DETAIL ASSSESSMENT OF BIODIVERSITY, THREATS AND HUMAN-WILDLIFE CONFLICT TO INITIATE CONSERVATION INTERVENTION IN RAMAROSHAN LAKE COMPLEX IN WESTERN NEPAL

Report Submitted by

Friends of Nature (FON)
Kathmandu, Neepal
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Project Supporters

PROJECT DETAILS

Project Title	**Detailed Assessment of Biodiversity, Threats, and Human-Wildlife Conflict to Initiate Conservation Interventions in Ramaroshan Lake Complex, Far Western Nepal**
Project Site	**Ramaroshan Rural Municipality, Ward Number 5 and 6, Sudurpaschim Province, Achham, Nepal**
Project Duration	**15 August 2022 to 15 July 2023**
Objectives	**1. To assess biodiversity, threats to/of biodiversity, and human-wildlife conflict of Ramoroshan lake cluster in detail** **2. To recommend a data based holistic conservation plan for the landscape, using the baseline data**
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Funding Agencies	**Rufford Foundation, UK** **Bernd This Stiftung, Switzerland** **Dhole Conservation Fund, USA** **S.P.E.C.I.E.S., USA**
Technical Support	**Department of Forests and Soil Conservation** **Ministry of Industry, Tourism, Forests and Environment, Sudurpaschim Province** **District Administration Office, Achham** **Division Forest Office, Achham** **Ramaroshan Rural Municipality, Achham** **Ramarashon Tourism Board, Achham**
Implementing Agency	**Friends of Nature, FON Nepal**
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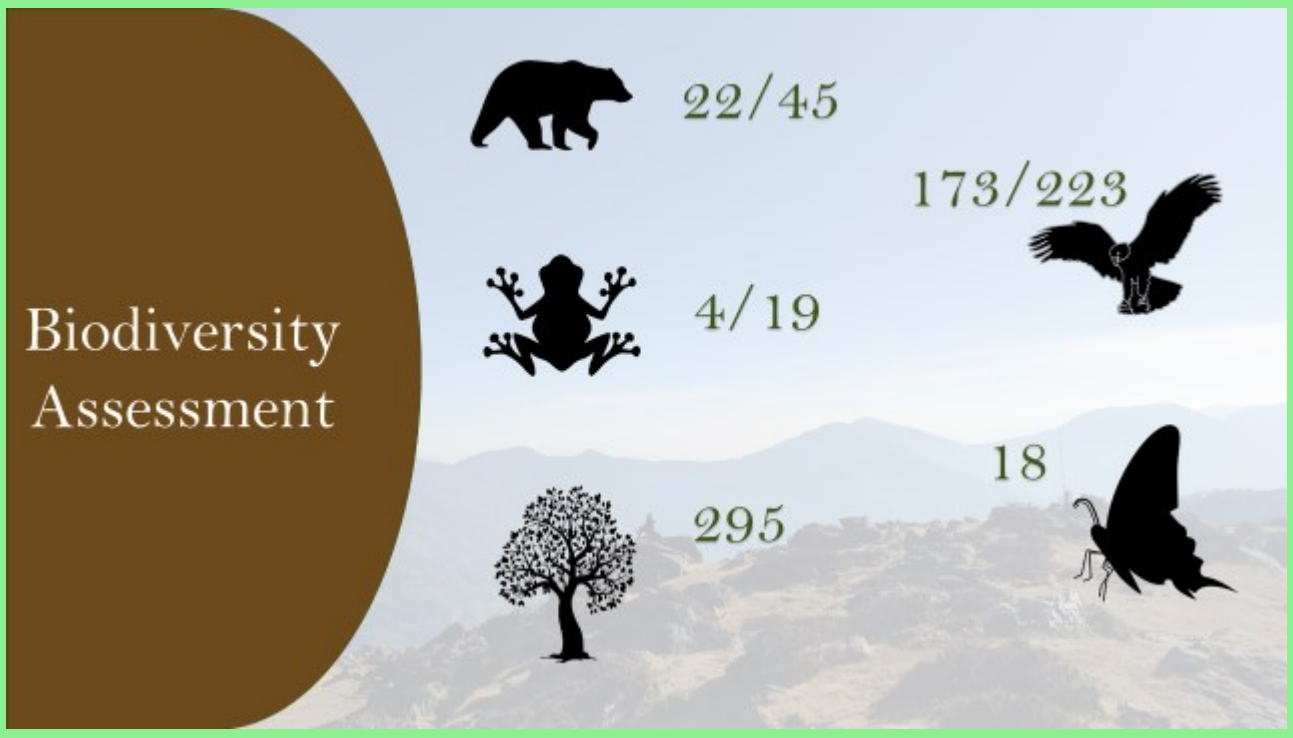

The first digit before the slash indicates the result of the research conducted in 2022, while the digit after the slash represents the total recorded in the study/project site

Monetary Loss in 2022

Data from 148 samples used to predict the area of 610 households

	Loss in NPR			Loss in USD		
Loss Category	Sampled household	Per household	Total area	Sampled household	Per household	Total area
Crop Loss	8,03,850	5,431.42	33,13,166	6,089.77	41.15	25,099.74
Livestock Loss	16,60,000	11,216.22	68,41,892	12,575.76	84.97	51,832.51
Total Loss	**24,63,850**	**16,647.64**	**1,01,55,058**	**18,665.53**	**126.12**	**76,932.25**

The figure indicates that the intensity of people-wildlife conflict in the area is very high

SUMMARY

Ramaroshan is a mid-hill wetland complex in Achham district of far western Nepal extending from 1400 m to 3800 m elevation range with mosaic of forest, wetland, grassland, and pasture. The complex, popularly known as 12 lakes and 18 meadows, is the headwater of Kailash River and it provides great ecological services in the region. The area has less recognition in terms of biodiversity and conservation despite its unique landscape. For the assessment of overall biodiversity and to understand the relationship between people and biodiversity in the area, a month-long expedition was carried out in November-December 2022. Extensive camera trapping, avifaunal survey, vegetation sampling and social survey were simultaneously conducted to cover the area of about 100 square kilometers.

During our field visit, we heard 7 gunshots, several signs of hunting and forest fire, also 10 mammals were live sighted indicating the threats and possibilities. We recorded 22 mammals, 173 birds, 295 plants, 18 butterflies and four herpetofauna from Ramaroshan Lake Complex. The heterogeneous landscape consists of five major forest types and four major habitat types creating diverse ecosystems. Our finding suggests the area serves as an important habitat for 13 globally threatened species which includes 5 mammals, 4 birds and 4 plants.

The findings from the social survey (147 households) indicate a serious issue of human-wildlife conflict in the area. The annual monetary loss by crop depredation is $6089.77 and livestock depredation is $12575.76 of the sampled household in 2022. Based on the annual loss per household i.e., $41.15 from crop depredation and $84.97 from livestock depredation, we have calculated the annual monetary loss of the area (610 households). Our data found the annual crop loss in the area to be $25,099.74 and annual livestock loss is $51,832.51. A huge sum of money i.e., $76,932.25 is lost each year from crop and livestock related loss in Ramaroshan Lake Complex. Besides, 3 people died, 2 got injured and 150 people were attacked by Asiatic Black Bear in last five years indicating alarming issue of Human-Bear Conflict.

We also noticed the low level of awareness related to biodiversity and conservation, leading to unproportional use of natural resources by the locals. The detailed analysis of camera trap image will guide us to map the problematic area and to reduce the conflicts. A long-term plan to reduce human-wildlife conflict and initiate integrated development and conservation activities in the area is crucial to ensure harmony between people and wildlife.

Figure 1: Mesmerizing view of Ramaroshan

INTRODUCTION

Ramaroshan is a wetland complex located in the northeastern corner of Achham district in Ramaroshan Rural Municipality ward number 5 bordering with Kalikot in the east and Bajura district in the North (Figure 2). The area is situated at roughly 32 KM and 65 KM aerial distance from Khaptad National Park and Rara National Park respectively and is not contiguous with any protected areas of the country. The landscape has a wider elevational gradient which ranges from 1400 to 3800 meters above sea level and climatic gradient ranging from subtropical to subalpine climatic zones. Ramaroshan is popularly known as *12 Banda 18 Khanda* by locals, which means the landscape consists of 12 lakes and 18 pastures/meadows. The area consists of five major forest types: Lower temperate mixed broad-leaved forest, Upper temperate mixed broad-leaved forest, *Quercus leucotrichophora- Quercus lanata* forest, *Tsuga dumosa* forest, and Rhododendron Forest and four major habitat types: Forest, Pasture, Grassland, Wetland. The mosaic of these habitats blended with human settlements make Ramroshan complex a beautiful landscape.

The heterogenous and rugged landscape of the region comes with its own set of problems. Local people are heavily dependent on forest for timber, firewood, fodder, and dry leaves for manure. They frequently visit forests which results in conflict primarily with Asiatic Black Bear. Several incidents of fatal encounters are reported from the area making the species most problematic. Low level of awareness is leading towards hunting and unscientific resource uses, which is gradually degrading the pristine landscape. Besides, most of the wetlands are vulnerable to siltation and erosion resulting in shrinkage. Unmanaged tourism is a bit of concern towards local biodiversity. For the proper management and conservation of the landscape, a concrete plan is required. Hence the project is designed to assess biodiversity, threats and understand the relationship between human and biodiversity. The findings from the project will guide concerned authorities towards formulating an integrated plan based on scientific evidence.

Figure 2: A perfect camping spot

GOAL AND OBJECTIVES

The overall goal of the project is to assess biodiversity and recommend conservation management plans/ strategies for the area.

The specific objectives are,

Objective 1: To assess biodiversity, threats to/of biodiversity, and human-wildlife conflict of Ramaroshan lake cluster in detail, and

Objective 2: To recommend a data based holistic conservation plan for the landscape, using the baseline data.

Figure 3: A perfect hilltop for sighting three lakes: Jingale, Batula and Mathillo Dhaune

PROJECT AREA

Ramaroshan is a mid-hill wetland complex in Achham district, Sudurpaschim Province Nepal, extending from 1400 to 3800 meters elevation range (Chalaune, et al., 2020). The complex, popularly known as 12 lakes and 18 meadows, is the headwater of Kailash River and it provides great ecological services in the region. The area harbors upper subtropical to upper temperate bioclimatic zones and the vegetation assemblage includes *Rhododendron*, *Quercus*, *Taxus* and *Patula* species. The area hosts five major forest types: Lover-temperate mixed broad-leaved forest, Upper temperate mixed broad-leaved forest, *Quercus* Forest, *Tsuga dumosa* forest and Rhododendron Forest and four major habitat types: Forest, Grassland, Wetland and Pasture.

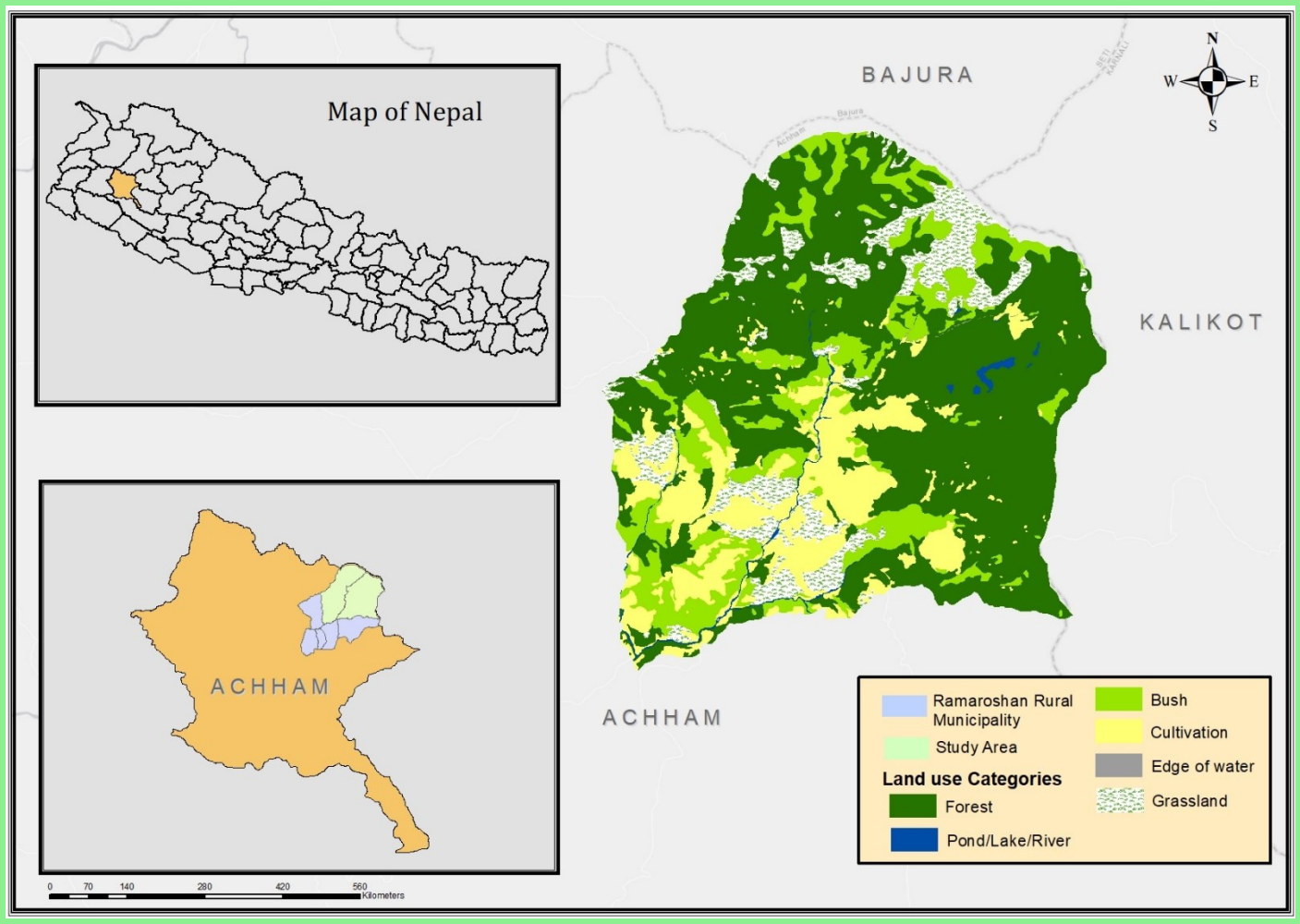

Figure 4: Map of the project area

Study Duration

The planning and designing of survey protocols, consulting experts and different stakeholders, acquiring permission from national to local level, managing field gears and scientific equipment and other activities were managed three months prior to the preliminary survey.

Preliminary Survey

Our team conducted a recce survey on August 13-22, 2022, in the area prior to field planning. Also, formal, and informal discussions with stakeholders from Ministry of Industry Tourism Forest and Environment, Kailali, Divisional Forest Office Achham, Ramaroshan Rural Municipality, and Ramaroshan Tourism Board was carried out to inform them about the scale of the project. All local stakeholders were supportive throughout the planning and implementation phase. The visit enabled us

to plan our field activities in a proper manner. We could generate more ideas on social survey sampling, camera trap sites, potter finalization and gather local support.

Field Days

The field work was carried out in the months of November and December 2022. A total of 34 days were spent in travel with 27 days in the field by our research team of 11 members including 4 potters and 1 local manager. After completing the camera trap installation, avifauna survey and social survey, the team returned from the field. Two local resource persons were assigned to monitor the camera traps regularly for three months by providing them with essential knowledge and gears. They retrieved the camera traps and two of our team members visited the area to receive the camera traps and carried out some surveys for five more days.

Table 1: Field schedule

Date	Day	Activities	Remarks
November 27, 2022	1	Departed from Kathmandu	
November 28	2	Reached Mangalsen	
November 29	3	Reached Ramaroshan	
November 30	4	Camp at Jingale Taal	Camp 1
December 1, 2022	5	Camp at Jingale Taal	
December 2	6	Camp at Jingale Taal	
December 3	7	Camp at Jingale Taal	
December 4	8	Camp at Roshan Maidan	Camp 2
December 5	9	Camp at Roshan Maidan	
December 6	10	Camp at Roshan Maidan	
December 7	11	Camp at Roshan Maidan	
December 8	12	Camp at Kinimini Phant	Camp 3
December 9	13	Camp at Kinimini Phant	
December 10	14	Camp at Kinimini Phant	
December 11	15	Camp at Pase Kharka	Camp 4
December 12	16	Camp at Pase Kharka	
December 13	17	Camp at Pase Kharka	
December 14	18	Camp at Pase Kharka	
December 15	19	Camp at Nigaldadi	Camp 5
December 16	20	Camp at Nigaldadi	
December 17	21	Camp at Bhaurechulla	Camp 6
December 18	22	Camp at Bhaurechulla	
December 19	23	Camp at Dhanesalla	Camp 7
December 20	24	Camp at Dhanesalla	
December 21	25	Camp at Rame	Camp 8
December 22	26	Camp at Rame	
December 23	27	Camp at Salimkot	Camp 9
December 24	28	Camp at Salimkot	
December 25	29	Camp at Salimkot	
December 26	30	Reached Mangalsen	
December 27	31	Reached Nepalgunj	
December 28	32	Departed from Nepalgunj	
December 29	33	Reached Kathmandu	

METHODOLOGY

Camera Trap Survey

For the camera trap survey, the land use land cover (LULC) map was created using Arc GIS, with the reference of LULC map from ESRI. Seven different land use categories were identified in the 96.46 sq. km area. Next 1*1 sq. km grids were laid down making a total of 120 grids. Settlement area, cultivated area, cliffs, ponds/lakes, and inaccessible areas above 3500 meters were discarded and a total of 60 grids were selected. After installing the camera trap in one grid, the alternative grid was omitted. If the randomly chosen grid was occupied with settlement/ cultivated/ cliffs/ inaccessible area, the consecutive grid in the east direction was chosen. If a similar issue arose, in the East grid, West grid was chosen. Further, if camera trapping was impossible in both Eastern and Western grids from the random grid, that random grid was left inaccessible.

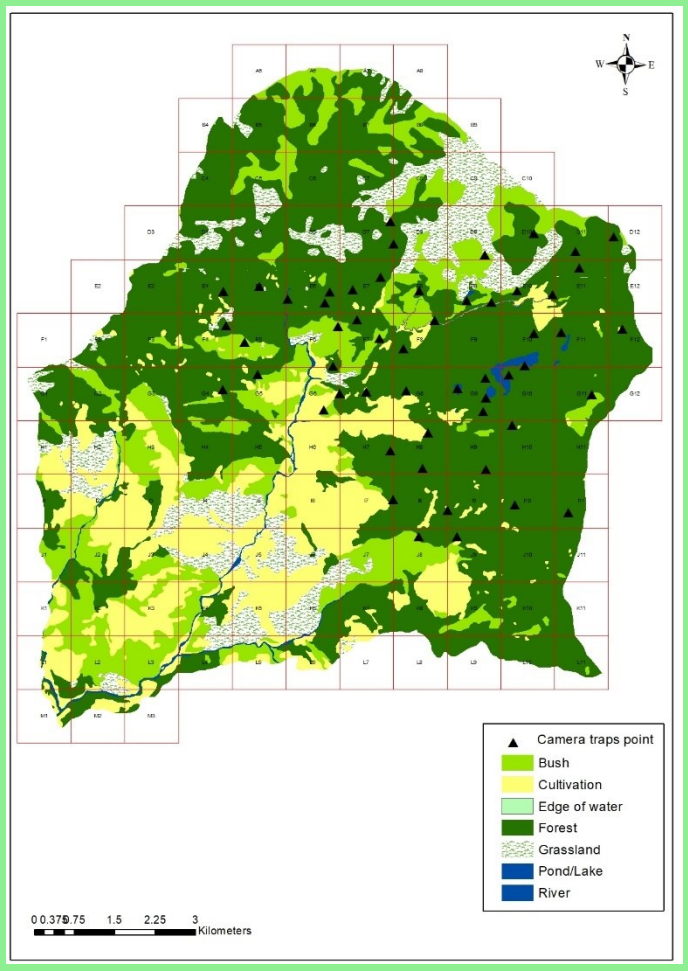

Figure 5: Camera traps locations along with surveyed grids

Before installing the camera traps, a transect walk was conducted in each chosen grid. Researchers walked along the transects at the speed of 3 km/ hour and searched for signs. Areas with maximum probability of animal movement were selected for which areas with forest trail junctions, water holes, streams, animal sign (pugmark, scrape mark, scratch marks, scats/ dung, etc.) availability and so forth was preferred. All the camera traps were set up uniformly. A detailed data sheet containing habitat information and disturbance assessment was filled simultaneously. A total of 57 camera traps were installed in the field. The camera traps used in this study are Scoutguard, Bushnell and Browning. The first camera trap was installed on 1st December 2022 and the last camera trap was installed on 26th December 2022.

Butterfly Survey

As the study was carried out in winter, butterfly survey was not conducted employing any methods. Along with the transects set for birding and camera traps, we searched for butterfly species and photographed. The photographs were then identified with the help of field guidebook, Butterflies of Nepal (Smith, 1989).

Avifauna Survey

The Avifauna survey took place in 23 different birding routes within the study area. Birds were observed by experts in the morning (6:30-10:30 AM) and evening (4:30-6:30 PM) hours using binoculars. Different habitat types such as forest, pasture, grassland, streams, and agroforestry were covered. Photographs were also captured for identification purposes. Mackinnon's Listing Method (20 species count) was used in each birding route to assess avifaunal diversity and relative abundance. The method works with a different list of 20 species. The number of birds heard/seen by the researchers are listed out till the list reaches 20 species without repeating the species in same list. This method is useful to know the diversity of birds in large areas.

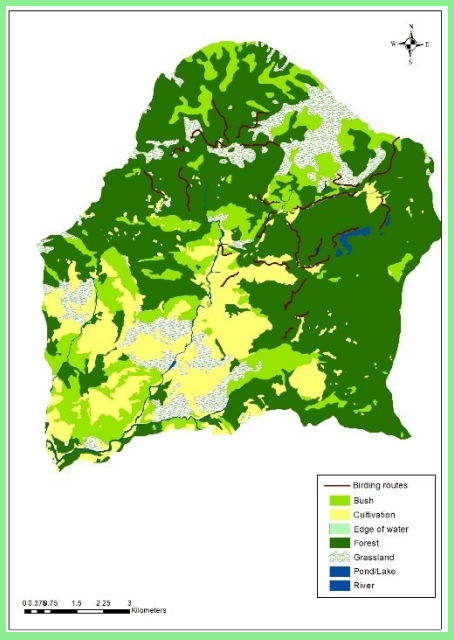

Figure 6: Birding routes followed during the study

Vegetation Survey

We planned to conduct vegetation surveys both in the center of random grids and camera trap locations. For the first week of the field work, we tried to reach the center of each randomly selected grid and conducted vegetation survey. However, due to time and budget constraint, we could not keep up with it and we decided to conduct the survey in camera trap locations only.

Circular plots of 500 m^2 area [radius (r)=12.62 m] for big trees [Diameter at breast height (DBH)>20 cm diameter], 250 m^2 area (r=8.92 m) for small trees (DBH 5 cm – 20 cm), 25 m^2 area (r=2.82 m) for sapling (height >1.3 m, DBH < 5 cm) and 3.1416 m^2 area for regeneration (height <1.3 m) were used for vegetation enumeration. Big trees and small trees were measured using the same center point. However, saplings and regeneration were measured at 5 m distance from center point in the North direction.

Herpetofauna Survey

We could not conduct herpetofauna survey as the survey was conducted in winter season which is generally the hibernating period. Although we have managed to capture a few pictures of lizards which were basking during our transect surveys.

Human-wildlife Conflict

For the assessment of Human-Wildlife Conflict in the Ramaroshan area, a semi-structured questionnaire survey was carried out. Our study area comprises of 23 villages including 1200 households. First, the villages were categorized into three categories (Nearby Communities (NC), Medium Distanced Communities (MDC), and Distanced Communities (DC)) based on the walking distance from the largest lake, Jingale Taal (here after referred as center of forest). We then identified 10 villages in NC category (less than 1 hour walking distance from center of forest), 6 villages in MDC category (1-3 hours walking distance from center of forest), and 7 villages in DC category (more than 3 hours walking distance from center of forest). The questionnaire survey was carried out only in NC and MCD village clusters, including 15 villages as the inhabitants were solely dependent in the forest of Ramaroshan area.

We did a purposive survey to choose the first house of each village which was below the major road. After surveying the first household systematic random sampling was employed to complete the survey in each village with a gap of two consecutive households. The survey time for each household takes 30 minutes for each surveyor. To minimize the biases one respondent was considered identical to that household. The overlapping issues of the same family with multiple houses is solved by verifications with locals. In such manner we surveyed n=148 households out of 610 existing houses in two village clusters, making the sample size of 25.37%. Data extraction also included unbiased pre consent of locals' practices and understanding. The crop loss and livestock depredation were recorded with monetary standards of current market values.

Figure 7: Expedition team members

RESULTS

Camera Trapping

A total of 57 camera traps were installed among 3 were lost and 1 malfunctioned. A total of 4072 trap nights produced 214353 images from 53 camera traps. We looked through all the images to count the number of wildlife captured. The majority of images were false triggered (61.32%) followed by humans (28.25%) and livestock (5.55%). The longest camera trap was placed for 112 nights and shortest was 1. The major habitat type covered were forest, grassland, pasture, riverine, and wetland. A total of 18 mammal species were recorded from the camera trap images, 3 live sighting and 1 through community discussion, making the diversity of 22 mammals from the region. The project area harbors four globally vulnerable mammals (Leopard, Asiatic Black Bear, Mainland Serow and Himalayan Tahr) while the status of Dhole (globally endangered) is questionable. The image of Northern Red Muntjac (n=1441) was the highest and the lowest image (n=10) was Jungle Cat. The most camera trapped species was Mainland Leopard Cat from 31 camera traps and the least captured were Rhesus Monkey and Mainland Serow from 2 camera traps. There is also a possibility of global range extension of Malayan Porcupine. Besides mammals, 20 bird species were also captured in camera traps. The list of camera trapped birds is in Table 4 and the detailed checklist of birds can be found in Appendix 4.

Table 2: List of mammals reported from Ramaroshan lake Complex. CT=Camera Trap, LS=Live Sighting, CD=Community Discussion, EN=Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concern, DD=Data Deficient

SN	Common Name	Scientific Name	Family	Source	IUCN Status	National Status
1	Leopard	*Panthera pardus*	Felidae	CT	VU	VU
2	Mainland Leopard Cat	*Prionailurus bengalensis*	Felidae	CT	LC	VU
3	Jungle Cat	*Felis chaus*	Felidae	CT	LC	LC
4	Large Indian Civet	*Viverra zibetha*	Viverridae	CT	LC	NT
5	Masked Palm Civet	*Paguma larvata*	Viverridae	CT	LC	LC
6	Yellow Throated Marten	*Martes flavigula*	Mustelidae	CT, LS	LC	LC
7	Indian Crested Porcupine	*Hystrix indica*	Hystricidae	CT	LC	DD
8	Malayan Porcupine	*Hystrix brachyura*	Hystricidae	CT	LC	DD
9	Assamese Macaque	*Macaca assamensis*	Cercopithecidae	CT, LS	NT	VU
10	Rhesus Monkey	*Macaca mulatta*	Cercopithecidae	CT, LS	LC	LC
11	Nepal Gray Langur	*Semnopithecus schistaceus*	Cercopithecidae	CT, LS	LC	LC
12	Asiatic Black Bear	*Ursus thibetanus*	Ursidae	CT	VU	EN
13	Wild Boar	*Sus scrofa*	Suidae	CT, LS	LC	LC
14	Golden Jackal	*Canis aureus*	Canidae	CT, LS	LC	LC
15	Red Fox	*Vulpes vulpes*	Canidae	CT	LC	DD
16	Northern Red Muntjac	*Muntiacus vaginalis*	Cervidae	CT	LC	VU
17	Himalayan Goral	*Naemorhedus goral*	Bovidae	CT, LS	NT	NT

18	Mainland Serow	*Capricornis sumatraensis*	Bovidae	CT	VU	DD
19	Himalayan Tahr	*Hemitragus jemlahicus*	Bovidae	LS	VU	NT
20	Lesser Striped Shrew	*Sorex bedfordiae*	Soricidae	LS	LC	DD
21	Himalayan Rat	*Rattus pyctoris*	Muridae	LS	LC	DD
22	Dhole	*Cuon alpinus*	Canidae	CD	EN	EN

Table 3: Frequency of image captured and total number of camera traps which captured the mammal species

SN	Common Name	Total Images	Frequency	Number of CT
1	Leopard	493	0.12	29
2	Mainland Leopard Cat	521	0.13	31
3	Jungle Cat	10	0.002	3
4	Large Indian Civet	230	0.06	18
5	Masked Palm Civet	114	0.03	11
6	Yellow Throated Marten	211	0.05	22
7	Indian Crested Porcupine	227	0.06	11
8	Malayan Porcupine	73	0.02	8
9	Assamese Macaque	289	0.07	15
10	Rhesus Monkey	12	0.003	2
11	Nepal Gray Langur	550	0.14	19
12	Asiatic Black Bear	139	0.03	9
13	Wild Boar	408	0.10	25
14	Golden Jackal	169	0.04	20
15	Red Fox	345	0.08	17
16	Northern Red Muntjac	1441	0.35	24
17	Himalayan Goral	172	0.04	5
18	Mainland Serow	13	0.003	2

Table 4: Avifauna captured in camera traps

SN	Common Name	*Scientific Name*
1	Kalij Pheasant	*Lophura leucomelanos*
2	Mistle Thrush	*Turdus viscivorus*
3	White-throated Laughingthrush	*Pterorhinus albogularis*
4	Chestnut-crowned Laughingthrush	*Trochalopteron erythrocephalum*
5	Himalayan Bush-robin	*Tarsiger rufilatus*
6	Blue Whistling-thrush	*Myophonus caeruleus*
7	Himalayan Monal	*Lophophorus impejanus*
8	Hill Partridge	*Arborophila torqueola*
9	White-collared Blackbird	*Turdus albocinctus*
10	Grey-winged Blackbird	*Turdus boulboul*
11	Grey-crested Tit	*Lophophanes dichrous*
12	Oriental Turtle-dove	*Streptopelia orientalis*
13	Ashy Woodpigeon	*Columba pulchricollis*
14	Yellow-billed Blue Magpie	*Urocissa flavirostris*
15	Black-throated Thrush	*Turdus atrogularis*
16	Spotted Forktail	*Enicurus maculatus*
17	Eurasian Woodcock	*Scolopax rusticola*
18	Himalayan Griffon	*Gyps himalayensis*

19	Chestnut Thrush	*Turdus rubrocanus*
20	Koklass Pheasant	*Pucrasia macrolopha*

Bird Survey

A total of 173 bird species belonging to 14 orders and 45 families (Figure 6) were sighted during the study period, which also includes 4 globally threatened, 2 restricted range and 4 western range species. A month-long study produced 38 lists (Figure 7) birding around 23 routes. Rufous Sibia was the most frequent sighted species (n=25 times), while the highest population sighted was Black Bulbul (n=231 individuals). Table 5 consists of the birds recorded during this study and the detailed checklist of birds in the area is presented in Appendix 4.

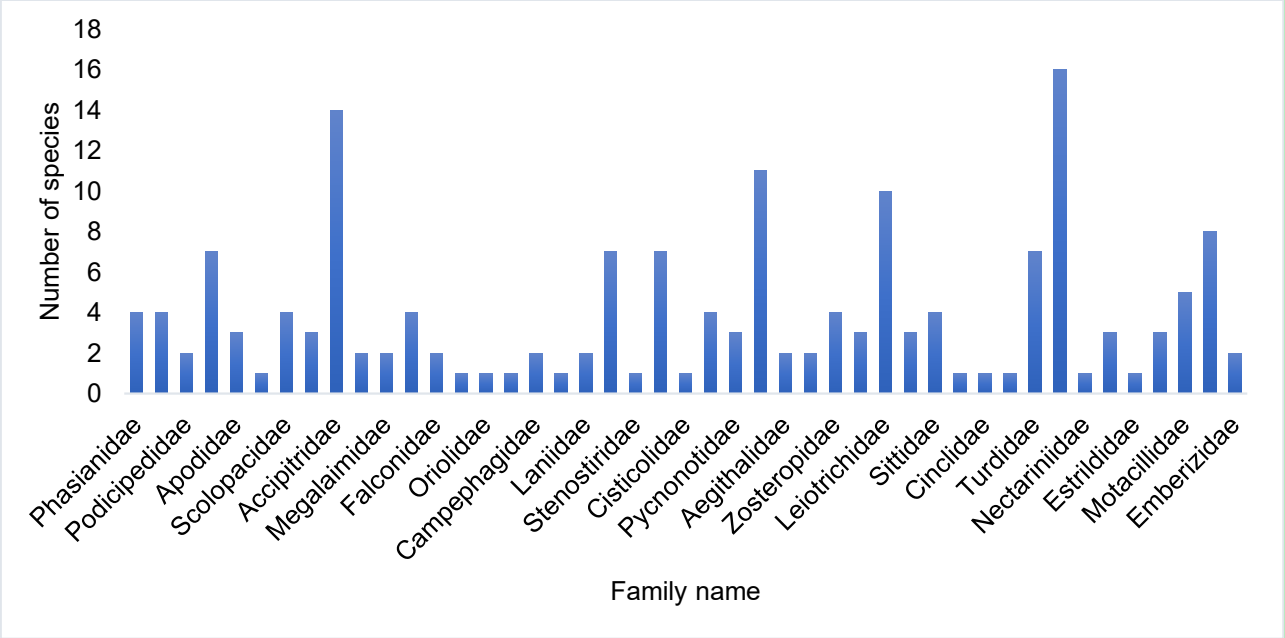

Figure 9: Familywise distribution of avifauna from Ramaroshan Lake Complex

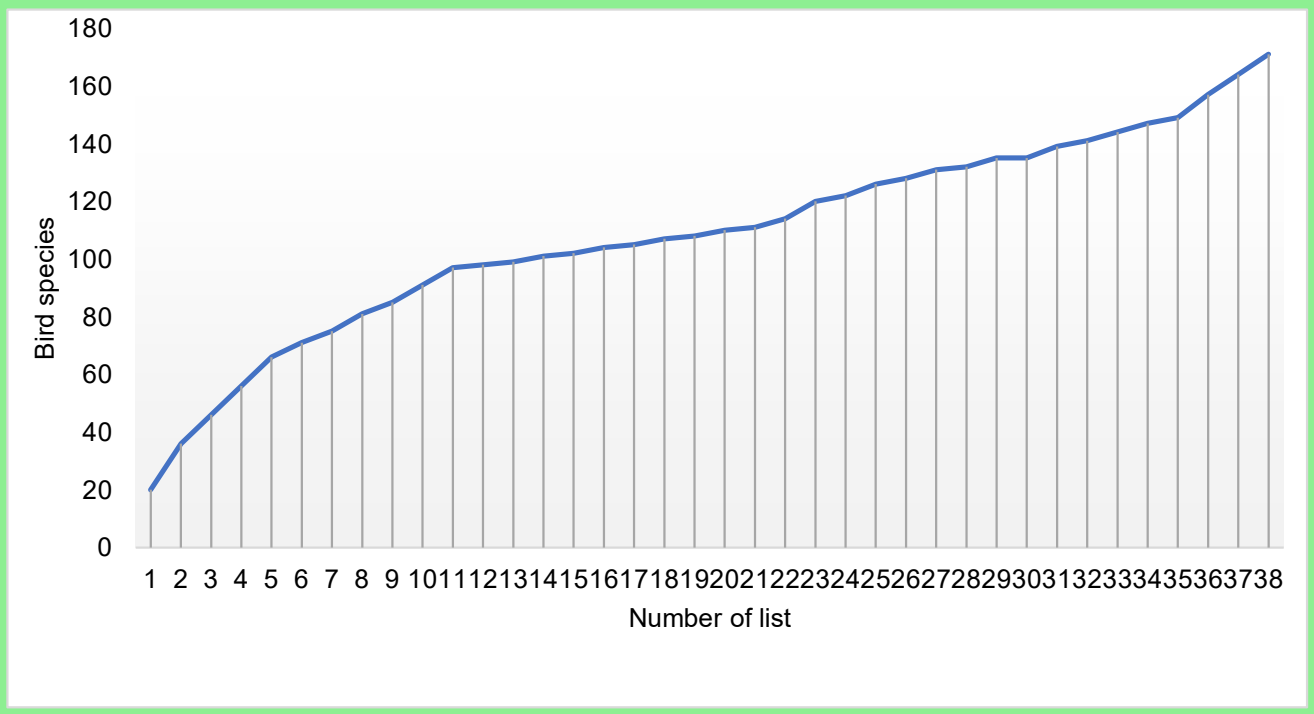

Figure 8: Species Discovery Curve of birds in Ramaroshan Lake Complex

The study was important in recording 1 Critically Endangered (Red-headed Vulture), 2 Endangered (Egyptian Vulture and Steppe Eagle) and 1 Vulnerable (Eastern Imperial Eagle) species. Hoary-throated Barwing and Upland Pipit were restricted range species recorded from western Nepal. Beside this, 4 western range species: Bar-tailed Treecreeper, Kashmir Nuthatch, White-cheeked Nuthatch and White-throated Tit were also sighted during the study. The study also recorded 18 individuals of Bar-headed Jay in one place, which might be the highest population recorded from western Nepal. The nesting sites of Bearded Vulture in a few localities indicate the importance of cliffs as breeding ground for raptors. We also heard the call of Rock Eagle-owl three times and several call of Himalayan Owl during our study.

Table 5: Checklist of birds recorded from Ramaroshan lake Complex. CR=Critically Endangered, EN=Endangered, VU=Vulnerable, NT=Near Threatened

SN	Common Name	Scientific Name	Global Status	National Status
1	Hill Partridge	*Arborophila torqueola*		
2	Himalayan Monal	*Lophophorus impejanus*		
3	Blood Pheasant	*Ithaginis cruentus*		
4	Koklass Pheasant	*Pucrasia macrolopha*		
5	Kalij Pheasant	*Lophura leucomelanos*		
6	Red-crested Pochard	*Netta rufina*		
7	Common Pochard	*Aythya ferina*	VU	NT
8	Mallard	*Anas platyrhynchos*		
9	Common Teal	*Anas crecca*		
10	Little Grebe	*Tachybaptus ruficollis*		
11	Great Crested Grebe	*Podiceps cristatus*		
12	Rock Dove	*Columba livia*		
13	Snow Pigeon	*Columba leuconota*		
14	Speckled Woodpigeon	*Columba hodgsonii*		
15	Ashy Woodpigeon	*Columba pulchricollis*		
16	Oriental Turtle-dove	*Streptopelia orientalis*		
17	Western Spotted Dove	*Spilopelia suratensis*		
18	Wedge-tailed Green-pigeon	*Treron sphenurus*		
19	Himalayan Swiftlet	*Aerodramus brevirostris*		
20	Alpine Swift	*Tachymarptis melba*		
21	House Swift	*Apus nipalensis*		
22	White-breasted Waterhen	*Amaurornis phoenicurus*		
23	Common Snipe	*Gallinago gallinago*		
24	Common Sandpiper	*Actitis hypoleucos*		
25	Green Sandpiper	*Tringa ochropus*		
26	Common Greenshank	*Tringa nebularia*		
27	Collared Owlet	*Glaucidium brodiei*		
28	Himalayan Owl	*Strix nivicolum*		
29	Rock Eagle-owl	*Bubo bengalensis*		VU
30	Bearded Vulture	*Gypaetus barbatus*	NT	VU
31	Egyptian Vulture	*Neophron percnopterus*	EN	VU

32	Red-headed Vulture	*Sarcogyps calvus*	CR	EN
33	Himalayan Griffon	*Gyps himalayensis*	NT	VU
34	Mountain Hawk-eagle	*Nisaetus nipalensis*		
35	Black Eagle	*Ictinaetus malaiensis*		
36	Steppe Eagle	*Aquila nipalensis*	EN	VU
37	Eastern Imperial Eagle	*Aquila heliaca*	VU	CR
38	Bonelli's Eagle	*Aquila fasciata*		
39	Booted Eagle	*Hieraaetus pennatus*		
40	Besra	*Accipiter virgatus*		
41	Eurasian Sparrowhawk	*Accipiter nisus*		
42	Black Kite	*Milvus migrans*		
43	Himalayan Buzzard	*Buteo refectus*		
44	Crested Kingfisher	*Megaceryle lugubris*		
45	White-breasted Kingfisher	*Halcyon smyrnensis*		
46	Great Barbet	*Psilopogon virens*		
47	Blue-throated Barbet	*Psilopogon asiaticus*		
48	Speckled Piculet	*Picumnus innominatus*		
49	Grey-capped Woodpecker	*Picoides canicapillus*		
50	Brown-fronted Woodpecker	*Dendrocoptes auriceps*		
51	Darjeeling Woodpecker	*Dendrocopos darjellensis*		
52	Himalayan Woodpecker	*Dendrocopos himalayensis*		
53	Common Kestrel	*Falco tinnunculus*		
54	Peregrine Falcon	*Falco peregrinus*		
55	Slaty-headed Parakeet	*Psittacula himalayana*		
56	Maroon Oriole	*Oriolus traillii*		
57	Green Shrike Babbler	*Pteruthius xanthochlorus*		
58	Long-tailed Minivet	*Pericrocotus ethologus*		
59	Indian Cuckooshrike	*Coracina macei*		
60	White-throated Fantail	*Rhipidura albicollis*		
61	Long-tailed Shrike	*Lanius schach*		
62	Grey-backed Shrike	*Lanius tephronotus*		
63	Grey Treepie	*Dendrocitta formosae*		
64	Yellow-billed Blue Magpie	*Urocissa flavirostris*		
65	Red-billed Blue Magpie	*Urocissa erythroryncha*		
66	Spotted Nutcracker	*Nucifraga caryocatactes*		
67	Plain-crowned Jay	*Garrulus bispecularis*		
68	Black-headed Jay	*Garrulus lanceolatus*		
69	Large-billed Crow	*Corvus macrorhynchos*		
70	Yellow-bellied Fairy-fantail	*Chelidorhynx hypoxanthus*		
71	Yellow-browed Tit	*Sylviparus modestus*		
72	Coal Tit	*Periparus rufonuchalis*		
73	Rufous-vented Tit	*Periparus rubidiventris*		

74	Grey-crested Tit	*Lophophanes dichrous*		
75	Green-backed Tit	*Parus monticolus*		
76	Cinereous Tit	*Parus cinereos*		
77	Black-lored Tit	*Machlolophus xanthogenys*		
78	Striated Prinia	*Prinia crinigera*		
79	Asian House Martin	*Delichon dasypus*		
80	Nepal House Martin	*Delichon nipalense*		
81	Barn Swallow	*Hirundo rustica*		
82	Red-rumped Swallow	*Cecropis daurica*		
83	Black Bulbul	*Hypsipetes leucocephalus*		
84	Himalayan Bulbul	*Pycnonotus leucogenys*		
85	Red-vented Bulbul	*Pycnonotus cafer*		
86	Tickell's Leaf Warbler	*Phylloacopua affinis*		
87	Hume's Leaf-warbler	*Phylloscopus humei*		
88	Lemon-rumped Warbler	*Phylloscopus chloronotus*		
89	Buff-barred Warbler	*Phylloscopus pulcher*		
90	Ashy-throated Warbler	*Phylloscopus maculipennis*		
91	Whistler's Warbler	*Phylloscopus whistleri*		
92	Greenish Warbler	*Phylloscopus trochiloides*		
93	Blyth's Leaf-warbler	*Phylloscopus reguloides*		
94	Western Crowned Leaf-warbler	*Phylloscopus occipitalis*		
95	Grey-hooded Warbler	*Phylloscopus xanthoschistos*		
96	Black-faced Warbler	*Abroscopus schisticeps*		
97	Red-headed Tit	*Aegithalos iredalei*		
98	White-throated Tit	*Aegithalos niveogularis*		
99	White-browed Fulvetta	*Fulvetta vinipectus*		
100	Great Parrotbill	*Conostoma aemodium*		
101	Stripe-throated Yuhina	*Yuhina gularis*		
102	Whiskered Yuhina	*Yuhina flavicollis*		
103	Rufous-vented Yuhina	*Yuhina occipitalis*		
104	Indian White-eye	*Zosterops palpebrosus*		
105	Slender-billed Scimitar-babbler	*Pomatorhinus superciliaris*		VU
106	White-browed Scimitar-babbler	*Pomatorhinus schisticeps*		NT
107	Black-chinned Babbler	*Cyanoderma pyrrhops*		
108	Striated Laughingthrush	*Grammatoptila striata*		
109	Variegated Laughingthrush	*Trochalopteron variegatum*		
110	Spotted Laughingthrush	*Garrulax ocellatus*		
111	White-throated Laughingthrush	*Garrulax albogularis*		
112	Streaked Laughingthrush	*Trochalopteron lineatum*		
113	Black-faced Laughingthrush	*Trochalopetron affine*		

114	Chestnut-crowned Laughingthrush	*Trochalopetron erythrocephalum*		
115	Rufous Sibia	*Heterophasia capistrata*		
116	Hoary-throated Barwing (RR)	*Sibia nipalensis*		
117	Bar-throated Siba	*Chrysominla strigula*		
118	Rusty-flanked Treecreeper	*Certhia nipalensis*		
119	Bar-tailed Treecreeper	*Certhia himalayana*		
120	Hodgson'sTreecreeper	*Certhia hodgsoni*		
121	Kashmir Nuthatch	*Sitta cashmirensis*		
122	White-tailed Nuthatch	*Sitta himalayensis*		
123	White-cheeked Nuthatch	*Sitta leucopsis*		
124	Wallcreeper	*Tichodroma muraria*		
125	Northern Wren	*Troglodytes troglodytes*		
126	Brown Dipper	*Cinclus pallasii*		
127	Common Myna	*Acridotheres tristis*		
128	Alpine Thrush	*Zoothera mollissima*		
129	Long-billed Thrush	*Zoothera monticola*		
130	Grey-winged Blackbird	*Turdus boulboul*		
131	White-collared Blackbird	*Turdus albocinctus*		
132	Mistle Thrush	*Turdus viscivorus*		
133	Chestnut Thrush	*Turdus rubrocanus*		
134	Black-throated Thrush	*Turdus atrogularis*		
135	Himalayan Bluetail	*Tarsiger rufilatus*		
136	Rufous-gorgetted Flycatcher	*Ficedula strophiata*		
137	White-browed Bush-robin	*Tarsiger indicus*		
138	Little Forktail	*Enicurus scouleri*		
139	Spotted Forktail	*Enicurus maculatus*		
140	Blue Whistling-thrush	*Myophonus caeruleus*		
141	Blue-fronted Redstart	*Phoenicurus frontalis*		
142	Blue-capped Redstart	*Phoenicurus coeruleocephala*		
143	White-capped Water-redstart	*Phoenicurus leucocephalus*		
144	Plumbeous Water-redstart	*Phoenicurus fuliginosus*		
145	Black Redstart	*Phoenicurus ochruros*		
146	Hodgson's Redstart	*Phoenicurus hodgsoni*		
147	Blue Rock-thrush	*Monticola solitarius*		
148	Grey Bushchat	*Saxicola ferreus*		
149	Pied Bushchat	*Saxicola caprata*		
150	Siberian Stonechat	*Saxicola torquatus*		
151	Green-tailed Sunbird	*Aethopyga nipalensis*		
152	Altai Accentor	*Prunella himalayana*		
153	Alpine Accentor	*Prunella collaris*		

154	Rufous-breasted Accentor	*Prunella strophiata*		
155	White-rumped Munia	*Lonchura striata*		NT
156	House Sparrow	*Passer domesticus*		
157	Russet Sparrow	*Passer cinnamomeus*		
158	Eurasian Tree Sparrow	*Passer montanus*		
159	Olive-backed Pipit	*Anthus hodgsoni*		
160	Rosy Pipit	*Anthus roseatus*		
161	Upland Pipit (RR)	*Anthus sylvanus*		
162	Grey Wagtail	*Motacilla cinerea*		
163	White Wagtail	*Motacilla alba*		
164	Collared Grosbeak	*Mycerobas affinis*		NT
165	Beautiful Rosefinch	*Carpodacus pulcherrimus*		
166	Pink-browed Rosefinch	*Carpodacus rodochroa*		
167	Spot-winged Rosefince	*Carpodacus rodopeplus*		
168	Red-headed Bullfinch	*Pyrrhula erythrocephala*		
169	Dark-breasted Rosefinch	*Procarduelis nipalensis*		
170	Plain Mountain-finch	*Leucosticte nemoricola*		
171	Yellow-breasted Greenfinch	*Chloris spinoides*		
172	Rock Bunting	*Emberiza cia*		
173	Little Bunting	*Emberiza pusilla*		VU

Figure 10: Pale Hedge Blue searching for the nectar

Butterfly Survey

We recorded 18 species of butterflies from 4 families. As the survey was conducted in winter these records are based on our photographs during transect walks for birds and mammals.

Table 6: Checklist of butterflies from Ramaroshan Lake Complex

SN	Common Name	Scientific Name	Family
1	Himalayan Grass Dart	*Taractrocera danna*	Hesperiidae
2	Green Sapphire	*Helioporous androcles*	Lycaenidae
3	Common Copper	*Lycaena phlaeas*	Lycaenidae
4	Pale Hedge Blue	*Udara dilectus*	Lycaenidae
5	Pale Grass Blue	*Zizeeria maha*	Lycaenidae
6	Pea Blue	*Lampides boeticus*	Lycaenidae
7	Chapman's Cupid	*Everes argiades*	Lycaenidae
8	Indian Red Admiral	*Vanessa indica*	Nymphalidae
9	Queen of Spain Fritillary	*Issoria lathonia*	Nymphalidae
10	Painted Lady	*Vanessa cardui*	Nymphalidae
11	Indian Tortoise Shell	*Aglais caschmirensis*	Nymphalidae

12	Dark Clouded Yellow	*Colias fieldii*	Pieridae
13	Spotless Grass Yellow	*Eurema laeta*	Pieridae
14	Common Brimstone	*Gonepteryx rhamni*	Pieridae
15	Indian Cabbage White	*Pieris canidia*	Pieridae
16	Hill Jezebel	*Delias belladonna*	Pieridae
17	Pale Clouded Yellow	*Colias erate*	Pieridae
18	Large Cabbage White	*Pieris brassicae*	Pieridae

Figure 11: A pack of Golden Jackal resting in Kinimini Maidan

Human-wildlife Conflict

To understand the scenario of human-wildlife conflict in Ramaroshan area, we conducted a questionnaire survey in 148 households from two village clusters i.e., Nearby Communities (NC) and Medium Distanced Communities (MDC) reaching the sample size of 25.37%.

There were 148 respondents (60 females and 80 males), and average population size of each household is 7.1 people. The level of education among the respondents was found to be uneducated (47.49%), educated without formal schooling (12.84%), primary level education (16.22%), and secondary level education (22.97%), which indicates the low level of awareness towards wildlife and their conservation.

Table 7: Information on sample size for household surveys. NC=Near Communities, MDC=Medium Distanced Communities and DC= Distanced Communities

Village Names in NC	Total household s	Sampled Household	Sample %	Village Names in MDC	Total household s	Sampled Household	Sample%	Village Names in DC	Total households
Dallena	25	5	20.00	Gairaa	29	8	27.59	Saini Bazar	105

Dhanesalla	48	9	18.75	Tadigairaa	22	7	31.82	Sanani	55
Jattola	35	12	34.29	Muthirumta	35	10	28.57	Netakot	80
Chaud	21	6	28.57	Tallo Patal	66	20	30.30	Aadekandh	53
Kalekha	35	9	25.71	Rawa	18	7	38.89	Alledi	100
Madu	55	10	18.18	Sallisen	70	14	20.00	Sera	64
Lamapada	40	8	20.00					Other small villages	133
Budhabada	31	8	25.81						
Dullarukh	50	11	22.00						
Bhittada	30	8	26.67						
Total	370	86	23.24%		240	66	27.50%		590

Crop and Livestock Related Loss

Asiatic Black Bear, Monkeys, Porcupines and Wild Boar were primarily responsible for crop raiding in the area. The preferred crops by wildlife were Maize, Wheat, Paddy, and Millet, which are the primary source of food for the people residing in the area. The annual crop loss by the surveyed household is NPR 8,03,850 ($6,089.77) and per household crop loss is equivalent to NPR 5,431.42 ($41.15).

Table 8: Information on crop depredation in Ramaroshan area in terms of monetary value in 2022. Values in NPR unless mentioned other

Crop	Maize	Wheat	Millet	Rice	Soybean	Potato	Peanut	Total loss
Loss Amount	539950 ($4090.53)	74350 ($563.26)	71650 ($542.80)	82600 ($624.8)	11200 ($84.85)	22600 ($171.21)	1500 ($11.36)	803850 ($6089.77)
Loss percentage	67.17%	9.25%	8.91%	10.28%	1.39%	2.81%	0.19%	100.00%
Loss per household	3648.311 ($27.64)	502.36 ($3.81)	484.12 ($3.67)	558.11 ($4.23)	75.68 ($0.57)	152.70 ($1.16)	10.14 ($0.08)	5431.42 ($41.15)

Table 9: Information on major wildlife responsible for crop depredation

Animal/Crop	Bear	Wild Boar	Porcupines	Monkeys	Otters	Mouses	Others
Maize	91	32	50	51	5	3	33
Wheat	7	21	8	15	1	0	7
Millets	17	2	6	27	1	1	1
Rice	16	3	6	22	0	15	2
Soybean	3	0	1	10	0	0	0
Potato	3	6	5	0	0	0	0
Peanuts	0	0	0	1	0	0	0

We also quantified the monetary loss of livestock depredation by wildlife in the area. It was found that goats and sheep were the major livestock which suffer heavy depredation. The annual monetary loss from livestock depredation in 2022 is NPR16,60,000 ($12,575.76) whereas the average loss per household is NPR11,216.22 ($84.97).

Based on the data available from the sample households, we have predicted the annual depredation in Ramaroshan Lake Complex of 610 households. Our data found the annual crop loss in the area to be NPR33,13,166 ($25,099.74) and annual livestock related loss is NPR68,41,892 ($51,832.51). A huge sum of money i.e., NPR1,01,55,058 ($76,932.25) is lost each year from crop and livestock related loss, leading the community to utilize limited resources with low economy.

Table 10: Information on livestock depredation in Ramaroshan area in terms of monetary value in 2022. Values in NPR unless mentioned other

Livestock	Goats	Sheep	Chickens	Cows	Total
Loss in amounts	10,81,400 ($8,192.42)	4,04,000 ($3,060.61)	1,34,600 ($1,019.70)	40,000 ($303.03)	16,60,000 ($12,575.76)
Loss%	65.14%	24.34%	8.11%	2.41%	100.00%
Loss per households	7,306.76 ($55.35)	2,729.73 ($20.68)	909.46 ($6.89)	270.27 ($2.05)	11,216.22 ($84.97)

The area also suffers numerous attacks to humans by wildlife, primarily Asiatic Black Bear. In the last five years, 3 people died, 2 got injured and 150 people were attacked, indicating the serous and alarming Human-Bear Conflict in Ramaroshan Lake Complex.

Figure 12: Rock Agama basking in the sun

Vegetation Survey

Ramaroshan area upholds 295 taxa (293 species and 2 infraspecific taxa) belonging to 203 genera and 90 families of seed plants. Out of 293 species of seed plants 5 species (belonging to 4 genera and 2 families; Appendix 5, Figure 13) were gymnosperms and the remaining 288 species (belonging to 199 genera and 88 families; Appendix 6, Figure 14) were angiosperms. This account includes 1 cultivated species, 12 naturalized species and 280 native species. This figure suggests that the area is rich in seed plants diversity as holds 21.74% of Nepal's gymnosperms and 4.93% of Nepal's indigenous angiosperms. Out of 295 taxa, 13 were climbers, 159 were herbs, 46 (45 spp. and 1 var.) were shrubs and subshrubs, and 77 (76 spp. and 1 var.) were trees. This represents 12.71% of the tree species found in Nepal.

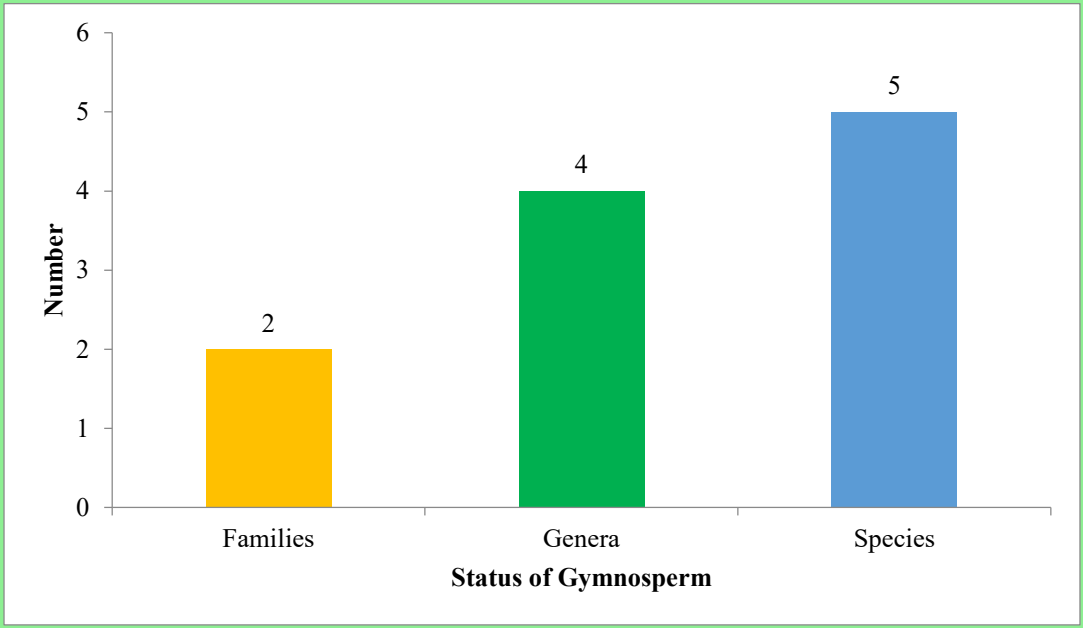

Figure 13: Distribution of Gymnosperms from Ramaroshan lake Complex

Based on species richness, Asteraceae, Rosaceae and Poaceae were the top three families with 26, 20 and 14 species respectively (Appendix 5). The largest genera recorded were *Quercus, Acer, Rubus, Persicaria* and *Stellaria* each with 5 species, followed by *Anaphalis, Ficus, Potamogeton, Primula, Cotoneaster* and *Viburnum* each with 4 species.

Status of Invasive Alien Plant Species (IPAS)

Five invasive alien plant species (IAPS) belonging to Asteraceae family (Table 11) were reported from Ramaroshan area. This figure represents 18.51% of IAPS found in the country. *Ageratina adenophora* and *Erigeron karvinskianus* were the most problematic IAPS. The dominance of Asteraceae might be due to its prolific seed production, efficient seed dispersal mechanism and high grazing resistance. Increasing human induced disturbances and fragmentation of the forested area increases the risk of increase in IAPS cover in the study area which ultimately affects the native biodiversity.

Table 11: Checklist of Invasive Alien Species from Ramaroshan Lake Complex

S.N.	Botanical Name	Family	Habit
1	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	Asteraceae	Herb
2	*Ageratum conyzoides* L.	Asteraceae	Herb
3	*Bidens pilosa* L.	Asteraceae	Herb
4	*Erigeron karvinskianus* DC.	Asteraceae	Herb
5	*Galinsoga quadriradiata* Ruiz & Pav.	Asteraceae	Herb

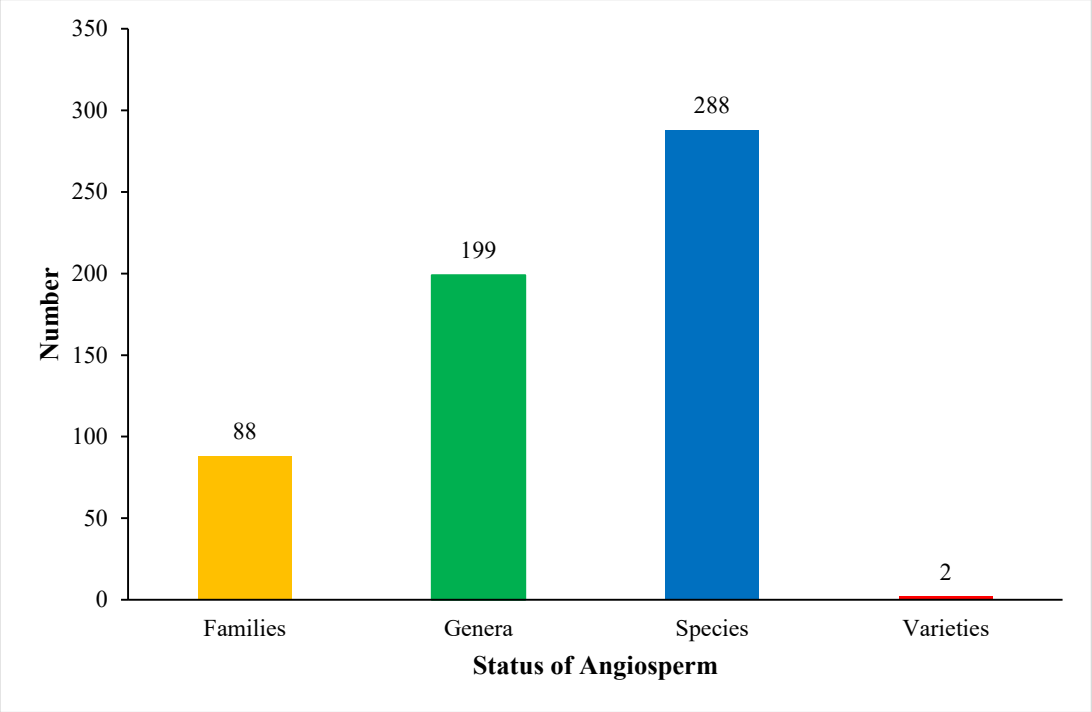

Figure 14: Distribution of Angiosperm from Ramaroshan Lake Complex

IUCN Red Listed Species

Ramaroshan houses one Endangered, three Vulnerable and one Near Threatened plant species (Table 12). These species are at higher risk than any other species and need immediate conservation actions.

Table 12: Checklist of globally threatened flora in Ramaroshan Lake Complex

S.N.	Botanical Name	Family	IUCN Status
1	*Taxus contorta* Griff.	Taxaceae	Endangered
2	*Fritillaria cirrhosa* D.Don	Liliaceae	Vulnerable
3	*Malaxis muscifera* (Lindl.) Kuntze	Orchidaceae	Vulnerable
4	*Paris polyphylla* Sm.	Melanthiaceae	Vulnerable
5	*Abies spectabilis* (D.Don) Mirb.	Pinaceae	Near Threatened

Interesting Findings

We recorded five species as new for the flora of western Nepal (Appendix 5) and one species (*Primula sulphurea*) as new for the flora of Nepal. Previously, *Primula sulphurea* was kept as a synonym of *Primula gracilipes* (POWO 2023) and after detailed study of the available specimens by Himalayan Primula experts, it was reinstated at species rank. We have submitted the manuscript entitled "Reinstatement of Species Rank for *Primula sulphurea* and a New Record for Nepal" to The Journal of Japanese Botany.

Figure 15: Primula sulphurea Craib

Figure 16: Strobilanthes glutinosa Nees

Similarly, another interesting finding of this study is the collection of *Strobilanthes glutinosa* from Nepal after about 70 years of its last collection. It was first collected by Nathaniel Wallich in 1820 from Makawanpur district. The last collection was made in 1953 by Mrs Proud on hills around the Nepal valley (Wood and Wise 2020). The collection from west Nepal was by O. Polunin, W.R. Sykes and L.H.J. Williams from Salyan district in 1952. Wood and Wise (2020) stated clearly that this species is either extinct from Nepal or likely to be present in the botanically less explored areas of west Nepal. *Strobilanthes glutinosa* is a winter flowering species and mere botanical exploration in the winter might be one possible reason for such under collection of the species in Nepal.

Figure 17: Himalayan Goral looking around from perfect vantage

Herpetofauna Survey

Although the study was conducted in winter season which is hibernating period for herpetofauna, we managed to record three species of lizards: Common Garden Lizard (*Calotes versicolor*), Kashmir Rock Agama (*Laudakia tuberculata*), and Agaupani Forest Agama (*Japulara dasi*), the later one being endemic to western Nepal. We also recorded one species of frog: Himalayan Toad (*Duttaphrynus himalayanus*) with eggs.

Figure 18: One of the camp sites in Roshan Maidan

RECOMMENDATIONS

Based on our research findings, field visit and community interactions, we have the following recommendations.

Research Recommendations

1. Survey efforts for herpetofauna, butterfly and migratory water birds was not up to the mark due to seasonal constrain. Hence, detailed research on these group of wildlife is crucial for complete biodiversity profiling of the region.
2. The region serves an important habitat for Asiatic Black Bear. Camera traps revealed the movement of mother and cubs even in winter season. Assessment of the spatial and temporal movement of the species is very critical to understand their ecology better.
3. Ramaroshan provides mosaic of habitats, which makes the area ideal for studying habitat use by wildlife. Site-specific and species-specific research are encouraged to explore microhabitat use by small mammals and other wildlife.
4. Since the area lies in the transition zone of Himalayan and mid-hill region, it can serve as research station to study the impacts of climate change.
5. Ramaroshan is the land of 12 lakes and 18 pastures in mid-hills, which itself is a geological mystery. Most of the lakes are in serious threat due to siltation and erosion. Geological studies to unfold these secrets would be interesting.
6. The region not only attracts researchers, but it has potential to attract outdoor enthusiasts. Rock climbing and other adventurous sports have lot of potential in the area. Thus, research on these possibilities is equally important.

Conservation Recommendations

1. Results from the social survey clearly indicates the emerging issue of human-bear conflict in the area. This issue should be prioritized, and the conflict must be minimized soon.
2. After being linked with the road network, different developmental activities are running in the Ramaroshan area. To minimize the effects of development in wildlife and resources, “Integrated Conservation and Development Programme” should be implemented.
3. During our survey we found low level of awareness in local people towards the issues of biodiversity conservation, wildlife crime, forest act and related policies. Conservation outreach programmes should be implemented to raise the awareness and motivate towards conservation.
4. Almost every local community heavily depend on forest resources for their livelihood. Frequent visit to forest for fodder, timber and other resources has led the issue of human-bear conflict. Alternative livelihood options which can be generated from local resources should be encouraged to make the communities economically strong which helps in livelihood upliftment. These activities can also lead to create climate resilient communities.
5. We have heard many gunshots and encountered several snares and hunting signs in the region. To minimize such events and sensitization, citizen science approach will be beneficial. Capacity building of few locals as citizen scientist will benefit local communities and biodiversity.
6. Ramaroshan is a marvel of natural beauty. The area will attract natural as well as religious tourists. It provides majestic view of lakes, grasslands, and forests as well as huge cliffs with pastures. It also serves as one of the important routes to Triveni Dhaam and Badimalika. Eco-

tourism promotion activities should be initiated soon with proper management and coordination.

7. The landscape and mosaic habitat of the region might be critical habitat for different cryptic and majestic species of flora and fauna. The lakes are the breeding ground of many migratory water birds and can host many endemic and threatened frogs, fishes, and other water dwelling species. For the integrated development and conservation of the area, lobbying with governmental agencies to declare as Protected Area should be initiated.

Figure 19: Dallena Village, one of the largest villages in Ramaroshan area.

APPENDIX

Appendix 1: Checklist of mammals from Ramaroshan Lake Complex

S. No.	Common Name	Scientific Name	Shah et. al. 2014	FON, Nepal 2023
1.	Nubra Pika	*Ochotona nubrica*	observation	----------
2.	Royle's Pika	*Ochotona roylei*	observation	----------
3.	Indian Hare	*Lepus nigricollis*	literature	----------
4.	Himalayan Stripped Squirrel	*Tamiops macclellandii*	Interview/literature	----------
5.	Irrawaddy Squirrel	*Callosclurus pygerythrus*	literature	----------
6.	Particolored Flying Squirrel	*Hylopetes alboniger*	literature	----------
7.	Hodgon's Giant Flying Squirrel	*Petaurista magnificus*	interview/literature	----------
8.	Common Giant Flying Squirrel	*Petaurista petaurista*	interview	----------
9.	Little Indian Field Mouse	*Mus booduga*	literature/interview	----------
10.	Eastern House Mouse	*Mus musculus*	literature/interview	----------
11.	Brown Rat	*Rattus norvegicus*	literature/interview	----------
12.	House Rat	*Rattus rattus*	literature/interview	----------
13.	Himalayan Rat	*Rattus pyctoris*	literature/interview	Observation
14.	Lesser Bandicoot Rat	*Bandicota bengalensis*	interview/literature	----------
15.	Malayan Porcupine	*Hystrix brachyura*	interview/sign	Camera Trap
16.	Large Indian Civet	*Viverra zibetha*	literature/interview	Camera Trap
17.	Masked Palm Civet	*Paguma larvata*	observation	Camera Trap
18.	Small Indian Civet	*Viverricula indica*	literature/interview	----------
19.	Jungle Cat	*Felis chaus*	literature/interview	Camera Trap
20.	Mainland Leopard Cat	*Prionailurus bengalensis*	interview/sign	Camera Trap
21.	Leopard	*Panthera pardus*	interview/signs	Camera Trap
22.	Small Indian Mongoose	*Herpestes auropunctatus*	interview/literature	----------
23.	Indian Grey Mongoose	*Herpestes edwardsii*	interview/literature	----------
24.	Bengal Fox	*Vulpes bengalensis*	interview/literature	----------
25.	Red Fox	*Vulpes vulpes*	Interview/sign	Camera Trap
26.	Golden Jackal	*Canis aureus*	observation	Camera Trap
27.	Wild Dog	*Cuon alpinus*	Interview/literature	Interview
28.	Asiatic Black Bear	*Ursus thibetanus*	Interview/literature	Camera Trap
29.	Eurasian Otter	*Lutra lutra*	Interview/literature	----------

30.	Yellow-throated Marten	*Martes flavigula*	Interview/literature	Camera Trap
31.	Asian House Shrew	*Suncus murinus*	Interview/literature	----------
32.	Himalayan Shrew	*Soriculus nigrescens*	Interview/literature	----------
33.	Himalayan Water Shrew	*Chimarrogale himalayica*	literature	----------
34.	Bats	*Bat spp.*	Observation/interview	----------
35.	Himalayan Grey Langur	*Semnopithecus ajax*	observation	Camera Trap
36.	Assam Macaque	*Macaca assamensis pelops*	interview	Camera Trap
37.	Rhesus Macaque	*Macaca mulatta*	observation	Camera Trap
38.	Wild Boar	*Sus scrofa*	Interview/signs	Camera Trap
39.	Alpine Musk Deer	*Moschus chrysogaster*	Do	----------
40.	Barking Deer	*Muntiacus vaginalis*	Do/do	Camera Trap
41.	Sambar Deer	*Rusa unicolor*	Do	----------
42.	Himalayan Goral	*Naemorhedus goral*	observed	Camera Trap
43.	Himalayan Serow	*Capricornis thar*	interview	Camera Trap
44.	Himalayan Tahr	*Hemitragus jemlahicus*	observed	Observation
45.	Lesser Striped Shrew	*Sorex bedfordiae*	----------	Observation

Appendix 2: Checklist of Herpetofauna from Ramaroshan Lake Complex

S. No.	Common Name	Scientific Name	Shah et. al. 2014	FON Nepal 2023
	Amphibians			
1.	Himalayan Toad	*Duttaphrynus himalayanus*	observation	----------
2.	Khaptad Pelobatid Toad	*Scutiger nepalensis*	observation	----------
3.	Beautiful Stream Frog	*Amolops formosus*	Interview/literature	----------
4.	Bajhang Frog	*Nanorana ercepeae*	observation	----------
5.	Tiny Frog	*Nanorana minica*	observation	----------
	Reptiles (Lizards)			----------
1.	Common garden lizard	*Calotes versicolor*	observation	Observation

2.	Himalayan rock lizard	*Laudakia tuberculata*	observation	Observation
3.	Agaupani Forest Agama	*Oriotiaris dasi*	observation	Observation
4.	Sikkim Skink	*Asymblepharus sikimmensis*	observation	----------
5.	Himalayan Ground Sink	*Asymblepharus himalayanus*	observation	----------
6.	Brahminy Skink	*Mabuya carinata*	observation	----------
7.	Spotted Litter Skink	*Sphenomorphus maculates*	observation	----------
	Reptiles (Snakes)			
1.	Burmese Rock Python	*Python bivittatus*	interview	----------
2.	Mountain Keelback	*Amphiesma platyceps*	interview	----------
3.	Himalayan trinket snake	*Ophithriophis hodgsonii*	interview	----------
4.	Asian Rat Snake	*Ptyas mucosa*	Interview/literature	----------
5.	Himalayan Pit Viper	*Gloydius himalayanus*	interview	----------
6.	Mountain Pit Viper	*Ovophis monticola*	Interview	----------
7.	Green Pit Viper	*Trimeresurus sp.*	interview	----------

Appendix 3: Checklist of butterflies in Ramaroshan Lake Complex

S.N.	Common Name	Scientific Name	Source	FON Nepal, 2023
1	Green Sapphire	*Helioporous androcles*	Karki et al. 2002	
2	Indian Red Admiral	*Vanessa indica*	Karki et al. 2002	FON Nepal 2023
3	Common Copper	*Lycaena phlaeas*	Karki et al. 2002	
4	Dark Clouded Yellow	*Colias fieldii*	Karki et al. 2002	
5	Queen of Spain Fritillary	*Issoria issaea*	Karki et al. 2002	
6	Pale Hedge Blue	*Udara dilectus*	Karki et al. 2002	
7	Spoteless Grass Yellow	*Eurema laeta*		FON Nepal 2023

8	Common Brimestone	*Gonepteryx rhamni*	Karki et al. 2002	
9	Indian Cabbage White	*Pieris canidia*	Karki et al. 2002	
10	Painted lady	*Vanessa cardui*		FON Nepal 2023
11	Indian Tortoise Shell	*Aglais Caschmirensis*		FON Nepal 2023
12	Hill Jezebel	*Delias belladonna*		FON Nepal 2023
13	Pale Clouded Yellow	*Colias erate*	Karki et al. 2002	
14	Pale Grass Blue	*Zizeeria maha*	Karki et al. 2002	
15	Himalayan Grass Dart	*Taractrocera danna*	Karki et al. 2002	
16	Pea Blue	*Lampides boeticus*	Karki et al. 2002	
17	Chapman's Cupid	*Everes argiades*	Karki et al. 2002	
18	Large Cabbage White	*Pieris brassicae*	Karki et al. 2002	

Appendix 4: Checklist of Birds in Ramaroshan Lake Complex

S.N.	Order/Family/Common Name	Scientfic Name	नेपाली नाम	Status				Observation			
				BIOM	CITES	GT	NT	1	2	3	4
	GALLIFORMES										
	Phasianidae										
1	Hill Partridge	*Arborophila torqueola*	पिउरा	B07							✓
2	Chukar	*Alectoris chukar*	च्याखुरा					✓			
3	Black Francolin	*Francolinus francolinus*	कालो तित्रा					✓			
4	Satyr Tragopan	*Tragopan satyra*	मुनाल	B07				✓			
5	Himalayan Monal	*Lophophorus impejanus*	डाँफे	B07	I						✓
6	Blood Pheasant	*Ithaginis cruentus*	चिलिमे	B07	II						✓
7	Koklass Pheasant	*Pucrasia macrolopha*	फोक्कास	B07					✓		
8	Cheer Pheasant	*Catreus wallichii*	चीर		I	VU	EN			✓	
9	Kalij Pheasant	*Lophura leucomelanos*	कालिज		III						✓
	ANSERIFORMES										
	Anatidae										
10	Ruddy Shelduck	*Tadorna ferruginea*	चखेवाचखेवा						✓		
11	Red-crested Pochard	*Netta rufina*	सुनजुरे हाँस								✓
12	Common Pochard	*Aythya ferina*	कैलोटाउके हाँस			VU	NT				✓
13	Eurasian Wigeon	*Mareca penelope*	सिन्दुरे हाँस							✓	
14	Mallard	*Anas platyrhynchos*	हरियोटाउके								✓
15	Common Teal	*Anas crecca*	विजुलागैरी								✓
	PODICIPEDIFORMES										
	Podicipedidae										
16	Little Grebe	*Tachybaptus ruficollis*	डुबुल्कीचरा								✓

17	Great Crested Grebe	*Podiceps cristatus*	सिउरे डुबुल्कीचरा								✓
	COLUMBIFORMES										
	Columbidae										
18	Rock Dove	*Columba livia*	मलेवा								✓
19	Snow Pigeon	*Columba leuconota*	हिमाली मलेवा	B05							✓
20	Speckled Woodpigeon	*Columba hodgsonii*	छिरबिरे वनपरेवा	B07							✓
21	Ashy Woodpigeon	*Columba pulchricollis*	फुस्रो वनपरेवा								✓
22	Oriental Turtle-dove	*Streptopelia orientalis*	तामे ढुकुर								✓
23	Eurasian Collared-dove	*Streptopelia decaocto*	कण्ठे ढुकुर						✓		
24	Western Spotted Dove	*Spilopelia suratensis*	कुर्ले ढुकुर								✓
25	Wedge-tailed Green-pigeon	*Treron sphenurus*	पहाडी हलेसो								✓
	CAPRIMULGIFORMES										
	Caprimulgidae										
26	Grey Nightjar	*Caprimulgus jotaka*	फुस्रो चैतेचरा						✓		
	Apodidae										
27	Himalayan Swiftlet	*Aerodramus brevirostris*	चीँचिका गौँथली								✓
28	Alpine Swift	*Tachymarptis melba*	बतासी गौँथली								✓
29	Pacific Swift	*Apus pacificus*	पुच्छरकापे गौँथली						✓		
30	House Swift	*Apus nipalensis*	फिरफिरे घरगौँथली								✓
	Cuculiformes										
	Cuculidae										

31	Western Koel	*Eudynamys scolopaceus*	कोहो कोइली						✓		
32	Large Hawk-cuckoo	*Hierococcyx sparverioides*	बीउकुहियो						✓		
33	Indian Cuckoo	*Cuculus micropterus*	काफल पाक्यो							✓	
34	Common Cuckoo	*Cuculus canorus*	कुक्कु कोइली							✓	
35	Himalayan Cuckoo	*Cuculus saturatus*	पूर्वीय कोइली						✓		
36	Lesser Cuckoo	*Cuculus policephalus*	सानो कोइली						✓		
	GRUIFORMES										
	Rallidae										
37	White-breasted Waterhen	*Amaurornis phoenicurus*	सिमकुखुरा								✓
38	Common Coot	*Fulica atra*	मरुल							✓	
	Ciconiformes										
	Ciconidae										
39	Asian Woollyneck	*Ciconia episcopus*	सेतोकण्ठे गरुड							✓	
	CHARADRIIFORMES										
	Charadriidae										
40	Northern Lapwing	*Vanellus vanellus*	जुरे हुटिट्याउँ							✓	
	Scolopacidae										
41	Wood Snipe	*Gallinago nemoricola*	वन चाहा	B05					✓		
42	Common Snipe	*Gallinago gallinago*	पानी चाहा								✓
43	Common Sandpiper	*Actitis hypoleucos*	चञ्चले सुडसुडिया								✓
44	Green Sandpiper	*Tringa ochropus*	रुख सुड्सुडिया								✓
45	Common Greenshank	*Tringa nebularia*	टिमटिमा								✓

	STRIGIFORMES										
	Strigidae										
46	Collared Owlet	*Glaucidium brodiei*	सानो डुन्डुल		II						✓
47	Brown Wood-owl	*Strix leptogrammica*	चश्मे उलूक						✓		
48	Himalayan Owl	*Strix nivicolum*	कैलो पहाडी उलूक								✓
49	Rock Eagle-owl	*Bubo bengalensis*	हाप्सिलो				VU				✓
	ACCIPITRIFORMES										
	Accipitridae										
50	Bearded Vulture	*Gypaetus barbatus*	हाडफोर		II	NT	VU				✓
51	Egyptian Vulture	*Neophron percnopterus*	सेतो गिद्ध		II	EN	VU				✓
52	Red-headed Vulture	*Sarcogyps calvus*	सुन गिद्ध	B11	II	CR	EN				✓
53	Himalayan Griffon	*Gyps himalayensis*	हिमाली गिद्ध	B05	II	NT	VU				✓
54	Mountain Hawk-eagle	*Nisaetus nipalensis*	पहाडी शदलचील		II						✓
55	Black Eagle	*Ictinaetus malaiensis*	द्रोणक चील		II						✓
56	Steppe Eagle	*Aquila nipalensis*	गोमायु महाचील		II	EN	VU				✓
57	Eastern Imperial Eagle	*Aquila heliaca*	रणमत्त महाचील		I	VU	CR				✓
58	Bonelli's Eagle	*Aquila fasciata*	मोरङ्गी चील		II						✓
59	Booted Eagle	*Hieraaetus pennatus*	काँधचन्द्र चील		II						✓
60	Besra	*Accipiter virgatus*	बेसरा		II						✓
61	Eurasian Sparrowhawk	*Accipiter nisus*	वनबाज		II						✓
62	Black Kite	*Milvus migrans*	कालो चील		II						✓
63	Himalayan Buzzard	*Buteo refectus*	श्येनबाज		II						✓
	Bucerotiformes										
	Upupidae										
64	Common Hoopoe	*Upupa epops*	फाप्रे चरा						✓		

	CORACIIFORMES										
	Alcedinidae										
65	Common Kingfisher	*Alcedo atthis*	सानो माटीकोरे						✓		
66	Crested Kingfisher	*Megaceryle lugubris*	ठूलो छिरबिरे माटीकोरे								✓
67	White-breasted Kingfisher	*Halcyon smyrnensis*	सेतोकण्ठे माटीकोरे								✓
	PICIFORMES										
	Megalaimidae										
68	Great Barbet	*Psilopogon virens*	न्याउली								✓
69	Blue-throated Barbet	*Psilopogon asiaticus*	कुथुर्के	B08							✓
	Picidae										
70	Speckled Piculet	*Picumnus innominatus*	थोप्ले ससिया								✓
71	Lesser Yellownape	*Picus chlorolophus*	सुनजुरे काठफोर							✓	
72	Grey-capped Woodpecker	*Picoides canicapillus*	फुस्रोटाउके काष्ठकूट						✓		✓
73	Brown-fronted Woodpecker	*Dendrocoptes auriceps*	खैरोटाउके काष्ठकूट								✓
74	Rufous-bellied Woodpecker	*Dendrocoptes hyperythrus*	कैलोछाती काष्ठकूट						✓		
75	Fulvous-breasted Woodpecker	*Dendrocoptes macei*	काष्ठकूट					✓			
76	Darjeeling Woodpecker	*Dendrocopos darjellensis*	दार्जीलिङ्ग काष्ठकूट	B07							✓
77	Himalayan Woodpecker	*Dendrocopos himalayensis*	हिमाली काष्ठकूट	B07							✓
	CARIAMIFORMES										
	Falconidae										

78	Common Kestrel	*Falco tinnunculus*	बौंडाइ		II						✓
79	Peregrine Falcon	*Falco peregrinus*	शाही बाज		I						✓
	PSITTACIFORMES										
	Psittacidae										
80	Slaty-headed Parakeet	*Psittacula himalayana*	मदना सुगा	B08	II						✓
81	Plum-headed Parakeet	*Himalayapsitta cyanocephala*	टुइँसी सुगा	B11	II					✓	
82	Rose-ringed Parakeet	*Alexandrinus krameri*	कण्ठे सुगा							✓	
	PASSERIFORMES										
	Oriolidae										
83	Maroon Oriole	*Oriolus traillii*	घनरक्त सुनचरी	B08							✓
84	Indian Golden Oriole	*Oriolus kundoo*	गाजले सुनचरी							✓	
	Vireonidae										
85	Green Shrike Babbler	*Pteruthius xanthochlorus*	हरित भद्राईंभ्याकुर	B07							✓
	Campephagidae										
86	Grey-chinned Minivet	*Pericrocotus solaris*	नौनीकण्ठे रानीचरी						✓		
87	Long-tailed Minivet	*Pericrocotus ethologus*	लामपुछ्रे रानीचरी								✓
88	Indian Cuckooshrike	*Coracina macei*	लटुशक विरहीचरी								✓
	Rhipiduridae										
89	White-throated Fantail	*Rhipidura albicollis*	नक्कले मारुनीचरी								✓
	Dicruridae										
90	Black Drongo	*Dicrurus macrocercus*	कालो चिबे							✓	
91	Ashy Drongo	*Dicrurus leucophaeus*	ध्वाँसे चिबे							✓	
	Laniidae										

92	Long-tailed Shrike	*Lanius schach*	भद्राई								✓
93	Grey-backed Shrike	*Lanius tephronotus*	हिमाली भद्राई	B05							✓
	Corvidae										
94	Rufous Treepie	*Dendrocitta vagabunda*	कोकले							✓	
95	Grey Treepie	*Dendrocitta formosae*	पहाडी कोकले	B08							✓
96	Red-billed Chough	*Pyrrhocorax pyrrhocorax*	टुङ्गा					✓			
97	Yellow-billed Blue Magpie	*Urocissa flavirostris*	सुनठूँडे लामपुच्छ्रे	B07							✓
98	Red-billed Blue Magpie	*Urocissa erythroryncha*	स्यालपोथरी लामपुच्छ्रे								✓
99	Spotted Nutcracker	*Nucifraga caryocatactes*	वनसर्रा								✓
100	Plain-crowned Jay	*Garrulus bispecularis*	कैले वनकाग								✓
101	Black-headed Jay	*Garrulus lanceolatus*	कालोटाउके वनकाग	B08							✓
102	Large-billed Crow	*Corvus macrorhynchos*	कालो काग								✓
	Stenostiridae										
103	Yellow-bellied Fairy-fantail	*Chelidorhynx hypoxanthus*	पहेंलो मारुनीचरी								✓
104	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*	चञ्चले अर्जुनक					✓			
	Paridae										
105	Yellow-browed Tit	*Sylviparus modestus*	चँदुवा चिचिल्कोटे	B07							✓
106	Coal Tit	*Periparus rufonuchalis*	सानो फुस्रे चिचिल्कोटे	B07							✓
107	Rufous-vented Tit	*Periparus rubidiventris*	सेतोगर्दने चिचिल्कोटे	B07							✓

108	Grey-crested Tit	*Lophophanes dichrous*	फुस्रोजुरे चिचिल्कोटे	B07							✓
109	Green-backed Tit	*Parus monticolus*	हरियो चिचिल्कोटे	B07							✓
110	Cinereous Tit	*Parus cinereos*	चिचिल्कोटे								✓
111	Black-lored Tit	*Machlolophus xanthogenys*	पाण्डु चिचिल्कोटे								✓
	Cisticolidae										
112	Striated Prinia	*Prinia crinigera*	सुया घाँसेफिस्टो	B08							✓
	Hirundinidae										
113	Asian House Martin	*Delichon dasypus*	एशियाली भीरगौंथली								✓
114	Nepal House Martin	*Delichon nipalense*	नेपाल भीरगौंथली	B07							✓
115	Barn Swallow	*Hirundo rustica*	घर गौंथली								✓
116	Red-rumped Swallow	*Cecropis daurica*	गेरुकटी गौंथली								✓
	Pycnonotidae										
117	Black Bulbul	*Hypsipetes leucocephalus*	बाखे जुरेली	B08							✓
118	Black-crested Bulbul	*Rubigula flaviventris*	कालोकल्की पहेंलोजुरेली							✓	
119	Himalayan Bulbul	*Pycnonotus leucogenys*	जुल्फे जुरेली	B08							✓
120	Red-vented Bulbul	*Pycnonotus cafer*	जुरेली								✓
	Phylloscopidae										
121	Tickell's Leaf Warbler	*Phylloacopua affinis*	पितोदर फिस्टो	B05							✓
122	Hume's Leaf-warbler	*Phylloscopus humei*	चञ्चले फिस्टो								✓
123	Lemon-rumped Warbler	*Phylloscopus chloronotus*	पीतकरी फिस्टो								✓

124	Buff-barred Warbler	*Phylloscopus pulcher*	सुन्तलेरेखी फिस्टो	B07							✓
125	Ashy-throated Warbler	*Phylloscopus maculipennis*	फुस्रोकण्ठे फिस्टो	B07							✓
126	Whistler's Warbler	*Phylloscopus whistleri*	सुसेली फिस्टो								✓
127	Greenish Warbler	*Phylloscopus trochiloides*	जीवल फिस्टो								✓
128	Blyth's Leaf-warbler	*Phylloscopus reguloides*	तालुधर्के फिस्टो								✓
129	Western Crowned Leaf-warbler	*Phylloscopus occipitalis*	ठूलो तालुधर्के फिस्टो	B07							✓
130	Grey-hooded Warbler	*Phylloscopus xanthoschistos*	तुमुलकारी फिस्टो	B08							✓
131	Black-faced Warbler	*Abroscopus schisticeps*	गाजले फिस्टो	B08							✓
	Aegithalidae										
132	Red-headed Tit	*Aegithalos iredalei*	कालीकण्ठे चिचिल्कोटे	B08							✓
133	White-throated Tit	*Aegithalos niveogularis*	सेतोकण्ठे चिचिल्कोटे	B08							✓
	Sylviidae										
134	White-browed Fulvetta	*Fulvetta vinipectus*	पीतनयन फूलबुट्टा	B07							✓
135	Great Parrotbill	Conostoma aemodium	चाँदे बाँदरचरी	B07							✓
136	Black-throated Parrotbill	*Suthora nepalensis*	नेपाल बाँदरचरी					✓			
	Zosteropidae										

137	Stripe-throated Yuhina	*Yuhina gularis*	थुपलकल्की जुरेचरा	B07							✓
138	Whiskered Yuhina	*Yuhina flavicollis*	जुंगे जुरेचरा								✓
139	Rufous-vented Yuhina	*Yuhina occipitalis*	खैरो जुरेचरा	B07							✓
140	Indian White-eye	*Zosterops palpebrosus*	कांकीर								✓
	Timaliidae										
141	Slender-billed Scimitar-babbler	*Pomatorhinus superciliaris*	लामोठूँडे पाल्कोटे	B07			VU				✓
142	White-browed Scimitar-babbler	*Pomatorhinus schisticeps*	फुस्रोटाउके पाल्कोटे				NT				✓
143	Black-chinned Babbler	*Cyanoderma pyrrhops*	कालोचिउँडे वनभ्याकुर	B08							✓
	Leiotrichidae										
144	Striated Laughingthrush	*Grammatoptila striata*	कल्की तोरीगाँडा	B07							✓
145	Jungle Babbler	*Argya striata*	बगाले भ्याकुर	B11						✓	
146	Variegated Laughingthrush	*Trochalopteron variegatum*	टिकीयुरी तोरीगाँडा	B07							✓
147	Spotted Laughingthrush	*Garrulax ocellatus*	मुँदाले तोरीगाँडा	B07							✓
148	White-throated Laughingthrush	*Garrulax albogularis*	सोइरने तोरीगाँडा	B07							✓
149	Streaked Laughingthrush	*Trochalopteron lineatum*	छिर्के तोरीगाँडा	B07							✓
150	Black-faced Laughingthrush	*Trochalopetron affine*	कानटाटे तोरीगाँडा	B07							✓
151	Chestnut-crowned Laughingthrush	*Trochalopetron erythrocephalum*	कटुसटाउके तोरीगाँडा								✓
152	Rufous Sibia	*Heterophasia capistrata*	सिबिया	B07							✓

153	Hoary-throated Barwing (RR)	*Sibia nipalensis*	वनचाहर								✓
154	Bar-throated Siba	*Chrysominla strigula*	शिव मिन्ला	B07							✓
	Certhiidae										
155	Rusty-flanked Treecreeper	*Certhia nipalensis*	कैलोकोखे छेपारेचरी	B07							✓
156	Sikkim Treecreeper	*Certhia discolor*	खैरो छेपारेचरी					✓			
157	Bar-tailed Treecreeper	*Certhia himalayana*	पुच्छरपाटे छेपारेचरी								✓
158	Hodgson'sTreecreeper	*Certhia hodgsoni*	सेतोपेटे छेपारेचरी								✓
	Sittidae										
159	Kashmir Nuthatch	*Sitta cashmirensis*	काश्मिरी मट्टा								✓
160	White-tailed Nuthatch	*Sitta himalayensis*	पहाडी मट्टा	B07							✓
161	White-cheeked Nuthatch	*Sitta leucopsis*	कालोटाउके मट्टा	B07							✓
162	Velvet-fronted Nuthatch	*Sitta frontalis*	मखमली मट्टा							✓	
163	Wallcreeper	*Tichodroma muraria*	मुरारी पुतलीचरा	B05							✓
	Troglodytidae										
164	Northern Wren	*Troglodytes troglodytes*	चित्री								✓
	Cinclidae										
165	Brown Dipper	*Cinclus pallasii*	खैरो वञ्जूल								✓
	Sturnidae										
166	Common Myna	*Acridotheres tristis*	डाङ्ग्रे रुपी								✓
167	Jungle Myna	*Acridotheres tristis*	डाङ्ग्रे रुपी							✓	
	Turdidae										

168	Alpine Thrush	*Zoothera mollissima*	सादाढाडे चाँचर								✓
169	Long-billed Thrush	*Zoothera monticola*	लामोठूँडे चाँचर	B07							✓
170	Scaly Thrush	*Zoothera dauma*	गोब्रे चाँचर					✓			
171	Grey-winged Blackbird	*Turdus boulboul*	मदना चाँचर	B08							✓
172	White-collared Blackbird	*Turdus albocinctus*	कण्ठे चाँचर	B07							✓
173	Mistle Thrush	*Turdus viscivorus*	हड्चूर चाँचर								✓
174	Chestnut Thrush	*Turdus rubrocanus*	कैले चाँचर	B07							✓
175	Black-throated Thrush	*Turdus atrogularis*	कालोकण्ठे चाँचर								✓
	Muscicapidae										
176	Himalayan Bluetail	*Tarsiger rufilatus*	सुन्तलाकोखे रबिन								✓
177	Rufous-bellied Niltava	*Niltava sundara*	सुन्दर नीलतभा	B07				✓			
178	Verditer Flycatcher	*Eumyias thalassinus*	नीलोतुथो अर्जुनक							✓	
179	Rufous-bellied Redstart	*Luscinia phaenicuroides*	सेतोपेटे खञ्जरी	B07				✓			
180	Rufous-gorgetted Flycatcher	*Ficedula strophiata*	सेतोटिके अर्जुनक	B07							✓
181	White-browed Bush-robin	*Tarsiger indicus*	सेतोआँखीभौं रबिन	B07							✓
182	Little Forktail	*Enicurus scouleri*	गंगा खोलेधोबिनी								✓
183	Slaty-backed Forktail	*Enicurus schistaceus*	फुस्रोढाडे खा्लेधोबिनी	B08				✓			
184	Spotted Forktail	*Enicurus maculatus*	थोप्ले खोलेधोबिनी								✓

185	Blue Whistling-thrush	*Myophonus caeruleus*	कल्चौंडे								✓
186	Little Pied Flycatcher	*Ficedula westermanni*	श्यामश्वेत अर्जुनक							✓	
187	Blue-fronted Redstart	*Phoenicurus frontalis*	नीलटाउके खञ्जरी								✓
188	Blue-capped Redstart	*Phoenicurus coeruleocephala*	धोबिनी खञ्जरी	B07							✓
189	White-capped Water-redstart	*Phoenicurus leucocephalus*	सेतोटाउके जलखञ्जरी								✓
190	Plumbeous Water-redstart	*Phoenicurus fuliginosus*	नीलाम्बर जलखञ्जरी								✓
191	Black Redstart	*Phoenicurus ochruros*	ध्याप्ची खञ्जरी								✓
192	Hodgson's Redstart	*Phoenicurus hodgsoni*	तनकम्प खञ्जरी	B05							✓
193	Chestnut-bellied Rock-thrush	*Monticola rufiventris*	हजारा चाँचर					✓			
194	Blue Rock-thrush	*Monticola solitarius*	उमा चाँचर								✓
195	Grey Bushchat	*Saxicola ferreus*	हिमाली झ्याप्सी								✓
196	Pied Bushchat	*Saxicola caprata*	काले झ्याप्सी								✓
197	Siberian Stonechat	*Saxicola torquatus*	झेकझेक झ्याप्सी								✓
	Nectariniidae										
198	Green-tailed Sunbird	*Aethopyga nipalensis*	नेपाल बुङ्गेचरा								✓
	Prunellidae										
199	Altai Accentor	*Prunella himalayana*	अल्ताई लेकचरी								✓

200	Alpine Accentor	*Prunella collaris*	हिमाली लेकचरी	B05							✓
201	Rufous-breasted Accentor	*Prunella strophiata*	मुसे लेकचरी	B07							✓
202	Brown Accentor	*Prunella fulvescens*	गाजले लेकचरी	B05						✓	
	Estrildidae										
203	White-rumped Munia	*Lonchura striata*	सेतोढाडे मुनियाँ				NT				✓
	Passeridae										
204	House Sparrow	*Passer domesticus*	घर भँगेरा								✓
205	Russet Sparrow	*Passer cinnamomeus*	कैलो भँगेरा								✓
206	Eurasian Tree Sparrow	*Passer montanus*	रुख भँगेरा								✓
	Motacillidae										
207	Olive-backed Pipit	*Anthus hodgsoni*	रुख चुइयाँ								✓
208	Rosy Pipit	*Anthus roseatus*	गुलाफीकण्ठे चुइयाँ	B05							✓
209	Upland Pipit (RR)	*Anthus sylvanus*	पहाडी चुइयाँ								✓
210	Grey Wagtail	*Motacilla cinerea*	फुस्रो टिकटिके								✓
211	White Wagtail	*Motacilla alba*	सेतो टिकटिके								✓
	Fringillidae										
212	Collared Grosbeak	*Mycerobas affinis*	सुन्तलेगर्दने महाँठूँड	B07			NT				✓
213	Beautiful Rosefinch	*Carpodacus pulcherrimus*	झिंबी तितु	B05							✓
214	Pink-browed Rosefinch	*Carpodacus rodochroa*	रातो झिंबी तितु	B07							✓
215	Spot-winged Rosefince	*Carpodacus rodopeplus*	पंखथोप्ले तितु	B07							✓

216	Red-headed Bullfinch	*Pyrrhula erythrocephala*	रातोटोउके टिउँटिउँ	B07							✓
217	Dark-breasted Rosefinch	*Procarduelis nipalensis*	नेपाल तितु	B07							✓
218	Plain Mountain-finch	*Leucosticte nemoricola*	तितुभँगेरा	B07							✓
219	Yellow-breasted Greenfinch	*Chloris spinoides*	गाजले पीतचरी	B07							✓
	Emberizidae										
220	Crested Bunting	*Emeberiza lathami*	जुरे बगेडी					✓			
221	Black-headed Bunting	*Emeberiza melanocephala*	कालोटाउके बगेडी					✓			
222	Rock Bunting	*Emberiza cia*	शिला बगेडी								✓
223	Little Bunting	*Emberiza pusilla*	लघु बगेडी				VU				✓

Keynote	
BIOM	Biological Observation Matrix
	B05: Eurasian High Montane (Alpine & Tibetan)
	B07: Sino-Himalayan Temperate Forest
	B08: Sino-Himalayan Subtropical Forest
	B11: Indo-Malayan Tropical Dry Zone
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
GT	Globally Threatened
NT	Nationally Threatened
RR	Restricted Range Species
1	Karki at al. (2002)
2	Shah at al. (2014)

3	Forest Action Nepal (2020)
4	FON Nepal (2023)

Appendix 5: Checklist of Gymnosperm from Ramaroshan Lake Complex.

S.N.	Family	Botanical Name	Habit	Local Name	IUCN category	Collection No.	Remarks	Horizontal Distribution	Use value
1	Pinaceae	*Abies pindrow* (Royle ex D.Don) Royle	Tree	Dhede Dhupi	LC	RRR17	Veg.	W	Wood is used as timber; firewood
2	Pinaceae	*Abies spectabilis* (D.Don) Mirb.	Tree	Thingre Dhupi	NT	RRR53	Veg.	W, C & E	Wood is used as timber; firewood
3	Pinaceae	*Pinus roxburghii* Sarg.	Tree	Salla	LC		Obs.	W, C & E	Wood is used as timber
4	Pinaceae	*Tsuga dumosa* (D.Don) Eichler	Tree	Dhupi	LC	RRR12	Rep.	W, C & E	Wood is used as timber
5	Taxaceae	*Taxus contorta* Griff.	Tree	Lauth salla	EN	RRR06	Veg.	W & C	

Appendix 6: Checklist of Angiosperm in Ramaroshan Lake Complex

S.N.	Family	Botanical Name	Habit	Local Name	IUCN category	Collection No.	Remarks	Horizontal Distribution	Use value
1	Acanthaceae	*Barleria cristata* L.	Subshrub		NE		Obs.	W, C & E	
2	Acanthaceae	*Dicliptera bupleuroides* Nees	Herb		NE	RRR121	Rep.	W, C & E	
3	Acanthaceae	*Strobilanthes glutinosa* Nees	Subshrub		NE	RRR107	Rep.	W & C	Plant lopped for fodder
4	Acanthaceae	*Strobilanthes lachenensis* C.B.Clarke	Subshrub		NE		PP, FAN	W, C & E	

5	Acanthaceae	*Strobilanthes pentastemonoides* var. *dalhousieana* (Nees) Kuntze	Subshrub		NE	RRR122	Rep.	W, C & E	
6	Amaranthaceae	*Achyranthes bidentata* Blume	Herb		NE	RRR123	Rep.	W, C & E	
7	Amaranthaceae	*Cyathula capitata* Moq.	Herb		NE	RRR40	Rep.	W, C & E	
8	Amaryllidaceae	*Allium tuberosum* Rottler ex Spreng.	Herb		NE		PP, FAN	W & C	
9	Amaryllidaceae	*Allium wallichii* Kunth	Herb		NE		FAN	W, C & E	
10	Anacardiaceae	*Rhus* sp.	Tree				Obs.		
11	Aquifoliaceae	*Ilex dipyrena* Wall.	Tree	Thinke	LC	RRR11	Rep.	W, C & E	Plant lopped for fodder; Firewood
12	Aquifoliaceae	*Ilex excelsa* (Wall.) Voigt	Tree	Kadedo	LC	RRR105	Rep.	W, C & E	Plant lopped for fodder
13	Araceae	*Arisaema propinquum* Schott	Herb		NE		PP, FAN	W, C & E	
14	Araliaceae	*Brassaiopsis glomerulata* (Blume) Regel	Tree	Chuletro	LC	RRR102	Veg.	E	Plant lopped for fodder
15	Araliaceae	*Brassaiopsis hainla* (Buch.-Ham.) Seem.	Tree	Chyndia	NE	RRR101	Veg.	W, C & E	Plant lopped for fodder
16	Araliaceae	*Hedera nepalensis* K.Koch	Climber		NE	RRR22	Rep.	W, C & E	
17	Aristolochiaceae	*Aristolochia* sp.	Climber	Badde Maulo			Obs.		
18	Asparagaceae	*Asparagus* sp.	Herb	Bann Kurilo			Obs.		
19	Asparagaceae	*Polygonatum punctatum* Royle ex Kunth	Herb		NE	RRR76	Rep.	C &E	
20	Asteraceae	*Adenostemma lavenia* (L.) Kuntze	Herb		NE		Obs.	W, C & E	
21	Asteraceae	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	Herb		NE		Obs.	W, C & E	

22	Asteraceae	*Ageratum conyzoides* L.	Herb		NE	RRR124	Rep.	W, C & E	
23	Asteraceae	*Anaphalis busua* (Buch.-Ham.) DC.	Herb		NE		PP, FAN	W, C & E	
24	Asteraceae	*Anaphalis contorta* (D.Don) Hook.f.	Herb		NE	RRR93	Rep.	W, C &E	
25	Asteraceae	*Anaphalis margaritacea* (L.) Benth. & Hook.f	Herb		NE	RRR56	Rep.	W, C &E	
26	Asteraceae	*Anaphalis triplinervis* (Sims) C.B.Clarke	Herb		NE	RRR125	Rep.	W, C & E	
27	Asteraceae	*Artemisia* sp.	Herb				Obs.		
28	Asteraceae	*Bidens pilosa* L.	Herb		NE	RRR39	Rep.	W, C & E	
29	Asteraceae	*Bidens tripartita* L.	Herb		LC		PP, FAN	W, C & E	
30	Asteraceae	*Carpesium nepalense* Less.	Herb		NE	RRR41	Rep.	W, C & E	
31	Asteraceae	*Conyza stricta* Willd.	Herb		NE	RRR126	Rep.	W, C & E	
32	Asteraceae	*Crassocephalum crepidioides* (Benth.) S.Moore	Herb		NE		Obs.	W, C & E	
33	Asteraceae	*Dichrocephala benthamii* C.B.Clarke	Herb		NE		PP, FAN	W, C & E	
34	Asteraceae	*Duhaldea cappa* (Buch.-Ham. ex D.Don) Pruski & Anderb.	Shrub		NE	RRR88	Rep.	W, C & E	
35	Asteraceae	*Erigeron emodi* I.M.Turner	Herb		NE	RRR92	Rep.	W, C & E	
36	Asteraceae	*Erigeron karvinskianus* DC.	Herb		NE	RRR42	Rep.	W, C & E	
37	Asteraceae	*Galinsoga parviflora* Cav.	Herb		NE		FAN	W, C & E	
38	Asteraceae	*Galinsoga quadriradiata* Ruiz & Pav.	Herb		NE	RRR127	Rep.	W, C & E	

39	Asteraceae	*Hippolytia dolichophylla* (Kitam.) K. Bremer & Humphries	Herb		NE		PP, FAN	W & C	
40	Asteraceae	*Jacobaea analoga* (DC.) Veldkamp	Herb		NE	RRR46	Rep.	W, C & E	
41	Asteraceae	*Jacobaea graciliflora* (DC.) Sennikov	Herb		NE	RRR34	Rep.	W, C & E	
42	Asteraceae	*Myriactis nepalensis* Less.	Herb		NE	RRR09	Rep.	W, C & E	
43	Asteraceae	*Sigesbeckia orientalis* L.	Herb		NE		Obs.	W, C & E	
44	Asteraceae	*Synotis alata* (Wall. ex DC.) C.Jeffrey & Y.L.Chen	Herb		NE		PP, FAN	W, C & E	
45	Asteraceae	*Taraxacum* sp.	Herb			RRR47	Rep.		
55	Balanophoraceae	*Balanophora* sp.	Herb				FAN		
46	Balsaminaceae	*Impatiens racemosa* DC.	Herb		NE		PP, FAN	W, C & E	
47	Balsaminaceae	*Impatiens serrata* Benth.	Herb		NE		PP, FAN	W, C & E	
48	Berberidaceae	*Berberis aristata* DC.	Shrub	Chutro	LC	RRR50	Rep.	W, C & E	
49	Berberidaceae	*Berberis asiatica* Roxb. ex DC.	Shrub	Triphulaa	NE		Obs.	W, C & E	Ripe fruits are eaten
50	Berberidaceae	*Mahonia napaulensis* DC.	Shrub	Myane	NE		Obs.	W, C & E	
51	Betulaceae	*Alnus nepalensis* D.Don	Tree	Uttis	LC		Obs.	W, C & E	Wood is used as timber; Firewood
52	Betulaceae	*Betula alnoides* Buch.-Ham. ex D.Don	Tree	Saur	LC		Obs.	W, C & E	Trunk is used as construction material; Firewood
53	Betulaceae	*Betula utilis* D.Don	Tree	Bhojpatra/ Bhojpaat	LC		Obs.	W, C & E	Trunk is used as construction material; Firewood
54	Betulaceae	*Carpinus faginea* Lindl.	Tree	Gadaayo	DD		Obs.	W	

56	Boraginaceae	*Cynoglossum zeylanicum* (Sw. ex Lehm.) Thunb. ex Brand	Herb		NE		PP, FAN	W, C & E	
57	Brassicaceae	*Barbarea intermedia* Boreau	Herb		NE		PP, FAN	W	
58	Brassicaceae	*Nasturtium officinale* W.T.Aiton	Herb		LC		FAN	W, C & E	
59	Brassicaceae	*Rorippa* sp.	Herb				FAN		
60	Buxaceae	*Sarcococca hookeriana* Baill.	Shrub		NE	RRR62	Rep.	W, C & E	
61	Buxaceae	*Sarcococca saligna* (D.Don) Müll.Arg.	Shrub		NE	RRR128	Rep.	W & C	
62	Campanulaceae	*Lobelia pyramidalis* Wall.	Herb		NE		Obs.	W, C & E	
63	Caprifoliaceae	*Lonicera quinquelocularis* Hardw.	Tree	Paani patte	NE	RRR73	Rep.	W & C	
64	Caprifoliaceae	*Morina longifolia* Wall. ex DC.	Herb		NE		Obs.	W, C & E	
65	Caprifoliaceae	*Valeriana hardwickei* Wall.	Herb		NE		PP, FAN	W, C & E	
66	Caryophyllaceae	*Cerastium fontanum* subsp. *triviale* (Link) Jalas	Herb		NE	RRR30	Rep.	W, C & E	
67	Caryophyllaceae	*Cerastium glomeratum* Thuill.	Herb		NE	RRR129	Rep.	W, C & E	
68	Caryophyllaceae	*Drymaria cordata* (L.) Willd. ex Schult.	Herb		NE		Obs.	W, C & E	
69	Caryophyllaceae	*Odontostemma glandulosum* Benth. ex G.Don	Herb		NE		PP, FAN	W, C & E	
70	Caryophyllaceae	*Schizotechium monospermum* (Buch.-Ham. ex D.Don) Pusalkar & S.K.Srivast.	Herb		NE		Obs.	W, C & E	

71	Caryophyllaceae	*Stellaria aquatica* (L.) Scop.	Herb		NE		FAN	C	
72	Caryophyllaceae	*Stellaria depauperata* Edgew.	Herb		NE		PP, FAN	W, C & E	
73	Caryophyllaceae	*Stellaria media* (L.) Vill.	Herb		NE		FAN	W & C	
74	Caryophyllaceae	*Stellaria nepalensis* Majumdar & Vartak	Herb		NE		FAN	C	
75	Caryophyllaceae	*Stellaria semivestita* Edgew.	Herb		NE	RRR130	RRR130	W & C	
76	Celastraceae	*Euonymus lucidus* D.Don	Tree	Raajbire	NE		Veg.	W, C & E	Plant lopped for fodder
77	Celastraceae	*Euonymus tingens* Wall.	Tree	Lisso	NE	RRR01	Rep.	W, C & E	
78	Coriariaceae	*Coriaria* sp.	Shrub				Veg.		
79	Cornaceae	*Cornus macrophylla* Wall.	Tree	Dornaa	LC		Obs.	W, C & E	
80	Cucurbitaceae	*Gynostemma pentaphyllum* (Thunb.) Makino	Climber		NE	RRR131	Rep.	W, C & E	
81	Cyperaceae	*Blysmus compressus* (L.) Panz. ex Link	Herb		LC		FAN	W, C & E	
82	Cyperaceae	*Carex baccans* Nees	Herb		LC		PP, FAN	W, C & E	
83	Cyperaceae	*Carex* sp.	Herb				PP		
84	Cyperaceae	*Carex* sp.	Herb				Obs.		
85	Cyperaceae	*Cyperus brevifolius* (Rottb.) Hassk.	Herb		LC		PP, FAN	W, C & E	
86	Cyperaceae	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Herb		NE		FAN	C & E	
87	Cyperaceae	*Eleocharis congesta* D.Don	Herb		LC		PP, FAN	W, C & E	
88	Daphniphyllaceae	*Daphniphyllum chartaceum* K.Rosenthal	Tree		NE	RRR132	Rep.	W, C & E	

89	Elaeagnaceae	*Elaeagnus infundibularis* Momiy.	Tree	Guyalo	NE	RRR32	Veg.	C &E	Ripe fruits are eaten
90	Elaeagnaceae	*Elaeagnus parvifolia* Wall.	Shrub		LC		PP, FAN	W, C & E	
91	Elaeagnaceae	*Hippophae salicifolia* D.Don	Tree	Chuk	NE		Obs.	W & C	Fruits are eaten
92	Ericaceae	*Gaultheria fragrantissima* Wall.	Shrub		LC		FAN	W, C & E	
93	Ericaceae	*Gaultheria nummularioides* D.Don	Herb	Kantha kafal	NE	RRR14	Rep.	W, C & E	
94	Ericaceae	*Lyonia ovalifolia* (Wall.) Drude	Tree	Thyar	LC	RRR26	Veg.	W, C & E	
95	Ericaceae	*Lyonia villosa* (Hook.f. ex C.B.Clarke) Hand.-Mazz.	Shrub		LC		PP, FAN	W, C & E	
96	Ericaceae	*Rhododendron arboreum* var. *arboreum* Sm.	Tree	Gurans	LC	RRR08	Rep.	W, C & E	Trunk is used to make theki
97	Ericaceae	*Rhododendron arboreum* var. *roseum* Lindl.	Tree	Gurans	NE	RRR33	Rep.	W, C & E	
98	Ericaceae	*Rhododendron barbatum* Wall. ex G.Don	Tree	Chimal	NE		Obs.	W, C & E	
99	Ericaceae	*Rhododendron lepidotum* Wall. ex G.Don	Shrub		NE		Obs.	W, C & E	
100	Euphorbiaceae	*Euphorbia sikkimensis* Boiss.	Herb		NE	RRR59	Rep.	W, C & E	
101	Fabaceae	*Albizia* sp.	Tree				Obs.		
102	Fabaceae	*Flemingia fruticulosa* Wall. ex Benth.	Subshrub		NE	RRR133	Rep.	W	
103	Fabaceae	*Oxytropis* sp.	Herb			RRR99	Rep.		
104	Fabaceae	*Parochetus communis* Buch.-Ham. ex D.Don	Herb		LC	RRR29	Rep.	W, C & E	

105	Fabaceae	*Piptanthus nepalensis* (Hook.) Sweet	Shrub		NE	RRR54	Rep.	W, C & E	
106	Fagaceae	*Castanopsis tribuloides* (Sm.) A.DC.	Tree	Katus	NE	RRR108	Veg.	W, C & E	Nuts are eaten raw; Plant is lopped for fodder; Wood is used a timber; Branches are used to make handles of digging tools and polugh
107	Fagaceae	*Quercus floribunda* Lindl. ex A.Camus	Tree	Kharsu	LC	RRR03	Veg.	W & C	Plant is lopped for fodder
108	Fagaceae	*Quercus glauca* Thunb.	Tree	Phalant	LC	RRR87	Rep.	W, C & E	Wood is used as timber; Firewood; Plant is lopped for fodder; Branches are used to make handles of digging tools and plough
109	Fagaceae	*Quercus lanata* Sm.	Tree	Dhallas	LC		Veg.	W, C & E	Firewood; Plant is lopped for fodder; Trunk is used to make the apical part of typical country plough
110	Fagaceae	*Quercus leucotrichophora* A.Camus	Tree	Baanjh	NE	RRR78	Rep.	W & C	Wood is used as timber; plant is lopped for fodder; branches are used to make handles of agricultural digging tools
111	Fagaceae	*Quercus semecarpifolia* Sm.	Tree	Bhede	LC	RRR02	Veg.	W, C & E	Wood is used as construction material; Plant is lopped for fodder
112	Gentianaceae	*Gentiana capitata* Buch.-Ham. ex D.Don	Herb		NE	RRR15	Rep.	W, C & E	
113	Gentianaceae	*Swertia angustifolia* Buch.-Ham. ex D.Don	Herb		NE		FAN	W, C & E	
114	Gentianaceae	*Swertia chirayita* (Roxb.) H.Karst.	Herb		NE		FAN	C & E	

115	Gentianaceae	*Swertia* sp.	Herb				Obs.		
116	Geraniaceae	*Geranium nepalense* Sweet	Herb		NE		Obs.	W, C & E	
117	Grossulariaceae	*Ribes griffithii* Hook.f. & Thomson	Shrub		NE		FAN	W, C & E	
118	Grossulariaceae	*Ribes* sp.	Tree				Obs.		
119	Haloragaceae	*Myriophyllum spicatum* L.	Herb		LC		PP, FAN	W	
120	Hydrangeaceae	*Hydrangea anomala* D.Don	Climber		NE		FAN	W, C & E	
121	Hydrangeaceae	*Hydrangea aspera* Buch.-Ham. ex D.Don	Tree		LC		Obs.	W, C & E	
122	Hydrocharitaceae	*Hydrilla verticillata* (L.f.) Royle	Herb		LC		FAN	W, C & E	
123	Hypericaceae	*Hypericum elodeoides* Choisy	Herb		NE		PP, FAN	W, C & E	
124	Hypericaceae	*Hypericum* sp.	Shrub				Obs.		
125	Iridaceae	*Iris kemaonensis* Wall. ex D.Don	Herb		NE		PP, FAN	W, C & E	
126	Juglandaceae	*Juglans regia* L.	Tree	Okhar	LC		Obs.	W, C & E	Nuts are eaten; Firewood
127	Juncaceae	*Juncus articulatus* L.	Herb		LC		PP, FAN	W & C	
128	Juncaceae	*Juncus concinnus* D.Don	Herb		NE		FAN	W, C & E	
129	Lamiaceae	*Clinopodium umbrosum* (M.Bieb.) K.Koch	Herb		NE	RRR134	Rep.	W, C & E	
130	Lamiaceae	*Craniotome furcata* (Link) Kuntze	Herb		NE	RRR135	Rep.	W, C & E	
131	Lamiaceae	*Elsholtzia fruticosa* (D.Don) Rehder	Shrub		NE	RRR98	Rep.	W, C & E	
132	Lamiaceae	*Elsholtzia strobilifera* (Benth.) Benth.	Herb		NE		Obs.	W, C & E	

133	Lamiaceae	*Leucas lanata* Benth.	Herb		NE	RRR89	Rep.	W, C & E	
134	Lamiaceae	*Leucosceptrum canum* Sm.	Tree	Guna Puch	NE	RRR60	Rep.	W, C & E	
135	Lamiaceae	*Origanum vulgare* L.	Herb		NE		PP, FAN	W, C & E	
136	Lamiaceae	*Salvia cana* Wall. ex Benth.	Herb		NE		FAN	W & C	
137	Lamiaceae	*Thymus linearis* Benth.	Herb		NE	RRR77	Rep.	W & C	
138	Lauraceae	*Dodecadenia grandiflora* Nees	Tree	Sunn Kaulo	LC	RRR24	Veg.	W, C & E	Wood is used as timber; leaves are used as fodder for goats and sheeps; branches are used to make handles of sickles
139	Lauraceae	*Lindera pulcherrima* (Nees) Benth. ex Hook.f.	Tree	Chhare Kaulo	LC	RRR23	Rep.	W, C & E	Wood is used as timber; firewood; Branches are used to make handles of sickles
140	Lauraceae	*Machilus* cf. *sericeus* (Nees) Blume	Tree	Damne Kaulo	NE	RRR74	Veg.	W & C	
141	Lauraceae	*Machilus duthiei* King ex Hook.f.	Tree	Kupe Kaulo	NE	RRR65	Veg.	W, C & E	Branches are used to make handle of sickle
142	Lauraceae	*Machilus odoratissimus* Nees	Tree	Hade Kaulo	NE	RRR75	Veg.	W, C & E	
143	Lauraceae	*Neolitsea pallens* (D.Don) Momiy. & H.Hara	Tree	Kidi Kaulo	NE	RRR20	Veg.	W, C & E	Wood is used as timber; Leaves are used as bedding material for cattles
144	Lentibulariaceae	*Utricularia australis* R.Br.	Herb		LC		PP, FAN	W & C	
145	Liliaceae	*Cardiocrinum giganteum* (Wall.) Makino	Herb		NE		FAN	W, C & E	
146	Liliaceae	*Fritillaria cirrhosa* D.Don	Herb		VU		FAN	W, C & E	
147	Linaceae	*Reinwardtia indica* Dumort.	Subshrub	Pyauli	NE	RRR100	Rep.	W, C & E	
148	Loganiaceae	*Gardneria angustifolia* Wall.	Climber		NE	RRR136	Rep.	W, C & E	

149	Magnoliaceae	*Magnolia kisopa* (Buch.-Ham. ex DC.) Figlar	Tree	Serba	DD	RRR71	Rep.	W, C & E	Wood is used as timber
150	Malvaceae	*Bombax ceiba* L.	Tree	Simal	LC		Obs.	C &E	
151	Malvaceae	*Urena lobata* L.	Subshrub		LC		Obs.	W, C & E	
152	Mazaceae	*Mazus surculosus* D.Don	Herb		NE		PP, FAN	W, C & E	
153	Melanthiaceae	*Paris polyphylla* Sm.	Herb		VU		PP, FAN	W, C & E	
154	Melastomataceae	*Osbeckia stellata* Buch.-Ham. ex D.Don	Subshrub		NE		Obs.	W, C & E	
155	Meliaceae	*Toona* cf. *sureni* (Blume) Merr.	Tree		LC	RRR104	Veg.	W & E	Wood is used as timber
156	Menispermaceae	*Stephania gracilenta* Miers	Climber		NE		PP, FAN	W, C & E	
157	Moraceae	*Ficus auriculata* Lour.	Tree	Timila	LC	RRR95	Veg.	W, C & E	Ripe fruits are eaten; Plant lopped for fodder
158	Moraceae	*Ficus hederacea* Roxb.	Climber	Bedulo	NE	RRR63	Rep.	W, C & E	Plant used as fodder
159	Moraceae	*Ficus neriifolia* Sm.	Tree	Dudhilo	NE	RRR90	Veg.	W, C & E	Plant lopped for fodder
160	Moraceae	*Ficus subincisa* Buch.-Ham. ex Sm.	Tree	Bedulo	LC	RRR103	Rep.	W, C & E	Plant lopped for fodder
161	Myricaceae	*Myrica esculenta* Buch.-Ham. ex D.Don	Tree	Kafal	NE		Obs.	W, C & E	Ripe fruits are eaten; Firewood
162	Nelumbonaceae	*Nelumbo nucifera* Gaertn.	Herb		DD		FAN	W, C & E	
163	Nyctaginaceae	*Boerhavia diffusa* L.	Herb		NE		PP, FAN	W, C & E	
164	Oleaceae	*Chrysojasminum humile* (L.) Banfi	Shrub	Ghyaa	NE	RRR07	Rep.	W, C & E	
165	Oleaceae	*Fraxinus floribunda* Wall.	Tree		LC		Obs.	W, C & E	
166	Onagraceae	*Epilobium palustre* L.	Herb		LC		PP, FAN	W & C	

167	Onagraceae	*Epilobium royleanum* Hausskn.	Herb		NE	RRR81	Rep.	W, C & E	
168	Orchidaceae	*Calanthe tricarinata* Lindl.	Herb		NE		FAN	W, C & E	
169	Orchidaceae	*Cephalanthera longifolia* (L.) Fritsch	Herb		NE		FAN	W & C	
170	Orchidaceae	*Malaxis muscifera* (Lindl.) Kuntze	Herb		VU		PP, FAN	W, C & E	
171	Orchidaceae	*Satyrium nepalense* D.Don	Herb		NE		FAN	W, C & E	
172	Orchidaceae	*Spiranthes sinensis* (Pers.) Ames	Herb		LC		FAN	W, C & E	
173	Oxalidaceae	*Oxalis corniculata* L.	Herb		NE	RRR137	Rep.	W, C & E	
174	Papaveraceae	*Corydalis hookeri* Prain	Herb		NE		PP, FAN	W, C & E	
175	Pentaphylacaceae	*Eurya acuminata* DC.	Tree	Jhigina	NE	RRR18	Rep.	W, C & E	
176	Piperaceae	*Peperomia tetraphylla* (G.Forst.) Hook. & Arn.	Herb		NE	RRR138	Rep.	W, C & E	
177	Plantaginaceae	*Hemiphragma heterophyllum* Wall.	Herb		NE	RRR16	Rep.	W, C & E	
178	Plantaginaceae	*Plantago asiatica* subsp. *erosa* (Wall.) Z.Yu Li	Herb		NE	RRR13	Rep.	W, C & E	
179	Poaceae	*Arundinella hookeri* Munro ex Keng	Herb		NE		PP, FAN	W, C & E	
180	Poaceae	*Arundo donax* L.	Herb	Sano Naltuwa Nigalo	LC	RRR58	Rep.	W, C & E	
181	Poaceae	*Capillipedium assimile* (Steud.) A.Camus	Herb		NE		Obs.	W, C & E	
182	Poaceae	*Chrysopogon* sp.	Herb				Obs.		
183	Poaceae	*Cynodon dactylon* (L.) Pers.	Herb		NE		PP, FAN	W, C & E	

184	Poaceae	*Digitaria cruciata* (Nees ex Steud.) E.G.Camus & A.Camus	Herb		NE		PP, FAN	W, C & E	
185	Poaceae	*Eragrostis* sp.	Herb				Obs.		
186	Poaceae	*Eulaliopsis* sp.	Herb	Babiyo			Obs.		
187	Poaceae	*Microstegium nudum* (Trin.) A.Camus	Herb		NE		PP, FAN	W, C & E	
188	Poaceae	*Oplismenus compositus* (L.) P.Beauv.	Herb		LC		Obs.	W, C & E	
189	Poaceae	*Poa annua* L.	Herb		LC		PP, FAN	W, C & E	
190	Poaceae	*Pogonatherum paniceum* (Lam.) Hack.	Herb		LC		PP, FAN	W, C & E	
191	Poaceae	*Polypogon fugax* Nees ex Steud.	Herb		NE		PP, FAN	W, C & E	
192	Poaceae	*Tenaxia cumminsii* (Hook.f.) N.P.Barker & H.P.Linder	Herb		NE		PP, FAN	W, C & E	
193	Polygonaceae	*Bistorta amplexicaulis* (D.Don) Greene	Herb		NE	RRR37	Rep.	W, C & E	
194	Polygonaceae	*Bistorta milletii* H.Lév.	Herb		NE		PP, FAN	W, C & E	
195	Polygonaceae	*Fagopyrum tataricum* (L.) Gaertn.	Herb		NE		PP, FAN	W, C & E	
196	Polygonaceae	*Koenigia mollis* var. *frondosa* (Meisn.) T.M.Schust. & Reveal	Subshrub		NE	RRR139	Rep.	W, C & E	
197	Polygonaceae	*Persicaria barbata* (L.) H.Hara	Herb		LC		FAN	W, C & E	
198	Polygonaceae	*Persicaria capitata* (Buch.-Ham. ex D.Don) H.Gross	Herb		NE		PP, FAN	W, C & E	

199	Polygonaceae	*Persicaria chinensis* (L.) H.Gross	Herb		NE	RRR140	Rep.	W, C & E	
200	Polygonaceae	*Persicaria hydropiper* (L.) Delarbre	Herb		LC		FAN	W, C & E	
201	Polygonaceae	*Persicaria posumbu* (Buch.-Ham. ex D.Don) H.Gross	Herb		NE		PP, FAN	W, C & E	
202	Polygonaceae	*Rheum* sp.	Herb	Padmechharaa			Obs.		
203	Polygonaceae	*Rumex hastatus* D.Don	Herb		NE		Obs.	W & C	
204	Polygonaceae	*Rumex nepalensis* Spreng.	Herb		NE		Obs.	W, C & E	
205	Potamogetonaceae	*Potamogeton crispus* L.	Herb		LC		PP, FAN	W, C & E	
206	Potamogetonaceae	*Potamogeton lucens* L.	Herb		LC		PP, FAN	W, C & E	
207	Potamogetonaceae	*Potamogeton natans* L.	Herb		LC		FAN	W & C	
208	Potamogetonaceae	*Potamogeton nodosus* Poir.	Herb		LC		PP	W, C & E	
209	Potamogetonaceae	*Stuckenia filiformis* (Pers.) Börner	Herb		LC		FAN	W & C	
210	Primulaceae	*Maesa argentea* (Wall.) A.DC.	Shrub		NE	RRR94	Veg.	W, C & E	
211	Primulaceae	*Maesa chisia* D.Don	Shrub		NE	RRR106	Rep.	W, C & E	
212	Primulaceae	*Myrsine semiserrata* Wall.	Tree	Nun Dhikke	LC	RRR64	Rep.	W, C & E	
213	Primulaceae	*Primula denticulata* Sm.	Herb		NE	RRR85	Rep.	W, C & E	
214	Primulaceae	*Primula sessilis* Royle ex Craib	Herb		NE	RRR57	Rep.	W	
215	Primulaceae	*Primula nana* Wall.	Herb		NE	RRR84	Rep.	W & C	
216	Primulaceae	*Primula sulphurea* Craib	Herb		NE	RRR82	Rep.	New record	
217	Ranunculaceae	*Aconitum lethale* Griff.	Herb	Bikh	NE		PP, FAN	W, C & E	

218	Ranunculaceae	*Caltha scaposa* Hook.f. & Thomson	Herb		NE		FAN	W, C & E	
219	Ranunculaceae	*Clematis grewiiflora* DC.	Climber		NE	RRR141	Rep.	W, C & E	Young twigs are used to kill fishes in river
220	Ranunculaceae	*Clematis* sp.	Climber			RRR142	Rep.		
221	Ranunculaceae	*Ranunculus sceleratus* L.	Herb		LC		FAN	W, C & E	
222	Ranunculaceae	*Ranunculus* sp.	Herb			RRR45	Rep.		
223	Ranunculaceae	*Ranunculus trichophyllus* Chaix	Herb		LC		FAN	W, C & E	
224	Ranunculaceae	*Thalictrum virgatum* Hook.f. & Thomson	Herb		NE		PP, FAN	W, C & E	
225	Rhamnaceae	*Berchemia flavescens* (Wall.) Wall. ex Brongn.	Tree		NE		PP, FAN	W, C & E	
226	Rhamnaceae	*Rhamnus purpurea* Edgew.	Tree	Gauthe	NE	RRR44	Veg.	W, C & E	
227	Rosaceae	*Cotoneaster acuminatus* Lindl.	Shrub		NE		PP, FAN	W, C & E	
228	Rosaceae	*Cotoneaster bacillaris* Wall.	Shrub		NE		PP, FAN	W, C & E	
229	Rosaceae	*Cotoneaster frigidus* Wall. ex Lindl.	Tree	Ruyes	NE	RRR05	Veg.	W, C & E	Stem and branches are used to make handles of axe, hammer and digging tools
230	Rosaceae	*Cotoneaster integrifolius* (Roxb.) G.Klotz	Shrub		NE	RRR55, RRR36	Rep.	W, C & E	
231	Rosaceae	*Fragaria nubicola* (Lindl. ex Hook.f.) Lacaita	Herb		NE	RRR49	Rep.	W, C & E	
232	Rosaceae	*Geum elatum* Wall. ex G.Don	Herb		NE		FAN	W, C & E	
233	Rosaceae	*Prinsepia utilis* Royle	Shrub	Dhatelo	NE	RRR52	Rep.	W, C & E	Stem is used to make madaani

234	Rosaceae	*Prunus cerasoides* Buch.-Ham. ex D.Don	Tree	Painyu	LC	RRR68	Rep.	W, C & E	Wood is used as timber
235	Rosaceae	*Prunus cornuta* (Wall. ex Royle) Steud.	Tree	Aaro	NE	RRR04	Veg.	W, C & E	
236	Rosaceae	*Pyracantha crenulata* (D.Don) M.Roem.	Shrub	Ghangaru	LC		Obs.	W, C & E	
237	Rosaceae	*Pyrus pashia* Buch.-Ham. ex D.Don	Tree	Mayal	LC		Obs.	W, C & E	
238	Rosaceae	*Rhaphiolepis elliptica* (Lindl.) B.B.Liu & J.Wen	Tree	Mayo	NE	RRR86	Veg.	W, C & E	Plant lopped for fodder
239	Rosaceae	*Rosa sericea* Lindl.	Shrub		NE		FAN	W, C & E	
240	Rosaceae	*Rosa* sp.	Shrub			RRR35	Rep.		
241	Rosaceae	*Rubus ellipticus* Sm.	Shrub	Ainselu	LC	RRR144	Rep.	W, C & E	
242	Rosaceae	*Rubus nepalensis* (Hook.f.) Kuntze	Subshrub		NE	RRR43	Rep.	W, C & E	
243	Rosaceae	*Rubus* sp. 1	Shrub				Obs.		
244	Rosaceae	*Rubus* sp. 2	Shrub				Obs.		
245	Rosaceae	*Rubus* sp. 3	Shrub				Obs.		
246	Rosaceae	*Stranvaesia nussia* (Buch.-Ham. ex D.Don) Decne.	Tree	Shoddo	NE	RRR69	Veg.	W & C	Wood is used as timber
247	Rubiaceae	*Galium elegans* Wall.	Herb				PP, FAN	W, C & E	
248	Rubiaceae	*Rubia manjith* Roxb.	Climber	Majetho	NE	RRR10	Rep.	W, C & E	Fruit used to make dye
249	Rubiaceae	*Wendlandia* sp.	Tree				Obs.		
250	Rutaceae	*Boenninghausenia albiflora* (Hook.) Rchb. ex Meisn.	Herb		NE	RRR27	Rep.	W, C & E	
251	Rutaceae	*Skimmia anquetilia* N.P.Taylor & Airy Shaw	Shrub	Nar pati	NE	RRR21	Rep.	W	Used as incense

252	Rutaceae	*Zanthoxylum armatum* DC.	Tree	Timur	LC		Obs.	W, C & E	Fruit is used as a flavouring agent in different dishes
253	Rutaceae	*Zanthoxylum bungeanum* Maxim.	Tree		LC		Veg.	W, C & E	
254	Salicaceae	*Salix babylonica* L.	Tree	Ralo Bains	DD		Obs.	W, C & E	
255	Salicaceae	*Salix* sp.	Shrub				Obs.		
256	Sapindaceae	*Acer caesium* Wall. ex Brandis	Tree	Rato Tilelaa	LC		Obs.	W, C & E	Plant lopped for fodder
257	Sapindaceae	*Acer campbellii* Hook.f. & Thomson ex Hiern	Tree		LC		FAN	W, C & E	
258	Sapindaceae	*Acer laevigatum* Wall.	Tree	Chaitalo	LC	RRR70	Veg.	W, C & E	
259	Sapindaceae	*Acer oblongum* Wall. ex DC.	Tree	Padinglaa	LC	RRR79	Rep.	W, C & E	Plant lopped for fodder
260	Sapindaceae	*Acer sterculiaceum* Wall.	Tree	Tilela	LC		Obs.	W, C & E	
261	Sapindaceae	*Aesculus indica* (Wall. ex Cambess.) Hook.	Tree	Paangar	LC		Obs.	W & C	Wood is used as timber
262	Saxifragaceae	*Bergenia ciliata* (Haw.) Sternb.	Herb	Selpaadi, Padi Phul	LC		Obs.	W & C	
263	Smilacaceae	*Smilax aspera* L.	Climber		LC	RRR97	Rep.	W, C & E	
264	Smilacaceae	*Smilax elegans* Wall. ex Kunth	Climber		NE	RRR66	Veg.	W, C & E	
265	Solanaceae	*Solanum aculeatissimum* Jacq.	Herb		NE		Obs.	W, C & E	
266	Solanaceae	*Solanum nigrum* L.	Herb	Kali gedi	NE	RRR38	Rep.	W, C & E	
267	Symplocaceae	*Symplocos lucida* (Thunb.) Siebold & Zucc.	Tree	Kalo Dabdabe	LC	RRR80	Rep.	W, C & E	
268	Symplocaceae	*Symplocos paniculata* (Thunb.) Miq.	Tree	Lodh	NE		Obs.	W, C & E	

269	Symplocaceae	*Symplocos ramosissima* Wall. ex G.Don	Tree	Dabdabe	LC	RRR19	Rep.	W, C & E	Wood is used as timber; Fodder for goats
270	Thymelaeaceae	*Daphne bholua* var. *bholua* Buch.-Ham. ex D.Don	Shrub	Badu	NE	RRR61	Rep.	W, C & E	Bark is used to make fiber
271	Thymelaeaceae	*Daphne bholua* var. *glacialis* (W.W.Sm. & Cave) B.L.Burtt	Shrub	Badu	NE	RRR51	Rep.	W, C & E	Bark is used to make fiber
272	Thymelaeaceae	*Daphne papyracea* Wall. ex G.Don	Shrub	Muse Badu/ Sano Badu	NE	RRR28	Rep.	W, C & E	Bark is used to make fiber; Roots are used to kill fishes in river
273	Typhaceae	*Typha angustifolia* L.	Herb		LC		FAN	W, C & E	
274	Urticaceae	*Boehmeria* sp.	Subshrub				Obs.		
275	Urticaceae	*Debregeasia* sp.	Tree				Obs.		
276	Urticaceae	*Elatostema monandrum* (Buch.-Ham. ex D.Don) H.Hara	Herb		NE		PP, FAN	W, C & E	
277	Urticaceae	*Elatostema obtusum* Wedd.	Herb		NE		PP, FAN	W, C & E	
278	Urticaceae	*Elatostema sessile* J.R.Forst. & G.Forst.	Herb		NE	RRR143	Rep.	W, C & E	
279	Urticaceae	*Girardinia diversifolia* (Link) Friis	Herb	Ullo	NE		Obs.	W, C & E	Bark is used to make fiber
280	Urticaceae	*Lecanthus peduncularis* (Royle) Wedd.	Herb		NE		PP, FAN	W, C & E	
281	Urticaceae	*Pilea symmeria* Wedd.	Herb		NE		PP, FAN	W, C & E	
282	Urticaceae	*Pilea umbrosa* Wedd. ex Blume	Herb		NE		FAN	W, C & E	
283	Urticaceae	*Urtica dioica* L.	Herb	Sisno	LC		Obs.	W & C	Young twigs are cooked as vegetable
284	Viburnaceae	*Viburnum cylindricum* Buch.-Ham. ex D.Don	Tree	Chilleto	NE	RRR91, RRR83	Rep.	W, C & E	

285	Viburnaceae	*Viburnum erubescens* Wall. ex DC.	Shrubs or small tree	Gadaune	NE	RRR25	Veg.	W, C & E	Stem are used to make handles of sickle, hammer and axe
286	Viburnaceae	*Viburnum grandiflorum* Wall. ex DC.	Tree	Chuyakra	NE	RRR31	Rep.	W & C	
287	Viburnaceae	*Viburnum mullaha* Buch.-Ham. ex D.Don	Tree	Malaayo	LC	RRR72	Rep.	W, C & E	Ripe fruits are eaten
288	Violaceae	*Viola betonicifolia* Sm.	Herb		NE		PP, FAN	W, C & E	
289	Vitaceae	*Tetrastigma serrulatum* (Roxb.) Planch.	Climber	Pal Lahara	NE	RRR67	Rep.	W, C & E	
290	Zingiberaceae	*Roscoea purpurea* Sm.	Herb		NE		PP, FAN	W, C & E	

NE= Not Evaluated, DD= Data Deficient, LC= Least Concern, VU= Vulnerable, Veg.= Vegetative specimen, Obs.= Based on observation, Rep.= Specimen with reproductive parts, W= West Nepal, C= Central Nepal, E= East Nepal, PP= Paudel and Pandey (2016), FAN= FAN (2020)

Appendix 7: Photographs of mammals, captured in camera traps

Asiatic Black Bear

Golden Jackal

Northern Red Muntjac

Leopard

Wild Boar

Himalayan Goral

Appendix 8: Photographs of birds from Ramaroshan Lake Complex

Bar-tailed Treecreeper

Collared Owlet

Upland Pipet

White-tailed Nuthatch

Yellow-browed Tit

Common Kestrel