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Research Article

THREAT CATEGORIZATIONS AND CONSERVATION PRIORITIZATION OF FLORISTIC DIVERSITY OF WATERSHED *RISSA-KHAD* FOR SOCIO-ECONOMIC DEVELOPMENT

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ABSTRACT

All across the globe anthropogenic pressures coupled with changing environmental conditions have led the loss of biodiversity to a great extent. Many species have been disappeared from natural habitats and many more are likely to disappear from the natural habitats in near future. Such situations have necessitated the assessment of biodiversity for IUCN threat categories and conservation prioritization. Realizing the importance of biodiversity for the sustenance of life, threat categorization and conservation prioritization at local, regional and global levels are essentially required. Threat categorization and conservation prioritization at local level would help in developing adequate conservation plans.. In *Rissa-Khad* Watershed, 754 species assessed for threat categories, 10 species were categorized as Critically Endangered, 23 Endangered; 71 Vulnerable and; 31 Near Threatened, 02 species were distributed in one habitat only, 17 species in two habitats whereas 117 species in 3 or >3 habitats. Study reveals that overexploitation and fragmentation of habitat are two major factor for species threat. In the present study, on the basis of threat categorization prioritization of species and habitats has been done.

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INTRODUCTION

Understanding biodiversity change is in the heart of the global GEO BON initiative (Schmeller *et al.* 2017). Loss of habitats, especially the conversion of tropical forests into agricultural and urban areas, is the main driver of the biodiversity crisis we are observing today (Foley *et al.* 2005).. Around 43% of the terrestrial world surface has been disturbed and the original vegetation converted into anthropogenic new habitats (Barnosky *et al.* 2017). The biodiversity studies all across the globe has clearly indicated that we have entered into a phase of mass extinction (Myers, N. 1990.) and have altered roughly half of the habitable surface of the earth (Singh, J.S. 2002). which is impairing and destroying the ecosystems.. The day by day increasing human population and decreasing biological resources have awakened the experts and planners for the conservation of biodiversity (Samant and Dhar 1997). Conservation planning is the practice of selecting areas for protecting biodiversity *in situ* so that these areas might mitigate the effects of ultimate and proximate threats on biodiversity (Marguely and Pressey 2000)

A species global conservation status, however, is not necessarily the same as the conservation status on a regional scale. Some species that are threatened on a global scale may not be threatened on a regional scale, and species that are not

threatened on a global scale might be threatened in some part of their range (Rana and Samant 2010) Degradation and fragmentation of >70 % of the original habitats placed Himalaya in the list of Global Biodiversity Hotspots (Pant and Samant, 2007). Rural inhabitants are largely dependent on biological resources for their sustenance.

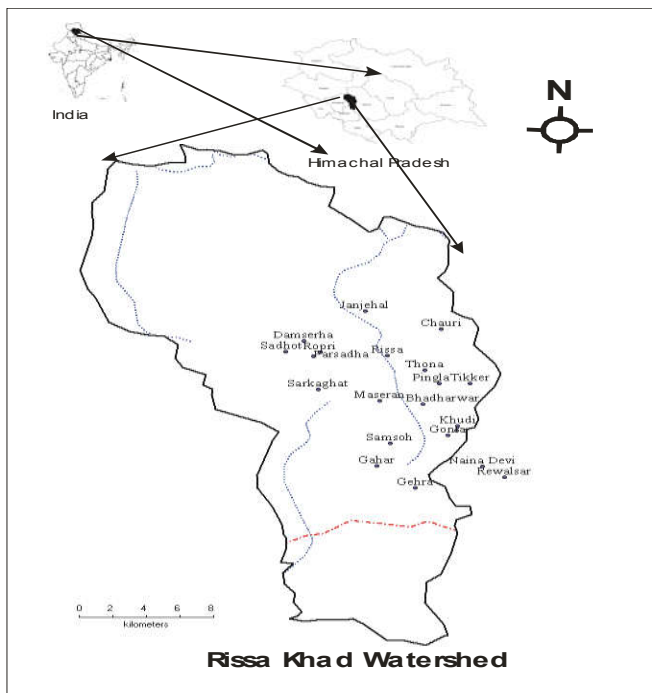
Over exploitation and habitat degradation are the two major factors responsible for the population depletion of species all across the IHR (Samant. *et al* 1996b) including *RissaKhad* Watershed. In view of the ongoing threats, it is important to identify and prioritize the biodiversity elements at local, regional and global levels. Therefore present attempt has been made to assess the floristic diversity of *RissaKhad* Watershed for various threat categories of the International Union for Conservation of Nature (IUCN), prioritize species and habitats for conservation using various attributes; and suggest appropriate conservation strategies for the prioritized species and habitats Biodiversity elements (*i.e.*, endemic species and habitat degradation) were the main criteria for the conservation priority areas like biodiversity hotspots and eco region (Myers *et al* 2000). Species richness, nativity, endemism, rarity, economically important species and anthropogenic pressure help in the prioritization of species, communities and habitats/ landscapes (Joshi and Samant 2004. Pant and Samant 2007)

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Study Area

The present study has been conducted in Rissa Khad Watershed (31° 37' 38" N latitudes and 76° 48' 20" E longitudes) of Mandi district, Himachal Pradesh. It covers approximately 123.07 Km² area and represents 20 panchyats and 132 villages. The altitude of the watershed ranges from 700-2150m. It supports diverse habitats, species, communities and Ecosystems. The vegetation mainly comprises of sub-tropical and temperate types and mostly dominated by broad leaved deciduous and evergreen species and coniferous species. The watershed is inhabited by a large number of villages with 11,258 households and 33,458 human populations. The total livestock population is 11,214. The inhabitants are largely dependent on floristic diversity including medicinal plants for their sustenance. The habitants use plant resource for various such as food/edible, medicine, fodder, fuel, agriculture tool, religious and other purposes. They are dependent on forest resources for their sustenance. The increasing human and livestock population and decreasing floristic diversity have created imbalance in the sub-tropical and temperate ecosystems of the Watershed. This has necessitated initiating studies on diversity, distribution, indigenous uses and conservation of floristic diversity in Rissa Khad Watershed.



METHODOLOGY

Threat categories of the species have been identified based on habitat preference, distribution range, use values, extraction, nativity and endemism. The cumulative values of these attributes termed as Conservation Priority Index (CPI), were used for each species to categorize under different threat categories (Rana and Samant 2010; Samant. *et al* 1996b). All the conservation attributes divided into three grades; highest (10 marks); subsequent 6 marks and least 2 marks. The species fulfilling all the attributes in highest grade resulted in highest cumulative values and one which falls in least grade for every attribute resulted in least cumulative values. The species having ≥ 70 CPI value were considered as Critically Endangered; 65-

69 as Endangered; 60-64 as Vulnerable; and 55-59as Near threatened, whereas <55 were considered as Least Concern categories.

The CPI is the cumulative values of all the attributes considered for prioritization. Species, habitats and communities have been prioritized based on CPI values. The attributes used for prioritization of species have been presented in Table 1. and habitats and communities based on Table 2. Following. (Joshi and Samant 2004; Rana and Samant 2009).

Table 1 Parameters used for the threat categorization of floristic diversity

Scores	Altitudinal Range (m)	H/Hs	Use Values	Native & Endemic	Extraction
10	<500	1	> 4	Native & Endemic	Commercial
6	500-1000	2-3	3-4	Native/Endemic	Self Use
2	>1000	>3	<3	Non-native	No Extraction

Abbreviations Used: H/ Hs= Habitat (s)

Table 2 Attributes used for conservation prioritization of the habitats in Rissa Khad Watershed

Grade	AR (m)	TS (%)	N (%)	EN (%)	US (%)	Th (%)
10	<200	>40	>35	>35	>40	>40
8	200-400	35-40	30-35	30-35	35-40	35-40
6	401-600	30-35	25-30	25-30	30-35	30-35
4	601-800	25-30	20-25	20-25	25-30	25-30
2	>800	<25	<20	<20	<25	<25

Abbreviations Used: AR=Altitudinal Range; H/s=Habitat(s); TS=Total Species; N=Native; EN=Endemic; US=Useful Species; and Th=Threatened.

RESULTS

Threat Categorization

In RissaKhad Watershed, of the total species 754 assessed for threat categories, 10 species were categorized as Critically Endangered, 23 Endangered; 71 Vulnerable and; 31 Near Threatened (Table 1). The remaining species were categorized as Least Concern. Some of the notable Critically Endangered species were *Pittosporum eriocarpum*, *Quercus floribunda*, *Ilex diplyrena*, *I. excelsa*, *Acer caesium*, *A. oblongum*, *Cinnamomum tamala*, *Melia azedaracht*, *Herminium lanceum*, *Cedrus deodara*; Endangered, *Calanthe tricarinata*, *Roscoea procera*, *Phytolacca acinosa*, *Alangium salvifolium*, *Pimpinella acuminata*, *Sarcococcalinga*, *Mesuaferrea*, *Cornuscipitata*, *Shorea robusta*, *Quercus leucotricophora*, *Didymocarpuspedicellata*, *Perseaduthiei*, *Toona serrata*, *Rubu. spaniculatus*, *Ulmus wallichiana*, *etc.*; Vulnerable, *Bambusa arundinacea*, *Thalictrum foliolosum*, *Pyracantha crenulata*, *Phoenix humilis*, *Cassia fistula*, *Quercus glauca*, *Flacourtia indica*, *Holboellia latifolia*, *Salix acmophylla*, *Ficus bengalensis*, *Eurya acuminata*, *Syzygium cuminii*, *Hypericum perforatum*, *Rauwolfia serpentina*, *Gloriosasuperba*, *Centellaasiatica*, *Acoruscalamus*, *Vincetoxicumhirundinaria*, *Asparagus adscendens*, *Leycesteriaformosa*, *Terminaliaarjuna*, *Berberisasiatica*, *Dioscoreabulbifera*, *Ribesglaciale*, *Buteamonosperma*, *Aesculusindica*, *Oleaglandulifera*, *Ulmusvillosa*, *Pistaciaintegerrima*, *Marsdenialucida*, *Alnusnepalensis*, *Bauhinia vahlii*, *B. variegata*, *Rhododendron arboreum*, *Emblicaofficinalis*, *Dalbergiasissoo*, *Acacia catechu*, *Delphinium denudatum*, *Symplocoschinensis*, *Hedychiumspicatum*, *etc.* and Near Threatened, *Begonia picta*, *Cerastium cerastioides*, *Drypetes roxburgii*, *Debregeasia*

longifolia, Dicliptera roxburghiana, Toona ciliata, Dendrocalamus strictus, Astilbe rivularis, Sorbaria tomentosa, Hypericum elodeoides, Fraxinusmicrantha, Carpinusviminea, Tinospora cordifolia, Stereospermumchelonoides, Bombax ceiba, Mallotus philippensis, Albizzia lebbeck, etc.

Habitat Wise Distribution

In Rissa-Khad Watershed, 02species were distributed in one habitat only, 17 species in two habitats whereas 117 species in 3 or >3 habitats. *Bauhinia vahlii, Cassia fistula, Geranium nepalense*, (7 habitats, each), *Emblica officinalis, Quercus glauca, Dioscorea bulbifera, Rhododendron arboretum* (6habitats, each) and *Toona serrata, Pistacia integerrima, Berberis asiatica, Dioscorea bulbifera, Emblica officinalis, Valeriana jatamansi* (3habitats, each) represented the maximum habitats (Table 1).

Species Prioritization

The species falling under Critically Endangered, Endangered and Vulnerable categories have been prioritized for conservation

Habitat Prioritization

The site representation, altitudinal range, total species, native, endemic, threatened and useful species of the habitats and CPI values have been presented in Table 3 and Fig. 1, respectively. Amongst the habitats, shady moist forest showed maximum CPI value, followed by dry forest, riverine and rocky habitats, hence prioritized for conservation. The remaining habitats showed comparatively low CPI values (Fig. 1).

Table 3 Conservation attributes for the prioritization of habitats in Rissa khad watershed

Habitats	TS	N	EN	Th	US
Shady moist	452	172	39	108	423
Riverine	164	93	18	39	148
Degraded	177	86	17	29	167
Dry	397	108	27	78	381
Bouldery	172	81	16	29	168
Rocky	101	46	11	23	100
Forest	460	179	38	106	436
Waste land/roadside/Wayside	155	36	6	22	148
Marshy/Watercourses	41	19	2	7	38
Grassland	187	72	8	17	182
cultivated/Planted	195	42	0	15	190
Parasitic	4	0	0	0	4

Abbreviations Used: SR=Site Representation; AR=Altitudinal Range; TS=Total Species; N=Native; EN=Endemic; US=Useful Species; and Th=Threatened Species

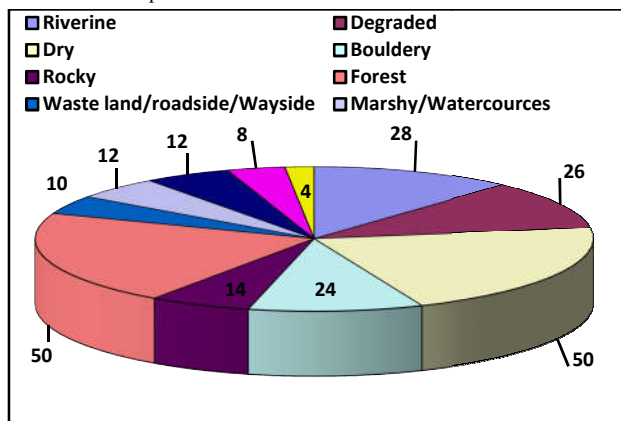


Fig 1 Conservation Priority Index of the habitats in Rissa-khad watershed

DISCUSSION

The Convention on Biological Diversity’s (CBD’s) Strategic Plan for 95 Biodiversity 2011–2020 envisages that “by 2050, biodiversity is valued, conserved, 96 restored and wisely used, maintaining ecosystem services, sustaining a healthy 97 planet and delivering benefits essential for all people (Schmeller *et al*, 2015)

In the present study, threat assessment of floristic diversity of Rissa Khad Watershed has been carried out. On the basis of Conservation Priority Index (CPI), species have been categorized as Critically Endangered, Endangered, Vulnerable, Near Threatened and Least Concern. The more CPI indicates the need for a greater level of attention to local strategies for conservation and management. Categorization of the Threatened species indicates the high degree of anthropogenic pressure. Some species such as, *Pittosporum eriocarpum, Quercus floribunda, Ilex dipyrena, I. excelsa, Acer caesium, A. oblongum, Cinnamomum tamala, Melia azadirachta, Herminium lanceum, Cedrus deodara* showed high threats in the RissaKhad Watershed of the Himachal Pradesh and have high conservation importance. Land use, climate change, nitrogen deposition, biotic exchange and atmospheric carbon dioxide have been the major cause of changes in biodiversity. Moreover, the climate change is not, at the moment, the major threat affecting plants and it is less important than the change in the land use (.Sala *et al* .2000). The increasing demand of the biodiversity throughout the globe, has affected the density and frequency of species drastically in the recent years. Large number of factors like change in climate, continuous unmanaged lopping/felling, increasing population, etc., indicates further deterioration of biodiversity. Two factors *i.e.*, overexploitation and habitat degradation have been causing decrease in the population of a species throughout globe (Samant, *et al* 2000a) In the present study Fifty (50) species were severely affected by both the factors. Similarly, 68 species were suffering from habitat degradation and 18 species from over exploitation. Over exploitation of underground parts *i.e.*, roots/rhizomes/tubers/bulbs of *Astilbe rivularis, Acorus calamus, Asparagus adscendens, A. racemosus, Berberis lycium, B. aristata, B. asiatica, Dioscorea bulbifera, D. deltoidea, Gloriosa superba, Habernaria edgeworthii, Rauwolfia serpentina, etc.* may lead to extinction of these species from their natural habitats. Listing of species like *Berberis aristata* and *Dioscorea deltoidea* in the Red Data Book of Indian Plants indicated priority attention for conservation.

Some of the species represented many sites and habitats indicating their wide range of distribution and habitat preferences but due to over exploitation for various purposes, and also due to habitat degradation, some of these species are facing high degree of threats. Promotion of mass propagation through conventional and *in vitro* methods and rehabilitation in the *in-situ* and *ex-situ* conditions may help in their conservation and management.

Amongst habitats, shady moist, forest and dry habitats support maximum number of threatened species, hence merit conservation attention. The identified species require adequate assessment and monitoring to understand the overall dynamics.

Table 4 Diversity, Distribution pattern and status of the threatened plants in RissaKhad Watershed in district Mandi, Himachal Pradesh

Taxa	Family	Altitudinal range (m)	LF	Habitat	Threats
Critically Endangered					
Herminiumlanceum(Thunberg ex Swartz) Vuijk	Orchidaceae	1800-2100	H	1,2,7,10	HD
PittosporumeriocarpumRoyle	Pittosporaceae	700-1700	T	1,7	OE
Cedrusdeodara(Roxb.) Loud.	Pinaceae	1700-2150	T	1,3,4,5	OE, HD
Acer caesium Wall. exBrandis.	Aceraceae	2000-2150	T	1,2,6,7	OE, HD
Acer oblongumWall. ex DC.	Aceraceae	900-1100	T	1,4,7	OE, HD
Ilex dipyrenaWall.	Aquifoliaceae	2000-2150	T	1,2,7	OE, HD
Ilex excelsa (Wall.) Hk.	Aquifoliaceae	1600-2000	T	1,2,7	OE, HD
Quercus floribunda Lind.	Fagaceae	1400-2100	T	1,4,6,7	OE, HD
CinnamomumtamalaL.	Lauraceae	700-1400	T	1,7,11	OE, HD
MeliaazedarachL.	Meliaceae	700-1500	T	1,4,7	OE
Endangered					
Alangiumsalvifolium(L.f.) Wang	Alangiaceae	1000-1700	T	1,2,4	HD
Bergeniaigulata (Wall.) Engl.	Sapindaceae	1200-2150	H	1,2,5,6,7	OE, HD
Pimpinellaacuminata(Edgew.) Cl.	Apiaceae	2000-2150	H	1,2	HD
Sarcococcalinga (D.Don) Muel.	Buxaceae	1800-2150	Sh	1,4,7	HD
ArenariaeelgherrensisWt. et Arn.	Caryophyllaceae	1900-2150	H	1,2	HD
ElaeodendronglaucumPere	Celasteraceae	1500- 2150	T	11	HD
MesuaferreaL.	Clusiaceae	700-1300	T	11	HD
Cornuscapitata Wall.	Cornaceae	1600-2000	T	1,2,7	OE, HD
ShoreaobustaGaertn.f.	Dipterocarpaceae	700-1700	T	1,7	OE, HD
QuercusleucotricophoraA. Camus	Fagaceae	1400-2100	T	1,2,3,5,6,7	OE, HD
DidymocarpuspedicellataR.Br.	Gesneriaceae	1400-1700	H	1,7,10	HD
JuglansregiaL.	Juglandaceae	1200-1800	T	1,2,5,6,7	OE, HD
PerseaaduthieiNees	Lauraceae	1500-1800	T	1,2,7	OE, HD
OsbeckiastellataBuch.-Ham.	Melastomaceae	1500-2100	Sh	1,4,7	HD
ToonaserrataRoyle	Meliaceae	1300-1800	T	1,3,4,7,8	OE, HD
Acacia chinensisOsbeck	Mimosaceae	700-1500	T	4,7,10	HD
CalantheatricarinataLindl.	Orchidaceae	1800-2150	H	1,2,7	HD
PhytolaccaacinosoRoxb.	Phytolaccaceae	1800-2150	H	1,2,7	OE, HD
Clematis connataDC.	Ranunculaceae	1800-2100	Sh	1,4	HD
RubuspaniculatusSm.	Rosaceae	1500-2150	Sh	2,4,7	OE
Daphne papyraceaWall.	Thymelaeaceae	1600-2150	Sh	1,2,4,6	HD
UlmuswallichianaPlanch.		1000-1800	T	2,7	OE, HD
RoscoeaproceraWall.	Zingiberaceae	1700-2100	H	1,7,10	HD
Vulnerable					
Agave americana L.	Agavaceae	700-1200	Sh	3,4,8.	HD
PistaciaintegerrimaSw.	Anacardiaceae	700-1400	T	1,3,4,5,7	OE, HD
SpondiaspennataWilld.	Anacardiaceae	700-1200	T	1,4,5	HD
Centellaasiatica (L.) Urban	Apiaceae	700-1500	H	1,3,4,8	OE
Rauvolfia serpentina (L.) Benth. exKurz.	Apocynaceae	700-1000	Sh	1,4	OE, HD
AcoruscalamusL.	Araceae	700-1500	H	9	OE, HD
Phoenix humilisRoyle ex Becc. &Hk.	Arecaceae	700-1400	T	4,5,6,7	OE, HD
P. sylvestrisRoxb.	Arecaceae	700-1200	T	4,5,6,7	OE, HD
Rhaphidophoraglauca(Wall.) Schott.	Arecaceae	800-1500	Sh	1,2,7	HD
Marsdenialucida Moon	Asclepiadaceae	1800-2150	Sh	3,7	HD
VincetoxicumhirundinariaMedic. subsp.glaucum (Wall.ex Wt.)	Asclepiadaceae	1800-2150	Sh	3,7,10	HD
Asparagus adscendensRoxb.	Asparagaceae	700-1700	Sh	1,4,7	OE, HD
InulacuspidataaCl.	Asteraceae	700-1600	H	1,6,7	
BerberisasiaticaRoxb.	Berberidaceae	700-1500	Sh	1,3,4,5,6,7	OE, HD
Alnusnepalensis Don	Betulaceae	1500-2150	T	2,7	HD
Bauhinia vahlii (Wt. &Arn.) Benth.	Caesalpiniaceae	700-1300	Sh	1,2,3,4,5,6,7	OE
B. variegata L.	Caesalpiniaceae	700-1400	T	1,3,4,5,7,8	OE, HD
Cassia fistula L.	Caesalpiniaceae	700-1500	T	1,3,4,5,7,8, 11	OE, HD
Lycesteriaformosa Wall.	Caprifoliaceae	1600-2150	Sh	1,2,7,6	OE, HD
Maytenusrufa(Wall.) Hara	Celasteraceae	1200-1600	T	1,3,4,7	
Terminaliaarjuna(Roxb.ex DC.) Wt. &Arn.	Combretaceae	700-1000	T	1,4,5,7	OE, HD
PoranaracemosoRoxb.	Convolvulaceae	700-1700	H	1,3,9	HD
CordiadicotomaFrost.	Cordiaceae	700-1700	T	1,7,8,11	HD
DioscoreabulbiferaL.	Dioscoreaceae	700-1400	H	1,4,7,8,10	OE
DioscoreadeltoideaKunth.	Dioscoreaceae	700-2100	H	1,4,5,6,7,8,10	OE
EhretiaacuminataBr.	Ehretiaceae	700-1500	T	4,7,5	HD
Rhododendron arboreumSm.	Ericaceae	1500-2100	T	1,4,5,6,7,11	OE, HD

<i>Emblcaofficinalis</i> L.	Euphorbiaceae	700-1600	T	1,4,7,8,10	OE
<i>Buteamonosperma</i> (Lamk.) Taub.	Fabaceae	700-1400	T	1,4,5,6,7	OE, HD
<i>Dalbergiasissoo</i> Roxb.	Fabaceae	700-1400	T	3,4,7,8,11	OE, HD
<i>Indigoferadosua</i> Buch.-Ham. ex D. Don	Fabaceae	700-1500	Sh	1,4,7	HD
<i>Indigoferapulchella</i> Roxb.	Fabaceae	1600-2100	Sh	1,4,7	HD
<i>Indigoferalinifolia</i> (L.f.) Retz.	Fabaceae	700-1200	H	1,3,4,7	HD
<i>Puerariatuberosa</i> (Willd.)DC.	Fabaceae	700-1200	Sh	1,2,7	OE, HD
<i>Quercusglauca</i> Thunb.	Fagaceae	800-1800	T	1,2,4,5,6,7	OE, HD
<i>Flacourtiaindica</i> (Burm.f.) Merr.	Flacourtiaceae	700-1700	T	1,3	HD
<i>Swertiacordata</i> Wall.	Gentianaceae	1600-2150	H	4,5,7,10	HD
<i>Geranium nepalense</i> Sw.	Gentianaceae	1500-2100	H	1,2,4,5,6,7,10	HD
<i>Ribesglaciale</i> Decne.	Grossulariaceae	2000-2150	Sh	1,2,5,6,7	HD
<i>Aesculus indica</i> Colebr.exCamb.	Hippocastanaceae	1500-2000	T	1,2,4,7	OE, HD
<i>Hypericumperforatum</i> L.	Hypericaceae	1200-2100	Sh	1,7,8,10	HD
<i>Holboellialatifolia</i> Wall.	Lardizabalaceae	1500-2150	Sh	1	HD
<i>Litsea monopetala</i> (Roxb.)Pers.	Lauraceae	700-1400	T	1,4,7	OE, HD
<i>Gloriosasuperba</i> L.	Liliaceae	700-1400	H	1,7	OE, HD
<i>Acacia catechu</i> (L.f.) Willd.	Mimosaceae	700-1700	T	4,7,10	OE
<i>Acacia nilotica</i> (L.)	Mimosaceae	700-1300	T	4,7,10	OE, HD
<i>Ficus bengalensis</i> L.	Moraceae	700-1200	T	1,4,7,11	HD
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	700-1600	T	13,4,7	OE
<i>Oleaglandulifera</i> N.F.	Oleaceae	700-1500	T	1,4,7	HD
<i>Epipactisheleborine</i> (L.) Crantz	Orchidaceae	1600-2100	H	1,7,9	HD
<i>Bambusaarundinacea</i> Ait.	Poaceae	700-1200	T	2,7,8,11	OE, HD
<i>Delphinium nudatum</i> Royle	Ranunculaceae	1500-2100	H	1,7	HD
<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	1000- 1700	H	1,4,7	HD
<i>Prunus cerasoides</i> Don	Rosaceae	700-1700	T	1,4,7	OE, HD
<i>Pyracantha crenulata</i> L.	Rosaceae	1300-2000	Sh	1,4	HD
<i>Rubus foliolosus</i> D. Don	Rosaceae	1700-2150	Sh	2,4,7	OE
<i>Salix acmophylla</i> Boiss.	Salicaceae	1700-2000	T	8,7,11	HD
<i>Salix tetrasperma</i> L.	Salicaceae	700-1400	T	1,6,7	HD
<i>Sapindus mukorossi</i> Gaertn.	Sapindaceae	700-1700	T	1,4	HD
<i>Schisandra grandiflora</i> (Wall.)Hk.f.&Th.	Schisandraceae	1800-2150	Sh	1,4	HD
<i>Lindenbergiamacrostachya</i> (Benth.) Benth.	Scrophulariaceae	1500-1900	H	1,7	HD
<i>Symplocos chinensis</i> (Lour.) Drace	Symplocaceae	1300-1700	T	1,4,7	OE, HD
<i>Eurya acuminata</i> DC.	Theaceae	1500-2150	T	1,3,4	HD
<i>Ulmus villosa</i> Brand. ex Gamble	Ulmaceae	1800-2150	T	2,7	OE, HD
<i>Boehmeria platyphylla</i> D.Don	Urticaceae	700-1700	Sh	1,2,7,9	HD
<i>Debregeasia longifolia</i> Wedd.	Urticaceae	700-1400	T	1,4,7,9	OE, HD
<i>Valeriana jatamansi</i> Jones	Valerianaceae	700-1700	H	1,4,5,7,11	OE, HD
<i>Tectonagrandis</i> L.f.	Verbenaceae	700-1700	T	1,7,11	OE, HD
<i>Vitiscapriola</i> D. Don,	Vitaceae	800-1200	Sh	1,7	HD
<i>Hedychium spicatum</i> Ham.ex Sm.	Zingiberaceae	1400-1800	H	1,4,5,6,7	OE, HD
<i>Zingiber chrysanthum</i> Rosc.	Zingiberaceae	1200-1700	H	1,2	HD
	Near Threatened				
<i>Debregeasia salicifolia</i> (D.Don) Rendl.	Urticaceae	1500-1900	T	1,2,7	OE, HD
<i>Dicliptera x burghiana</i> Nees	Acanthaceae	700-1700	H	1,3,4,5,8	HD
<i>Agave cantala</i> Roxb.	Agavaceae	700-1200	Sh	3,4,8	HD
<i>Yucca gloriosa</i> L.	Agavaceae	1000-1800	Sh	3,4,8	HD
<i>Cheirophyllum villosum</i> Wall.ex DC.	Apiaceae	2000-2150	H	1,2,7	HD
<i>Begonia picta</i> Sm.	Begoniaceae	700-1800	H	1,2,7,9	HD
<i>Stereospermum chelonoides</i> DC.	Begoniaceae	900-1400	T	3,4,11	HD
<i>Bombax ceiba</i> L.	Bombacaceae	700-1500	T	1,4,7,8	OE
<i>Bauhinia racemosa</i> Lamk.	Caesalpiniaceae	700-1300	T	1,2,4	OE, HD
<i>Cerastium cerastioides</i> (L.) Britt.	Caryophyllaceae	700-2100	H	2,4	HD
<i>Euonymus pendulus</i> Wall.	Celastereae	1700-2100	T	1,5,7,8	HD
<i>Cordia obliqua</i> Willd.	Cordiaceae	700-1200	T	1,7,8,11	HD
<i>Carpinus viminea</i> Dcne.	Corylaceae	1700-2150	T	1,7	HD
<i>Drosera peltata</i> Sm.	Droseraceae	1600-2000	H	1,7,10	HD
<i>Drypetes roxburgii</i> (Andr.) Focke	Euphorbiaceae	1000-1500	T	4,5,7	HD
<i>Mallotus philippensis</i> Muell. -Arg.	Euphorbiaceae	700-1200	T	1,3,4,7,8	OE
<i>Indigofera heterantha</i> Wall. ex Brandis	Fabaceae	1800-2100	Sh	1,3,4,5,6,7	OE, HD
<i>Lespedeza gerardiana</i> Grah. ex Maxim.	Fabaceae	1500-1800	H	4,7,8,10	HD
<i>Sesbaniagrandiflora</i> Pers.	Fabaceae	700-1200	T	1,7	HD
<i>Geranium wallichianum</i> Don ex Sw.	Geraniaceae	1900-2100	H	1,4,7,10	HD
<i>Hypericum elodeoides</i> Choisy	Hypericaceae	1600-2100	Sh	4,5,7,10	HD
<i>Hypericum muralum</i> Buch. -Ham. ex D. Don	Hypericaceae	1200-2150	Sh	1,4,7	HD
<i>Toonaciliata</i> Roem.	Meliaceae	700-1400	T	1,3,7,8,9	OE, HD

Tinosporacordifolia (L.) Merr.	Menispermaceae	700-1700	H	1,2,4,7	OE
Albizialebeck (L.) Willd.	Mimosaceae	700-1200	T	1,4,6,7,11	OE, HD
FraxinusmicranthaLinglesh.	Oleaceae	2000-2150	T	1,2,3,7	OE, HD
DendrocalamusstrictusNees	Poaceae	700-1400	T	1,3,4,7	OE
Sorbariatomentosa (Lindl.) Rehder	Rosaceae	1600-2150	Sh	1,2,4,6,7	HD
Mitragynaparvifolia(Roxb.) Korth.	Rubiaceae	700-1400	T	1,4	HD
AstilberivularisBuch. -Ham.	Sapindaceae	1600-2150	H	1,3,4,5,7	HD
Veronica bilobaL.	Scrophulariaceae	1000-1500	H	1,4	HD

Abbreviations used: AR=Altitudinal range;HF=Habit forms; H = Herb; Sh = Shrub; 1=shady moist; 2=Riverine; 3=degraded; 4=Dry; 5=Bouldery; 6=Rocky; 7=Forest, 8=Waste and/roadside/Wayside; 9=Marshy/Watercourses; 10=Grassland; 11=cultivated/Planted; 12=Parasitic; OE=Over Exploitation and HD=Habitat Degradation

In the present study area, Rissa Khad Watershed, which falls in the sub-tropical and temperate zones is facing heavy biotic pressure, leading to habitat degradation and the degradation of habitat is making congenial environment for the growth and development of non-natives like *Lantana camara*, *Ageratum conyzoides*, etc. ultimately to extinction of the species. Therefore, to develop an appropriate strategy for the conservation and management of all these threatened species and their habitats, population assessment and habitat monitoring using standard ecological methods are urgently required.

Prioritization of species and habitats with authentic information is prerequisite for the conservation management planning (Joshi and Samant 2004) Amongst the prioritized species, *Cedrus deodara*, *Ilex dipyrena*, *I. excelsa*, *Acer caesium*, *Valeriana jatamansi*, *Hedychium spicatum*, *Berberis lycium*, *Pittosporum eriocarpum*, *Cinnamomum tamala*, *Melia azedaracht*, *Bergenia ligulata* and *Berberis aristata* are facing high pressures due to over exploitation and habitat degradation. Therefore, population monitoring using standard ecological methods is urgently required. Given the extent to which natural disturbance regimes have been disrupted and species have been transported across the globe, the degradation of species composition is a very real threat to biodiversity (Nicholson *et al* 2009) Therefore, proper management of these communities would help in maintaining the natural ecosystems of the Rissa Khad Watershed.

Amongst the habitats, high CPI values of shady moist, forest, dry habitats indicated their conservation importance. The conservation priority of shady habitat is in accordance with their worldwide status of most endangered ecosystems (.Sala *et al* .2000). Adequate management planning of these habitats would help in maintaining the conservation and socio-economic values of these habitats.

The prioritized species and habitats possess not only high species richness, but also the highest number of native, endemic, economically important and threatened species. Therefore, any negative impact on these habitats may lead to a change in their composition, resulting in to the loss of important biodiversity and socio-economic elements. Further, consistent information on threatened species, habitats and communities through regular monitoring indeed for land use planning and for prioritizing conservation, management and restoration actions for the present study area.

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