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J&K ENVIS NEWSLETTER

State of Environment & its Related Issues in J&K

J&K ENVIS Hub

Department of Ecology, Environment & Remote Sensing, Jammu& Kashmir

Biodiversity of Jammu & Kashmir - II

CONTENTS

- Global Biodiversity
- Biodiversity in India
- Biodiversity in J&K
- Threatened Flora & Fauna of J&K
- Economically Important Plant Species
- Pressures on Biodiversity
- Biodiversity Conservation in J&K
- Action Plans to Conserve Biodiversity

"Be responsible for better world, Work to sustain biodiversity. Save biodiversity, Save yourself."

FROM THE DIRECTOR'S DESK

Biodiversity – the diversity of life on earth – is integral to a healthy and stable environment. It includes variety of animals, plants, fungi, and even microorganisms. Each of these species and organisms work together in ecosystems to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter. Due to the increasing human activities the planet is currently experiencing a biodiversity crisis which is resulting in the loss of species and populations of species and the habitats that support them. Since 1970 there is an average 60% decline in global populations of mammals, fish, birds, reptiles, and amphibians around the world. The 2019 records indicated that the threatened species of animal and plants are around one million, highest number in human history. Three-quarters of the land-based environment have been significantly altered. More than a third of the world's land surface and nearly 75% of freshwater resources are now devoted to crop or livestock production. Humans have overfished the lakes, cleared forests, polluted our water sources, and created a climate crisis. These actions are impacting biodiversity around the world, from the most remote locales to our own backyards. The natural world relies on a diversity of organisms to keep it in balance, healthy and thriving. To ensure we protect and nourish this biodiversity it is imperative that we gather and disseminate essential knowledge that can empower people, industries and governments and help them live in harmony with nature. Together, we can take action to create lasting solutions and protect the future of nature.

Sd
Dr. Neelu Gera, IFS
Director
DEE&RS, J&K

GLOBAL BIODIVERSITY

Global biodiversity is the measure of biodiversity on planet Earth and is defined as the total variability of life forms. With the enormous number of species that exists on Earth, it is remarkable that the distribution of these species is so highly concentrated in specific areas. Species richness, the total number of species found in an area, is not evenly distributed around the globe: two-thirds of all known species occur in tropical areas, especially in tropical forests. Around the world there are places that are both biologically rich and deeply threatened. These areas that are particularly important for biodiversity conservation are called as biodiversity hotspots. There are 36 biodiversity hotspots around the world.

Global biodiversity is affected by extinction and speciation. Habitat change is the most important driver currently affecting biodiversity, as 40% of forests and ice-free habitats have been converted to cropland or pasture. Other drivers are: overexploitation, pollution, invasive species, and climate change. More than 99% of all species on Earth are estimated to be extinct. Estimates on the number of Earth's current species range from 2 million to 1 trillion. The background extinction rate varies among taxa but it is estimated that there is approximately one extinction per million species years. Mammal species, for example, typically persist for 1 million years. Biodiversity has grown and shrunk in earth's past due to (presumably) abiotic factors such as extinction events caused by geologically rapid changes in climate. A cooling and drying resulted in catastrophic rainforest collapse and subsequently a great loss of diversity, especially of amphibians.

#	Name	Location
1	*California Floristic Province*	California, USA
2	*Madrean pine-oak woodlands*	Southern USA
3	*Mesoamerica*	Central Mexico, Belize, Guatemala, Nicaragua, and Northern Costa Rica
4	*Caribbean Islands*	East of Central America
5	*Atlantic Forest*	Parts of Brazil, Argentina, and Paraguay
6	*Cerrado*	Central Brazil
7	*Chilean Winter Rainfall-Valdivian Forests*	Central North of Chile, to the Western regions of Argentina
8	*Tumbes-Choco-Magdalena*	Pacific Coast of South America and the Galapagos Islands
9	*Tropical Andes*	Part of the Andes Mountains in South America
10	*Mediterranean Basin*	Surrounds the Mediterranean Sea
11	*Cape Floristic Region*	Southern tip of South Africa
12	*Coastal Forests of Eastern Africa*	Eastern Coast of Africa
13	*Horn of Africa*	Northeastern Africa
14	*Madagascar*	Southeast Coast of Africa
15	*Indian Ocean Islands*	Comoros, Mauritius, and Seychelles, surrounding Madagascar
16	*Maputaland-Pondoland-Albany*	Southeastern coast of South Africa
17	*Succulent Karoo*	Coastal region of South Africa
18	*Mountains of Central Asia*	Central Asia: extends through Afghanistan, China, Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan
19	*Eastern Himalaya*	Parts of China, Bhutan, India, Tibet, and Myanmar
20	*Indo-Burma*	Parts of Bangladesh, India, Myanmar, China, Cambodia, Vietnam, Thailand, and Malaysia, Hainan Island and Andaman Island
21	*Western Ghats*	Indian Peninsula
22	*Sri Lanka*	South of India
23	*East Melanesian Islands*	North East of Australia
24	*New Caledonia*	South Pacific Ocean
25	*New Zealand*	Southwest Pacific Ocean
26	*Philippines*	Southeast Asia
27	*Polynesia-Micronesia*	Southern Pacific Ocean
28	*Southwest Australia*	Southwest tip of Australia
29	*Sundaland*	Southeastern Asia comprising the Malay peninsula, Borneo Island, Java Island, and Sumatra Island as well as their smaller surrounding islands
30	*Wallacea*	Eastern Indonesia
31	*Japan*	Northen Pacific Ocean
32	*Mountains of Southwest China*	Includes Tibet, Sichuan, Qinghai, Gansu, and Myanmar
33	*Caucasus*	Border between Europe and Asia, separating the Black and Caspian seas
34	*Irano-Anatolian*	Parts of Armenia, Azerbaijan, Georgia, Iraq, Iran, Turkey, and Turkmenistan
35	*Forest of East Australia*	Eastern coast of Australia
36	*Guinean Forests of West Africa*	Coastal western africa

BIODIVERSITY IN INDIA

India is a megadiverse nation and land of around 10% of world's species. India, with only 2.20% of the world's land area, contributes ca.12% of the global biota and is, thus, recognized as one of the mega-biodiverse countries. Ranked 12th in the world in terms of total number of catalogued species [1,50,170 species (49,003 plants + fungi + 1,01,167 animals out of 1,244,360] in the world. Much of Indian biodiversity is intricately related to the socio-cultural practices of the land. Unfortunately, due to population explosion, climate change and lax implementation of environmental policies, several species are facing the threat of extinction. The Biodiversity of India is classified into four types.

- **MALAYAN BIODIVERSITY:** It is along the densely forested areas of the Eastern Himalayas and along the coastal areas.
- **ETHIOPIAN BIODIVERSITY:** The arid and semi-arid regions of Rajasthan are characterised by this kind of biodiversity.
- **EUROPEAN BIODIVERSITY:** This kind of biodiversity is found in the areas of upper Himalayas where the climatic characteristics are mostly temperate in nature.
- **INDIAN BIODIVERSITY:** The dense forest areas of Indian plain are characterised by this kind of biodiversity.

BIO GEOGRAPHIC REGIONS AND PROVINCES OF INDIA

1. **TRANS HIMALAYA:** This zone has three provinces Ladakh mountains, Tibetan Plateau, Trans- Himalaya Sikkim.
2. **THE HIMALAYA:** It has four provinces-North-West Himalaya, West Himalaya, Central Himalaya and East Himalaya.
3. **THE INDIAN DESERT:** This zone includes two provinces- Thar and Kutch.
4. **THE SEMI-ARID:** This constitutes two namely-Punjab Gujarat-Rajasthan.
5. **THE WESTERN GHATS:** Two provinces namely Malabar plains and Western Ghats Mountains are included in this zone.
6. **THE DECCAN PLATEAU:** This zone has five provinces Central Highlands, Chhota Nagpur, Eastern Highlands, Central Plateau and Deccan South.
7. **THE COASTS:** Three provinces namely- West coast, East coast and Lakshadweep.
8. **THE GANGETIC PLAINS:** This zone has two provinces- Upper Gangetic plains and lower Gangetic plains.
9. **NORTH EAST INDIA:** Two provinces are included- Brahmaputra valley and North-East hills.
10. **ISLANDS:** This zone includes two provinces-Andaman and Nicobar. It is highly diverse set of biomes.

FLORA AND FAUNA OF INDIA

1. There are about 45,000 species of plants, which is about 7% of world's total. About 33% of these are endemic.
2. There are 15,000 flowering plants, which is 6% of world's total. Roughly, 1,500 plant species are endangered.
3. There are 91,000 animal species, representing about 6.5% of world's fauna. These include 60,000 insect species, 2,456 fish species, 1,230 bird species, 372 mammals, over 440 reptiles and 200 amphibians with largest concentration in Western Ghats and 500 molluscs.
4. Livestock diversity is high. There are 400 breeds of sheep, 27 of cattle and 22 of goats found in India.
5. It has also globally important populations of some of Asia's rarest animals, such as the Bengal Fox, Asiatic Cheetah, Marbled Cat, Asiatic Lion, Indian Elephant, Asiatic Wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo etc.

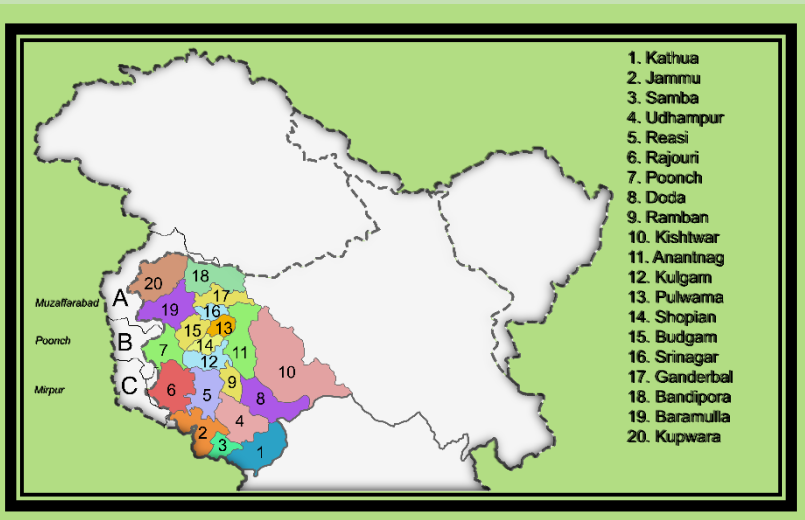
IGNORING CARRYING CAPACITY THREATENS HILL STATES INCLUDING J&K:

One factor that has caused incalculable damage to biodiversity & the life support system of the indigenous people of hill states is the thoughtless growth of Tourist Industry beyond their carrying capacity

Tourist influx, beyond carrying capacity boosts economy but destroys ecology and biodiversity

BIODIVERSITY IN JAMMU & KASHMIR

UT of Jammu and Kashmir occupies a crucial position in Indian ecological and geographical context, due to its strategic location in the northern most limits, as well as the position of confluence it commands over flow of flora and fauna over time and space. Characteristic climate and terrain pattern of the UT renders it as a unique context, harbouring natural resources, tourism destinations as well as potential regions for scientific explorations. Located between the parallels of 32º 17'N and 36º 58'N latitudes and meridians of 73º 26'E and 80º 30'E longitudes.



The UT is rich in the cultural diversity of the people, as well as diversity of the flora and fauna in the forest areas, and domesticated species outside the forest. The bio-diversity of the rich area of Kashmir happens to be one of the 26 hotspots in India where there are high rates of deforestation and endemicity. The UT of Jammu and Kashmir has a fairly rich diversity of plant life, and on this the people depend for their daily needs of food, medicine, fuel, fibre, etc. The varied plant life also contributes to the food and habitat needs of the wild and domesticated animals. Plants are also an integral part of the social fabric of the UT. On the other hand, the faunal component of the bio-diversity of the UT is rich, with interesting and unique forms both in the forest zones and above the forest-line. The variety of animal forms ranges from higher groups like vertebrates, including mammals, birds, reptiles, amphibians, and lower groups like invertebrates including insects and even unicellular micro-organisms.

DID YOU KNOW: THE J&K HAS BEEN CALLED AS THE BIOMASS STATE OF INDIA AND HAS ITS ECONOMY INTIMATELY LACED WITH THE FLORA AND FAUNA IT HOSTS

Morus alba
Sericulture

Juglans regia
Wood Carving

Malus pumila
Fruit industry

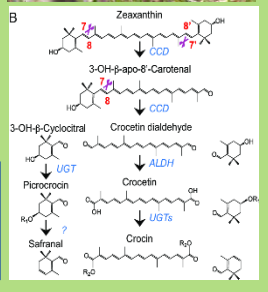
Buxus Wallichiana
Chikri-Wood Craft

Apis mellifera
Apiculture

Capra hircus
Shawl industry

Salix spp.
Wicker work / Sports goods

Crocus sativus
Saffron



Nature has provided the Jammu and Kashmir with diverse bioresources and rich biodiversity to meet the basic sustenance need - food, fodder, fuel, fiber, fertilizer, shelter and healthcare of people.

FLORA OF JAMMU & KASHMIR

The flora of Himalayan Kashmir comprises about 3,054 species. The flora of the Jammu district comprises 506 species. These figures include only the angiosperms, gymnosperms and pteridophytes. The plants of the western Himalayas are well known for their medicinal properties. This area is a storehouse of medicinal and aromatic plants, which are used in pharmaceutical and perfume industries. The list includes 55 species of important medicinal and aromatic plants. Several medicinal plants grow wild in the temperate and alpine habitats. Some native medicinal plants have been taken up for cultivation, e.g. *Dioscorea deltoidea* is now cultivated for its tubers, which are rich in diosgenin and yield cortisone, a steroid hormone.

Representative Medicinal Plants of Kashmir

Knowledge Update

PLANT DIVERSITY	
Algae	**Total of 1065 species recorded**
Bryophytes	**42 species, 328 mosses, 91 liverworts, single species of hornwort (Phaecceros laevis)**
Lichens	**424 species, represents 18% of the Indian Lichens**
Pteridophytes	**200 species, including 189 ferns and 11 fern allies**
Gymnosperms	**41 species, 20 wild and 21 cultivated**
Angiosperms	**5056 taxa, including 4778 species, belonging to 1306 genera in 180 families.**

Source: Dar & Khuroo (Eds.) 2020. Biodiversity of the Himalayas: Jammu and Kashmir State, SpringerNature

Invasives are like the catastrophic wild fire in slow motion

DID YOU KNOW

MAJOR INVASIVE SPECIES IN J&K

Species	Area km²
Lantana camara	132
Parthenium hysteropharus	50
Ageratum conyzoides	18
Ipomoea fistulosa	6
Solanum viarum	5

Source: ISFR, 2019

FAUNA OF J&K

The fauna of Jammu and Kashmir is diverse due to its unique location and climatic condition. About 16% of the Indian mammals, birds, reptiles, amphibians and butterflies are represented in the UT. Birds contribute much to the chordate diversity following by mammals, reptiles, fishes and amphibians. The J&K is home to about 112 species of mammals. Carnivores represent 32% of the total mammalian fauna in J&K. A total of 19 species of the ungulates reported from the UT, 13 have been listed as globally threatened.

Mammals: (A) Snow Leopard (B) Tibetan Wolf (C) Himalayan Brown Bear (D) Kashmir Stag (E) Kashmir Musk Deer (F) Tibetan Gazelle; (G) Wild Ass (H). Siberian Ibex (I) Himalayan Blue Sheep (J) Kashmir Markhor (K) Tibetan Antelope (L) Himalayan Stoat

Knowledge Update

ANIMAL DIVERSITY	
Ants	**198 Taxa belonging to 54 genera in 7 subfamilies**
Butterflies	**408 species, *ca.* 27% of Indian Butterflies**
Moths	**461 species, Jammu having more species than Kashmir**
Fishes	**120 species, 105 in Jammu and 23 in Kashmir**
Amphibians and Reptiles	**7 and 63 respectively**
Aves	**555 species of birds including resident, passage visitors, summer and winter migrants**
Mammals	**112 species recorded**

Source: Dar & Khuroo (Eds.) 2020. Biodiversity of the Himalayas: Jammu and Kashmir State, Springer Nature

Jammu and Kashmir is home to 7 species of amphibians belonging to 6 genera, 5 families and 1 order. 63 species of reptiles belonging to 43 genera, 12 families and 2 orders have also been reported. The available data suggest that there are 120 species of fishes belonging to 14 genera under 5 families occur in J&K. The available data also reveals that as many as 198 species of ants, 408 species of Butterflies and 461 species of Moths occur in the J&K.

Avian Diversity

The avian diversity varies seasonally and available data suggest the existence of as many as 555 species of birds belonging to 179 genera, 51 families under 16 orders including resident, passage visitors, summer and winter migrants

Avifaunal diversity:(a) Black-necked Crane, (b) Black Stork, (c) Ruddy Shelduck, (d) Northern Pintail, (e) Mallard, (f) Himalayan Bluetail, (g) Robin Accentor, (h) Tibetan Sandgrouse, (i) Tibetan Snowcock, (j) Tibetan Snowfinch, (k) Common Raven, (l) Fire-fronted Serin

Kashmir falls under the Central Asian Flyway zone, and it covers 279 species of migratory waterbird out of which 29 are globally threatened.

THREATENED FLORA & FAUNA OF J&K

In recent times, rich biodiversity of the J&K is experiencing grave threats leading to loss in floral as well as faunal biodiversity due to human-driven pressures. Like other forms of biodiversity, extinction of plants is also worrying as they play a key role in supporting the planet's ecological balance and being also an irreplaceable component of natural habitats. Habitat loss and fragmentation, owing to land-use conversion for agriculture and allied activities, mining, infrastructure development, and overharvesting of species of economic interest, are the major threats to plants. The major threats to faunal diversity include habitat loss, habitat degradation and fragmentation, unregulated livestock grazing, poaching, pollution, unsustainable use, over-exploitation, and changing land use patterns. The biotic interference, including unsustainable land use pattern, encroachment and livestock grazing, has resulted in dislocation of many wildlife species.

Examples of Threatened Flora: (a) Corydalis cashmeriana, (b) Aralia cachemirica, (c) Arnebia benthamii, (d) Aconitum heterophyllum, (e) Gaultheria trichophylla, (f) Eremurus himalaicus, (g) Dioscorea deltoidea, (h) Paeonia emodi , (i) Saussurea costus, (j) Trollius acaulis, (k) Picrorhiza kurroa, (l) Lavatera kashmiriana, (m) Rhododendron campanulatum, (n) Dolomiaea macrocephala, (o) Gentiana cachmerica, (p) Meconopsis latifolia

Examples of Threatened fauna: (a) Kashmir Stag, (b) Snow Leopard, (c) Kashmir Grey Langur, (d) Himalayan Brown Bear, (e) Kashmir Markhor, (f) Western Tragopan, (g) Black Necked Crane, (h) Bearded Vulture.

The common medicinal herbs such as balladona, hyoseyamus, digitalis, menthol, artemisia, polygola, podophyllum, rubus, trilliu, hops and kuth grow in forests of J&K.

FAST FACTS

Chinar was introduced to Kashmir by renowned Sufi Saint named Syed Qasim Shah around 650 years ago.

Hangul, the UT animal of Jammu and Kashmir has been categorised as endangered by the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of threatened species in 1996. There are only 237 Hangul's left in J&K.

Under Section-38 of the Biological Diversity Act, 2002, the MoEF&CC , GoI in consultation with the Govt. of Jammu & Kashmir notified 20 plant and 10 animal species which are on the verge of extinction listed below vide S.O. No: - 3845 (E), dated: - 02-08-2018.

Plant Species

Sl.No.	Name of the species
1.	***Aconitum chasmanthum*** **Stapf (Ranunculaceae).**
2.	***Aconitum deinorrhizum*** **Stapf (Ranunculaceae).**
3.	***Aconitum heterophyllum*** **Wall. Ex. Royle (Ranunculaceae).**
4.	***Aconitum kashmiricum*** **Stapf Ex. Coventry (Ranunculaceae).**
5.	***Aconitum violaceum Jacq.*** **Ex. Stapf (Ranunculaceae).**
7.	***Gentiana ornata*** **Wall. Ex. Griseb (Gentianaceae).**
8.	***Gentiana kurroo*** **Royle, (Gentianaceae).**
9.	***Lagotis cashmeriana*** **(Royle) Rupr. (Plantaginaceae).**
10.	***Meconopsis latifolia*** **(Prain) Prain (Papaveraceae).**
11.	***Meconopsis aculeata*** **Royle (Papaveraceae).**
12.	***Saussurea costus*** **(Falc.) Lipsch. (Asteraceae).**
13.	***Saussurea medusa*** **Maxim. (Asteraceae).**
14.	***Saussurea simpsoniana*** **(Fielding & Gardner) Lipsch. (Asteraceae).**
15.	***Sophora moorcroftiana*** **Benth. Ex. Baker (Leguminosae).**
16.	***Podophyllum hexandrum*** **Royle (Berberidaceae).**
17.	***Dactylorhiza hatagirea*** **(D. Don) Soo (Orchidaceae).**
18.	***Picrorrhiza kurrooa*** **Royle Ex. Benth (Plantaginaceae).**
19.	***Betula utilis*** **D. Don (Betulaceae).**
20.	***Taxus wallichiana*** **Zucc. (Taxaceae).**

Animal Species

Sl.No.	Name of the species
1.	***Cervus hanglu*** **(Wagner, 1844)**
2.	***Capra falconeri*** **(Wagner, 1839)**
3.	***Cuon alpines laniger*** **Pocock, 1936**
4.	***Moschus cupreus*** **Grubb, 1982**
5.	***Pantholops hodgsonii*** **(Abel, 1826)**
6.	***Procapra picticaudata*** **Hodgson, 1846**
7.	***Panthera uncia*** **(Schreber, 1775)**
8.	***Hemitragus jemlahicus*** **(Smitth, 1823)**
9.	***Gyps bengalensis*** **(Gmelin, 1788)**
10.	***Tragopan melanocephalus*** **(Grey, 1829)**

ECONOMICALLY IMPORTANT PLANT SPECIES

Economically important plants are the species, which have social and economic value.

Table: Transportation of some important forest produce outside J&K (Quantity trade in kgs):

S. NO.	SPECIES	QUANTITY	S. NO.	SPECIES	QUANTITY
1	Aftimoon	13695.3	31	Patees/Atees	24568.36
2	Ata Sudah	5550.5	32	Rasount Oil	25261
3	Anab	93257	33	Ratanjot	18701
4	Anardana	99660	34	Salim Dana	12514.49
5	Attaresh	34651.2	35	Sandalwood Powder	174400
6	Ajwain	4000	36	Oregano	8276
7	Barang	5724.3	37	Sarish	22012
8	Sayag	3300	38	Shakakhi	4916.3
9	Asteteen	2630	39	Shatavar	19007.6
10	Bavan white	27104	40	Suranjan	28566.9
11	Balangoo	17092.9	41	Wowring	101460.06
12	Behman	11884	42	Reetha	14028
13	Banafsha	35375.8	43	Kababa	4242
14	Satva	42192.8	44	Walnut	1800
15	Bhoj Pather	25059.93	45	Guchies	11165.98
16	Banjaf	5113	46	Gugal	239447
17	Sammunder Sawn	18800	47	Gouzaban	160701.7
18	Charela	47800.29	48	Harar	18359
19	Col Doda	81434.77	49	Lal Dana	57990
20	Majuphal	78202	50	Howbair	39398.5
21	Mochras	4142	51	Kakar singhi	83701.4
22	Khabazi	10720	52	Kuth	600073.22
23	Mostagi	3026	53	Kode kutki	33375.64
24	Mulathi	81217	54	Majeeth	38360
25	Marmakhi	4100	55	Jangli Payaz	6222.35
26	Mushkbala	167111.35	56	Kohu	18273
27	Musli	152281.29	57	Zoofa	19778.16
28	Nagchatri	29720.52	58	Doop	46748.16
29	Ood saleb	6140	59	Otangan	13690.92
30	Paneer dodi	29161	60	Kalizeeri	47269.66

Source: Handbook of Forest Statistics 2016-2017

PRESSURES ON BIODIVERSITY

Many factors, both natural and man-made, have been responsible for extinction of species. It is well known that several plant species have become extinct due to certain natural phenomena, such as land upheavals, volcanic eruptions, glaciations, and protracted periods of drought, spread of desert lands, forest fires and eutrophication in the geological past. In certain other cases, species became too old or senescent and suffered genetic depletion, thus becoming unable to adapt to the new environment, leading to restricted distribution and, eventually extinction.

Normally for a species the processes involved in its evolution, spread and finally extinction is very slow. While such natural processes in the past led to the extinction of species, they had also contributed to the evolution and speciation of plants. Anthropogenic factors, on the other hand, have accelerated rarity and extinction of plants species to a level where the very existence of the eco-system is threatened. The bio-diversity of the rich area of Kashmir happens to be one of the 26

hotspots in India, where there are high rates of deforestation and endemicity. The whole Himalayan belt is one hotspot mega center, having eight critical areas, which includes Jammu and Kashmir.
The causes for loss of biodiversity in J&K are presented below:

1. Habitat loss due to change of land use and land utilization in agriculture.
2. Decreasing forest area due to loss of top soil, fertility and vegetative cover.
3. Shrinkage of cultivable land and subsequent reclamation from the forest & wetland area leading to degradation of a number of endemic species.
4. Degradation of landscapes.
5. Excessive commercial exploitation of plants and animals.
6. The unbridled activities of felling trees and wild fire etc. far narrow economic gains without regards for the natural and social cost are becoming decimating factors for loss of biodiversity.
7. Habitat destruction and loss due to development projects.
8. Over exploitation of useful/ economic plants species and other living resources.
9. Implementation of forestry practices unsuitable to local conditions, which ultimately transform heterogeneous forests.
10. Modern agriculture practices without proper management and conservation of top soil.
11. Invasion and domination by introduced species, resulting in decline in species and varietal diversity.
12. Change in agro-ecosystem due to shifting in land use pattern for maximization in production and change in the attitude of farmers towards production-oriented farming.
13. Lack of knowledge about the importance of domesticated biodiversity.
14. Loss of wetland habitat due to erosion of catchments areas, siltation, eutrophication and encroachment for settlement and farming purpose, directly affecting the biodiverse nature of the wetland.
15. Fishing and other malpractice by using toxic chemicals, herb extracts and dynamiting in the hill streams etc. thereby causing massive impairment and destruction in the aquatic ecosystem.
16. Contribution of agro-chemical products like pesticides into the wetlands from periphery paddy fields as well as during fishing.

BIODIVERSITY CONSERVATION IN J&K

At present a large proportion of area in the UT has been demarcated under the protected area network; this comprises 4 national parks, 12 wildlife sanctuaries, 30 conservation reserves and 3 Ramsar sites. Over the years, several botanical gardens, zoos and aquaria have been established.
Besides, concerted research and comprehensive management plans are in place to conserve the flagship species, such as hangul (*Cervus hanglu*), markhor (*Capra falconeri*), snow leopard (*Panthera uncia*) and Asian black bear (*Ursus thibetanus*)




ACTION PLANS TO CONSERVE BIODIVERSITY

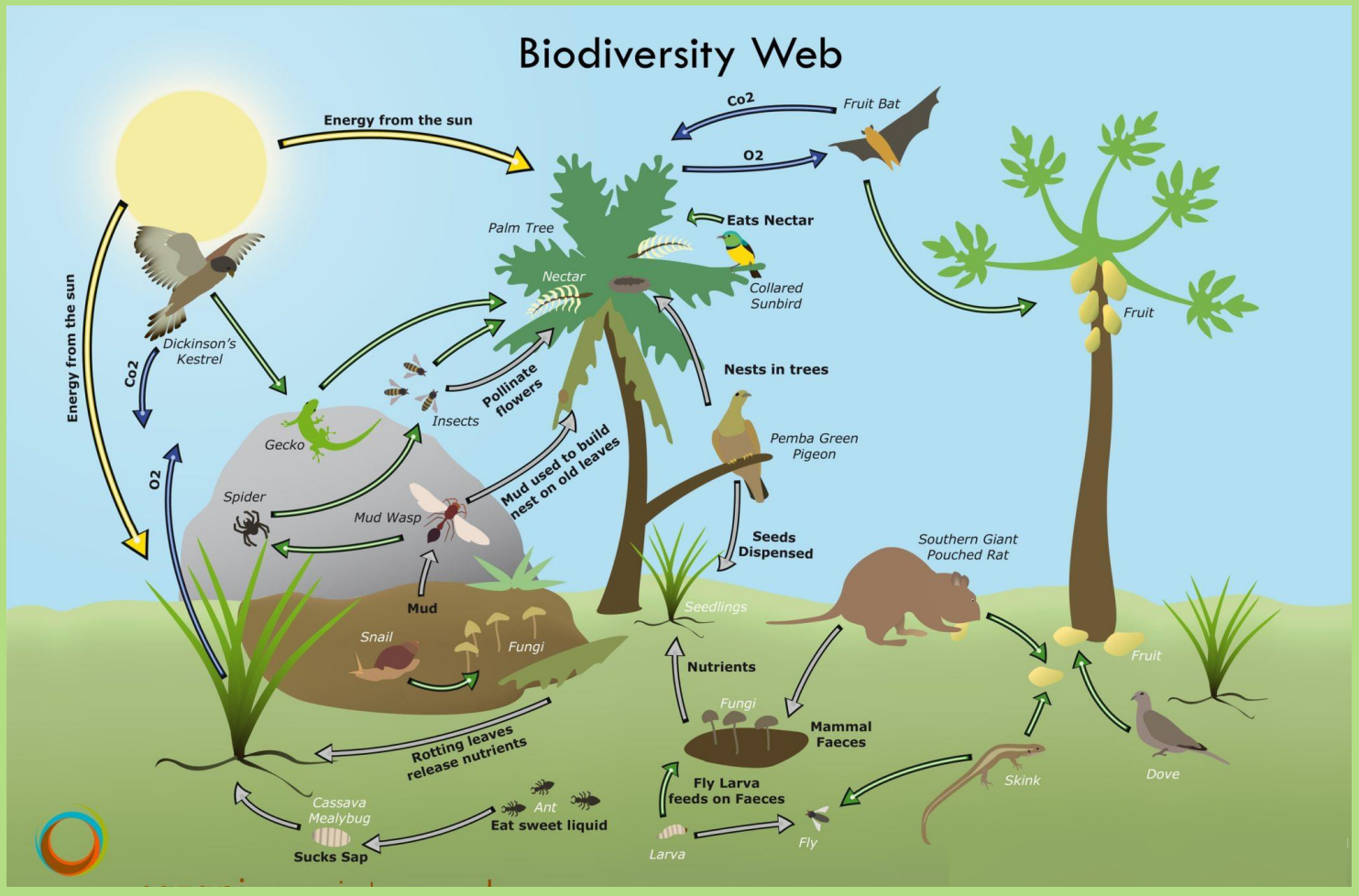
As per the J&K Biodiversity Strategy and Action Plan prepared by JKFRI following strategies have been proposed to conserve both wild and domesticated biodiversity in J&K.

1. Complete inventory of plant and animal groups in J&K to be prepared,
2. Identification of more vulnerable taxa, fragile habitat and threatened ecosystems,
3. Compilation of integrated database and its dissemination,
4. Economic evaluation of bio-resources in the budgeting and planning process,
5. Sound management plan needs to be evolved for wild and domesticated biodiversity,
6. Multiple use of ecosystem needs to be promoted on sustainable basis,
7. Technologies which are environmentally and biodiversity friendly need to be promoted and adopted,
8. The Govt is has constituted J&K Biodiversity Council on the direction of the Central Biodiversity Board,
9. Biodiversity conservation needs to be integrated with all developmental activities,
10. Public participation needs to be promoted to conserve biodiversity with emphasis on women's role on conservation. Village panchayats and Village Development Committees need to be sensitized for their participation towards biodiversity conservation efforts,
11. Regulations need to be monitored on a regular basis to foster conservation of bioresources,
12. A fair and equitable system of sharing benefits among all the stakeholders needs to be devised,
13. Mechanism needs to be evolved to collect traditional knowledge and need to be integrated with scientific approach,
14. Biodiversity issues need to be incorporated in formal and informal education and awareness programs. Role of print, electronic media, theatres, cultural groups needs to be emphasized in biodiversity conservation,
15. Training and capacity building of field staff needs for undertaken for biodiversity conservation.
16. Religious links with biodiversity needs to be revived and strengthened.
17. *In-situ* conservation models of sacred groves and sacred waters need to be replicated

ENDEMISM

Endemism is an important attribute of the IHR. Of the total plant species reported from the region, nearly 32% are endemic. These include 5 endemic families, namely Tetracentraceae, Hamamelidaceae, utomac-eae, Circaesteraceae and Stachyuraceae besides more than 90% species of Berberidaceae and Saxifragaceae.

Of the nearly 300 recorded mammal species 12 are endemic; and of the 979 bird species 15 are endemic.



DECLARATION

The literature, data and photographs presented in this newsletter is from various secondary sources. We thank all the authors and workers whose work has been used in the compilation of this newsletter. The sole purpose of this newsletter is the dissemination of the knowledge already done by different workers at a common platform to common people who don't have access to scientific literature.

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