

**FORESTRY RESEARCH EDUCATION AND EXTENSION PROJECT
GREAT HIMALAYAN NATIONAL PARK
FREE-GHNP RESEARCH PROJECT**

Consultancy Report No. 3

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Work Schedule

15.07.1995	Organised and coordinated Start-up Workshop of FREE-GHNP Research Project at Sai-Ropa.
16.07.1995	Sai-Ropa to Rolla on a field visit alongwith the WII resource persons, researchers and consultants of FREE-GHNP Research Project.
17.07.1995	Return journey to Dehradun.
10.10.1995	Arrival Banjar and meeting with the researchers and Park officials. Discussions regarding the field visit and methodology.
11.10.1995	Banjar to Gushaini. Started laying sample points (plots) from Gushaini Devata tree onwards at an interval of 250m. Trekked upto Kharauncha. Made observations on Kaleej pheasant habitat.
12.10.1995	Trek from Kharauncha to Dilunga thatch. Made observations on Koklash habitat.
13.10.1995	Dilunga thatch to Chordwari. Continued marking of sample points at 250m interval. Heard morning chorus of Koklash at Dilunga thatch.
14.10.1995	From Chordwari onwards observed Western Tragopan, Koklash and Monal habitat. Reached Guntrao thatch and camped. Also heard morning chorus of Koklash at Chordwari.
15.10.1995	Guntrao to Patal thatch to Dhela thatch in Sainj valley. Continued with marking of sample points. At Guntrao heard Koklash morning chorus.
16- 17.10.1995	Camped at Dhela thatch. Seen and heard Monals in Kharsu (<i>Quercus semicarpifolia</i>) forest.
18.10.1995	Dhela to Shakti village. Made observations on pheasant habitats enroute. Continued with marking of the sample points.
19.10.1995	Shakti to Neoli village. Observed Koklash and Kaleej habitat enroute.
20.10.1995	Neoli to Kullu. At Kullu, had a meeting with Director, GHNP.
21.10.1995	Returned back to Dehra Dun HQ.

- 11-
15.11.1995 As Principal Investigator on FREE-GHNP Research Project visited Banjar, Galingcha village, Rolla and Larjee alongwith the World Bank Mission.
- 15-
17.11.1995 Field visit to Indo-German Changar Project, Palampur alongwith the researcher on sociological aspects on FREE-GHNP Research Project.
- 18.11.1995 Returned to Dehradun HQ.
- 10.02.1996 Dehradun to Dharamshala
- 12-
13.02.1996 Had a meeting with the Conservator of Forests, Dharamshala, regarding the Kangra Forest Cooperatives Societies.
- 14.02.1996 Dharamshala to Kullu
Meeting with Director, Great Himalayan National Park at Shamshi.
- 15.02. 1996 Conducted a Training Need Workshop at Shamshi in which whole of the field staff of the GHNP participated.
- 16.02.1996 Facilitated presentations and discussions of two reports to the staff of GHNP (i) feasibility review of the Ecodevelopment Project by Mr. H.S. Pabla and (ii) Soil Conservation Aspects of the GHNP by Mr. A.S. Negi.
- 17.02.1996 Return Journey

Executive Summary

The present report is part of Wildlife Institute of India's consultancy support to the FREE-GHNP Research Project on biodiversity conservation. The first part of report deals with the work accomplished by me as the Principal Investigators on the FREE-GHNP Research Project; the second part provides details on setting-up of experimental plots, and the third one suggests pheasants surveys and census methods.

During the formative year of the Project, I drafted the initial research programme which was further evolved through discussions among the WII resource persons, researchers, consultants and local NGOs. The diverse needs of ecodevelopment for biodiversity conservation have necessitated initiation of several of the research studies simultaneously. The results from these studies will be utilized for the Park management through frequent interchange of ideas among the research personnel of WII and the Park officials.

Depending upon my experience at the Great Himalayan National Park, appropriate pheasant survey and census methods have been suggested. These are expected to assist the Project researchers and the frontline staff of GHNP in conducting pheasant surveys and census in GHNP.

A detailed scheme for setting-up experimental plots in GHNP has been prepared for conducting various studies. The efficient use of these sample will depend upon coordination among different elements of the project so that proper research information is drawn from disparate studies in order to interpret common patterns of occurrence, and to extract the information most relevant to future ecosystem monitoring.

Terms of Reference

The following are the allotted Tasks and themes:

Task No.1: Research leadership, coordination and integration and biological monitoring.
Duration : 1 year.

- a) Design a research programme for GHNP based on the outcome of a field workshop.
- b) Coordinate research activities to promote communication among individual studies and integration of results, including the convening of periodic evaluation workshops.

Task No.5: Study on livestock grazing (resident and migratory) impacts on the GHNP and WLSs .
Duration : 1 year.

- c) Set up experimental plots to study various aspects of research work (including grazed and non-grazed or dug and non-dug areas in the thatches).

Task No.6: Assessment of the fauna: biological diversity, ecological requirements and responses to human activities.
Duration : 1 year.

Suggest pheasant surveys and census methods.

Sub-Task No.1

Design a research programme for GHNP based on the outcome of a field workshop.

Coordinate research activities to promote communication among individual studies and integration of results, including the convening of periodic evaluation workshops.

Progress Report 1995-96

The present research and monitoring project of the Wildlife Institute of India (WII) is part of Forestry Research Education and Extension Project (FREEP) funded by the World Bank. In order to ensure long term goals of biodiversity conservation at the Great Himalayan National Park (GHNP), the Himachal Pradesh Department of Forest Farming and Conservation (HPDFFC) initiated this project in 1994. As Principal Investigator, I drafted a research proposal entitled "An Ecological Study of the Conservation of Biodiversity and Biotic Pressures in the Great Himalayan National Park: An Ecodevelopment Approach". The draft proposal further evolved through discussions among the WII resource persons, researchers, and consultants. The process of consultation involved the local villagers and NGOs along with the WII research team members during various field trips and a Start-up Workshop held at Sai-Ropa, GHNP on 15th and 16th July 1995. The present consultancy report discusses the work accomplished by the author as Principal Investigator during the project's formative year 1995-96.

Considering that ecodevelopment for biodiversity conservation is an ongoing and dynamic process, several of the research studies have been initiated simultaneously. Results from different Tasks will be closely inter-related and maximum value will be obtained by frequent inter-change of ideas among participants and between them and the Park staff. A sum of Rs. 9.5 lacs was allotted to WII in April, 1995 to initiate the project work.

Research Personnel

The following research personnel are involved in the FREE-GHNP Research Project:

- (i) Nine researchers (designated as Biologist/Sociologist I, II and III).
- (ii) Seven collaborating individuals from the following institutions:

Jawahar Lal Nehru University, New Delhi;
Delhi University;
Indian Institute of Remote Sensing, Dehradun;
Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore;

Department of Science and Technology, Himachal Pradesh;
Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore;
and
Land Survey Directorate, Dehra Dun.

- (iii) Ten faculty members of the Wildlife Institute of India.

Recruitment of Researchers

In June 1995 interview letters were issued after considering several applications which were received in response to a WII advertisement for recruitment of researchers, and through contacts with various universities, departments, consultants and resource persons. Interview for selection of candidates for FREE-GHNP Research Project were conducted on 5th July, 1995. A total number of 53 candidates were called, out of which only 27 attended the interview. The interview committee selected 7 candidates based on their educational qualifications, professional experience and performance in interview. One candidate was selected as Biologist Gd. III and six were in the category of Biologist Gd. I. Appropriate rules for selection and recruitment of project staff, researchers and consultants were evolved through the involvement of concerned faculty members at WII.

Recruitment of Project Staff

A Project Assistant (PA) was recruited to assist on the FREE-GHNP Research Project. The PA helps in typing work, maintenance of files, material and other records. For accounting and auditing of finances, timely submission of utilization certificate/audited account to the funding agency, the Finance Officer, WII, Audit Officer, WII Accountant and UDC/LDC are contributing to this project. In addition to this, services of attendants are also being utilized. Appropriate rules in order to engage the services of these personnel at the Institute have been framed for their engagement and payments.

Start-up Workshop

On 15th - 16th July, 1995 a Start-up Workshop of FREE-GHNP Research Project was held at Sai - Ropa (Distt. Kullu), H.P. (HQ of Tirthan Wildlife Range of GHNP). This workshop was attended by the Chief Conservator of Forests, (WL), HP, several forest officers of Kullu Forest Circle, Kullu Wildlife Division, HP Forest Corporation, Great Himalayan National Park and Himachal Gyan Vigyan Samiti, consultants from FRLHT, Bangalore; IIRS, Dehradun; Land Survey Directorate, Dehradun; Delhi University; SACON, Coimbatore; and concerned faculty members from the Wildlife Institute of India. Four researchers who had joined the project by then also attended this workshop.

The workshop discussed FREE-GHNP Research Project in detail. All the Tasks as mentioned in the Research Proposal were presented by the respective resource persons and discussed by the participating members. The workshop concluded with the recommendations of execution of the Tasks alongwith some changes.

Setting-up of Research Camp

The researchers started their work from a temporary accommodation at Banjar which is only 10 kms. away from Sai-Ropa. This accommodation can house 8 researchers alongwith their research equipment. There is a proposal of construction of a permanent building for research purposes in the Sainj Wildlife Sanctuary. The present research station set up in September 1995 has provided for local employment through porters, research assistants, demand for vegetables etc. which in itself constitute an ecodevelopment initiative.

Camping Gear for Research Team

All the researchers and faculty members have been provided with appropriate camping gear which includes woolens, rucksacks, sleeping bags, boots, two men and four men tents, carry mats, jackets, trousers, knapsack, water bottles, etc. This is to facilitate the research work in the field during winters when the climatic conditions are quite harsh.

Scientific Instruments

Due to lack of funds very few scientific instruments could be provided under this project so far. However, some of the instruments such as altimeter, thermometer, clinometer, telefix, microscope, compass, wind velocitymeter, rain gauge, alarm clock, tele counter, butterfly net, balance, sherman trap, spring balance, digital thermometer, hygrometer etc. have been provided through the WII Laboratory to the researchers. Only two binoculars could be obtained which is a bare minimum facility for wildlife observations to the researchers. The data collection in the field is in progress using these scientific instruments.

Field Tours

The newly recruited researchers went on tour into all the four valleys of the GHNP by September 1995. In October 1995, three resource persons from WII (including Principal Investigator) accompanied the eight researchers on a preliminary survey of GHNP in Tirthan and Sainj valleys. The party started working along the Tirthan river, climbed into the coniferous, sub-alpine and alpine zones touching an altitude of 4000m from where it crossed into the Sainj river catchment along the ridge. All along this route, the research party noted longitude, and latitude using Global Positioning System (GPS), altitude by an altimeter, slope, vegetation types, occurrence of signs of wild animals at an interval of 250m. About 200 points were marked along this route some of which ultimately can become monitoring points for specific biological and geomorphological parameters.

Presentations

All the researchers made presentations based on their initial field visits to the full house of WII. This provided an opportunity of exchange of views on various aspects of the Tasks given in the research proposal. The presentations helped in formation of ideas in order to improve various elements of the project.

Synopsis Writing

After the preliminary tour, the researchers started writing their synopsis according to the Tasks allotted to them. Meanwhile, the researchers kept on visiting the field and acquainted themselves with the local terrain, configuration of land in order to select their specific study areas. During winters most of the researchers consulted their respective supervisors at WII in order to evolve methodologies for their work to be done in the field. The emphasis is given on coordination of various Tasks so that maximum value of research work can be obtained by frequent inter-change of ideas among the researchers, consultants and WII resource persons.

Consultancy Work

Shri H.S. Pabla, WII resource person completed his work on Task No.4 'Feasibility review of identified village ecodevelopment investments and appraisal of the practicability of the ecodevelopment approaches in the project area'. Similarly, Shri A.S. Negi of Land Survey of India, completed his work on Task No. 12 'Assessment of issues related to soil erosion, landslides and provide technical support to the park management'. Both of these consultants presented their reports to the staff of GHNP at Shamshi. It helped in sharing the preliminary insights of the studies with the officials of GHNP. This process initiated discussions at working-out solutions for implementation of the Ecodevelopment Project at GHNP.

New Recruitment

In early 1996 two researchers discontinued their work. Fresh recruitment for these positions were made in May, 1996 so that the continuity of the work is resumed.

Research Coordination and Integration:

Ecodevelopment for biodiversity conservation is an ongoing and dynamic process. For effective monitoring and evaluation of ecodevelopment alternatives and their effect on biodiversity conservation, research work at GHNP is aiming to have a good understanding of the ecological processes within the major Park ecosystems. The partnership between researchers and the implementers of the project is being evolved in the field.

To improve coordination among different elements of the project, there is a Research Committee, consisting of the Director GHNP, and Project Coordinator, Principal Investigator, & Co-Investigators (Resource Persons) from WII plus outside experts to be co-opted from time to time. Coordinators have been designated for biological, and sociological studies. They are overseeing research in their respective areas to ensure that project objectives are not forgotten and that the best possible use is made of incidental discoveries and opportunities for inter-study comparisons and synergies.

Co-investigators are drawing together information from disparate studies, to interpret common patterns of occurrence, and to extract the information most relevant to future ecosystem monitoring. All researchers and coordinators deposit copies of information obtained with the relevant research coordinator and the Park Director.

Research Linkages

The Wildlife Institute of India is currently conducting a UNDP assisted project "Strengthening Wildlife Management and Ecodevelopment Planning Capabilities". The Project aims at preparing 10 eco-development plans and 10 wildlife management plans for various protected areas in different biogeographic zones of India. Besides, there are several ongoing as well as completed WII research projects in Himalayas. The learnings from these projects and other ICDP projects under operation elsewhere in the world are being used in the present FREE-GHNP Research Project. In addition, there are several projects such as H.P. Forestry Project in Kullu & Mandi district funded by the Overseas Development Agency, Indo-German Changar Project in Kangra district which give emphasis on the participatory management of the natural resources in the state of Himachal Pradesh. The Cooperative Societies in Kangra district are a recent example of involvement of local communities in the management of the forests. Linkages with these projects under the FREE-GHNP Research Project are being developed so that the learnings and outputs are shared and made use of in conducting the research more meaningfully.

Linking Research to Park Management

The following framework is being developed for linking of the research work between the researchers, WII resource persons & consultants and the Park management:

- a) The Conservation of Biodiversity (CoB) Project at GHNP has a prominent component of training which is seen as a key strategy for the capacity building of the field staff and village communities. The mechanism of training involves training need analysis followed by a well planned competence-based training programme. The output of the research will be more meaningful when the Park management and the local communities have requisite skills to comprehend the researched issues.
- b) On the spot interaction between the researchers, WII resource persons & consultants working in the field and the Park management is helping to obtain the maximum value of research. It is envisaged that such interaction will synergize the situation of conservation of GHNP biodiversity by the Park authorities.
- c) Besides presenting formal reports of the study, preliminary insights from the study are being shared with the officials of the Great Himalayan National Park and local officials (if any) in meetings. Such meetings are part of a process of creating a dialogue aimed at working out solutions and evolving feasible recommendations that can be incorporated expeditiously into the implementation of the Ecodevelopment Project.
- d) The programme is flexible to incorporate changes in research directions in response to the initial findings and to make the best use of available skills.

Sub-Task No.2

Set up experimental plots to study various aspects of research (including grazed and non-grazed or dug and non-dug areas in the thatches).

The present research project of the Wildlife Institute of India aims at assisting the management of the Great Himalayan National Park in order to achieve the objectives of ecodevelopment approach for conservation of biodiversity. At the start of the project, there is almost a total paucity of information on ecological and socio-economic aspects necessitating generation of an information base through research. A strategic approach to generate critical information needs of the GHNP on various aspects is to be followed. The main aspects for which information is needed are as below:

1. GHNP-local communities interactions
2. PA management
3. Village ecodevelopment

In order to develop an information base on these aspects, simple methods need to be considered which can be followed by the field staff of the GHNP as well as they can be of help for scientific research by the members of the research team. Collection of baseline data and field research is essential for developing integrated management strategies and ecodevelopment guidelines. This needs to be done keeping in mind the twin objectives of conserving biodiversity and meeting people's needs. For doing so, there is a need to evolve a system of experimental plots which can be easily understood by the Park staff and used for the data-generation by the researchers.

In order to create information on biological diversity and socio-economic aspects, the use of plots, quadrats and different types of transects is made. They are all similar in their nature, entailing different ways of defining a measured area to create a sample. The scale of sampling would decide the choice of use of one of these types. Considering the vast area of the Great Himalayan National Park, it is suggested that the existing trails in the park can be used as transect lines in all the four valleys.

Methodology

The entry points in all the four valleys of GHNP are on the western boundary. The trail starts from the roadhead and goes along the valley-bottom touching the Park boundary after covering about 7 km. in Tirthan valley; 12 km. in Sainj valley; 10 km. in Jiwa Nal valley and more than 50 km. in Parvati valley. After crossing the boundary, these paths either follow the valley-bottom or lead to the hilltops covering various altitudinal gradients. Thus walking along a path can give idea about the vegetation, and animals across the altitudinal variations. This transect line also covers the ecodevelopment project area (EPA) to study GHNP-local communities interactions, impacts of Park management actions as well as the impacts of village ecodevelopment programmes.

The experimental plots can be laid all along the considered transect line (the path). From a statistical point of view, it is better to use many small plots than a few large ones. However, the minimum size should be such as to avoid more than 5% of plots with zero presence of monitoring index. In addition, plots and transects need to be placed randomly with respect to the area being sampled (Gaston and Pandey, 1996). In this regard, regular dispersion of plots on a pre-existing transect line is easier and simpler to arrange and is also valid as long as the arrangement of the transect line bears no relation to regularities in the habitat.

An example of laying experimental sample plots along a transect line in GHNP can be considered : the path or transect line starting from Gushaini (roadhead) in Tirthan valley and leading into the National Park through Rolla (2080m), Shilt (2900m), Rakhundi (3750m), Guntrao (3460m), Patal (3500m) and upto the ridge point of Sainj catchment (3820m) can be named as T1. It is suggested that the first experimental plot can be considered at Gushaini followed by second plot after 250m, then the third plot after next 250m and so on. Thus there will be four experimental plots in each km. Each point after every 250m can be marked on a tree or rock or any other easily recognised object. Each of these points can be numbered as T1/1, T1/2, T1/3,..... and so on, suggesting that T1 is the number of a particular transect line (path) and denominator is number of the particular experimental plot. Similarly, Sainj, Jiwa, Parvati valleys will have numbers like S1/1, J1/1, and P1/1, respectively.

An observer, whether a field level official or a researcher aware of these numbers indicated for the experimental plots can make observation at these points. In order to record the observations, a performa needs to be devised. For each experimental plot, such a performa can have the following parameters:

- i) Circular plots of 12.65m radius: trees including timber and fodder species, their regeneration, signs of human pressure and wild life use, structure and species composition.
- ii) Nested plots of 5.65m radius: all the shrubs and saplings, their cover, height, browsing signs and other uses.
- iii) Four square plots of 1m x 1m within each circular plot at NWSE directions: to record cover of herbs and grasses, presence of medicinal plants, mushrooms etc.

The performa will have following information for each experimental plot:

General Information

1. Experimental Plot No.
2. Date of observation
3. Locality
4. Latitude and Longitude
5. Altitude (m)
6. Aspect
7. Slope (degree)

8. Tarrain
9. Rock soil
10. Snow cover

Floral Information

1. Tree cover
2. Trees
3. Canopy
4. Shrub cover
5. Herb cover
6. Grass cover
7. Medicinal plants
8. Weeds
9. montane bamboo

Faunal Information

1. Mammals (signs or sightings)
2. Birds (signs or sightings)
3. Insects
4. Reptiles
5. Amphibians
6. Fishes

Human Interference

1. Signs of grazing
2. Signs of grass collection
3. Signs of lopping
4. Signs of wood collection
5. Signs of bamboo collection
6. Cultivation
7. Habitation

Recommendations

1. Photography monitoring
2. Long term ecological monitoring

As indicated above, the performa filled-up at an experimental plot will give lot of information regarding biodiversity of the area as well as human interference. Based on the information collected, such experimental plots which have large number of biodiversity values or some other specific characteristics would be selected for monitoring over a longer period of time. The experimental plots can be used for conducting research work for several studies based on faunal, floral and aspects of GHNP-human interactions.

Usefulness of Experimental Plots

The data recorded on the performa as mentioned above can be easily entered into a computer using Foxbase or FoxPro software. However, it can also be suggested that a performa filled-up at one or several experimental plots on a particular date can be kept in a file. Repeat observations for the same experimental plots can be inserted in this file by the observer. Over the years, this data will help in showing trends in change of biodiversity of the area or GHNP-local communities interactions. It is suggested that one file should be made for one transect line (path). This will help in updating as well as retrieval of data. The frontline staff of GHNP will find this method quite easy to follow. The forest guards usually know the local names of plants and animals. Therefore, it is suggested that the Park staff can fill-up the performa using local names which ultimately can easily be translated/converted into the latin names.

The most important aspect of the above mentioned methodology is that it is frontstaff-freindly, easy to understand and follow in the field. Such a methodology can be standerdized in the field for research work through a well coordinated effort. The observations made through different studies at these experimental plots can be used to draw together information from disperate studies to interpret common patterns of occurrence. The experimental plots will also allow best possible use of incidental discoveries and opportunities for interstudy comparisons and synergies.

Map of GHNP on this page

Sub-Task No.3

SURVEY AND CENSUS TECHNIQUES FOR HIMALAYAN PHEASANTS AT THE GREAT HIMALAYAN NATIONAL PARK

Introduction

The Great Himalayan National Park (GHNP), Kullu District, Himachal Pradesh, is located on the junction of two great faunal realms; Palaearctic to the north and Oriental to the south (Mackinnon *et al.* 1986). Geographically, the National Park covers the catchment area of the upper Beas river in four valleys of Parbati, Jiwa, Sainj and Tirthan rivulets (Map enclosed). The human population exist only on the western and north-western boundary of the Park, the other sides demarcated by the high ridges and peaks. The Park is representative of western Himalayan flora and fauna under biogeography category 2A (Rodgers & Panwar 1988). The present biodiversity of the Park is rich, compared to other areas at a similar altitude in the western Himalayas (Gaston *et al.* 1981).

Ecological Attributes of the Great Himalayan National Park:

The Great Himalayan National Park supports several endangered mammals and pheasants such as the Himalayan musk deer, serow, brown bear, blue sheep, western tragopan, cheer pheasant and Himalayan monal. The order Galliformes is well represented in the Great Himalayan National Park through family Phasianidae. The biological diversity of this area is particularly interesting with the conspicuous presence of pheasants such as Monal *Lophophorus impejanus*, Kaleej *Lophura leucomelana*, Cheer *Catreus wallichii*, Western Tragopan *Tragopan malanocephalus*, and Koklas *Pucrasia macrolopha*. This is one of only two National Parks in the world to support a population of endangered western tragopan *Tragopan malanocephalus* (Collar and Andrew 1988). Other genera from Phasianidae include Snow Partridge *Lerwa*, Himalayan Snowcock *Tetragallus himalayensis*, Partridge *Francolinus*, Quail *Perdica*, Chukor *Alectoris*, and Hill Partridge *Arborophila*. Very limited work has been done on methods for survey and census of these galliformes.

The plant communities are representative of temperate and alpine regions and consist of oak and coniferous forests, high altitude mixed forests and sub-alpine as well as alpine pastures. The park flora includes a number of unusual plant associations, with little-disturbed low and middle altitude oak forests (<2500 m) and alpine meadows above 3800 m rich in medicinal plants such as *Aconitum heterophyllum*, *Salvia moorcroftiana*, *Viola serpens*, *Jurinea macrocephala*, *Rheum emodi* (Gaston and Garson 1993).

The Himachal Pradesh state government imposed a moratorium on felling of timber in all the protected areas in 1984 and this has been upheld for this National Park. Likewise, a ban on hunting was imposed in 1982 which is still continuing and has shown favourable results for the wildlife of this National Park. The survey results by Himachal Wildlife Project HWP I and III indicate that the forested areas within the GHNP contained far more wildlife in 1991 than areas outside its boundaries did in 1985. This gives the area national as well as international significance for the conservation of several birds and mammal species (Gaston *et al.* 1981, Gaston and Garson 1993).

Literature Survey:

The Department of Forest Farming and Conservation (DFFC) and Himachal Wildlife Project (HWP) carried out surveys in 1980 and based on their field surveys, the creation of Great Himalayan National Park (GHNP) was suggested (Gaston *et al.* 1981). HWP II in 1983 conducted wildlife surveys in the demarcated area of proposed GHNP and made suggestions for management strategies. A management plan of GHNP has been operational since 1985 (Sharma, 1987). A reappraisal was undertaken by HWP III in 1993, which concluded that some improvement in the status of certain wildlife species has been achieved through protection and infrastructure development (Gaston & Garson 1993). An inventory of birds of GHNP has recently been published (Gaston, Garson and Pandey 1994). The Indian Institute of Public Administration, New Delhi has prepared an indicative plan, based on extensive field research in areas adjacent to the Park (Mehta *et al.* 1993).

Most of the work on survey and census techniques for pheasants has been done in Europe and North America (Robinette *et al.* 1974, Eberhardt 1978, Gates 1979, Burnham 1980, Woodburn 1993). However, there is very little work done on the aspects of population ecology of pheasants occurring in temperate regions of Western Himalayas. Gaston (1980), and Rodgers (1991) have discussed census methods for pheasants in India. For monitoring population trends in the intensive study areas in the western Himalayas, several methods have been evolved (Gaston *et al.* 1981; Gaston *et al.* 1983; Garson *et al.* 1992; Young *et al.* 1987; Sharma and Pandey 1989; Sathyakumar *et al.* 1992; Sankaran 1993; Kaul and Ahmed 1992).

Survey and Census Techniques for Pheasants in GHNP:

During the present consultancy work, possible approaches to survey and census Himalayan pheasants with special reference to the Great Himalayan National Park have been outlined. These suggested approaches have been adopted from the earlier studies in different parts of the Himalayan region. They are expected to help the wildlife biologists as well as the Park management in knowing the present distribution status and the abundance estimation of Himalayan pheasants. Such information is urgently required for initiating detailed research on pheasants and improving their conservation status in wild.

The Pheasant survey and census techniques have been discussed considering the following aspects:

1. Methods to enumerate pheasants in a given area
2. Methods to compare the abundance of pheasants during successive surveys or between different areas.

Total enumeration of pheasants involve a lot of intensive field work compared to the comparative methods. For an endangered species like Western Tragopan, total enumeration is very necessary, because the number of remaining birds will determine the urgency of conservation of this particular species. However, the comparative methods allow a manager to undertake adequate management decisions. Important parameters for a successful pheasant

survey and census operation include knowledge about behaviour and ecology of a particular pheasant species. For example, a method for Western Tragopan which is a territorial species by nature can not be applied to Quails which live in flocks. Pheasants may change their behaviour, home ranges and habitats according to the time of the year, hence, different census techniques are to be used for their survey and census in different seasons.

Suggested Techniques:

Initial Surveys

During Pheasant surveys in the Shimla Hills, we used this technique very successfully (Sharma and Pandey 1989). The villagers and shepherds going into the forests proved a great source of information for choosing sites for pheasant surveys. Bird identification booklets, photographs of pheasants and their field signs (e.g. crest of Monal, piece of skin or feathers of Western Tragopan, droppings of pheasants) were shown to the villagers during interviews. The villagers could identify most of the pheasants through their local names. In the Great Himalayan National Park, the similar exercise done with the local villagers yielded very good results (See Table 1 for filing-up survey results).

The follow-up surveys were conducted by the frontline staff of the GHNP management. Local people who knew about the pheasants were also involved. Direct (sightings) as well as indirect (droppings, tracks and feeding signs) evidences of pheasants were recorded. The Cheer pheasant could be located by noting their reply to the broadcast of pre-recorded amplified calls in the prospective habitats. This could help in establishing the presence/absence of a particular pheasant species in an area.

Pheasant Census:

The following techniques were considered useful for censusing pheasants in the Great Himalayan National Park:

1. Call Counts:

The literature survey suggests that this method has been widely used: Stewart-Cox and Quinnell (1990) for green peafowl; McGowan (1990) on Malaysian peacock-pheasant; Garson *et al.* (1992) on Cheer Pheasant; Young *et al.* (1987) on Cheer Pheasant. This method can be used for most of the pheasants which call during morning hours in their breeding season. The counts can be made from a strategic point in the habitat of the particular pheasant. The number obtained can be doubled for obtaining the estimate of breeding population. In doing so, the following factors are to be kept in mind:

a) Season of year

The counts of calling males assume that all the existing males in the area will call every morning. In the western Himalayas, the calling behaviour of three species of pheasants during various months of the year (Gaston 1980; Young *et al.* 1987; Ridley 1986) is as following:

Cheer Pheasant	-	January to May September to December
Koklas	-	January to June September to December
Western Tragopan	-	April to June

b) Time of day

Most of the observations in case of Koklas were made during short period of early morning. The males called for 15 - 20 minutes at dawn. The Western Tragopan, on the otherhand starts in early morning and continues intermittently throughout the day during breeding period. Cheer pheasants call in chorus at dusk and dawn.

c) Position of observation point

It is always suggested that a strategic point is selected in the habitat of pheasant. This needs to be done with care on the previous day of survey/census. The observation point should allow the observer to hear the birds over as wide an area as possible. A point on the ridge allows the observer to listen to the pheasant calls on both the sides. Usually, it is possible to hear all the calling birds within the radius of 400m (Gaston 1980), however, this can be reduced by the intervening ridges.

d) Position of observers

In case there are many observers taking part in census operation of pheasants, they must be positioned at an interval of about 500m to 600m. All the observers must have visited their observation points on the previous evening of the census day. They should be in position well before dawn so that all the calling pheasants are counted.

e) Recording of observations

The observer should have good knowledge of identification of the calls of pheasants which he is likely to encounter in the field. The observers should practice counting the involved numbers of calling birds. An approximate range of each call and the direction of the call, must be anticipated. A compass can be used by the observer.

It is better to have similar kind of formats for all the observers. These formats will have following details:

- i) Date of observation
- ii) Time of start and end of observations
- iii) Altitude of the observation point
- iv) Major vegetation types within the sample area.
- v) Weather conditions on the day of observation including wind speed, precipitation, cloud cover, temperature etc.
- vi) Marking of observation points on a large scale map of the area.
- vii) Marking of a conspicuous point such as a rock or a tree which can be located for subsequent census in the same area.

Analysis of observations:

Pheasant habitats are in difficult and remote terrain. The approach is usually by a rudimentary path. A population estimate for the entire forest area being censused can be obtained by extrapolation of the observations made in the sample area (Gaston 1980). For example if 16 pheasants have been observed in the census area of 20 ha., and the total habitat area is 30 ha., then our estimate of the total pheasant population will be $16 \times 30/20 = 24$. Care has to be taken of the proportion of the total area represented in the sample area and the uniformity of the habitat. If different kind of vegetation types are available in the survey area, it is better to calculate numbers of pheasants separately for each type of forest.

To compare the data of observations between the years, it is recommended that the census must be repeated on the same date every year. The uniformity of the procedure adopted must be maintained. Direct comparisons between the counts can be made in case the weather conditions are similar on these dates. Similarly, the angle of slope can be taken into account in cases of the census area being quite steep.

Limitations of the call count method:

- (i) The usefulness of this method depends upon the ability of the observer to recognize/distinguish calls of different pheasant species.
- (ii) It also assumes that the observers have a good hearing capacity.
- (iii) For Cheer Pheasant, this method is difficult to follow because the observers often get confused in determining the densities of calling birds.

2. Strip (Transect) Method:

In Great Himalayan National Park, this method is being followed over the years. This is perhaps the simplest method to get an index of pheasant population and can be carried out at any time of the year. However, great caution needs to be taken while analysing the observations.

Method:

The strip or transect method has been widely used in western Himalayas by Pandey (1993/94), Gaston and Garson (1992), Sathyakumar *et al.* (1993), Sankaran 1993, Kaul and Ahmed (1993). The frontline staff at GHNP was trained to get information from the local communities, old hunters and shepherds (Sharma and Pandey 1989). The information thus obtained is marked on the map of 1:50,000 scale. This facilitates later field visits by the census teams in the field. The grazing trails covering most of the pheasant habitats are used to count the pheasants (Pandey, 1993; 1993/94). All the pheasants disturbed along the route (60m is usually the maximum effective distance on both sides) are counted. The observations are recorded on the similar format as mentioned above under 'call count' method.

Analysis of observations:

Simple encounter rates of pheasants can be obtained by walking on a strip (transect) of a known length. Sathyakumar *et al.* (1993) describes encounter rates as number of animals seen per unit effort. The unit effort refers to either distance travelled or the time spent in intensive search. Encounter rate is expressed as $ER = n/l$; where 'n' denotes number of birds encountered (seen/heard) and 'l' denotes distance travelled (Sathyakumar *et al.* 1993).

During strip method, the pheasant density can be counted per unit area considering the maximum effective distance of observation (approximately 60m: this distance needs to be determined based on the factors, like visibility at the ground level, etc.) on both sides of the strip which makes it $60 \times 2 = 120\text{m}$. The width can be multiplied by the distance travelled to get estimate of the total area covered. The density of pheasant can be counted as $d = l \times w/n$ where 'd' is density, 'l' is length of the strip, 'w' is width of the strip and 'n' is the total number of pheasants seen. For example, a count of 18 birds (Western Tragopan) in an area of 12 sq. km. in Daranghati Wildlife Sanctuary give a density estimate of 1.5 birds/sq.km. (Pandey 1993/94). This estimate is comparable to Mirza's estimate of 0.8-1.6 birds/sq. km. (Gaston *et al.* 1983). Although there are no replicates and no estimate of error, this index provides a bench mark for future managers. This method can be used by the frontline staff for its simplicity.

For more precision, King's Method can be used to calculate density of the pheasants by using formula $d = n/2lr$ where 'd' is density, 'n' is number of bird sighted, 'l' is the length of transect and 'r' denotes the mean angular sighting distance.

Merits of Strip Transect:

This method is quite user-friendly. Comparisons of the pheasant observations over the seasons/years can easily be made. However, it needs to take several considerations into account:

- i) Direct sightings on the line transect are more accurate and reliable.
- ii) The pheasants usually descend to the lower elevations in the winter where it is easy to approach them.
- iii) At lower elevations, the visibility on the forest floor is better during winter because of leaf fall. Pheasants mostly remain confined in the snow clearings hence can be easily counted. The same area in summer is disturbed by the villagers, trekkers and shepherds.
- iv) The experience shows that it is easier to identify pheasants by sight than from calls. In the event of more than one bird calling, the observers listening from the same spot, made different observations. Faint calls coming from distance further add to the confusion. The line transect method also overcomes the problem of hearing capacity differences of the observers.
- v) Line transect method is relatively simple and can be easily duplicated frequently. Between two subsequent visits, there should be a gap of at least two weeks so that the birds behaviour does not affect the chances of their being detected (Gaston, 1980).

3. Special Index Techniques:

i) Pheasant droppings:

Abundance of pheasant droppings in a given area can become a good index of pheasant population. In a situation when the forest floor is covered with leaf litter, it is difficult to locate the pheasant droppings.

ii) Pheasant roosts:

The local shepherds and MFP collectors have good knowledge of areas where pheasants roost. The number of roosts in a given sample area can provide information on abundance of pheasants.

Notes on individual pheasant species:
(Please also refer to Table No. 1, 2 and 3)

1. White-crested Kaleej (*Lophura leucomelana*)
Local Name: Kalesa, Kolsa

In GHNP, the White-crested Kaleej has been observed close to the villages in Ecodevelopment Project Area (EPA) in the thickets of bamboo, bushes and shrubs adjacent to cultivation and water sources. They can be seen around dusk and dawn. Observations on Kaleej have been made in pure Ban Oak *Quercus leucotrichophora* forest as well as mixed forest of Deodar *Cedrus deodara*, Blue Pine *Pinus wallichiana* and Kharsu Oak *Quercus semicarpifolia*. Most of the roosting sites were observed in Ban Oak forests. There appears to be a positive association between Kaleej and forest close to human habitation (Gaston and Garson, 1981). I could sight White-crested Kaleej upto Rolla in Tirthan valley; Kunder in Jiwa valley and close to Park boundary in Sainj (Pandey, 1993).

For survey and census of Kalij, efforts need to be made in open scrub adjacent to cultivations and water sources around dusk and dawn. Strip (transect) method can be used to count Kalij. Pheasant droppings and roosting sites can be other index for counting.

2. Cheer Pheasant (*Catreus wallichii*)
Local Name: Chaild

Reports of Cheer pheasants from GHNP are quite limited. I could observe this pheasant near Gati pat in Jiwa Nal valley on the southern facing grassy slopes. Pre-recorded calls of Cheer pheasant were broadcasted at this site during dawn. Two parties of Cheer pheasant responded to these calls. There are potential Cheer pheasant sites in the grassy slopes of villages in EPA. Using the pre-recorded amplified calls is the best technique to locate/observe this pheasant in its habitat. Otherwise, it is very difficult to see Cheer pheasant in its natural habitat.

3. Monal Pheasant (*Lophophorus impejanus*)
Local Name: Bnal(m), Bodh(f), Kardi(f)

Monal in past has been persecuted for its crest which is made-up of wire-like spatula tipped feather and meat (Ali and Ripley, 1987). In the villages around GHNP, the local villagers can be seen wearing Monal crest on their caps. It is a rather conspicuous pheasant, very well known to the local villagers and often recorded by the tourists and trekkers. The Himachal Wildlife Project (HWP I: 1980) report mentions density of calling Monal between 1 to 10 birds per sq. km. in Kullu district (Gaston *et al.* 1981). In Great Himalayan National Park, I could flush 42 Monals in November on a 5 km. long path from Majhan to Apgain in Jiwa Nal valley. On the same route 62 Monals were flushed in mid December by a survey party. During another survey, 38 Monals were counted on a 6 km. long trail from Rolla to Nada Thatch in November. The reappraisal report on GHNP compares the Monal records which were 44 in 41.6 hours

(106/100 h) in 1980 and 15 times in 7.8 h (192.3/100 h) in 1991. This shows that Monal numbers remained at or above their 1980 levels (Gaston and Garson 1993).

The strip (transect) method can be employed to survey and census Monal.

4. Koklash (*Pucrasia macrolopha*)
Local Name: Plash, Khwaksha

This pheasant is mostly observed by its dawn chorus which can be heard most of the year except late summer (Gaston 1980). In GHNP, fir-spruce forests at 2300-3200m seem to constitute the typical habitat for this species, though it could also be observed in Deodar-Kail areas on way from Chalocha to Nada thach in Tirthan valley. In most of the places where Koklash were observed, the understorey was thick. In October-November, the dawn chorus of Koklash could be heard from the thatches of Guntarao (3400m altitude) in Tirthan valley and Dhela (3200m altitude) in Sainj valley. In a survey effort 5 to 8 koklash were flushed on the trail from Gatti pat hut to Majhan village and 14 birds were observed on Rohla-Nada trail in Tirthan valley. The reappraisal report of HWP-1992 mentions 24 records of Koklash at 1900-3700m altitude as compared to 6 such record in 1980, all above 2500m. The report favourably comments on a possible increase in Koklash population in the Park (Gaston and Garson 1992).

The survey and census of Koklash can be done using call count, and strip (transect) methods.

5. Western Tragopan (*Tragopan melanocephalus*)
Local Name: Jujurana

The Great Himalayan National Park is perhaps the most distinct stronghold of the rare Western Tragopan (Chauhan and Sharma 1991). The most spectacular of pheasants, the Western Tragopan has been reported from all the valleys of the GHNP. This pheasant is found in high altitude fir-spruce and Deodar forests with Ringal Bamboo (*Arundinaria* spp.). The maximum number of sightings have been from forests of Basu, Shilt, Nada, Chordwar in Tirthan valley. For the survey and census of this endangered species, all the sightings must be recorded on the map. Each year, the same sites need to be visited by the survey parties to observe the birds. This will be done in addition to the routine strip (transect) method of census of pheasants in GHNP.

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Table 1: Performa to fill-up Pheasant Survey Results

Site No./Name	Date	Altitude	Aspect	Habitat Type	Pheasant observed/ heard

Table 2: Methods to be employed for Pheasant Census in GHNP

Pheasant	Altitudinal Range in GHNP	Recommended Methods of survey and census in GHNP
1. White-crested Kaleej (<i>Lophura leucomelana</i>)	1800-2600m	i. Strip (transect) method ii. Identification and counting of roosts/droppings
2. Cheer Pheasant (<i>Catreus wallichii</i>)	1750-2500m	i. Broadcasting of amplified pre-recorded calls
3. Monal Pheasant (<i>Lophophorus impejanus</i>)	2600-3200m	i. Strip (transect) method
4. Koklash (<i>Pucrasia macrolopha</i>)	2400-3500m	i. Dawn chorus ii. Strip (transect) method
5. Western Tragopan (<i>Tragopan melanocephalus</i>)	2500-2900m	i. Call counts ii. Strip (transect) method

Table 3: Showing Important Places of Occurrence of Pheasants in GHNP

Pheasants	Important Places of Occurrence of Pheasants in GHNP
1. White-crested Kaleej <i>(Lophura leucomelana)</i> Local Name: Kalesa, Kolsa	Tirthan Valley: near Rolla, Kharaungcha Sainj: near villages of Lapah, Shakti, Shaghiyar, Marore Jiwa: near villages of Saran, Pashi, Kunder, Majhan Parvati: near villages of Kasol, Pulga, Manikaran, Barseni, Khirganga springs
2. Cheer Pheasant <i>(Catreus wallichii)</i> Local Name: Chaild	Tirthan: in the grasslands of adjoining villages near the boundary Sainj: in the grasslands on the slopes adjoining to the boundary Jiwa: in the grasslands of Gati Pat Parvati: in the grasslands of hill slopes above Manikaran and Pulga villages
3. Monal Pheasant <i>(Lophophorus impejanus)</i> Local Name: Bnal(m), Bodh(f), Kardi(f)	Tirthan: forests around thatches of Shilt, Hara, Nara, Kobri, Rakhundi, Guntarao, Basu, Khorli Poi Sainj: forests around thatches of Dhela, Parkachi, Homkhani Jiwa: Gati Pat and Diun forests, and forests around Apgain thatch Parvati: Khirganga forests including thatches of Tunda Bhuj, Tosh Nal forests
4. Koklash <i>(Pucrasia macrolopha)</i> Local Name: Plash, Khwaksha	Tirthan: forests above Chalocha, at Guntarao, Dilunga thatch Sainj: forests around Homkhani, Dhela thatches Jiwa: forests of Gati Pat, Diun Parvati: forests of Tosh Nal, Khirganga
5. Western Tragopan <i>(Tragopan melanocephalus)</i> Local Name: Jujurana	Tirthan: understorey of forests of Rakhundi, Shilt, Nada, Hada, Basu, Khorli Poi, Chalocha Sainj: understorey of Dhela, Homkhani, Parkachi Jiwa: understorey of forests of Gati Pat, Diun, Apgain Parvati: understorey of Khirganga forests, Tosh Nal forests