RF in the Mysore-Nilgiri corridor; Kerti, Padinalknad, Pattighat, Agumbe, Someshwara and Balahalli RFs in the Malnad-Kodagu corridor; and Amboli forest in the Sahyadri-Konkan corridor. Some of these areas contain highly threatened and unique communities and habitats such as the Myristica swamp forests and Ochlandra reeds.

In addition to identifying gaps, a rational framework for assessing the success or failure of different categories of protected areas and conservation projects is also required. An assessment of the effectiveness of the two protected areas with the highest conservation values in each of the corridors is recommended. Determination of the causes of success or failure of these protected areas would provide government agencies with the information required to make appropriate changes in approaches and management. The protected areas with the highest conservation value in each of the corridors are as follows: Periyar-Agastyamalai- Kalakkad Mundanthurai Tiger Reserve and Peppara Wildlife Sanctuary; Anamalai- Chinnar Wildlife Sanctuary and Indira Gandhi National Park; Mysore-Nilgiri- Bandipur Tiger Reserve and Wayanad Wildlife Sanctuary; Malnad-Kodagu-Kudremukh National Park and Pushpagiri Wildlife Sanctuary; Sahyadri-Konkan-Anshi National Park, and Dandeli Wildlife Sanctuary.

2.4 Support interdisciplinary efforts to analyze and disseminate biodiversity data
A number of organizations, governmental as well as nongovernmental, are collecting and collating considerable information about the distribution of species, ecosystems, and landscapes in India. There is also a vast amount of information available about other aspects of biodiversity such as images of species and ecosystems, uses of plants, threats to biodiversity and institutions involved in biodiversity conservation. If such information were readily available, it could benefit efforts to conserve biodiversity and involve civil society in conservation. A recently held Indo-U.S. workshop on biodiversity informatics recommended the establishment of a national committee to procure a server and software to initiate a comprehensive program of collating and organizing biodiversity databases. With relatively little investment, such efforts could receive a boost and pay huge dividends.

The geographic focus of this activity should be extended to the entire Western Ghats, however CEPF should not support more than one such effort and funding should be

contingent upon such databases being made publicly available within one year of the implementation of this activity.

Strategic Direction 3: Provide strategic leadership and effective coordination of CEPF investment through a regional implementation team

An independent evaluation of the global CEPF program found that CEPF regional implementation teams are particularly effective with the support of the CEPF grant directors in linking the key elements of comprehensive, vertically integrated portfolios such as large anchor projects, smaller grassroots activities, policy initiatives, governmental collaboration, and sustainable financing. As recommended by the evaluators, the responsibilities of these teams, formerly known as coordination units, have now been standardized to capture the most important aspects of their function.

In every hotspot, CEPF will support a regional implementation team to convert the plans in the ecosystem profile into a cohesive portfolio of grants that exceed in impact the sum of their parts. Each regional implementation team will consist of one or more civil society organizations active in conservation in the region. For example, a team could be a partnership of civil society groups or could be a lead organization with a formal plan to engage others in overseeing implementation, such as through an inclusive advisory committee.

The regional implementation team will be selected by the CEPF Donor Council based on an approved terms of reference, competitive process, and selection criteria available in PDF format at www.cepf.net/xp/cepf/static/pdfs/Final.CEPF.RIT.TOR_Selection.pdf. The team will operate in a transparent and open manner, consistent with the CEPF mission and all provisions of the CEPF Operational Manual. Organizations that are members of the Regional Implementation Team will not be eligible to apply for other CEPF grants within the same hotspot. Applications from formal affiliates of those organizations that have an independent operating board of directors will be accepted, and subject to additional external review.

3.1 Build a broad constituency of civil society groups working across institutional and political boundaries toward achieving the shared conservation goals described in the ecosystem profile

The regional implementation team will provide strategic leadership and local knowledge to build a broad constituency of civil society groups working across institutional and geographic boundaries toward achieving the conservation goals described in the ecosystem profile. The team's major functions and specific activities will be based on an approved terms of reference. Major functions of the team will be to:

- Act as an extension service to assist civil society groups in designing, implementing, and replicating successful conservation activities.
- Review all grant applications and manage external reviews with technical experts and advisory committees.
- Award grants up to $20,000 and decide jointly with the CEPF Secretariat on all other applications.

- Lead the monitoring and evaluation of individual projects using standard tools, site visits, and meetings with grantees, and assist the CEPF Secretariat in portfolio-level monitoring and evaluation.
- Widely communicate CEPF objectives, opportunities to apply for grants, lessons learned, and results.
- Involve the existing regional program of the RIT, CEPF donor and implementing agency representatives, government officials, and other sectors within the hotspot in implementation.
- Ensure effective coordination with the CEPF Secretariat on all aspects of implementation.

Specific activities and further details are available in the CEPF Regional Implementation Team Terms of Reference and Selection Process.

Sustainability

Sustainability of any program requires long-term financial and institutional commitment. Conservation trusts are often viewed as mechanisms for financial sustainability. Although it will be desirable to establish a conservation trust fund in the long run, CEPF investments should be used to promote institutional and public commitment to sustainability. The foundation of sustainability in the CEPF context should be the adoption and dissemination of sound and effective plans by active civil society engagement. By empowering individuals and institutions to engage in best conservation practices, CEPF will help catalyze a new wave of effective conservation in the Western Ghats.

The Western Ghats region, because of its strong traditions and faith in democratic institutions and belief in free communication, offers the ideal setting for adoption and implementation of new ideas. In this particular case, there is already a general acceptance of the key concepts and Strategic Directions outlined in the profile by citizens as well as conservation organizations in the Western Ghats region. Furthermore, a number of institutions in the region are already involved in promoting the goals of this profile. These activities, if strengthened and expanded through CEPF investments, would go a long way to sustain the objectives of the profile.

Finally, the extraordinarily large and competent human resources of the region will enhance sustainability. A motivated, educated public and strong civil society organizations can provide staff for research and enforcement as well as policy directives needed to establish and maintain protection for species and habitats. If CEPF investment is to have long-term impact, such activities are particularly essential, given the large biodiversity-rich areas in currently unprotected lands. Although expansion of protected areas and establishment of corridors are important goals, in the long term it is unrealistic to expect all critical habitats to be placed under the umbrella of government-sponsored protected areas. Thus, it is imperative to develop new management models, bolster civil society capacity to mitigate threats and support government-led initiatives in conservation efforts within and beyond reserves.

CONCLUSIONS

A unique feature of the Western Ghats is the extraordinarily high level of biodiversity confined within a relatively small land area. This biodiversity coexists with an unusually high density of human population, a significant percentage of which has great reverence for nature. The presence of fledgling civil society organizations, strong human capital and deep reverence for nature in the region provide an unprecedented opportunity for CEPF to strengthen conservation efforts in the hotspot.

Analyses of conservation outcomes reveal the presence of 332 globally threatened species and thousands of endemic species. Populations of many of these species extend beyond protected areas that themselves contain high concentrations of biodiversity. Although these landscapes are highly fragmented, the potential for connectivity exists.

The rich biological diversity of the region is under considerable thereat. Expanding human populations, poor governance and a host of macro-economic development policies contribute to degradation. Proximate threats include extraction of forest products, poaching, mining, pollution, invasive species, inadequate enforcement of existing conservation laws, and absence of involvement of local communities in conservation efforts. Consequently, unless conservation efforts are strengthened, biodiversity of the region is likely to degrade further.

Current investments in conservation by government agencies suffer from heavy emphasis on infrastructure, inability to evaluate and monitor conservation effectiveness of investments and lack of support from civil society. Huge government investments have not been able to curtail losses of biodiversity. A new approach that facilitates partnerships between government and civil society organizations is required. The presence of a range of diverse and dynamic civil society organizations that include NGOs, universities and research institutions in the Western Ghats offers an unprecedented opportunity for CEPF to strengthen the recent entry of these organizations into the conservation.

The niche of CEPF in the Western Ghats should be to effectively conserve biodiversity-rich areas within and outside existing protected areas by mitigating threats to globally threatened species and their habitats by enhancing connectivity and strengthening civil society involvement in conservation efforts. CEPF investments should be directed toward efforts that would: a) create new partnerships to improve in-situ biodiversity conservation, primarily through enhancing connectivity of habitats and implementation of scientific management of sites; b) bolster the capacity and resolve of government and civil society organizations to conserve biodiversity; and c) generate and apply knowledge of the distribution and status of key biodiversity parameters to facilitate systematic conservation planning and conserve globally threatened species.

The strategic directions and investment priorities outlined in this profile seek to capitalize on the tremendous human resource base in the region that is the key to sustained efforts. Human capital in the Western Ghats is huge and extraordinarily well equipped, in terms of education and motivation, to undertake conservation enterprises. CEPF investments will strengthen the fledgling participation of civil society in biodiversity conservation and

provide resources to a range of organizations that seek to catalyze change and undertake innovative and effective approaches to conservation of the unique biotic endowment of the region.

WESTERN GHATS AND SRI LANKA (WESTERN GHATS) LOGICAL FRAMEWORK

Objective	Targets	Means of Verification	Important Assumptions
Conserve and manage globally important biodiversity by strengthening the involvement and effectiveness of NGOs and other sectors of civil society in biodiversity conservation in the Western Ghats and Sri Lanka Biodiversity Hotspot: Western Ghats Region.	NGOs and civil society actors, including the private sector, actively participate in conservation programs guided by the CEPF ecosystem profile for the Western Ghats Region. Alliances and networks among civil society groups formed to avoid duplication of effort and maximize impact in support of the CEPF ecosystem profile for the Western Ghats Region. Development plans or policies influenced to accommodate biodiversity. 80 key biodiversity areas have new or strengthened protection and management guided by a sustainable management plan.	Grantee and RIT performance reports Annual portfolio overview reports; mid-term and final portfolio assessments	The CEPF grants portfolio will effectively guide and coordinate conservation action in the Western Ghats.
Intermediate Outcomes	**Intermediate Indicators**	**Means of Verification**	**Important Assumptions**
Outcome 1: Action by diverse communities and partnerships enabled to ensure conservation of key biodiversity areas and to enhance	Percent of targeted protected areas with strengthened protection and management. Percent of projects outside protected areas that introduce and/or strengthen biodiversity in	Grantee and RIT performance reports and site visits Protected Areas Tracking Tool (SP1 METT) Productive Landscape Tracking Tool	Local community leaders, national government and NGOs are willing to cooperate and collaborate to achieve conservation. National governments and local

connectivity in the target corridors $2,300,000	management practices Percent of projects that enable stewardship of biodiversity and ecosystem services by Indigenous and local communities in focus areas. Number of hectares of key biodiversity areas with strengthened protection and management. Number of hectares in newly established or expanded protected areas. Partnerships (including with state agencies) established to implement progressive science-based management, conservation and monitoring of priority sites.	(SP2 METT) Formal legal declarations or community agreements designating new protected areas.	community leaders will understand and support participation in biodiversity conservation projects.
Outcome 2: Conserve globally threatened species and habitats through systematic conservation planning and action $1,800,000	Percent of targeted areas with strengthened protection and management. Number of hectares of key biodiversity areas with strengthened protection and management. Number of hectares in newly established or expanded protected areas.	Grantee and RIT performance reports and site visits Species survival action plans	National government and local community leaders understand and support participation in biodiversity conservation projects.

	The status and distribution of globally threatened plant species investigated and results applied to planning, management, awareness raising and/or outreach		
Outcome 3: A regional implementation team effectively coordinates the CEPF investment in the Western Ghats Region. $400,000	Number of groups receiving grants that achieve a satisfactory score on final performance scorecard RIT performance in fulfilling the approved terms of reference.	Grantee and RIT performance reports CEPF Secretariat site visits and monitoring.	Qualified organizations will apply to serve as the regional implementation team in line with the approved terms of reference and the ecosystem profile. The CEPF call for proposals will elicit appropriate proposals that advance the objectives of the ecosystem profile. Civil society organizations will collaborate with each other, government agencies, and private sector actors in a coordinated regional conservation program in line with the ecosystem profile.
Strategic Funding Summary	**Amount**		
Total Budget Amount	**$4,500,000**		

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APPENDICES

Appendix 1. Species Outcomes for the Western Ghats

No.	Scientific Name	Endemic Status*	Global Threat Status†		
			Critically Endangered	Endangered	Vulnerable
	MAMMALS	**14**	**3**	**7**	**21**
1	*Antelope cervicapra*				+
2	*Cremnomys elvira*				+
3	*Cuon alpinus*				+
4	*Elephas maximus*			+	
5	*Hemiechinus nudiventris*	WG			+
6	*Hemitragus hylocrius*	WG		+	
7	*Herpestes fuscus*				+
8	*Hipposideros hypophyllus*				+
9	*Latidens salimalii*	WG	+		
10	*Loris tardigradus*				+
11	*Lutra lutra*				+
12	*Lutrogale perspicillata*				+
13	*Macaca silenus*	WG		+	
14	*Martes gwatkinsii*	WG		+	
15	*Melursus ursinus*				+
16	*Millardia kondana*	WG		+	
17	*Mus famulus*	WG		+	
18	*Otomops wroughtoni*		+		
19	*Panthera tigris*			+	
20	*Paradoxurus jerdoni*	WG			+
21	*Petinomys fuscocapillus*	WGSL			+
22	*Prionailurus rubiginosus*				+
23	*Prionailurus viverrinus*				+
24	*Rattus ranjiniae*	WG			+
25	*Ratufa indica*	WG			+
26	*Ratufa macroura*	WGSL			+
27	*Suncus dayi*	WG			+
28	*Suncus montanus*	WGSL			+
29	*Tetracerus quadricornis*				+
30	*Trachypithecus johnii*	WG			+
31	*Viverra civettina*	WG	+		
	BIRDS	**3**	**2**	**1**	**12**
32	*Aquila clanga*				+

33	*Brachypteryx major*	WG			+
34	*Chaetornis striatus*				+
35	*Columba elphinstonii*	WG			+
36	*Falco naumanni*				+
37	*Ficedula subrubra*				+
38	*Gallinago nemoricola*				+
39	*Garrulax cachinnans*	WG		+	
40	*Gyps bengalensis*		+		
41	*Gyps indicus*		+		
42	*Leptoptilos javanicus*				+
43	*Parus nuchalis*				+
44	*Pycnonotus xantholaemus*				+
45	*Pelecanus philippensis*				+
46	*Schoenicola platyura*				+
	Amphibians	**52**	**11**	**28**	**13**
47	*Ansonia ornata*	WG		+	
48	*Ansonia rubigina*	WG			+
49	*Bufo beddomii*	WG		+	
50	*Bufo koynayensis*	WG		+	
51	*Bufo microtympanum*	WG			+
52	*Fejervarya brevipalmata*	WG			+
53	*Fejervarya murthii*	WG	+		
54	*Fejervarya nilagiricus*	WG		+	
55	*Indirana brachytarsus*	WG		+	
56	*Indirana diplosticta*	WG		+	
57	*Indirana gundia*	WG	+		
58	*Indirana leptodactyla*	WG			+
59	*Indirana phrynoderma*	WG	+		
60	*Melanobatrachus indicus*	WG		+	
61	*Micrixalus gadgili*	WG		+	
62	*Micrixalus kottigeharensis*	WG	+		
63	*Micrixalus nudis*	WG		+	
64	*Micrixalus phyllophilus*	WG			+
65	*Micrixalus saxicola*	WG			+
66	*Microhyla sholigari*	WG		+	
67	*Minervarya sahyadris*	WG		+	
68	*Nasikabatrachus sahyadrensis*	WG		+	
69	*Nyctibatrachus aliciae*	WG		+	
70	*Nyctibatrachus beddomii*	WG		+	
71	*Nyctibatrachus deccanensis*	WG			+
72	*Nyctibatrachus humayuni*	WG			+
73	*Nyctibatrachus hussaini*	WG		+	
74	*Nyctibatrachus minor*	WG		+	
75	*Nyctibatrachus sanctipalustris*	WG		+	

76	*Nyctibatrachus vasanthi*	WG		+	
77	*Pedostibes tuberculosus*	WG		+	
78	*Philautus* “Amboli forest”	WG	+		
79	*Philuatus* “Athirimala”	WG		+	
80	*Philautus bombayensis*	WG			+
81	*Philautus chalazodes*	WG	+		
82	*Philautus charius*	WG		+	
83	*Philautus* “Eravikulam NP”	WG			+
84	*Philautus glandulosus*	WG			+
85	*Philautus griet*	WG	+		
86	*Philautus* “Kalpatta”	WG		+	
87	*Philautus* “Munnar”	WG	+		
88	*Philautus* “Munnar_2”	WG	+		
89	*Philautus* “Ponmudi_3”	WG	+		
90	*Philautus signatus*	WG		+	
91	*Philautus* “Tholpetti forest”	WG			+
92	*Philautus tinniens*	WG		+	
93	*Philautus wynaadensis*	WG		+	
94	*Ramanella mormorata*	WG		+	
95	*Ramanella triangularis*	WG			+
96	*Rhacophorus calcadensis*	WG		+	
97	*Rhacophorus lateralis*	WG		+	
98	*Rhacophorus pseudomalabaricus*	WG	+		
	REPTILES	**1**	**0**	**1**	**3**
99	*Aspideretes leithii*				+
100	*Crocodylus palustris*				+
101	*Geoemyda silvatica*	WG		+	
102	*Indotestudo travancorica*				+
	FISH		**0**	**0**	**1**
103	*Horaglanis krishnai*	WG			+
	PLANTS	**169**	**39**	**111**	**79**
104	*Acacia campbellii*				+
105	*Acer oblongum*				+
106	*Acer oblongum*		+		
107	*Actinodaphne bourneae*	WG		+	
108	*Actinodaphne campanulata*	WG			+
109	*Actinodaphne lanata*	WG	+		
110	*Actinodaphne lawsonii*	WG			+
111	*Actinodaphne salicina*	WG		+	
112	*Adinandra griffithii*			+	
113	*Aglaia apiocarpa*	WGSL			+
114	*Aglaia bourdillonii*				+

115	*Aglaia malabarica*	WG	+		
116	*Aglaia perviridis*				+
117	*Anacolosa densiflora*	WG		+	
118	*Aporusa bourdillonii*	WG		+	
119	*Aquilaria malaccensis*				+
120	*Aralia malabarica*	WG			+
121	*Ardisia amplexicaulis*	WG		+	
122	*Ardisia blatteri*	WG		+	
123	*Ardisia sonchifolia*	WG		+	
124	*Arenga wightii*				+
125	*Atuna indica*	WG		+	
126	*Atuna travancorica*	WG		+	
127	*Bentinckia condapanna*	WG			+
128	*Bentinckia nicobarica*			+	
129	*Berberis nilghiriensis*	WG	+		
130	*Brysophyllum tetrandrum*	WG		+	
131	*Buchanania barberi*	WG	+		
132	*Buchanania lanceolata*	WG			+
133	*Canthium ficiforme*	WG		+	
134	*Canthium neilgherrense*	WG			+
135	*Canthium pergracilis*	WG		+	
136	*Capparis pachyphylla*			+	
137	*Casearia wynadensis*	WG			+
138	*Chionanthus linocieroides*	WG		+	
139	*Chionanthus leprocarpa*	WG		+	
140	*Chloroxylon swietenia*				+
141	*Cinnamomum riparium*	WG			+
142	*Cinnamomum chemungianum*	WG		+	
143	*Cinnamomum filipedicellatum*	WG		+	
144	*Cinnamomum perrottetii*	WG			+
145	*Cinnamomum walaiwarense*	WG	+		
146	*Cleistanthus malabaricus*	WG			+
147	*Cleistanthus travancorensis*	WG		+	
148	*Cleyera japonica*			+	
149	*Croton lawianus*	WG	+		
150	*Cryptocarya stocksii*	WG			+
151	*Cryptocarya beddomei*	WG			+
152	*Cryptocarya anamallayana*	WG		+	
153	*Cynometra travancorica*	WG		+	
154	*Cynometra bourdillonii*	WG		+	
155	*Dalbergia latifolia*				+
156	*Dialium travancoricum*	WG	+		
157	*Dimorphocalyx beddomei*	WG		+	
158	*Diospyros barberi*	WG			+
159	*Diospyros trichophylla*	WGSL			+

160	*Diospyros atrata*	WG			+
161	*Dipterocarpus alatus*			+	
162	*Dipterocarpus bourdillonii*	WG	+		
163	*Dipterocarpus indicus*	WG		+	
164	*Dipterocarpus turbinatus*		+		
165	*Dipterocarpus costatus*			+	
166	*Dipterocarpus gracilis*		+		
167	*Dipterocarpus grandiflorus*		+		
168	*Dipterocarpus kerrii*		+		
169	*Dipterocarpus retusus*				+
170	*Drypetes porteri*	WG		+	
171	*Drypetes travancorica*	WG		+	
172	*Drypetes wightii*	WG			+
173	*Dysoxylum beddomei*	WG		+	
174	*Dysoxylum ficiforme*	WG			+
175	*Elaeocarpus prunifolius*				+
176	*Elaeocarpus blascoi*	WG		+	
177	*Elaeocarpus gaussenii*	WG	+		
178	*Elaeocarpus venustus*	WG			+
179	*Elaeocarpus recurvatus*	WG			+
180	*Eriolaena lushingtonii*				+
181	*Eugenia calcadensis*	WG			+
182	*Eugenia cotinifolia*	WG		+	
183	*Eugenia discifera*	WG		+	
184	*Eugenia floccosa*	WG		+	
185	*Eugenia indica*	WG		+	
186	*Eugenia rottleriana*	WG			+
187	*Eugenia singampattiana*	WG	+		
188	*Euodia lunuankenda*	WG		+	
189	*Euonymus angulatus*	WG			+
190	*Euonymus paniculatus*	WG		+	
191	*Euonymus serratifolius*	WG		+	
192	*Ficus angladei*	WG	+		
193	*Garcinia cadelliana*		+		
194	*Garcinia imberti*	WG		+	
195	*Garcinia kingii*			+	
196	*Garcinia rubro-echinata*	WG			+
197	*Garcinia travancorica*	WG			+
198	*Garcinia wightii*	WG			+
199	*Gleditsia assamica*				+
200	*Glochidion johnstonei*	WG			+
201	*Glochidion tomentosum*	WG		+	
202	*Glochidion bourdillonii*	WG			+
203	*Glochidion ellipticum*	WG		+	
204	*Glochidion pauciflorum*	WG		+	

205	*Glochidion sisparense*	WG		+	
206	*Glyptopetalum lawsonii*	WG			+
207	*Goniothalamus rhynchantherus*	WG		+	
208	*Goniothalamus simonsii*			+	
209	*Gymnacranthera canarica*	WG			+
210	*Hildegardia populifolia*		+		
211	*Homalium travancoricum*	WG			+
212	*Homalium jainii*	WG		+	
213	*Hopea glabra*	WG		+	
214	*Hopea parviflora*	WG		+	
215	*Hopea racophloea*	WG		+	
216	*Hopea ponga*	WG		+	
217	*Hopea wightiana*			+	
218	*Hopea erosa*	WG	+		
219	*Hopea helferi*		+		
220	*Hopea jacobi*	WG	+		
221	*Hopea odorata*				+
222	*Hopea utilis*	WG		+	
223	*Humboldtia bourdillonii*	WG		+	
224	*Humboldtia laurifolia*	WGSL			+
225	*Humboldtia unijuga*	WG	+		
226	*Hydnocarpus macrocarpa*	WG			+
227	*Ilex khasiana*		+		
228	*Ilex venulosa*			+	
229	*Isonandra stocksii*			+	
230	*Isonandra villosa*			+	
231	*Ixonanthes khasiana*				+
232	*Ixora johnsonii*	WG	+		
233	*Ixora lawsonii*	WG		+	
234	*Ixora malabarica*	WG			+
235	*Ixora saulierei*	WG		+	
236	*Julostylis polyandra*	WG		+	
237	*Kingiodendron pinnatum*	WG		+	
238	*Koilodepas calycinum*	WG		+	
239	*Lagerstroemia minuticarpa*			+	
240	*Lasianthus ciliatus*	WG			+
241	*Lasianthus rostratus*	WG			+
242	*Litosanthes capitulatus*	WG			+
243	*Litsea beddomei*	WG		+	
244	*Litsea ligustrina*	WG			+
245	*Litsea nigrescens*	WG		+	
246	*Litsea travancorica*	WG		+	
247	*Madhuca bourdillonii*	WG		+	
248	*Maesa velutina*	WG		+	
249	*Magnolia gustavi*				+

250	*Mallotus atrovirens*	WG			+
251	*Mangifera andamanica*			+	
252	*Melicope indica*	WG		+	
253	*Memecylon flavescens*			+	
254	*Memecylon lawsonii*	WG			+
255	*Memecylon sisparense*	WG	+		
256	*Memecylon subramanii*	WG		+	
257	*Mesua manii*		+		
258	*Meteoromyrtus wynaadensis*	WG	+		
259	*Michelia punduana*				+
260	*Microtropis densiflora*	WG		+	
261	*Miliusa nilagirica*	WG			+
262	*Mitrephora grandiflora*	WG			+
263	*Mitrobryum koelzii*			+	
264	*Myristica magnifica*	WG		+	
265	*Myristica malabarica*				+
266	*Neolitsea fischeri*	WG			+
267	*Nostolachma crassifolia*	WG		+	
268	*Nothopegia aureo-fulva*	WG	+		
269	*Nothopegia beddomei*	WG		+	
270	*Nothopegia castanaefolia*	WG	+		
271	*Ochreinauclea missionis*	WG			+
272	*Orophea uniflora*	WG			+
273	*Orophea thomsoni*	WG		+	
274	*Palaquium bourdillonii*	WG			+
275	*Palaquium ravii*	WG		+	
276	*Photinia serratifolia*	WG		+	
277	*Pithecellobium gracile*	WG			+
278	*Pittosporum eriocarpum*			+	
279	*Pittosporum viridulatum*	WG	+		
280	*Poeciloneuron pauciflorum*	WG	+		
281	*Polyalthia rufescens*	WG		+	
282	*Polyalthia shendurunii*	WG		+	
283	*Popowia beddomeana*	WG		+	
284	*Pseudoglochidion anamalayanum*	WG	+		
285	*Pseuduvaria prainii*				+
286	*Psychotria beddomei*	WG		+	
287	*Psychotria globicephala*	WG		+	
288	*Psychotria macrocarpa*	WG		+	
289	*Psychotria nilgiriensis*	WG		+	
290	*Pterocarpus marsupium*	WGSL			+
291	*Pterocarpus santalinus*			+	
292	*Pterospermum reticulatum*	WG			+
293	*Rapanea striata*	WG		+	
294	*Rhododendron dalhousiae*				+

295	*Sageraea grandiflora*	WG		+	
296	*Santalum album*				+
297	*Saprosma fragrans*	WG			+
298	*Saraca asoca*				+
299	*Schefflera bourdillonii*			+	
300	*Shorea roxburghii*			+	
301	*Sophora wightii*	WG		+	
302	*Symplocos macrocarpa*	WG			+
303	*Symplocos anamallayana*	WG		+	
304	*Symplocos barberi*			+	
305	*Symplocos nairii*	WG		+	
306	*Symplocos oligandra*	WG		+	
307	*Symplocos pulchra*	WG		+	
308	*Syzygium stocksii*	WG		+	
309	*Syzygium palghatense*	WG	+		
310	*Syzygium beddomei*	WG		+	
311	*Syzygium benthamianum*	WG			+
312	*Syzygium bourdillonii*	WG		+	
313	*Syzygium chavaran*	WG		+	
314	*Syzygium courtallense*	WG	+		
315	*Syzygium densiflorum*	WG			+
316	*Syzygium microphyllum*	WG		+	
317	*Syzygium myhendrae*	WG		+	
318	*Syzygium occidentale*	WG			+
319	*Syzygium parameswaranii*	WG		+	
320	*Syzygium ramavarma*	WG			+
321	*Syzygium travancoricum*	WG	+		
322	*Syzygium zeylanicum*	WG		+	
323	*Takakia ceratophylla*				+
324	*Tarenna agumbensis*	WG		+	
325	*Tarenna monosperma*	WG		+	
326	*Tarenna nilagirica*	WG			+
327	*Ulmus wallichiana*				+
328	*Vateria indica*	WG	+		
329	*Vateria macrocarpa*	WG	+		
330	*Vatica lanceaefolia*		+		
331	*Vatica chinensis*		+		
332	*Xylosma latifolium*	WG		+	

* WG - endemic to the Western Ghats; WGSL - endemic to the Western Ghats and Sri Lanka hotspot.
† Defined by the 2002 IUCN Red List of Threatened Species.

Appendix 2. Provisional Species Outcomes for CEPF Investment in the Western Ghats*

	Scientific Name
	MAMMALS
1	*Amblonyx cinereus*
2	*Platacanthomys lasiurus*
	AMPHIBIANS
3	*Ichthyophis beddomei*
4	*Ichthyophis bombayensis*
5	*Ichthyophis longicephalus*
6	*Ichthyophis malabarensis*
7	*Ichthyophis peninsularis*
8	*Ichthyophis subterrestris*
9	*Ichthyophis tricolor*
10	*Uraeotyphlus malabaricus*
11	*Uraeotyphlus menoni*
12	*Uraeotyphlus narayani*
13	*Uraeotyphlus oxuyrus*
14	*Gegeneophis carnosus*
15	*Gegeneophis ramaswamii*
16	*Indotyphlyus battersbyi*
	REPTILES
17	*Salea anamallayana*
18	*Ahaetulla perroteti*
19	*Amphiesma monticola*
20	*Boiga dightoni*
21	*Brachyophidium rhodogaster*
22	*Calliophis bibroni*
23	*Calodactylodes aureus*
24	*Calotes andamanensis*
25	*Calotes nemoricola*
26	*Chalcides pentadactylus*
27	*Chamaeleo zeylanicus*
28	*Cnemaspis tropidogaster*
29	*Cnemaspis beddomei*
30	*Cnemaspis goaensis*
31	*Cnemaspis indica*
32	*Cnemaspis jerdonii*
33	*Cnemaspis nairi*
34	*Cnemaspis ornata*
35	*Cnemaspis sisparensis*
36	*Cnemaspis wynadensis*
37	*Dasia haliana*
38	*Dendralephis grandoculis*
39	*Dendrelaphis bifrenalis*
40	*Dendrelaphis caudolineolatus*
41	*Dryocalamus nympha*
42	*Elaphe helena monticollaris*

	Scientific Name
	REPTILES (Cont'd)
43	*Enhydris dussumieri*
44	*Eryx whitakeri*
45	*Eumeces poonaensis*
46	*Geckoella deccanensis*
47	*Geochelone elegans*
48	*Hemidactylus anamallensis*
49	*Hemidactylus prashadi*
50	*Hemidactylus scabriceps*
51	*Hemiphyllodactylus aurantiacus*
52	*Lycodon flavomaculatus*
53	*Lygosoma goaensis*
54	*Mabuya clivicola*
55	*Mabuya gansi*
56	*Melanochelys trijuga coronata*
57	*Melanochelys trijuga thermalis*
58	*Melanophidium punctatum*
59	*Oligodon nikhili*
60	*Oligodon travancornicum*
61	*Otocryptis beddomii*
62	*Platyplectrurus madurensis*
63	*Platyplectrurus trilineatus*
64	*Plectrurus guentheri*
65	*Rhabdops olivaceus*
66	*Ristella beddomii*
67	*Ristella guentheri*
68	*Ristella rurkii*
69	*Ristella travancorica*
70	*Salea horsfieldii*
71	*Scincella bilineata*
72	*Scincella travancornicum*
73	*Trimereurus huttoni*
74	*Typhlops beddomei*
75	*Uropeltis dindigalensis*
76	*Uropeltis liura*
77	*Uropeltis macrolepis*
78	*Uropeltis maculatus*
79	*Uropeltis pulneyensis*
80	*Uropeltis rubromaculatus*
81	*Uropeltis woodmasoni*
82	*Xylophis perroteti*
83	*Xylophis stenorhyncus*

* These species could become eligible for CEPF investment if their global threat status is assessed as globally threatened during the 5-year investment period.

Appendix 3. Site Outcomes in the Western Ghats by Corridor

No.	Site Name	No. Globally Threatened Species*				Protected Area	Priority site for CEPF investment
		CR	EN	VU	Total		
	Periyar-Agasthyamalai Corridor						
1	Achankovil FD -Kerala	5	1	14	20		
2	High Wavy Mountains	1	3		4		+
3	Kalakkad- Mundunthurai TR	6	19	37	62	+	+
4	Kulathapuzha-Palode RF (Ponmudi Hills)	8	21	29	58		+
5	Neyyar WLS	3	13	20	36	+	+
6	Peppara WLS	7	18	28	53	+	+
7	Periyar TR	7	9	26	42	+	+
8	Ranni FD	5	5	15	25		+
9	Shendurney WLS	2	9	21	32	+	+
10	Srivilliputtur / Grizzled Giant Squirrel WLS		5	5	10	+	+
11	Tirunelvelli FD	9	41	30	80		+
	Annamalai Corridor						
12	Cardamom Hills RF	1	2	11	14		+
13	Chimmony WLS		2	4	6	+	+
14	Chinnar WLS		3	4	7	+	+
15	Eravikulam NP		5	11	16	+	+
16	Grass Hills NP		1	4	5	+	+
17	Indira Gandhi WLS & NP/ Anamalai/ Top Slip	7	18	25	50	+	+
18	Malayattur FD		1		1		
19	Munnar area	3	2		5		+
20	Nemmara FD – Nelliampathy RF	1	2	4	7		+
21	Palni Hills (Including Kodaikanal RF)	4	8	15	27		+
22	Parambikulam WLS		5	10	15	+	+
23	Peechi-Vazhani WLS	1	3	6	10	+	+
24	Thattekad Bird Sanctuary			2	2	+	
25	Vazhachal FD	1	2	4	7		+
	Mysore –Nilgiri Corridor						
26	Aralam WLS		3	7	10	+	+
27	Attapadi RF	1	5	6	12		+
28	Bandipur NP/TR	1	3	13	17	+	+
29	Bannerghatta NP	2	1	3	6	+	
30	Brahmagiri WLS	2	8	8	18	+	+

31	BRT WLS	2	3	9	14	+	+
32	Cairnhill RF- Nilgiris			2	2		
33	Cauvery WLS	2	1	8	11	+	+
34	Conoor		2	2	4		
35	Erode FD		1		1		+
36	Govenor's Shola		1	1	2		+
37	Hosur FD		1		1		+
38	Kallar forests - Ooty	1	2		3		
39	Kodanad - Nilgiri		1	1	2		
40	Kollegal FD		1		1		+
41	Kotagiri- Longwood shola		1	5	6		
42	Kundah RF – Avalanche & Bison Swamp		3	4	7		+
43	Mudumalai WLS	3	5	16	24	+	+
44	Mukurthi NP		8	8	16	+	+
45	Naduvattam RF	1	1	1	3		+
46	Nilambur range – Nilambur North FD & New Amarambalam RF	1	7	12	20		+
47	Nilgiri North FD	1	1	12	14		+
48	Nugu WLS		2	2	4	+	
49	Rajiv Gandhi (NH)NP/ Nagarhole	1	2	10	13	+	+
50	Sathyamangalam FD (Part)		1	1	2		+
51	Silent valley NP		11	16	27	+	+
52	Siruvani Foothills		4	1	5		+
53	Kalpetta (forest- coffee matrix)		1		1		
54	Talaimalai RF			1	1		+
55	Thai Shola RF		1	2	3		
56	Wayanad WLS	3	15	19	37	+	+
	Malnad - Kodagu Corridor						
57	Agumbe RF		2	2	4		+
58	Balahalli RF		1		1		+
59	Balur RF		1	1	2		+
60	Baregundi RF		1		1		+
61	Bhadra TR	4	11	10	25	+	+
62	Bhagimalai RF		1	1	2		+
63	Bisale RF		3	1	4		+
64	Chakra RF		1		1		
65	Charmadi RF	1	2	2	5		+
66	Forests of Gundia-KN		1	1	2		+
67	Hulikal SF		1		1		
68	Kabbinale RF		1	1	2		
69	Kagneri RF		1	1	2		
70	Kanchankumari RF		1	1	2		

71	Kemphole RF	1	1	1	3		+
72	Kerti RF		1		1		+
73	Kidu RF		1	1	2		
74	Kilarmale RF		1		1		+
75	Killandur RF		1		1		+
76	Kiribag RF		1	1	2		+
77	Kodachadri RF		1	1	2		
78	Kudremukh NP	1	6	16	23	+	+
79	Metkalgudde RF		1		1		+
80	Mookambika WLS	1	2	4	7	+	+
81	Neriya RF		1	1	2		
82	Padinalknad RF		1	1	2		
83	Pattighat RF		1	1	2		+
84	Pushpagiri WLS	1	4	5	10	+	+
85	Sharavati WLS	2	2	6	10	+	+
86	Shettihally WLS		3	1	4	+	
87	Shiradi Shisla RF		1	2	3		+
88	Someshwara WLS	1	2	2	5	+	+
89	Someshwara RF		1		1		+
90	Talakaveri WLS	2	5	3	10	+	+
91	Tombattu RF		1		1		+
92	Varahi SF		1		1		
	Sahyadri-Konkan Corridor						
93	Amboli	1	2	1	4		+
94	Anshi NP	1	1	7	9	+	+
95	Barpede cave - Khanapur taluk- KN	1			1		
96	Bhagavan Mahaveer WLS		1	5	6	+	
97	Bondla WLS			1	1	+	
98	Castle Rock-Bhimgad forests	2			2		
99	Chandoli WLS		1	1	2	+	+
100	Cotigao WLS		3	4	7	+	+
101	Dandeli WLS	2	2	9	13	+	+
102	Haliyal RF			1	1		+
103	Koyna WLS	2	3	3	8	+	+
104	Madei WLS		1	2	3	+	
105	Molem National Park		2	4	6	+	+
106	Netravalli WLS			1	1	+	+
107	Radhanagari WLS	2	1	4	7	+	
	OUTSIDE CORRIDORS						
108	Adichunchungiri Bird Sanctuary			1	1	+	
109	Bhimashankar WLS			7	7	+	

110	Gudavi WLS	2			2	+	
111	Harishchandragad-Kalsubai WLS			2	2	+	
112	Idduki WLS		4	5	9	+	
113	Kokkre-Bellur	1		1	2		
114	Krishana Rajasagar Reservoir	1		2	3		
115	Kunthur-Kallur lakes	1		2	3		
116	Kurumbapatti –Salem dist.			1	1		
117	Lonavala – INS Shivaji & adjoining areas	1		2	3		
118	Mahabaleshwar RF		1	4	5		
119	Melkote Temple WLS	2		1	3	+	
120	Narasimabuddhi Lake	1		2	3		
121	Phansad WLS			1	1	+	
122	Ramanagara SF			1	1		
123	Ranganthitoo Bird Sanctuary	1		1	2	+	
124	Sinhgarh		1		1		+
125	Tansa WLS	2		2	4	+	
126	Theni FD		2		2		+

* According to the 2002 IUCN Red List of Threatened Species (CR=Critically Endangered, EN=Endangered, VU=Vulnerable)

Appendix 4. Methods Followed for the Prioritization of Site Outcomes in the Western Ghats

In order to prioritize site outcomes, a grid-based analysis was conducted for the Western Ghats. The decision to pursue a grid-based approach arose from the fact that it allows both a comprehensive and objective assessment of the entire study area. The area within the hotspot boundary that can be considered to have natural vegetation and biodiversity attributes and for which spatial data and remotely sensed data were available was defined as the area of analyses (Appendix 5). This area was divided into grid cells to correspond to Survey of India (SOI) 1:25,000 (about 175 square kilometers each) topographic maps.

The administrative boundaries of Protected area categories such as National Parks and Wildlife Sanctuaries as well as Reserved forests were used to delineate polygons within which presence of species could be located. These thus constitute all known sites within the Western Ghats that merit conservation attention (Figures 5 and 6). The known presence of IUCN Red Listed species belonging to mammals, birds and amphibians in each of these polygons or sites was based on published literature, consultation and field experience of the team.

The grids cells were overlayed on these polygons and each grid cell was allotted the IUCN species based on their location within the sites.

The total number of IUCN presences was summed up for each grid cell and this was rescaled over 0-100 by dividing by the maximum grid value and multiplying by hundred.

In addition to the species attribute each grid cell was allotted two other conservation values based on percentage of unique and rare habitats and the percentage of high quality forest and other natural vegetation.

This was done by dividing the area of analyses into subregions based on physiography and limits of individual remotely sensed imagery. An index of evergreeness (Krishnaswamy et al. 2004) as well as a detailed vegetation map was prepared for each subregion. The detailed vegetation map for each subregion was also aggregated to generate a vegetation classification map for the entire area of analyses.

The unique habitats were identified on the basis of the index of evergreenness. The wettest and most evergreen sites that are closely associated with presence of close canopy evergreen forest or unique evergreen communities such as the *Myrstica* swamps were identified in each subregion. The rarest vegetation type in each subregion was identified using the vegetation map. The quality of the forest cover was based on a “edginess” factor derived from analyses of remotely sensed data and the top 25 percent on this index was considered high quality. The percentage of this high quality forest cover within each grid cell made up the third conservation value.

These two additional conservation attributes were also normalized on a scale of 100 as described earlier.

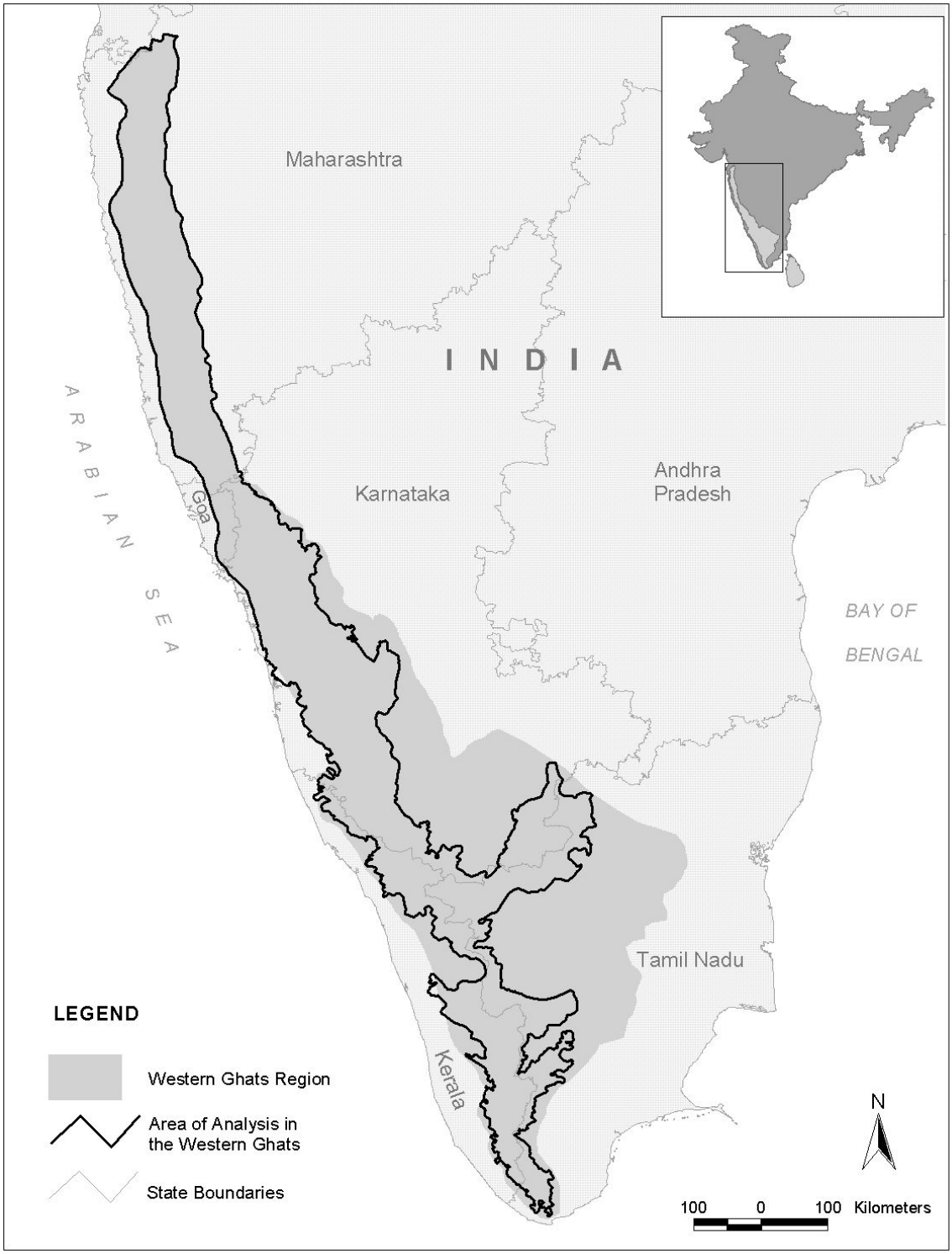
A combined conservation value was generated by summing up the conservation values from each of the three individual components (the IUCN species index, the unique and rare habitat index and the high quality forest index) and this was also rescaled over 0-100.

The upper 25 percent of the grid cells on this combined conservation value score were defined as the prioritized grids.

In addition a conservation value map based on Western Ghats plant species presence within administrative units called talukas derived from the Western Ghats plant database that has been generated by Dr. K.N. Ganeshaiah at UAS was compared with our prioritized sites and all the hotspots of plant diversity are covered.

The sites (polygons corresponding to National Parks, Wildlife Sanctuaries, Reserved Forests, etc.) corresponding to these categories, along with those sites that are wholly irreplaceable globally, were defined as the prioritized sites that would be considered along with other criteria such as the degree of threat and analyses of past investments in deciding the sites for CEPF investment.

Appendix 5. Area of Analysis for the Prioritization of Site Outcomes in the Western Ghats



Source: Political boundaries from Environmental Systems Research Institute, Inc.- Digital Chart of the World.

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