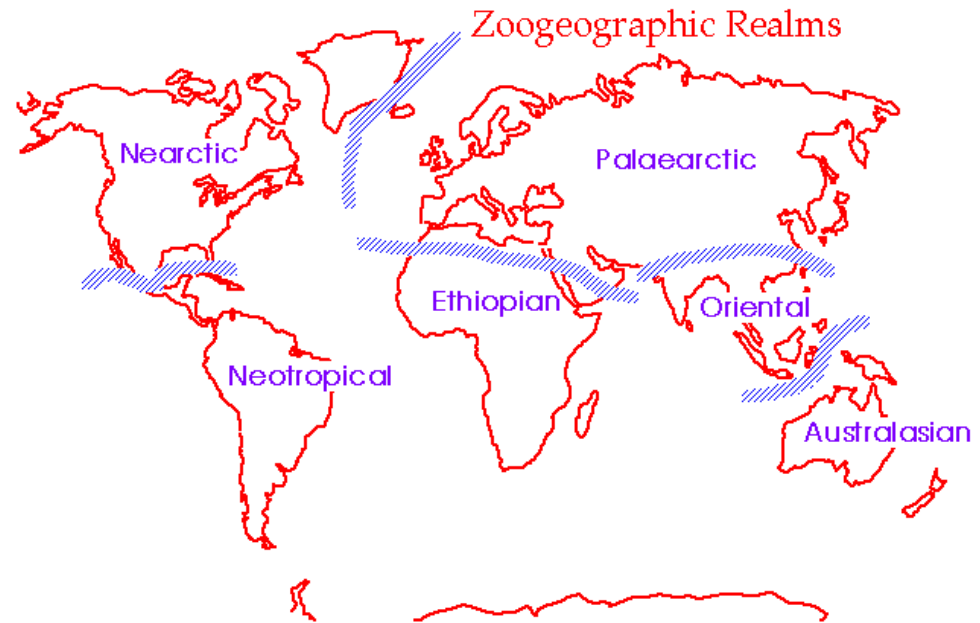


ZOOGEOGRAPHY OF INDIA – FOREST TYPES

Dr. K. Sivakumar
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Zoogeography of world

- Zoogeography is the study of the patterns of the past, present, and future distribution of animals in nature and the processes that regulate these distributions. It is the scientific analysis of the spatial patterns of biodiversity.



- Oriental region: India, Indochina, and southern China, Malaya archipelago including Bali, Java, Sumatra and the Philippine islands.
- Primarily tropical with some exceptional areas having sub tropical to temperate (Himalayan region) and semi arid to arid (western region) conditions.
- The eastern parts are covered mostly with tropical rain forest and it shades into dry desert conditions as one moves westward.

Indigenous Peoples of the World

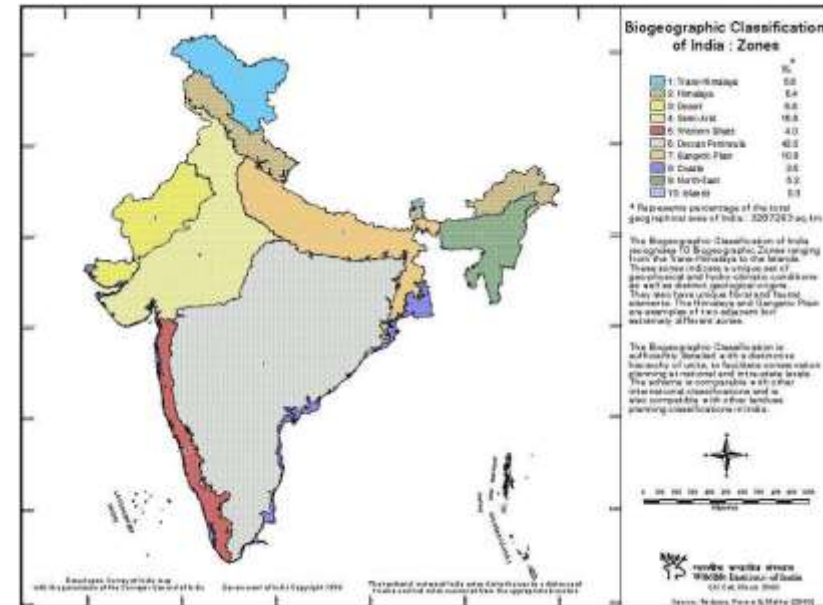


ZOOGEOGRAPHIC REALMS (WALLACE 1897)



The Indian Zoogeography...

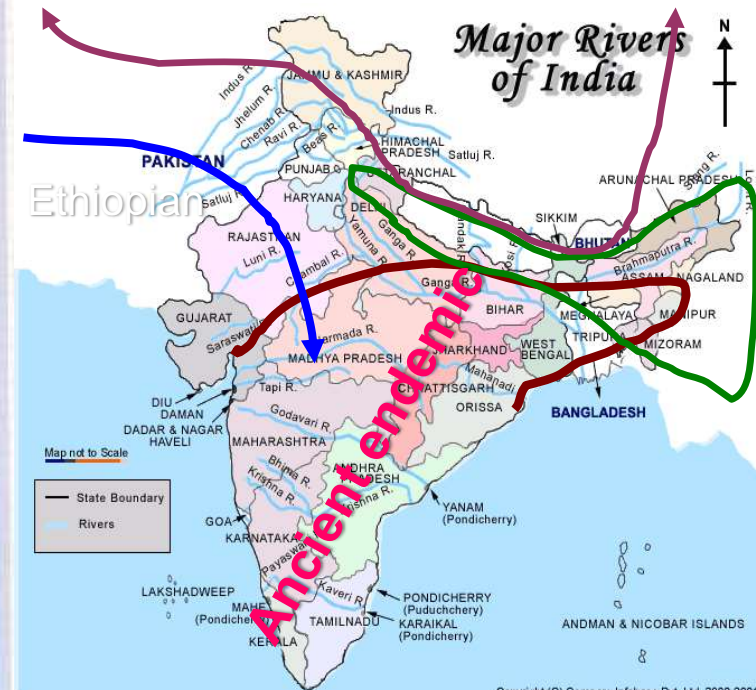
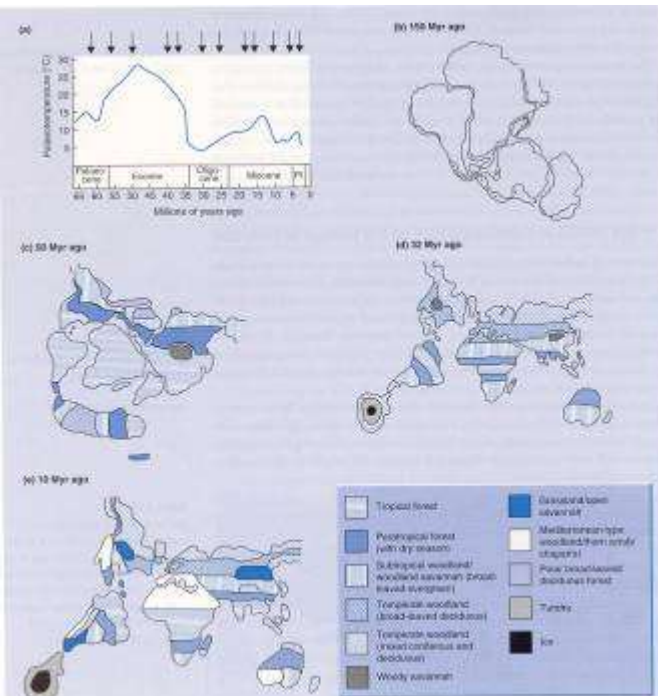
- ▶ India has deep rooted ethos for nature and wildlife conservation
- ▶ India is also amongst 17 '*mega-biodiverse*' countries and has 4 '*biodiversity hot-spots*'
- ▶ India is amongst the few countries in the world that has developed a conservation planning framework on biogeographic basis
- ▶ India conservation estate is ca. 21.34% of its total geographic area




more...

... unique biodiversity

- African element: Hyena and Gazelle
- European element: Wolf, Wild Goat, Hangul
- South east asian: Hoolock Gibbon and Elephant
- Hundreds of endemic species






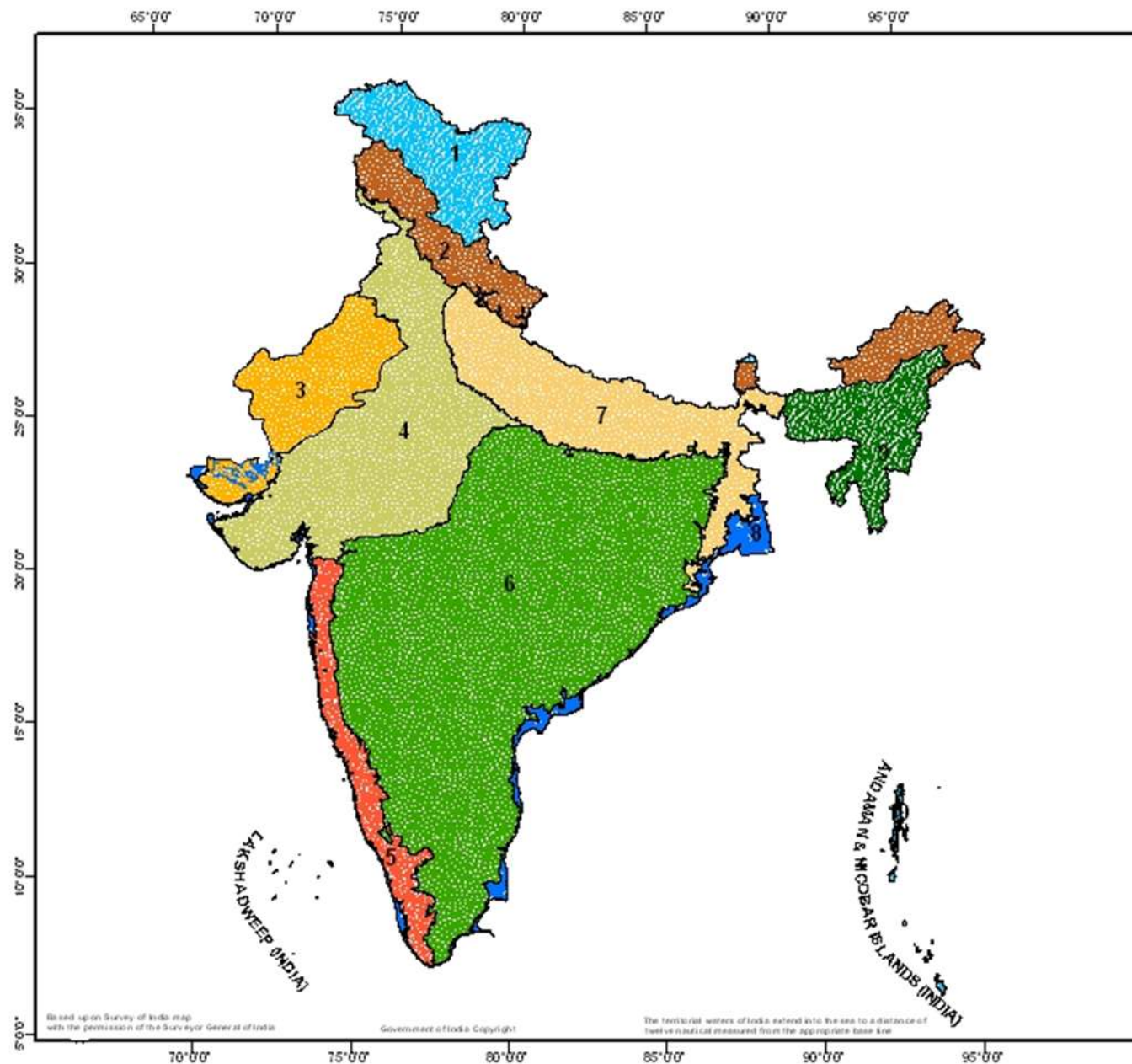
India is one of the select nations that have applied modern biogeographic knowledge and concepts for the planning of rational conservation strategies



In 1988, the Wildlife Institute of India (WII) prepared a Biogeographic Classification of India to facilitate rational conservation planning at the national and intra-state levels



Within India, this classification recognizes 10 Biogeographic Zones, which are further divided into 26 Biotic Provinces



Biogeographic Classification of India : Zones

	% *
1 : Trans - Himalaya	5.6
2 : Himalaya	6.4
3 : Desert	6.6
4 : Semi - Arid	16.6
5 : Western Ghats	4.0
6 : Deccan Peninsula	42.0
7 : Gangetic Plain	10.8
8 : Coasts	2.5
9 : North East	5.2
10 : Islands	0.3
Marine Influenced Area	10440 sq.km

* Represents percentage of the total geographical area of India : 3287263 sq.km



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The territorial waters of India extend into the sea to a distance of twelve nautical miles from the appropriate base line

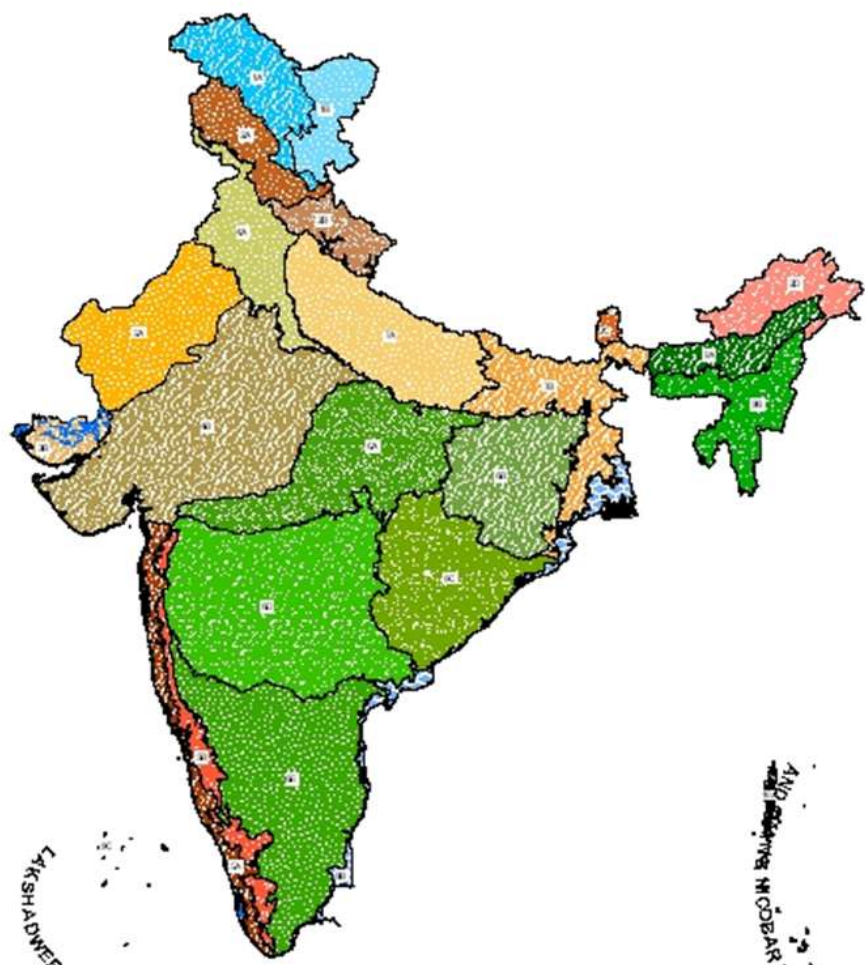
BIOGEOGRAPHIC CLASSIFICATION

BIOGEOGRAPHIC ZONE	Distinctive set of physical and Historical conditions. e.g. Himalayas & desert
BIOTIC PROVINCE	Further level of detail within zone. Contains some distinctive species elements. e.g. Western & Eastern Himalayas
BIOGEOGRAPHIC REGION	Distinctive geographic subdivision. e.g. Garhwal & Kumaon in Western Himalayas
BIOMES	Major ecosystem groupings found Within each province and region. e.g. Alpine, Subalpine, Temperate Conifer Forest within Western Himalayas

60°00' 65°00' 70°00' 75°00' 80°00' 85°00' 90°00' 95°00'

Biogeographic Classification of India : Provinces

%^a



	1A:Himalaya - Ladakh Mtns	3.3
	1B:Himalaya - Tibetan Plateau	2.19
	1C:Trans - Himalaya - Sikkim	0.10
	2A:Himalaya - North - West Himalaya	2.1
	2B:Himalaya - West Himalaya	1.6
	2C:Himalaya - Central Himalaya	0.2
	2D:Himalaya - East Himalaya	2.5
	3A:Desert - Thar	5.4
	3B:Desert - Katchchh	1.1
	4A:Semi - Arid - Punjab Plains	3.7
	4B: Semi - Arid - Gujrat Rajputana	12.9
	5A:Western Ghats - Malabar Plains	2.0
	5B: Western Ghats - Western Ghats Mtns.	2.0
	6A:Deccan Peninsula - Central Highlands	7.3
	6B: Deccan Peninsula - Chotta - Nagpur	5.4
	6C: Deccan Peninsula - Eastern Highlands	6.3
	6D: Deccan Peninsula - Central Plateau	12.5
	6E:Deccan Peninsula - Deccan South	10.4
	7A:Gangetic Plain - Upper Gangetic Plain	6.3
	7B: Gangetic Plain - Lower Gangetic Plain	4.5
	8A:Coasts - West Coast	0.6
	8B: Coasts - East Coast	1.9
	8C:Coasts - Lakshadweep	0.1
	9A: North - East - Brahmaputra Valley	2.0
	9B: North - East - North - East Hills	3.2
	10A: Islands - Andamans	0.2
	10B: Islands - Nicobars	0.1
	Marine Influenced Area : 10440 sq.km	

^a Represents percentage of the total geographical area of India : 3287263 sq.km



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The territorial waters of India extend into the sea to a distance of twelve nautical miles from the appropriate base line

15°00' 20°00' 25°00' 30°00' 35°00'

75°00' 80°00' 85°00' 90°00' 95°00' 100°00'

Biogeographic Zone:

Trans Himalayas



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Trans Himalaya	184823	5.62	3	5809.00	3.14	4	11305.56	6.12	7	17114.56	9.26

Biogeographic Zone Trans Himalaya



Span:
Ladakh, Jammu & Kashmir, North Sikkim
Lahaul and Spiti areas of Himachal Pradesh
Vegetation Type
Sparse Alpine Steppe Vegetation



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ENVIS-RP Wildlife and Protected Areas-2019

0 100 200 400 600 Km

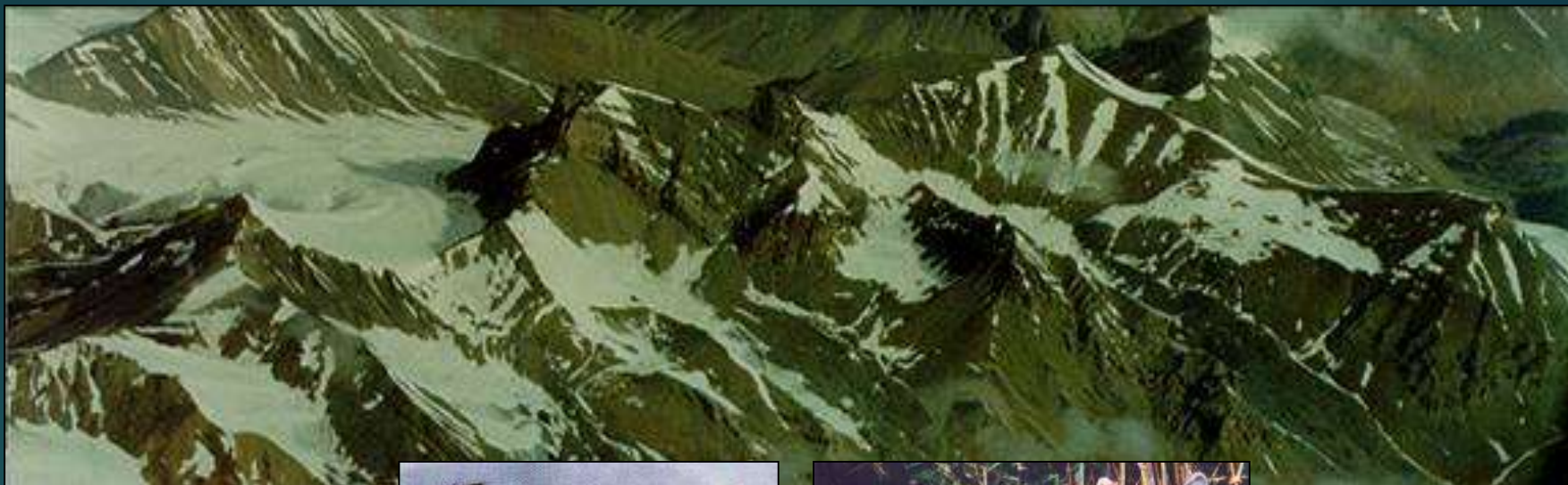


Trans Himalaya



Biogeographic Zone:

Himalayas



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Himalaya	210673	6.41	15	8203.00	3.89	65	16850.10	8.00	80	25053.10	11.89

Himalayas





Biogeographic Zone The Himalaya



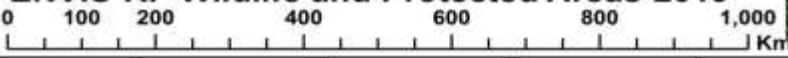
- Biogeographic Provinces:**
1: Himalaya - North West Himalaya
2: Himalaya - West Himalaya
3: Himalaya - Central Himalaya
4: Himalaya - East Himalaya

Vegetation Type:
Alpine and Sub-Alpine Forests, Grassy Meadows
and Moist Mixed Deciduous Forests



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Wildlife Institute of India

ENVIS-RP Wildlife and Protected Areas-2019



The Himalayas









Biogeographic Zone:

Desert



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Desert	214014	6.51	1	3162.00	1.48	5	12913.38	6.03	6	16075.38	7.51



Biogeographic Zone The Indian Desert



Biogeographic Provinces:
1: Desert – Thar
2: Desert – Katchchh
Vegetation Type:
Tropical Thorn Forests and Grasslands



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ENVIS-RP Wildlife and Protected Areas-2019

0 100 200 400 600 Km

The Indian Desert

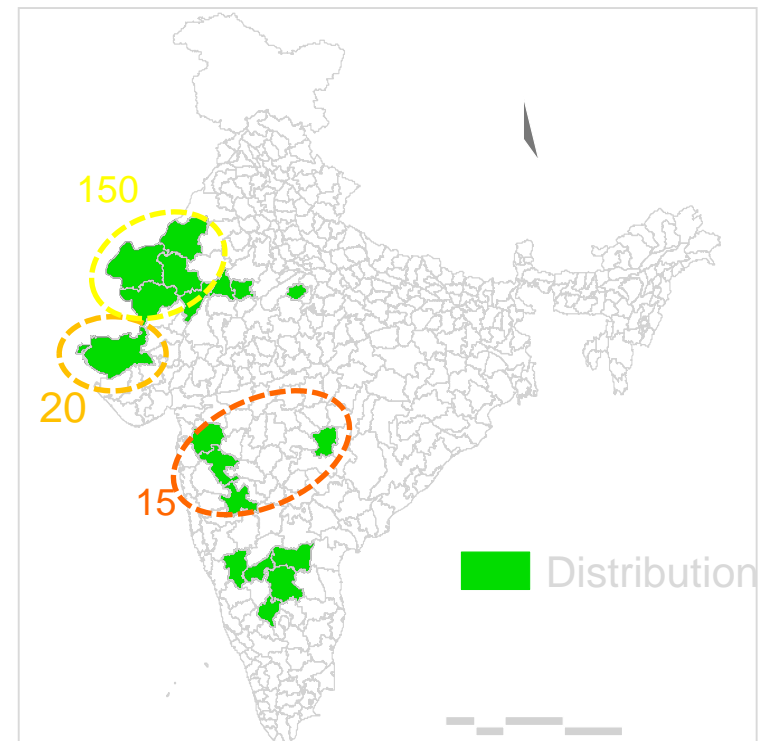
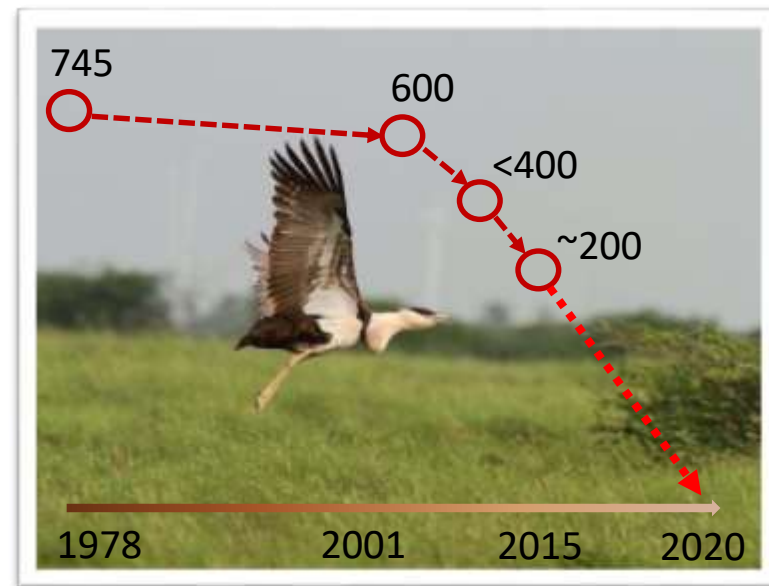


Great Indian Bustard

- Critically Endangered ~ 200 birds left
- Flagship & indicator of grasslands
- Threatened by hunting & hostile habitat
- Wide ranging nature in human-use areas; cannot be conserved only through PAs
- Needs integrated conservation approach involving research, management, protection & communities

Objectives

- Conservation Breeding Program
- Applied research
- Capacity building & awareness
- Pilot implementation of making habitat GIB friendly – Smart Green Infrastructure



Threats

Human induced mortality & Hostile Habitat

- Massive historical hunting – current
- Fatal bird collisions with power lines & other structures
- Nest damage – dogs, pigs, cattle & egg collection
- Agricultural expansion & mechanization, Pesticides ?
- Well intentioned but ill-informed management.
- Small population size



© N. Bhatt



© K. Gore

Conservation Breeding Program

- Develop captive population from wild eggs/birds – artificial incubation, chick rearing & breeding
- Partnership between WII –Rajasthan and other State Governments – MoEFCC – International Bustard Breeding Facilities.
- Detailed Agreed upon action plan for the next 25-30 years



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The UK great bustard *Otis tarda* reintroduction trial: a 5-year progress report

ROBERT J. BURNSIDE, IAN CARTER, ALASDAIR DAWES, DAVID WATERS
LEIGH LOCK, PAUL GORIUP and TAMÁS SZÉKELY

Abstract The great bustard *Otis tarda* became extinct in the UK during the 19th century due to a combination of factors, including hunting, egg collection and changes in agriculture. In 2003 a 10-year licence was granted to begin a trial to reintroduce the species back to the UK. Here we report on the first 5 years of the trial and assess the progress made towards establishing a founder population. From April 2004 to September 2009 a total of 102 great bustard chicks were imported from Russia and 86 released on Salisbury Plain. Monitoring showed that post-release survival was 0% in the first year following release, and that mortality of released bustards was mainly attributable to predation and collisions. Estimated adult survival was 7.6%, although the sample size was small. All known surviving great bustards are faithful to the surroundings of the release site, returning throughout the year. A lek has been established where males have been observed displaying to females. The first nesting attempt was in 2007, and in 2009 two females aged 3 and a

(IUCN, 1998). However, when gaps in knowledge exist about the ecology of a species in an area from where it was extirpated, it is often difficult to determine the ability of that species to survive and persist once the original causes of extinction are removed. Consequently, trial reintroduction provides an opportunity to fill in the gaps in understanding and to assess the feasibility of a full-scale reintroduction project (Osborne, 2005).

Although the aim of a reintroduction is to establish a free-living, self-sustaining population, the progress of a reintroduction comprises a sequence of objectives, including the survival of released individuals, breeding by released individuals in the wild and then subsequent growth and persistence of the population (Seddon, 1999). Each of these stages must be assessed to identify the appropriate methodology and limitations (Seddon et al., 2007; Sutherland et al., 2010) and the importance of post-release monitoring has been increasingly emphasized in

Biogeographic Zone:

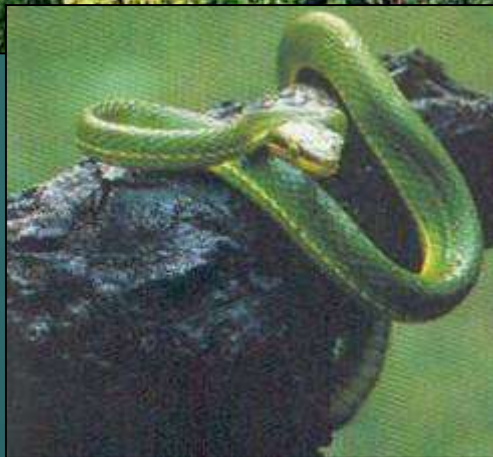
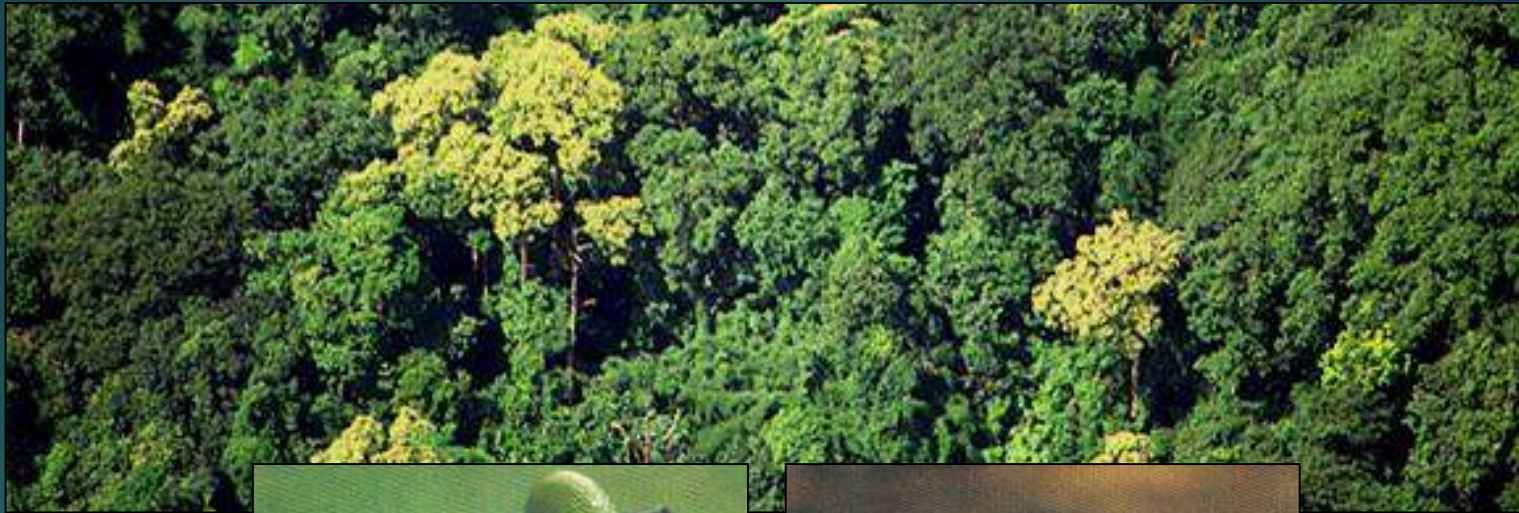
Semi-Arid



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Semi-Arid	539479	16.41	10	1505.78	0.28	81	12690.54	2.35	91	14196.32	2.63

Biogeographic Zone:

Western Ghats



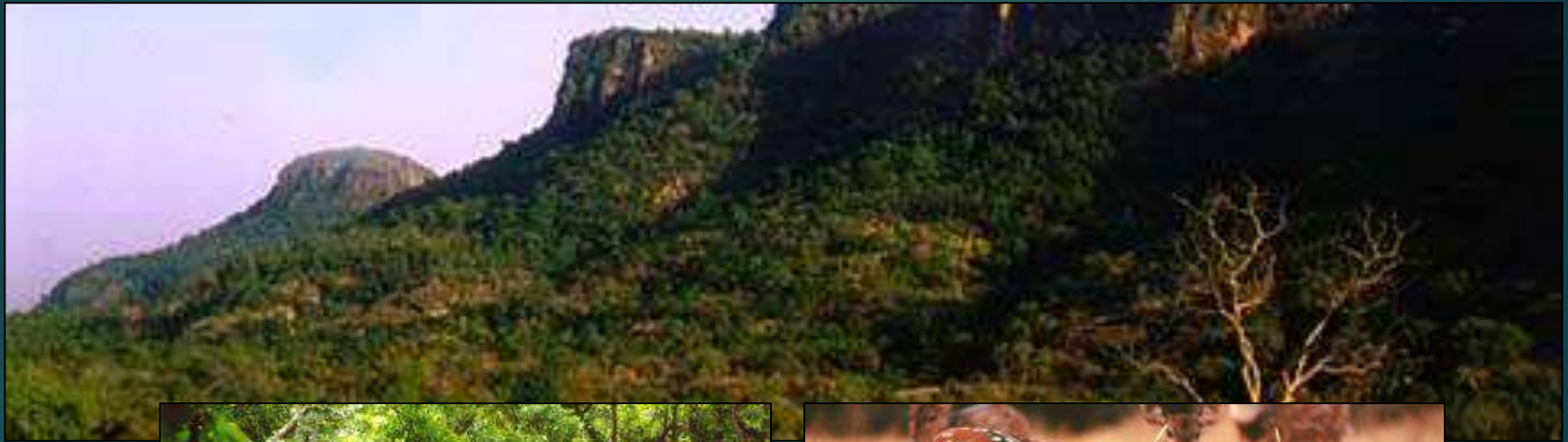
Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Western Ghats	132179	4.02	16	3673.52	2.78	50	10419.67	7.88	66	14093.19	10.66



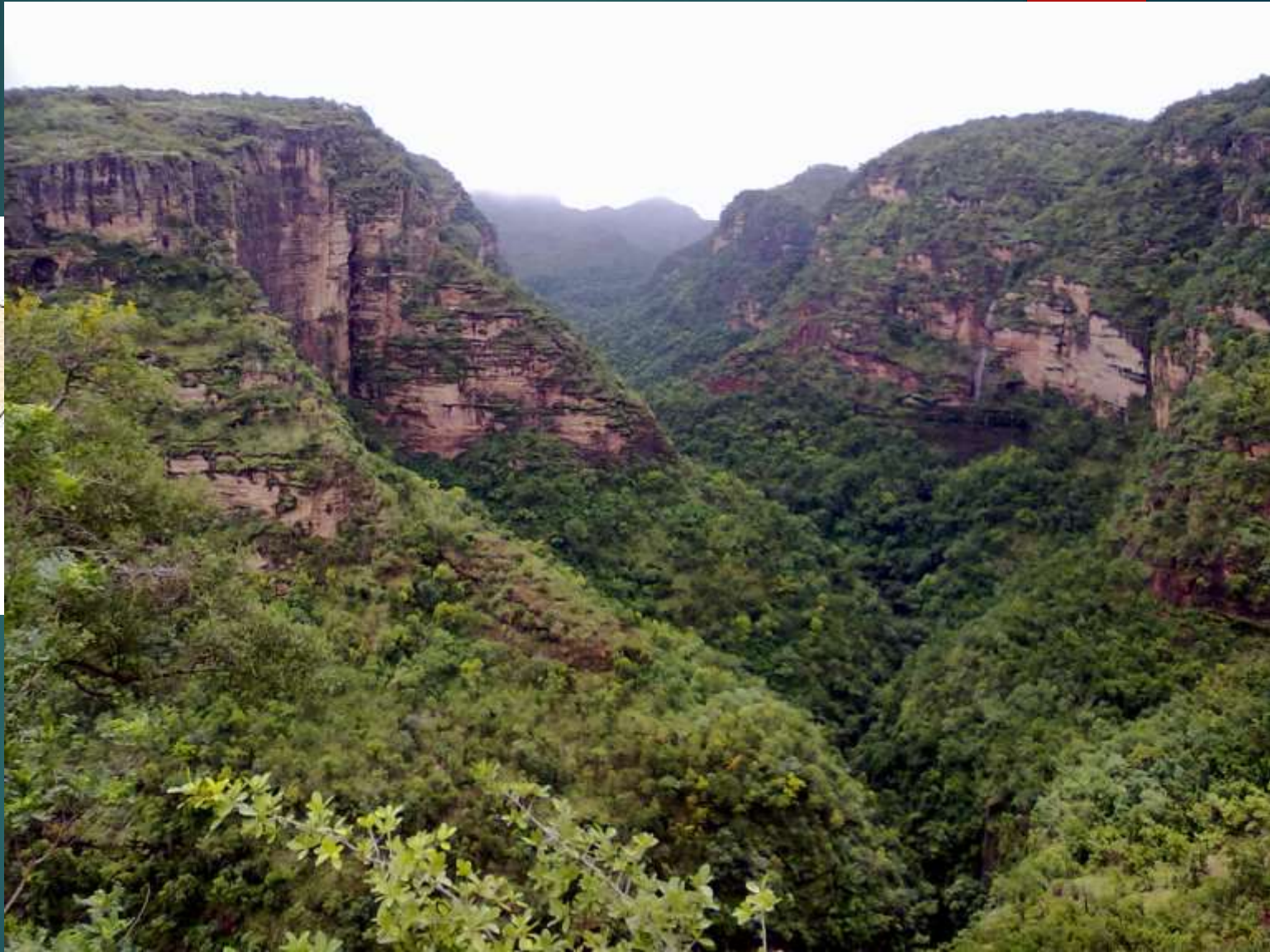


Biogeographic Zone:

Deccan Peninsula



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Deccan Peninsula	1380339	41.99	24	9798.91	0.71	130	46230.45	3.35	151	56029.36	4.06



Central Highlands, Eastern Ghats



Biogeographic Zone:

Gangetic Plains



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Gangetic Plain	354848	10.79	6	2363.44	0.67	32	5372.05	1.51	38	7735.49	2.18

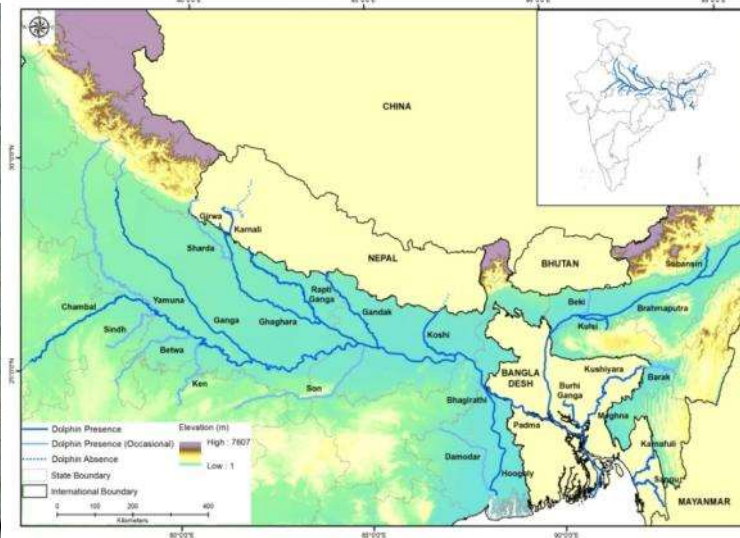


Gangetic Dolphin

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	<ENDANGERED>	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX



© Mansur/BCDP



- ❖ A blind dolphin in one of the world's most populated areas
- ❖ Less than 2000 individuals and continuously declining
- ❖ Endangered and protected by the Government of India
- ❖ Threatened due to dams and barrages, poaching and pollution
- ❖ Identification of more critical of habitats of dolphin and prepare management plan for the same
- ❖ Awareness programme to protect the species from fisheries and pollution



Gharials





Gharials: Threatened by poaching/fisheries



planetwildlife
MAGAZINE



Ghariales: Threatened by pollution



Gharials: No place to go

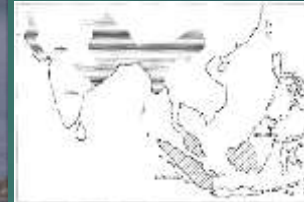




Gharials

Gavialis gangeticus

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	< CRITICALLY ENDANGERED >	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR		



- ❖ Less than 200 individuals in the world and most are in India
- ❖ Critically Endangered
- ❖ Extirpated from many places and continuously declining
- ❖ Protected and conservation breeding programs by the Governments
- ❖ But still declining due to change river flows, poaching and pollution
- ❖ About a 1000 juvenile sub adults and adults are in captivity but have no destination to be reintroduced in India
- ❖ Protection of river stretches, free from pollution, more artificial breeding centre etc

Biogeographic Zone:

Coasts



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Coasts	91319	2.78	5	1731.18	1.90	20	2959.43	3.24	25	4690.61	5.14



Sea turtles



Whale Sharks



Biogeographic Zone:

North East

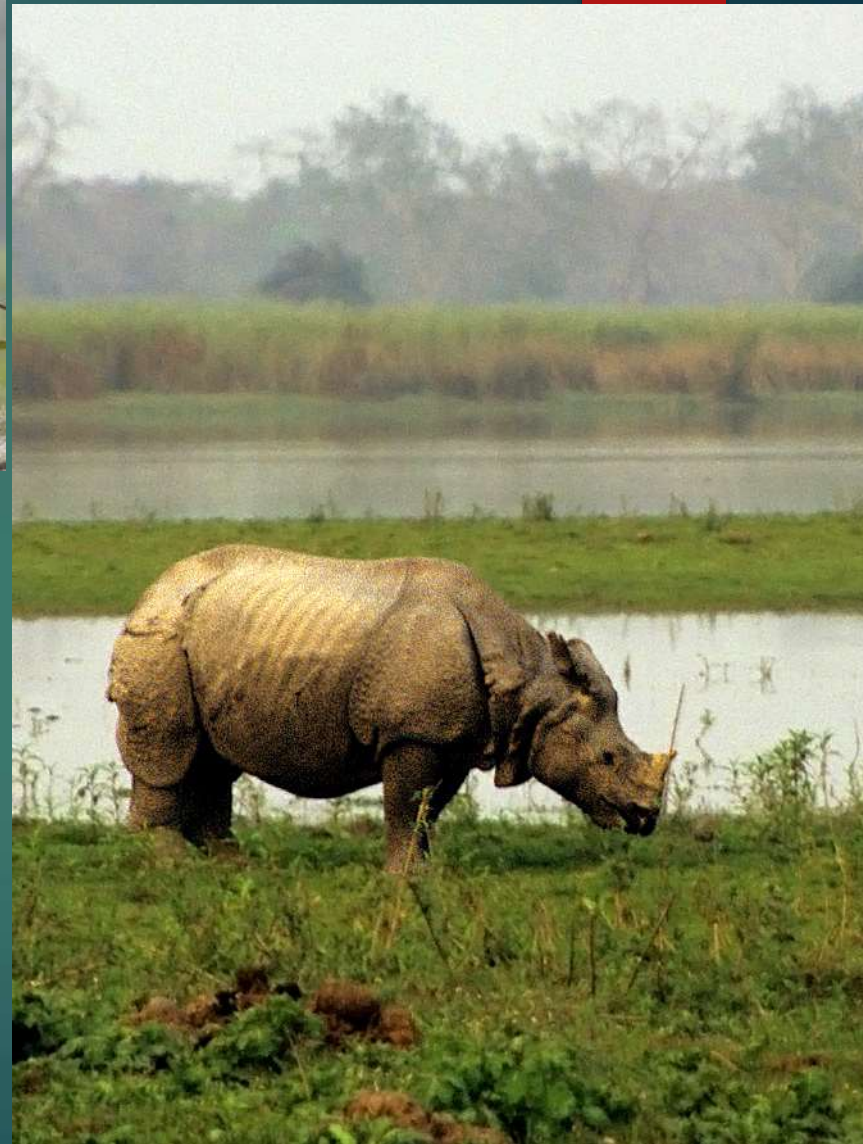


Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
North East	171340	5.21	13	2674.00	1.56	37	3736.76	2.18	50	6410.76	3.74

North Eastern India

North-East India







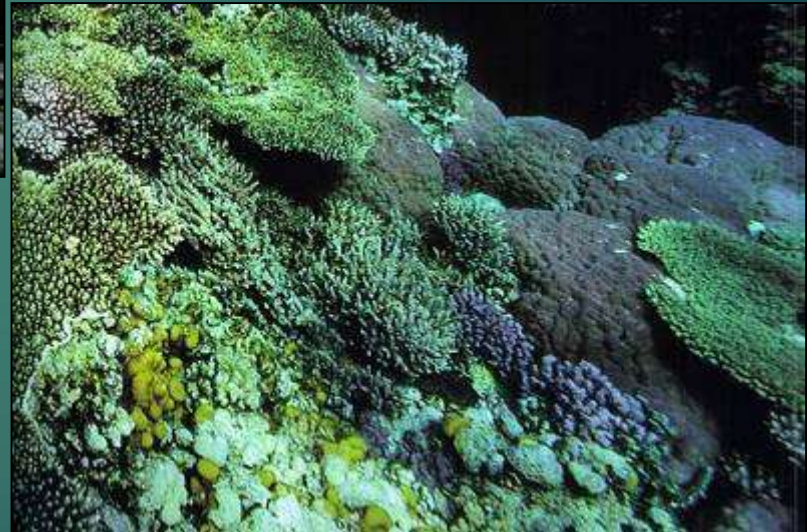
Sangai *Rucervus eldii eldii*

- Single, isolated and small population ~100
- Found only in Keibul Lamjao NP, Manipur
- Endangered (IUCN), Schedule-I species (WPA)
- Globally threatened
- Highly inbred, low genetic diversity



Biogeographic Zone:

Islands



Zone Name	Zone Area (km ²)	% of India	No. of NPs	Area (km ²)	% of Zone	No. of WLS	Area (km ²)	% of Zone	No. of NPs + WLS	Area (km ²)	% of Zone
Island	8249	0.25	9	1153.94	13.99	96	389.39	4.72	105	1546.30	18.75





Action Plan for Mitigation of Human-Crocodile Conflicts in the Andaman and Nicobar Islands



Ministry of Environment, Forest
and Climate Change
Government of India



भारतीय वन्यजीव संस्थान
Wildlife Institute of India



Measures for mitigating HCC in Andaman & Nicobar Islands



2. **Human Crocodile Co-existence Zone (HCCZ)**- Include creeks and areas where crocodile habitat and human settlements are in close proximity and are known for occasional or regular conflicts. Management interventions are needed to mitigate the conflicts for peaceful co-existence of humans and saltwater crocodiles.
3. **Crocodile Free Zone (CFZ)**- Include areas important for livelihood of local communities. Activities like fishing, aquaculture, tourism etc are to be permitted.

This zone has to be kept '**Crocodile Free**' through all possible means.

Any crocodile that is sighted in CFZ would be declared as '**Problem Crocodile**', to be captured and translocated to the proposed '**Rescue and Rehabilitation Centre**'.

Contd...

DISTRIBUTION BY BIOGEOGRAPHIC ZONES

The existing distribution of NPs and PAs by Zones is as follows

Zone	Name	% as NPs	% as PAs
1.	Trans-Himalaya	3.55	9.20
2.	Himalayas	3.58	9.94
3.	Desert	1.48	7.51
4.	Semi-Arid	0.25	2.65
5.	Western Ghats	2.52	9.48
6.	Deccan	0.62	3.69
7.	Gangetic Plain	0.67	2.16
8.	Coasts	1.90	6.15
9.	North-East India	1.13	2.54
10.	Islands	10.92	15.43

DISTRIBUTION BY BIOTIC PROVINCE

Five provinces have a PA network totalling less than 2.0% of the province

These are:

3A	Thar Desert	1.78
4A	Punjab Plains	1.08
6E	South Deccan	1.32
7B	Lower Gangetic Plain	1.20
8A	West Coast	1.96

Note: In 1988 eleven provinces had a coverage below 2.0%

MAMMAL SPECIES OF CONSERVATION SIGNIFICANCE

12 Mammalian species have no or insignificant populations in a National Park. Species concerns are:

Indian Wild Ass	3A	Kutchchh
Pharye's Leaf Monkey	8B	Assam Hills-Tripura
Malabar Civet	5A+B?	Western Ghats, Kerala
Malay Sun Bear	8B	extinct in India
Markhor	2A	N.W. Himalaya, J&K
Argali/Nayan	1A	Ladakh
Pallas Cat	1A	Ladakh
Rusty-spotted cat	5B+6B?	Maharashtra & Gujarat
Tibetan Antelope	1A	Ladakh
Tibetan Gazelle	1A	Ladakh
Pig-tailed Macaque	8B	Assam Hills
Stump-tailed Macaque	8B	Assam Hills

Hangul, Sangai, Urial, Tibetan Ass, Dryland Swamp deer, Asiatic Lion, Golden Langur, Hispid Hare, Pygmy Hog are all dependent on the protection offered in a single NP.

THE CONSERVATION STATUS OF SPECIES

Viable population found in NO NP

Crab-eating macaque	10B	Two new NPs in Nicobar
Indian Wild Ass	3B	Upgrade WLS to NP in Gujarat
Pharye's Leaf Monkey	9B	Need for a park in Tripura
Malabar Civet	5A/B	Survey-possible in Annamalai
Malay Sun Bear	9B ?	EXTINCT IN INDIA-SURVEY
Markhor	2A	Possible in Pir Panjal WLS - TRANSLOCATE to new home
Argali/Nayan	1A/2C	SURVEY(few in Hemis, few in North Sikkim)
Pallas Cat	1A	SURVEY
Rusty-spotted cat	5A/B	SURVEY
Tibetan Antelope	1B	SURVEY
Tibetan Gazelle	1B	SURVEY
Pig-tailed Macaque	9B	Possible WLS in Assam, Nagaland SURVEY
Stump-tailed Macaque	9B	Possible WLS in Assam, Nagaland SURVEY
Grizzled Giant Squirrel	6E	WLS in Tamil Nadu and Kerala

THE CONSERVATION STATUS OF SPECIES

Found in only ONE NP

Hangul	2A	TRANSLOCATE
Sangai	9B	TRANSLOCATE
Urial	1A	SURVEY
Tibetan Ass	1B	Rupshu NP in Ladakh (Proposed)
Rhinoceros	7A,B,9A	MORE TRANSLOCATION
Asiatic Lion	4B	TRANSLOCATE
Central Indian Swampdeer	6A	TRANSLOCATE

THE CONSERVATION STATUS OF SPECIES

The following five species may not have a viable population in any NP

- **Caracal**
- **Musk Deer**
- **Desert Cat**
- **Serow (possible in new areas for Arunachal)**
- **Lynx**

PROTECTED AREA SUMMARY OF INDIA BY BIOGEOGRAPHIC ZONE

Biogeographic Zone	Zone Area in km ²	Existing PAs	Area in km ²	Protected Areas % of Zone Area
1- Trans Himalaya	184823	7	17002.5	9.20
2- Himalaya	210673	67	20939.36	9.94
3- Desert	214014	6	16076.08	7.51
4- Semi-Arid	539479	88	14320.49	2.65
5- Western Ghats	132179	53	13000.33	9.84
6- Deccan Peninsula	1380339	130	50870.72	3.69
7- Gangetic Plain	354848	36	7672.12	2.16
8- Coasts	91319	26	5619.58	6.15
9- North East	171340	37	4354.15	2.54
10- Island	8249	102	1273.13	15.43

Key Challenges for Wildlife Conservation

At a glance...

- ◆ Mitigation of Human-wildlife conflicts.
- ◆ Delineation of Eco-Sensitive Zones (ESZs).
- ◆ Management of Invasive Alien Species.
- ◆ Mainstreaming of wildlife conservation in development planning.



more...

NWAP (2017-2031): Highlights...

- ◆ The Plan is based on the premise that essential ecological processes that are governed or strongly moderated by ecosystems are essential for food production, health and other aspects of human survival and sustainable development.
- ◆ The Plan recognizes the intrinsic value of nature and its manifold components as '*Life Support Systems*', which are considered vital for all societies regardless of their stage of development.
- ◆ The Plan emphasizes the preservation of genetic diversity and sustainable utilization of species and ecosystems, which have a direct bearing on our scientific advancements and support to millions of rural communities.



NWAP (2017-2031): Highlights...

- ◆ The Plan advocates adopting a '*landscape approach*' for conservation of wildlife, which is a significant advancement over the '*protected area-centric*' approach of the earlier plan (2002-2016).
- ◆ The Plan underscores planning and implementation of '*Endangered Species Recovery Plan*' of wild animal species inhabiting terrestrial, inland aquatic, coastal and marine ecosystems.
- ◆ The Plan for the first time recognizes the concerns relating to climate change impacts on wildlife, by integrating actions that need to be taken for its mitigation and adaptation into wildlife management planning process.



NWAP (2017-2031): Highlights...

- ◆ The Plan takes into account the increasing need for people's support for conservation of wildlife and to this effect recommends strengthening of the '*core- buffer- multiple use surround*' structure with higher inputs for eco-development, education, innovation, training, extension, conservation awareness and outreach programmes.
- ◆ The Plan addresses the rising human animal conflict issues, owing to shrinkage, fragmentation and deterioration of habitats and generating animosity against wild animals and protected areas.



more...

NWAP (2017-2031): Highlights...

- ◆ The Plan recommends that the national planning processes have to take comprehensive cognizance of adverse ecological consequences of reduction and degradation of wilderness areas from the pressures of population, commercialization and development projects.



NWAP (2017-2031): Components...

Strengthening and Promoting the Integrated Management of Wildlife and their Habitats

Chapter	Theme	Actions	Projects
1	Strengthening and Improving the Protected Area Network	11	22
2	Landscape Level Approach for Wildlife Conservation	6	13
3	Conservation of Threatened Species	5	8
7	Control of Poaching and Illegal Trade in Wildlife	4	14
8	Wildlife Health	4	10
9	Mitigation of Human-Wildlife Conflict	6	11
	Total	36	78



more...

NWAP (2017-2031): Components...

Adaptation to Climate Change and Promoting the Integrated and Sustainable Management of Aquatic Biodiversity in India

Chapter	Theme	Actions	Projects
4	Conservation of Inland Aquatic Ecosystems	13	19
5	Conservation of Coastal and Marine Ecosystems	11	20
6	Integrating Climate Change in Wildlife Planning	7	11
	Total	31	50



more...

NWAP (2017-2031): Components...

Promoting Eco-tourism, Nature Education and Participatory Management

Chapter	Theme	Actions	Projects
10	Management of Tourism in Wildlife Areas	6	15
11	People's Participation in Wildlife Conservation	4	16
12	Conservation Awareness and Outreach	4	26
	Total	14	57



NWAP (2017-2031): Components...

Strengthening Wildlife Research and Monitoring and Development of Human Resources in Wildlife Conservation

Chapter	Theme	Actions	Projects
13	Development of Human Resources	7	16
14	Strengthening Research and Monitoring	4	17
	Total	11	33



more...

NWAP (2017-2031): Components...

Enabling Policies and Resources for Conservation of Wildlife in India

Chapter	Theme	Actions	Projects
15	Improving compliances of Domestic Legislations and International Conventions	3	18
16	Ensuring Sustained Funding for Wildlife Sector	4	7
17	Integrating National Wildlife Action Plan with other Sectoral Programmes	3	6
	Total	10	31

In total, the Plan suggests 102 Conservation Actions with 249 Projects



Nature Nurtures... Conserve Nature

Together we can build a frame work that
nourishes and not depletes our natural assets...

Thank You !
