

BIODIVERSITY AND CONSERVATION

- The sum of all the organisms in a given area
- But, it can vary according to the biologist and situation...

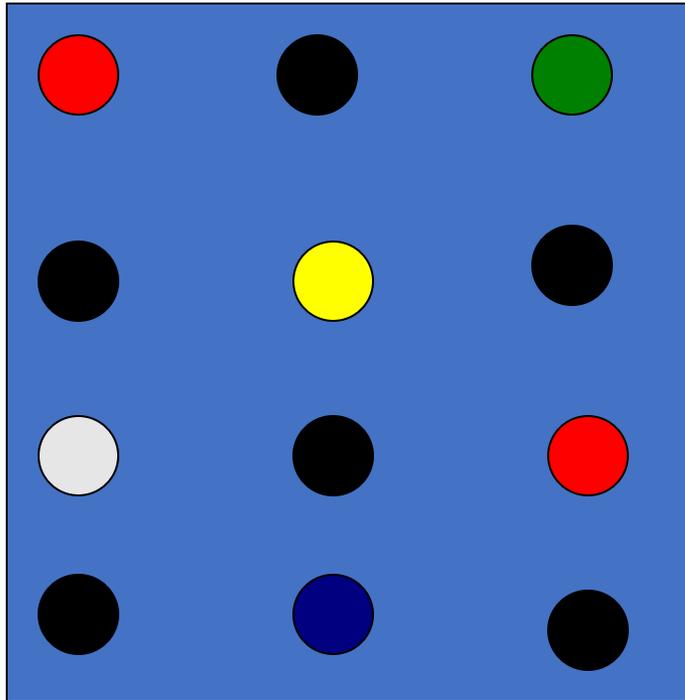


Diversity = variety

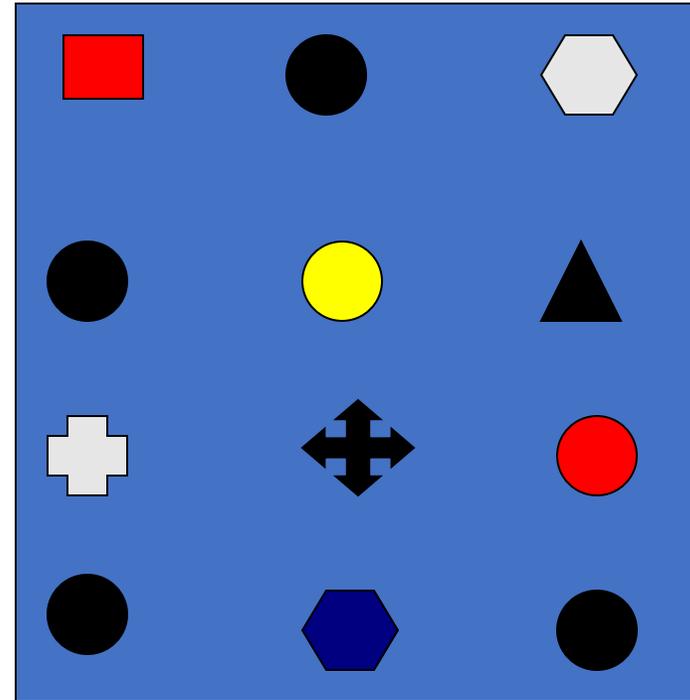
Bio= living

Thus, variability among living organisms from all sources including inter alia, terrestrial, marine & other aquatic ecosystems and ecological complexes of which they are part of.

Which is more diverse?

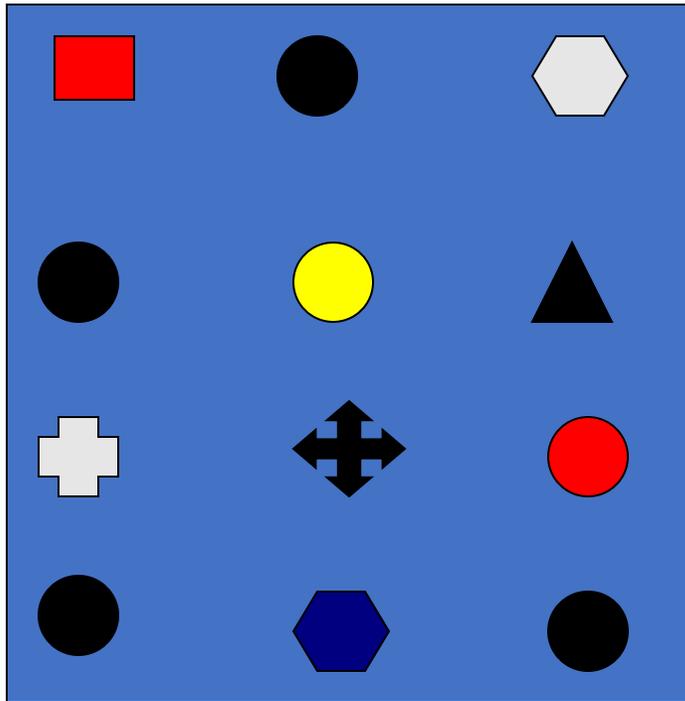


A

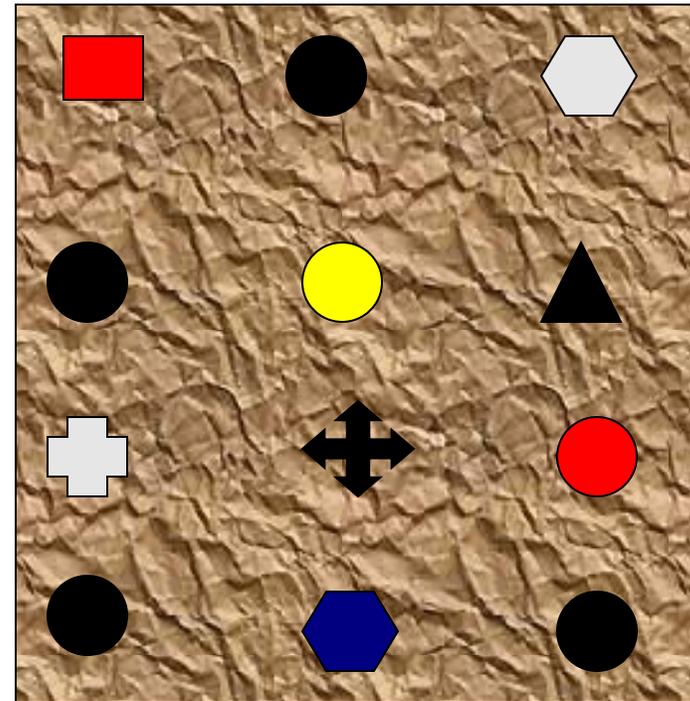


B

Which is more diverse?

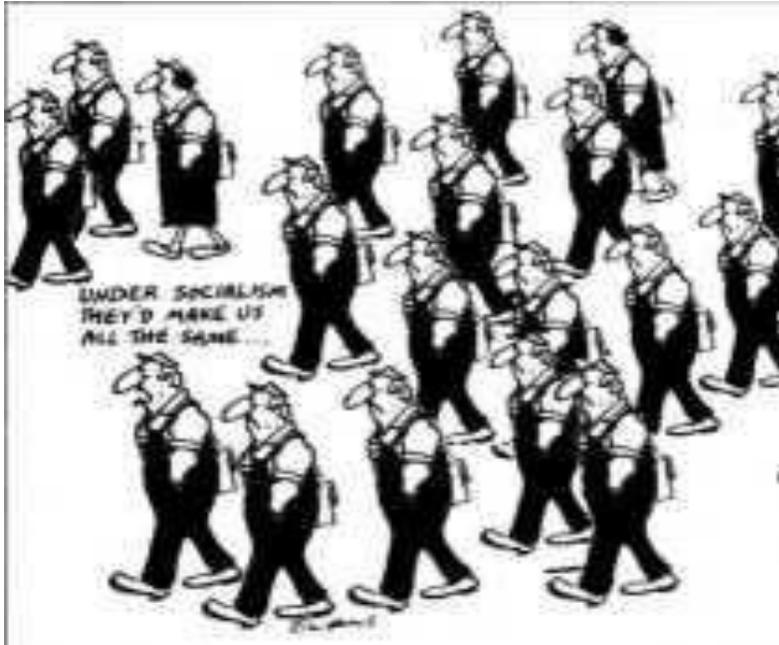


A



B

Which has more cultural diversity?



A



B

Which has more biodiversity?



A



B

Which has more biodiversity?



A



B

Biodiversity has Intrinsic Value

**Intrinsic Value = Something that has value
in and of itself**

Biodiversity also has Utilitarian Value

Utilitarian Value = the value something has as a means to another's end.

Utilitarian values include:

- **Goods eg sustainable timber**
- **Services eg eco-tourism**
- **Information eg National Park Wardens**

What do we get from biodiversity?

Oxygen

Food

Clean Water

Medicine

Aesthetics

Ideas

Should we be concerned about biodiversity?

What we know:

The Earth is losing species at an alarming rate

- Some scientists estimate that as many as 3 species per hour are going extinct and 20,000 extinctions occur each year.
- when species of plants and animals go extinct, many other species are affected.

WILDLIFE IN DANGER
THE MOST THREATENED SPECIES

1	Brown
2	White
3	Grey
4	Black
5	Yellow
6	Red
7	Blue
8	Green
9	Purple
10	Orange

That's one more creature we can remove from the endangered species list.

It's become extinct.



Levels of Biodiversity....

Genetic

- Genes within same species show variation
- E.g. Colour & sizes of Rose

Species

- Represents species richness & abundance in a community
- No. of plants, animals, birds in an area.

Ecosystem

- Diversity in complex systems in physical, ecological, food web, nutrient cycling
- Diversity in forest

There are 3 components of biodiversity

1. Diversity of genes

Chihuahuas, beagles, and rottweilers are all the same species —but they're not the same because there is variety in their genes.



Chihuahua



Beagle



Rottweilers

Genetic Diversity

- Everyone differs from others in their DNA to some degree (except?)
- So there is genetic diversity present in all species and populations
- Genetic Diversity provides the raw material for evolution - survival of the fittest.

DNA profiles of Primates

- % DNA similar

- **100**

- **99**

- **98**

- **97**

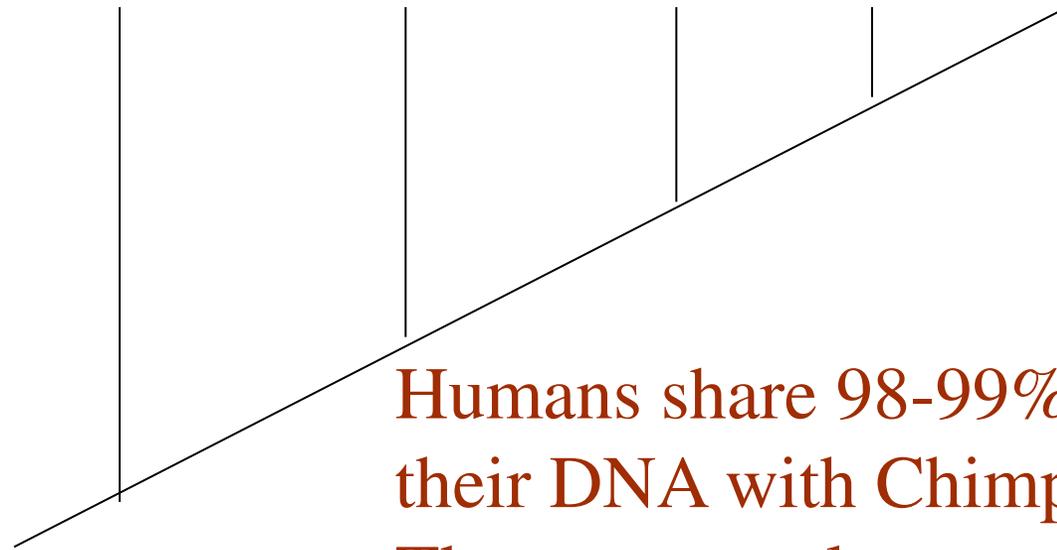
- **96**

- **95**

- **94**

- **93**

- Gibbon Orang Utan Gorilla Chimp Man



Humans share 98-99% of their DNA with Chimps. They are our closest living relatives.

More genetic diversity = more flexibility to adapt to environmental changes

Less genetic diversity = depressed genetic diversity = less chance of survival

Inbreeding = mating between genetically related individuals = less fitness = more diseases surface.

How? Give examples in humans. In animals?

There are 3 components of biodiversity

2. Diversity of number of species

For example, monkeys, dragonflies, and meadow beauties are all different species.



Saki Monkey



Golden Skimmer



Meadow Beauty

There are 3 components of biodiversity

3. Variety of ecosystems

Lakes, Ponds, and Rivers are all Freshwater Ecosystems.

Rocky coast, Sand Dune, Estuary, Salt Marsh , Coral Reef are all Marine Ecosystems.

So what's an ECOSYSTEM???

ECOSYSTEM DEFINITION

“ A self-contained community of microorganisms, animals and plants, that interact with each other and with their physical environment.”

eg a rock
pool

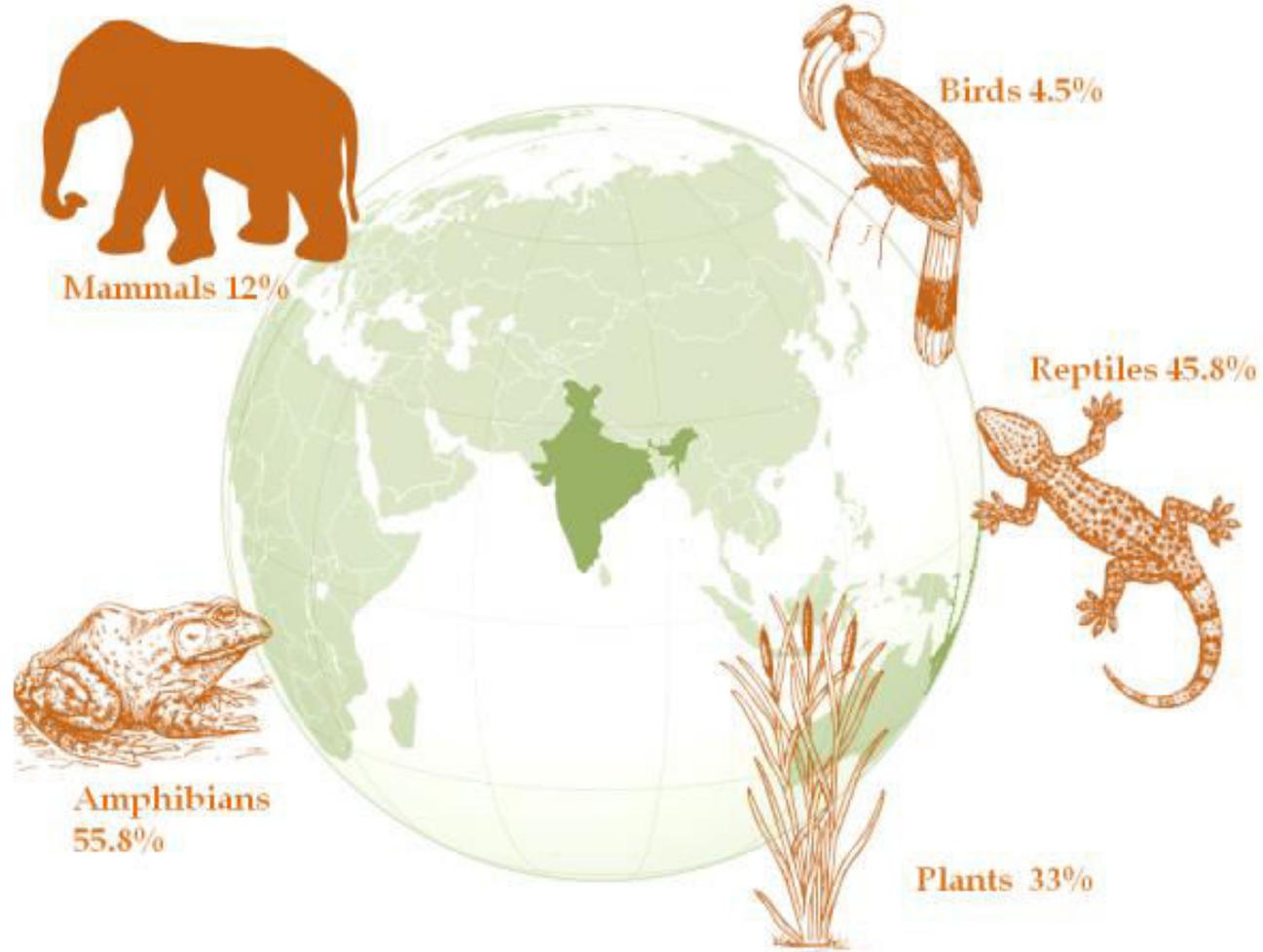


India – as a Mega-Diversity Nation

- Endemism- species which are restricted only to a particular area. Eg. 50% Lizards are endemic to India. Western Ghats are the site of maximum endemism.
- Center of origin: Nearly 5000 species of flowering plants, 166 species of cropping plants and 320 species of wild relatives of cultivated crops have their origin in India.
- Marine Diversity: India has 7500 Km long coastline having (mangroves, estuaries, coral reefs, black waters) rich biodiversity.
 - More than 340 species of corals are found in India
 - Rich in Mollusks, crustaceans, polychaetes, corals
 - 93 major wetlands, Large Forest Cover.

Endemism

Endemism in India's Biodiversity



Global Biodiversity....

- Currently about 1.9 million species are known,
- Thought to be a significant underestimate of the total number of species (as of 2010).
- 0-30 million insects;
- 5-10 million bacteria;
- 1.5 million fungi;
- 1 million mites
- 3,21,212 – Plants
 - 1,367,555 animals, including: 1,305,250 invertebrates ,62305 vertebrates

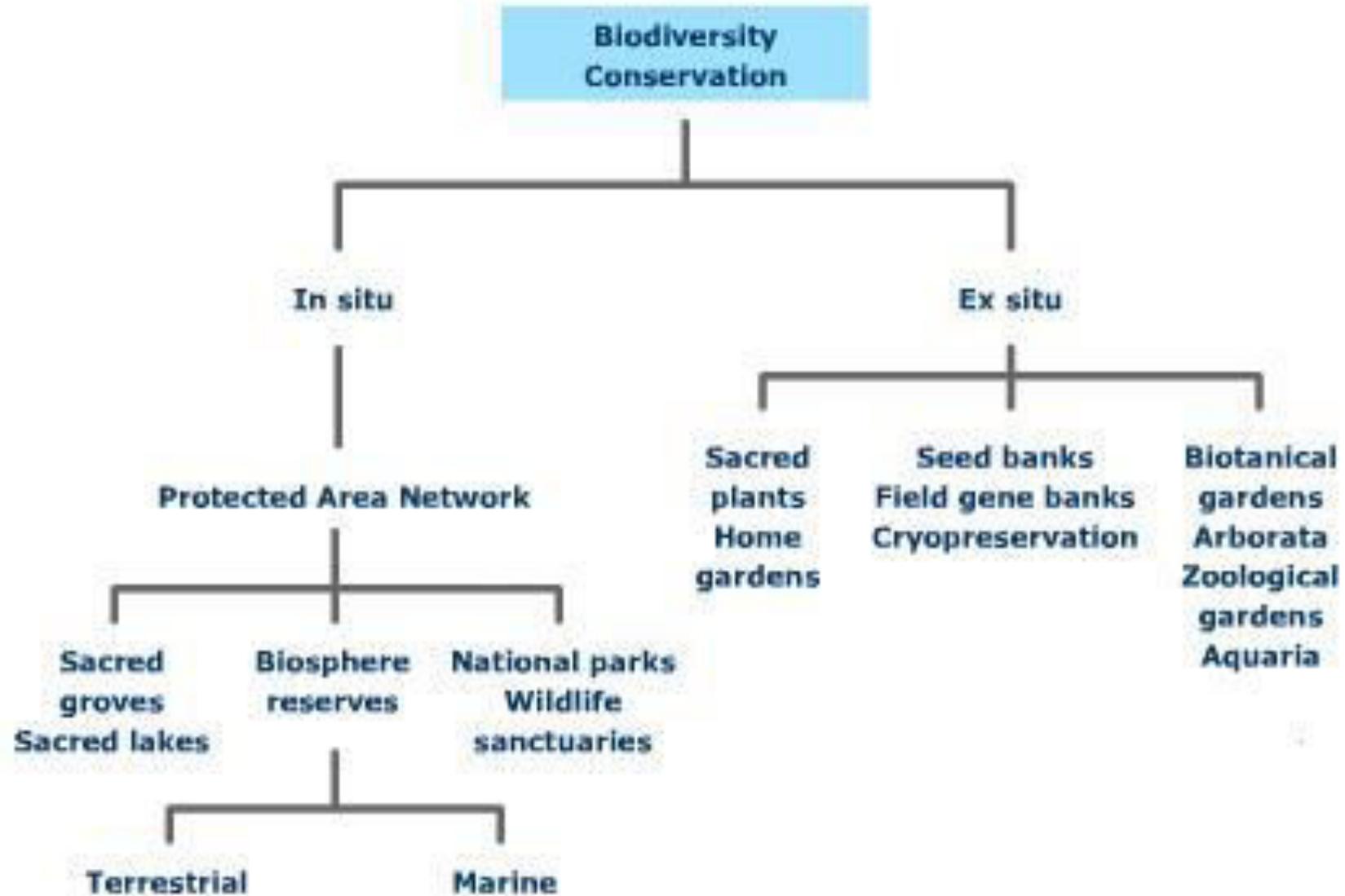
Did u know this..?????

- 50 to 80% of Biodiversity is in rain forests.
- Deserts show minimum biodiversity
- Many species are identified everyday...
- List goes on increasing
- Marine biodiversity is extremely high.
- 1,25,000 flowering plant species are in Tropical forests
- Roughly 1.5 million species are known till date which may be just 15% of actual number.

Biodiversity Conservation

- Considering the rich diversity and the threats conservation of this vast biodiversity is very important
- 2 major approaches
- **In-situ** conservation (at the place)
- **Ex-situ** conservation (out of the place)

Conservation Measures



Threats to biodiversity

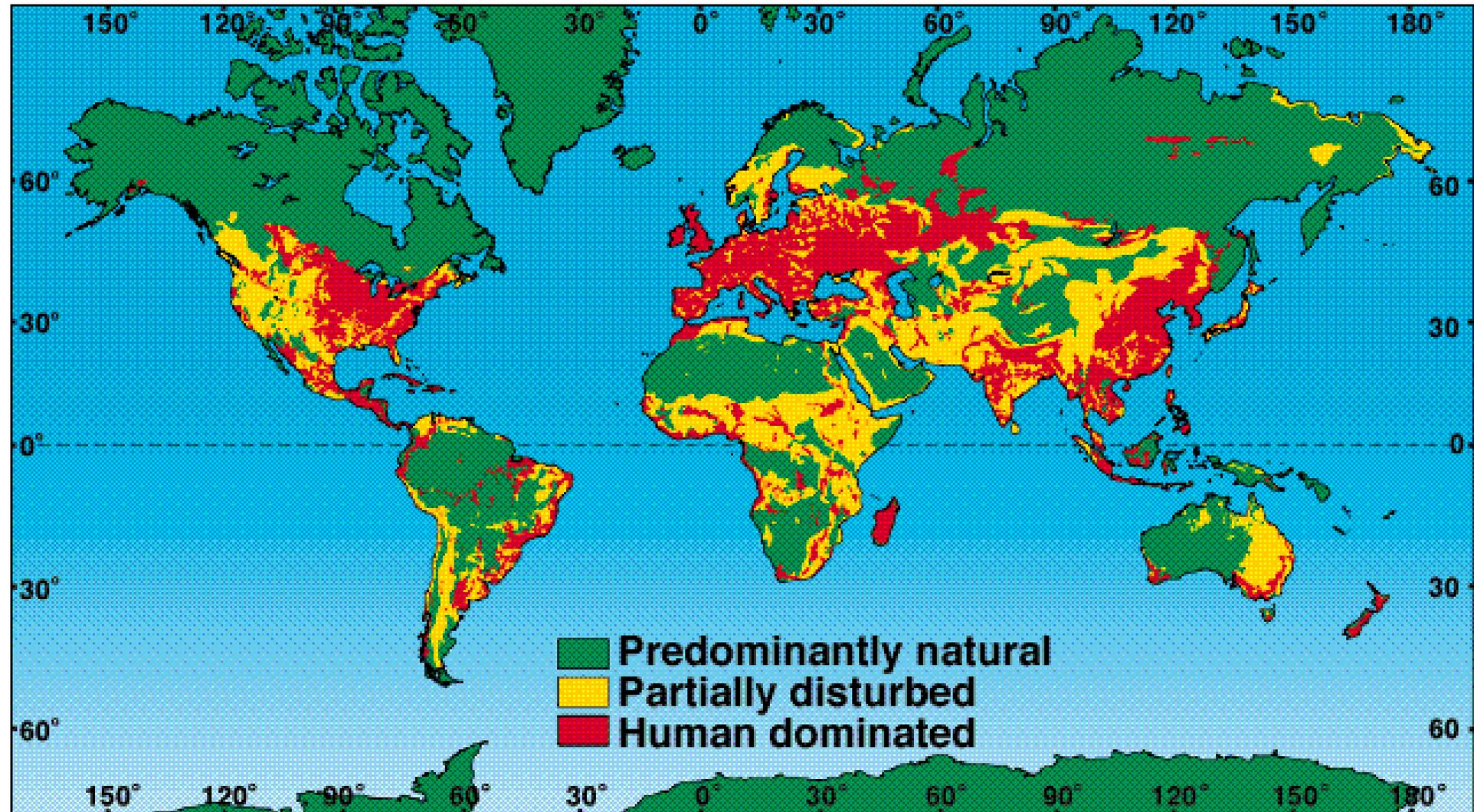
- **Anthropogenic causes**

- Loss of habitat
- Poaching
- Man- Animal conflict
- Introduction of exotic varieties
- Pollution
- Global warming and Climate change

- **Natural causes**

- Narrow geographical area
- Low population
- Low breeding rate
- Natural disasters

A human-disturbance map.



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SCIENCE & SPACE

Bird warning: 10 percent extinct by 2100

Tuesday, December 14, 2004 Posted: 10:05 AM EST (1505 GMT)

WASHINGTON (Reuters) -- Ten percent of all bird species are set to disappear by the end of this century -- and with them the services they provide such as cleaning up carcasses and spreading seeds, U.S. researchers say.

A careful study of extinction rates so far, conservation measures underway and climate and environmental change shows that at least 1,200 species of birds will be gone by 2100. And that is a conservative estimate, the team at Stanford University in California said Monday.

"Even though only 1.3 percent of bird species have gone extinct since 1500, the global number of individual birds is estimated to have experienced a 20 percent to 25 percent reduction during the same period," they wrote in their report, published in the Proceedings of National



The gold macaw, just one of many endangered bird species.

—advertiser links— [what's this?](#)

Extinct on LAUNCH
Check out Extinct. See artist photos, music videos, live interviews and...
launch.yahoo.com

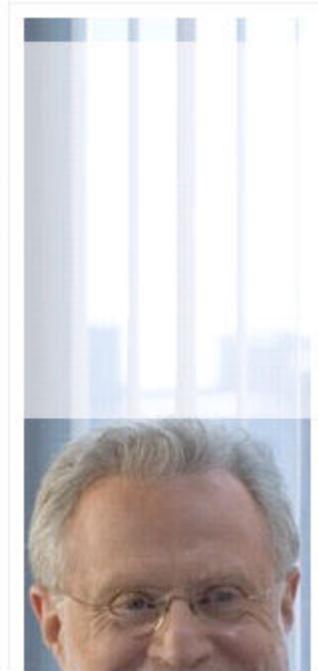
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Stanford University

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Loss of habitat

- Continuous increase in human population and escalating demand for our natural resources
- Conversion of forested land to agriculture.
- Loss of habitat to grazing land, industries, roads and cities.
- Habitat loss leads to the formation of isolated, small, scattered populations.



are
los
to
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Poaching

- Hunting for various body parts.
- Illegal trade of skins, tusks, hair, horns
- Many animals fall prey to various traps
- International market very active
- Tibet, China
- Tiger skins, elephant tusks etc
- Cost is very less.



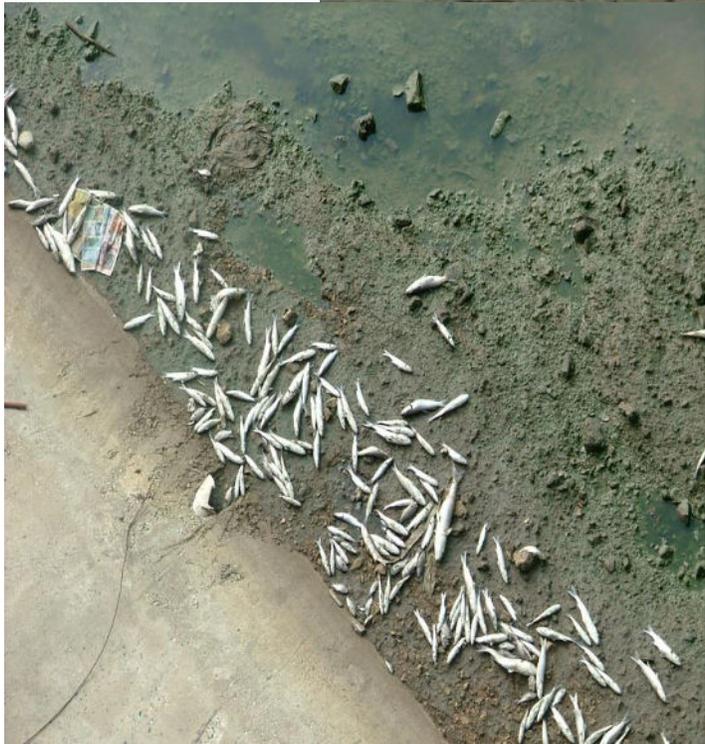
Man Animal conflict

- When animal enters human territory and kills
- From fear



Pollution

- Oil Spills
- Biomagnification
- Plastic accumulation
- Noise
- Algal Blooms
- Heat



Introduction of Exotic / Invasive species

- Introduced from outside.
- Harm the growth of local species.
- Entire population wiped out
- Competition for resources
- Eg: Congress grass in Sanjay Gandhi National Park.
- Some exotic species like Eucalyptus, Australian Acacia and Gliricidia have been introduced in India for afforestation.

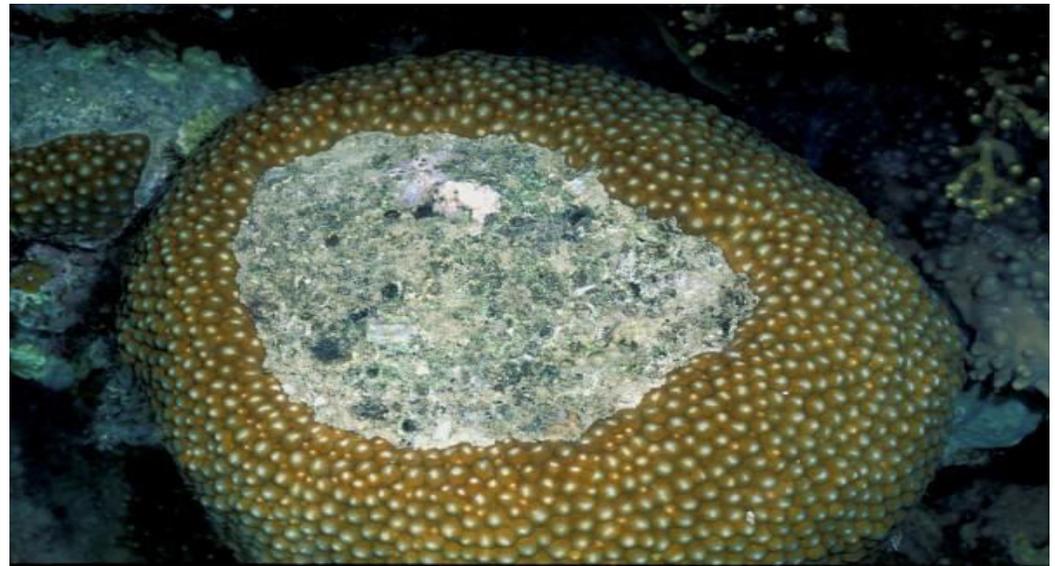
Global Warming and Climate Change

- As temperatures increased in recent decades, certain species began breeding and migrating earlier than expected.
- Other studies found that the geographical range of numerous species had shifted pole ward or moved to a higher elevation -- indicating that some plants and animals are occupying areas that were previously too cold for survival.
- Decline in breeding populations



Coral Bleaching

- Increase in temperature causes bleaching.
- The Great Barrier Reef along the coast of Australia experienced bleaching events in 1980, 1982, 1992, 1994, 1998, 2002, and 2006.
- While most areas recovered with relatively low levels of coral death, some locations suffered severe damage, with up to 90% mortality

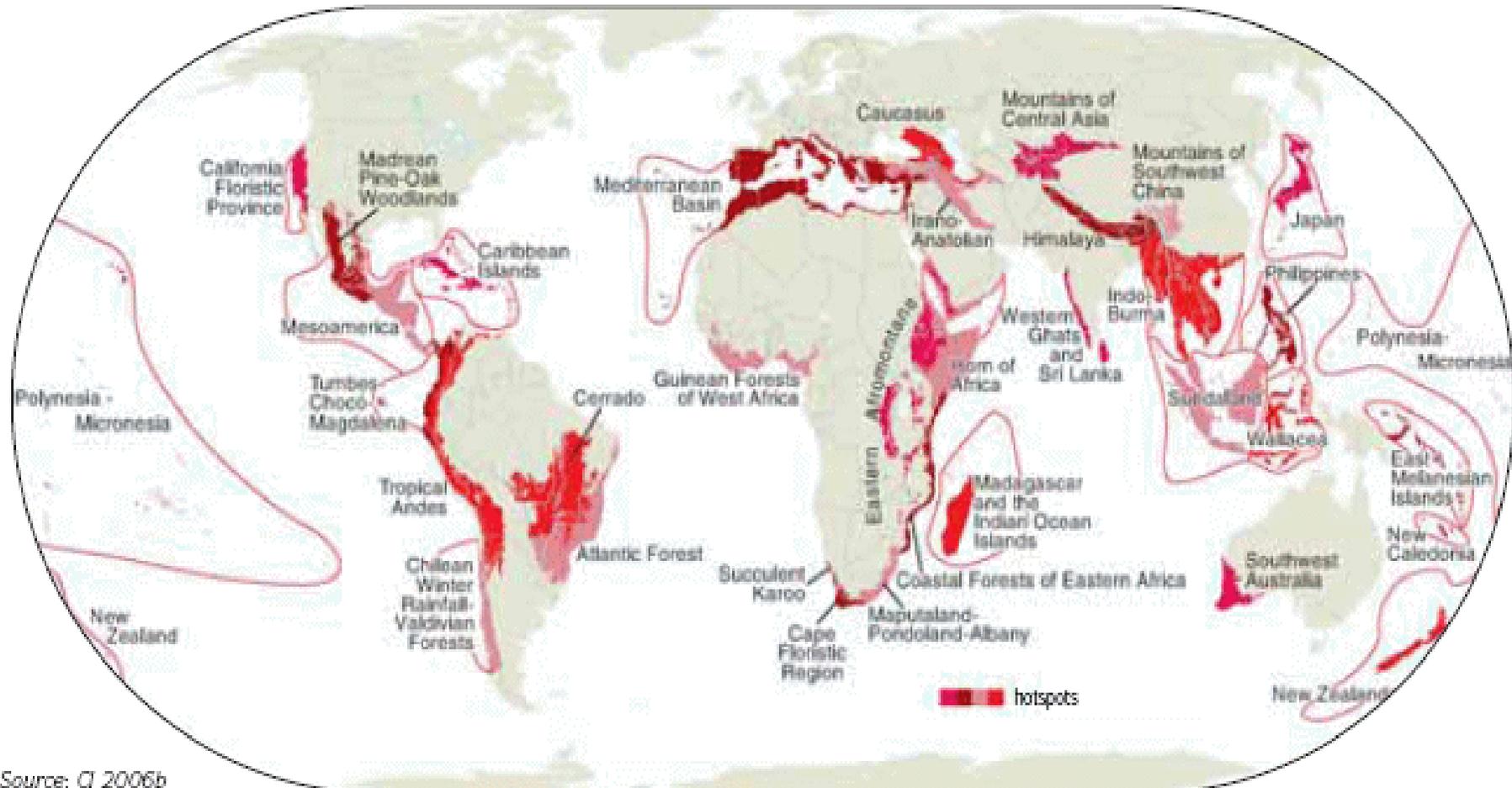


Hotspots of Biodiversity

- A **biodiversity hotspot** is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.
- Areas which exhibit high species richness as well as endemism are termed as Hotspots of Biodiversity.
- Myers introduced this term, at that time 25 Hotspots were identified out of which 2 were in India. Later 9 were added more bringing a total to 34.
- About 40% terrestrial & 25 % vertebrate are endemic found in this hotspots
- After tropical rain forests the second highest number endemic species are found in Mediterranean
- These hotspots are threatened by human activities. More than 1 billion people most whom are desperately poor people, live in these areas.
- Measures protecting these areas should be planned.

Biodiversity Hotspots

Figure 4: Biodiversity hotspots



Source: CI 2006b

List of Hotspots

Sr. No	Name of Hotspots	Sr. No	Name of Hotspots
1	Tropical Andes	19	Indo-Burma
2	Mesoamerican Forests	20	South Central China
3	Caribbean	21	Western Ghats
4	Brazil's Atlantic Forest	22	South-Western Australia
5	Choc/Darien of Panama Western Ecuador	23	New Caledonia
6	Brazil's Cerrado	24	New Zealand
7	Central Chile	25	Polynesia/Micronesia
8	California Floristic Province	26	The Madrean Pine-Oak woodlands
9	Madagascar	27	Maputaland-Pondoland Albany
10	Eastern Arc & Coastal forest of Tanzania/ Kenya	28	The eastern Afromontane
11	Western African Forest	29	The Horn Africa
12	Cape Floristic Province	30	The Irano-Anatolian
13	Succulent Karoo	31	The Muntains of Central Asia
14	Mediterranean Basin	32	Eastern Himalaya
15	Caucasus	33	Japan
16	Sundaland	34	East Melanesiaan Islands
17	Wallacea		
18	Phillipines		

Eastern Himalayas

- Many deep and isolated valleys in Sikkim.
- 35,000 recorded flora endemic to Himalayas
- 4250 species in Sikkim of which 60% endemic
- *Sapria himalayana*: a parasitic angiosperm seen only twice in last 70 years



Western Ghats

- 17000 km² strip of forests
- 20% forest Evergreen and semi-evergreen
- 4 states: Maharashtra, Kerala, Karnataka and Tamil Nadu
- 40% endemic plants
- 62% amphibians
- 50% lizards
- Agastyamalai hills, Silent Valley, New Ambamalam Reserve basin
- **UNDER ALARMING THREAT**



INDO-BURMA

- East of Ganges – Brahmaputra lowland
- Indian states of Manipur, Mizoram, Tripura, Meghalaya, Nagaland, South Assam.
- One of the most densely forested regions of the country
- 13,500 species of plants out
- 1260 species of birds
- 430 mammals



Extinct Species.....

Asiatic Cheetah

(Acinonyx jubatus ssp. venaticus)

- **Extinct in India** since 1949.
- It lives in open semi-arid grassland, savannah, scrub or isolated low hillocks amidst plains
- Fastest animal on land and can achieve terrific speeds of 115-120 km/h
- Drier parts of southwestern and central Asia to India. In the past, the species used to occur in northern and central India.
- Presently extinct in India; now found in USSR and in northeastern Iran as scattered survivor.
- Main cause of extinction of this magnificent cat was destruction of **habitat due to increase in human habitation and overgrazing by domestic stock**



Pink Headed Duck

(Rhodonessa caryophyllacea)

- Size of a domestic duck. 60 cm in length.
- Its bill was reddish pink, eyes red orange and its feet dark with a red tint. It was not only unique in having a pink head and neck, but was also the only duck to lay perfectly spherical eggs which looked like unpolished billiard balls.
- Its habitat was tall grassland, floodplains and small lakes and ponds.
- **This bird was shy and secretive, and was rarely seen.**
- Resident of northern and northeastern India (Orissa, Bihar, Bengal, Assam and Manipur) in the forested foothills of the Himalayas and the adjoining plains. Some were also recorded as winter visitors to Punjab, Uttaranchal, Maharashtra, A P and T N.

- **Status:** Probably extinct, but until the last known area of its former range is surveyed, this cannot be confirmed.
- Its population started declining as early as 1878, obviously due to the shrinkage of its habitat and hunting.
- The last authentic sight record was in June 1935 (Darbhanga, Bihar).
- From 1984-1990, under the Project Endangered Birds, BNHS carried out intensive surveys to rediscover the bird, but were unsuccessful.



Wildlife Protection Act, 1972

- The **Wildlife Protection Act, 1972** is an [Act](#) of the [Parliament of India](#) enacted for protection of plants and animal species. Before 1972, [India](#) only had five designated [national parks](#).
- The Act provides for the protection of wild animals, birds and plants;
- It extends to the whole of [India](#), except the State of [Jammu and Kashmir](#) which has its own wildlife act.

- It has six schedules:
- [Schedule I](#) and part II of [Schedule II](#) provide absolute protection - offences under these are prescribed the highest penalties.
- [Schedule III](#) and [Schedule IV](#) are also protected, but the penalties are much lower.
- [Schedule V](#) includes the animals which may be hunted.
- The specified endemic plants in [Schedule VI](#) are prohibited from cultivation and planting.

- As of July 2018, there were 104 national parks encompassing an area of 40,501 km² (15,638 sq mi), comprising 1.23% of India's total surface area.

National Parks:

The Hailey National Park in Uttar Pradesh (now Uttaranchal) was the first national park in India, established in 1936. Later, the name was changed to Ramganga National Park but now it is called **Corbett National Park**, after the famous hunter-conservationists Jim Corbett.

Wildlife Sanctuaries

The Vedanthangal Wildlife Sanctuary in Tamil Nadu is perhaps the country's first officially declared bird sanctuary. It was established in 1925.

- Wildlife Sanctuaries are defined as a space which is set aside exclusively for the use of wild animals, who are protected. Wildlife sanctuaries are also referred to as wildlife refuges in some areas. These wildlife sanctuaries are managed by the Government where rangers or authorized employees patrol the area to ensure that no one hunts or otherwise harasses the animals.
- There are at least 500 wildlife sanctuaries in India, which attract travelers and tourists from all parts of the world.
- Some of the major wildlife sanctuaries are Corbett National Park, Gir Wildlife Sanctuary, Kaziranga National Park in Assam , Periyar Wildlife Sanctuary, Neyyar Sanctuary, Blackbuck National Park, Kutch Desert Wildlife Sanctuary and so on.

Tadoba Andhari Tiger Reserve

- **Tadoba Andhari Tiger Reserve** is located in [Chandrapur district](#), [Maharashtra](#) state, [India](#).
- It is Maharashtra's oldest and largest [National Park](#). Created in 1995, the area of the Reserve is 625.40 square kilometres (241.47 sq mi).
- This includes Tadoba National Park, created in 1955 with an area of 116.55 sq. km. and Andhari Wildlife Sanctuary created in 1986 with an area of 508.85 sq. km.

Flora:

- Tadoba reserve is a predominantly [southern tropical dry deciduous forest](#).
- [Teak](#) is the predominant tree species.
- Other deciduous trees include , [bija](#), [dhauda](#), [hald](#), [salai](#), [semal](#) and [tendu](#). [beheda](#), [hirda](#), [karaya gum](#), [mahua madhuca](#) (crepe myrtle) and [Lannea coromandelica](#) (wodier tree) are other common species.
- Axlewood ([Anogeissus latifolia](#)) is a fire-resistant species growing here. Palas or flame of the forest ([Butea monosperma](#)) adds vibrant color to the forest.
- [Black plum](#) trees grow in the riparian habitat around the lake.
- The climber [kach kujali](#) (velvet bean) found here is a medicinal plant used to treat Parkinson's disease. The leaves of [bheria](#) are used as an insect repellent and [bija](#) is a medicinal gum. [Beheda](#) is also an important medicine found here.

Fauna



Sambar deer at Tadoba National Park



Tiger at Tadoba



Tigress Maya with her Cubs



Tigress Madhuri in the Agarzari Buffer

There are **88 tigers**, as of August 2016 in the reserve, and **58** in the forests immediately outside the reserve.

Mammals, including: Indian leopards, sloth bears, gaur, nilgai, dhole,

striped hyena, small Indian civet, jungle cats,

sambar, barking deer, chital, chausingha and honey badger.

Reptiles are : endangered Indian python and the common Indian monitor. Terrapins, Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.

The lake contains a wide variety of **water birds**, and **raptors**.

195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are examples of raptors seen in the park.



Indian Paradise Flycatcher - Female

Kanha Tiger Reserve



- **Kanha Tiger Reserve**, also called **Kanha National Park**, is one of the [tiger reserves of India](#) and the largest [national park](#) of [Madhya Pradesh](#), state in the heart of India.
- The present-day Kanha area is divided into two sanctuaries, Hallon and Banjar, of 250 and 300 km² respectively.
- Kanha National Park was created on 1 June 1955 and in 1973 was made the Kanha Tiger Reserve.
- Today it stretches over an area of 940 km² in the two districts [Mandla](#) and [Balaghat](#).

Kanha Tiger Reserve is:

- . Area: (core) 940 km²**
- . Terrain: sal and bamboo forests, plateaus, meadows and meandering streams**
- . Best season: February to June**
- . Morning visiting hours: 6:30 am to 11:00 am**
- . Evening visiting hours: 3:00 pm to 6:00 pm**
- . Closed: 1 July to 15 October**



Tiger at Kanha hiding in bamboo



Spotted deer in Kanha



Tigers killing a wild boar



The gaur is the largest wild animal in the park.



A male hard-ground barasingha

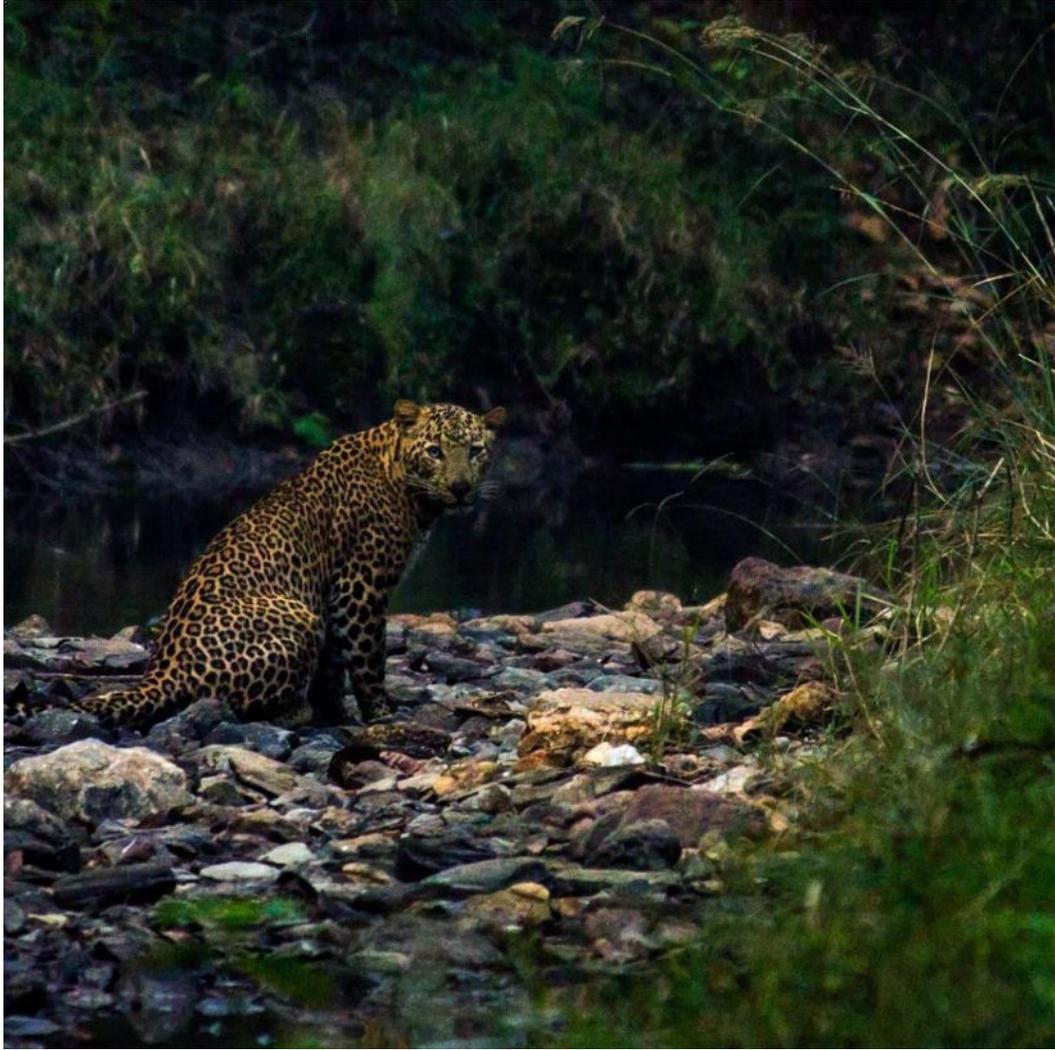
Other animals seen at kanha :

- [Blackbuck](#) have inexplicably become very rare. They vanished completely, but have been reintroduced recently inside a fenced area in the park.
[Nilgai](#), the [Indian wolf](#), [Striped hyena](#) and [sloth bear](#) are seen occasionally.
Langurs and [wild boars](#) are common,
The [rhesus macaque](#) is seen less often.
- Nocturnal animals like fox, hyena, [jungle cat](#), civets, porcupine, ratel or [honey badger](#), and hares can be seen outside the park confines.
- The reserve brings around 300 species of birds like the black ibis, bee-eaters, [cattle egret](#), [blossom-headed parakeets](#), pond heron, drongos, [common teal](#), [crested serpent eagle](#), grey hornbill, [Indian roller](#), and many more.
- Reptiles such as [Indian pythons](#), [Indian cobras](#), krait, rat snakes, vipers, keelbacks, and grass snakes are nocturnal animals, so rarely are seen. Many species of turtles and amphibians are found in or near the water bodies. *[citation needed]*

Nagzira wildlife sanctuary

- **Nagzira wildlife sanctuary** is located between [Bhandara district](#) and [Gondia district](#) of [Maharashtra](#) .
 - Nagzira Wildlife Sanctuary is locked in the arms of nature and adorned with a picturesque landscape, luxuriant vegetation and serves as a living outdoor museum to explore and appreciate nature.
 - This sanctuary has a number of [fish](#), 34 species of [mammals](#), 166 species of [birds](#), 36 species of [reptiles](#) and four species of [amphibians](#).
 - The [invertebrate fauna](#) includes, besides a number of [insects](#) and [ant](#) species.
- Wild [animals](#) found here are the [tiger](#), [Indian gaur](#), [sambar](#), [nilgai](#), [chital](#), [wild boar](#), [sloth bear](#), [Barking Deer](#), [Mouse Deer](#) and [wild dog](#).
- There are also tigers, leopard and one elephant named Rupa.¹

Nawegaon-Nagzira Tiger Reserve (NNTR) was notified as 46th tiger reserve of India on 12th December, 2013. Its 5th Tiger reserve of Maharashtra.



Bharatpur Bird Sanctuary,



- Also known as **Keoladeo Ghana National Park**
- situated in **Rajasthan**.

➤ Bharatpur bird sanctuary is one of the best bird sanctuaries in India and one of the finest bird parks in the world.

➤ Apart from the **Great Thar Desert**, Big forts and beautiful lakes, Birds of bharatpur sanctuary are one of the major tourist attractions in Rajasthan.

➤ The bharatpur bird sanctuary is paradise for the bird lover's to watch some of the **most exotic birds in the world**.

- It is famous [avifauna](#) sanctuary that hosts thousands of birds, especially during the winter season.
- Over 230 species of birds are known to be resident. It is also a major tourist centre with scores of [ornithologists](#) arriving here in the hibernal season.
- It was declared a protected sanctuary in 1971. It is also a [World Heritage Site](#).
- These diverse habitats are home to 366 bird species, 379 floral species, 50 species of fish, 13 species of snakes, 5 species of lizards, 7 amphibian species, 7 turtle species and a variety of other invertebrates.[[]



Great egret



Eurasian spoonbill



Group of painted storks



Indian Saurus crane

BIRD SANCTUARIES IN INDIA

- Bharatpur bird Sanctaury
- Kunthankulam Bird Sanctuary
- Mayani Bird Sanctuary
- Nal Sarovar Bird Sanctuary
- Nawabgani Bird Sanctuary
- Rajasthan
- Tamil Nadu
- Maharashtra
- Gujarat
- Uttar Pradesh



Cont...

- Porbandar Bird Sanctuary
- Kulik (Raigani) Bird Sanctuary
- Ranganathittu Bird Sanctuary
- Sultanapur Bird Sanctuary
- Gujarat
- West Bengal
- Karnataka
- Haryana



B.Sc I UNIT TEST – I
2018-19 Session I

1. Where the knowledge of biodiversity is applicable ?

a) To study classification of animals and plants.

b) To study Ecosystem

c) To study biological region

d) All of Them

2. Which information is correct for our country?

a) India is one of the twelve mega biodiversity country of world.

b) India comprises 2.4 % biodiversity of world.

c) India contain more than 7% plant species of world.

d) India stands 7th in traditional crop varieties.

3. How can the biodiversity be conserved?

- a) By maintenance of different species.
- b) By maintenance of different ecosystem
- c) By maintenance of genes of different species
- d) All of the

4. Which regions are included in biodiversity Hotspots.

- a) Sanctuary
- b) National Park
- c) Only Hot spots
- d) All the given

5. Which is the example of ex-situ conservation .

- a) National park
- b) Sanctuary
- c) Biosphere reserve
- d) Zoo

6. Which is the Hotspot of India ?

- a) Gangatic plain
- b) Western Ghat
- c) Eastern Ghat
- d) Arravali Mountain

7. Where are the genes of rare plants species stored.

- a) Gene Bank
- b) Gene library
- c) Herbarium
- d) None of them

8. Who publishes Red Data Book.

- a) WWF
- b) IUCN
- c) MAB
- d) IBWL

9. Bharatpur bird sanctuary is situated in

- a) Kerala
- b) Karnataka
- c) Gujarat
- d) Rajasthan

10. What is important about Gene diversity ?

- a) Maintenance of species
- b) Speciation
- c) Research and Genetic code
- d) Maintenance and research of species

11. How many National parks are included in Maharashtra.

a) 04

b) 06

c) 08

d) 02

12. Wild life protection act extended to whole India except.

A) Utter Pradesh

b) Haryana

c) Jammu and Kashmir

d) Karnataka

13. Wild life protection act was enacted in the year ,

- a) 1982 b) 1974
- c) 1972 d) 1984

14. Nawegaon-Nagzira Tiger Reserve (NNTR) was notified as 46th tiger reserve of India on,

- a) 12th December, 2013.
- b) 2nd December 2014
- c) 10th December 2013
- d) 12th November 2013.

15. Global biodiversity Currently shows _____ number of species .

- a) 1.6 million
- b) 1.9 million
- c) 1.2 million
- d) 1.5 million