# Finding Cinderella

Selecting a Conservation Surrogate Species for Sri Lanka's Endangered Wildlife

Introduction

Sri Lanka is an island nation geographically isolated from the Asian mainland continent by a shallow straight between its northwest coast and southern India. The surrounding coastline is bordered by the Bay of Bengal and Indian Ocean whose seasonal changes in atmospheric pressure bring about heavy monsoon winds that influence rainfall over the entire country. As a result, Sri Lanka's terrain is divided into two main ecological zones shaped by annual precipitation levels. The majority of Sri Lanka's northern and southeastern regions are designated as a dry zone since the area receives comparatively less rainfall than the southwestern wet zones. Despite the smaller proportion of wet zones, they harbor immense biological wealth due to the formation of highly productive moist and wet forest types.
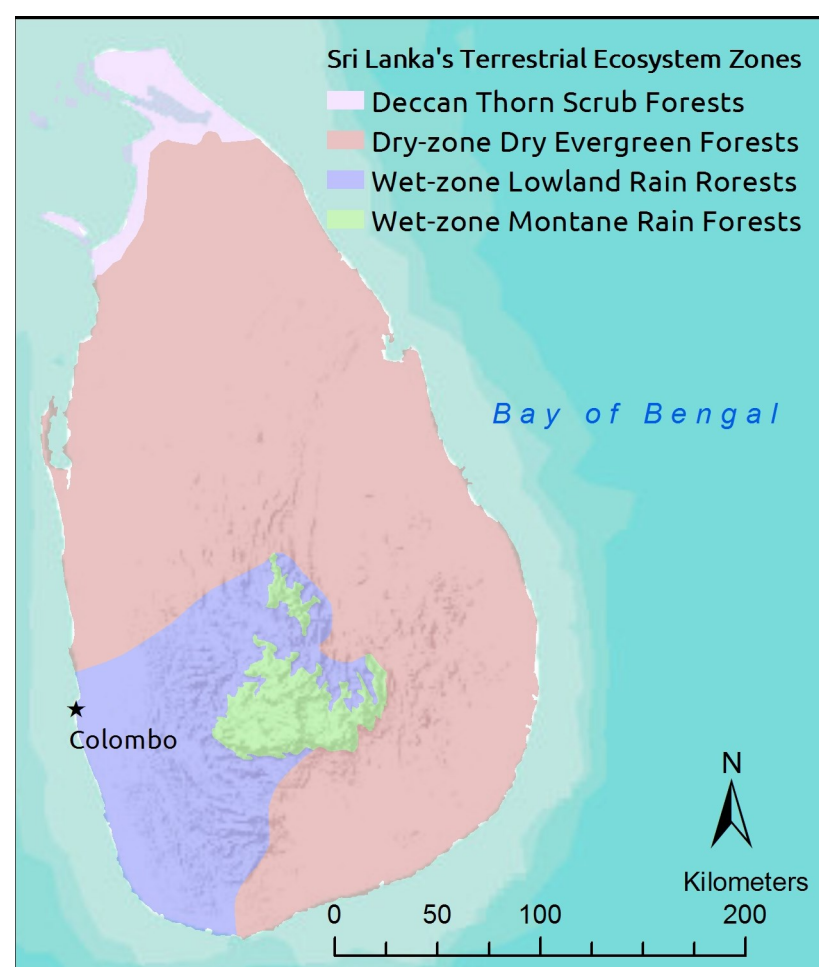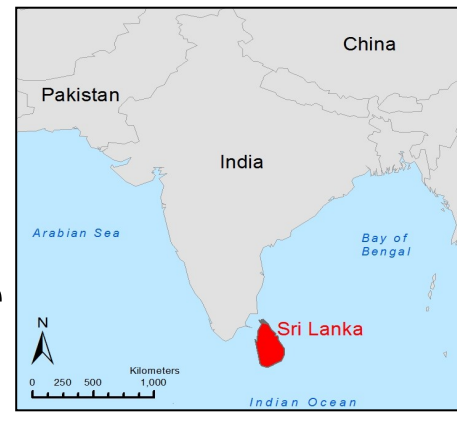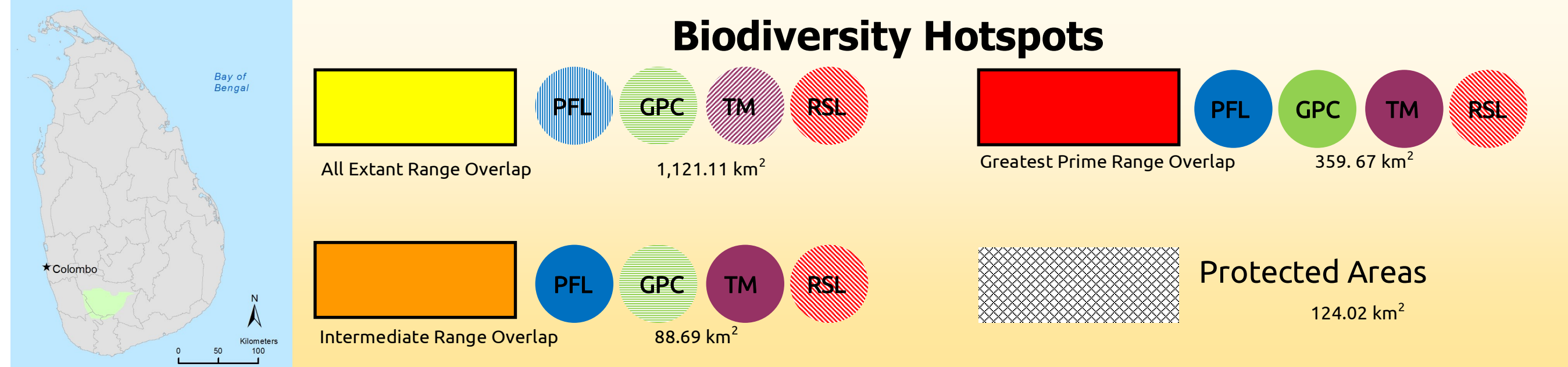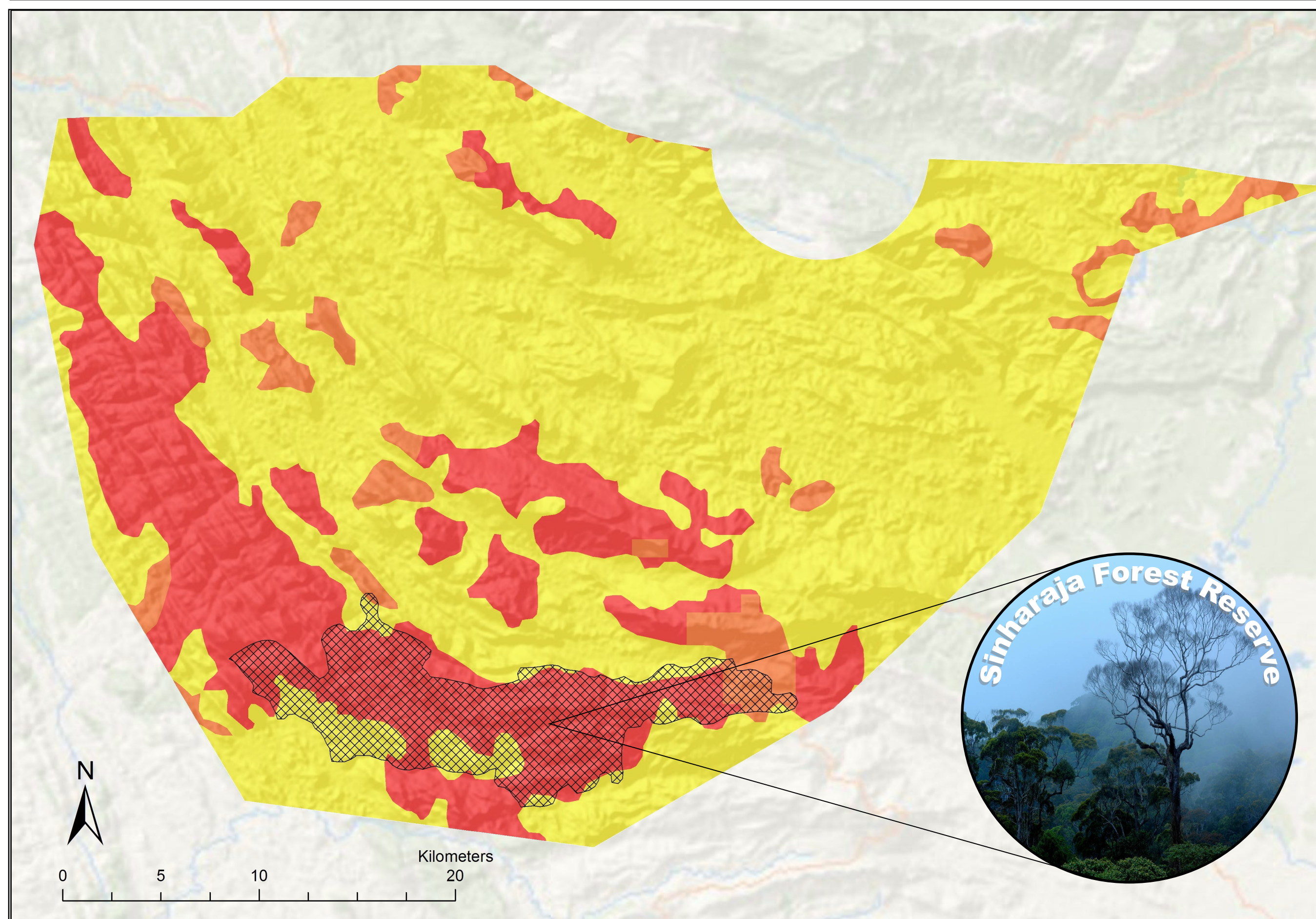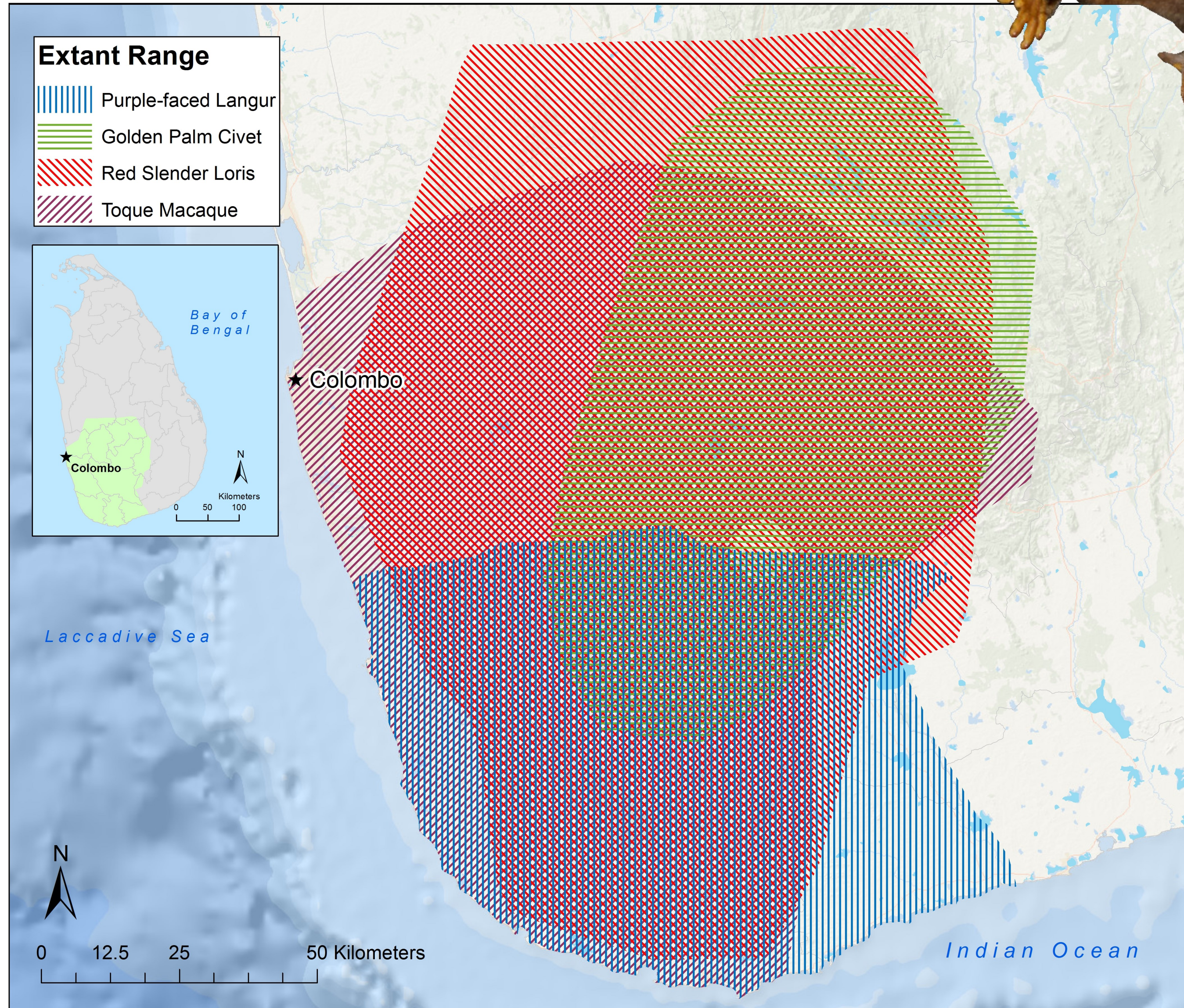
Many of the resident flora and fauna found in these wet forest habitats are evolutionarily distinct from their mainland counterparts and, subsequently, Sri Lanka is home to one of the greatest levels of endemic species worldwide. Sri Lanka along with portions of India's Western Ghats is currently listed as one of the twenty-five global biodiversity hotspots due in part to the high level of imperiled species. Fourteen of its sixteen endemic terrestrial mammals are presently threatened or endangered, highlighting an urgent need to conserve these areas. Habitat loss through hunting, timber felling, extraction of firewood/fodder, livestock grazing, and fire is the greatest threats to Sri Lanka's biodiversity. Estimates of forest loss in the Western Ghats/Sri Lanka has been so rapid that out of the original extent of 182,500 km² of primary vegetation only 12,450 km² (6.8%) remains.
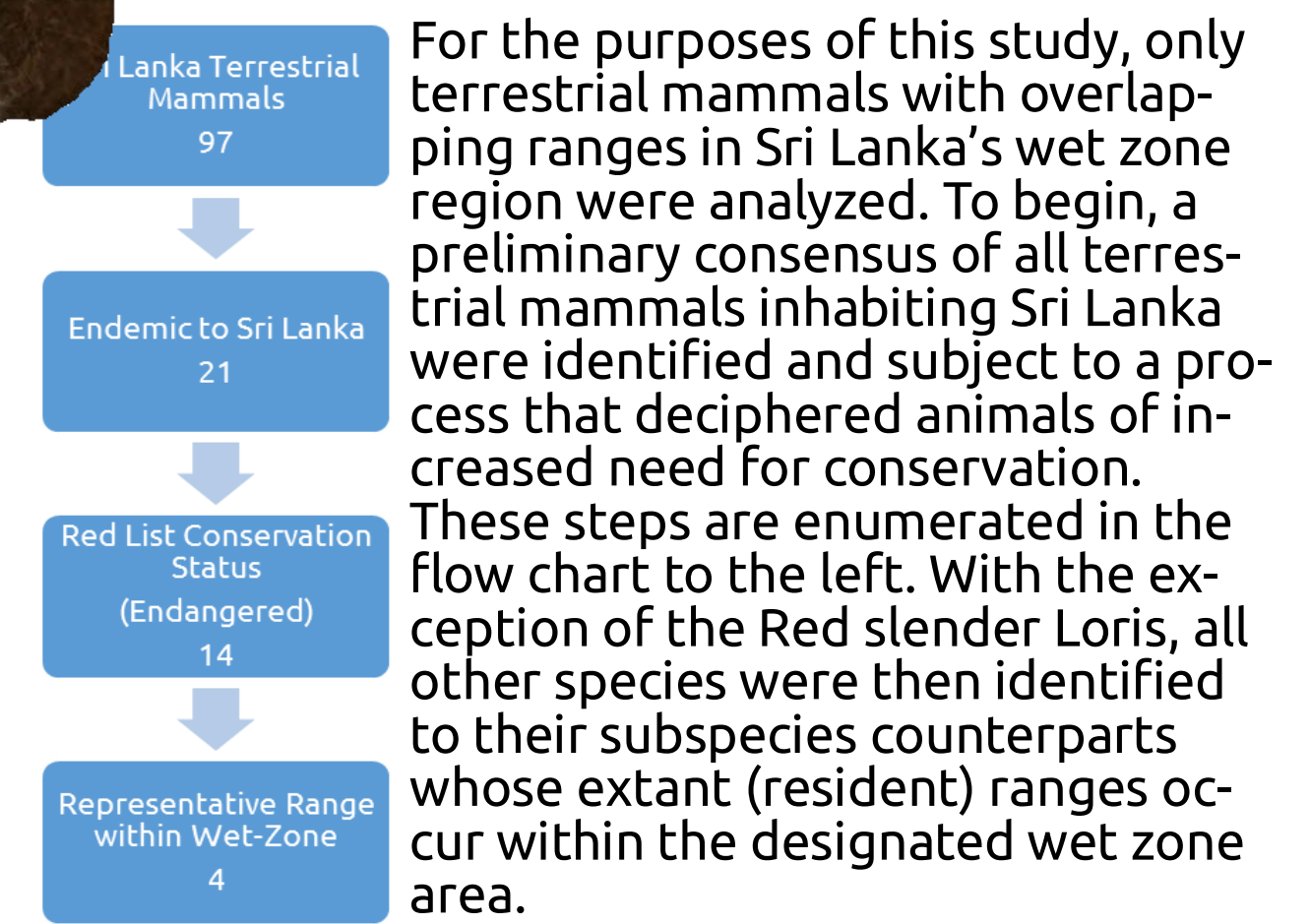
Over 50% of Earth's species are found within tropical latitudes where coinciding poverty and population pressures put substantial demands on natural ecosystems. The burdens of conserving the remaining wildlife must, therefore, identify surrogate species and their habitats that have the greatest protection for sympatric threatened species. These species are often called flagship species since they act as an icon for a particular ecosystem after they have suffered from heavy exploitation or habitat destruction. Conservation institutions selectively anoint this designation for certain species in order to attract public support and, as a result, typically feature animals that are both large and visually 'charismatic' to appeal to western cultures. Unfortunately, this approach precludes other similarly endangered species for conservation efforts based on such superfluous traits.

Scientists now agree that the primary consideration of assigning ambassador species needs to feature those animals whose habitats support a wide variety of species and not just the most well-known. This concept was first put forward my J.R. Smith that coined the term, Cinderella species, which considers the often overlooked species with potential flagship appeal. By focusing conservation efforts on the ecosystems that each of these potential Cinderella species inhabit, it becomes possible to protect a greater number of rare and endemic wildlife that may benefit from protecting shared ecosystems.

Results

Extant Range

- Purple-faced Langur
- Golden Palm Civet
- Red Slender Loris
- Toque Macaque

Biodiversity Hotspots

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All Extant Range Overlap	PFL GPC TM RSL	1,121.11 km²
Greatest Prime Range Overlap	PFL GPC TM RSL	359. 67 km²
Intermediate Range Overlap	PFL GPC TM RSL	88.69 km²
Protected Areas		124.02 km²

Methodology

For the purposes of this study, only terrestrial mammals with overlapping ranges in Sri Lanka's wet zone region were analyzed. To begin, a preliminary consensus of all terrestrial mammals inhabiting Sri Lanka were identified and subject to a process that deciphered animals of increased need for conservation. These steps are enumerated in the flow chart to the left. With the exception of the Red slender Loris, all other species were then identified to their subspecies counterparts whose extant (resident) ranges occur within the designated wet zone area.

Sri Lanka Terrestrial Mammals **97** → Endemic to Sri Lanka **21** → Red List Conservation Status (Endangered) **14** → Representative Range within Wet-Zone **4**

Spatial information for extant ranges for each species was obtained from the most recent versions downloaded from their IUCN red list page. A habitat suitability analysis was then conducted on prime areas of habitat within this same area. Prime areas of habitat were mapped according to species-specific requirements listed on the table below. Dense canopy cover was a requirement for both the Red slender Loris and Golden palm civet due to the risks of entrapment and poaching by nearby villagers that subsume their major threats. Once all habitat suitability factors were created and intersected, areas of prime habitat were joined to their previous extant ranges and categorized as either prime (10) or non-prime (1) for further analysis.

In order to find regions of Sri Lankan forest with the most protective potential for all prime and non-prime habitats, the habitat shapefile for each species was converted to a raster. Prime areas overlapping non-prime areas were summed using raster calculator revealing three distinct areas of habitat overlap.

Species	Elevation	Habitat	Vicinity to Settlement Impact	Habitat Patch Size
Southern lowland wetzone Purple-faced Langur *Trachypithecus vetulus vetulus*	<1,000 m	Open Forest Dense Forest	N/A	N/A
Wetzone Golden Palm Civet *Paradoxurus aureus*	N/A	Dense Forest (Needs secondary forest growth)	Negative: Prime habitats ≥ 3 km from cities	≥ 5 sq. km
Wetzone Toque Macaque *Macaca sinica aurifrons*	<2,100 m	Open Forest Dense Forest	N/A	N/A
Red Slender Loris *Loris tardigradus*	1,500-2,000 m	Dense Forest (Needs secondary forest growth)	Negative: Prime habitats ≥ 3 km from cities	≥ 5 sq. km

Discussion
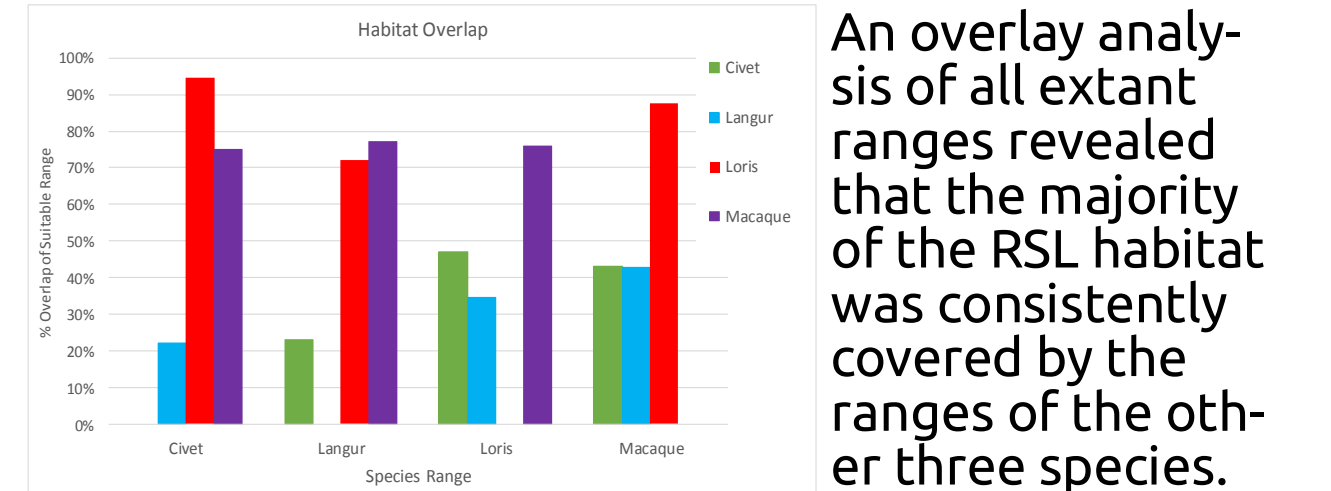
An overlay analysis of all extant ranges revealed that the majority of the RSL habitat was consistently covered by the ranges of the other three species.

The red areas on the Biodiversity Hotspot map represent forests with the greatest need for conservation efforts. These red habitats subsume prime habitats for all species with the exception of the RSL. Nevertheless, adequate protection of these areas may be beneficial to reintroduction programs for the primate species that are the most susceptible to habitat degradation. The analysis failed to produce any area with four prime habitats overlap which should be a topmost concern for future environmental protection policies.

Due to the lack of coverage in the biodiversity hotspot map along with its encompassing habitat overlap for the remaining species, the Red slender Loris should be designated as Sri Lanka's newest Cinderella species. Adequate protection of the primate's extant range along with conservation of its prime habitats is likely to have maximum benefit to the remaining three endemic species.

Sources

Habitat Suitability Analysis

Purple-faced Langur (PFL)
Southern lowland wetzone
Trachypithecus vetulus vetulus

- Mountain
- Populous City
- Extant 7,248 km²
- Prime Habitat 1,017 km²
- District Boundary

Ecology & Diet: Arboreal, diurnal, folivorous, moderately frugivorous

Habitat: Lowland and midland tropical rainforest and modified areas with adequate canopy cover. Where its natural habitat has been destroyed, groups may refuge in home gardens and plantations. Occurs in elevations up to 1,000 m.

Threats: Selective logging, human settlement, hunting, trade, habitat loss, encroachment for agriculture and plantations.

Red List Category: Endangered

Golden Palm Civet (GPC)
Wetzone
Paradoxurus aureus

- Mountain
- Populous City
- Extant 7,520 km²
- Prime Habitat 1,408 km²
- District Boundary

Ecology & Diet: Arboreal, nocturnal, solitary, insectivorous, frugivorous, carnivorous (small prey)

Habitat: Lowland rainforest, evergreen mountain forests and monsoon forests. Positively associated with dense canopy cover but are tolerant of minor habitat modification. Elevation data missing.

Threats: Deforestation and widespread fragmentation from habitat modification. In human settlements, civets may be poisoned on plantations or trapped for meat.

Red List Category: Information missing on subspecies.

Toque Macaque (TM)
Wetzone
Macaca sinica aurifrons

- Mountain
- Populous City
- Extant 13,069 km²
- Prime Habitat 2,240 km²
- District Boundary

Ecology & Diet: Arboreal, nocturnal, solitary, insectivorous, frugivorous, carnivorous (small vertebrate prey)

Habitat: Lowland and midland tropical rain forest, wet zone lowland forests. Macaques show tolerance to human settlements. Elevations occur up to 2,100 m.

Threats: Deforestation and habitat loss increases risks of fragmented populations that are ecologically unstable. Other threats include shooting, snaring, and poisoning as animals are widely considered pests.

Red List Category: Endangered

Red Slender Loris (RSL)
Wetzone
Loris tardigradus

- Mountain
- Populous City
- Extant 15,100 km²
- Prime Habitat 394 km²
- District Boundary

Ecology & Diet: Arboreal, nocturnal, solitary, insectivorous, frugivorous, carnivorous (small prey)

Habitat: Tropical rain, swampy coastal and evergreen forests, and wetzone lowland forests. Requires dense canopy cover. Elevation occurs from 1,500-2,000 m.

Threats: Habitat loss, road kill, superstitious killing, hunting for pet trade, and poaching for traditional medicine. Populations are negatively associated in vicinity to human settlements.

Red List Category: Endangered