# Management Plan

of

# Churdhar Wildlife Sanctuary
# Himachal Pradesh

**(2018-19 to 2027-28)**

| | |
|---|---|
| **repared By:** | Wildlife Division Shimla |
| **ommissioned By:** | Wildlife Wing, H P F D |
| **uthors:** | **Rajesh Sharma**, HPFS (DFO Wildlife)<br>&<br>**Anita Bhardwaj**, HPFS (ACF Wildlife) |
| **nder the supervision of:** | **Dr. Sushil Kapta**, IFS (CCF WIldlife Shimla) |
| **nder the overall Guidance of:** | **Dr. R. C. Kang**, IFS (PCCF, Wildlife cum Chief Wildlife Warden HP) |

Approved

Pr. Chief Conservator of Forests (WL)
and Chief Wildlife Warden HP Shimla

## Acknowledgements

Churdhar wildlife sanctuary is situated in sub-Himalayan region in Shimla and Sirmour districts of Himachal Pradesh. It provides home to a variety of endemic flora and fauna. The Government of Himachal Pradesh declared its intention to notify it as a sanctuary in 1974 and final Notification under the wild life (Protection) Act, 1972 was issued in 2013 to this effect, taking into consideration it's ecological, faunal, floral, geomorphologic and zoological significance.

This management plan is the revision of the existing plan which expired on 31/3/2013 and has been prepared for a period of 10 years w.e.f. 2018-19 to 2027-28. The emphasis has been on the protection and improvement of the habitat with a view to conserve the rich biodiversity existing in the sanctuary. The natural habitats have been proposed to be developed keeping in view the requirements of the native fauna. The key species of this sanctuary is Monal pheasant. The prescription of the management plan has been made keeping main species in view. Different measures have also been proposed to eliminate the decimating and the limiting factors specially the biotic pressure. Emphasis has also been laid for educating the people and making them aware about the significance of conserving the wildlife so that the sanctuary sustains the local economy and becomes an asset to local people. Research and training has also been given due priority for the better management of sanctuary and also for providing learning opportunities to the field staff.

This management plan would have been incomplete without the valuable suggestions, guidance and words of advice from Dr R.C. Kang ,IFS PCCF(Wildlife) Himachal Pradesh and Dr. Sushil Kapta, IFS (CCF South).

I would like to place on record the efforts put in by Smt. Anita Bhardwaj, ACF wildlife for preparing this document. Efforts done by entire staff of Nohra Range for providing valuable inputs are also appreciated.

This management plan will definitely contribute towards achieving the long terms goal of maintaining viable wild populations in the Churdhar wildlife sanctuary.

**Rajesh Sharma**, HPFS
**Divisional Forest Officer**
**Wldlife Division, shimla**

Contents


| | | Page No. |
|---|---|---|
| | Foreword | |
| Chapter 1 | **Introduction** | 1- 15 |
| 1.1 | Name and Location | 1 |
| 1.2 | Constitution and Extent | 1 |
| 1.3 | Geography of the Sanctuary | 1 |
| 1.4 | Approach and Access | 2 |
| 1.5 | Natural Boundaries | 3 |
| 1.6 | Internal Administrative Units | 4 |
| 1.7 | Geology, Rock and Soil | 5 |
| 1.8 | Climate and Rainfall | 6 |
| 1.9 | Biogeographic Zone | 6 |
| 1.10 | Flora of the Sanctuary | 7 |
| 1.11 | Status of Vegetation | 10 |
| 1.12 | Fauna of the Sanctuary | 11 |
| 1.13 | Connectivity and Buffer Zones | 13 |
| 1.14 | Cultural Values of the Sanctuary | 14 |
| 1.15 | Statement of Significance | 14 |
| Chapter 2 | **History of Management, Present Practices** | 16-28 |
| 2.1 | Past Administrative and Management History | 16 |
| 2.2 | Timber operations and firewood harvesting | 16 |
| 2.3 | Protection Practices | 17 |
| 2.4 | Infrastructure inside the Sanctuary | 17 |
| 2.5 | Use of Forest Produce by Local People | 18 |
| 2.6 | Grazing Permits | 18 |
| 2.7 | Tourism in the Sanctuary | 19 |
| 2.8 | Pilgrimage at Churdhar | 19 |
| 2.9 | Soil Erosion | 21 |
| 2.10 | Assessment of Works Carried Out Inside the Sanctuary | 22 |
| 2.11 | Equipments | 25 |
| 2.12 | Drying of Kharsu Oak trees | 25 |
| 2.13 | Wildlife Monitoring and Population Estimation | 26 |
| 2.14 | Realignment of Boundaries | 26 |
| 2.15 | Proposed Eco- Sensitive Zone | 26 |
| Chapter 3 | **The Protected Area and the Interface Land use** | 27-34 |

| | | |
|---|---|---|
| | **Situation** | 29 |
| 3.1 | Panchayats in the Zone of Influence | 30 |
| 3.2 | Findings of Socio-economic Study | 31 |
| 3.3 | Wildlife Human Conflict | 32 |
| 3.4 | NTFP Collection | 33 |
| 3.5 | Lifestyle of Gujjar Community | 33 |
| 3.6 | People's Requirements | 35-37 |
| **Chapter 4** | **Vision, Objective, Issues and Problems** | 35 |
| 4.1 | Vision Statement | 35 |
| 4.2 | Objectives of Management | 35 |
| 4.3 | Issues and Problems | 38-47 |
| **Chapter 5** | **Management Strategies** | 38 |
| 5.1 | Management Philosophy | 40 |
| 5.2 | Thrust Areas for Management | 40 |
| 5.3 | Protection Mechanism | 43 |
| 5.4 | Managing Human Pressures on the Sanctuary | 44 |
| 5.5 | Infrastructure Development | 45 |
| 5.6 | Soil conservation | 46 |
| 5.7 | Tree Plantation | 47 |
| 5.8 | Equipment Purchase | 47 |
| 5.9 | Development of Communication Facilities | 48- 54 |
| **Chapter 6** | **Development of Tourism** | 48 |
| 6.1 | Tourism Goals and Strategy | 49 |
| 6.2 | Philosophy of Tourism | 49 |
| 6.3 | Tourism Development Measures | 52 |
| 6.4 | Signage | 52 |
| 6.5 | Creation of Interpretation Centre | 53 |
| 6.6 | Management of Pilgrim Tourism at Churdhar | 55-62 |
| **Chapter 7** | **Monitoring, Research and Training** | 55 |
| 7.1 | Considerations in Design of Monitoring Programme | 55 |
| 7.2 | Synopsis of Monitoring Techniques | 58 |
| 7.3 | Recommended Monitoring Techniques | 60 |
| 7.4 | Research Needs of the Sanctuary | 61 |
| 7.5 | Training of Sanctuary Staff | 63-65 |
| **Chapter 8** | **Management of Human Interface** | 63 |
| 8.1 | Philosophy of Interactions with Local Communities | |

| | | |
|---|---|---|
| 8.2 | Formation of Coordination Committee | 63 |
| 8.3 | Eco-development Programme | 64 |
| 8.4 | Involvement of Local People in the Conservation Activities | 65 |
| Chapter 9 | **Proposed Budget** | 66-68 |
| 9.1 | Expenditure in the Previous Years | 66 |
| 9.2 | Proposed Budget | 66 |
| Annexures | | 69-115 |
| Annexure 1 | Preliminary Notification of the Sanctuary | 69 |
| Annexure 2 | Final Notification of the Sanctuary | 70 |
| Annexure 3 | Compartment-wise Area of Churdhar Wildlife Sanctuary | 73 |
| Annexure 4 | Constitution of Blocks and Beats by Compartments | 73 |
| Annexure 5 | Staffing Pattern | 73 |
| Annexure 6 | List of Survey of India Toposheets Covering the Sanctuary | 74 |
| Annexure 7 | List of Natural and Perennial Water Sources | 74 |
| Annexure 8 | Average Annual Rainfall at Rajgarh Station | 74 |
| Annexure 9 | List of Plantations from 2012-13 to 2016-17 | 75 |
| Annexure 10 | List of Mammal Species Recorded in Churdhar Sanctuary | 75 |
| Annexure 11 | Checklist of Birds Recorded from Churdhar Sanctuary | 76 |
| Annexure 12 | Checklist of Flora of Churdhar Sanctuary | 77 |
| Annexure 13 | List of Plants of Ethnobotanical Value | 83 |
| Annexure 14 | List of Plants that Serve as Food to Wild Herbivores | 84 |
| Annexure 15 | Expenditure in Churdhar Wildlife Sanctuary from 2012-13 to 2016-17 | 84 |
| Annexure 16 | TD Grants in Churdhar Wildlife Range | 86 |
| Annexure 17 | Location of Nurseries | 86 |
| Annexure 18 | List of Villages outside PA Boundry with their Status, Village-wise Human & Cattle Populations including Migratory Graziers/ Local Graziers & II Right-holders | 86 |
| Annexure 19 | List of Migratory Permit Holders | 87 |
| Annexure 20 | List of Local Permit Holders | 87 |
| Annexure 21 | List of Persons Holding Firearms Licenses in Villages outside the Protected Area Boundary and Within a Zone of 10 km Surrounding the External PA Boundary & Within the Buffer, whichever is Larger | 88 |

| | | |
|---|---|---|
| Annexure 22 | Loss of Livestock Due to Attacks of Wild Animals | 90 |
| Annexure 23 | List of Roads and Paths Constructed by the Forest Department | 90 |
| Annexure 24 | List of Buildings in the Sanctuary | 90 |
| Annexure 25 | Locations of Recent Musk Deer Sightings | 91 |
| Annexure 26 | List of Trekking Routes to Churdhar | 91 |
| Annexure 27 | Annexure 27 | 92 |
| Annexure 28 | Format for recording field observation | 104 |
| Annexure 29 | Control Forms | 116-142 |
| Form 1 | Creation of New Artificial Water Bodies | 116 |
| Form 2 | Maintenance of Water Bodies: Natural | 117 |
| Form 3 | Maintenance of water Bodies: Artificial | 118 |
| Form 4 | Restoration of Habitat: Weed Control, Initial Operations | 119 |
| Form 5 | Restoration of Habitat: Weed Control, Subsequent operations | 120 |
| Form 6 | Restoration of Habitat: Control of Regeneration of Woody Species in Grasslands | 121 |
| Form 7 | Restoration of Habitat: Prescribed Burning | 122 |
| Form 8 | Restoration of Habitat: Soil Conservation Measures-Initial Operations and Subsequent Maintenance | 123 |
| Form 9 | Restoration of Habitat: Planting, Sowing etc. | 124 |
| Form 10 | Animals: Measuring Trends in Population | 125 |
| Form11 | Animals: New Records | 126 |
| Form 12 | Animals: Mortality other than that attributable to Poaching or act of an Offence | 127 |
| Form 13 | Animals: Mortality Attributed to Poaching or an act of Vandalism | 128 |
| Form 14 | Animals: Killing of Human by Wildlife or Injury Caused | 129 |
| Form 15 | Plants: New Records | 130 |
| Form 16 | Plants: Disease and Mortality | 131 |
| Form 17 | Construction/ Maintenance of Infrastructure: Roads and Bridges | 132 |
| Form 18 | Construction/Maintenance of Infrastructure: Building (Existing/New) | 133 |
| Form 19 | Development/Maintenance of Infrastructure: Building (Existing/New) | 134 |

| | | |
|---|---|---|
| Form 20 | Developing Infrastructures: Construction of Boundaries, fences etc. (Existing/New) | 135 |
| Form 21 | Developing Infrastructure: Fire lines (Existing/New) | 136 |
| Form 22 | Tourism | 137 |
| Form 23 | Eco-tourism: Visitors Aspirations | 138 |
| Form 24 | Outbreaks of Fires | 139 |
| Form 25 | Offence Cases detected | 140 |
| Form 26 | Surveys and Monitoring | 141 |
| Form 27 | Eco-development Programme: Targets and Implementation | 142 |
| References | | 143 |

# Chapter 1

# Introduction

## 1.1 Name and Location

Churdhar wildlife sanctuary lies in the state of Himachal Pradesh. It lies at the boundary of Sirmour and Shimla Districts. The sanctuary lies partly in Renuka and Rajgarh Tehsils of Sirmour District and Chopal Tehsil of Shimla District.

Churdhar sanctuary is under administrative control of Divisional Forest Officer, Shimla Wildlife Division. The sanctuary lies between 30° 52' 24" E and 77° 29' 45" E longitude and 30° 54' 44" N and 77° 27' 49" E latitudes and is covered in Survey of India Toposheet Number 53 F-5 with scale 1:50,000. It consists of one Range i.e. Nohradhar Range, with headquarter at Nohra.

The Government of Himachal Pradesh declared its intention to notify Churdhar as a wildlife sanctuary vide Himachal Pradesh G.O. No. 6.24/73-SF-, dated 18-11-85 (Annexure 1). The final notification of Churdhar Sanctuary was issued vide Government of Himachal Pradesh notification No. FFE-B-F(6)-11/2005-II/ Choordhar 2013 dated 7.6.2013. The sanctuary area formed part of Rajgarh Forest Division and Chopal Forest Division before its notification.

## 1.2 Constitution and Extent

The total area of the sanctuary is 55.52 $km^2$. The detailed compartment-wise breakup of areas is given in the Annexure 3.

## 1.3 Geography of the Sanctuary

Churdhar Sanctuary is located in the outer Himalayas. It is named after the Chur peak, which is located inside the sanctuary. Chur peak, at an altitude of 3647 m, is the highest peak in the outer Himalayas, and is also the highest point in the sanctuary. Churdhar ridge is the east-west ridge on which the Chur peak is located, which is also part of the outer Himalayan Range. The site of the famous Chudeshwar Mahadev Mandir is also known as Churdhar.

Churdhar Sanctuary lies between an altitude of approximately 2000 m and 3647 m. Nohradhar, the Headquarter of Nohradhar Range is located at an altitude of 2150 m. A number of hill ranges emanate from Chur peak. The peak Julhasan Tibba lies to the west of Chur Peak, at an altitude of 3355 m. The Topi Dhar emanates from Julhasan Tibba and runs westwards. A number of ridges, known locally as *Dhar*s, run perpendicular to the Churdhar ridge to the north and the south. They form the watershed boundaries of streams that drain the slopes on the north and south. Nohradhar is one such ridge to the south of Churdhar ridge, on which Nohra, the sanctuary headquarter, is located. Some of these ridges, such as Uchchen Dhar and Aindhar on the east, Sen-Ki-Dhar on the west and Baldhar on the north form the natural boundaries of the sanctuary.

All streams to the north and south of Churdhar ridge form the catchment of the Giri River, a tributary of the Yamuna. There are many streams in the area which are locally known as Khala. The main Khalas are Reundar Ka Khala, Rana Ka Khala and Jalta ka Khala. Reundar Ka Khala lies between Khur Dhar and Taran ki Dhar, Rana ka Khala lies between Taran Ki Dhar and Nohradhar. Jalta Khala lies between Nohra Dhar and Sen Ki Dhar. The main catchment on the northern side of the ridge is that of Patal Nadi which is formed by confluence of Shakti Khala, Lana Bagta Nala and Kharanch Nala. Patal Nadi lies between Bal Dhar and Kokli Dhar. The forests of Rajgarh Division lie to the south of the sanctuary and to its west. The forests of Chopal Division lie to the north and to the east of the sanctuary.

## 1.4 Approach and Access

The main access points to Churdhar Sanctuary are Nohra and Sarain (also known as Sarahan). Trekking routes lead from both these points to Churdhar peak. Solan, the headquarter of Solan District, is the nearest city to Churdhar sanctuary. It lies on the Kalka-Shimla Highway. Nohra, the headquarter of Churdhar Sanctuary, is reachable by road from Solan by the Solan-Haripurdhar Road.

The distance of the Nohra from various towns is given in Table 1.1.

**Table 1.1: Distances of Important Towns and Cities from Nohra**

| Town | Distance from Nohra (km) |
|---|---|
| Shimla | 117 |
| Chandigarh | 145 |
| Solan | 72 |
| Nahan (via Rajgarh) | 165 |
| Nahan (via haripurdhar) | 130 |
| Rajgarh | 32 |

The nearest airstrip is at Jubbarhatti near Shimla. This airstrip is often closed during winter and bad weather. The nearest regularly operational airport is at Chandigarh.

The nearest railway station is at Solan, which is on the Kalka-Shimla small gauge railway line. The nearest railway station on a broad gauge railway line is at Kalka, which is on the Delhi-Chandigarh railway line. Sarain, the approach point to the sanctuary on the north, is reachable by road from Shimla.

Nohra is a large village that has telephone communication by landline, as well as mobile network. The population of Nohradhar is about 1700. A private hotel at Nohra caters to accommodation for the tourists and trekkers. There are regular buses from Solan to Haripurdhar passing through Nohradhar.

## 1.5 Natural Boundaries

Churdhar Sanctuary is bound to the north and northeast by Bal Dhar. It is bound to the east by Uchchan Dhar and Ain Dhar. It is bound to the southeast by the Khur Dhar which rises from the Ain Dhar and descends in a southwest direction till it merges into Reundar Nala at Chauras Village. It is bound to the south by the Rajgarh-Haripur Dhar Road from Chhogtali Village in the West till Chauras Village in the east. It is bound to the West by Sen Ki Dhar which starts from Topi Dhar to the north and descends southwards till it merges with Mika Ka Khala near Chhogtali Village. It is bound on the Northwest by Topi Dhar that radiates westwards from Julhasan Tibba and by Kokli Dhar that radiates to the northeast from Chur Dhar just east of Julhasan Tibba till it merges with Patal Nadi at its northernmost point. (M. B.

Srivastava, 1991; Map of Churdhar Sanctuary; Toposheet No. 53 F-5; Sanctuary Notification).

## 1.6 Internal Administrative Units

The sanctuary comprises of one range, i.e. Nohra Range. Nohra Range is divided into two blocks, Nohra Block and Pulbahal Block that are further divided into five beats. There are three beats under Nohra block and two beats under Pulbahal block. Each block is headed by a deputy ranger and each beat headed by a forest guard. The block and beat boundaries generally follow natural boundaries of the sanctuary and compartment boundaries. The details of internal administrative units are given in Table 1.2. The compartment-wise break-up of beats is given in Annexure 4.

**Administrative Map of Churdhar Wildlife Sanctuary**

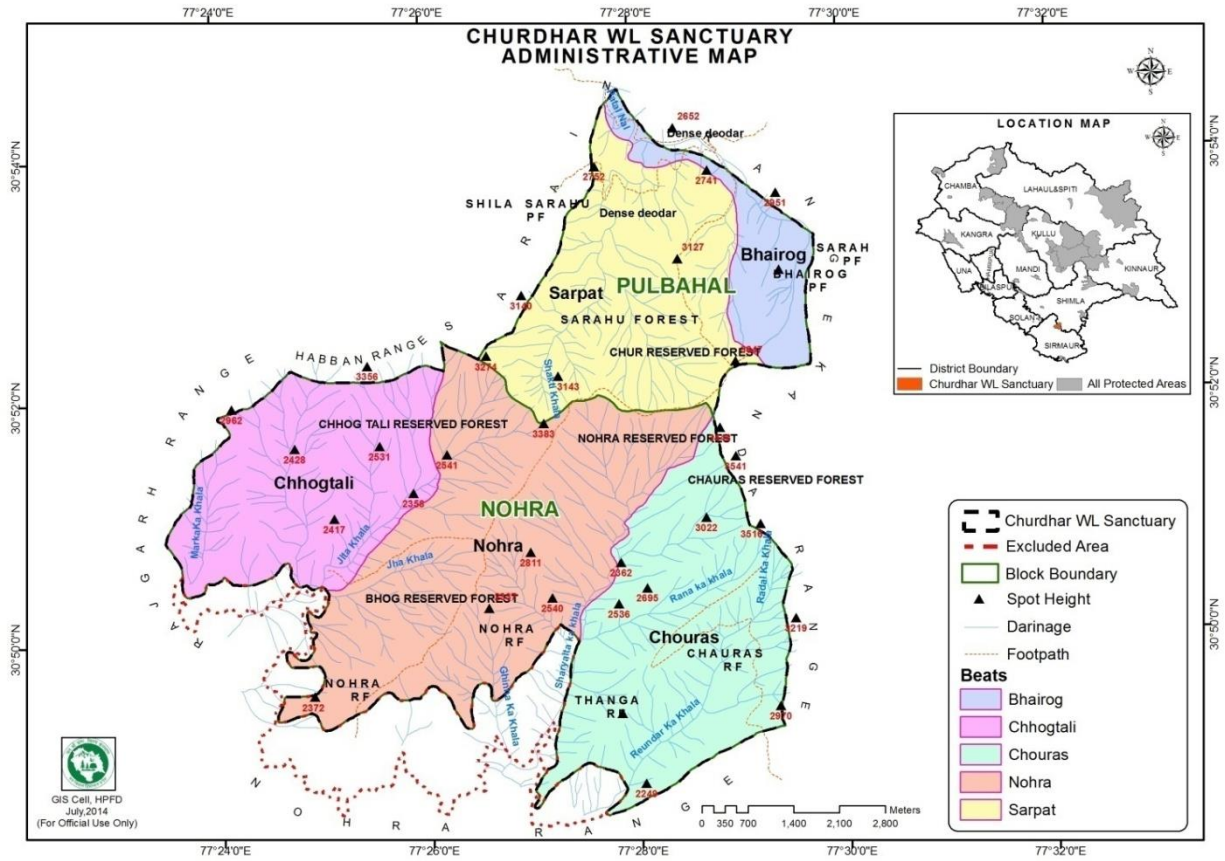


**Table 1.2: Blocks and Beats in Nohra Range**

| Block | Beat | Headquarter |
|---|---|---|
| Nohra | | Nohra |
| Nohra | Nohra | Nohra |
| Nohra | Chhogtali | Chhogtali |
| Nohra | Chauras | Chauras |
| Pulbahal | | Pulbahal |
| Pulbahal | Sarpat | Baldhar |
| Pulbahal | Bhairog | Baldhar |

The main ridge of the outer Himalayas passes through the sanctuary in a generally east-west direction. The ridge divides the sanctuary into two sides, the southern side and the northern side. Chauras, Nohra and Chhogtali Beats are on the southern side while Bhairog and Sarpat Beats are on the northern side of the ridge.

## 1.7 Geology, Rock and Soil

The tract comprises rocks from the Pre-Cambrian to recent. The major rock formations are as follows:

**Jatog formation**

This is exposed around Chur peak and extends to Nohra. The formation consists of carbonaceous slate, phyllite schist, with bands of carbonaceous limestone. It was formed in the Archean period. It supports deep micaceous clay loam soils that are fertile and support dense oak, fir and spruce forests.

**Chur granite**

It consists of coarse granite to prophysitic and garnetiferous granites and gneiss. It is exposed along the Chur peak. It was formed in the Archean to late palaezoic age. Soil resulting from granite is clayey loam, and shallow to moderately deep. It supports oak, fir, spruce forests and alpine pastures.

Rocky Slopes of Churdhar

**Soil**

The high ridges branching from Chur Dhar have pockets of shallow clayey soil, logged in outcrops of granitic and gneissic rocks near the top. Lower down, deep clayey loam soil, quite rich in humus, is found under dense oak, silver fir and deodar forests, in spite of the steep slopes. Fairly deep clayey soil occurs on northern and eastern aspects wherever the slope is moderate and forest is well stocked. The soil is shallow and lacking in fertility on grassy blanks on the southern aspect.

**Terrain**

The terrain of the sanctuary is rugged and is typical of the Himalayas. The slope is gentle along the ridges and at the bottom of the valleys. The slope is moderate to steep over the rest of the sanctuary and very steep at a few places.

## 1.8 Climate and Rainfall

The climate of the sanctuary is temperate since the sanctuary altitude ranges from about 2000 m to 3647 m. The mean annual rainfall at Rajgarh (1550 msl), which is at 8 km approximate aerial distance to the east of the sanctuary, is 1293 mm. The month-wise breakup of rainfall is given in the Annexure 8. The average annual snowfall at Chopal (2000 msl), which is at 10 km approximate aerial distance to the northwest of the sanctuary, is 1303 mm. Snowfall on the higher reaches is very heavy and snow depth is more than 15 ft at Chur temple at the peak of winter. The temperature is pleasant in summer and cold in winter in the lower reaches of the sanctuary. The temperature drops sharply with altitude but temperature records are not available. The temperature is several Celsius below freezing point at higher altitudes during winters.

## 1.9 Biogeographic Zone

The sanctuary occurs in Province 2B of Zone 2 Biogeographic Zone (Himalaya Biogeographic Zone) of Rodger and Panwar, 1998 classification of Bio-geographic zones of India.

## 1.10 Flora of the Sanctuary

Churdhar sanctuary represents mid to high elevation West Himalayan flora. The detailed list of forest types according to Champion and Seth's classification is given below:

**Group 9: Subtropical Forests**

C1b: Chir pine forest (*Pinus roxburghi*) found in a few patches in lower parts of the sanctuary.

**Group 12: Himalayan Moist Temperate Forest**

C1a: Ban oak forest (*Quercus leucotrichophora*) at altitudes below 2200 m

C1b: Mohru oak forest (*Quercus dilatata*) at altitudes between 2300 to 2600 m

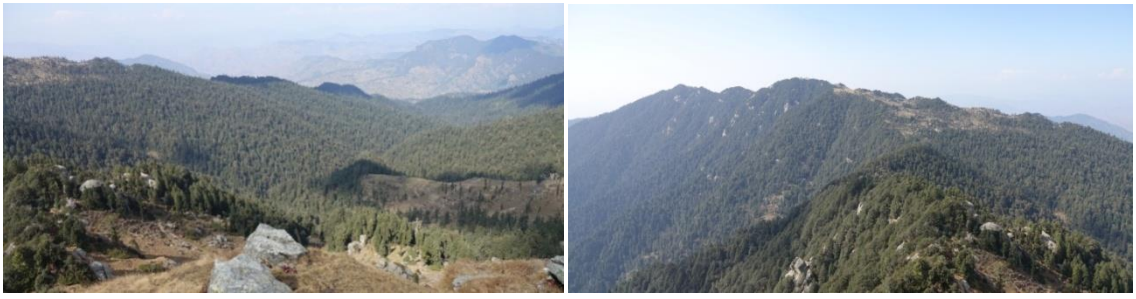
C1c: Moist deodar forest (*Cedrus deodara*)

C1d: Western mixed coniferous forest (spruce, blue pine, silver fir)

C2a: Kharsu oak forest (*Quercus semicarpifolia*) at altitudes between 2500 to 3000 m

C2b: West Himalayan upper oak/fir forest – mixed associations of kharsu oak with spruce (*Picea smithiana*) and silver fir (*Abies pindrow*) at altitudes between 2500 to 3200 m especially on the steeper, north and north-eastern aspects.

DS3: Himalayan temperate pastures (degradation stage of Himalayan moist temperate forest) found in lower parts of the sanctuary, especially steep and exposed slopes. These slopes are grazed by livestock and are managed for hay (locally known as *ghasni*). The dominant grass species are *Themeda anathera*, *Cymbopogon distans*, *Chrysopogon gryllus*, *Eulalia mollis*, *Agrostis pilosula* and a large number of forbs.



Himalayan Moist Temperate Forest of Churdhar

**Group 14: Sub-alpine Forests**

C1a: These are formed of fir or mixed forests of fir and birch (*Betula utilis*). The steeper rocky slopes are dominated by fir and very few patches of birch are also seen.

**Group 15: Moist Alpine**

C1, C2 & C2/E1: Moist alpine scrub is represented by Krummholz formations of *Rhododendron campanulatum*, *Lonicera-Rosa* scrub and patches of *Rhododendron anthopogon* respectively. Scattered patches of *Juniperus recurva*, a rare species in the outer Himalayas, are found in the sub-alpine/alpine ecotone.

**Rhododendrons of Churdhar:**

*Rhododendron arboreum*

*Rhododendron anthopogon*

*Rhododendron lepidotum*

*Rhododendron companulatum*

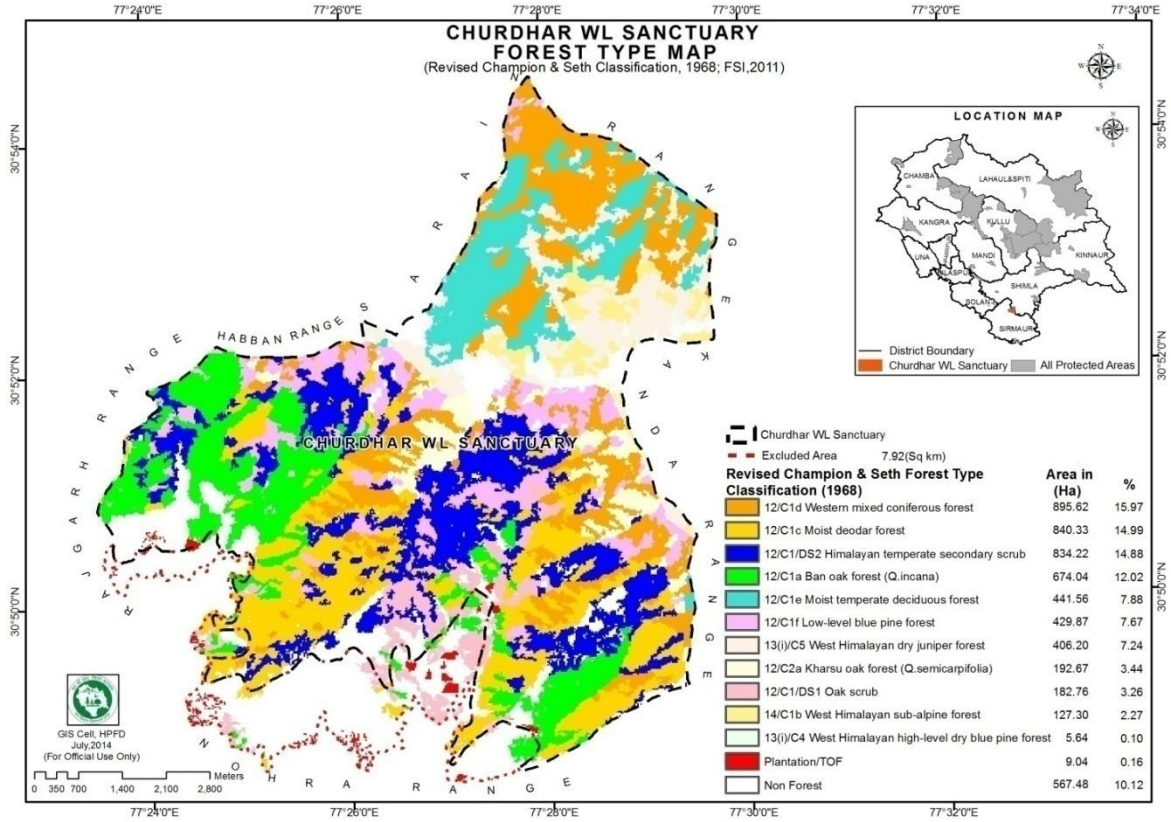
C3: Alpine meadows are found in small patches along the crest-line of the main ridges. The meadows are dominated by *Potentilla fulgens*, *Geranium wallichianum*, *Morina longifolia*, *Ranunculus hirtellus*, *Polygon amplexicaule* and *Anemone rivularis*.

Some other miscellaneous vegetation types are found scattered in the sanctuary such as Ban oak scrub (12/C1/DS1), Bamboo brakes (12/DS1) and small patches of *Alnus nitida* (12/IS1).

Exclusive studies of the flora of the sanctuary have not been undertaken so far. Sir Henry Collet explored the area around Churdhar extensively during early twentieth century. Chur peak appears as an important locality of botanical interest in Flora Simlensis (Collet, 1921). The following species have been reported from Chur Peak by Sir Collet: *Caltha palustris*, *Cotoneaster rosea*, *Saxifraga diversifolia*, *Lonicera parvifolia*, *Galium acutum*, *Valeriana pyrolaefolia*, *Tanacetum longifolium*, *Gaultheria nummularioides*, *Rhododendron campanulatum*, *Rhododendron anthopogon*, *Swertia speciosa*, *S. alternifolia*, *S. cuneata*, *Scrophularia calycina*, *Betula utilis*, *Juniperus recurva*, *Epipogium aphyllum*, *Aletris nepalensis* and *Allium govanianum*. Goraya (2002) listed over 125 species of flowering plants from the sanctuary. Notable among these are *Cyprepedium himalaicum*, *Dactylorhiza hatagirea*, *Meconopsis aculeata*, *Houttuynia cordata*, *Primula reidii* and *Rheum australe*. The alpine vegetation of Churhdar Sanctuary forms the most important component of the flora of Churhdar. A list of species found in the sanctuary is given in the annexure 12.

Species of conservation significance found in the sanctuary are *Podophyllum hexandrum*, *Meconopsis aculeata*, *Ribes alpestre*, *Valeriana jatamansi*, *Primula reidii*, *Swertia ciliata*, *Cypripedium himalaicum*, *Dactylorhiza hatagirea*, *Epipogium aphyllum*, *Allium humile*, *Juniperus recurva*, *Taxus baccata*, species of Rhododendron (*Rhododendron anthopogon, R. campanulatum,* and *R. lepidotum)* and two species of hill bamboo.

**Forest Type Map of Churdhar**



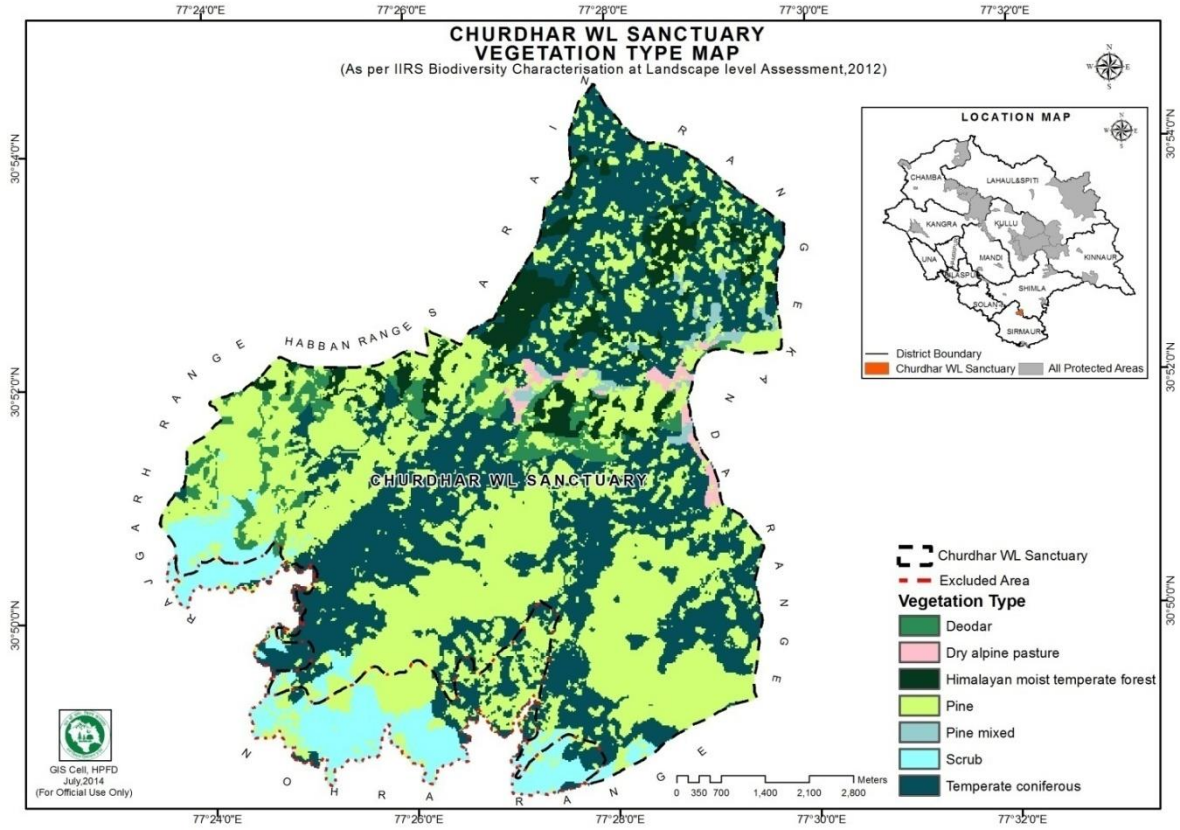

## 1.11 Status of Vegetation

The forests of the sanctuary are under considerable pressure from a range of sources such as grazing by cattle, browsing by goats and lopping for fodder collection by gujjars, and local people. By and large the tree cover is fairly dense and relatively undisturbed. However, there is considerable local damage to the forests due to above-mentioned pressures, especially in the shrub layer and the ground cover. Over the years this will undoubtedly result in depletion of the tree cover.

There is considerable lopping of trees for fodder in the lower reaches of the sanctuary by local people and other parts of the sanctuary by gujjars and local permit holders. There are openings in the forest wherever there are gujjar d*eras*. The undergrowth is cut and lopped for feeding goats around *deras*. Many areas of the sanctuary are devoid of undergrowth and ground cover because of cattle grazing and goat browsing. The pressure is high along the ridges where several Gujjars have established *deras*. Here the tree line is pushed lower and artificial pastures have been created due to

deforestation and pressure of livestock. This is noticeable at 'Tisri' and along the way to Churdhar. The forests around Chur temple have been depleted of trees due to pressure for firewood by restaurant owners and other establishments.

**Vegetation Type Map of Churdhar**




## 1.12 Fauna of the Sanctuary

### Mammals

The forests of Churdhar Sanctuary are rich in a wide range of mammal species. The list of mammal species found in the sanctuary is given in the Annexure 10. The list is likely to increase if a thorough survey is carried out due to addition of small mammals such as rodents, shrews and bats.

Leopard *Panthera pardus* is distributed all over the sanctuary, especially near villages and settlements as it thrives on livestock and also on Wild Boar *Sus scrofa*. Pika *Ochotona roylei* is found mostly above 3,000 m and forms the prey base for many smaller predators such as weasels, cats and civets. The Black bear is fairly common in the sanctuary. It sometimes attacks local people, either when they venture into the forest or when a

bear sometimes enter crop-fields or human habitation. It also damages crops and apple orchards. There are a few attacks almost every year. Himalayan fox is found in the sanctuary but its frequency of occurrence is unknown. The jackal is found near villages around the sanctuary and is not common inside the sanctuary.

The musk deer is reported from the sanctuary though its numbers are probably very low. The musk deer was fairly common a few decades ago but its numbers have been severely reduced. The barking deer is found at lower altitudes in the sanctuary. The goral is found in the sanctuary on steep grassy hillsides at lower altitudes, that provides them escape from predators. These sites are located at a few places in the sanctuary at lower altitudes so the goral distribution is sporadic. The Himalyan palm civet, the yellow-throated marten and the flying squirrel are arboreal mammals found in the sanctuary.

There is a possibility of the occurrence of the serow at higher altitudes in the sanctuary but its presence has not been confirmed. Efforts need to be made to determine if it exists in the sanctuary. Many rodent species other than the flying squirrel and pica are likely to be found in the sanctuary. A survey needs to be carried out to determine the mammal species found in the sanctuary.

**Birds**

The high altitudinal range of the sanctuary gives it a rich bird life. It has forest dependent bird species that are commonly found in temperate forests of the Himalayas as well as species of the sub-alpine zone and a few species of the alpine zone. The beautiful Monal pheasant is found in the sanctuary. Other pheasants such as Kalij pheasant, Koklass pheasant and cheer pheasant are reported from the sanctuary.

The bird life of the sanctuary is not well studied. A brief list of bird species found in the sanctuary is given in the Annexure 11.

**Amphibians and Reptiles**

There is no information on amphibians and reptiles found in the sanctuary. There is need for a thorough survey to obtain information regarding their presence/abundance.

## 1.13 Connectivity and Buffer Zones

The sanctuary is bordered by forests of Chopal Forest Division on the northeast and Rajgarh Forest Division on the northwest and the south. The sanctuary is fairly well buffered on the side of Chopal Forest Division, while it is somewhat less well-buffered on the side of Rajgarh Forest Division because of the presence of a number of villages to the south and west of the sanctuary.

Being in contiguity with forests of both these divisions gives it importance as a well protected zone in an otherwise disturbed forest habitat. It can act as a source for populations of mammals such as leopard, black bear, barking deer and other species.

## 1.14 Cultural Values of the Sanctuary

The sanctuary is home to the well known Churdhar temple, revered by the local people. The temple is located just below the Chur peak at an altitude of 3350 m. The temple is visited by a large number of pilgrims every year who reach it by trekking from Sarain and Nohra. Other trekking routes are used by local villagers. An estimated 200 to 600 people visit the temple every day between May and September. The number increases to 2000 during holidays.

Legend has it that a *rakshas* named Chudiya Danav used to live at Chur peak. He used to harass the local people in various ways. Lord Shiva came down to earth and killed Chudiya Danav and put an end to the people's miseries. Before his death the *rakshas* asked Lord Shiva for a boon that the peak would always be known after him, which was granted to him. Hence the peak is known as Chur peak.

Another legend says that Lord Shirgul, a descendant of Shiva, came to Shaya Village near Rajgarh. Later he moved to Churdhar and established a temple

of Lord Shiva at the place. Hence the temple is known as Shirgul Mahadev temple.

## 1.15 Statement of Significance

The sanctuary has several important values from various perspectives. These values are identified and categorized in this section.

**Conceptual**

- Chur Peak is the highest peak in the Outer Himalayas

**Biological**

- The sanctuary has the potential for protection of high altitude Western Himalayan ecoysystem in the outer Himalayas, including forests and alpine meadows, and a range of faunal species, in an undisturbed state
- The sanctuary is home to the highly endangered musk deer

**Ecological**

- The sanctuary lies in the watershed of the Giri River and regulates the runoff of precipitation into the river Giri
- It is responsible for soil conservation in the geologically fragile Himalayas

**Cultural & Religeous**

- The Churdhar Temple, which is of religious importance to the local people, is located inside the sanctuary


Idol of Lord Shiva at Churdhar

**Recreational**

- The sanctuary offers opportunities for wildlife tourism to nature lovers

**Research and Education**

- It has potential for Research on a variety of subjects of biological importance
- It has potential for conservation education of local community, tourists and rural and urban students

# Chapter 2

# History of Management and Present Practices

## 2.1 Past Administrative and Management History

Prior to the declaration of the sanctuary in 1985 the area falling in Sirmour District was part of Rajgarh Forest Division while the area in Shimla District formed part of Chopal Forest Division and these areas were managed under the provisions of respective working plans of the two Forest divisions. Commercial fellings were discontinued after declaration of the sanctuary. Treatments given under various working circles are given in the following sections.

The control of the area was transferred to the Wildlife Wing for management in 1986.The first management plan was effective from 1994-95 to 1999-2000 and the last management plan from 2008-09 to 2012-13.

## 2.2 Timber operations and firewood harvesting

Prior to declaration of the sanctuary forests having fir and spruce were managed under the commercial felling series of the Fir/Spruce Working Circle of Chopal and Rajgarh Working Plans. The areas bearing predominantly oak forests were managed under the provisions of the Coppice Working Circle in Rajgarh Forest Division while they were managed under the Selection Working Circle in Chopal Forest Division.

All forests under fir/spruce working circle in Rajgarh and Chopal Division were managed under Regular Shelterwood System and fixed blocks. The areas under Coppice Working Circle of Rajgarh Forest Division were being managed under Coppice with Standard System. A few blocks were also managed under Rehabilitation Working circle.

At present the crop gives the impression of comprising predominantly of middle aged to mature trees as far as fir and spruce forests are concerned. Oak forests also consist mainly of mature crops. They show a lack of regeneration and sparse young crop. The meadows near the top of Churdhar and natural grassy blanks in the sanctuary show signs of grazing stress.

## 2.3 Protection Practices

The members of the field staff of the sanctuary, comprising forest guards and deputy rangers, are responsible for protection of the sanctuary. Patrolling the sanctuary on foot is the only means of protection since there are no roads inside the sanctuary. Patrolling is generally carried out by the forest guard alone or accompanied by an assistant. Sometimes patrolling is carried out by the forest guards, block officer and the forest workers in a group. Regular trekking routes and trails in the forest are used for patrolling. Some trails have been recently created for patrolling and trekking inside the sanctuary. The list of trails inside the sanctuary used for patrolling is given in the Annexure 26.

In the past there was problem of poaching for the musk deer in the sanctuary area, mostly by hunters from local villages. It is claimed that the incidence of poaching has reduced after the formation of the sanctuary. There are a number of licensed gun owners in the surrounding region. The list of gun owners is given in the Annexure 21. Local people also report poaching by use of snares.

At present there is no patrolling hut inside the sanctuary for patrolling. However, camping equipments such as tents and sleeping bags have been purchased and made available to the field staff. This enables them to camp in the forest while on protection duty.

## 2.4 Infrastructure inside the Sanctuary


Inspection Hut at Churdhar

The infrastructure inside the sanctuary consists of range office, block officer quarters, forest guard quarters, and Inspection huts. The detailed list of buildings inside the sanctuary is given in Annexure 24. Though not listed as such, the forest trails and, bridges also form a component of the infrastructure.

## 2.5 Use of Forest Produce by Local People

Collection of forest produce was governed under *Shokhta-Patti* and the timber rights notification till 2003. Under this system a forest block, consisting of specified compartments, is assigned to each village. Villagers are allowed to collect fodder by lopping leafy branches from trees and also cutting grass. Their bonafide timber requirements are also met from the same forest block on payment of a nominal fee on making a written application.

Timber was allotted to local people mainly for house construction. Traditional houses use timber for making a wooden framework for the walls. Timber required is mainly coniferous wood such as deodar, spruce and fir. The walls are constructed of blocks from locally available sedimentary rocks. The wooden framework often has a horizontal beam through the center of the wall. This gives it additional strength for resistance to earthquakes. Now a day the requirement for timber is lower than earlier because many people have started constructing RCC houses with brick mortar walls, especially near the roadside. Timber is required mainly for frames and shutters for doors and window and rafters for roofing. Nevertheless there is a steady requirement for timber. Year-wise details of TD permits issued by Nohra Range are given in the Annexure 16.

This system was discontinued from 2003-04 because of the Supreme Court order of 1996 banning removal of forest produce from sanctuary and national parks. This is causing dissatisfaction among the local people. The main problem is caused because of ban on timber collection from the sanctuary. Extraction of firewood and fodder from the forest continues, to some extent, from areas of the sanctuary near the villages, by lopping oak trees and extraction of grass. It is difficult to implement the ban with regard to fodder and firewood because local people have been traditionally extracting these produce from these forests. Remaining part of the requirement is met from private forest areas belonging to local people.

## 2.6 Grazing Permits

Earlier Gaddi and Gujjars were issued permits to enter the area but now no permits are being issued. Previously the migratory graziers used to graze

their flocks of sheep and goats during winter season. These sheep and goats some time become carriers of many diseases for the wild animals and cause disturbance and also compete for food and water with the wild animals.

## 2.7 Tourism in the Sanctuary

A few trekkers come to the sanctuary for trekking. The trekkers are of various origins such as foreigners, domestic trekkers from various places and local trekkers from schools and colleges. Domestic trekkers are mainly from the northern states including Himachal Pradesh, Punjab, Haryana, Delhi and Uttrakhand. Other than this most of the visitors are mainly pilgrims going to Churdhar. There is hardly any nature tourism worth the name at present.

There is a Inspection Hut at 'Chauras' where tourists can get accomodation. They can also pitch tents in the Inspection Hut lawn. There are several establishments at Churdhar where rooms are available for tourists but sanitation facilitiy is poor. There is a private lodge at Nohra and a Sarai Bhawan belonging to the Chudeshwar Samiti. There is good accomodation facility at Sarain including a forest rest house and a Dharamshala. There is also a camping site for pitching tents. Tent platforms have been created for trekkers at Jamnala, Tisri, Khadanch and Kalabagh by Forest Department.

## 2.8 Pilgrimage at Churdhar

Pilgrims walk to Churdhar Temple along existing trekking routes. The list of trekking routes to Churdhar Temple is given in Annexure 26. The main trekking routes are Sarain-Churdhar and Nohra-Churdhar. The Nohra-Churdhar route passes through the sanctuary for a distance of 18 km while the Sarain-Churdhar route lies mostly outside the sanctuary and passes along the sanctuary border for the last 1 km. Most pilgrims travel to Churdhar along these two routes. The other routes are used mainly by local people from villages around Churdhar Sanctuary.

There is no record of the number of pilgrims arriving at Churdhar every year. Most pilgrims arrive by the Sarain route and the Nohradhar route and a few come by the other routes. More pilgrims arrive via Sarain than via Nohradhar. The pilgrim season is from May till Diwali. An estimated 200 to 600 people visit Churdhar on normal days. An estimated 2000 people visit

each day during Navratri. The total number of pilgrims visiting Churdhar temple is estimated to be between 50,000 to 1,50,000 annually.

At present there is no regulation on entry of pilgrims into the sanctuary and their movement through the sanctuary. However, by and large, the pilgrims do not wander from the trekking routes.

There are three bodies that are important in management of pilgrimage at Churdhar.Firstly there is a trust named 'Seva Samiti' consisting of more than 400 members from nearby villages. Each member contributes Rs. 2100 annually for the functioning of the trust. The second establishment is an 'ashram' established by a well known Saint in the region. The founder has expired few years back and the Ashram is now headed by his disciple. The third entity is the 'Temple Committee' that is headed by the Subdivisional Magistrate (SDM) Civil, Chopal on behalf of state government.

There are a number of buildings, mostly staying accomodation, at Churdhar in the vicinity of the Shirgul Mahadev temple. There is a guesthouse managed by the Ashram. There are 8 rooms for visitors at the Ashram. Secondly there is a guesthouse belonging to the Seva Samiti. There are 8 rooms in the guest house belonging to the Seva Samiti. Thirdly there is a guest house belonging to the Temple Committee. There are 7 rooms in the guesthouse belonging to the committee. Lastly there is a two room Inspection Hut of the Forest Department. There are therefore nearly 25 rooms at Churdhar. Each room may be used by 20 to 30 people in the peak season when there is a shortage of accomodation. People even sleep in the open in spite of the cold.

The Seva Samiti runs a langar (community kitchen) that serves free food to all tourists. There are 6 restaurants serving food to the tourists. There are a few shops selling various daily need items, pooja items, religious curios and other items to tourists.

There are three bathroom-cum-toilets at Churdhar, one in the guest house of the Seva Samiti, one in the Ashram and one in the guest house of the temple committee. These are for private use and not open for the pilgrims. Earliar there were no public bathrooms and latrines at Churdhar. Because of

this pilgrims had to use the nearby forests to attend nature's call. But now there are 18 public bathrooms and toilets at Churdhar. Water is being supplied by Irrigation and Public Health Department and there is no shortage of water as such except, caused due to eletricty failure when pumping of water cannot be done.

There is considerable pressure for firewood at Churdhar due to the presence of so many establishments. Many restaurants use LPG but some quantity of firewood is still being used by the restaurants, other establishments and private persons. Over the years this has caused the tree line to recede, and impoverished the shrub layer in the surrounding forests. The constant traffic of pilgrims on foot has eroded the pathways and caused deep gullies at several places, at Churhdar, and along the trekking routes to Churdhar.

There is a restaurant at Jamnala on the Nohra-Churdhar Route run by a resident of Nohra. There is another restaurant at Tisri on the Nohra-Churdhar route, run by a resident of Habban. Both these restaurants provide tea, food and snacks to pilgrims traveling to Churdhar. Pilgrims occasionally stay for the night in these restaurants in case of bad weather or delays. These restaurants use both, LPG and firewood, for cooking and for heating. Their presence puts pressure on the sanctuary vegetation due to use of firewood.

## 2.9 Soil Erosion

Soil erosion is found to be taking place at many places in the sanctuary. It is mainly the result of two factors:

Loss of vegetative cover due to livestock pressure and physical erosion by hooves of livestock. There is considerable erosion of this nature around Churdhar.

Heavy erosion was also observed near some villages, mainly due to wear caused by regular movement of people. At some places narrow vertical gullies of 10 ft deep and two ft wide were observed.

Another type is soil erosion along the main trekking routes due to regular movement of pilgrims and tourists.

The main type of soil erosion observed is gully formation in grassy meadows around Gujjar *deras*. Erosion on the trekking routes consists of gullies due to wear of the trekking routes and lack of vegetative cover.

## 2.10 Assessment of Works Carried Out Inside the Sanctuary

A number of works have been carried out inside the sanctuary over the last few years. A brief assessment of works carried out is given in this Section.

### Plantation Work

Plantations are carried out in the sanctuary every year. Details of plantations carried out in the past five years are given in the Annexure 9. Plantations carried out are mainly of tree species for restoration of sanctuary tree cover and few fodder plantations of grass species for benefit of local villagers.
Plantations of tree species have mostly been carried out in blank areas. Species used include Deodar, Blue Pine, Ban Oak, Walnut, Chuli and Robinia. Survival rate of plantations is variable. Some plantations are successful while others are somewhat deficient.

As a general practice it would be advisable to avoid plantation of non-native species such as walnut, chuli and robinia. Walnut, though native to Himachal Pradesh is not common inside the sanctuary.

Blank areas have generally come into existence because of some form of biotic pressure, either existing or in the past. If they have been formed by biotic pressure it is preferable to remove the forces responsible for biotic pressure. The blanks will be colonized by natural processes. The other case is that of natural grassy blanks on steep hillsides. These are generally maintained in this state because of natural factors such as steep terrain, thin soil or aspect. They are useful as a habitat for goral. It is better to leave them as they are. In general plantations should be carried out only where there are under stocked areas because of biotic pressure.

**Creation and Maintenance of Pathways and Trails**

Maintenance of pathways and trails has been carried out under eco-development activity. New pathways have been created such as the path from Chauras to Tallondhar. Improvement and maintenance of existing paths is also carried out annually. Creation and maintenance of pathways is a useful activity as it is required for movement of pilgrims to Churdhar as well as for patrolling activities by the field staff.

**Construction of Camping Platforms**

Camping sites have been developed at Jamnala and Tisri in Nohra Block and Kalabagh and Khadanch in Pulbahal Block. Several platforms have been constructed at both these places for setting up tents. These platforms are constructed of stone and mud mortar.

Construction of tent platforms is useful provided there is a regular flow of trekkers. This is not the case in Churdhar sanctuary as yet since regular trekking has not yet taken off. Because of lack of maintenance these platforms have deteriorated. Hence construction of further tent platforms should be deferred till there is regular tourist activity in the sanctuary and construction should be of cement mortar. Rather than constructing new platforms the present platforms should be repaired.

**Soil Conservation Works**

Check dams have been constructed at a number of places in the sanctuary where soil erosion is taking place. The check dams are constructed of stone and rubble masonry and are of fairly good quality.

Soil conservation is normally considered an important activity inside sanctuaries. In the present case it is observed that soil erosion is taking place at a large number of places by gully formation and sheet erosion. The cause of soil erosion is overuse by livestock belonging to Gujjars and local permit holders and also due to overuse of the paths by trekkers. Soil conservation has to be combined with control of livestock pressure otherwise it will not be effective.

**Creation of water resources**

Water holes and water ponds have been created for wild animals at suitable locations all over the sanctuary. Two types of water ponds have been constructed, *kuchcha,* constructed of stone and earth masonry, and *pucca*, constructed of stone and cement masonry. The existing water ponds are desilted depending on the need and availability of the fund. Waterholes are used by goral, barking deer, black bear and monal.

Some waterholes are near Gujjar *deras*, hence remain disturbed throughout the day. They may be more useful after departure of the permit holders.

Water availability is quite good all over the sanctuary. Hence construction of more water pond is not necessary. However, maintenance of existing water ponds may be carried out wherever necessary.

**Boundary Demarcation**

100 boundary pillars (20 per beat) were erected throughout the sanctuary in 2005-06. 25 boundary pillars were constructed in 2009-10 in Churas and Chogtali beat. Boundary demarcation is an important activity since it helps to prevent encroachments and boundary disputes.

**Community Works**

Most villages in the neighbourhood of the sanctuary lack public toilets. Public toilets have been constructed in Chhogtali, Nohra and Chauras under eco-development activity. The construction of public toilets was welcomed by the community and more such toilets should be constructed. The toilets were constructed with a low budget; they are of poor quality and some are breaking down. Construction of toilets is a useful activity since it helps to build relationships with the local community and improves sanitation and health of local populations. Toilets should be of better quality and thought should also be given to their maintenance. Ideally prefabricated, sturdy, maintenance-free toilets would be the best solution.

**Training and Workshops**

Training on population monitoring of wildlife was carried out by Wildlife Institute of India at Simbalbara. This programme was well conducted and was a useful introduction on monitoring concepts for the participants.

Awareness workshops are conducted among local villages in schools in villages around the sanctuary during the wildlife week. The participants are informed about various aspects of the importance of wildlife and forests. The programmes are generally attended by 100 to 150 people. Programmes are also conducted during wildlife week such as quiz competitions for children, and trekking in the sanctuary. They are well received by the local people and school community.

**Infrastructure Development**

Construction and maintenance works have been carried out under the head such as improvement of forest guard hut, construction of rain shelter on various routes, construction of inspection huts etc. This is a necessary part of the sanctuary management and is useful for sanctuary management. Isolated structures without an attendant, such as rain shelter on Churdhar route, were found to be misused and damaged by vandals. Unattended structures are prone to vandalism and should be avoided.

## 2.11 Equipments

Camping equipment including rucksack, sleeping bag, and jacket have been purchased and issued to the field staff. Supply of equipment is found to be useful for the field staff for patrolling the sanctuary.

## 2.12 Drying of Kharsu Oak trees

Large scale drying of Kharsu oak trees had been reported in Nohradhar in the year 2017 and was got investigated through a multi-disciplinary team of scientists from Himalayan Forest Research Institute – Panthaghatti. Field investigations exhibited a range of drying symptoms, coupled with the presence of fungal conks on drying/ dead trees. Variable intensity of secondary insect borer attack was also observed. It had been observed and also informed by staff that study area in past had been subjected to high biotic pressure, which may be one cause for further spread of fungus and

subsequent mortality. Ground survey of the area also revealed that approximately 10-15% trees in the specified area i.e. RF-Nohra C-3 compartment were found to be dead and many are in different stages of drying. The causes and the control measures to be adopted are given in detailed report attached as annexure 28.

## 2.13 Wildlife Monitoring and Population Estimation

A wildlife census was carried out in 2000-01 and 2004-05. The census was carried out by drive method.

A repeatable well documented procedure is not followed. Hence the results are indicative at best. At the same time it is a fact that it is difficult to carry out rigorous population estimation in the Himalayas considering the rugged terrain. No regular monitoring system is in place at present. It is imperative to establish a regular monitoring system.

However, monitoring of primates is done regularly as part of state wide population estimation process.

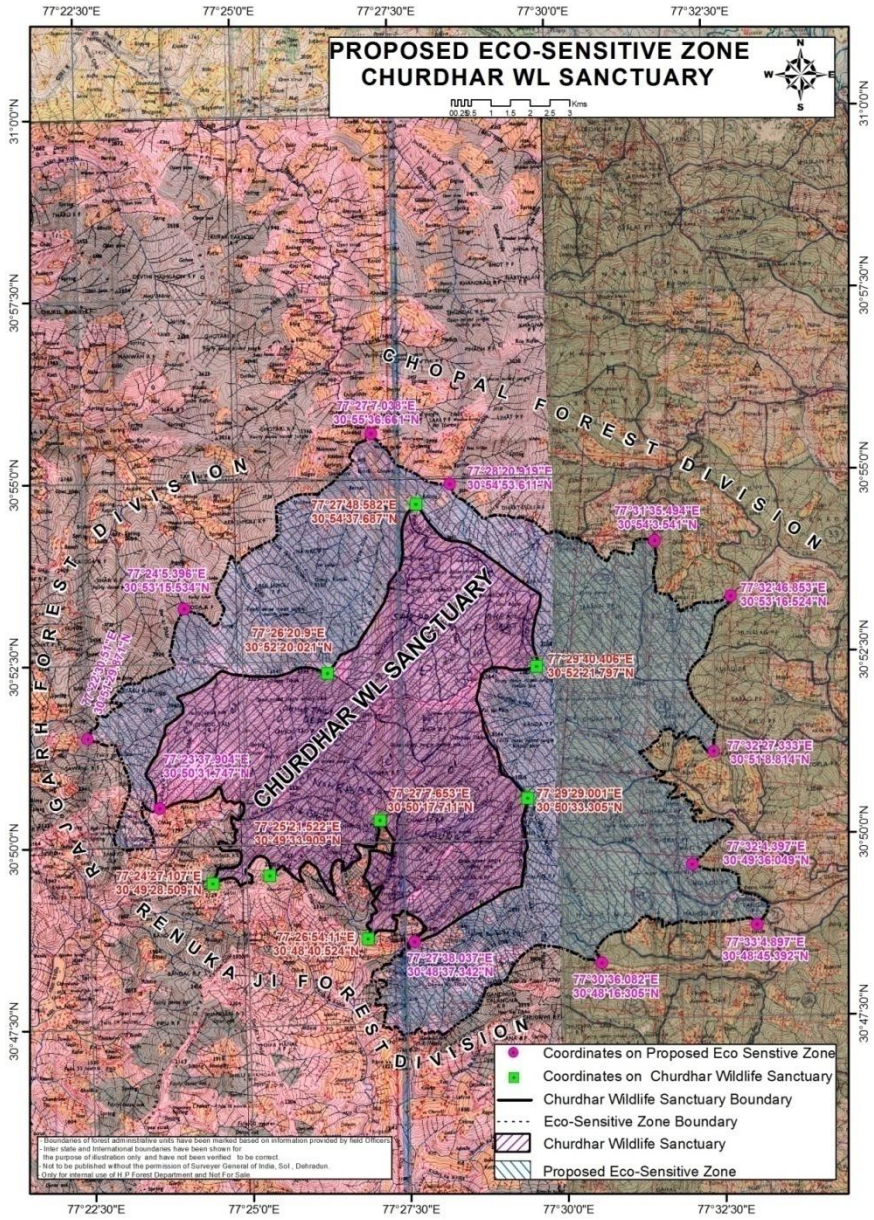
## 2.14 Realignment of Boundaries

The presence of villages inside the sanctuary creates conflict between the needs of the local people and the management objectives. Keeping this in view 1100 ha of land comprising villages on the southern side of Chauras, Nohradhar, Chhogtali, Kanda, Thanga, Satauni etc. were excluded from the sanctuary mainly along its southern boundary in the year 2013. However this will not achieve the purpose since the private land is still inside the sanctuary as enclaves. It is necessary to delete the entire area from the sanctuary including private and forest land.

## 2.15 Proposed Eco- Sensitive Zone

83.90 $Km^2$ area (76.41 $Km^2$ Forest land and 7.49 $Km^2$ Private land) with extent varying from 446.63m to 6261.04 m has been proposed as Eco-Sensitive Zone and is under consideration with Government of India. The area of ESZ is as shown in the map below.

**Proposed Eco-Sensitive Zone Map**




Commercial mining, stone quarrying, setting up new saw mills, setting up of industries, new major hydroelectric projects, fishing, muck disposal, establishment of large scale commercial livestock and poultry farms by firms, setting up of kilns etc have been proposed to be prohibited in the Proposed Eco-sensitive Zone. Activities like establishment of hotels and resorts, widening of roads, construction and repair of civic amenities, cottage industries, homestays, felling of trees, erection of electrical lines, communication towers, collection of fodder, change of agriculture system, extraction of ground water, vehicular traffic at night, introduction of exotics, collection of NTFP, solid waste management, eco-tourism etc have been

proposed to be regulated. However, emphasis will be on promoting certain activities like agriculture and horticulture practices, dairy farming, aquaculture, fishries, organic farming, rain water harvesting, use of renewable energy and fuels, agro-forestry, use of eco-friendly transport, skill development, restoration of degraded habitats, environmental awareness.

# Chapter 3

# The Protected Area and the Interface Land use Situation

## 3.1 Panchayats in the Zone of Influence

There are 12 gram panchayats adjacent to the sanctuary boundary as listed in the Annexure 18. Most of these gram panchayats are formed of a number of hamlets each with a distinct name. Officially a gram panchayat is divided into a number of wards. The largest gram panchayat is Nohradhar. Most villages are located along the southern and northern boundaries of the sanctuary; the eastern and western boundaries of the sanctuaries are buffered by forests of Rajgarh Forest Division and Chopal Forest Division and have relatively few villages. The population density is much higher along the southern boundary of the sanctuary since it is along the Rajgarh-Haripurdhar road.

The local people belong to two main social classes, general and scheduled caste. Economic classes often run along caste lines since scheduled caste families are often deprived of economic opportunities and have small land holdings. The main occupation of local people is agriculture, followed by animal husbandry. Artisan work such as carpentry and masonry is also an important occupation. The economically better off families have businesses such as shops, while some people work as contractors. A few individuals have jobs, either government jobs or jobs in private establishments such as shops and restaurants. People often supplement their incomes with labour work in agricultural fields, as porters, or labour work in government projects.

The main crops grown are maize, garlic, ginger and potato. Non-traditional cash crops such as garlic and ginger have become important in recent years. Vegetables grown are rajma, peas, arbi, onion and french beans. A few families own apple orchards. Percentage of apple and pear cultivation is more on Pulbahal side (Shimla District) of the sanctuary. Area under apple cultivation is gradually increasing in most villages.

### 3.2 Findings of Socio-economic Study

The dependence of local people on forests has been studied in detail in a socio- economic study of five villages, Kanda/Tali, Batheori, Satauni, Nohra and Chauras, by the Wildlife Wing of the Forest Department in 2006-07(Chauhan Satyan, 2007). All these villages are outside the southern boundary of the sanctuary, where the human presence is highest. The study throws light on a number of issues pertinent to sanctuary management, including the socio-economic status of the people and their dependence on sanctuary resources. A brief summary of some of the important findings are given in this section.

The overall sex ratio in the study area is 971 females per 1000 males, which is close to the average for the state. The percentage of people above 60 years of age is quite low pointing to a low life expectancy in the region compared to the rest of the state, perhaps as a result of generally poor quality of life. The percentage of scheduled caste persons in the population is quite high, ranging from 37% in Batheori to 79 % in Chauras with an average of 53%.

The percentage of illiterates is 8.5% in the general caste and 13.8% in the scheduled caste. There are few graduates in most villages except Nohra and Chauras; percentage of graduates is higher among the general caste compared to the scheduled caste.

The local people are dependent on forests of the sanctuary to a great extent for their needs of firewood, fodder from lopping and grass and timber. The extent of dependence varies from village to village depending on their animal husbandry practices, land use practices, and alternative resources available to them.

Firewood is used by all families. Some families use LPG but it is used mainly for quick heating needs. LPG is used in a majority of households in Batheori, Satauni and Nohra but to a much lesser extent in Kanda and Chauras. Erratic availability of LPG, high cost of transporting and porterage from the road to their homes are the main bottlenecks in use of LPG. House-heating in winter is carried out entirely by firewood. People were generally in agreement that use of LPG could be an important means to reduce the dependence on

firewood from forests. Firewood is obtained from the sanctuary as well as from private land.

Livestock rearing is an important occupation and people generate a substantial amount of income from this activity. Cows, bullocks, sheep, goats and buffalo, are the main livestock animals. The number of cross-bred cows is more than twice the local breed, while the number of cross-bred oxen is about the same as the local breed. Goats are reared for meat for self-consumption while sheep are maintained for wool production. The livestock is heavily dependent on lopped fodder as well as grass from the sanctuary. The pattern of grazing in the sanctuary is diurnal grazing in case of most households and local migratory grazing in case of permit holders.

The dependence on the sanctuary varies from village to village. It is relatively low in Batheori and Satauni, intermediate for Nohra and high in case of Chauras and Kanda, both for fodder and for grass. In villages where the dependence on the sanctuary is low or moderate, the balance requirement is met from private land.

In all villages the cross-bred cows are stall fed throughout the year. Milk-yielding cows are also stall fed during lactation period. Other animals are stall fed part of the year and graze in the sanctuary for the remaining months. In villages Batheori and Satauni, where the dependence on sanctuary is lower, the stall feeding is higher.

### 3.3 Wildlife Human Conflict

Wildlife human conflict is an important issue for the people surrounding the sanctuary. The animals that affect the people most are the rhesus macaque, black bear and leopard. The rhesus macaque has always been found in the area. Though it was responsible for some crop damage it was earlier not considered a serious problem. In the last few years or so it has been causing serious damage to their crops. It causes most damage to food crops such as maize, potato, garlic and ginger. Corn is their favourite food. They eat ripening corn in the fields and also harvested corn kept for drying on roofs. They are very aggressive and attack children and women. They damage far more crops than they eat. They damage crops like garlic and ginger that they eat only in small quantities. They spoil potato crops that are meant as a seed

crop for vegetative propagation by budding. The economic losses are quite heavy. Some people have given up farming maize because of the severity of the losses.

The local people are tired of the situation and want the Forest Department to rid the area of monkeys. The Government has given permission for licensed hunters to shoot the macaques anywhere in the state after taking requisite permission from the local range officer. In July-August 2007, permission to kill monkeys was given to about 20 local farmers in Nohradhar. Over 90 monkeys were killed over two months. Thereafter, the local people reported respite from monkey damage in the area and said that now most monkeys run away to the forest on seeing human beings.

Leopards were responsible for death of a number of livestock. A majority of the kills occur when the livestock are grazing in the forest. Black bear also killed some livestock. They are provided compensation by the sanctuary authorities if the kills are in agricultural fields or in houses. The local people have a fairly equanimous attitude to this problem and do not exhibit resentment over this issue. Award of ex-gratia payment in such cases helps in relieving their resentment over the issue. Details of livestock kills due to wild animal attacks are given in the Annexure 23.

Bears damage maize and apples. Encounters with bears are reported to be higher in recent years. This holds true for bears encountered in the forest when taking cattle out for grazing, as well as incidents of bears wandering into outskirts of villages. Assuming that the people's perceptions are genuine the likeliest explanation for this is that there is an increase in number of bears. There have been few incidences of attacks by bears in recent years. Encounters with leopards were also reported to be higher in recent years. Porcupine damage to crops also takes place in the area. This is a general problem in many parts of the state and needs further research to find out effective ways to control it.

### 3.4 NTFP Collection

People collect a few types of NTFP from the forest but the quantities of extraction are not very high except for fodder. The main plants of ethno botanical value are given in the Annexure 13.

### 3.5 Lifestyle of Gujjar Community

Practices regarding issues of grazing permit to Gujjars in the sanctuary have been described in Section 2.6. Gujjars often have two homes, one in the plains and the other in the hills. The whole family travels to both the places but one or two family members remain behind in the plains to look after ailing or very young animals. Since the whole family lives in the forest this puts additional pressure on the sanctuary due to firewood collection and disturbance to wildlife.

They generally have a low level of education. The Education Department arranges teachers for teaching Gujjar children and also provides them books. However, considering their remote residences teachers generally go there very rarely hence the level of education of their children is poor.

Gujjar women practice a few handicrafts such as embroidering caps and making quilts. They do not make commercial use of their skills. Commercial exploitation of their handicraft skills may help them to earn some income.

The welfare of Gujjars is overseen by the Gujjar Welfare Board whose chairman is the Chief Minister of the state.

Gujjars have to undergo considerable hardship because of their nomadic lifestyle. Many of them would like to be settled permanently. Their representatives in the past have given their willingness to be permanently settled provided they are offered a good resettlement package by the state government.

Gujjars earn their livelihood by sale of milk and milk products. In remote areas where transportation of milk is difficult, such as Churdhar Sanctuary, they make *khoya* from milk and sell it. Production of *khoya* entails further dependence on sanctuary vegetation for firewood. Gujjars also sell goats for meat. Though they are non-vegetarian they consume meat very rarely. Gujjars also earn some income by doing labour work in villages near their deras.

### 3.6 People's Requirements

The life of local people is closely linked to the forests becaue of their various dependencies. Local people have several expectations from the sanctuary

authority with regard to fulfillment of their needs from the forest as well as development activities. Some of their expectations are given below:

**Usufruct from the sanctuary**

- Nirgal from the sanctuary for basket-making by the Dom community.
- Area for grazing, fodder collection and firewood collection.

**Solving problems with respect to the sanctuary**

- Control of damage to apple orchards, maize crop, and hunting of small animals by bears
- Control of livestock kills by leopards
- Control of crop damage by monkeys.

**Developmental needs**

- Soil conservation measures and structures for preventing land slide and soil erosion in shamlat and private land.
- Water harvesting and water conservation measures.
- Distribution of Deodar, Poplar, ban, Robinia, Mulberry seedlings for plantation on private land.
- Development of tourism in the sanctuary.
- Development of trekking route from Chhogtali to Churdhar via Khad/ Kanda.
- Works such as bridges, roads and water conservation structures.
- Public toilets.

# Chapter 4

# Vision, Objectives, Issues and Problems

## 4.1 Vision Statement

A vision statement is useful in stating the direction of management and what the sanctuary would like to become or known as. The vision statement for Churdhar Sanctuary is as follows:

- To be a well protected high altitude sanctuary in the Outer Himalayas free of human pressures, with an undisturbed and well protected ecosystem that is home to a variety of species, especially the musk deer
- To be known as a premier centre for wildlife tourism that provides a rich experience of interaction with the nature to tourists etc

## 4.2 Management Objectives

The following are the management objectives for achieving the vision statement:

- To relieve the sanctuary from anthropogenic pressures such as grazing, firewood, fodder etc.
- To provide high level of protection to the sanctuary and minimize poaching etc.
- To have professional management in the sanctuary based on scientific methods and research inputs.
- To have well managed wildlife tourism that provides a rich experience to tourists and gives economic benefits to local people.
- To manage pilgrim tourism to Churdhar effectively.
- To have active, mutually beneficial involvement of local people in sanctuary management and nature conservation.
- To provide opportunities for staff to have professional development in their field.

## 4.3 Issues and Problems

The issues and problems and addressing them for each of the above objectives are discussed in this section.

- **Relieve anthropogenic pressures on sanctuary:** In the present case the significant Gujjar presence inside the sanctuary is an untractable problem that is very complex. Voluntary resettlement seems to be a way out, but this needs to be backed by grant of 1 ha land per family and a good resettlement package. Yet it is important to handle this issue in order to achieve the sanctuary vision. Managing the pressures on the protected areas due to local people, in the present case, may be somewhat easier, since it may be possible to find alternatives for their needs. Promotion of LPG and solar devices among local, poorer households and some subsidy on carriage holds much promise.

- **Protection in the sanctuary:** The field staff needs to be highly motivated in carrying out patrolling in order to protect the sanctuary from poaching. Patrolling the forests in difficult terrain of the Himalayas is difficult. There are no halting places inside the sanctuary. However, the recently introduced idea of group patrolling, if gradually fine tuned, could become an effective protection and monitoring strategy, especially against poaching. Involvement of local youths from surrounding villages will help make sanctuary restrictions more acceptable to local people. A small core group from among the sanctuary staff and some suitable local youths and organizations could be formed and trained for effective management interventions for the conservation of musk deer.

- **To have professional management:** Well trained manpower is necessary to have professional management in the sanctuary. Frequent transfer of trained wildlife staff causes problems and continuity in management suffers. Involvement of professionals and scientists from various fields is also necessary for having professional management via specialized training, research inputs, Insights into various issues and quality upgradation.

- **To have well managed tourism:** Foremost the tourists need to have a good experience so that tourism levels can increase. This can only happen when the sanctuary has a healthy ecosystem. Secondly the

local people and sanctuary staff need to be well trained and well organized to implement quality tourism. The problem is that surge in tourist arrivals will not wait for the sanctuary to become healthy and sustainable. Therefore, eco-tourism regulations need to be made effective right now and appropriate mechanisms developed in partnership with local communities.

- **Management of Churdhar Temple Complex:** The sanctuary authority has to make its presence felt at Churdhar complex. It needs to take a decisive stand regarding the activities at Churdhar, especially with respect to growing number and extent of civil structures of the various interest groups around the temple and pilgrim traffic.

- **Involvement of Local people in Sanctuary management:** This is possible only through a process of dialogue. A change in attitude of the sanctuary authority may also be necessary so that they are open-minded about the process. Involvement of a sincere, committed NGO / CBO will also help in facilitating the process.

- **Professional development of field staff:** This needs concerted efforts on part of the senior officers to create quality upgradation of the field staff, through regular trainings and exposure visits. Lack of guidance and direction to sanctuary staff seems to be one of the issues that can be tackled by training and implementing a capacity building programme for staff and local community at regular intervals.

# Chapter 5

# Management Strategies

## 5.1 Management Philosophy

At the outset it would be appropriate to discuss the philosophy or the approach towards management of the sanctuary. Some of the ideas are discussed in this section.

### Degree of Intervention

A policy of low intervention in natural biological processes has been followed in this management plan. Put in simple terms it may be stated as "nature knows best". The floral and faunal assemblage of the sanctuary has arisen through years of evolution and adaptation to a natural set of conditions. All life forms are dependent on each other in a complex web of life. The chain of interdependence is too complex to be understood in totality. Fiddling with this natural ecosystem out of insufficient understanding may create a chain of events that we do not understand and may have long-term undesirable effects. Hence the management is therefore mostly directed towards reducing human influences that may create undesirable impact on the flora and fauna.

At the same time a totally hands off approach cannot be justified since the sanctuary ecosystem has already been altered by human influences over the years. In situations where the cause and effect relationship is well understood it may be justifiable to carry out interventions that help to alleviate or "set right" some components of the sanctuary ecosystem. This requires a certain level of expertise in the ecology of the sanctuary at the habitat level and species level. The contribution of experts is a valuable tool for improving the quality of sanctuary management.

Today's protected areas are often like islands in human altered landscape. Unlike in the distant past, when the species and ecosystems evolved, the natural checks and balances do not function fully. The sanctuary fauna

therefore inevitably spill out into the human landscape creating conflict. In such situations interventions are necessary to manage the problem.

**Functions of the Sanctuary Authority**

Perhaps the most important role of the sanctuary authority is protection of the sanctuary. This role, if implemented effectively, is itself sufficient to relieve the sanctuary ecosystem of a majority of its constraints and ensure its well-being.

The influence of the human population belonging to the enclaved and surrounding villages, on the sanctuary, is most important. Management of this influence is an important function of the sanctuary authority. The second important role of the sanctuary authority is therefore to act as an interface between the sanctuary and the local people. The effectiveness with which they perform this function often determines how well the pressures on the sanctuary are managed.

The third important role is that of monitoring the sanctuary biota. Monitoring is a very important tool for understanding what is going on in the sanctuary. It helps gain an understanding regarding the status of various floral and faunal elements. The most important component is often the population of large mammals and important bird species. These generally occur in relatively small numbers and are the most threatened component of the ecosystem and it is essential to keep track of their population. The other components may be monitored based on changing needs once the essential components are taken care of.

Other important functions are implementation of various habitat amelioration works, creation and maintenance of infrastructure, staff management, management of tourism and better coordination with local communities and institutions.

The management strategies adopted in this management plan are described under these categories.

## 5.2 Thrust Areas for Management

Thrust areas for management are identified in this section for the period of this management plan. This will help in directing efforts in important areas of sanctuary management. These thrust areas are given below:

- Strengthening patrolling and protection in the sanctuary.
- Minimizing the biotic pressure on the sanctuary of both migratory and local permit holders
- Strengthening of monitoring mechanism.
- Strengthening the interface with local people.
- Generating information on the biodiversity of the sanctuary.
- Development of an active eco-tourism industry
- Soil conservation and stabilization of eroded surfaces

## 5.3 Protection Mechanism

### Patrolling Procedure

Regular patrolling is the best means of ensuring protection inside the sanctuary. The present patrolling system should be continued. The Wildlife Wing of Himachal Pradesh has introduced group patrolling system whereby patrolling is carried out by the field staff in a group. This practice will give the field staff confidence in dealing with poachers.

The Range Forest officer should make a monthly patrolling schedule for the field staff and the field staff should submit monthly compliance reports. The schedule can be flexible and can be changed according to practical exigencies provided the earmarked routes are patrolled within a given period. Cross-checking of beats by members of the other block should be carried out periodically to ensure strict patrolling.

### Fire arms

Firearms are useful deterrent measure for controlling poaching in a sanctuary. It is suggested that the block officer should carry a gun with him while patrolling the field. The gun needs to be used only rarely if at all. However possession of a gun will give confidence to the field staff in dealing with poachers and other anti social elements indulging in illicit activities in the sanctuary.

All the field staff should be trained in handling of firearms. An annual refersher course should be conducted for this purpose and experts from the Police/Army should be requested to train the field staff in handling, maintenance of guns and ammunition. Conducting trainings annually will ensure that there are regular refresher courses and fresh entrants also receive training within few months of joining. Trainings can be held in the firing ranges of the Police Department. A schedule should be decided for annual or biannual maintenance of the guns in the possession of the range staff.

**Development of Patrolling Trails**

Some trails used for patrolling by the field staff are difficult to negotiate. Some of these trails have not been developed while others have been developed but are in poor condition. Improvement of these trails should be carried out. The trails that should be surveyed and prioritized for development are given in Table 5.1. The same trails will also serve as trekking routes for tourists.

**Development of Bridges**

The field staff in Pulbahal Block faces difficulty in patrolling during monsoon because some of their paths are blocked due to flooding of Patal Khad at Manon, Khelna and Shaka Khal, and due to flooding of Chicha Khad at one point. Footbridges are required at these four points. A bridge is also required at Matida or Suralta across Rana ka Khala in Nohra Beat. A summary of the bridges required is given in Table. 5.2.

**Creating Patrolling Hut**

There is no patrolling hut anywhere in the sanctuary. The field staff will find it easier to carry out patrolling if they have a proper place for halting inside the sanctuary. It will also provide them additional safety at night. There are a number of locations where patrolling huts can be created. There are already adequate halting facilities at Churdhar. The best centralized location for creating a patrolling hut is “Tisri” since it can be used by field staff of both blocks. Hence a patrolling hut (Stone+Mud) or some pre-fabricated structure should be created at Tisri.

The disadvantage of constructing a patrolling hut is that it may be damaged by vandals when not occupied. Therefore the patrolling hut should be regularly visited by the field staff. The construction of the patrolling hut should be sufficiently strong to prevent it from damage such as construction of steel doors and windows as well as frames. The roof should also be strong enough to withstand damage by casual efforts. The benefits of this intervention can be evaluated for the period of this plan. If found useful, necessary additional patrolling huts may be proposed in the next management plan.

**Checkpost cum information centre**

It is important for the sanctuary authority to keep track of the number of visitors entering the sanctuary. A check post is proposed on the Nohra-Churdhar route. The main purpose of setting up the checkpost is to monitor the tourists and to inform visitors about the protected area status of the area. The checkpost staff should monitor the visitors passing by the checkpost and search any suspicious person.

This check post should be managed on contract basis, or by hiring a daily wage employee, for the duration of this plan. An isolated check post is not likely to be manned regularly. Hence it should be set up near one of the settlements on the Nohra-Churdhar route just after starting the climb and the contract should be given to one of residents of the settlement. Alternatively the check post may be set up at Tisri where a number of routes converge.

A nominal fee of Rs. 1 to Rs. 5 should be charged from all visitors as road-maintenance charges. The entry fees will also help in earning a small amount of revenue for the sanctuary.

**Secret Funds for Prevention of Poaching**

Secret funds should be kept at the disposal of the Range Forest Officer for paying informers. Informers should be paid on a need basis in consultation with the DFO. This is a very useful means for keeping check on poaching acitivites in the sanctuary.

## 5.4 Managing Human Pressures on the Sanctuary

### (i) Presence of Gujjars and Local graziers in and around the Sanctuary

Presence of 'Gujjars' in and around the Sanctuary has been noted to be a source of severe biotic pressure on the sanctuary resources. Although no permits are given to the graziers but they try to infiltrate along with their cattles leading to conflict with the sanctuary authority. There is a need to resettle Gujjars in order to minimize the impact. There were 22 migratory permit holders (all Gujjars) and the total number of permissible livestock of all their permits was 319 of which majority is buffaloas. There were 24 local permit holders and the total permissible livestock of all their permits was 227 of which a large percentage is of sheep. This has severe adverse impact on the vegetation and fauna.

Permanent settlement of Gujjars is the most effective option for managing the biotic pressures. This will also satisfy the stated aspirations of Gujjars. While this is a desirable solution there is considerable uncertainty on the likelihood of its implementation. Gujjars are a large community and finding sufficient land to resettle all of them will not be easy. However, a beginning should be made with Gujjar families who had permits in Sanctuaries. There is sufficient justification for this approach in light of the Supreme Court ruling prohibiting grazing and fodder collection in sanctuaries.

The second anticipated problem in this regard is that the Gujjars may continue to follow their age-old migratory practices while availing of the benefits of resettlement so that they get the benefits of both worlds. This has been noticed in case of resettlement of Gujjars from Rajaji National Park in Uttarakhand. This possibility can be minimized by implementing the terms of the settlement strictly. Difficulty is not anticipated on this account in case of Gujjars migrating to sanctuaries since they are also aware of the Supreme Court rulings on this issue.

Some Gujjars have their winter camps near 'Dhaula Kuan' in Puruwala forests of Paonta Sahib Division. Others come from Batamandi, Girinagar of Himachal Pradesh and even Mohand forests in Uttarakhand. The possibility of giving them year-round permits in the plains at the same location as their

winter permits need to be explored. If this is feasible then the Gujjars will have to give up their migratory habit and settle permanently at one place.

**(ii) Managing Local Diurnal Grazing**

Local diurnal grazing is common on the southern boundary of the sanctuary. As of now it is difficult to maintain control on local diurnal grazing along the sanctuary boundary. However, the some villages have been excluded from the sanctuary but the problem has not been fully resolved.

## 5.5 Infrastructure Development

**(i) Development of New Trails**

Improvement of existing trails and development of new trails is required mainly for patrolling, which will also be useful for developing trekking inside the sanctuary in some cases. The list of trails that should be considered for development and improvement is given in Table 5.1. Other trails should be considered according to requirements.

**Table 5.1: Trails Prioritized for Development**

| Sr. No. | Trail |
|---|---|
| 1 | Mandah Ghati – Dopti Section of Sarahan-Habban |
| 2 | Pulbahal to Tisri via Dopti, Bhairog |
| 3 | Khadach – Tisri |
| 4 | Bal Dhar to Churdhar |
| 5 | Manon to Churdhar via Thunal Dhar |
| 6 | Tisri – Mana Ghati trail |
| 7 | Bhateodi to Bhid |
| 8 | Rondi Pul to Jamnala |
| 9 | Moti Rai to Tisri |

**(ii) Construction of Foot Bridges**

The foot bridges that have been identified for construction are given in Table 5.2.Construction of more foot bridges should be carried out if more such points are found.

**Table 5.2: List of Foot Bridges to be constructed**

| Sr. No. | Stream | Bridge |
|---|---|---|
| 1 | Patal Khad | 3 Nos (Manon, Khelna, Shaka Khal) |
| 2 | Chicha Khad | 1 No. |
| 3 | Rana ka Khala | 1 No (Suralta or Matida) |

**(iii) Stone pitching of Main Pilgrim Routes**

The main route from Nohradhar to Churdhar is badly gullied and furrowed at many places. Some stretches between Tisri and Churdhar are quite degraded. It is degraded near Jamnala and Tisri also. This route should be repaired by carrying out stone pitching. This technique is known as surface hardening. Considerable funds will be required for this purpose. Funds for this activity should be sought from the district administration and from the Himachal Pradesh Tourism Development Corporation. Other routes having similar problem should also be surface-hardened by stone pitching. This should form a major activity during the term of this present management plan.

**(iv) Construction of New Buildings**

The headquarters of Pulbahal Block is at Baldhar. The nearest road-head is at Pulbahal. Construction material such as cement and iron bars unloaded at Pulbahal is often stolen overnight before it can be transported to Pulbahal. A storehouse is required at Pulbahal to store goods.

**(v) Development of Accomodation Facilities**

The forest rest house at Dopti is badly damaged. It is proposed that this rest house should be repaired along with staff quarters. This rest house can function as accommodation for trekking groups and also as a patrol camp for the field staff. No need is felt for development of more accomodation at present.

## 5.6 Soil conservation

Soil conservation has been carried out mainly by construction of check dams. However this will not be effective in face of intensive livestock grazing. The following technque should be adopted:

i. Identification of areas prone to severe erosion.
ii. Closure of the area for grazing by brushwood fencing for a period of two to three years.
iii. Eroded surfaces should be stabilised by planting tussocks of local grass species and shrubs, and cuttings of shrubs that will take root from cuttings.
iv. Gulleys should also be stabilised in the above manner. In addition stone pitching may be carried out at gulley heads if necessary to prevent gulleys from progressing.
v. In case of forested areas tree plantation should be carried out by planting native species in keeping with the character of the surrounding forest.Plantation should be avoided in the alpine meadow zone and native species should be allowed to colonise by themselves. Plantation should also be avoided in natural grassy blanks that are part of habitat of the goral.

Soil conservation works should not be carried out if an area cannot be completely closed to livestock grazing.

**5.7 Tree Plantation**

Tree plantation should be carried out only in understocked areas where there are clear signs of soil and vegetation degradation due to severe biotic pressure. Plantation should not be carried out in the alpine zone or on natural blanks on steep slopes. The plantation area should be closed for livestock grazing for a period of five years by brushwood fencing. As far as possible plantation should be combined with soil conservation works using the techniques described in the previous subsection.

Plantation also needs to be carried out outside the sanctuary along the main approach routes, i.e. Nohra-Churdhar and Sarain-Churdhar. The landscape along these routes is degraded and tree vegetation is almost non-existent in the initial few kilometres. This gives the landscape a very barren look. The land ownership along the routes is a mix of forest land and private land. Part of the private land is cultivated while part is under forests, but with mostly degraded vegetation. Tree plantation with native tree species should be carried out on the forest land. Private land owners should also be

encouraged to carry out tree plantation wherever they are not cultivating the land. The local people indicated that they are highly interested in tree plantation. This will give a welcome green appearance to the approach route. The local people should be motivated to protect the new plantations.

The local people are highly interested in planting trees on their private land and on village land. Disribution of seedlings of economically important species such as deodar, ban oak and other species needs to be carried out at a nominal price. Demand should be estimated and additional seedlings should be produced for fulfilling the demand. Alternatively seedlings may be procured from other adjoining forest divisions with big nurseries.

### 5.8 Equipment Purchase

Scientific instruments such as digital camera, computer and Global Postioning System will be useful for improving quality of sanctuary management and these should be procured. Most staff members have been issued warm clothing and some have been issued binoculars. Additional binoculars and camping equipment would be purchased if necessary. Status of camping equipment and personal kit for cold climate should be reviewed once every three years and new items should be requisitioned as required. Field guides books for identification of mammals and birds should be purchased for the Range office.

### 5.9 Development of Communication Facilities

There should be telephone facility at the Range office. This will help in communication of instructions to staff and also help tourists in obtaining information about the sanctuary and monitoring other activities.

# Chapter 6

# Development of Tourism

## 6.1 Tourism Goals and Strategy

Churdhar Sanctuary has great scenic beauty and is an ideal site for tourism. Putting Churdhar on the tourism map is part of the vision for Churdhar Sanctuary. Tourism in a sanctuary achieves several valuable functions. It increases the visitation levels to an area and contributes to the economy. In a state such as Himachal Pradesh, which depends on tourism, this is very important. Tourism raises the profile of the sanctuary and ensures that it receive funds. Tourism benefits the local people and increases their appreciation of the sanctuary. Tourism increases awareness about wildlife, among tourists as well as local people. However excessive and poorly managed tourism can be detrimental to the sanctuary ecosystem.

Being located in the Himalayas, Churdhar Sanctuary is a natural candidate for trekking. However, trekking should not be limited to adventure tourism alone; there should be a component of wildlife appreciation. Since visibility of wild animals in the sanctuary is quite low, nature interpretation needs to form an important part of the tourism package. Training of guides is therefore an important part of tourism development in the sanctuary. These issues are described in greater detail in this chapter.

Since the extent of the sanctuary is relatively small a trek through the sanctuary can easily be completed in two days. An effort should be made to retain the tourist for at least 3-4 days by planning a package that gives tourists some activity while staying in the sanctuary.

Success of wildlife tourism inside the sanctuary depends on good experience of tourists. Good management of the sanctuary, especially reduction in human pressures and high level of protection, are important for improving wildlife sightings.

## 6.2 Philosophy of Tourism

Different sites need different philosophies for tourism development. Some issues in this respect are discussed in this section.

Firstly some thinking is necessary about the extent to which tourism infrastructure should be developed. Churdhar is a small sanctuary and as yet the tourism level in the sanctuary is low. Development of infrastructure such as lodging facilities requires considerable expenditure with no guarantee that it will be used to a sufficient extent. Moreover, there is a fear of vandalism and damage to constructions at remote locations. Development of permanent lodging facilities may also put pressure on the surrounding area due to presence of caretakers. Hence it is recommended that no lodging facilities should be created for the term of this management plan.

Secondly a decision is necessary about the main agency that will be responsible for executing tourism. Typical agencies executing tourism in protected areas are the Forest Department, Tourism Department, external tour operators, hotel owners and local people, and the tourism business is divided among them in some combination or proportion. Since tourism is still in its infancy in Churdhar a direction can be given to nature of tourism to be promoted at this stage. Ecotourism in its true sense implies that the benefits of tourism will go to the local people. This will also motivate them to place higher value on the sanctuary and protect it more actively. It is therefore proposed that the main stakeholders implementing tourism shall be the local people around the sanctuary with the Forest Department playing a facilitator's role. This will also free the Forest Department staff for executing their other regular duties.

## 6.3 Tourism Development Measures

Tourism in the sanctuary should be developed by a combination of measures described in this section.

### (i) Publicity

Churdhar sanctuary should be publicized as a tourism destination. Information on the sanctuary should be put up on the website of the Forest Department including contact details such as addresses, telephone numbers and email addresses. Contact details of local tour organizers and lodges and

hotels should also be given. Contacts should be built with tour organizers at Shimla.

All local tour operators should report to the Range office about the tours that they are conducting in the sanctuary. This should be made compulsory and tour operators should be informed of this.

**(ii) Capacity Building**

Capacity of local community for carrying out trekking tours and nature interpretation should be developed. Training camps should be conducted for them for taking tourists on treks. An association of local tour operators should be formed to manage tourism.

Treks inside the sanctuary should not be limited to adventure tourism. Nature interpretation should be an important component of treks in the sanctuary. Interpretation skills of local tour operators and guides should be developed in this respect. Knowledge of plants, bird watching and knowledge of wild animals are some of the important skills that should be developed. They should be trained to follow sanctuary rules such as avoidance of littering, prevention of disturbance to wildlife and maintaining silence inside the sanctuary. Consumption of alcohol inside the sanctuary should be discouraged. Trekkers should camp at established camping spots and follow designated trekking trails. Tour operators should report animal sightings to the Range office.

**(iii) Camp sites and trails**

Trails should be established for trekking inside the sanctuary. Camping sites should be developed along the main trails for pitching tents. Trails and camping sites should avoid the sensitive areas of the sanctuary such as locations where musk deer are found. A list of trekking routes in the sanctuary is given in the Annexure 27. A circuit can be completed by a combination of various trekking routes.

Suitable camping sites are Jamnala, Tisri, Dopti, Khadanch and Churdhar. Water facility should be developed at all the camp sites. Additional camping sites may be designated if found necessary, especially in Chauras beat. Tisri

does not have accommodation facilities or tent platforms. Tent platforms should be constructed at Tisri.

Camping is proposed mostly in tents. No new permanent accommodation is proposed. This will give the local people additional income through tent hiring. The dilapidated rest house at Dopti is proposed for renovation so permanent accommodation will be available at this place.

Trekking routes and camp sites should be carefully monitored to prevent littering and degradation of the site due to overuse. If this is found to be taking place corrective measures should be taken.

At present the starting point to the Nohra-Churdhar route, at Nohra, is rather shabby and unappealing. The entry point should be made clean and pleasant and the route itself should be properly developed. At present the initial few kilometres of the route has a very barren appearance due to the degraded vegetation. The tourists should ideally have a pleasant experience of nature from the beginning of the trek. Therefore, this entire route should be targeted for tree plantation on both forest land and private forest land. Tree plantation along this route, both avenue plantation and block plantation, should consist of native species such as oak, deodar, rhododendron and other native species. Similarly tree plantation should also be carried out along the Sarain-Churdhar route. Though this route is outside the sanctuary it is one of the approach routes to the sanctuary and should be made presentable. Land owners along the route, Chopal Forest Division and private land owners, should be motivated to carry out large scale tree plantation along the route.

**(iv) Sanctuary Literature**

Brochures/pamphlets about the important natural features of the sanctuary should be printed for distribution to tourists. The brochure should give the map of trekking routes, list of wild animals, birds, and main plants. It should also inform tourists about the rules to be followed in the sanctuary such as prevention of fire, littering, noise pollution and disturbance to wildlife etc.

### (v) Role of Range Office

The Range office staff should be trained to act as a liaison center for tourism. Local tour operators should register themselves at the Range office. When tourists call they should be put in touch with the local tour operators association. The sanctuary authorities may rent out tents to local tour operators on payment of a fee.

## 6.4 Signage

There is a lack of adequate signage in the sanctuary. There is a sign on the main road at Nohra and one at Chhogtali. Some signs are to be put up at Chauras and on the Nohra-Churdhar route and Sarain-Churdhar route. Signs board be put up at important points in the sanctuary.

Large signboards are necessary at Nohra, Sarain and Churdhar and smaller ones at Tisri, Jamnala and other proposed camping sites. There should also be signs along the main trekking routes.

Vandalism is a major problem for signage. The signage design should consider this and create signage that is durable and resistant to vandalism. The signage should also be appropriate for the setting. The signs at Nohra, Sarain and Churdhar should be aesthetic yet highly visible while the one inside the sanctuary should be visible yet unobtrusive and blending with the surroundings.

Signage is an important part of sanctuary management. Professionals or institutes specializing in signage should be invited for development of a signage system for the sanctuary.

## 6.5 Creation of Interpretation Centre

Churdhar is visited by a large number of pilgrims every year. An interpretation centre should be developed at Churdhar. This will ensure that a large number of visitors are educated about the sanctuary. The interpretation centre should perform the following functions:

i. Create publicity about the sanctuary.
ii. Create awareness of the sanctuary values.
i. Give information on tourism opportunities and facilities.

ii. Inform people about the rules of the sanctuary.
iii. Educate people to keep the place clean.

Design and development of the interpretation centre should be entrusted to a professional organization.

### 6.6 Management of Pilgrim Tourism at Churdhar

Churdhar is located at the sanctuary border on the western edge of the sanctuary. As noted earlier this puts considerable pressure on the sanctuary ecosystem around Churdhar

The pilgrim tourism at Churdhar should be managed actively and the sanctuary authorities should play an active role in the tourism administration at Churdhar. The DFO, Shimla Wildlife Division should be a member of the temple committee and his presence will ensure that sanctuary interests receive consideration in development at Churdhar.

As noted earlier cleanliness and hygiene are very poor at Churdhar especially during the Navratri season when a large number of pilgrims visit Churdhar. Firewood use has depleted the forests around Churdhar. The layout at Churdhar is haphazard and unaesthetic. The following steps should be taken at Churdhar:

i. Water Supply arrangements should be made at Churdhar. The proposal for establishing a lift irrigation system should be implemented soon.
ii. Public toilets and bathrooms should be established at Churdhar to cater to requirement of tourists and to improve sanitation levels at Churdhar.
iii. Adequate accommodation facilities should be created at Churdhar. These facilities may be a combination of temporary and permanent. Care should be taken that they are well managed. Temporary facilities may be of the nature of tents erected for a few weeks to cater to tourist rush. Bedding may also be arranged. Bedding should be low maintenance type such as foam carry-mats. The whole thing may be given as a contract to a contractor or more than one contractor. Pilgrims should be charged for use of these facilities.

iv. An eminent architect or civil planner should be engaged for planning the development at Churdhar.

v. Some effort should be made for beautification of the surroundings around Churdhar by planting rhododendron, juniper and other natural shrubs.

vi. There should be a compound around the temple complex. Visitors should be discouraged from wandering outside the compound into the sanctuary. Entrance fee should be charged to tourists entering the sanctuary through Churdhar.

vii. A study should be carried around Churdhar to assess the damage to vegetation. If substantial degradation is found efforts should be made to restore the vegetation.

viii. There should be a strict ban on use of firewood at Churdhar for cooking or domestic heating. This ban should be applied to all establishments.

# Chapter 7

# Monitoring, Research and Training

## 7.1 Considerations in Design of Monitoring Programme

Mammals are generally the most visible charismatic species of a sanctuary. They are also generally among the most threatened because of their small population. Therefore, the main target of the monitoring program shall be large mammals. These include goral, barking deer, musk deer, black bear, langur and rhesus macaque.

Because of the steep terrain population estimation is very difficult in the Himalayas. An appropriate scientific methodology needs to be adopted so that it is feasible to execute the monitoring protocol and obtain reliable results.

Some of the methods that can be used for monitoring are described in the following sections. The techniques described can be divided into index-based monitoring techniques and absolute population estimate techniques. Monitoring by index-based techniques yields trends in populations. Monitoring must be carried out for a few years before clear population trends emerge. Absolute population estimation techniques can give estimates of absolute population within error margins.

The techniques described assume an even distribution of animals throughout the sanctuary. Species with clumped populations or high habitat specificity, such as goral, may require different monitoring techniques.

## 7.2 Synopsis of Monitoring Techniques

### Animal encounter rate

In this method a network of routes are marked inside the sanctuary that are well dispersed inside the sanctuary. The routes should not follow the main trails only but should pass through the undisturbed parts of the forest where probability of encounters is higher. Each route should be about 4 to 5 km long. The total length of routes inside the sanctuary should be sufficient to

give reliable results. These routes should be regularly walked at fixed hours in the morning and evening, when animal visibility is higher, and animals encountered along the route should be recorded. This exercise should be carried out regularly throughout the year, say once in a month. The walks should be carried out at a fixed time at dawn or in the evening when the animal sightings are highest.

The encounter rate of a species is defined as:

$$\text{Encounter rate (i)} = \frac{\text{Number of animals sighted of ith species}}{\text{(Total length of routes walked x no. of times walked)}}$$

The encounter rate is an index of population density. If this exercise is carried out every year we can get population trends reliably. However this exercise cannot give estimates of absolute population.

**Sign encounter rate**

The sign encounter rate relies on sighting/collection of animal signs. It is useful for monitoring carnivore populations, since their scats are highly visible. Sign encounter routes are laid as above. Since there is no compulsion of walking during morning hours or evening the length of the route can be increased to 10 km. The routes should be broad and clear with no vegetation growth so that scats can be spotted easily. Heavy human traffic should not be there on the routes so that scats are not trampled. These routes are also walked a number of times in a year and scats of leopard, bear and other carnivores with highly visible scats, are collected.

$$\text{Scat encounter rate (i)} = \frac{\text{Number of scats sighted of ith species}}{\text{(Total length of routes walked x no. of times walked)}}$$

The scat encounter rate is an index of population density. If this exercise is carried out every year we can get population trends. This exercise also cannot give estimates of absolute population. It is useful for monitoring population trends in species wherein sightings are very low, such as leopards.

Carnivore scats collected during the exercise can be analysed by microscopic examination of hair of prey in the scat samples to determine the dietary pattern of the carnivore.

**Pellet densities**

This method is used for monitoring populations of ungulates by estimating density of their dung pellets. Pellet densities are estimated by laying plots in the forest all over the sanctuary and counting the pellet piles in each plot. The plots should be in the shape of belt transects with dimension 50 m x 2 m or 100 m x 2 m.The plots should be laid in the same season and month every year. This method is fairly simple but it cannot give absolute population estimates. Its reliability has not been well established.

**Line transect sampling**

Line transect sampling is used for making absolute estimates of wild animal population. A number of straight lines, known as transects, are laid in the forest in a scientifically designed pattern. Each transect has a fixed length, generally 3 to 4 km, and fixed orientation. Transects are clearly marked by marking the trees along the transect in red or yellow paint. Extensive bush cutting is not necessary. An estimated 15 to 20 transects should be laid with a total length of 50 to 100 km.

These transects are walked by observers and records are made of each animal sighting. For each encounter the distance of the group is estimated by a rangefinder and a compass bearing is taken. This data is used to estimate the perpendicular distance of the animal from the transect. In this manner all transects are walked and animal sightings recorded. All transects must be walked a number of times so that sufficient observations are made to make reliable estimates. If number of observations is low reliable estimates cannot be made. Ideally all observations must be made in the same season. Typically 10 to 20 repetitions may be necessary considering the low ungulate density in the sanctuary. However it may be possible to carry out the sampling by making monthly rounds of observations without much loss of accuracy.

Line transect sampling requires a high level of training of the observers for proper recording of observations such as compass bearings and distance estimation by rangefinders. It is also fairly laborious technique. It has the advantage that one can make reliable estimates of animal populations.

Considering the steep Himalayan terrain line transects cannot be laid in the standard manner because a straight line cannot follow the contours of the mountains. Transects laid along steep slopes will require too much effort on part of the observer and he will not be able to concentrate on making observations of animals.

Hilby and Krishna (2001) describe a modification of the line transect method for curved transects. This modification is well suited for line transect monitoring in the Himalayas. Curved transects should be laid along the contour lines all over the sanctuary in a well-distributed manner. Line transect sampling should be carried out in the sanctuary on these curved transects like straight line transects.

Design and layout out of line transects need considerable effort. These transects need to be remarked annually if they are to be used on a repetitive basis. Considerable effort is also needed in carrying out observations. Nature enthusiast volunteers from Shimla and nearby towns and youth from local villages should be invited to participate in the monitoring exercise.

**Population estimation of Leopards by DNA analysis of scats**

DNA analysis of leopard scats can be used for population estimation. The technique is still at an experimental stage and researchers in the country are working on it to perfect it. The technique may soon become generally available, but it may be expensive. The technique requires collection of fresh scat and its preservation by appropriate technique. DNA analysis is carried out in specially-equipped laboratories.

## 7.3 Recommended Monitoring Techniques

**Herbivores**

All the above mentioned techniques have their advantages and disadvantages. If population estimation of ungulates is the goal then line

transects monitoring is the only suitable technique. Hence the line transect method is recommended for monitoring herbivore populations in the sanctuary.

**Carnivores**

Population estimation of carnivores is not possible by line transect method because number of encounters is generally too low. Hence some other monitoring technique is necessary. Scat collection and DNA analysis is possible only through involvement of a professional research institute. Otherwise scat encounter rate is the only technique for monitoring population of carnivores for conditions such as Churdhar Sanctuary.

Scat collection routes should be laid all over the sanctuary. Existing trails and trekking routes may be used for this purpose. Each route should be 6 to 10 km long. The start and end points of the routes should be clearly marked and the routes should be marked at one kilometer intervals. Considering the size of the sanctuary about 10 to 15 routes should be laid.

Scat collection walks should be carried out regularly. The success of the method depends on collection of large number of samples. Hence more walks will give better results. Scat collection walks should be conducted 5 to 6 times a year. Scats of leopards and black bear should be collected and labelled. The results for the entire year should be pooled and scat encounter rate should be determined for each species. The exercise should be conducted every year. The trends in scat encounter rate reflect the trends of population density.

Camera trap method should be used to supplement density estimation, abundance survey, proof of presence of a species in an area and trends in population change due to anthropogenic pressures of both herbivores and carnivores.

**Integrity of Data**

The reliability of the results of population monitoring depends on the quality of data collected. Hence accurate data collection is very important. The participants should carry out the exercise in a sincere manner. The

participants should be thoroughly trained in the techniques so that the data collected is accurate.

**Development and Implementation of Monitoring Programme**

The monitoring exercises outlined in this section require qualified and trained persons for its implementation. A professional institute with experience in monitoring techniques should be engaged for developing and fine-tuning a monitoring programme for the Churdhar Sanctuary including implementation of the meothod and training the staff. The monitoring exercise should be carried out for one year by the institute with the help of the sanctuary staff. The sanctuary staff should continue the exercise themselves in subsequent years with periodic visits by the concerned agency for checking and correcting mistakes.

**Recording Opportunistic Observations**

The field staff should record opportunistic observations of important wildlife species seen during their patrolling rounds. A format for recording these observations is given in the Annexure 28. These should be regularly filled and submitted to the range officer on a monthly basis.

It is necessary to pinpoint the location of such observations. The field staff should have good quality topographic maps with contours gridded at approximately 1 cm intervals. Location of observations can be accurately recorded as horizontal and vertical coordinate of each square on the grid. Such maps should be prepared on priority and distributed to all field staff.

## 7.4 Research Needs of the Sanctuary

Sanctuary managers often function in an information vacuum. Research in a sanctuary can contribute considerably to effective management of the sanctuary by providing useful information on the biological features of the sanctuary.

Study on vegetation of Churdhar Sanctuary is urgently required. The primary need is to carry out thorough inventory of various animal taxons in the sanctuary. Mammals and birds of the sanctuary are not fully listed. Though the large mammals found in the sanctuary are known there is no

information on bats and rodents. There is hardly any information on reptiles, amphibians and fish found in the sanctuary.

A survey for the musk deer and a study on its ecology, including food and habitat needs, will be useful for conservation of the musk deer. Surveys should also be carried out for other rare and endangered species such as Western Tragopan.

### 7.5 Training of Sanctuary Staff

Training is a very important tool for capacity building and improving the professionalism of sanctuary staff. The sanctuary staff, while carrying on their normal protection duties, also need to develop an understanding of various issues related to sanctuary management at a professional level. Capacity building in this regard can best be achieved through trainings designed for this purpose.

Improving the knowledge and capacity of staff has several benefits. It helps them to carry out their duty with an increased understanding and awareness and hence with increased dedication. It gives them more confidence in their work. This helps them to deal with various stakeholder groups, such as local people and tourists, with more confidence. Improved skills and knowledge will improve their productivity and quality of output.

Some areas where training will benefit the staff are as follows:

i. Knowledge and identification of mammal species found in the sanctuary, habits of species, biology and ecology of important species
ii. Identification of bird species found in the sanctuary
iii. Knowledge of reptile and amphibian species found in the sanctuary
iv. Knowledge and identification of plants, including medicinal plants found in the sanctuary
v. Sanctuary ecology, interdependence of plant and animal species
vi. Monitoring methods, population estimation methods.
vii. Anti-poaching skills and documentation of offence cases
viii. Wildlife interpretation skills

ix. Wildlife tracking and field signs

x. Conflict resolution skills for dealing with local people

xi. Weapon training

xii. Darting and trapping wild animals

xiii Soil conservation methods

xiv. Nursery techniques

xv. Use of instruments such as compass, binoculars, digital camera, GPS

xvi. Computer literacy

Field staff should be given small projects on which they should collect information from the field such as information on mammal, bird or plant species. They should make write-ups and give presentations on their project.

Training should also be imparted to local people, particularly guides and tour operators with the intention of upgrading their skills for tourism. Some training subjects are:

i. Sanctuary rules
ii. Skills of setting up camp
iii. Skills of dealing with tourists
iv. Interpretation skills
v. Basic information on identification of species, tracks and signs, habits of species.

Professional organizations should be involved in developing and conducting training programmes. Officers of the department should also be involved in training programmes.

# Chapter 8

# Management of Human Interface

## 8.1 Philosophy of Interaction with Human Population

Presence of human population around the sanctuary is an unavoidable reality. Their presence impacts the sanctuary biotic components in a number of ways described in the previous chapter. It is important to manage the interaction of the community with the sanctuary so that the most beneficial results are obtained for the people as well as for the sanctuary. The objectives of the interactions with local community are as follows:

i. Create awareness about sanctuary values among local people
ii. Obtain cooperation from local community for the management of sanctuary
iii. Give benefits to local people from the sanctuary, especially the poor and women
iv. Resolution of various issues and conflicts that the sanctuary authority may have with local people and vice versa.

Interactions with local community are often ad hoc and without a fixed policy and direction. Therefore true progress is not achieved in co-operative efforts. Conflicts arise because proper communication does not take place.

## 8.2 Formation of Co-ordination Committees

Issues regarding people's interaction with the sanctuary are difficult to solve unless an interactive forum is created for resolving various issues especially conflict of interests. A coordination committee is proposed for achieving this purpose consisting of representatives of the local people and representatives of the sanctuary authority. The composition of the coordination committee shall be as follows:

- DFO (Wildlife), Shimla Division (President)
- Range Forest Officer Nohra Range (Chairman)
- All Dy. Rangers (One of them shall be Member Secretary)
- All Forest Guards

- Two members each from each village
- Representatives of district administration and government line departments, equivalent to RFO in rank, at the discretion of the President
- One or more NGO representatives at the discretion of the President.

Since the sanctuary is divided into two parts even two coordination committees can be considered, one for Pulbahal block and the other for Nohra Block. The committee shall meet once in three months on a pre-decided day of the month. The President shall attend at least one meeting in a year. Proceedings of each meeting shall be recorded in detail by the member secretary.

The following shall be the the main functions of the co-ordination committee:

i. To provide a forum for communication to the local people and resolve various issues of sanctuary management such as grazing, firewood collection, lopping, poaching and any other issues that may come up.
ii. To obtain cooperation of local people in sanctuary management.
iii. To give opportunity to local people to voice their grievances and requests.
iv. To seek opinion of people about implementation of eco development works in villages.
v. To arrange joint programmes and functions, especially awareness programmes.
vi. To decide modalities for tourism in the sanctuary with involvement of local people.
vii. To involve local people in monitoring activities of the sanctuary.

The decisions taken during the committee meetings may be communicated in each village through meetings conducted by the wildlife guard and the village representatives.

### 8.3 Eco-development Programme

Eco-development activities in the sanctuary should be carried out as part of the regular sanctuary activities to build relationship with the local people. If

possible a local Community Based Organisation or a local NGO facilitated by the sanctuary authority should be employed as an intermediary. Where such agencies do not exist the sanctuary authority should make efforts to involve one or take help of a reputed NGO. This will help in development of the villages and it will also help to gain their cooperation for sanctuary objectives. Some activities that may be carried out are as follows:

i. Distribution of seedlings of deodar, poplar, ban, robinia, local wild fruit bearing species and mulberry at subsidized rates
ii. Soil conservation and stabilization activities in shamlaat and private lands
iii. Water conservation structures such as check dams
iv. Development and stabilization of paths in the villages
v. Sulabh shauchalay
vi. Donation of tents and trekking equipment to village committee
vii Promotion of LPG use by offering incentives to poorer households

It is important that various eco development interventions be carried out in a gender sensitive manner and for this a good representation of women from all social groups/strata need to be ensured/encouraged to actively participate in community activities and social development issues.

### 8.4 Involvement of Local People in Conservation Activities

Desire for conservation comes from appreciation of wildlife and its importance. Appreciation from wildlife is best achieved from personal experience of wildlife in natural settings. Therefore local people, especially school and college children, should be involved in treks, outings and various field programmes. If local people can be made conservationists the job of the sanctuary authority will be a lot easier. Wildlife NGOs should be involved in the task of spreading awareness and conservation message among local people. If possible nature clubs can be started for local children and youths.

Local youths and college students should also be involved in wildlife monitoring programme on a voluntary basis. Collaborative programmes of various kinds should be started in schools, colleges and local bodies depending on their interest.

# Chapter 9

# Budget

## 9.1 Expenditure in Previous years

Expenditure in Churdhar Sanctuary has been incurred under the major components viz. Habitat Improvement, Forest Protection, Soil Conservation Work, Eco-development Work, Training and Workshops, Infrastructure, Equipment, Miscellaneous and Recurring Expenditure. The breakup of expenditure from 2012-13 to 2016-17 is given in the Annexure 15.

## 9.2 Proposed Budget

The proposed budget for the sanctuary is given in Table 9.1. The suggested annual budget ranges from Rs. 22.125 lakh to Rs. 31.125 lakh. The items covered include most of the prescriptions made in this management plan. Routine expenditure such as staff salaries has not been included.

## Table 9.1: Proposed Budget from 2018-19 to 2027-28

| Sr. No | Name of work | 2018-19 | | 2019-20 | | 2020-21 | | 2021-22 | | 2022-23 | | 2023-24 | | 2024-25 | | 2025-26 | | 2026-27 | | 2027-28 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** | **Phy.** | **Fin** |
| (A) Habitat Improvement | | | | | | | | | | | | | | | | | | | | | |
| 1 | Regeneration of Forests | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 | 10 | 2.00 |
| 2 | Plantation of fodder fruit spp. | 5 | 1.25 | 5 | 1.30 | 5 | 1.35 | 5 | 1.40 | 5 | 1.45 | 5 | 1.50 | 5 | 1.60 | 5 | 1.75 | 5 | 1.75 | 5 | 1.75 |
| 3 | Maintenance of Nurseries | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 | 2 | 1.50 |
| **(B) Forest Protection** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Anti Poaching/fire prevention. | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 |
| 2 | Secret Funds | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 | L/S | 2.5 |
| (C) Soil-Conservation | | | | | | | | | | | | | | | | | | | | | |
| 1 | Gulley Plugging and check dams | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 | 10 | 2.50 |
| 2 | De-silting of water ponds | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 | 10 | 1.50 |
| **(D) Eco-Development Activities** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Vaccination of cattle | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 | L/S | 20 |
| 2 | Meeting of coordination committee | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 | L/S | 10 |
| 3 | DIstribution of seedling to private people | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 |
| 4 | Awarenss workshop for local people/wildlife week | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 | L/S | 0.30 |
| **(E) Training Workshop** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Training/work shop/tour of staff | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 | L/S | 50 |
| **(F) Infrastructure** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Surface dressing of Eroded Trail on Nohradhar-Churdhar and sarahab chudhar | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 | 27 KM | 2.70 |
| 2 | Development of new trails. | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 |
| 3 | Patrolling hut at Tisri (Stone-Mud) | | | L/S | 5.00 | | | | | | | | | | | | | | | | |
| 4 | Construction of Bridges) | 1 | 1.50 | 1 | 1.50 | 1 | 1.50 | 1 | 1.50 | 1 | 1.50 | | | | | | | | | | |
| 5 | Construction of FRH at Dopti | 1 | 3.00 | | 2.00 | | 2.00 | | | | | | | | | | | | | | |
| **(G) Equipment Purchase** | | | | | | | | | | | | | | | | | | | | | |
| 1 | GPS, Digital Cameras | | 1.00 | | 1.00 | | | | | | | | | | | | | | | | |
| **(H) Tourism Development** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Interperation centre at chudhar (traditional type) | | | | 3.00 | | 3.00 | | 3.00 | | 1.00 | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Repair of tent platforms | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 |
| 3 | Installation of signages. | L/S | 1.00 | | | L/S | 1.00 | | | | | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 | L/S | 1.00 |
| 4 | Publicity, development of brochures | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 | L/S | .20 |
| **(I) Monitoring Programme** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Annual Population monitoring exercise | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 |
| **(J) Boundary Demarcation** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Construction of boundary pillar. | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 | L/S | 1.50 |
| **(K) Miscellaneous** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Ear-tagging of livestock | | | | | L/S | 50 | | | | | | | | | | | | | | |
| **(L) Recurring Expenditure** | | | | | | | | | | | | | | | | | | | | | |
| 1 | Funds for office expenses + Mobile connectivity | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 | L/S | .50 |
| | **Total** | | **26.5** | | **32.5** | | **26.5** | | **21.65** | | **22.7** | | **19.75** | | **18.85** | | **21.5** | | **21.5** | | **21.5** |

## Annexure 1

## Preliminary Notification of the Sanctuary

GOVERNMENT OF HIMACHAL PRADESH,

DEPARTMENT OF FOREST FARMING AND CONSERVATION

No. 6.24/73-SF- Dated Shimla-2. the 18-11-85

**Notification**

Whereas the Government, Himachal Pradesh Considers that the areas mentioned in the schedule below are of adequate ecological, faunal, floral, geo-morphological, natural or zoological significance, for the purpose of protecting, propagating or developing wildlife in its environment.

Now therefore, in exercise of the powers conferred under Section 18 of the Wildlife (Protection) Act, 1972 (Act No. 53 of 1972) the Governor, Himachal Pradesh is pleased to declare the aforesaid areas as Sanctuary for the purpose of protecting, propagating or developing wildlife or its environment.

| Sr. No. Name of sanctuary | Name of Distt. Divn. | | Situation |
|---|---|---|---|
| 1. Churdhar 6,670 h. | Sirmour/ Renuka Rajgarh | North | Baldhar |
| | | East | UchchanDhar-Kakaralani Dhar |
| | | South | Kurdhar till it meets the Nohra Haripur Road near the village. Choras and then along the Haripur Dhar–Rajgarh road uptoChhog village |
| | | West | Chhog village all along theDhar forming catchment of Marka-Ka Khala – Julhasan Tibba Koklidhar till it meets the Baldhar near Bhaila village |

By Order

Secretary (Forests) to the

Govt. of Himachal Pradesh

## Annexure 2

## Final Notification of the Sanctuary

**(Authoritative English Text of this Department Notification No. FFE-B-F(6)11/2005-11,Dated 7th June,2013 as required under article 384 (3) of the constitution of India)**

**GOVERNMENT OF HIMACHAL PRADESH**

**DEPARTMENT OF FORESTS**

No. FFE-B-F(6)-11/2005-11/ Churdhar Dated Shimla-2,the 7th June,2013

**NOTIFICATION**

Whereas a Notification under Section 26A of the Wildlife (Protection) Act,1972 (53 of 1972)was issued by the Government vide Notification No. FFE-B-F (6)-28/99dated 1st November 1992, to declare Churdhar as Wildlife Sanctuary comprising an area of 66.00Sq.Km;

And whereas, the matter with regard to rationalization of the Wildlife Sanctuaries and National Parks in Himachal Pradesh was under consideration of the Hon'ble Supreme
Court in IA No. 139/2010 in Writ Petition civil No. 337 of 1995 titled Centre for Environmental Law, WWF-1Versus Union of India & Others;

And whereas, in pursuance to the Hon'ble Supreme Court order dated 7th May 2010, the State Government issued intention Notifications under Section 18 of the Wildlife (Protection ) Act, 1972,in respect of the Wildlife Sanctuaries and National Parks for which, rationalization had been proposed;

And whereas the Hon'ble Supreme Court vide orde dated 05/08/2011, further directed the State Government to follow the Procedure laid down under Section 18 to26A and 35 of the Wildlife (Protection)Act, 1972 which procedure was duly followed;

And whereas, the Hon'ble Supreme Court vide order dated 01/02/2013,Passed in IA No. 155 (Earlier IA No. 139/2010),has permitted the State Government to issue final Notifications under Sections 26A, 35(4) &36A of the Wildlife (Protection) Act,1972, with regard to the proposed Rationalization of boundaries of Wildlife Sanctuaries and National Parks in Himachal Pradesh;

And whereas, as a consequence of rationalization of boundaries of Churdhar Wildlife Sanctuary, out of actual ground area of 66.70 sq.km, 11.18 sq. km, area (Comprising of 5 villages namely Bateori Satani, Nohra, Chouras & Kanda) is hereby denotified. The remaining area of 55.52 sq.km shall constitute the Churdhar Wildlife Sanctuary after rationalization;

Now, therefore, the Governor Himachal Pradesh in exercise of the powers vested in her under Section 26A of the said Act is pleased to declare this remaining area of 55.52 sq. km,of Churdhar as '**Churdhar Wildlife Sanctuary'** with immediate effect for the purpose of protecting, propagating and developing wildlife and its environment;

The limits of Churdhar Wildlife Santuary Shall be as under:

| Sr. No. | Name of Wildlife Sanctuary | Constituents i)District ii)Forest Division | Boundaries of Churdhar Wildlife Santuary |
|---|---|---|---|
| 1. | **Churdhar Wildlife Santuary** | i)Sirmour & Shimla<br>ii) Shimla (WL) Division | **North**: North boundary starts from Bai Dhar near a bridge at ghat Godam on Patal Khad and follows the Bai Dhar via point 2655mtr.between Bhairog PF inside and Sara PF outside upto turning point on the path along the origin of Patal Khad near point 3108 mtr.<br>**East**: East boundary starts near point 3108 mtr. Boundary moves towards the bifurcation of paths coming from Bhanal and Chur temple via point 3387mtr.then excluding the Churdhar temple complex point 3647 mtr.further routes through Pal Ka pass Districts boundaries Shimla & Sirmour Uchchen tibba 3544mtr. then along Uchchen dhar peak 3506 mtr. Along the path / Aini dhar Kakralani dhar then turns on Khur dhar separating the water shed of Renundar ka Khala inside & Bairbo ka Khala outside upto point 2249 mtr.<br><br>**South:** The boundary starts from point 2249mtr. On Khurdhar excluding the cultivation of Chauras,Khilag and Ghalvari villages & along the boundary of Thanga RF via Kotiyan along the upstream Rana ka khala excluding the private land of Sharyalta & Kauchunj ka Patthar & Shidal villages across the dhar and point 2481 mtr.and Ghinna ka khalla along the forest boundary excluding private lands both side of Barau dhar & village Khanatiyan &via peak 2700 mtr. further along DPF boundary excluding dehats of Satani,Dungsar villages& RF Batewari & then along the Haripur dhar Nohra road upto nalla below Marori then excluding the Kanda and adjoining villages cultivation &dehat upto Marka ka khalla and the same road.<br><br>**West:** The western boundary of the sanctuary starts Marka ka khalla and road on the ridge upto points 2962 then Julhasan tibba 3355 mtr.,3342mtr.,3394mtr.,on the District boundaries of Shimla & Sirmourthen slightly on the same boundary & then turns on Kokli dhar via point 2946mtr. down to the Patal Khad and starting point northen boundary Godam bridge. |

This area is situated within the Geo-coordinates **North** Lat.$30^0$ 54’44’’N &Long $77^0$ 27’49’’E **East** Lat.$30^0$ 52’ 24’’N& Long $77^0$ 29’ 45’’E **South** Lat.$30^0$ 48’39’’N&Long $77^0$ 27’39’’E,**West** Lat.$30^0$ 51’00N&Long.$77^0$ 23’30’’E which falls on Survey of India topo sheet No.53F/5 on scale 1:50,000.
**Area of Churdhar Wildlife Sanctuary =55.52sq.km.**

By Order

Principal Secretary (Forests) to the
Government of Himachal Pradesh.

Endst. No. As above Dated Shimla-2 the 7th June,2013.

Copy forwarded to:-

1. All the Administrative Secretaries to the Govt. of H.P. Shimla-2.
2. All the divisional commissioners, Shimla, Mandi& dharamshala,H.P.
3. All the Heads of Departments of H.P.
4. The principal Chief Conservator of Forests, H.P.Shimla-1
5. The Principal Chief Conservator of Forests,(Wildlife)H.P.Shimla-1
6. All CCFs/DFOs (Wildlife)in H.P.
7. All the Deputy Commissioners in H.P.
8. All the CCFs/CFs/DFOS in H.P.
9. ALR-cum-Under Secretary Law to the Government of Himachal Pradesh.
10. The Commissioner, Municipal Corporation, Shimla.
11. The controller H.P. Printing & Stationary Department Shimla-5for publication in the Raj-Patra (extra-ordinary) Five copies of the Raj-Patra be Sent to this Department.
12. Guard File.

Under Secretary (Forests)to the
Government of Himachal
Pradesh.

## Annexure 3

## Compartment-wise Area of Churdhar Wildlife Sanctuary

| Sr.no | Name of forest | Legal status | Compartment No. | Area in (ha) |
|---|---|---|---|---|
| 1 | Nohra | RF | R-1 | 926.60 |
| 2 | Bhog | | R-3 | 862.70 |
| 3 | Thanga | | R-2 | 62.40 |
| 4 | Choras | | R-4 | 1242.00 |
| 5 | Chhogtali | | R-30 | 950.90 |
| | | | Total RF | 4044.60 |
| 6 | Chur | DPF | P-1 | 270.40 |
| 7 | Bharog | | - | 347.85 |
| 8 | Shilla sarau | | - | 890.17 |
| | | | Total DPF | 1508.42 |
| | | | Grand total | 5553.02 |

## Annexure 4

## Constitution of Blocks and Beats by Compartments

| Range | Block | Beat | Compartments | Area (ha) |
|---|---|---|---|---|
| Nohra | Nohra | Nohra | RF Nohra C1 to C3<br>RF Bhog C1 to C3<br>RF Thanga C1<br>PF Chur | 2122.10 |
| | | Chhogtali | RF Chhogtali C1 to C3 | 950.90 |
| | | Chauras | RF Chauras C1 to C3 | 1242.00 |
| | Pulbahal | Sarpat | DPF Shila Sarao C1 to C10 | 890.17 |
| | | Bhairog | DPF Bhairog & Amta C5 | 347.85 |

## Annexure 5

## Staffing Pattern

| Sr. No. | Rank | Number | Location |
|---|---|---|---|
| 1 | Range officer | 1 | Nohradhar |
| 2 | Dy. Ranger | 2 | Nohra, Pulbahal |
| 3 | Forest Guard | 5 | Nohra, Chhogtali, Chauras, Sarpat, Bhairog |
| 4 | Chowkidar | 1 | |

## Annexure 6

## List of Survey of India Toposheets Covering the Sanctuary

| Sr. No. | Sheet No. | Scale | |
|---|---|---|---|
| 1 | S3 F-5 | | 1:50,000 |

## Annexure 7

## List of Natural and Perennial Water Sources

(Source: Residents, R/o Nohra)

| Beat | Water |
|---|---|
| Nohra | Beed, Nigali, Lujaan, Shadapani, Rota, Ganghal, Khachi, Shidhal, Sharyalta, Kuftu, Rewsala, Tisri |
| Chhogtali | Devli, Motirai, Roi, Thera, Kayar ka Khala |
| Chauras | Buwad, Giroti, Ain dhar, Tallon, Kufta, Sareni |
| Sarpat | Bhairog Nala, , Chadgai, Chicha Khad, Shake ki Dhar, Patal Khad |
| Bhairog | Khadanch Nala, Lana Bagta Nala |

## Annexure 8

## Average Annual Rainfall at Rajgarh Station

| Month | Jan | Feb | Mar | Apr | May | Jun Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rainfall (mm) | 73 | 84 | 50 | 68 | 144 | 307 | 229 | 131 | 31 | 42 | 61 | **1293** |

Source: Working Plan of Rajgarh Division

## Annexure 9

## List of Plantations from 2012-13 to 2016-17

| Year | Location | Area (Ha) | Cost (Rs) | Species | No. | Survival (%) |
|---|---|---|---|---|---|---|
| 2012-13 | 1. RF Choras C-2<br>2. RF chhogtalli<br>3. RF Nohra C-3 | 3.5 Ha<br>3.5 Ha<br>3 Ha | 52498<br>42734<br>45000 | Deodar Mohroo Ban<br>Ban Deodar Ban<br>Mohroo | 400<br>2750<br>650<br>3500<br>300<br>3025<br>300 | 65%<br>65%<br>65%<br>70%<br>70%<br>70%<br>70% |
| 2013-14 | 1. RF Nohra C-3<br>2. RF Chhogtalli C-3 | 4 Ha<br>2.5 Ha | 94000<br>43400 | Chuli<br>Ban Kainth | 4400<br>1500<br>500 | 70%<br>70%<br>70% |
| 2014-15 | 1. RF Nohra C-3<br>2. RF Choras C-3<br>3. RF Chogtali | 3 Ha<br>3.5 Ha<br>6.0 Ha | 23899<br>27572<br>44700 | Ban,Agave, Buens<br>Ban, Kainth, Buens<br>Ban, Kainth Buens | 2748<br>1520<br>2140 | 55%<br>60%<br>52% |
| 2015-16 | 1. RF Chogtali C- 3 | 20 Ha | 427750 | Chuli, Jamun, Mulberry, Walnut, Ban | 15000 | 60% |
| 2016-17 | 1. RF Choras C-3<br>2. RF Chogtali C-3<br>3. DPF Shila sarau | 3.34 Ha<br>3.72 Ha<br>5 Ha | 100494<br>111929<br>137000 | Deodar, Ban, Chuli, Kashmal, Bhikhal,<br>Poplar<br>Ban Oak, Deodar, Bhikhal, Poplar Ban | 3674<br>4092<br>5500 | 62%<br>58%<br>60 % |

## Annexure 10

## List of Mammal Species Recorded in Churdhar Sanctuary

(Source: Chauhan R.P.S., 2005 et. al.)

| Sr.No. | Common Name | Scientific Name | Local Name | Schedule |
|---|---|---|---|---|
| 1 | Leopard | *Panthera pardus* | Baghera | I |
| 2 | Jungle Cat | *Felis chaus* | Ban Billa | |
| 3 | Leopard cat | *Felis bengalensis* | - | |
| 4 | Jackal | *Canis aureus* | Gidad | II |
| 5 | Himalayan fox | *Vulpes vulpes* | Fokiya, | |
| 6 | Himalayan black fox bear | *Selenarctos thibetanus* | Bhaloo | II |
| 7 | Yellow throated marten | *Martes flavigula* | Ooj | II |
| 8 | Himalayan Palm Civet | *Paguma larvata* | Kothiya, Shikralu, | II |
| 9 | Barking Deer | *Muntiacus muntjac* | Kakkad | III |
| 10 | Musk Deer | *Moschus moschiferus* | Kastura | I |
| 11 | Goral | *Nemorrhaedus goral* | Ghorad | III |
| 12 | Common angur | *Presbytis entellus* | Langur | II |
| 13 | Rhesus Macaque | *Macaca mulatta* | Bandar | II |
| 14 | Common Giant Flying squirrel | *Petaurista petaurista* | Ayn | II |
| 15 | Porcupine | *Hystrix indica* | Shail | IV |
| 16 | Pica, Himalayan Mouse hare | *Ochotona roylei* | - | IV |

## Annexure 11

## Checklist of Birds Recorded from Churdhar Sanctuary

| Sr.No. | Common Name | Scientific Name | Source * |
|---|---|---|---|
| 1 | Himalayan Vulture | *Gyps himalayensis* | PM, HPFD |
| 2 | Bearded Vulture | *Gypaetus barbetus* | PM, HPFD |
| 3 | Black Eagle | *Ictinaetus malayensis* | HPFD |
| 4 | Golden Eagle | *Aquila chrysaetos* | HPFD |
| 5 | Shahin Falcon | *Falco peregrinus* | HPFD |
| 6 | Black Francolin | *Francolinus francolinus* | PM, HPFD |
| 7 | Himalayan Monal | *Lophophorus impejanus* | PM |
| 8 | Common Sandpiper | *Actitis hypoleucos* | PM |
| 9 | Speckled woodpigeon | *Columba hodgsonii* | PM, HPFD |
| 10 | Oriental Turtle Dove | *Streptopelia orientalis meena* | PM, HPFD |
| 11 | Spotted Dove | *Streptopelia chinensis* | PM |
| 12 | Common Hoopoe | *Upupa epops* | PM, HPFD |
| 13 | Little Swift | *Apus affinis* | PM |
| 14 | Great Barbet | *Megalaima virens* | PM, HPFD |
| 15 | Brown Fronted Pied Woodpecker | *Dendrocopos auriceps* | PM |
| 16 | Grey-capped Pygmy Woodpecker | *Dendrocopos canicapillus* | PM |
| 17 | Fulvous-Breasted Pied Woodpecker | *Dendrocops macei* | |
| 18 | Grey Wagtail | *Motacilla cinerea* | PM |
| 19 | Tree Pipit | *Anthus trivialis* | PM, HPFD |
| 20 | Common Woodshrike | *Tephrodornis pondicerianus* | PM |
| 21 | Long-tailed Minivet | *Pericrocotus ethologus* | PM |
| 22 | Himalayan Bulbul | *Pycnonotus leucogenys* | PM |
| 23 | Common Iora | *Aegithina tiphia* | PM |
| 24 | Brown Dipper | *Cinclus pallasii* | PM |
| 25 | Blue-Headed Rock Thrush | *Monticola cinclorhychus* | PM, HPFD |
| 26 | Blue-Whistling Thrush | *Myophonus caeruleus* | PM, HPFD |
| 27 | Forktail | | PM |
| 28 | Common Stone Chat | *Saxicola torquatus indicus* | PM, HPFD |
| 29 | Grey Bushchat | *Saxicola ferreus* | PM, HPFD |
| 30 | Rufous-bellied Niltava | *Niltava sundara* | PM |
| 31 | Verditer flycatcher | *Eumyias thalassinus* | PM, HPFD |
| 32 | Streaked Laughing Thrush | *Trochalopteron lineatus* | PM, HPFD |
| 33 | Variegated Laughing Thrush | *Trochalopteron varigatus* | PM |
| 34 | Rufous Sibia | *Heterophasia capistrata* | PM, HPFD |
| 35 | Striated Prinia | *Prinia criniger* | PM, HPFD |
| 36 | Grey headed Flycatcher | *Culicapa ceylonenses* | PM, HPFD |
| 37 | Grey-faced leaf warbler | *Phylloscopus maculipennis* | PM |
| 38 | Great Tit | *Parus major* | PM, HPFD |
| 39 | Green-backed Tit | *Parus monticolous* | PM, HPFD |
| 40 | Red Headed Tit | *Aegithalos concinnus* | PM |
| 41 | Black-lored Yellow Tit | *Parus xanthogenus* | PM |
| 42 | Bar-tailed Treecreeper | *Certhia himalyana* | PM, HPFD |
| 43 | White-Eye | *Zosterops palpebrosus* | PM |
| 44 | Rock Bunting | *Emberiza ciapar* | PM, HPFD |
| 45 | Himalayan Greenfinch | *Carquelis spinoides* | PM |
| 46 | Red Headed Bullfinch | *Pyrrhula erythrocephala* | PM |
| 47 | Scaly Breeasted Munia | *Lonchura punctata* | PM |
| 48 | Ashy Drongo | *Dicrurus leucophaeus* | PM, HPFD |
| 49 | Common Myna | *Acridotheres tristis* | PM, HPFD |
| 50 | Spotted Nutcracker | *Nucrifraga caryocatctes* | PM, HPFD |
| 51 | Indian Jungle Crow | *Corvus macrorhychos* | PM, HPFD |
| 52 | Grey Treepie | *Dendrocitta formosae* | PM, HPFD |
| 53 | White-tailed Nuthatch | *sitta himalyensis* | PM, HPFD |
| 54 | Black and Yellow Grosbeak | *Mycerobas icterioides* | HPFD |
| 55 | White wagtail | *Motacilla alba* | HPFD |
| 56 | Yellow wagtail | *Motacilla flava* | HPFD |
| 57 | Upland pipit | *Anthus sylvanus* | HPFD |
| 58 | Black bulbul | *Hypsipetes Leucocephalus* | HPFD |
| 59 | Striated prinia | *Prinia crinige* | HPFD |
| 60 | Greensish warbler | *Phylloscopus trochiloides* | HPFD |
| 61 | Plain backed thrush | *Zoothera molissima* | HPFD |
| 62 | Asian brown flycatcher | *Muscicapa daurica* | HPFD |
| 63 | Ultramarine flycatcher | *Ficedula superciliaris* | HPFD |
| 64 | Chukor Patridge | *Alectoris Chukar* | HPFD |

| | | | |
|---|---|---|---|
| 65 | Common Hill Partridge | *Arborophila torqueola* | HPFD |
| 66 | Koklas pheasant | *Pucrasia macrolopha* | HPFD |
| 67 | Kalij pheasant | *Lophura leucomelanus* | HPFD |
| 68 | Himalayan woodpecker | *Dendrocops himalayensis* | HPFD |
| 69 | Scaly-bellied woodpecker | *Picus squamatus* | HPFD |
| 70 | Large hawk-cuckoo | *Cuculus sparverioides* | HPFD |
| 71 | Indian cuckoo | *Cuculus micropterus* | HPFD |
| 72 | Slaty-headed parakeet | *Psittacula himalayana* | HPFD |
| 73 | Mountain scops owl | *Otus spilocephalus* | HPFD |
| 74 | Rock pigeon | *Columba livia* | HPFD |
| 75 | Wedge-tailed green pigeon | *Treron sphenura* | HPFD |
| 76 | Common buzzard | *Buteo buteo* | HPFD |
| 77 | Common kestrel | *Falco tinnunculus* | HPFD |
| 78 | Eurasian jay | *Garrulus glandarius* | HPFD |
| 79 | Yellow-billed blue magpie | *Urocissa flavirostris* | HPFD |
| 80 | White-throated fantail | *Rhipidura albicollis* | HPFD |
| 81 | Black drongo | *Dicrurus macrocercus* | HPFD |
| 82 | Chestnut-bellied rock thrush | *Monticola rufiventris* | HPFD |
| 83 | Slaty-blue flycatcher | *Ficedula tricolor* | HPFD |
| 84 | Black redstart | *Phoenicurus ochrurus* | HPFD |
| 85 | Greensish warbler | *Phylloscopus trochiloides* | HPFD |
| 86 | White-throated laughing thrush | *Garrulax albogularis* | HPFD |

* PM=Dr. Prachi Mehta (birds recorded between August 17th to 23rd) 2007
HPFD = Himachal Pradesh Forest Department

## Annexure 12
## Checklist of Flora of Churdhar Sanctuary

(Source: Wildlife Institute of India, 2005)
Local Use: M=Medicinal, Ar=Aromatic, Fw=Fuelwood, Fd=Fodder, Tm=Timber, Pl=Planted, Vg=Vegetable, W=Weed, Ri=Religious importance
Habit: T= Tree, S=Shrub, C=Climber, H=Herb, P=Parasite, G=Graminoid, F=Fern

| Family/Species | Habit | Elevation Range (m) | Local Name/Local use |
|---|---|---|---|
| **I. ANGIOSPERMS** | | | |
| **A. DICOTS** | | | |
| **Ranunculaceae** | | | |
| *Anemone rivularis* | H | 2500-3500 | |
| *A. vitifolia* | H | <2500 | |
| *Aquilegia pubiflora* | H | >3000 | |
| *Caltha palustris* | H | 2600-3500 | M |
| *Clematis barballata* | C | <300 | |
| *C. Montana* | C | 2800-3300 | |
| *Delphinium denudatum* | H | <2500 | M |
| *Ranunculus hirtellus* | H | >3000 | |
| *R. laetus* | H | 2000-3000 | |
| *Thalictrum foliolosum* | H | <3000 | Mamira / M |
| *Thalictrum sp.* | H | 2600-3300 | |
| **Schisandraceae** | | | |
| Schizandra grandiflora | C | 2500-3000 | |
| **Berberidaceae** | | | |
| *Berberis aristata* | S | 2000-2500 | Kashal, M, Fw |
| *B. asiatica* | S | <2200 | Kashal, M, Fw |
| *B. chitria* | S | <3000 | M |
| **Podophyllaceae** | | | |
| *Podophyllum hexandrum* | H | 3000-3500 | Bankakri, M |
| **Papaveraceae** | | | |
| *Meconopsis aculeate* | H | >3300 | M |
| **Fumariaceae** | | | |
| *Corydalis cornuta* | H | <3000 | |
| *C. cashmeriana* | H | 3000-3600 | |
| **Brassicaceae** | | | |
| *Arabidopsis himalaica* | H | 2500-3500 | |
| *Arabis amplexicaulis* | H | >3000 | |

| | | | |
|---|---|---|---|
| *Capsella bursa-pastoris* | H | <3500 | |
| *Cardamine impatiens* | H | 2500-3300 | Vg |
| *Lepidium sativum* | H | <3500 | Vg |
| *Sisymbrium officinale* | H | 3000-3500 | |
| **Violaceae** | | | |
| *Viola biflora* | H | >3000 | |
| *V. canescens* | H | <3500 | Banafsha, M |
| **Caryophyllaceae** | | | |
| *Cerastium cerastioides* | H | 2500-3500 | |
| *Gypsophyla cerastioides* | H | >3000 | |
| *Lychnis nutans* | H | 2600-3500 | |
| *Sagina saginoides* | H | >3200 | |
| *Silene sp.* | H | >3000 | |
| *Stellaria media* | H | <3000 | |
| **Hypericaceae** | | | |
| *Hypericum elodeoides* | S | 2000-2500 | |
| *H. oblonifolium* | S | <2600 | Basanti, M |
| **Tiliaceae** | | | |
| *Grewia optiva* | T | <2200 | Bhimal, Fw, Fd |
| **Linaceae** | | | |
| *Reinwardia indica* | S | <2400 | |
| **Geraniaceae** | | | |
| *Geranium nepalense* | H | <3400 | |
| *G. wallichianum* | H | 2500-3600 | Root dye |
| **Oxalidaceae** | | | |
| *Oxalis acetosella* | H | >3000 | |
| *O. corniculata* | H | <2200 | |
| **Balsaminaceae** | | | |
| *Impatiens amphorata* | H | <2400 | |
| *I. scabrida* | H | <2100 | |
| *I. sulcata* | H | 3000-3500 | |
| **Rutaceae** | | | |
| *Boenninghausenia albiflora* | H | <2400 | |
| *Skimmia laurerola* | S | 2800-3500 | Ar |
| *Zanthoxylum armatum* | S | <2400 | Timru, M |
| **Meliaceae** | | | |
| Toona ciliate | T | <2100 | Toon, Tm |
| Toona serrata | T | 2000-2500 | Darl, Tm |
| **Aqulifoliaceae** | | | |
| *Ilex dipyrena* | T | 2000-2800 | Chharoli,Fw |
| **Celastraceae** | | | |
| *Euonymus tingens* | T | 2200-3000 | Bamoi, Fw, Fd |
| **Rhamnaceae** | | | |
| *Rhamnus triqueter* | S | <2400 | Fw |
| *R. virgatus* | S | <2400 | FW |
| **Vitaceae** | | | |
| *Parthenocissus semicordata* | C | 2000-3300 | |
| *Tetrastigma serrulatum* | C | <3000 | |
| **Hippocastanaceae** | | | |
| *Aesculus indica* | T | <2500 | Khanor, Tm, Fd, Fr |
| **Aceraceae** | | | |
| *Acer acuminatum* | T | 2200-2800 | Fw, Fd |
| *A. caesium* | T | >3000 | Fw, Fd |
| *A. oblongum* | T | <2000 | |
| **Anacardiaceae** | | | |
| *Rhus punjabensis* | T | <2400 | Fw |
| *R. wallichii* | S | <2500 | Rikhar, |
| poisonous | | | |
| **Coriariaceae** | | | |
| *Coriaria nepalensis* | S | <2400 | Fw |
| **Fabaceae** | | | |
| *Desmodium elegans* | S | 2000-2600 | Fd |
| *D. triflorum* | H | <2200 | 63 |
| *Indigofera heterantha* | S | <2400 | Kathi, Fd |
| *I. dosua* | S | <2500 | |
| *Parochetus communis* | H | 2000-3300 | |

| | | | |
|---|---|---|---|
| *Robinia pseudo-acacia* | T | <2400 | Robinia, Fd, (Pl) |
| *Trifolium pretense* | H | <3000 | |
| *T. repens* | H | <3200 | |
| *Vicia pallida* | H | <2400 | |
| *V. sativa* | H | <2100 | |
| **Rosaceae** | | | |
| *Agrimonia pilosa* | H | 2000-2600 | |
| *Cotoneaster acuminatus* | S | 3000-3300 | |
| *C. bacillaris* | S | 2200-3000 | Reensh, Fw |
| *C. microphyllus* | S | 2200-3500 | Talishang |
| *C. roseus* | S | >3300 | |
| *Duchesnea indica* | H | <2600 | |
| *Fragaria vesca* | H | >2500 | |
| *Geum elatum* | H | 3000-3600 | |
| *Malus pumila* | T | <2400 | Sev (Pl) |
| *Potentilla astrosanguinea* | H | >3300 | |
| *P. fulgens* | H | 2200-3500 | |
| *P. nepalensis* | H | <3000 | |
| *Prinsepia utilis* | S | <2400 | Bekhni, M, Fw |
| *Prunus cornuta* | T | 2800-3300 | Jamun, Fw |
| *P. armeniaca* | T | <2500 | Chuli (Pl) |
| *P. persica* | T | <2400 | Aadu (Pl) |
| *P. cerasoides* | T | <2500 | Panja, Tm, Fd |
| *Pyracantha crenulata* | S | <2200 | |
| *Rosa macrophylla* | S | 2200-3000 | Jungli Gulab |
| *R. moschata* | S | <2600 | |
| *R. sericea* | S | 2600-3300 | Fw |
| *Rubus biflorus* | S | <2500 | |
| *R. ellipticus* | S | 2000-2800 | |
| *R. niveus* | S | <2400 | |
| *Sibbaldia cuneata* | H | >3300 | |
| *Sorbaria tomentosa* | S | 2500-3200 | Fw |
| *Sorbus microphylla* | S | 3000-3500 | Fw |
| *Spiraea bella* | S | 2800-3500 | |
| *S. canescens* | S | <2400 | Chaku |
| **Saxifragacaeae** | | | |
| *Bergenia ciliate* | H | 2000-3000 | Silfar, M |
| *B. stracheyi* | H | >3200 M | |
| *Saxifraga diversifolia* | H | 3300-3600 | |
| **Parnassiaceae** | | | |
| *Parnassia nubicola* | H | 3300-3600 | |
| **Grossulariaceae** | | | |
| *Ribes alpestre* | S | 2800-3500 | |
| **Crassularaceae** | | | |
| *Rosularia adenotricha* | H | 2000-3200 | |
| *Sedum ewersii* | H | 2600-3500 | |
| **Onagraceaea** | | | |
| *Circoea alpine* | H | 3000-3400 | |
| *Epilobium brevifolium* | H | <3300 | |
| *Oenothera rosea* | H | <2400 | |
| **Apiaceae** | | | |
| *Bupleurum candollii* | H | 2600-3000 | |
| *Chaerophyllum reflexum* | H | <3500 | |
| *Heracleum candicans* | H | 2000-3000 | |
| *Ainsliaea aptera* | H | <2400 | M |
| *Anaphalis royleana* | H | 2000-3500 | |
| *A. triplinervis* | H | <2600 | |
| *Artemisia vestita* | H | <2600 | Ar |
| *Aster mollisculus* | H | 2200-3000 | |
| *A. thomsonii* | H | 2000-3000 | |
| *Cicerbita macrorhiza* | H | >3000 | |
| *Cirsium wallichi* | H | <3000 | W |
| *Conyza japonica* | H | <2400 | W |
| *C. stricta* | H | <2200 | |
| *Eerigeron alpinus* | H | 2400-3200 | |
| *E. karvinskiauns* | H | <2600 | |
| *Eupatorium adenophorum* | H | <2400 | W |
| *Gerbera gossypiana* | H | 2000-2800 | Kurhu |
| *Gnaphalium affine* | H | <2800 | |

| | | | |
|---|---|---|---|
| *Lactuca dissecta* | H | 2200-3000 | |
| *Myriactis nepalensis* | H | 2500-3000 | |
| **Campanulaceae** | | | |
| *Campanula argyrotricha* | H | 2000-2600 | |
| **Ericaceae** | | | |
| *Cassiope fastigiata* | S | >3300 | |
| *Gaultheria nummularioides* | S | >3000 | |
| *Lyonia ovalifolia* | T | 2000-2600 | |
| *Rhododendron anthopogon* | S | >3300 | Talshi, Ar |
| *R. arboretum* | T | 2000-3000 | Brans, Fw |
| *R. campanulatum* | S | 3000-3500 | Sweta Brans, Fw |
| *R. lepidotum* | S | 3000-3600 | Ar |
| **Primulaceae** | | | |
| *Androsace lanuginose* | H | 2000-3000 | |
| *A. rotundifloia* | H | <2200 | |
| *Primula denticulate* | H | 2600-3600 | |
| *P. petiolaris* | H | 2500-3600 | |
| **Myrsinaeae** | | | |
| *Myrsine Africana* | S | <2200 | Fw |
| **Symplocaceae** | | | |
| *Symplocos chinensis* | T | <2500 | Fw, Fd |
| **Oleaceae** | | | |
| *Jasminum dispermum* | C | <2600 | |
| *J. humile* | S | 2600-3300 | |
| **Loganiaceae** | | | |
| *Buddleia paniculata* | S | <2600 | |
| **Gentianaceae** | | | |
| *Gentiana algida* | H | 2000-3600 | |
| *G. capitata* | H | <2600 | |
| *G. carinata* | H | 2000-3000 | |
| *Halenia elliptica* | H | <3300 | |
| *Swertia alternifolia* | H | 2800-3600 | |
| *S. ciliate* | H | 2600-3500 | M |
| *S. cuneata* | H | >3000 | |
| *S. speciosa* | H | >3300 | |
| **Boraginaceae** | | | |
| *Cynoglossum glochidiatum* | H | 2500-3500 | |
| *hackelia uncinata* | H | >3300 | |
| **Scrophulariaceae** | | | |
| *Mazus surcullosus* | H | <2500 | |
| *Pedicularis bicornuta* | H | 3000-3600 | |
| *Scrophularia calycina* | H | 2400-3000 | |
| *S. himalensis* | H | 2000-3000 | |
| *Verbascum thapsus* | H | 2000-3600 | |
| *Veronica biloba* | H | >2600 | |
| **Acanthaceae** | | | |
| *Dicliptera roxburghiana* | S | <2100 | |
| *Pteracanthus alatus* | S | 2000-2600 | |
| *Goldfussia dalhousiana* | S | 2400-3000 | |
| *Strobilanthus atropurpureus* | S | 2400-3300 | Fd |
| *S. wallichii* | S | 2600-3300 | Fd |
| **Lamiaceae** | | | |
| *Ajuga bracteosa* | H | 2200-3000 | Clinopodium |
| *A. parviflora* | H | <2200 | Neelkathi, M |
| *Clinopodium umbrosum* | H | <3000 | |
| *Elsholtzia strobilifera* | H | 2500-3500 | Ar |
| *E. eriostachya* | H | 2000-3000 | |
| *Leucas lanata* | H | <2400 | |
| *Micromeria biflora* | H | 2000-2800 | |
| *Nepeta connata* | H | 2400-3000 | |

| | | | |
|---|---|---|---|
| *Origanum vulgare* | H | 2500-3000 | |
| *Plectranthus coesta* | H | <2200 | |
| *P. rugosus* | S | <2400 | |
| *Prunella vulgaris* | H | 2400-3000 | |
| *Salvia lanata* | H | <2200 | |
| *Scutellaria angulosa* | H | 2000-2700 | |
| *Thymus linearis* | H | <3500 | M |
| **Plantaginaceae** | | | |
| *Plantago lanceolata* | H | <3000 | |
| *P. major* | H | <3600 | M |
| **Amaranthaceae** | | | |
| *Cyathula capitata* | H | 2500-3500 | W |
| *C. tomentosa* | H | <2200 | W |
| **Chenopodiaceae** | | | |
| *Chenopodium album* | H | 2000-3000 | W |
| *Phytolacca acinosa* | H | <3300 | Jarka, M, Vg |
| *Fagopyrum cymosum* | H | <2600 | Vg |
| *Polygonum amplexicaulis* | H | >2200 | M |
| *P. capitata* | H | <2200 | |
| *Rheum australe* | S | >3000 | Urch, Chukhli, M |
| *Rumex acetosa* | S | <2200 | |
| *R. nepalensis* | H | 2000-3600 | |
| **Piperaceae** | | | |
| *Hottuynia cordata* | H | 2400-2800 | |
| **Lauraceae** | | | |
| *Litsea consimilis* | T | <2600 | Fw |
| *Neolitsea umbrosa* | T | 2200-3000 | Tm |
| **Thymelaeaceae** | | | |
| *Daphne papyracea* | S | 2000-2600 | Gandhri, Fibre |
| *Wickstroemia canescens* | S | 2200-2800 | |
| **Elaeagnaceae** | | | |
| *Elaeagnus parvifolia* | S | <2500 | Ghain,Fr |
| **Loranthaceae** | | | |
| *Korthalsella opuntia* | P | <2000 | |
| **Euphorbiaceae** | | | |
| *Euphorbia pilosa* | H | 2400-2800 | Jungli Dudhi |
| *Phyllanthus urinaria* | H | <2100 | |
| **Buxaceae** | | | |
| *Buxus wallichiana* | T | 2200-2600 | Shsmshad, T, Fw |
| *Sarcococca saligna* | S | <2600 | |
| **Urticaceae** | | | |
| *Debregrasia salicifolia* | S | <2400 | Shai Jha, Fd |
| *Girardinia diversifolia* | H | <2600 | Bichchhu Booti |
| *Pilea scripta* | H | <2800 | |
| *P. umbrosa* | H | <2600 | |
| *Urtica dioca* | H | <3000 | Baksor |
| **Ulmaceae** | | | |
| *Celtis tetrandra* | T | <2600 | Kharik, Fd, Fw |
| *Cannabis sativa* | H | 2000-2400 | Bhang, M, Fibre |
| **Moraceae** | | | |
| *Ficus hederaceae* | C | <2700 | Fd |
| *F. neerifolia* | T | <2600 | |
| *F. palmate* | T | 2600 | Khagra, Fd |
| *Morus serrata* | T | <2400 | Kimu, Chiung, Fd |
| **Juglandaceae** | | | |
| *Juglans regia* | T | <2600 | Shing Ka |
| **Myricaceae** | | | |
| *Myrica esculenta* | T | <2200 | |
| **Betulaceae** | | | |
| *Alnus nitida* | T | <2500 | Kosh, Fw, Tm |
| *Betula utilis* | T | 3000-3500 | Bhoj, Fw, Ri |
| **Corylaceae** | | | |
| *Corylus jacquemontii* | T | 2200-2500 | Ge-Biza, Fd |
| **Fagaceae** | | | |
| *Quercus floribunda* | T | 2200-2600 | Mohru, Fd, Fw |
| *Q. leucotrichophora* | T | 2000-2600 | Ban, Fd, Fw |
| *Q. semicarpifolia* | T | 2600-3400 | Kharsu, Fd, Fw |
| **Salicaceae** | | | |

| | | | |
|---|---|---|---|
| *Salyx denticulate* | S | 2600-3000 | Beli, Fw |
| *S. wallichiana* | S | 2000-2800 | Shunn, Fd, Tm |
| **B. MONOCOTS** | | | |
| **Orchidaceae** | | | |
| Calanthe tricarinata | H | <3000 | |
| Cypripedium himalaicum | H | 3000-3600 | |
| Dactylorhiza | H | >3400 | |
| Epipactis latifolia | H | 2200-3300 | |
| Epipogium aphyllum | H | >3000 | |
| Goodyera repens | H | 2400-3300 | |
| **Zingiberaceae** | | | |
| *Hedychium spicatum* | H | <2600 | Fibre |
| *Roscoea alpine* | H | 2400-3000 | |
| **Haemodoraceae** | | | |
| *Aletris nepalensis* | H | 2800-3200 | |
| *Ophiopogon intermedius* | H | 2400-3200 | |
| **Amaryllidaceae** | | | |
| Allium humile | H | >3400 | M, Ar |
| **Dioscoraceae** | | | |
| *Dioscorea deltoidea* | C | <3000 | M |
| *Dioscorea kumaonsensis* | C 2 | 000-2500 | |
| **Liliaceae** | | | |
| *Asparagus filicinus* | H | <2100 | M |
| *A. racemosus* | H | <2400 | |
| *Cardiocrinum giganteum* | H | 2200-2600 | |
| *Polygonatum cirrhifolium* | H | 2200-2800 | M |
| *P. verticillatum* | H | 2600-3500 | |
| **Smilacaceae** | | | |
| *Smilax aspera* | C | <2100 | |
| **Juncaceae** | | | |
| *Juncus himalensis* | H | 2200-2800 | Fd |
| *J. thomsonii* | H | >3300 | Fd |
| **Araceae** | | | |
| *Arisaema intermedium* | H | <2600 | |
| *A. wallichianum* | H | <2800 | |
| *Arisaema sp.* | H | 2600-3300 | |
| *Gonatanthus pumilus* | H | <2600 | |
| **Cyperaceae** | | | |
| *Carex nubigena* | G | >2600 | Fd |
| *C. obscura* | G | 2500-3300 | Fd |
| *C. inanis* | G | 2000-3000 | |
| *C. setigera* | G | 2500-3200 | Fd |
| *Carex sp.* | G | 3000-3500 | |
| *Eriophorum comosum* | G | <2200 | |
| **Poaceae** | | | |
| *Agrostis pilosula* | G | 2200-3300 | |
| *Andropogon munroi* | G | <2200 | |
| *Arundinella benghalensis* | G | <2400 Fd | |
| *Calamogrostis sp.* | G | 2600-3300 | Fd |
| *Chrysopogon gryllus* | G | 2000-2600 | |
| *Cymbopogon distans* | G | <2200 | |
| *Cynodon dactylon* | G | <2400 | |
| *Dactylis glomerata* | G | 2800-3300 | Fd |
| *Danthania cachemyriana* | G | >3000 | Fd |
| *Eulalia mollis* | G | <2500 | |
| *Koeleria micrantha* | G | <2800 | Fd |
| *Phacelurus speciosus* | G | 2200-3000 | Fd |
| *Phleum alpinum* | G | >2800 | Fd |
| *Poa annua* | G | <3000 | Fd |
| *P. alpine* | G | >2800 | Fd |
| *Poa sp .* | G | 3200-3600 | Fd |
| *Pogonatherum paniceum* | G | <2200 | |
| *Saccharum rufipilum* | G | <2400 | |
| *Sinarundinaria falcate* | G/S | <2600 | Nirgal, Fd, Fibre |
| *Stipa roylei* | G | <2800 | Fd |
| *Thamnocalamus spathiflorus* | G/S | >3000 | Nirgal, Fw, Fibre |
| *Themeda anathera* | G | <2200 | Fd |
| **II. GYMNOSPERMS** | | | |
| *Abies pindrow* | T | <3000 | Tosh, Tm |
| *A. spectabilis* | T | 3000-3300 | Kalonta, Tm |

| | | | |
|---|---|---|---|
| *Cedrus deodara* | T | <2800 Dyar, | Tm |
| *Juniperus recurva* | S | 2800-3300 | Chandan, Fw, Ar |
| *Picea smithiana* | T | <3000 | Rai, Tm |
| *Pinus roxburghii* | T | <2100 | Chil, Tm, Fw |
| *Pinus wallichiana* | T | 2400-2800 | Kail, Tm |
| *Taxus baccata* | T | 2200-2800 | Tm, M |
| **III. PTERIDOPHYTES** | | | |
| *Adiantum capillus-veneris* | F | <2600 | |
| *Adiantum venustum* | F | <2500 | |
| *Asplenium dalhousiae* | F | 2000-2800 | |
| *A. ensiforme* | F | 2000-2600 | |
| *Athyrium foliolosum* | F | 2400-3300 | |
| *A. rupicola* | F | 2400-3200 | |
| *Coniogramme affinis* | F | 3000-3300 | |
| *Diplazium esculentum* | F | <3000 | Lingar, Vg |
| *Drynaria mollis* | F | 2200-2600 | |
| *Dryopteris barbigera* | F | <3000 | |
| *D. komarovii* | F | 2500-2800 | |
| *Onychium contiguum* | F | <2800 | |
| *Polystichum bakerianum* | F | 2000-3000 | |
| *P. squarosum* | F | <2800 | |
| *Pteridium aquilinum* | F | 2000-2600 | Barn |
| *Pteris cretica* | F | <2500 | Barn |
| *P. dactylina* | F | <2600 | Barn |
| *P. quadriaurita* | F | 2400-3000 | Barn |
| *P. vittata* | F | 200-2800 | Barn |
| *Woodwardia unigemmata* | F | <2400 | |

**Annexure 13**
**List of Plants of Ethnobotanical Value**
**(**Sources: Chauhan R.P.S., 2000; Raghuveer Singh)

| **Local name** | **Where found** | **Use** |
|---|---|---|
| Ban | Forest | Fodder |
| Moru | Forest | Fodder |
| Kharsu | Forest | Fodder |
| Kanjdu | Forest | Fodder |
| Thami | Forest | Fodder |
| Burans | Forest | Fodder |
| Oaanr | Forest | Fodder |
| Marod falli | | Stomach ache |
| Taxus baccata (Brahmi) | Forest | Treating cold |
| Banaksha flower | | Fever |
| Guchchhi (mushroom) | Forest | Vegetable |
| Lasuri leaves | Pasture | Spice |
| Lingad leaves | Forest | Vegetable |
| Duma leaves | | Vegetable |
| Chaura roots | | Spice |
| Patharfod leaves | | Kidney stone |
| Maruwad leaves | | Kidney stone |
| Koaydu | | Vegetable |
| Strawberry | Pasture | Fruit |
| Gandhi | | Fruit |
| Kashmal | | Fruit |
| Khadjoanu (Ajwayan) | | Stomach ache |
| Bankakdi | | Salad |
| Walnut fruits | Forest | Nuts |

## Annexure 14

## List of Plants that Serve as Food to Wild Herbivores

(Source: Chauhan R.P.S., 2000)

| Sr. No. | Local Name | Botanical Name | Edible Parts |
|---|---|---|---|
| 1 | Khanor | *Aesculus indica* | Fruits |
| 2 | Kharik | *Celtis australis* | Fruits, leaves |
| 3 | Kharsu | *Quercus semicarpifolia* | Fruits, leaves |
| 4 | Kimu | *Morus serrata* | Fruits, leaves |
| 5 | Kuhnish | *Alnus nitida* | Fruits |
| 6 | Moru | *Quercus dilatata* | Fruits, leaves |
| 7 | Ban | *Quercus leucotrichophora* | Fruits, leaves |
| 8 | Kainth | *Pyrus persica* | Fruits |

**Annexure 15**
**Expenditure in Churdhar Wildlife Sanctuary from 2012-13 to 2016-17**

| Sr No | Name of Work | 2012-13 | | 2013-14 | | 2014-15 | | 2015-16 | | 2016-17 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Phy | Fin | Phy | Fin | Phy | Fin | Phy | Fin( Rs) | Phy | Fin |
| 1. | Regeneration of Forest | 10ha | 149999 | 6.5ha | 137400 | | | | | | |
| 2. | Improvement of 1/path-B/path | 5 | 124999 | 3 | 100000 | 10 km | 100000 | 30 km | 200000 | | 100000 |
| 3. | Maintenance of RO office cum residence at Nohra | - | - | - | - | | | | | | |
| 4. | maintenance of 1/Hut at Churas | - | - | - | - | | | | | | |
| 5. | Maintenance of FGD Hut at Nohra | - | - | - | - | | | | | | 100000 |
| 6. | Maintenance of FGd Hut at Churas | - | - | - | - | | | | | | |
| 7. | Construction of field rest room cum BO quarter Baldhar | - | - | - | - | | | | | | |
| 8. | Maintenance of BO Qtr at Baldhar | - | - | - | - | | | | | | |
| 9. | Maintenance of Bo Qtr. At Nohra | - | - | 1 | 40000 | | | | | | |
| 10. | Maintenance of store at Nohra | - | - | - | - | | | | | | |
| 11. | Maintenance of FG Hut Chhogtali | - | - | - | - | | | | | | |
| 12. | Maintenance of FG hut Baldhar | - | - | - | - | | | | | | |
| 13. | Maintenance of field accommodation churdhar | - | - | - | - | | | | | | |
| 14. | Maintenance of Nursery | 2 | 60515 | 2 | 178000 | 2 No | 50000 | 2 No | 150000 | 2 No | 75000 |
| 15. | Cleaning of fire line/path | 5 | 50000 | 5 | 31120 | | | | | | |
| 16. | Construction of water pond | - | - | - | - | | | | | | |
| 17. | Construction of water tank | - | - | - | - | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18. | Construction of water pond | - | - | 2 | 73000 | | | | | | |
| 19. | Construction of jeep able road at churas | - | - | - | - | | | | | | |
| 20. | Bio-engineering works | 25 | 156355 | 6 | 70000 | 6 | 60000 | | | | |
| 21. | Eradication of unwanted weeds | 15ha | 72799 | - | - | | | | | | |
| 22. | Construction of boundary pillars | - | - | - | - | | | LS | 100000 | | |
| 23. | Construction of wooden bridge | - | - | - | - | | | | | | |
| 24. | Temp. check post (wages) | - | - | - | - | | | | | | |
| 25. | De-silting of existing water pond | - | - | 10 | 52000 | 10 No | 100000 | 10 No | 150000 | 15 No | 150000 |
| 26. | Construction of public toilet at Nohra | - | - | - | - | | | | | | |
| 27. | Construction of garbage pits | - | - | 2 | 46856 | | | | | | |
| 28. | Group patrolling | L/s | 58120 | | | LS | 75000 | | | | |
| 29. | Construction of Rock shelter | - | - | 2 | 30000 | | | | | | |
| 30. | Purchase of camera | | | | | 1 | 15000 | | | | |
| 31. | Purchase of GPS | | | | | 1 | 10000 | | | | |
| 32. | Purchase of computer with printer | | | | | 1 | 60000 | | | | |
| 33. | Mapping using GIS technology | | | | | 1 | 20000 | | | | |
| 34. | Maintenance of plantation raised during last three years | | | | | 16 ha | 128000 | 16 Ha | 150000 | 20 ha | 75000 |
| 35. | Awareness activity and camps for school children and villagers | | | | | LS | 50000 | LS | 35000 | | 20000 |
| 36. | Connectivity charges | | | | | | 4800 | | 4800 | | 5400 |
| 37. | Wildlife census | | | | | | 25000 | | 10000 | | 25000 |
| 38. | PoL | | | | | | 30000 | | | | |
| 39. | Capacity Building of staff | | | | | | 75000 | | | | |
| 40. | Office expenses | | | | | | 50000 | | | | |
| 41. | Fruit and fodder tree plantation | | | | | | | 10 ha | 160000 | 5 Ha | 137000 |
| 42. | Engagement of Fire watchers and anti poacher mazdoors | | | | | | | 135 man days | 135000 | | 85000 |
| 43. | Revision of Management plans after rationalization | | | | | | | | | | 10000 |
| 44. | Fencing | | | | | | | | | LS | 200000 |
| 45. | Construction of rain shelter cum resting points | | | | | | | | | | 200000 |
| 46. | Maintenance of FRH Churas | | | | | | | | | 1 No | 300000 |

## Annexure 16

## TD Grants in Churdhar Wildlife Range

| Year | No. of Applicants | Species | Trees Marked in TD | | | | | | Amount Received in (Rs. |
|---|---|---|---|---|---|---|---|---|---|
| | | | IV | II | IIA | IA | IB | Total | |
| 1987-88 | 53 | Rai & Tosh | 2 | 28 | 47 | 45 | 21 1 | 43 918 | |
| 1988-89 | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil | |
| 1989-90 | 5 | Rai & Tosh | Nil | 2 | 5 6 | Nil | 13 | 91 | |
| 1990-91 | 6 | " | Nil | Nil | 7 | 13 | Nil | 20 | 118 |
| 1991-92 | 45 | " | Nil | Nil | 45 | 54 | Nil | 99 | 644 |
| 1992-93 | 17 | " | 1 2 | 10 | 15 | Nil | 28 | 198 | |
| 1993-94 | 6 | " | Nil | Nil | 2 4 | Nil | 6 | 42 | |
| 1994-95 | 2 | " | Nil | Nil | 3 1 | Nil | 4 | 23 | |
| 1995-96 | 5 | " | Nil | Nil | 1 7 | Nil | 8 | 81 | |
| 1996-97 | Nil | " | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| 1997-98 | 27 | " | 13 | 14 | 6 | 22 | Nil | 55 | 265 |
| 1998-99 | 42 | " | 8 | 4 | 18 | 19 | Nil | 49 | 400 |
| 1999-99 | 8 | " | Nil | Nil | Nil | 7 | Nil | 7 | 136 |
| 2000-01 | 8 | " | Nil | Nil | Nil | 6 | Nil | 6 | 88 |
| 2001-02 | 38 | " | Nil | Nil | 1 | 19 | Nil | 20 | 417 |
| 2002-03 | 26 | " | Nil | Nil | 1 | 3 | Nil | 4 | 279 |
| **Total** | **288** | | **24** | **50** | **146** | **221** | **21** | **462** | **3700** |

## Annexure 17
## Location of Nurseries

| Sr. No. | Name | Beat | Area | Status |
|---|---|---|---|---|
| 1 | Nohra | Nohra | 0.2 | Temporary |
| 2 | Matira | Chauras | 0.3 | Temporary |

## Annexure 18

## List of Villages outside PA Boundry with their Status, Village-wise Human & Cattle Populations including Migratory Graziers/ Local Graziers & ll Right-holders

| Sr. No. | Village | Human | Cow | Bull | Calves | Goat/ Sheep | Buffalo | Cock/ hen | Pig | Horses |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Nohra | 1866 | 542 | 369 | 395 | 790 | 80 | 114 | 52 | 5 |
| 2 | Bhogbhateori | 236 | 86 | 59 | 86 | 93 | 17 | 5 | 0 | 0 |
| 3 | Thanda | 362 | 75 | 58 | 42 | 82 | 22 | 5 | 0 | 3 |
| 4 | Devna | 411 | 55 | 46 | 70 | 20 | 5 | 3 | 0 | 0 |
| 5 | Kanda/Chogtali | 744 | 180 | 140 | 92 | 305 | 126 | 0 | 0 | 0 |
| 6 | Chauras | 634 | 136 | 149 | 60 | 344 | 96 | 24 | 8 | 2 |
| 7 | Churva | 70 | 29 | 24 | 12 | 18 | 1 | 0 | 0 | 0 |
| 8 | Baldhar | 147 | 62 | 34 | 33 | 116 | 9 | 0 | 8 | 0 |
| 9 | Bhaila | 73 | 76 | 24 | 30 | 111 | 2 | 0 | 14 | 0 |
| 10 | Sarpat | 128 | 17 | 12 | 9 | 22 | 0 | 0 | 0 | 0 |
| 11 | Bahanh | 74 | 45 | 35 | 40 | 95 | 4 | 0 | 0 | 0 |
| 12 | Barkoli | 38 | 15 | 12 | 9 | 27 | 2 | 0 | 0 | 0 |
| **Total** | **4783** | **1318** | **962** | **878** | **2023** | **364** | **151** | **82** | **10** | |
| Migratory graziers | | 22 families | 22 | 5 | 0 | 74 | 236 | 0 | 0 | 0 |

## Annexure 19
## List of Migratory Permit Holders

| Sr No | Graziers | RF & Compartment | Animals | | | | |
|---|---|---|---|---|---|---|---|
| | | | Buffalo | Cow | Ox | Horse | Total |
| 1 | Ammi Gujjar | Shila Sarao C8, C10, C11 | 4 | - | - | 2 | 6 |
| 2 | Lal Sain Gujjar Abal Sain Gujjar | Shila Sarao C2, C3, C4, C5, C6, C9 37 | 37 | - | - | - | 37 |
| 3 | Nura | Shilla Sarao C4 | 18 | - | - | 4 | 22 |
| 4 | Bani S/o Ambu | Nohra | 10 | - | 3 | - | 13 |
| 5 | Sain Ali | Shilla Sarao C7 | 2 | - | 1 | - | 16 |
| 6 | Smt. Bagga D/o Mian Sh. Fakir | Chauras Talodhar | 12 | - | 4 | - | 16 |
| 7 | Ilam Din | Chauras Talodhar | 6 | 1 | 1 | - | 8 |
| 8 | Musha | Chauras Talodhar | 10 | 2 | 3 | - | 15 |
| 9 | Gulam Din | Chauras (Aindhar) | 6 | - | - | - | 6 |
| 10 | Mir Ali r | Chauras Talodha | 6 | 2 | 2 | - | 10 |
| 11 | Ranu Gujjar | Chauras Talodhar | 16 | - | - | 2 | 18 |
| 12 | Isha Gujjar | Shilla Sarao C10, C11, C12, C7 & C13 | 16 | - | - | - | 18 |
| 13 | Mohd. Husan Shilla | Sarao C8 | 12 | - | - | - | 12 |
| 14 | Aslam | Shilla Sarao C7 & C8 | 12 | - | - | - | 12 |
| 15 | Amboo S/o Chatu | Chauras (Aindhar) | 6 | - | - | - | 6 |
| 16 | Zakir Hussain S/o Karamdin | Chauras Talodhar | 11 | - | 3 | - | 14 |
| 17 | Roshan S/o Gulam Hussain | Chhogtali (Deoli) | 15 | - | 2 | - | 17 |
| 18 | Jumman, Fajal Din, Nur Sain, S/o Gulam Husain | Chhogtali (Motirai) | 13 | 2 | 2 | - | 17 |
| 19 | Manyi S/o Shera | Bhairog | 8 | 4 | 4 | - | 16 |
| 20 | Yusuf S/o Ali Sain | Chhogtali (Motirai) | 5 | - | - | - | 5 |
| 21 | Jhoor Sain & Brother, S/o Gulam Ali | Nohra (Kuftu) | 21 | 2 | 1 | - | 24 |
| 22 | Amboo, Ali Sher, Dara S/o Chattu | Nohra (Oridhar) | 20 | 1 | 2 | - | |
| | **Total** | | **263** | **16** | **32** | **8** | **319** |

## Annexure 20

## List of Local Permit Holders

| Sr No | Graziers | Village | RF | Animals | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Buffalo | Cow /Ox | Goat | Sheep | Total |
| 1 | Ujager Singh | Ulana | RF Nohra | - | 8 | - | 4 | 12 |
| 2 | Ghanu Ram | Nohra | RF Nohrs | - | - | 9 | 12 | 21 |
| 3 | Deep Ram | Kanda | RF Chhogtali C2 | 10 | 3 | - | - | 13 |
| 4 | Het Ram | Kanda | -do | 2 | 2 | - | - | 4 |
| 5 | Kundia | Chauras | RF Chauras PF Churdhar | - | - | 4 | 6 | 10 |
| 6 | Fanchku | Chauras | - do- | - | - | - | 4 | 4 |
| 7 | Sher Singh | Nohra | RF Nohra | - | - | - | 6 | 6 |
| 8 | Nakhru | Chaura | PF Churdhar | - | - | 4 | 7 | 11 |
| 9 | Sobha Ram | Chauras | RF Chauras | - | - | 2 | 4 | 6 |
| 10 | Meena Ram | Thanga | RF Thanga | - | - | 2 | 2 | 4 |
| 11 | Magni Ram | Sarain | DPF Shilla Sarao | - | - | - | 28 | 28 |
| 12 | Jati Ram | Chauras | PF Churdhar PF Churdhar | - | - | 3 | 5 | 8 |
| 13 | Chet Singh | Satauni | RF Nohra | - | - | 10 | - | 10 |
| 14 | Babu Ram | Chhogtali | RF Chhogtali | 2 | 2 | 2 | 5 | 11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 15 | Nain Singh | Kanda | RF Chhogtali | 2 | 2 | - | - | 4 |
| 16 | Jalim Singh | Bhaturi | RF Bhog | 4 | 4 | - | - | 8 |
| 17 | Partap Singh | Nohra | RF Nohra | 4 | - | 4 | 8 | 16 |
| 18 | Hira Singh | Nohra | RF Nohra | 4 | 4 | - | - | 8 |
| 19 | Padam Singh | Kanda | RF Chhogtali | 6 | - | - | - | 6 |
| 20 | Ram Bhaj | Kanda | RF Chhogtali | 2 | 2 | - | - | 4 |
| 21 | Sunder Singh | Kanda | RF Chhogtali | 6 | - | - | - 6 | |
| 22 | Ram Swaroop | Sanoga | RF Chhogtali | 3 | - | - | - | 3 |
| 23 | Gurdia | Kanda | RF Chhogtali | 2 | - | - | - | |
| 24 | Kanshi Ram | Bhog | 4 | 3 | - | 15 | 22 | |
| | **Total** | | | **51** | **30** | **40** | **106** | **227** |

## Annexure 21

## List of Persons Holding Firearms Licenses in Villages outside the Protected Area Boundary and Within a Zone of 10 km Surrounding the External PA Boundary & Within the Buffer, whichever is Larger

| Sr.No. | Name of License Holder | Father's Name | Village |
|---|---|---|---|
| 1 | Sh.Sahi Ram | Sh.Sherha | Chhogtali |
| 2 | Sh.Prem Chand | Sh.Chet Ram | Shamoga |
| 3 | Sh.Udam Singh | Sh.Kanshi Ram | Shamoga |
| 4 | Sh.Ashok Kumar | Sh.Prithvi Singh | Dhar sania |
| 5 | Sh.Bhim Singh | Sh.Jalim Singh | Chogtali |
| 6 | Sh.Kripa Ram | Sh.Khanta Ram | Kanda |
| 7 | Sh.Kundan Singh | Sh.Sobha Ram | Chogtali |
| 8 | Sh.Dleep Singh | Sh.Jati Ram | Kanda |
| 9 | Sh.Maharshan | Sh.Jhatku | Chogtali |
| 10 | Sh.Rattan Singh | Sh.Mohan Singh | Chogtali |
| 11 | Sh.Hira Singh | Sh.Jamlu | Smoga |
| 12 | Sh.Kanku | Sh.Kalu | Saniodidag |
| 13 | Sh.Ganga Ram | Sh.Kanshi Ram | Chogtali |
| 14 | Sh.Deep Ram | Sh.Dhayan Singh | Saniodidag |
| 15 | Sh.Sania | Sh.Sadh | Smoga |
| 16 | Sh.Jagmohan Singh | Sh.Rushku Ram | Chogtali |
| 17 | Sh.hatinder | Sh.Daia Ram | Smoga |
| 18 | Sh.Padam Singh | Sh.Inder Singh | Saniodidag |
| 19 | Sh.Jaber Singh | | Didag |
| 20 | Sh.Shankru Ram | | Didag |
| 21 | Sh.Gopal Singh | Sh.Naryan Singh | Didag |
| 22 | Sh.Vaid Prakesh | Sh.Inder Singh | Saniodidag |
| 23 | Sh.Jagdish Singh | Sh.Laxmi Singh | Didag |
| 24 | Sh.Taman Singh | Sh.Basti Ram | Chogtali |
| 25 | Sh.Madan Lal | Sh.Sobha Ram | Chauras |
| 26 | Sh.Lekh Ram | Sh.Dhayan Singh | Chauras |
| 27 | Sh.Ran Singh | Sh.Devi Singh | Chauras |
| 28 | Sh.Jeeven Singh | Sh.Nupa Ram | Chauras |
| 29 | Sh.Sobha Ram | Sh.Bhonchu | Chauras |
| 30 | Sh.Mohan Singh | Sh.Devi Ram | Chauras |
| 31 | Sh.Mohar Singh | Sh.Devi Ram | |
| 32 | Sh.Mohan Lal | Sh.Moti Ram | Chauras |
| 33 | Sh.Kalyan Singh | Sh.Sadhu Ram | Ganduri |
| 34 | Sh.Kamal Singh | Sh.Tunglu | Devamanal |
| 35 | Sh.Gopal Singh | Sh.Raia | Devamanal |
| 36 | Sh.Lekh Ram | Sh.Tulsi Ram | Devamanal |
| 37 | Sh.Gulab Singh | Sh.Uday Ram | Bandal |
| 38 | Sh.Kalyan Singh | Sh.Thargu | Chokar |
| 39 | Sh.Bhim Singh | Sh.Mahender Singh | Nohra |
| 40 | Sh.Kamal Chauhan | Sh.Het Ram | Nohra |
| 41 | Sh.Mohan Lal | Sh.Jati Ram | Chokar |
| 42 | Sh.Bhagat Ram | Sh.Ram | Bhag Manal |
| 43 | Sh.Sant Ram | Sh.Amru | Thanda |
| 44 | Sh.Man Singh | Sh.Amru | Thanda |

| | | | |
|---|---|---|---|
| 45 | Sh.Surrat Ram | Sh.Raia | Chokar |
| 46 | Sh.Ved Prakash | Sh.Vidya Ram | Chokar |
| 47 | Sh.Daulat Ram | Sh.Kana Ram | Devamanal |
| 48 | Sh.Nakhru | Sh.Kaltu | Thanda |
| 49 | Sh.Rama Nand | Sh.Tulsi Ram | Manal |
| 50 | Sh.Raghubir Singh | Sh.Jati Ram | Nohra |
| 51 | Sh.hatinder | Sh.Jhatku | Nohra |
| 52 | Sh.Ramesh Chand | Sh.Man Singh | Nohra |
| 53 | Sh.Tulsi Ram | Sh.Mehar Singh | Nohra |
| 54 | Sh.Jati Ram | Sh.Fisha | Thanda |
| 55 | Sh.Jalam Singh | | Bateori |
| 56 | Sh.Roop Chand | Sh.Ujagar Singh | Nohra |
| 57 | Sh.Jati Ram | Sh.Fisha | Thanda |
| 58 | Sh.Budhia Ram | Sh.Kaltu | Thanda |
| 59 | Sh.Gulab Singh | Sh.Bhajnu | Bhaila |
| 60 | Sh.Jodha | Sh.Sudhama | Chiog |
| 61 | Sh.Jhukhru | Sh.Dhania | Barkoli |
| 62 | Sh.Bija Ram | Sh.Hira Singh | Jorna |
| 63 | Sh.Jalim Singh | Sh.Kripa Ram | Thanda |
| 64 | Sh.Sant Ram | Sh.Lachi Ram | Lihat |
| 65 | Sh.Dhola Ram | Sh.Bhindru | Lihat |
| 66 | Sh.Jeet Singh | Sh.Moti Ram | Lihat |
| 67 | Sh.Naria | Sh.Jania | Lihat |
| 68 | Sh.Chma Ram | Sh.Sudhama | Lihat |
| 69 | Sh.Padam Singh | Sh.Moti Ram | Lihat |
| 70 | Sh.Mehar Singh | Sh.Jania | Lihat |
| 71 | Sh.Padama Ram | Sh.Bhajnu | Sarain |
| 72 | Sh.Dula Ram | Sh.Kripa Ram | Baldhar |
| 73 | Sh.Ganga Ram | Sh.Sudma Ram | Lihat |
| 74 | Sh.Sidhia | Sh.Nehalu | Lihat |
| 75 | Sh.Bansi Lal | Sh.Rai Mal | Pulwahal |
| 76 | Sh.Kalia Ram | Sh.Khintu | Lihat |
| 77 | Sh.Dhirju | Sh.Motu | Jawag |
| 78 | Sh.Lachi Ram | Sh.Moti Ram | Thana |
| 79 | Sh.Sita Ram | Sh.Mina Ram | Bhaila |
| 80 | Sh.Nika Ram | Sh.Minju | Jorna |
| 81 | Sh.Sita Ram | Sh.Mina Ram | Bhaila |
| 82 | Sh.Khayali Ram | Sh.Magni Ram | Chiog |
| 83 | Sh.Masat Ram | Sh.Rati Ram | Chiog |
| 84 | Sh.Masat Ram | Sh.Jeet Ram | Thana |
| 85 | Sh.Bakak Ram | Sh.Sobha Ram | Bahal |
| 86 | Sh.Het Ram | Sh.Sania Ram | Bagahan |
| 87 | Sh.Relu Ram | Sh.Nimtu | Thana |
| 88 | Sh.Jhinia Ram | Sh.Naktu Ram | Sarain |
| 89 | Sh.Sant Ram | Sh.Kamal Chand | Lihat |
| 90 | Sh.Pratap Singh | Sh.Lachi Ram | Bhaila |
| 91 | Sh.Keolu Ram | Sh.Aklu | Lihat |
| 92 | Sh.Ram Singh | Sh.Mushu Ram | Jorna |
| 93 | Sh.Jaia | Sh.Sania | Sarain |
| 94 | Sh.Sahia | Sh.Bhindru | Jorna |
| 95 | Sh.Kansia | Sh.Mathu | Srain |
| 96 | Sh.Padam Singh | Sh.Mouji | Lihat |
| 97 | Sh.Atma Ram | Sh.Kripa Ram | Bhal |
| 98 | Sh.Meena Ram | Sh.Parsu | Lihat |
| 99 | Sh.Sahia | Sh.Bhudu | Sarian |
| 100 | Sh.Tanya | Sh.Bhudu | Sarain |
| 101 | Sh.Daulat Ram | Sh.Jhushu | Bahal |
| 102 | Sh.Kripa Ram | Sh.Jhushu | Dimoh |
| 103 | Sh.Bhadur Singh | Sh.Nand Ram | Ganduri |
| 104 | Sh.Fisha Ram | Sh.Ram Dyal | Bhog |

## Annexure 22

## Loss of Livestock Due to Attacks of Wild Animals

| Year | Livestock | | | | | | |
|---|---|---|---|---|---|---|---|
| | Imported Cow | Desi Cow | Buffalo | Imported Oxen | Horse/ Mule | Sheep | Goat |
| 2007-8 | 2 | - | - | 1 | - | - | - |
| 2008-9 | 4 | - | - | 5 | - | - | 12 |
| 2009-10 | - | - | - | - | - | - | - |
| 2010-11 | - | - | - | 1 | - | - | - |
| 2011-12 | 2 | - | - | - | - | - | - |
| 2012-13 | 2 | - | - | - | - | - | - |

## Annexure 23

## List of Roads and Paths Constructed by the Forest Department

| Sr.No. | Name | Type | Width (m) | Length (km) | Year of Constr. | Amount Spent | |
|---|---|---|---|---|---|---|---|
| 1 | Approach Road to Churdhar FRH | Kuchcha, jeepable | 3.55 | 0.750 | Old Road | Not Known | Special repairs in 1993-94 |
| 2 | Tallon to Tisri | Bridle path | | 7.500 | 1989-90 | 80,000 | |
| 3 | Khadach to Churdhar | Trail | 4.020 | 1988-89 | 25,000 | | |
| 4 | Dopti to Khadach | Trekking route | | 16.000 | 1992-93 | 91,400 | Special repair of old inspection path |
| 5 | Chhogtali to Tisri | Inspection path | 9.500 | 1993-94 | 100,600 | | |
| 6 | Nohra to Churdhar | Bridle path | 14.000 | 1977-78 | Not known | | |
| 7 | Approach road to Range Office and Colony at Nohra | Cemented path | 1.20 | 0.090 | 2001-02 | 44,900 | |
| 8 | Nohra to Jamnala via Sutan | | | | | | |

## Annexure 24
## List of Buildings in the Sanctuary

| Name of Building | Location | Year of Construction | Cost |
|---|---|---|---|
| Range Officer office cum residence | Nohradhar | 1983-84. Transferred to Sanctuary in 1986-97 | Not known. |
| Dy. Ranger Quarter | Nohra | 1989-90 | 101800 |
| Seed Store | Nohra | 1989-90 | 66149 |
| Forest Guard Hut | Nohra | 1994-95 | 125000 |
| Inspection Hut | Chauras | 1962-63 | Not known.Special repairsin 1991-92 Rs. 75000 |
| Forest Guard Hut | Chauras | 1989-90 | 6948 |
| Forest Guard Hut | Chhogtali | 990-91 | 68000 |

| | | | |
|---|---|---|---|
| FG Hut (Bhairog Beat) | Baldhar | 1992-93 | 75000 |
| FG Hut (Sarpat Beat) | Baldhar | 1997-98 | 175000 |
| Field Accomodation | Churdhar 1992-93 125000 | | |
| Toilet Churdhar | 1992-93 | | 32999 |
| Rain Shelter | Kharach | 1992-93 | 58599 |
| Rain Shelter | Tisri | 1993-94 | 58000 |

## Annexure 25
## Locations of Recent Musk Deer Sightings

| Name of Person | Location | When | Remarks |
|---|---|---|---|
| Raghuveer Singh R/o Nohra | Chhogtali Beat (twice) | 2007 | |
| -do- | Katre ki Lani (Below Ain Dhar) | July 2007 | |
| -do- | Bijath (Below Kuftu near Suralta) | 2003 | Not seen now |
| A Chauras resident | Ain Dhar | 2007 | |
| Ambu Deen Gujjar (Tisri) | Uchchen Tibba | 1995 | |

## Annexure 26
## List of Trekking Routes to Churdhar

| Sr. No. | Trekking Route | Distance (km) |
|---|---|---|
| 1 | Nohra to Churdhar via Tisri | 14 |
| 2 | Didag to Churdhar via Tisri | 28 |
| 3 | Habban to Churdhar via Tisri | 30 |
| 4 | Pulbahal to Churdhar via Dopti, Bhairog, Tisri | 22 |
| 5 | Sarain to Churdhar | 8 |
| 6 | Kupi to Churdhar | 15 |
| 7 | haripurdhar to Churdhar via Aindhar, Uchchen Dhar | 30 |
| 8 | Chauras to Churdhar via Taran ki Dhar, Tisri | 20 |
| 9 | Chauras to Churdhar via Uchchen Dhar | 22 |
| 10 | Chhogtali to Churdhar via Moti Rai, Tisri | 20 |
| 11 | Chhogtali to Churdhar via Sen ki Dhar, Julhasan Tibba | 25 |
| 12 | Baldhar to Churdhar along ridge | 16 |

**Annexure 27**

# Drying of Kharsu Oak (*Quercus semecarpifolia* Smith) Trees in Nohra Forest Range of Shimla Wildlife Division: A Report


## Himalayan Forest Research Institute

**(*Indian Council of Forestry Research and Education*)**

**Conifer Campus, Panthaghati**

**SHIMLA – 171 013**


September, 2017

# Acknowledgements

The institute would like to acknowledge its sincere gratitude to **Dr. S.K. Kapta** IFS, Chief Conservator of Forests (Wildlife), for posing the problem pertaining to Drying of Kharsu Oak in Nohra Beat of Shimla Wildlife Division and accordingly, requesting the Director, HFRI to suggest some remedial measures so as to contain/ manage the same after in depth study of the probable causes behind.

The institute is also thankful to the personal interest shown by field functionaries of Nohra range during the above said investigation and also for sharing their field experiences with the team. Their suggestions related to drying of kharsu oak provided required leads and became quite handy during compilation of the report.

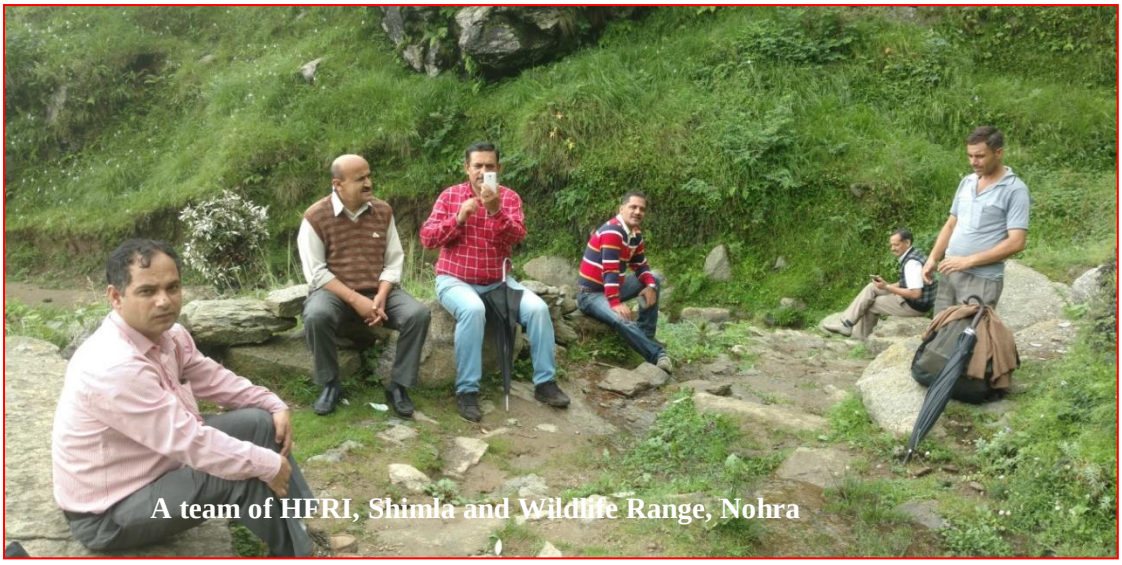
The team would also like to acknowledge the interest shown and required support extended to the team by Dr. V.P. Tewari, Director, HFRI. Help extended by Dr. K.S. Kapoor, GCR of this institute during editing and finalizing of the report is also thankfully acknowledged.

## A Treatise:

Field functionaries of Nohra Wildlife Forest Range falling in Shimla Wildlife Division, Himachal Pradesh (HP) observed large scale drying of kharsu oak in the said range. Subsequent to it, the matter was discussed elaborately during a meeting held under the chairmanship of Sh. Tarun Kapoor, Additional Chief Secretary (ACS) Forest, Govt. of HP who ultimately directed that this mortality be get investigated through some national level Institute. Accordingly, Director, Himalayan Forest Research Institute, Shimla received a request from Chief Conservator of Forests, Wildlife (CCF WL) Shimla for carrying out complete field investigations behind this drying in Nohra wildlife forest range, for which, a multi-disciplinary team comprising of the following scientists of this Institute under the leadership of Dr. Ashwani Tapwal was deputed to investigate the causes behind this large scale drying of kharsu oak in the said range:

1. Dr. Ashwani Tapwal, Scientist-E : Forest Pathologist
2. Dr. Ranjeet Kumar, Scientist-E : Forest Ecologist
3. Dr. Pawan Kumar, Scientist -D : Forest Entomologist

The above team visited the affected areas of Nohra wildlife range on August 2, 2017. Preliminary discussions of the team with the concerned field officials revealed that the RF Nohra C-3 compartment is the most affected. However, it was also informed that drying of kharsu oak trees also occurs in other compartments of Nohra wildlife range.



A team of HFRI, Shimla and Wildlife Range, Nohra

Field investigations exhibited a range of drying symptoms, coupled with the presence of fungal conks on drying/ dead trees. Variable intensity of secondary insect borer attack was also observed. It had been observed and also informed by staff that study area in past had been subjected to high biotic pressure, which may be one of cause for further spread of fungus and subsequent mortality. Ground survey of the area also revealed that approximately 10-15% trees in the specified area i.e. RF-Nohra C-3 compartment were found to be dead and many are

in different stages of drying. The immediate causes of current mortality in the study site seems to be of biotic interferences followed by fungal attack with some beetle syndrome.

## Background of the Problem and Some Past Events:

Forest health is generally defined as the apparent condition of a forest which normally is the overall reflection of different factors like age, structure, composition, function, vigour, presence of unusual levels of insects or diseases including resilience to disturbance (Helms, 1998). Both living (biotic) and non-living (abiotic) factors interacting at the site, normally lead towards degradation of health of forests. As per the report (FAO, 2003) biotic agents operating include fungi, bacteria, viruses, insects, mites, parasitic plants, weeds and larger animals whereas non-living factors are related directly to the weather conditions (e.g. fire, wind, snow, hail, and lightning), water (e.g. flooding, water logging and drought), soil conditions (e.g. deficiency of nutrients or poor drainage), mechanical agents (e.g. heavy machinery), and chemicals (e.g. pesticides, salt, industrial waste, and atmospheric pollution).

It is beyond any doubt that insect and pathogens are the integral components of any forest ecosystems and are normally present at a relatively low density, causing little damage and having negligible impact on tree growth and vigour (Allard *et al.*, 2003). However, in the recent past, number of insect-pest and disease incidences had shown a continuous rise in the forest ecosystems and frequent changes in climatic conditions can be one of the major contributory factor and even migration of disease from one place to other and from one continent to another. *Phytophthora cinnamomi,* is one such example which is an important fungal pathogen and having wide host range and capable of attacking more than 1000 varieties and species of plants across the world. It is probably originated from *Cinnamomum zeylanicum* in Sumatra and now worldwide introduced to more than 70 countries (Ploetz *et al*., 1994). Many soil-borne parasitic fungi like *Armillaria*, *Fomes*, *Ganoderma*, *Rosellinia* and *Verticillium* species can also build up inoculum on one host plant and spread to another, associated host (Ploetz *et al*., 1994; Muraleedharan and Chen, 1997). Many of the fungal pathogens are host-specific and would not readily be transmitted from one plant to another, including most mildews, smuts, rusts and many leaf spots (Schroth *et al*., 2000).

From 1900 onwards, a regular decline in the population and mortality of the oak species have been reported in large area of forests in the world. Outbreak of such events with different names such decline, wilting and mortality was normally caused by the reaction of pests and diseases to a particular set of environmental stresses (Philip *et al.*, 1983). Pathogenic fungi recorded on *Quercus semicarpifolia* were *Ganoderma lucidum* causing root rot and species of *Fomes, Hymenochaete* and *Polyporus* causing heart rot (Butler and Bisby, 1960; Spaulding, 1961). Singh and Singh (1992) observed that the pre-dominant oak species of Uttarakhand viz, *Q. leucotrichophora*, being grown to the close proximity to human population has declined in population due to changes in the environment and biotic pressures. The other species i.e. *Q. floribunda* and *Q. semecarpifolia* have also been noticed under high biotic pressure next to *Q.*

*leucotrichophora*. Singh (2011) observed beetle attack on *Quercus* species in the Tehri Garwal region of Uttarakhand and recorded up to 34.4% mortality. Mortality of oaks was also observed in the Mussoorie region of Uttarakhand (Singh *et al*., 2012).

## Study area:

As also discussed earlier, Nohra wildlife forest range falls in Shimla wildlife forest division. The area forms a part of Chhurdhar wild life sanctuary, situated in the higher Himalayan region of Sirmour district. The sanctuary is named after the Churdhar Peak, a holy place having relevance to Shri Shirgul Maharaj (Chureshwar Maharaj) and peak has a great religious significance for the people of Sirmour, Shimla and Solan districts of Himachal Pradesh.

Nohradhar, a small hamlet located in the Sirmour district of Himachal Pradesh lies approximately 115 Kilometres from Shimla. The range having an area of 2500 ha with altitude varying from 2000m-3600m amsl. Slope of the study area varies from 50-75%. The geo-coordinate of infected site is 30° 49′ 51.48″ N and 77° 26′ 1.02″ E. The patches of *Quercus semecarpifolia* and *Rhododendron arboretum* occurs in between 2450 m -2700 m amsl (Subramani, 2006). Subramani, *et al.* (2014) recorded 352 species of phenerogams comprising 251 dicotyledons, 97 monocotyledons and four species of gymnosperms belonging to 85 families from Nohra Forest Block of Churdhar Wildlife Sanctuary.


It is quite evident by now that the present investigation deal with the mortality of kharsu oak which is mainly due to the insect pest and disease incidences. But, what lead to this disproportionate population of the organisms is also required to be looked into.

## Methodology Adopted:

In order to draw some specific but basic conclusions from the present assessment, the sample size and numbers of trees sampled in the survey area were based on the random sampling. Sample plots of the size 10m x 10m were laid in compartment RF Nohra C-3 and observations were recorded as per the indicators given in the table below;

**Indicators identified to assess the health status of forest**

| S.No. | Indicator | Description |
|---|---|---|
| **1.** | Biotic and abiotic pressures | • Grazing pressure<br>• Fuel wood collection<br>• Forest fires |
| **2.** | Vegetation | • Tree, shrub and herb species<br>• Tree density<br>• Girth classes<br>• Natural regeneration |
| **3.** | Edaphic factors | • Soil pH<br>• Soil moisture |
| **4.** | Insect-pest attack | Incidence of beetle, borer, defoliator or the insect pests or their remains, if any. |
| **5.** | Fungal infection | • Symptoms like colour changes in leaves, canker, punk knots, decay in stem, and decay in roots.<br>• Appearance of fungal conks on living/ drying/ dead.<br>• Holes/ hollowness in the crown region of living trees. |

## Field/ Visual Observations:

**Preliminary observations made during the survey are as under:**

1. Overall health of RF Nohra C-3 compartment supporting mainly of kharsu oak was not so sound as it was apparent from the presence of scattered dead trees and trees in various stages of drying.
2. Early defoliation i.e. leaves falling prematurely in kharsu oak was also observed.
3. Heavy growth of ferns and mosses was observed on the bark of the dead trees.
4. *Rhododendron arboreum* trees were also dead or in various stages of drying.
5. Insect larvae were seen below bark in the wood of dead trees.
6. Fungal fruiting bodies were seen on the base of dead trees.

7. Fungal mycelium was observed on inner side of the bark and also inside the wood of dead trees.

## Preliminary Findings:

Results of the close scrutiny of the study area and assessment of symptoms including laboratory analysis of the investigations revealed as under;

## Ecological Aspects:

The vegetation of study site was dominated by *Quercus semecarpifolia* followed by the presence of *Rhododendron arboreum* and *Picea smithiana.* The associated shrubs recorded were, *Cotoneaster* sp.*, Berberis* sp.*,* and *Viburnum* sp*.* The associated herbs were *Artemisia* sp.*, Arisaema* sp.*, Anaphalis triplinervis, Galium asperifolium, Geranium* sp., *Origanum vulgare, Oxalis* sp., *Phlomis* sp., *Ranunculus* sp., *Micromeria* sp., *Sedum* sp., and *Viola serpens*. Ferns like *Asplenium*, *Selaginella, Polystichum* and *Onychium* were also observed on the ground. The natural regeneration of kharsu tree species was found to be quite poor in infected compartment. The drying of kharsu oak trees was observed in almost in all the diameter classes irrespective of tree density

Mortality was recorded maximum in *Q. semecarpifolia* and few trees of *R. arboreum* were also found dead or different stages of drying. No scars of forest fire were observed on the stem of trees. The average pH of soil was 5.43 and the average soil moisture was recorded 53.13 per cent. The slope was steep and there was no possibility of any water logging. Grazing pressure and lopping for collection of fodder, mainly by the local inhabitants were quite discernible in the study area. Dead trees were covered with ferns and mosses point out specifically at the humid conditions in the area which can contribute towards spread of insect-pests and diseases.

Grazing pressure

Lopped tree

Fodder collection

Dead tree covered with ferns and mosses

Since, *Q. semecarpifolia* is a temperate, timberline, multipurpose oak species and plays an important role in the Himalayan ecosystem. Human pressure, predation, short-lived acorns,

failure of good seed crop every year followed by poor regeneration, desiccation, frost sensitivity and climate change may lead to complete extinction of the species in a very near future. In view of this immediate attention for conservation and restoration measures of the Himalayan ecosystem, in which this species grows, is essentially required.

## Entomological Aspects:

Drying of kharsu oak trees seems to have alarmed a series of perception in Nohra Wildlife Range of Shimla Wildlife Division. During the spot observations, it was noticed that tree mortality is certainly very alarming and might have occurred due to some external biotic or abiotic pressures. Insect attack mainly by larvae/ larval infection could have added to varied such reasons leading towards high mortality of these trees. Further, analysis of the site on the entomological lines and reasons behind including the intensity of insect attacks it was found that the trees were not drying due to the insect attack, yes minor attack of borer on drying trees was noticed and accordingly, other abiotic or biotic reasons may be responsible for the cause. Recent studies elsewhere on the drying of forest trees had revealed that over a period of time various species of forests trees all over the globe have become vulnerable to insect attacks due to various pre-dominant reasons may be biotic and abiotic leading towards drying and dying of these important resources. Sometimes these attacks are sporadic and sometime epidemic outbreaks and at that time these attacks becomes difficult to contain. This problem is akin to such observations, and hence, for developing long term solutions for the problem require proper and detailed research on this species of significance especially in Himalayan settings.

Sampling from invaded tree

Insect borer (Coleoptera) on dried tree

No borer attack observed on green trees

## Pathological Aspects:

Coming on to pathological issues attached to the existing problem, as per the visual observations made in the study area, the kharsu oak trees were at different stages of drying. Fungal conks were observed on most of the dead trees whether uprooted or standing. These fungal conks were even seen on few of the living and healthy trees showing susceptibility of this natural wealth in the time to come thereby leading towards an alarming situation. The preliminary observations on the presence of these fungal

conks identified them as the species of *Ganoderma lucidum* and *G. applanatum*, which are supposed to be the deadly fungus and are known to cause root rot in tree species. The mycelial characters of the fungi isolated in laboratory on artificial media from the decayed wood of trees also exhibited the features of basidiomycetes. *G. lucidum* having wide host range and infecting more than 144 tree species worldwide (Fernando, 2008), including species in India (Kumari and Harsh, 2004). *G. lucidum* and *G. applanatum* infect the roots and lower trunk (butt) of many deciduous trees and some conifers. They have also been found attacking lower heartwood and at advanced stages, damage the structural integrity of the host tree, often resulting in wind throw. Trees affected by fungal rot may exhibit yellowing, wilting, or undersized leaves and dead branches. Tree vigour may decline as decay of the sapwood advances. The first visible sign of infection is often the formation of fruiting bodies on the lower trunk and exposed root areas. Young trees as well as older, larger ones can be killed by this disease. Unfortunately, by the time the conks are noticed, it becomes too late to reverse the infection. Similar symptoms were observed on the *Quercus semecarpifolia* and *Rhododendron* trees of the studied compartment of Nohra WL forest range, clearly supporting the observations behind.

## Sporophore of *Ganoderma* species:

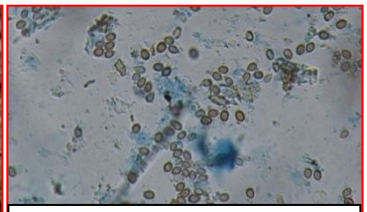
*Ganoderma lucidum* commonly known as the varnish fungus, is a pathogen that enters openings in root systems of many tree and shrub species. Fruiting bodies of *Ganoderma* commonly develop on affected plants, usually at base or apparently on the ground but in the later case, these bodies are invariably attached to the decayed roots. Due to the presence of sporophores, it is easy to locate the infected plants. When compared with the ecology of the area, it is reflected quite clearly that various biotic interferences prevailing in the area, contributed towards initial invasion of the fungus.

## Type of Damage:

*G. lucidum* infects roots through roots intact as well as through injured surfaces. It attacks and kill the bark and causes white spongy rot in the sapwood. Infected plants exhibit pale foliage which eventually dries up. Young plants are killed soon after infection but in case of mature trees the complete process takes time and the trees get killed when most of roots become affected. The fungus produces thin white mycelial mat between the bark and wood.

Tree bark covered by fungal conks

Fungal conk at the base of tree (Inset: closer view)



*Ganoderma lucidum* spores

Fungal mycelia in the infected wood

**Life Cycle of *Ganoderma* species*:***

New spores released from the existing conks keep on dispersing throughout the summer during humid periods and infect open wounds on root flares and lower trunk areas of susceptible trees. The spores germinate and the infection advances to attack the sapwood of major roots and the lower tree trunk. The amount of decayed wood increases year after year, resulting in dangerously soft, spongy wood in the part of the tree that serves as its anchor. The conks are annual and accordingly, new conks keep on forming each summer and fall, after which they die and deteriorate, leading towards continues invasion and infection.

**Management Strategies:** Since, a part of the compartment RF Nohra C-3 was visited and observed to assess and ascertain the cause behind drying of trees and where fungal pathogen *Ganoderma* sp. and insect borer (Coleoptera) attack was recorded on dried trees. Hence, reasons for the initial attack of fungus and insect were attributed mainly to the biotic interferences experienced by the sites. Microclimatic conditions prevailing in the area further facilitated the development of insect-pest and diseases. Hence, initial management strategies have been recommended on the basis of these preliminary investigations. But detailed investigations are essentially required to study the complete process of infection and devise specific management measures for formulation of suitable strategy.

**Cultural practices:**

1. **Proper maintenance:** Good cultural practices (planting, pruning, controlled lopping etc.) will help in containing the further spread of such incidences, thereby, maintaining the health and vigour of these stands.
2. **Avoiding damage to tree trunks and roots:** Even small wounds on trees can facilitate infection by decaying fungi, hence, people need to be made aware of such practices with a clear objective to minimise harm to these forest stand, both young and old.
3. **Isolation and protection of the infected area:** Some steps are essentially required to be taken for the protection of such forest stands by fencing the infected areas so as to prohibit the entry of human and animals in view of fact that animals and humans always act as the primary cause of further spread of the disease.
4. **Isolation trenches:** Root diseases generally spread in plantations from root to root contact or through root graft resulting in diseased plants occurring in groups. Isolation trenches (30cm wide, 70 cm deep) can prove effective in containing the disease in between the trenches thus, preventing its spread beyond. It may be advised to dig an additional trench which should include one apparently healthy plant immediately after the first trench.
5. **Eradication:** Removal of trees those exhibit conks on the lower trunk and exposed root areas is required. Since, large trees with severe internal rot may fall with little warning thereby, injuring people and causing extensive property damage as soon as possible. Since, the conks on the dead/ dying trees serve as potential inoculum source for the

further spread, drying trees should be removed during winter when fungal inoculum is minimum.

For achieving the effective management of disease, stump removal must be fairly complete, as even small-infected roots left in the site may initiate new infection centres. Severity of disease may depend on site conditions like drought or high soil moisture, species composition in the earlier and also in the present stand, soil alkalinity, spacing and thinning. In infected sites, it is possible to reduce further losses by raising disease resistant forestry species.

**Chemical control:**

Chemical control of the forest diseases is generally not recommended due to huge expenses and harm caused to wildlife, beneficial microbes and insects, associated healthy vegetation and contamination of soil and underground water resources. Though, specific application of fungicides for the control of *Ganoderma* root rot on oaks, is not available, yet Nirwan *et al.* (2016) reported the use of Bavistin, Mancozeb and Propiconazole quite effective under laboratory conditions.

**An Advisory:**

Even after the infected tree has been removed, *Ganoderma*- a highly destructive fungus - remains active in the soil for some time. Hence, it is advised that planting of new seedlings in the areas/ adjacent areas should not be taken up and at the same time. Extra care must be taken to prevent wounds and stresses on neighbouring trees. Pruning of the trees is recommended only during winter or in the late spring, when the fungus is dormant and the tree have full time to recover, but wound dressings must be avoided, in view of the fact that such actions will allow the deadly fungus to enter into the tree system through opening of these wounds which then will grow further, thereby, aiding the proliferation of the fungus in the system.

**Literature cited:**

Allard, G.B., Fortuna, S., See, L.S., Novotny, J., Baldini, A. and Courtinho, T. (2003). Global information on outbreaks and impact of major forest insect pests and diseases. Paper presented at XII FAO World Forestry Congress, Quebec City, Canada.

Butler, E.J. and Bisby, G.R. (1960). The fungi of India, 552pp. Revised by R.S. Vasudeva. IndianCoun. Agric. Res., New Delhi.

FAO (2003). An illustrated guide to the state of health of trees. Recognition and interpretation of symptoms and damage. Eric Boa, Diagnostic and Advisory Service, CABI Bioscience, Egham, Surrey, United Kingdom.

Fernando, K.M.E.P. (2008). The host preference of *Ganoderma lucidum* strain for three species of Fabaceae family: *Cassia nodosa, Cassia fistula* and *Delonix regia.* J. The National Science Foundation of Sri Lanka, 36: 323-326.

Helms, J. 1998. The Dictionary of Forestry. Society of American Foresters.

Kumari, S. and Harsh, N.S.K. (2004). Host range of *Ganoderma lucidum* in India. Indian Journal of Forestry, 27: 213-215.

Muraleedharan, N. and Chen, Z.M. (1997). Pests and diseases of tea and their management. *J. Plantation Crops*, 25: 15–43.

Nirwan , B., Choudhary, S., Sharma, K. and Singh, S. (2016). In vitro studies on management of root rot disease caused by *Ganoderma lucidum* in *Prosopis cineraria*. Current Life Sciences, 2(4): 118-126.

Philip, M. David, R. and Leon, A. (1983). Oak decline. Forest Insect & Disease Leaflet.165: 1-8.

Ploetz, R.C., Zentmyer, G.A., Nishijima, W.T., Rohrbach, K.G. and Ohr, H.D. (1994). Compendium of tropical fruit diseases. APS Press, St Paul, 88 p.

Schroth, G., Krauss, U., Gasparotto, L., Duarte Aguilar, J. A and Vohland, K. (2000). Pests and diseases in agroforestry systems of the humid tropics. *Agroforestry Systems*, 50: 199–241.

Singh, A.P. (2011). Incidence of Oak Borers and Oak Mortality in Garhwal Himalaya, India. Indian Forester, 137 (10): 1188-1193.

Singh, G., Rai, I.D. and Rawat, G.S. (2012). The mortality of banj oak (*Quercus leucotrichophora* A. Camus) trees in Mussoorie, Uttarakhand: is it an alarming call for rapid degradation?. Current Science: 102 (12): 1622-1623.

Singh, J.S. and Singh S.P. (1992). Forests of Himalaya, Gyanodaya Prakashan, Nainital, India.

Spaulding, P. (1961). Foreign diseases of forest trees of world. Agric. Handbook 197,U.S. Dept/ Agric. 361 pp.

Subramani, S.P. (2006). Systematic studies on the flora of Churdhar Wildlife Sanctuary, Himachal Pradesh. Ph.D. Thesis. Forest Research Institute, Deemed University, Dehradun Uttarakhand.

Subramani, S.P., Kapoor, K.S. and Goraya, G.S. (2014). Additions to the floral wealth of Sirmaur District, Himachal Pradesh from Churdhar Wildlife Sanctuary. Journal of Threatened Taxa, 6(11

**Annexure 28**

**Format for recording field observation**

**Data Sheet-1**

**Data sheet for Leopard & other Carnivore Sign Encounter Rate**

Observer Name:_____ Date:_____

Start Time:_____ End Time:_____

Begin GPS: Lat:_____ N, Long:_____ E,

Forest Circle _____ Forest Division:_____

Range:_____ Beat:_____

Total Kms. Walked:___Km. Time Spent in any other activity___Min.

| Sr. No. | ˆCarnivore Species | *Sign Type | Forest Type | Terrain Type | Remarks |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |

ˆCarnivore Species to be recorded: Leopard

*Sign Types to be recorded are pugmark, scats, scraps, rake, vocalization, and direct sighting.

**Data Sheet-2**

**Encounter Rate on Line Transects**

Observer name: ..... Start Time: .....

Date: ..... End Time: .....

ID No. of Line Transect: ..... Total Length: ..... Km

Forest Circle: ..... Forest Division: .....

Range: ..... Beat: .....

Transect Forest Type: ..... Transect Terrain Type: .....

Weather condition: Cloudy/ Clear Sky

Beginning GPS Lat: .....N Long: .....E

End GPS Lat: .....N Long: .....E

| Sr. No. | Time | *Species | Total Number (Adult&Young) | Young | Forest Type | Terrain Type | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |

*Species that need to be recorded on the transect: Goral, Barking Deer, Sambar, Langoor, and other mammalian species seen.

**Data Sheet-3A**

**VEGETATION**

Name of Observer: .....  Date: .....

Forest Circle: .....  Forest Division: .....

Range:.....  Beat:.....

ID No. of Line Transect: .....

| **Distance** of the plot from beginning of transect in metres | **Canopy Cover** (0-1) | **Tree Species** (Descending Order of Abundance, all veg.>6ft.) | | | | | **Shrub Species** (Descending Order of Abundance, all veg.>20 cm &<6 ft.) | | | | | **Shrub Abundance** 0 to 4, 0-absent,4-very high | **Weed/ Invasive Species**(Descending Order of Abundance) | | | **Remarks** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | | **1** | **2** | **3** | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

**0-absent to 4-very high**

**Data Sheet-3B**

**Recording Ground Cover (1 m radius or 2m diameter plot)**

Name of Observer:..... Date: .....

Forest Circle: ..... Forest Division:.....

Range: ..... Beat: .....

ID No. of Line Transect: .....

| **Distance** of the plot from beginning of transect in meters | **Dry leaf litter** % | **Ground Cover** (The following 5 columns should total 100%) | | | | | **Grass Species** ( Report in descending order of numbers) | | | **Herb Species** (Report in descending order of numbers) | | | **Remarks** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Dry Grass %** | **Green Grass %** | **Herb(Small Plants) %** | **Weeds %** | **Bare Ground %** | **1** | **2** | **3** | **1** | **2** | **3** | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Data Sheet-4**

**Pellet Counts of Ungulates**

Name of Observer: ..... Date: .....

Forest Circle: ..... Forest Division: .....

Range: ..... Beat: .....

ID No. of Line Transect: .....

| Distance of the plot from beginning of transect in metres | Forest Type | Terrain Type | Goral | Barking Deer | Langoor | Porcupine | Cattle | Goat & Sheep | Other Wild Animals/ Unidentified | Other Domestic Livestock |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| *Present /Absent | | | | | | | | | | |

To the best of your knowledge do the above mentioned species occurs in the sampled beat irrespective of whether their dung was recorded or not.

1. Do goat/ sheep graze in the sampled area?

2. In case pellets are obtained in large piles then these could be categorised into the following categories:

| No. of Pellets | Category |
|---|---|
| 50-100 | A |
| 100-200 | B |
| >200 | C |

**Data Sheet-5**

**Bird Count using Variable Radius Point Count Method**

Date: ..... Time: ..... Place: .....

Location:..... Climate: ..... Transect Name: .....

Starting Time: ..... End Time: ..... Length of Transect: .....

Altitude: ..... Habitat: Natural/Plantation

| Plot No. | Species | Numbers | Perpendicular Distance | Activity | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Data Sheet 6**

**Line Transect: Ungulates & other mammals**

Transect No. Name: Date:

Weather: Length of Transect: Area:

Bearing: Time Start: Time End:

Terrain: Hills/ Plain

| Time | Species | No. | Left/Right | Sighting Angle | Angular Sighting Distance | Remarks (Age&Sex etc.) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Data Sheet 7**

**Estimating relative abundance of animals based on pellet/dung density**

Team: Date: Starting Time: End Time:

Place: Terrain: Bearing: Weather:

| Plot No. | No. Of Goral Pellets | No. of Barking Deer Pellets | No. Cattle Dung |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Method: Circular plot-(10 $m^2$) Belt Transect-(2x 30m)

Barking Deer: 20-26 Pellet groups/day/per deer

Goral: 20-26 ? pellets groups/day/goral

**Data Sheet 8**

**Road side habitat and animal monitoring**

Team: Date: Starting Time: End Time:

Place: Terrain: Bearing: Weather:

| 500m Segment | Animals | | | Vegetation Type | | Terrain Type | | Presence of | | Livestock | Visibility | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Species | No | PSD | L | T | L | R | Water | Human | | L | R |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Vegetation Type:

Terrain types: (Plain, Undulating, Hilly) L-Left side, R-Right side, PSD- Perpendicular sighting distance

**Data Sheet 9**

**Block Count (Ungulates & other major mammals)**

Team: Date: Starting time: End time:

Place: Weather: Bearing: Area:

| Time | Species | No. | Adult | | Y | UN | Movement (L/R) | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | M | F | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Data Sheet 10**

**Reptile Quantification (Encounter rate method)**

Date: Time: Place: Location:

Climate: Transect Name: Starting Time: End Time:

Area covered: Altitude: Habitat/Undisturbed/Partially disturbed

| S No | Species | Numbers | Microhabitat | Activity |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# Call Count Data Sheet

Trail: Station//: Observer (s): Date:

Starting Time: Ending time:

Weather:

Wind speed: 0-15 kph 16-30 kph >30 kph

Precipitation: None fog Light rain Heavy Rain Hail

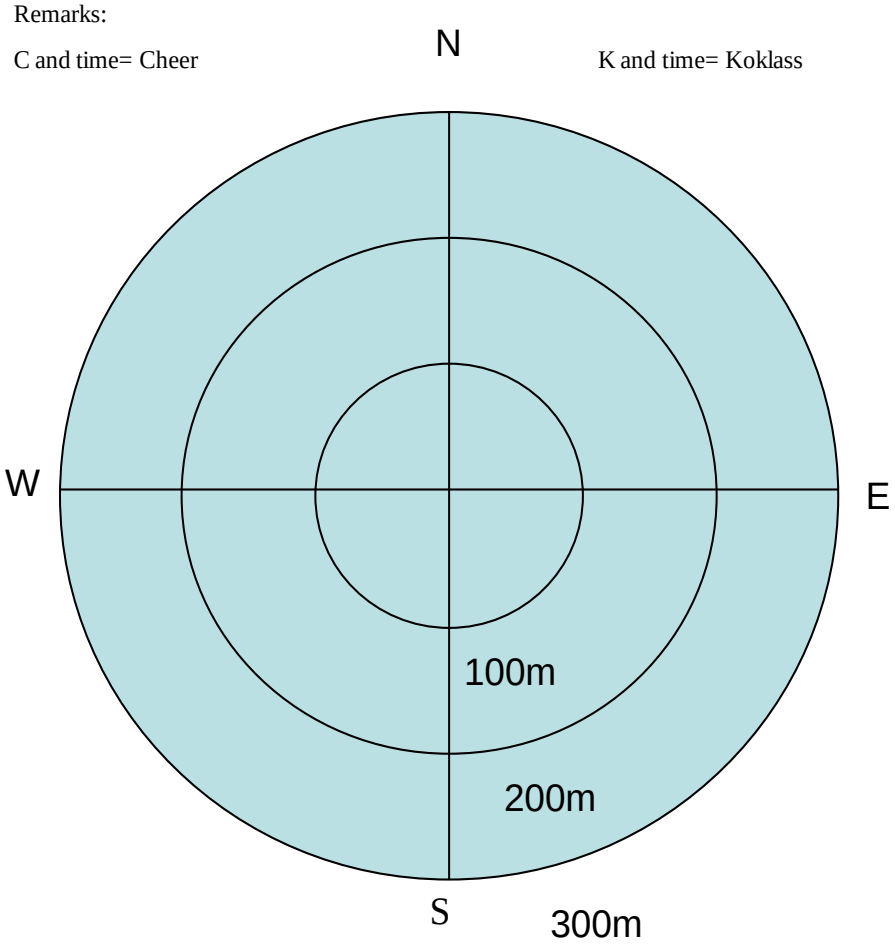
Cloud cover: Sunny Partly cloudy Dense clouds

Temp.: 0-10 C (32-50 F) 11-20 C (50-70) 21-30 C (70-85 F) > 30 C (>85 F)

Influences on audibility:

Remarks:

C and time= Cheer K and time= Koklass



## Annexure 29

# Control Forms

**Form 1**:

**Creation of new artificial waterbodies**

| Sr. No. | Category | Year | Location | Cost | Performance |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Note**:

Category: Masonry anicut, earthen bund, lined depression, borewell and pump, reservoir, spring fed, aquifer; permanent or temporary

Location: By compartment or by a named feature and name given if any

Performance: Successful, partially successful, failure (give reason for the latter two)

**Form 2**:

**Maintenance of Waterbodies: Natural**

| Sr. No. | Category | Perennial or Seasonal | Location | Year | Nature of work | Cost | performance |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**:

Category: Spring, seep, natural depression, a flowing stretch, reservoir

Location: By compartment or by a named feature and name given if any

Nature of work: Desilting, provision of apron, any other category

Performance: Successful, partially successful, failure (reason for the last two)

**Form 3**:

**Maintenance of waterbodies: Artificial**

| Sr. No. | Category | Perennial or Seasonal | Location | Year | Nature of work | cost | Performance |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Note:

Category: Masonry anicut, earthen bund, lined depression, spring fed, aquifer etc.

Location: By compartment or named feature and name given if any.

Year: Year of maintenance, with year of establishment in parenthesis

Nature of work: Desilting, repairing leaks, closing anicut openings, any other work.

Performance: Successful, partially successful, failure (reason for the latter two).

**Form 4**:

**Restoration of Habitat: Weed control, Initial Operation**

| Sr. No. | Location & Name of site | Year | Extent of area (Ha) | Species of weed | Operation | Total Cost | Cost per ha | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Location: By compartment, site name or land feature

Operation: Uprooting, cutting, burning, ploughing, manual or by using animals or machinery

Remarks: Measure of success and/or problem faced.

**Form 5**:

**Restoration of Habitat: Weed Control, Subsequent Operations**

| **Sr. No.** | **Location & name of site** | **Year** | **Extent of area (ha)** | **Complete or partial coverage** | **Species of weed** | **Operation** | **Total cost** | **Cost per ha** | remarks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Note**:

Location: by compartment, site name or land feature

Operation: Uprooting, cutting, burning, ploughing, manual or by using animals or machinery.

Remarks: Percent cover of weeds before operation, problems, if any.

**Form 6**:

**Restoration of Habitat: Control of Regeneration of Woody species in Grasslands**

| Sr. No. | Location & Name of site | Year | Extent of area ( ha) | Species Controlled | Operation | Total cost | Cost per ha | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Location: By compartment, site name, etc.

Species controlled: List of species.

Operation: Uprooting, cutting, burning etc. manual or mechanised methods.

Remarks: The measure of success, suitability of methods, problems encountered.

**Form 7**:

**Restoration of Habitat: Prescribed Burning**

| Sr. No. | Location & Name of Site | Year | Extent of area ( ha) | Area treated (ha) | Period | Total cost | Cost per ha | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Location: By compartment or name of site.

Period: Date of starting operation and completion.

Remarks: Mention resultant structure e.g. a mosaic, % burnt, % intact.

Problems encountered in conducting the operation e.g. fire escape.

**Form 8**:

**Restoration of Habitat: Soil Conservation Measures- Initial Operations and Subsequent Maintenance**

| Sr. No. | Location & name of site | Year | Extent of area(ha) | Area treated | operations | Total Cost | Cost per ha | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Location: by compartments, name of site or landmarks.

Extent of area: Total area identified for such treatment. In case of streams or gullies, the length involved.

Area treated: If linear feature then quote length; otherwise area.

Operation: Structures involved such as gully plugs, trench-cum-mound, terracing, spurs and bunds etc. quote quantity nos. and $m^3$ of earthwork.

Remarks: Mention if initial work or maintenance.

**Form 9**:

**Restoration of Habitat: Planting, Sowing, etc**.

| Sr. No. | Location | Year | Extent of area (ha) | Species | Planting Stock | Spacing | Operations | Total cost | Cost per ha | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**Note**:

Location: By compartments, or landmarks and describe the site factors e.g. vegetation cover, soil, perturbations etc.

Planting stock: Kind and condition e.g. root shoot, naked root seedling, seedlings in polythene bags, age or average size.

Operation: Mention site preparation if any, crowbar holes, pits and pit size, trench, seed sowing (rate), and protection measures.

Remarks: Mention operational problems if any.

**Form 10**:

**Animals: Measuring Trends in Population**

| Sr. No. | Species | Population estimation methodology | Adult | | Sub-adults | | Yearlings | Fawns | Cubs | Total | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | Male | Female | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Note**:

Population estimation: e.g. pugmark, line transect, roadside count etc., area covered, sampling intensity, data treatment, extrapolation where involved. In case of indices of density or dung count, mention those figures under the remarks column. Describe age classes for each species.

Remarks: Operational problems, protection problems, any other useful information. Indices of density or dung count details to be recorded here.

**Form 11**:

**Animals: New Records**

| Sr. No. | Species | Location | Year | How Discovered | Detail of Number, age, Sex | Habitat Description | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**: Animals will include vertebrates and invertebrates.

How Discovered: Sighting, dead specimen, reliability of sighting, captured specimen, incontrovertible other evidence.

Number, age, sex etc.: As applicable to vertebrates.

Habitat description: Broad Habitat description such as vegetation, and elements such as water, large old trees, den trees, snags, down log material. Use habitat descriptors only if relevant.

Remarks: Any other useful information.

**Form 12**:

**Animals: Mortality other than that attributable to an offence**

| Sr. No. | Species | Location | Year | Sex & Age | Number | Discovered in What Condition | Cause of mortality | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Location: By compartment, landmark etc.

Sex & age: As per parameters for age class. Sex, if possible to identify.

Discovered in what condition: Carcass, complete or partial. Skull or any other recognisable remains collected where only some remains of an animal are found.

Cause of mortaility: If known e.g. territorial fight, accident, possible disease( following post-mortem results), old age, cause difficult to determine, predation etc.

Remarks: Any other useful information.

**Form 13**:

**Animals: Mortality Attributed to Poaching or an act of Vandalism**

| Sr. No. | Species | Location | Cause of Mortality | | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Number | Sex | Age | Class | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**: Location: By compartments or landmarks.Cause of mortality: Whether the animal was intact or remains found, article or trophy to be recorded. Cause if known e.g. animal snared, shot or poisoned etc. Remarks: Any other useful information, especially matters of illegal trade.

**Form 14**:

**Animals: Killing of human by wildlife or injury caused**

| Sr. No. | Range | Month | No. of incidents | No. of people killed, age & sex | Location, circumstances & species | No. of people injured, age and sex | Location circumstances and species | Ex gratia payment (Rs) |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**: Location, circumstances and species: Location by Compartment Number, activity, species responsible on proof.

**Form 15**:

**Plants: New Records**

| Sr. No. | Family | species | Year | Location | Habitat | Status | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**: Habitat: Description by vegetation associates at various levels, % canopy closure if relevant, soil/site, microhabitat elements such as higher level of moisture, woody debris or humus etc. Status: A broad idea on its frequency, national status e.g. endangered, rare, endemic etc.

Remarks: any specific information.

**Form 16**:

**Plants: Disease and Mortality**

| Sr. No. | Species | Location | Year | Particulars of disease morbidity & mortality | Area affected | Remarks |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Note**:

Location: By compartment or landmarks.

Particulars of disease: In case of trees, the mortality by diameter classes and number, symptoms, insect pest activity or any other external indicators if visible, none if not seen. No mortality but infestation detected, mention that as morbidity.

**Form 17**:

**Construction/Maintenance of Infrastructure: Roads & Bridges (existing/ new)**

| Sr. No. | Category | Range | Surface | Name or number | Length covered ( km) | Cross drainage works, bridges | Total cost and status |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**:

Category of road: National highway, state highway, district road etc. public road, forest road or open only to managers should be stated.

Surface type: Black topped, metal, earth etc. Applies to roads.

Name or Number: As the case may be.

Cross drainage type: e.g. culverts, hume pipe culvert etc.

Bridge type: Wooden trestle, suspension, metal multi span, masonry arch etc.
Status: Work completed or ongoing. State also the agency responsible; state whether operational or non-operational.

**Form 18**:

**Construction/ Maintenance of Infrastructure: Buildings (existing/ new)**

| Sr. No. | Range | Nature of the Building | Location | Type of construction | Numbers | Total cost | Status |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**: Nature of the building: e.g. residential, office, store, chauki, watch tower, tourist facility, hide, barrier, patrolling camp (temporary or permanent) etc. Location: By compartment or landmark as appropriate. Type of construction: Masonry (brick/stone), log or wooden, metal, local material etc.

Status: Completed or ongoing.

**Form 19**:

**Development/ Maintenance of Infrastructure: Vehicles (Existing/ New)**

| Sr. No. | Kind of Vehicle | Number | HQ if any | Intended use | Cost | Remarks |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Note**: Kind of vehicle: Jeep, motorcycle, bicycle etc.

Intended use: Management support, patrolling/ anti-poaching, tourism etc.

Remarks: Any other useful information. Mention written off vehicles.

**Form 20**:

**Developing Infrastructure: Construction of Boundaries, fences etc. ( Existing/ New)**

| Sr. No. | Category of Construction | Range | Location | Length(m) | Numbers | Specifications | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Note**: Category: Kind of boundary e.g. compartment, block, zone etc. In case of fences: barbed wire fence, inter-linked chain fence, others.

Location: By compartment or suitable landmark.

Numbers: Number of pillars etc.

Specification: As applicable to the construction: dry rubble, chain link, local material, height, area, depth, width etc.

Remarks: Any other relevant information.

**Form 21**:

**Developing Infrastructure: Fire lines (Existing/ New)**

| Sr. No. | Range | Fire line category and width | Name of points connected | Length(m) | Cost | Remarks |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Note**: Category: Main or subsidiary etc.

**Form 22**:

**Tourism**

| Sr. No. | The category of visitors by month & number | | | | | Indian | | Revenue |
|---|---|---|---|---|---|---|---|---|
| | Adult | | | Children | Foreigners | Rural | Urban | |
| | Month | Male | Female | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Form 23**:

**Eco-tourism: Visitors Aspirations**

| Visitor Category | | | | | | Number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indian | | | Foreigners | | | | Plants | Bird watching | Animal sighting | Photography | Scenic places | Historical sites | Trekking | Other |
| Male | Female | Children | Male | Female | Children | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

**Form 24**:

**Outbreak of Fires**

| Sr. No. | Year | Location | Extent(ha) | Dates | | Reasons | Estimated loss | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | Detected | Controlled | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**: Location: By compartment

Reasons: Established or suspected

Estimated loss: e.g. number of trees damaged wild animals dead, particulars of sensitive sites affected, other property or life destroyed.

Remarks: State particularly problems encountered in detection and suppression and any other useful information. State also, whether, the extent of fires has been mapped.

**Form 25**:

**Offence cases detected**

| Sr. No. | Year | Category | Numbers | Number of cases decided | | Number of cases under process | Number of cases compounded | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | Successful | Failure | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Category: e.g. illegal cutting of trees, illegal fire-wood, poaching, encroachment, illegal cattle grazing etc.

Remarks: Any other useful information.

**Form 26**:

**Survey and Monitoring**

| Sr. No. | Title of survey, inventory activity | Completed | ongoing | New | By PA | By other agency | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Form 27**:

**Eco - development Programme: Targets and Implementation**

| Sr. No. | Nature of the Programme | Sector(Central/State) or NGO sponsored | Target set | | Achievements | | Village | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | Physical | Financial | Physical | Financial | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Note**:

Nature of the programme: e.g. pasture development, fodder plantations, livestock improvement, revival of local skills such as handicraft, water harvesting systems etc.

Remarks: State problems, state failures and reasons thereof, reasons for not attaining targets, for non-implementation or deviation etc.

**References:**


1. Kulkarni Jayant, Mehta Prachi. Management plan of Churdhar Sanctuary (2008-09 to 2012-13)

2. Chauhan Satyan, 2007. Churdhar Wildlife Sanctuary" Socioeconomic Survey, March- April 2007. Report Submitted to Himachal Pradesh Forest Department (Wildlife Wing)

3. Sawarkar V.B. 2005. A Guide For Planning Wildlife Management in Protected Areas and Managed Landscapes. Natraj Publishers, Dehradun.

4. Srivastava M.B., 1991. Working Plan of Rajgarh Division, 1991-92. Vineet Kumar, 1998. Working Plan of Nahan and Paonta Sahib Divisions, 1998-99 to 2012-13.

5. Wildlife Institute of India, 2005. Strategic Plan, Conservation of Endangered Wildlife in Himachal Pradesh. Project Forumlated for Himachal Pradesh Forest Department as a part of the Execution of Parbati Hydroelectric