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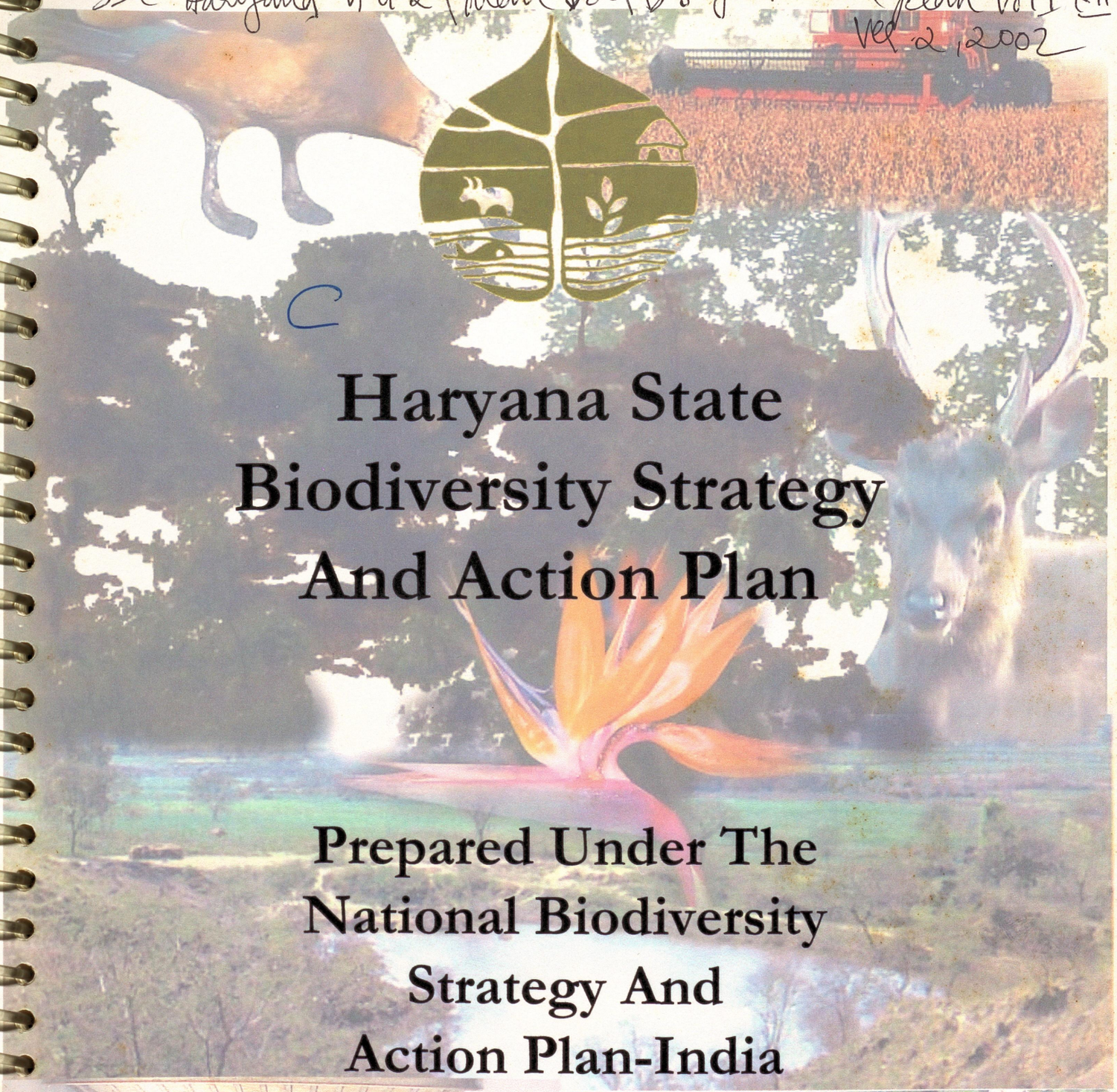
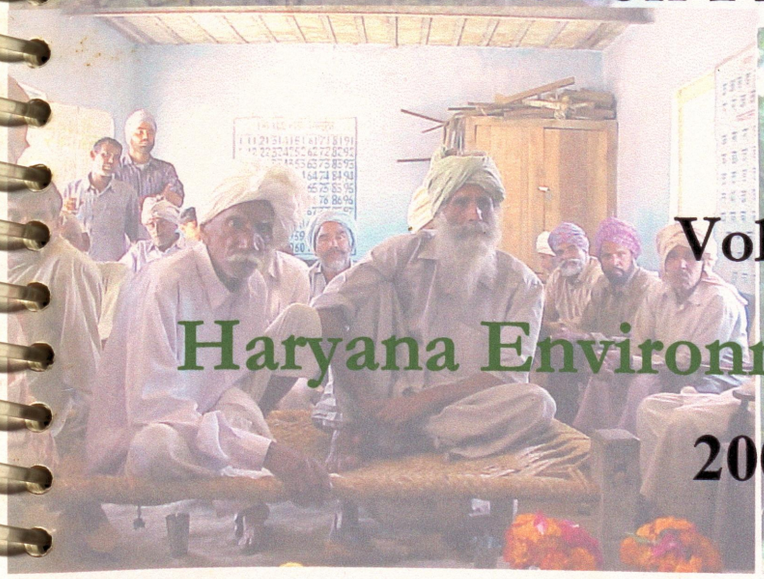


Haryana State Biodiversity Strategy And Action Plan

Prepared Under The National Biodiversity Strategy And Action Plan-India





Vol. I

Haryana Environment Department

2002

HARYANA STATE BIODIVERSITY STRATEGY AND ACTION PLAN

PREPARED UNDER THE
NATIONAL BIODIVERSITY STRATEGY AND
ACTION PLAN-INDIA

HARYANA ENVIRONMENT DEPARTMENT

2002

NBSAP EXECUTING AGENCY: Ministry of Environment and Forests, Government of India.

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NBSAP ADMINISTRATIVE AGENCY: Biotech Consortium India Ltd.

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State Biodiversity Strategy and Action Plan

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Foreword

The utilisation of various forms of plants and animal life has been an essential and integral part of human civilisation. There have also been conscious efforts to conserve biodiversity in practice since ages through various social, religious and agricultural traditions, and forests and wildlife management practices in our country. But the deliberate efforts to conserve the entire gamut of biological resource got impetus after the Convention on Biodiversity on 1992. This has mainly been because of the realisation of the economic importance associated.

Biodiversity conservation is a serious job. At the theoretical level it tends to be purely scientific while at the practical level it is obviously economic. Although, the old regimental management practices may be irrelevant, especially in the democratic polity of the country, yet at the same time making the resource totally free for all may not be a prudent policy. A balance, therefore, needs to be struck but within the frame work of the sustainability of the resource as a bottom line.

We may not know, fully, all that is with us but lack of knowledge should not be the reason for not taking adequate measures to prevent further degradation and loss.

I believe all these considerations have been kept in view while working out the strategies and action plans for the conservation of the entire range of biodiversity in the state.

D S Dhesi IAS
Commissioner and Secretary
Environment Department
Government of Haryana -cum-
Chairman, State Steering Committee
BSAP, Haryana

Chandigarh
October 2001

Acknowledgement

The genesis of National Bio-Diversity Strategy and Action Plan lies in the fact that we can not afford to sacrifice our tomorrow for the sake of today. The 1972 United Nations Conference on Human Environment at Stockholm, the convention on Biological Diversity signed by 158 Governments at the 1992 United Nations Conference on Environment and Development- The Earth Summit, coming into being of Global Environmental Facility, UNEP, UNDP demonstrate global concern for conserving environment and Bio-Diversity. The inter-dependence of different species hardly needs to be over emphasized. Over the years, a need for Sustainable Development has been felt everywhere.

Taking a big leap forward, apart from fulfilling the commitments made at the International level, Government of India in the Ministry of Environment and Forest decided for undertaking the largest ever environmental planning exercise in the shape of formulating a National Bio-diversity Strategy and Action Plan for the country. Like all other states, Haryana has prepared its own Bio-diversity strategy and Action Plan which will form the part of the National document. In this exercise, a large number of experts, departments, organizations, grass root level people have been involved. Obviously, in the process of accomplishing a job of such a magnitude, it is difficult to individually thank all those who made their contributions. However, I would like to express my gratitude to those who directly took part in this attempt on the preparation of State Bio-Diversity Strategy and Action Plan-Haryana.

The process was set in motion with the constitution of the State Steering committee in August, 2000. Regular meetings, discussions and monitoring at the level of Chairman of the State Steering Committee- Sh. D.S. Dhesi, IAS, Commissioner & Secretary to Govt. Haryana, Environment Department, were a source of constant inspiration, guidance and encouragement for the team. The detailed discussions with Sh. J.P.L. Srivastava, IFS, Chief Conservator of Forests, Haryana culminating into a survey on Bio-Diversity in 98 villages of Gurgaon, Mahendergarh and Rewari Districts occupies a significant part of the document. The co-operation extended by Sh. Rajiv Sharma, IAS, Deputy Commissioner, Yamuna Nagar, Sh. A.K. Singh, IAS, Deputy Commissioner, Gurgaon and their teams made the workshops conducted in their districts successful. The resource Dr. B.N. Mathur, Director, NDRI Karnal and Dr. S.K. Prasad, Director, National Bureau of

Animal Genetic Resources, Karnal is a valuable input. The papers received from Dr. M.S. Kuhar, Registrar and Dr. B.S. Dahiya, Director, Research, Haryana Agriculture University, Hisar throw ample light on conservation of bio-diversity in agriculture. The Heads of Departments of participating Departments, Sh. Rajiv Arora, IAS, Director, Agriculture; Dr. K.S. Dangi , Director Animal Husbandry; Dr. V.P. Ahlawat, Director Horticulture; Sh. B.S. Saharan, Director, Fisheries; Sh. Banarsi Dass, IFS, PCCF made contributions relating to their departments. M.D. Sinha and Dr. Verma of Haryana Land Use Board provided timely assistance. An interactive session with Sh. N.S. Tiwana, Executive Director and Dr. Neelima Jerath of Punjab State Council for Science and Technology proved useful in the initial stages. Participation of Sh. V.D. Sharma, Co-ordinator Aravali Range Eco Regional working Group, Jaipur was of great value. Ms. Madhu Sarin made rich contributions on gender issues. The Regional Officers, Haryana State Pollution Control Board, Dr. S.S. Kadian and Mr. Bhagwan Singh took special pains during the organisations of workshops.

I will be failing in my duty if I do not thank the Senior Officers and eminent experts and scholars of Ministry of Environment and Forests, Government of India; UNDP; GEF; Technical and Policy Core Group and Bio-tech consortium India Limited, who sent guidelines from time to time and organized the mid-term national workshop from where many thrust areas came to our notice through the presentations and discussions. Mr. R.D. Jakati, IFS, Chief Wildlife Warden, Haryana assisted by Sh. D. Hembram, IFS Subject Matter Specialist, in addition to contributing his departmental share to this document also made every effort in his capacity as Chairman of the Drafting Committee to pool in all the resource material and compiled them to give its present shape in a time- bound manner. Last but not least, I appreciate the work done by the officers of my office Mr. A.K. Mehta, Mrs. Usha Sharma and Mr. V.K. Garg and the personal/office staff who were found always ready during the undertaking of this exercise. In the end, I wish to thank all those whose names I have not been able to mention.

Sarban Singh, IAS
Director, Environment, Haryana,
And member secretary/coordinator for
State steering committee
BASP, Haryana

Chandigarh
October 2001

Preface

The term conservation is the essential and key ingredient of the concept of sustainable development. Conservation means protection and utilisation. For defining the term conservation another parameter which needs to be considered is the "time frame". In the context of natural resource conservation the "time frame" is "in perpetuity". This perpetual utilisation of the natural resource brings in the limits on the harvests. The utilisation, therefore, has to be in such manner so as to retain the natural resource intact for all future times to come.
We may think of a set of strategies for the conservation of certain resource under consideration for a definite foreseeable future but at the policy and vision level it must be clear that the resource has to be protected for all times to come.

These considerations have been kept in mind while working out the strategy and action plan in this report.

Although found throughout the natural biological resource is confined broadly to Forests and Wildlife, Agriculture, Horticulture, Animal Husbandry, Fishery and aquatic resources, sectors of the economy. The management of these sectors of economy lies with respective departments in the State. At present all of these sectors do not necessarily make conscious efforts for the conservation of the diversity as such but by virtue of knowledge and the skill of the concerned sectors appropriate inputs required for this strategy and action plan from the concerned departments and other institutions has been obtained and incorporated in this report. Definite sections have been allotted to each of these sectors and the interlinkages affecting the other sectors have been reflected in both. This approach of writing strategy and action plan separately for each sector is presumed to be of practical and implementable value.

Efforts have been made to make this document as complete as possible within the time constraints. The report incorporates the names of all the contributors, however, there might be others who might have contributed indirectly or directly but whose name may not be appearing in the list. We are grateful to all these people for sharing their experiences and contributions.

Jakati R D
Hembram D

Panchkula
October 2001

Summary

1. Haryana is amongst the smaller states of the Indian Union. The state has 1.3% of the total area of the country supporting 2% of its population. About 75% of the state population lives in rural areas and about the same percentage of the population depends directly upon agriculture. 77% of the land under agriculture is irrigated. Presently canal water irrigates 54% of the area and the ground water the remaining 46%. The state contributes about 6% to the total food production of the country. The per capita income of the state as recorded in 1996-97 at 1980-81 prices was Rs. 4029 and the state stood at 4 th position in the list of states and Union Territories in this regard. As per 2001 census (provisional), there were 861 females per 1000 males as against 865 in 1991. The literacy rate is 68.59% (excluding the children between 0-6 years).

2. **Natural resources**

About 83% of the land is put to agricultural use. The land under forests is barely 3.8%. Of the total forest area, about 50% is along the rail, road and canals in strips which are mainly man made plantations. The natural forests are mainly confined the Shiwaliks on the northern border along Himachal Pradesh and Uttaranchal. The natural vegetation on the Aravalli Hills in the south is in degraded state.

2.1. Although the extent of wild resource is very limited yet the state is quite rich in ecological diversity. The state has Shiwaliks and outer Himalayas, a substantial part under the Gangetic plains, the north-eastern tail ending in Delhi of the Aravalli Hill system and a considerable area under the arid desertic conditions on the border of the Thar deserts. Each of these regions support flora and fauna of its own kind.

2.2. The central Gangetic plains are flat and accumulate water in depressions especially during the monsoon which harbour aquatic flora and fauna, and a plethora of migratory birds in the winter.

2.3. There is only one river, Yamuna, which is perennial and flows along the border with Uttar Pradesh. The other smaller rivers are seasonal.

3. The State BSAP

3.1. This strategy and action plan deals with the state of Haryana within the overall frame work of the National Biodiversity Strategy and Action Plan and attempts to deal with the issues of conservation and sustainable utilisation of the biodiversity in a holistic manner.

3.2.1. The strategy and action plans for the conservation of biodiversity were obtained from the departments dealing with the corresponding natural resource. In the process, the state departments of Agriculture, Forests, Animal Husbandry, Wildlife, Horticulture, Fisheries were involved. Inputs were also obtained from the National Dairy Research Institute, Karnal, CCS Haryana Agriculture University, Hisar, Department of Zoology, and Botany, Punjab University and Institute of Microbial Technology.

3.2.2. To get the views of people, two workshops were organised at Yamunanagar and Gurgaon. To get the perceptions of all the categories of rural population survey was conducted in 98 villages in Gurgaon, Mahendergarh and Rewari. Two public hearings were also organised. One was organised in the Chicken village in the Shivalik foothills of Yamuna Nagar district and another was organised at village Bodla in the fertile gangetic plains of Kurukshetra district.

3.2.3. The contributions obtained from the volunteers have also been incorporated in the report.

3.3. This report contains the strategy and action plans for the sectors separately. It is felt that this scheme of writing separate chapters for different sectors will be helpful and easy especially from the comprehension and implementation point of view.

4.0 Reasons for loss of biodiversity

4.1 One of the most important reasons for the loss of biodiversity which manifests in different forms is the increasing human population. The waste lands which met the fuel and fodder requirement of the local community gradually were diverted for various developmental activities which resulted into the increased pressure on the natural resources. The increased human population is responsible for the encroachment of forest lands or utilisation of forestry resource and hunting of wild animals beyond the sustainable limits. In the last 30 years the lands where domestic animal could graze

decreased by 43%. The decrease in the available wastelands resulted into consequent pressure on the natural resources.

The Sukhomajri experiment has clearly indicated that the biological resource conservation in a developing country like ours is possible only with the joint efforts of the government and the local community especially those who depend most on these resources. Adequate care, therefore, has been taken to involve the local community in the conservation efforts suggested in this plan.

4.2. With increased population, the land holding decreased considerably. The formation of new state, Haryana, saw the taking up of large sale developmental. This coincided with the beginning of green revolution. These factors resulted into the conversion of wastelands for agriculture purpose, and the decrease of the fallow lands resulting into increasing pressure on wild natural resources. With the need for the increasing the agricultural productivity newer hybrid varieties were developed. The agricultural crop varieties which had evolved over centuries of human efforts were replaced by newer varieties. These new varieties produced more and so they removed more nutrients from the soil. The enhanced use of pesticides and fungicides disrupted the plant insect/pathogen association. The improved agriculture prosperity resulted into the loss of agricultural crop varieties and the destruction of floral and faunal composition of the agricultural field ecosystem.

4.3. The development resulted into the levelling of large number of wet lands affecting the aquatic fauna of the state. The increased pesticides also resulted into the decreased avian population, the most important of which, observed recently, is the mortality of peacock in the state.

4.4. To produce more wood to meet the local fuel wood requirements large scale afforestation of the community waste lands was done. Mono-culture was raised with high density of trees which did not allow the growth of other plants. Thus, even the afforestation activities have been responsible to some extent for the reduction of biodiversity in the areas out side forests. These plantations however indirectly reduced the pressure on the natural forests elsewhere and thus helped the protection of biodiversity of the natural forest areas.

5.0 Strategies

The following paragraphs summarise the strategies and action plans of the various sectors:

5.1. Forests

5.1.1. Creation of preservation plots in various vegetation types and ecosystems represented in the state is recommended.

5.1.2 Standardisation of nursery techniques of 100 lesser known species is proposed to be taken up. To reduce the pressure on the natural forests promotion of agro-forestry on farmers fields, promotion of silvi-pasture practice on community lands with very low tree density, and taking up of income generating activities for the population depending on the forests resources have been proposed.

5.1.3. For the conservation of the species and improvement of the habitat, soil and moisture conservation works and fire protection measures have been provided for.

5.1.4. To know and monitor the status of various species, it is necessary to have base line survey. This would also help in calculating the sustainable productivity potential of the various species (NTFPs).

5.1.5 The state is one of the pioneers in the field of Joint Forest Management (JFM) in the country, having evolved and successfully implemented the JFM rules. To further strengthen the people's participation in the management of natural resource throughout the state, provisions to this effect have been incorporated in the report.

5.2 Wildlife

5.2.1. For the conservation of the wild biodiversity and other vertebrate and invertebrate faunal diversity of the state, eight pronged strategies both short term and long term, has been stressed. Improvement of the habitat in the forested ecosystem by plantation of fruit species and making water available in the protected areas, provisions of water to the threatened wet lands and to protect the wild life out side the forest areas amendments to the Panchayat act to keep 25-30% of community lands under tree cover (very low density tree crop) have been suggested.

5.2.2. For creating the awareness amongst the people at large, nature education and conservation programmes, and to wean the communities involved in wildlife offences away, the provision of income generating activities have been suggested.

5.2.3. To help and monitor the status of various species at a later date, base line survey of all life forms have been incorporated in the report.

5.2.4. To conserve the biodiversity of the north western Himalayan region and also of the state, strengthening of the protection mechanism has been provided for in the report.

5.3. Agriculture

5.3.1. For the conservation of the varieties of various agricultural crops, improvement of soil and restoration of the earlier plant animal association through the use of farmyard manure and bio pesticides has been suggested. Although it is difficult to conserve all that we have lost yet it is hoped that this strategy will make a beginning to that effect.

5.3.2. Cryo preservation of various strains and genetic material has been suggested as an ex situ conservation method.

5.3.3 During the process of development, the agricultural crop diversity as also of varietal diversity has greatly shrunk. This is proposed to be restored through extension and integrated crop management practices.

5.3.4. There are large number of medicinal plant species which are used for ailments. The CCS HAU, Hisar has proposed to take up a detailed survey of medicinal plants in the state, the study of their bio-chemical composition and also the pharmacology of various ingredients. The University has already formulated a project to that effect. The project also envisages holding of workshop to elicit the local knowledge of the people about various plant and animal species.

5.4 Horticulture

Surveying and documentation of existing horticultural diversity by various means and various ex-situ and in-situ conservation methods have been suggested over a period of 20 years.

5.5 Fish and aquatic fauna

5.5.1. There are 77 species of fish of 41 genera found in the state. The list of endangered species of the fish has been mentioned. Rapid industrialisation, pollution of water resource have direct bearing on aquatic ecosystem. Siltation of pondages and levelling of the depressions have led to depletion in the fish diversity.

5.5.2. The base line survey of the existing fish and aquatic fauna in the state already exists. However, a monitoring mechanism which is needed, has been incorporated in the report.

5.5.3. For in situ conservation of the aquatic flora and fauna, some stretches of Yamuna river and some other canal systems is proposed to be declared as "Fish Sanctuary".

5.5.4. To reduce the pollution in the aquatic systems especially in the Yamuna river, setting up of the sewage treatment plants in major towns has been recommended. It has also been proposed to create bigger ponds in the Yamuna river bed for the conservation of the aquatic fauna.

5.6 Animal husbandry

5.6.1. The state is gifted with the presence of some of the very good cattle and buffalo breeds of the world. Murrah buffalo is world known. The Hariana breed of cattle is being cross bred with the high yielding European breeds. The Karan Fries and Karan Swiss breeds developed at NDRI, Karnal by cross breeding of Holstine Frisian and Brown Swiss have received wide acceptance amongst the farmers in the state.

5.6.2. The in situ and ex situ conservation measures have been proposed. Formation of breeder association and progressive farmers club is encouraged to be formed to adopt multi-pronged strategy including provision for keeping biodiversity intact.

5.6.3. Genetic mapping of the wilder relatives of the domesticated animals has been suggested over a period of next 15 years.

5.7 Financial requirements

The tentative requirements of the funds for the implementation of various action plans over 5-20 years' period as worked out for various sectors is given below:

*(Rs. in lakhs)

Sectors	5 year	5-10 year	10+ year
1. Forests and plant life	1921	1076.5	13779
2. Wildlife and animal life	50	1710	1233
3. Agriculture and medicinal plants	150	1500	23000
4. Horticulture	Up to 10 year	1000	
5. Fish and aquatic fauna	400	3200	1800
6. Animal husbandry	4000	2000	4000

* These financial requirements are based on very rough estimates and are likely to vary greatly.

Introduction

Introduction

1.0 Brief background to the SAP

The National Biodiversity Strategy and Action Plan l(NBSAP), a project of Union Ministry of Environment & Forests (MoEF) aims to produce a series of planning documents dealing with the conservation of India's biodiversity, sustainable use of its biological resources, and equity including in decisions regarding access to such resources and the benefits accruing from them. The project is funded by the Global Environment Facility through United Nations Development Programme (UNDP). A unique aspect of the project is that its technical execution is by a Technical and Policy Core Group(TPCG) being coordinated by an NGO Kalpavriksh, and its administrative coordination is by Biotech Consortium India Ltd.

The NBSAP process has included extremely widespread consultation across the country and across all sectors of society, involving tens of thousands of people. It aims to produce not one national action plan, but 18 local (substate) plans, 33 state and union territory plans, 10 ecoregional (interstate) plans, and 13 thematic plans. All these will coalesee into a national plan, but will also remain independent for implementation purposes. In addition, over 30 thematic papers have been commissioned on a variety of topics related to biodiversity.

Within this overall process, one of the state action plans is on Haryana, which has been drafted by various departments and agencies who are members of steering committee (the list of contributors is appended as annexure) consisting of persons experienced in the field.

1.1 Scope of the SAP

The SAP covers the State of Haryana, which is situated between 27° 39' to 30° 56' N latitude and 74° 27' to 77° 36' E longitude, covering an area about 44,212 Sq. km. It occupies 1.35% of the total area of the country. The state has natural geographical boundaries of the Shiwalik hills in the north, the river Yamuna in the east and the river Ghaggar in the West. The southwest boundary is provided by a range of Aravalli hills which runs through southern Delhi and Gurgaon district upto Alwar in Rajasthan. The state is bounded by Uttar Pradesh on the east, Punjab on the

west, Himachal Pradesh on the north and Rajasthan in the south. Administratively, the state has been divided into 19 districts. Various important aspects of the state have been provided in detail in Chapter 2 which deals of the profile with area.

1.2 Objectives of the SAP

The main objectives of the SAP, in terms of National Policy and Macro level Action and Strategy on Bio-diversity, are to:

i) achieve conservation and sustainable use of biological diversity through consolidating ongoing efforts and initiating new steps wherever necessary.

ii) secure participation of community, people, NGOs, industries and other stakeholders including women in the conservation and sustainable use of biodiversity.

iii) realize the consumptive and non-consumptive values of biodiversity through necessary investment in R&D & biotechnology development.

iv) ensure benefits to the local community and people as conservers of biodiversity, creators and holders of indigenous knowledge systems, innovations and practices.

v) ensure consideration of biodiversity concerns in other sectoral policies and programmes.

1.3 Contents of the SAP

This SAP has been divided into a number of chapters. It generally follows the format suggested in the Ministry's publication entitled 'National Biodiversity Strategy and Action Plan-Guidelines and Concept Papers'. After the chapters dealing with introduction and profile of the State, further discussion has been organized sector wise. This has been done to facilitate a clear-cut demarcation of responsibilities and accountability in implementing the SAP. While it is necessary to recognize and clarify the linkages amongst the various sectors or agencies, which has been reflected in the action plans of the executing organization, the proposed sector wise action plan provides us the advantage of delineating the role of various organizations at the implementation stage. The Agriculture sector includes the SAP for domesticated crops, vegetables, and medicinal plants. The Fishery sector incorporates the SAP for

fish, frog, tortoise and other aquatic fauna both domesticated and wild. The Forestry sector SAP includes all kinds of plant life including fungi, lichens, gymnosperms etc. The SAP of Wildlife sector incorporates all the faunal components including reptiles, amphibians, molluscs, avians and mammals etc. The other sectors for which separate SAPs have been prepared are Horticulture and Animal Husbandry.

A SAP, which deals with a rich biodiversity at the level of genes, species and eco-systems, requires considerable amount of information. All of such information may not be readily available. An effort, therefore, has been made in this SAP to compile the information that became available as a result of concerted efforts. At the same time information is being collected on the gaps identified in this report. A lot of useful information has also been provided in the Annexes.

1.4 Methodology adopted for the compilation of the Strategy and Action Plan

For the compilation of this biodiversity action plan, the following method was adopted:

1. The nodal agency for the compilation of this action plan is Environment Department of Haryana. A meeting under the Chairmanship of Commissioner and Secretary to Government of Haryana, Environment Department was held initially. In this meeting the departmental heads of Agriculture, Animal Husbandry, Fishery, Horticulture, Forests, Wildlife and representative of Hisar Agriculture University were invited and they were requested to submit their strategy and action plan for the conservation of the biodiversity of their respective areas of working.

   The final chapters sent by the respective departments were reviewed as per the guidelines of NBSAP (TPCG) by experts who were not involved earlier in making the state BSAP. The comments of these experts were sent to the concerned departments for their views. These have been incorporated in the final plan of the state.

2. That State of Haryana can broadly be divided into the northern and southern region. The first workshop of local Sarpanches, Non-Governmental Organizations (NGOs), Government officials of the concerned departments, individuals and women on biodiversity conservation in the State was held for the northern region in February, 2001 at Yamunanagar. For the southern

region a similar workshop of Government officials, NGOs, individuals, village representatives was organized in the month of June, 2001.

Two public hearings were organised. One was organised at the village Chicken in the foothills of Shivalik hills of Yamuna Nagar district. The second public hearing was organised at village Bodla in the fertile Gangetic plains of Kurukshetra district.

3. In order to get the views of all the socio-economic classes of the rural community on the conservation of the biodiversity, a survey was conducted in 98 villages of Gurgaon, Rewari, Mahendergarh districts of Haryana.

4. The detailed write up on the biodiversity in the field of Agriculture, Animal Husbandry and Horticulture and the strategy and action plan to conserve the same was obtained from Hisar Agriculture University. The concerns as given their write up on these three fields has been incorporated in this report.

5. For the conservation of domesticated animals, the strategy and action plans were obtained from National Bureau of Animal Genetic Resources and National Dairy Institute, both at Karnal.

6. In order to cover the whole spectrum of biodiversity of the State, inputs were requested from the Botany Department, Zoology Department of Punjab University. And also from Institute of Microbial technology Chandigarh. These inputs have been incorporated at the appropriate place.

7. Inputs from individuals who had volunteered to help in the formulation of the SAP have been incorporated in the report.

Profile of The State

Profile of the state

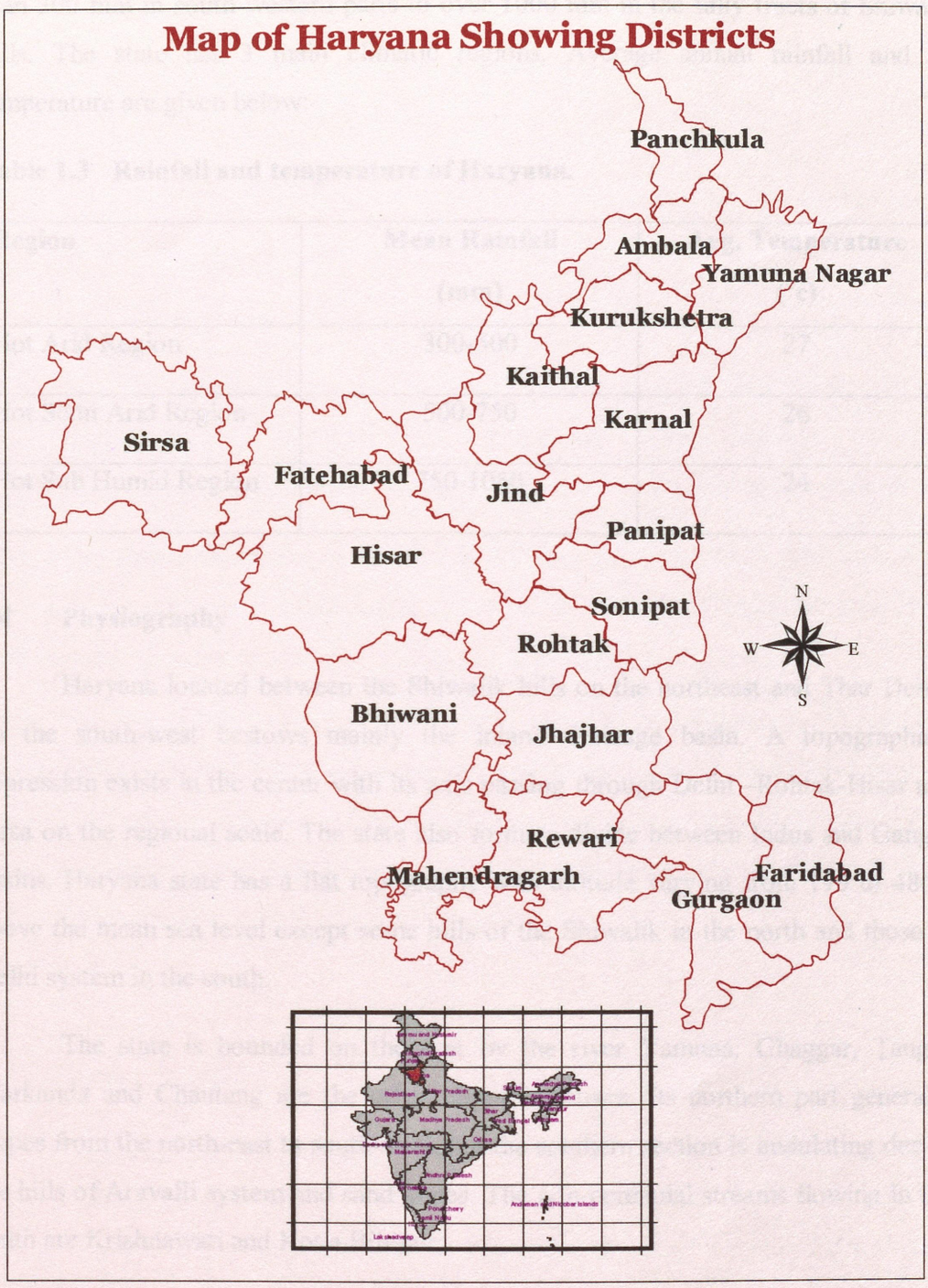
1.1 Area and location

The state of Haryana has an area of 44212 sq. km. which forms 1.3 percent of total area of the country. The state's landscape and soil fertility are remarkably diverse. Situated in the north of Indian Union it is bounded by Uttar Pradesh and Uttaranchal in the east, Punjab on the west and part of Himachal Pradesh on the north and it extends to Rajasthan in the south. It is located between 27^0 to 31^0 north latitude and 74^0 to 77^0 east longitude.

The national capital Delhi is surrounded on three sides by Haryana. Nearly half of National Capital Region representing about 40 percent of its population falls within the state.

1.2 Administrative set up

The state of Haryana came into being on Ist November 1966 as the 17th state of the Indian Union, as a result of reorganization of erstwhile state of Punjab into Haryana and Punjab. For administrative purposes, the state is divided into 4 Divisions namely Ambala, Hisar, Rohtak and Gurgaon. The state is further subdivided into 19 districts 45 sub-division, 65 tehsils, 31 subs-tehsils, 111 development block, 94 towns and 6759 inhabited villages. There are 90 state legislature assembly seats and 10 parliamentary seats in the state. At the time of formation of Haryana state, there were seven districts viz, Ambala, Karnal, Rohtak Gurgaon, Mahendragarh, Hisar and Jind. During the subsequent reorganization of the state 12 new districts were notified from the time to time by changing the boundaries of the districts. The districts of the state are shown in Figure below:



1.3 Climate and rainfall

The climate of the state is subtropical, semi-arid to sub-humid, continental and monsoonic type. The average rainfall of the state is 560 mm which varies from less

than 300 mm in south-western parts to over 1000 mm in the hilly tracts of Shiwalik hills. The state has 3 main climatic regions. Average annual rainfall and air temperature are given below:

Table 1.3 Rainfall and temperature of Haryana.

Region	Mean Rainfall (mm)	Avg. Temperature (^{o}c)
Hot Arid Region	300-500	27
Hot Semi Arid Region	500-750	26
Hot Sub Humid Region	750-1050	24

1.4 Physiography

Haryana located between the Shiwalik hills on the northeast and Thar Desert on the south-west bestows mainly the inland drainage basin. A topographical depression exists in the center with its axis passing through Delhi –Rohtak-Hisar and Sirsa on the regional scale. The state also forms a divide between Indus and Ganges basins. Haryana state has a flat topography with altitude varying from 190 to 480m above the mean sea level except some hills of the Shiwalik in the north and those of Delhi system in the south.

The state is bounded on the east by the river Yamuna. Ghaggar, Tangri, Markanda and Chautang are the other important rivers. Its northern part generally slopes from the north-east to south-west, but the southern section is undulating due to the hills of Aravalli system and sand dunes. The non-perennial streams flowing in the south are Krishnawati and Kotla Bibipur.

Yamuna is the only perennial river. It forms the boundary between Haryana and Uttarpradesh for over 320 km. The Ghaggar river rises on the slopes in the Shiwaliks in Sirmur and enters Haryana near Pinjore. It alternately passes through Punjab and Haryana before entering Rajasthan and ultimately disappears in Hanumangarh area of Rajasthan.

1.5 Geology

The geological formation ranges from precambrian to recent times and can be divided into 3 geological systems, viz.,.

i) Aravalli System

ii) Shiwalik System

iii) Indo-Gangetic Alluvial Plains.

1.5.1 Aravalli system is the oldest formation present in south western parts of the state covering Bhiwani, Mahendragarh, Rewari and Gurgaon districts. They are composed of quartzite sandstone, mica schists, phyllites and crystalline limestone.

1.5.2 The Shiwalik system is located in northern part of Ambala and Panchkula districts and is composed of sedimentary rocks. The dominant rocks are sandstone, shale, clays and boulders.

1.5.3 Indo-Gangetic Alluvial plains are formed by deposition of alluvial sediments between Shiwaliks and Aravallis and forms a part of great Indo-Gangetic plains. They consist of sand, silts, clays and occasional gravel beds. Wind blown sand deposits are found in the form of sandy plains and sand dunes over alluvial deposits in parts of Bhiwani, Hisar, Sirsa and Fatehabad districts.

1.6 Soils

The soils of Haryana have been divided into 10 district units namely soils of Shiwalik hills, soils of piedmont plains, soils of Aravalli hills, soils of old alluvial plains, soils of old alluvial plains with sand dunes, soils of active flood plains, soils of aeofluvial plains, soils of aeolian plain.

1.7 Water resources

1.7.1 Water scenario

Haryana state is in a disadvantageous position with regard to rainfall, surface water quantum and groundwater quality. On an average, the state receives 545 mm

rainfall annually, as compared to the environmental requirement of 1550 mm and the country's average rainfall of 1250 mm. The total potential utilizable surface and groundwater resources are estimated at 25.7 x 10^9 m^3/year. The total surface water potential is 14.8 x 10^9 m^3/year and includes the state's share of 4.2 x 10^9 m^3/year of Ravi and Beas water, yet to be developed. Total potential groundwater resources are estimated at 10.9 x 10^9 m^3/year including marginal quality groundwater. In addition to canal water and groundwater, effective rainfall for meeting consumptive use demand of crops is estimated at about 10 x 10^9 m^3/year.

For the projected cropping pattern and a gross cropped area of about 6.2 million ha in the year 2000, the gross irrigation water requirement (excluding effective rainfall) has been estimated at 46 x 10^9 $m^{3/}$ year. The potential availability is, therefore, only 60 percent of the irrigation water requirement. However, present use of the potential water availability is even less than 50 percent of the requirements. In addition to agricultural water requirements, the demand for other uses, such as municipalities, industries, forestry and livestock is expected to be about 2 x 10^9 m^3/year, which makes the affective demand of water of the order of about 48 x 10^9 m^3/year.

1.7.2 Surface water potential

Haryana state falls under two major river basins, the Ganges and Indus basin. The Yamuna river, a parennial river and tributary of the Ganges, flows along the eastern boundary of Haryana. The flow of Yamuna river varies from 6.4 x 10^9 m^3/year with an average of 10.3 x 10^9 m^3/year. The Ghaggar river on the western boundary of the state forms part of Indus basin. The Tangri, Markanda and Sarswati, the minor streams flowing into Haryana state join the Ghaggar river on its left bank after passing through Kurukshetra district.

1.7.3 Groundwater

Ground water cell of Dept. of Agriculture, Haryana has carried out extensive studies on the quality and quantity of groundwater in Haryana. For this purpose, it has installed 2021 observations wells spread throughout the state. Out of these 131 are piezometric tubes and another 106 as key observation wells. In addition Haryana State Minor Irrigation Tubewell Corporation(HSMITC), Central Ground Water Board

(CGWB) and Agriculture Dept. have drilled 639 exploratory bores to assess the quality and quantity of water at various locations of Haryana. Based upon the observations made from the observation wells, groundwater contours for pre-monsoon and post-monsoon have been prepared. It shows that maximum area falls between 3 to 20 metres depth of water table. Almost 13 percent area in pre-monsoon period and 28 percent area in post-monsoon is under critical water table level of 0 to 3 metres. Almost 9 percent of the geographical area has deep water table varying from 20 metres and above. This area falls mostly in the districts of Ambala, Mahendergarh and Rewari.

Historical water table fluctuations for pre-monsoon period for the period from 1974 to 1998 indicate the water table has fallen drastically in the districts of Kurukshetra, Mohendragarh, Gurgaon, Panipat and Panchkula. During the same period, water table has risen substantially in districts of Hisar, Jind, Bhiwani, Fatehabad and Rohtak. Historical water table fluctuations in the post monsoon period for the years from 1974 to 1998 indicate that the water table has risen in districts of Hisar, Sirsa, Jind, Bhiwani, Rohtak and Fatehabad. On the other hand, water table has fallen substantially in the districts of Mohendragarh, Gurgaon, Kurukshetra and Panipat. Thus, the position remains almost unchanged during the pre and post monsoon period as far as rise or fall in water table is concerned.

The percentage of fresh water is more in the shallow depth zone as compared to deeper depth zone. Water salinity becomes more predominant with the increase in depth of water zone. In fact, the area under saline water is substantially higher in the deep depth water zone. Position is more acute in case of districts Rohtak, Hisar, Bhiwani, Sirsa, Jind, Gurgaon and Sonepat.

Groundwater exploitation is highest in the districts of Karnal, Panipat, Kurukshetra, Rewari, Jhajjar and Yamunanagar. The least exploited districts are Bhiwani, Hisar, Panchkula and Sirsa. Groundwater balance is the difference between the net recharge and the net draft from aquifer. It has a net bearing on the long-term sustainability of water availability in the area. A look at the table shows that ground water has been over exploited in the districts of Mohendragarh, Kurukshetra, Karnal , Panipat and Rewari. Optimum exploitation is observed in the districts of Bhiwani, Gurgaon, Kaithal and Yamunanagar whereas it is underutilized in case of districts of

Hisar, Jind, Panchkula, Rohtak, Jhajjar, Sonepat and Sirsa. While over-exploitation need to be avoided, under-utilization of ground water potential shows the need for more efforts in this direction.

District Wise Position of Ground Water Exploitation (1997)

S. No.	Districts	Name & Category of Blocks		
		Over Exploited	Optimum	Under-Exploited
1.	Ambala	Barara Naraingarh	Ambala	-
2.	Bhiwani	Badhra Dadri-I Dadri-II	Loharu	Bawani Khera Bhiwani Tosham,Siwani
3.	Faridabad		Ballabgarh Palwal	Hathin Hodel
4.	Gurgaon	Farukh Nagar Gurgaon Pataudi Taoru, Sohna	Punhana	F.P.Zhirka Nagina Nuh
5.	Hisar (including Fatehabad)	Ratia Tohana	Hansi Narnaul	Adampur Agroha Barwala Bas Bhattukalan Bhuna Fatehabad Hisar-I,Hisar-II Uklana
6.	Jind	Alewa Safidon	-	Jind, Julana, Narwana, Pillukhera Uchana
7.	Karnal	Assandh Gharaunda Indri Karnal Nilokheri Nissing	-	-
8.	Kaithal	Gulha,Pundri	-	Kaithal,Kalayat Rajaund
9.	Kurukshetra	Ladwa,Pehowa Shahabad,Thanesa r	-	-
10.	Mahindergarh	Ateli Nangal Kanina Mahindergarh Nangal Chaudhary	-	-

		Narnaul		
11.	Panipat	Madlauda,Panipat Samalkha	Israna	-

1.7.4 Irrigation system

In 1966, irrigation facilities were available for 1.3 million ha out of total cultivable area of 3.6 million ha i.e. 35 percent of the cropped area. The state government, therefore, accorded the highest priority to develop and utilize all surface and groundwater resources. New major and medium irrigation schemes and lift canal irrigation schemes were taken up in addition to modernizing old irrigation systems. The schemes for augmentation of deep tubewells, supplying groundwater to canals as well as direct irrigation to canals as well as direct irrigation tubewells were launched. As a result of the development of canal water and groundwater resources, the net irrigated area has doubled to 2.6 million ha which is about 70 percent of the net sown area. Presently canal water accounts for 54 percent of area and groundwater for the remaining 46 percent. Surface water irrigation in Haryana is received form two canal system, namely, Bhakra Canal Systems and Western Yamuna Canal system. These two main canal systems supply water by gravity to about 88 percent of the surface water irrigated area.

About 12 percent of state area in the south west consists of upland area with sand dunes and Aravalli hills and is not suitable for gravity irrigation. These areas are chronically drought prone and to provide life saving irrigation, lift irrigation schemes have been developed. These are Jui, Siwani, Loharu, Indira Gandhi, Jawahar Lal Nehru and Rewari Irrigation Schemes. The present irrigation system in Haryana is highly insufficient in terms of irrigation water allowances. In the Western Yamuna Canal Command Area, the annual allocation is 4950 m3/ha resulting in an annual irrigation intensity of 50 percent. In the Bhakra Canal System, the allocation is 6070 m3/ha with an irrigation intensity of 62 percent. In the lift irrigation systems, irrigation intensities vary from 4 to 38 percent. Irrigation water is supplied to farmers following the classic rotational schedule, also known as 'Warabandi system'. The farmer's entitlement of water is proportional to his land holding without consideration of soil type, crops grown, climatic factors etc. Irrigation water charges to the farmers are fixed based upon type of crops and area actually irrigated with

surface water. The water charges are very low and based upon the area actually irrigated. This system leads to over-irrigation and wasteful use of water.

1.8 Socio-economic status

The total population of the state as per 2001 census (provisional) is 21.1 million and has 1.3% of the total area of the country supporting 2% of its population. The percentage of the rural population is 75.37%. The density of population works out to be 372/sq km. The literacy rate (exclusive of children in the age group of 0-6 yr.) is 68.59%. The population of the state was around 58.59 lakhs in 1951. The population grew by 34% (1951-61) and 32% (1961-71) in the first two decades respectively but later the rate of growth slowed down and the population increased by 28.75% in 1981 and by 27.4% in 1991. The percentage of the population below poverty line reduced from 25% in 1971 to 12% in 1991.

The per capita income of Haryana as recorded in 1996-1997 at 1980-81 prices is Rs. 4029 and the state holds the 4th position in the Indian Union below Goa, Maharashtra and Punjab. The average All India per capita income stands at Rs. 2761. As per the 2001 census (provisional) there were 861 females per 1000 males as against 865 in 1991.

2.0 Agriculture

Agriculture is the mainstay of Haryana economy and it is the highest contributor to the state treasury. 75% of the population depends directly upon agriculture. In 1991 about 59% of the workers were engaged in agriculture sector as compared to about 62% in the year 1981. Wheat, Rice, Bajra, Gram, Sugarcane, Cotton and Mustard are amongst the principal crops grown. 80% of the total geographical area of Haryana is put to agriculture use, 77% of which is irrigated. The state produced 11.45 M tonnes of food grains in 1998, contributing about 6% to the total food production of the country.

After comparing the area in 1966-67 with that of 1996-97 it is seen that he area under wheat cultivation has increased by 102% and that of rice, by 271%. The area under all the crops under consideration has shown continuous increase. The increase in case of mustard (including rape seed) has been 363% and that of 225% in case of cotton. This increase in the area under mustard and cotton especially, has great significance from the Social Forestry point of view. The stalks of both these crops

are used as fuel in mainly the rural areas of the state especially in south Haryana. So it can be seen that the oilseed production has been responsible for meeting the energy requirements of the farming community to a great extent. These two crops have helped in easing the pressure on the plantations for fuelwood in the rural area.

The study on the 'Energy Consumption Patterns and Technologies in Villages of Haryana' conducted by Energy Research Center, Punjab University, reveals that 92% population in sandy areas uses agricultural residue while the percentage of population using agricultural residue in plains is 67% and 22% in hills.

The decrease in the landholding has been responsible for the increased intensity of cropping, the decrease in the extent of current fallow lands, and also in the decrease in the width of inter-field bunds. Earlier the width of the inter-field boundaries used to be about 1m which is now less than 30cm. These wide bunds were a source of fodder in the rural areas which is not the case now. The current fallow lands used to provide temporary grazing facilities to the village cattle. The decrease in the land holding has lead to the decreased availability of fodder in the rural areas.

3.0 Forests

The forests in the context of the state could be divided into two main categories: the natural forests and the man made ones. The natural forests are mainly confined to the Shiwaliks on the northern border and to the highly degraded forests of the Aravalli Hills in the south. The total extent of the forests in the state is 1538 sq. km of which about 7.6% is private forest closed under Section 38 of IFA and under Section 4&5 of Punjab Land Preservation Act 1900. The extent of Reserved Forests (RF) is 16.06% and that of Protected Forests (PF) 74.97%. About 50% of the total PF is in the form of linear strips along rail, road and canal sides.

3.1 Natural Forests

The Shiwalik hill forests of the northern part of the state belong to the Northern Tropical Dry Deciduous type with Sal as the important species. In the higher elevation, in Morni Hills, the chir pine forests belonging to the Sub Tropical type Pine forests cover a small area of 22.7 sq.km. Dry Bamboo Brake forests, an edaphic climax, are found on the H.P. border. In the south and southwestern part, the vegetation belongs to Northern Tropical Thorn forest and cover sizeable area with *Acacia nilotica*, *Prosopis cineraria*, *Acacia senegal* as the important species.

The Aravalli Hills in the south carry the edaphic type-*Anogeissus pendula* forest, most of which is in a highly degraded state. The blanks and the degraded areas have now been planted mainly by *Prosopis juliflora*, *A.senegal*, *Holoptelia* species etc. under EEC aided Aravalli Afforestation Project. Most of the natural forests are poorly stocked. In the good forests of Shiwalik Hills the growing stock is around 50-60 m^3 / ha.

3.2 Man Made Forests

The degraded forests in the state have been planted mainly by species like *A.catechu*, *A. nilotica*, *Eucalyptus hybrid*, *D.sissoo*, *A. tortilis* and *Prosopis juliflora*. The strip forests are wholly man made and carry growing stock upto 60-80 m^3 . The productivity of the forests depends on many factors but on an average Eucalyptus gives mean annual increment (MAI) of upto 10 m^3 /ha./yr , but under good soil and moisture conditions MAI upto 18 m^3/ha/yr are not uncommon. The clonal Eucalyptus is likely to give MAI upto 30 m^3/ha/yr. A.nilotica produces MAI upto 8m^3/ha/yr on strips and about4 m^3/ha/yr in block forests in the semi-arid tracts of the state. The growth of A. tortilis which is extensively planted in the sandy deserts of the state gives MAI of about 3-4 m^3/ha/yr.

3.3 Agroforestry

Good economic returns from the initial trials of Eucalyptus in the early seventies gave a boost to agroforestry in the state. Eucalyptus was the preferred species among farmers till mid eighties. After its debacle in the late eighties, Poplar gained popularity and became an important species in agroforestry. With the decline in the economic returns from agriculture, due to various reasons, agroforestry is gaining prominence as one of the important options of land-use diversification being thought of in this region.

4.0 Common lands

In Haryana there are 5958 Gram Panchayats. The total number of Sarpanches is 5058 (3964 male and 1994 female). The total number of Panches is 54149 of which 30583 are male, 17928 female and 5648 belonging to Backward Classes. (Haryana Statistical Abstract 1996-97.) Of the total Panchayat land in Haryana 0.9 lakh hectares is cultivable land and about 2.142 lakh ha., the uncultivable land (Social Forestry Project, 1981). A study was conducted by The Indian Institute of Rural Management For Haryana Community Forestry Project on the common lands in

Haryana. It reveals that of the total common land 13% is under forest, 43% is used for non-agriculture purpose, 36% is leased out for agriculture, 5% is cultivable waste, 3% is pasture and grazing land and about 1% is barren and uncultivable waste. The study has also estimated that about 41% of the land is not under the Panchayat possession due to either leasing for agriculture purpose (22%), encroachment (10%) or social transfer (9%). In Kurukshetra District, however, the extent of Panchyat area not-under possession is of the order of 82% and of this area (not-under possession) 58% is under encroachment. In Mahendragarh 13% of land not-under possession is under encroachment. (Common Land study- 11RM For HCFP, Haryana Feb. 2000).

5.0 Cattle Population

The population of different animals has undergone changes for various reasons. Earlier cows were maintained as milch cattle and bullocks were put into use as draught animals. Over the last thirty years, this population has shown a considerable decrease. This is because of two main reasons. First was the introduction and the subsequent popularity of tractors among the farming community in Haryana. This resulted in the removal of the bullocks from the agriculture scene thereby reducing the cow population. Secondly, the cows were slowly replaced by the buffaloes because cows yield relatively less quantity of milk as compared to buffaloes and they also require large areas as grazing lands which had been constantly decreasing in the state. On the other hand there is an increase in the population of sheep and goats which could be attributed to economic factors. Because of reduction in grazing lands and consequent reduction in the fodder availability, the number of cows/bullocks decreased. So some people, especially the landless and poor, started rearing sheep and goats instead of cows. Moreover, the sheep and goats can survive on relatively poorer fodder. Goats were reared mainly for meat and sheep for wool and meat. However, because of the availability of synthetic carpets in the market, the sheep is now reared mainly for meat purposes. There has not been any significant change in the camel population. The marginal reduction in the population is due to the replacement of camels by tractors in the southern districts of the state. The buffalo population in the state has gone up. This is because many people prefer buffaloes over cows for economic reasons. Moreover, buffalo is basically a stall fed animal and doesn't need vast areas of grazing land. The decreased extent of grazing lands, therefore, didn't affect their population growth. Moreover, because of increase

in the irrigational facilities, the extent of land under cultivation of irrigated fodder crop has gone up by about 48% i.e. from 213 thousand ha. in 1977-78 to 316 thousand ha. in 1996-97. The number of tractors in the state has increased many folds. It was 4803 in 1966-67 but 1,87,078 in 1998-99. This increase is mainly responsible for the decrease in the population of cows and bullocks.

5.1 Grazing Lands

5.2 Permanent Pasture Lands

The land which was/is meant for grazing purposes has reduced from its 1966 value of 46 thousand hectares to 25 thousand hectares in 1997-98. The land was put to use for various other developmental activities.

5.3 Barren and unculturable land

The lands belonging to this category were put to many uses like afforestation, construction of school building, hospitals, roads, housing colonies and other infrastructural facilities during the process of development. The extent of these lands in the year 1966 was about 232 thousand hectares, which in the year 1997-98 came down to 88 thousand hectares. This has reduced the grazing lands in the state. With the introduction of sprinkler irrigation system, many uncultivable lands have been brought under plough, especially in the south and south-west Haryana. This has also contributed to the decrease in the wasteland in Haryana.

5.4 Culturable but barren land

The land area falling under this category has shown a perceptible decrease i.e. from 87,000 ha. in 1966 to 23,000 ha. in 1997-98. One of the major reasons is the ever increasing demand for more cultivable land and the other, an increased availability of irrigation. This has facilitated the conversion of this category of land into agriculture land.

5.5 Current fallow land

The fallow lands in the villages have also reduced. Because of increased facilities of irrigation and decreased land holding in the state there has been a tendency to cultivate all available land. Every farmer in his effort to increase his income tries to cultivate most of the land he owns. This has lead to the reduction in

this land category. Though these lands are not meant for grazing they are used as such when they are not under cultivation temporarily.

5.6 Forest lands

The extent of forest land has shown an increase from 91 thousand hectares in 1966 to 115 thousand hectares in 1997-98. This increase is at the cost of other categories of lands mentioned earlier. When new rail, road and canals are constructed, the waste strip along these utilities is declared as protected forest. Secondly, there has been acquisition of land by the Forest Department for various reasons, and also because of the transfer of land under Forest Conservation Act(FCA), 1980-compensatory afforestation purposes. These factors have led to the increase in the extent of forestland in the state.

It can thus be concluded that in the rural areas, all categories of land which could be used for grazing purposes have decreased considerably. The total area of all pasture land put together was reduced to 407 thousand hectares in 1997-98 from 715 thousand hectares in 1966 i.e., to 57% of its extent in 1966. It can thus be seen that there is a reduction of 43% in the land available for grazing in the state.

6.0 Energy Consumption Pattern in Rural Haryana

The consumption of various sources of energy in rural areas depends mainly upon the economic status of the user and the availability of the source of energy. Economically well-off population in villages now uses LPG. For example, in the prosperous villages of Jhansa and Jakhwala of Kurukshetra district, 60% of the villagers now use LPG as the main source of energy. This however, may not be applicable to all rural areas. In the areas in the proximity to the forests like those near the Shiwalik Hills of Yamunanagar, Panchkula and Ambala District or the Aravalli Hills in the south, the rural population still depends mainly on the wood brought from the forests.

The study on Energy Consumption Patterns and Technologies in Villages in Haryana (2000) has arrived at the following conclusions:

i) Wood consumption is maximum in hilly areas- because of the relatively easy availability of wood from the forests.

ii) Consumption of cow dung and agriculture- crop residue is maximum in sandy areas. This is because of the easy availability of cotton and mustard stalks and relatively higher population of cattle in this region.

iii) The consumption of wood decreased with the increase in the household income. The middle income groups of rural population use cow dung and agriculture waste as the main source of energy and the population in the higher income groups of the village use more kerosene and LPG.

(Source: Study on Energy Consumption Pattern and Technologies in villages of Haryana. Energy Research Center: Punjab University, Chandigarh-2000).

7.0 Socio-economic development and biodiversity

Understanding of natural ecosystems that support diverse flora and fauna is far more complex than imagined and involves intricate interactions between the organisms and the environment at various levels. However, definite evolutionary or economic significance of each and every organism of nature, whether identified or not, is established and accepted. Therefore, all the living organisms on the earth have one or other essential role for the ecosystem viability. The development of any kind without understanding the systems or far away from the natural systems only for economic goal is deleterious to natural resources and the environment. This understanding has strengthened the idea of conservation of biodiversity.

Increased population and economic development during last few decades saw a tremendous changes in use of natural resources in the state. In order to meet the food requirement of ever increasing population, there have been intensive and revolutionized agricultural practices over three decades involving use of high yielding varieties, intensive use of chemicals, mechanization etc. Land resources have been subjected to severe exploitation by way of fragmentation, shrinkage of common and fallow lands being brought under agriculture and exploitation ground water for growing more food. Cropping pattern and practices have been changing so fast that a crop species or varieties lose their importance over a short period of time and space. Traditional agriculture practices which co-existed harmoniously in the past with natural environment have changed to become exploitative of nature and natural resources. Forest resources are depleting gradually but surely day by day due to increased biotic pressure, both from human and cattle which has led to irreparable destruction of wildlife habitat and damage to the watersheds. Changing life style of new consumer generations have developed distaste for forests, natural resources or professions related to natural resources and hence, indigenous knowledge is being lost with the passage of time. Such socio-economic developments have brought about

quantitative and qualitative changes and spatial distribution of a vast known and unknown flora and fauna of the state. Such developmental activities in many eco-regions have brought about drastic changes in landscape, which supported diverse vegetation growth and harbor innumerable living forms. Though quantitative information is not available, landscape modifications are amply indicative as to how the socio-economic changes have affected the flora and fauna of the state over the years.

forests & Plant life

Forests & Plant life

Forests

1.0 Profile of Area

Introduction

The present section is an action plan for conservation of biodiversity submitted by Forest Department of Government of Haryana. Less than one percent of the area of the state has natural forests in Shiwalik and Aravalli hills. Except these natural and habitat forests not much of forest areas are left in the state and scope for action plan, therefore, is very limited. The existence of very small area under natural forests also highlights the reason why natural forest area should be preserved because unless that is done whatever wild tract we have in the state would also be lost in foreseeable future. It is a sectoral plan by a line department, focussing perceptions of experienced professionals. For last two decades, at various interphases with the people, some lessons have been learnt in Shiwalik and Aravalli forest area which are also incorporated in the proposals made here under. Wildlife related strategy and action plan has been dealt separately. Habitat preservation is the core issue. For conserving living organisms sizeable areas are to be left out for supporting viable breeding populations. Unlike human beings habitat for wildlife is a space to exist, gather food, shelter, breeding ground to continue species and place for interaction with other species. If any of the above linkages fail, the truncated habitat fails to serve natural purpose. While human beings can subsist by ingenuity and can create alternatives for difficult situations plants and animals have much less options in the game of survival. It is in this crucial understanding that ultraistic nature of man should find expression to ensure inter - generational equity, hence this effort.

1.1 Geographical profile

Haryana has a geographic area of 44212 sq. km. It lies between latitude 27^0 39" to 30^0 56" N and longitude 74^0 27" to 77^0 36" E. The state is divided into two natural zones, the Shiwalik and the Aravalli Hills and the Indo-Gangetic plains. The Yamuna and the Ghaggar rivers are the important fresh watercourses of the state. Former being more important as it is perennial in nature, the later though seasonal in nature is beneficial as a source of recharge of water and also notorious for flood damage in Kaithal and other districts such as Sirsa. The land use pattern of the state is given in Table No 1.6 .

The state experiences sub-tropical monsoonic climate with bulk of rainfall during summer and some sprinkling of rain during winter owing to western disturbances. Winters are mild in comparison to harsh winters elsewhere in temperate countries. Summers are harsh and the temperature touches a maximum of 45^0 centigrade. The rainfall varies from 213 mm in south - west to 1,400 m in the north - east. The annual mean temperature varies between 22.5^0 C to 25^0 C.

The state can broadly be divided into four major vegetation/ phyto-geographical regions which are very briefly described below:

a) the northern-most region has Shiwalik hills with northern tropical dry mixed deciduous forest with small patches of sal and chir pine and bamboo.

b) the central plain region which is predominantly prosperous agricultural land has practically nothing left of the earlier savannah with scrub vegetation of Butea monosperma and Acacia leucophloea .

c) the south-western sandy region borders the Thar desert and supports thorny vegetation.

d) in the south south-eastern part of the state the north north-eastern fringe of the Aravalli hill system supports highly degraded vegetation of Anogeissus pendula.

1.2 Socio – economic profile

Haryana state is an agrarian state with its majority of people engaged in raising agricultural crops. Traditionally keeping milch cattle is one of the important

subsidiary operations of peasants. Assured irrigation exists in 63 % of the area of the state, 50 % by canals and 13% by tube wells. There are 5, 75, 513 tube wells all over the state. River Yamuna through Western Yamuna Canal Irrigates central and eastern side of the state, Ghaggar being a monsoonic torrent is used to recharge ground water. Western districts use water from Bhakra System.

The rural population adjoining the Shiwaliks hill forest depend on the forest for their livelihood. In most forest the villagers have rights of fuel fodder collection against their service of protection of the forest from fire. The Aravalli hills are by and large under the control of the village panchayats and there are very few government forests. Although the hills are denuded the poor people depend on these degraded hills for their fuel and fodder requirements. In the other regions the dependence of the rural community on the forests is minimal. Only the very-poor people depend partly on the forest vegetation, their most requirements being met by the agriculture waste.

1.2.1 Demography and life stock

The population of the state is 21.1 million (2001 census- provisional). There is no Scheduled Tribe population in the state. Population density of the state is 477 persons per sq.km. Haryanvi is by and large a vegetarian, on account of which wild animal conservation should have been better than what it is today. But, for a flourishing agriculture land was diverted in the past to such an extent, loss of habitat is nearly complete. The state has a dubious distinction of having just 1.38 percent of habitat forests. Elsewhere in the country both non-vegetarian food habits of resident population and habitat destruction have combinedly damaged existence of variety of animals. The livestock population of Haryana is 9.14 million (1992 livestock census) which is largely stall-fed. Except in Shivalik and Aravalli hills damage to vegetation by goat and sheep is not rampant. Regular cattle migrations to escape drought situations periodically and annual migrations during dry part of the year occurs from Rajasthan and Gujarat.

1.2.2. Ethnic groups

A belt of Jats in central and northern districts of Haryana is evident. Those of early settlers are called “deshwals” and later settlers are called “bagris” meaning there

by new migrants from "bagar" (Barmer and Jaisalmere districts of Rajasthan). In to this more or less homogenous group, at the time of partition Indian repatriates from Pakistan were added. Land lost by them was reallotted in similar or comparable agro-climatic zones. Eventually large proportion of repatriates have since migrated to urban centres in search of better economic prospects. Gurgaon, Rewari and Mahendergarh have large concentration of Ahirs also, Jhajjar, Faridabad and Bhiwani have sizeable number of Ahirs in clusters. Above areas are locally called "ahirwal". Near southern side of Ahirwal adjacent to Rajasthan border there is a belt of Meos, a mughal time Mohammedan converts mostly belonging to ranghad and meena tribes. Both varieties of Brahmans from Bengal (Gaur Desh Bengal, hence Gaur Brahman) and Saraswat Brahman (from extinct river saraswati on the banks of which lived fair skinned Brahmans) continue to live in the state. Some villages are single caste villages of Brahmans indicates caste wise pioneering occupancy of fertile plains. Gujjars mostly settled in hilly terrains carry out animal rearing. Some belong to Hindu fold and others to Islam fold, as they share common sub caste titles common origin is often concluded.

1.2.3 Major occupations

Agriculture and animal husbandry are the major occupations of resident population. In the hilly areas one of the minor occupations is mining building material. Youth from all ethnic groups tend to get themselves employed in defence services. Educational opportunities have since improved and technical and professional courses are being preferred.

1.3 Political profile

All villages have a panchayat and at the district level panchayats are organized in to Zila Parishads. Decentralization of power is proposed for effective grass roots democracy. Leader of the majority party is sworn in as the Chief Minister who acts as the chief political executive and chooses council of ministers. Every district has a civil administration headed by Deputy Commissioner helped by Additional Deputy Commissioner who specially looks after current economic development. Forest, Fisheries, Agriculture and Animal Husbandry are technical line departments. Line

departments are controlled by technical officers of respective lines and for coordination they are also controlled to a limited extent by Deputy Commissioner at the district level.

1.4 Ecological profile

1.4.1. Forest Resources

Haryana, an intensively cultivated state, is deficient in natural forests. The recorded forest area of the state is 167,300 ha which is 3.78% of the geographic area of the state. As per legal classification, Reserved Forest constitutes 14.76%, Protected Forest 65.99% and Unclassed Forest 19.25%. Forests are mainly distributed in the north - eastern and south - eastern districts of state. There are three forest types, the Tropical Dry Deciduous in the eastern part, Tropical Moist Deciduous in the Shiwalik region and Tropical Thorn Forests in the western part of the state.

1.4.1.1 Protected Areas

One National Park and 9 Wildlife Sanctuaries in Haryana cover an area of 27,975 ha. which constitutes 0.63% of the geographic area. Bulk of the above-cited area is at Abubshehar Wildlife Sanctuary as a large tract of above named sanctuary is privately owned agricultural land



where not much of regulatory activity is being done, effective net work is very small. Proposed work in BSAP can usefully contribute towards this requirement.

1.4.1.2 Forests in Villages

There are 6,759 villages in the state of which 90 have forest as a land use. In these villages, 7,967 ha is classified as forest. Population inhabiting these villages is 0.13 million. The villages having less than 100 ha. between

100-500 ha and more than 500 ha forest area in each village constitute 79%, 17% and 4% of the total villages, respectively. Table 1.1 provides details of villages by forest area and population.

1.4.1.3 Joint Forest Management

In Haryana, Joint Forest Management was started as early as 1972 though the Government notification in this regard was issued in 1990. The world famous Sukhomajri model of village development through the use and management of available natural resource was developed by Late Padmashri P.R.Misra.The concept of 'social fencing' evolved in Sukhomajri. There are, at present, 350 village level committes, Hill Resource Management Societies,(HRMSs), Village Forest Protection Committes,(VFPCs) managing 60,734 ha of forestland.

JFM is to be practiced in forests for their development and meeting the requirements of the local people. The net income is to be apportioned between the Government and the HRMS as 70% and 30%. The HRMS shall contribute 30% of its share towards plough back fund for further improvement of management area and another 10% towards *Kalyan Kosh* (Welfare Fund).

Table 1.1 Forests as land use in villages

Forest area	No. of villages	Total forest area (ha)	Population
Less than 100 ha	71	1388	114,413
100-500 ha	15	3858	12,773
More than 500 ha	4	2721	492
Total	90	7967	127,678

1.4.1.4 Forest Plantations

The plantation activities in the state started extensively in early 1980s. Large-scale plantations were carried out under Aravalli Project since 1992. Plantations have been raised mostly on panchayat lands,



along the roads, canals, railway lines, water courses, on the available institutional land and on the farm lands.

Table 1.2 Forest plantations by all agencies

Period	Area in '000 ha
Upto 1980	72.87
1980-85	182.41
1985-90	159.35
1990-91	51.31
1991-92	45.12
1992-97	192.37
1997-98	19.61
1998-99	19.70
Total	742.74

Source: NAEB, MoEF: 1999

Existence of large-scale plantation outside forest (55 million trees) was also estimated by FSI through the inventory as reported in SFR-1997.

1.4.1.5 Forest Cover

The forest cover of the state, based on satellite data of November-December, 1996, is 964 sq.km. which constitutes 2.18% of the geographic area. Dense forest accounts for 449 sq.km. and open forest 515 sq.km. An

overall increase of 360 sq. km in forest cover has been observed in the present assessment compared to the previous assessment. The difference between the data periods of the two assessments is about 3 years.

The change matrix, given in Table1.3 reveals that there has been an overall increase of 79 sq.km of dense forest. This is the result of improvement of 18 sq.km of open forest, 17 sq.km of scrub and 61 sq.km of non forest to dense forest, which is partly offset by degradation of 3 sq. km to open forest and 14 sq.km of dense forest to non forest.

The increase of 281 sq.km of open forest is on account of conversion of 3 sq.km of dense forest, 53 sq.km of scrub and 260 sq.km of non-forest to open forest. The improvement is also associated with conversion of 18 sq.km of open forest to dense forest and 17 sq.km of non-forest to open forest.

There are 19 districts in the state but boundaries of only 12 districts, excluding newly created ones, are incorporated in the SOI maps. The extent of dense and open forests and scrub, alongwith the change compared to 1997 assessment, has been provided in Table 1.4.

The table reveals that Gurgaon district has registered an increase of 212 sq.km, mostly in open forest category. In the previous assessment, the imageries used were mainly of October-November, 1994. Because of non-availability of suitable imageries of the above period for a part of Aravalli hills, imageries of October 1992 were used. Therefore, in the current assessment, for some part where extensive plantations were carried out, the changes reflected are for four years. Forest cover increase in Gurgaon, Mahendergarh, Faridabad and Bhiwani is mainly due to plantations raised under the Aravalli Project, which was started in early 1990s.

During the field visits the plantations of *Prosopis juliflora*, *Acacia nilotica, Acacia tortilis*, *Ailanthus* spp., *Euphorbia* spp., *Dalbergia sissoo*, *Acacia catechu* etc. raised during 1991-94, were observed. In Ambala also, plantations of *Eucalyptus* spp., *Acacia nilotica*, *Dalbergia sissoo*, *Bombax ceiba*, *Syzgium cumini*, etc raised between 1991-93 are now accounted for.

Table 1.3 Forest cover change

1999 Assessment (Data Nov.-96) (Sq.km)

1997 Assessment (Data Oct.92&Oct. -Nov.94)	Dense forest	Open forest	Scrub	Non-forest	Total 1997
Dense	353	3	0	14	370
Open forest	18	199	0	17	234
Scrub	17	53	86	1	157
Non-forest	61	260	105	43,025	43,451
Total 1999	449	515	191	43,057	44,212
Net change	+79	+281	+34	-394	

Table 1.4 District-wise forest cover

1999 Assessment

(Sq.km)

District	Geographic area	Dense forest	Open forest	Total	Change compared to 1997	Scrub
Ambala	3,832	283	175	458	+63	64
Bhiwani	5,099	26	15	31	+19	5
Faridabad	2,150	23	33	56	+39	34
Gurgaon	2,716	43	199	242	+212	71
Hisar	6,515	11	3	14	+1	15
Jind	3,306	4	1	5	-1	0
Karnal	3,721	5	1	6	-4	1
Kurukshet	3,740	28	14	42	-3	0
Mahendergarh	3,009	24	47	71	+32	0
Rohtak	3,841	1	20	21	+4	0
Sirsa	4,276	1	0	1	0	1
Sonipat	2,2072	0	7	7	-2	0
Total	**44,212**	**449**	**515**	**964**	**+360**	**191**

In Haryana 1062 species of angiosperms plants have been described as per Botanical Survey of India. The plants have been mostly described in the flora of Chakrata by Sh. Kanji Lal, U.N. and also by Sh. Parker, R.N. As per

the introductory pages of Maheshwari who has written flora of Delhi which includes adjacent districts of Haryana, there is diversity in plant species owing to convergence of three streams of vegetation, one type represents the Shiwalik hill vegetation, second the Indo Gangetic plain vegetation and a third from the Aravalli & desertic zone. Because of above convergence there is unusually large floral diversity not usually imagined to be existing in a small geographic area of 44, 212 sq. Km.

Owing to agricultural pressure most of the land is sown, about 83% constitutes the sown area. Rest of the area has canals, roads and rails that are scrupulously kept clean of vegetation. Only about 1% of the total land support natural plants and in that land also for economic reasons more of monoculture has spread leading to decimation of species. There are however some good area of natural vegetation left in some areas such as Morni, Panchkula, Pinjore, Kalesar, Jhir forest, Nimbi Duloth, Sohlabuddin which are to be further preserved and extended along scientific lines in consultation and involvement of people.

1.4.1.6 Natural Forest and wildlife Ecosystems

(a) Transitional Shiwalik Sal Forests of Kalesar, Yamuna Nagar District.

(b) Transitional Shiwalik Chir Forests of Morni, Panchkula District.

(c) Anogeissus pendula forests of Jhir area in Firozpur- Zhirka of Gurgaon District.

- (d) *Terminalia chebula* forests of Mandhna and Hathia- Udhon-
- Panchkula District.
- *(e) Dendrocalamus strictus* or bans forests of Thadugarh- Pinjore-
- Panchkula District,
- (f) *Salvadora olioides* forests of Nimbi-Dulath with *Capparis aphylla* and *Acacia senegal* in Mahendergarh District.
- *(g) Commiphora wightii*- Gugal (endangered) forests of Madhogarh-Mahendergarh,

- (h) *Sterculia urens* and *Acacia senegal* forests in Khol of Rewari District.
- (i) Phoenix forest of Faridabad.
- *(j) Prosopis cineraria, Tamarix articulata* forests of Sohlabuddin-
- Mahendergarh district.

(k) Hill forests of *Anogeissus latifolia, Lannea coromandelica, Acacia catechu* in Panchkula and Yamuna Nagar districts.

1.4.1.7 Grass Land ecosystems

Not many grass land ecosystems are preserved in the State. Some of them that can be taken up for preservation are as under:

- *(a) Cenchrus ciliaris/Cenchrus setigerus* grass lands of Nimbi and Duloth Forests in Mahendergarh District.
- *(b) Saccharum munja* grass lands in Sohlabuddin in Mahendergarh District.
- *(c)Saccharum spontaneum* grass lands along the streambed of Sahibi in Jhabua Forest of Rewari District.
- (d) Neem/*Saccharum munja* grass lands of Jhumpa in Bhiwani District.
- (e) Dholu grass lands of Mandhna (*Chrysopogon fulvus*)
- *(f) Eululioplis binata* or Bhabbar grass lands of Morni & Yamuna Nagar.
- *(g) Desmostachya binata and Vetiveria zizonioides* grass lands of Saraswati plantations of Kurukshetra.
- *(h) Diplacnema fusca* Karnal grass lands of kallar areas.

1.4.1.8 Wetland Ecosystems

- (a) Wetland ecosystem of Sultanpur in Gurgaon District.
- (b) Wetland ecosystem of Bhindawas in Rohtak District.
- (c) Wetland ecosystem of Chilchila in Kaithal District.
- (d) Wet land ecosystem of Dam Dama in Gurgaon District.



1.4.1.9 Desert Ecosystem

Semi arid ecosystems that are similar to desert ecosystems have been covered elsewhere in Bhiwani, Rewari and Mahendergarh forest ecosystems hence have not been repeated here.

1.4.1.10 Mountain Ecosystem

Mountain ecosystem has already been covered under hill ecosystem and hence not repeated here.

1.4.1.11 Coastal & Marine Ecosystems

Coastal and marine ecosystems are not present in the state.

1.4.1.12 Riverine ecosystem

(a) Yamuna river - bank terrace riverine ecosystem.

(b) Ghaggar river - bank terrace riverine ecosystem.

Above ecosystems are present along Yamuna and Ghaggar rivers of Haryana State and it is proposed to conserve them.

1.4.1.13 Other land water uses: Unique habitats of the state

1. Johar – Bani habitat

Apart from the above natural eco- systems, in villages of Haryana there are what are called village ponds or " Johars". All these johars have catchments that are kept under natural vegetation of the area and that patch is

called "bani". "Johar and bani" ecosystem is peculiar to Haryana. Usually it is associated with an open well that has fallen into disuse after piped water supply was given. This ecosystem requires to be rejuvenated into a village park by conserving diversity. It is proposed to develop these systems in representative areas at a cost of Rs. 100.00 lakh for a period of five years.

2. Bawri - habitat

In Shiwalik hills there are community maintained wells called as "bawri s". These community water holes were built around a spring called "uggal". The bawri had many levels. The top level, is generally covered overhead, to prevent unwanted material polluting water. It was kept separate for collection of drinking water. Excess water used to flow out and get collected at a lower level for consumption by domesticated animals. The over-flow from "Khel"-water point for animals, was used for washing clothes or taking bath by humans and the unclean-water after coursing through some distance was again channeled into a natural drain. This elaborately designed water supply system owing to disuse, after piped water supply came, requires to be rejuvenated in the hills. It is proposed to develop these systems in representative areas at a cost of Rs. 100.00 lakh for a period of five years.

3. Johar - Temple

In addition to being a water spot the village well used to be associated with "Kua Pujan" custom. Also, the village temple or mandir invariably used to be built near the well where village festivals got organized. Being rallying points of village community they used to serve a meaningful social purpose as a daily forum of interaction. Owing to disuse many of the social links are snapping they are required to be renovated as they give glimpses of extant low cost- low energy technologies that can be re invented in case of emergencies. It is proposed to develop these systems in representative areas at a cost of Rs. 100.00 lakh for a period of five years.

4. Jaal Forests of Mahendergarh & Bhiwani

Salvadora oleoides is a species that grows in semi-arid areas of the state. It occupies a unique place in the landscape of the state and gives it a

Savannah like appearance during summer. It is the habitat where lions lived in the past and feasted on plentiful supply of black bucks. Of course, lions have been eliminated from the state and are presently confined to remote areas of Kathiawar of Gujarat. Some time past such land, though privately owned, was not much valuable. Since the advent of deep tubewells and sprinkler irrigation such marginal areas have become valuable as they produce lucrative crops every year. Position of farmers is also pitiable and cannot be expected to preserve this habitat on their own initiative. Such areas are a habitat for lizards and reptiles of many species and if eliminated they are not likely to find a second home. It is proposed to preserve 200 ha. of such land, 100 ha. each in Mahendergarh and Bhiwani districts at cost of Rs. 100.00 lakh, which also includes possible cost of acquisition and fencing. It is proposed to convert them into nature parks.

5. *Phoenix* Forest of Faridabad District

An area about 25 ha. in extent is a patch of gregarious phoenix forests in the district of Faridabad. The area on the right bank of river Yamuna is the only patch of gregarious phoenix present in the State. The wild date fruits are a treat to many birds and rodents and attracts many food seekers. Also many migratory birds roost during night on these trees. Preservation of this unique heritage is a requirement of present time. Also the phoenix nursery and growth habits are required to be studied. It is to be preserved as nature park at a cost of Rs. 10.00 lakh.

6. *Capparis decidua* forests

Some of the old destroyed habitations of the yore constitute suitable habitat for natural gregarious growth of *Capparis decidua*. These forests are a source of tender fruits called "dela" or "teenth" in local parlance extensively used in pickle making in the countryside. The locations are getting gradually absorbed into cultivation or construction. Such areas eg. Beri Bhandore in Mahendergarh are proposed to be preserved in districts of Mahendergarh,

Jhajjar and Bhiwani to an extent of 100 ha. at a cost of Rs. 200.00 lacs. It is to be developed as nature park for research and education.

7. Other species of ecological importance

There are patches of forests in various parts of the state having immense ecological value but have received innadequate attentions. Plant species in such forests are gradually disappearing due to change in land use pattern. Some of the species, for example, are Butea monosperma in the Aravalli hills and also in Karnal, Kaithal and Kurukshetra districts; Saccharum munja near Farukh Nagar and Firozpur Jhirka in Gurgaon districts and on some sand dunes in desert areas; Vetiveria zizoinioides and Desmostachya bipinnata in various places of Kurukshetra and Karnal districts; Zizyphus numularia, Flacourtia ramontchii, Diospyros spp etc in various places of the state. It is proposed to protect and preserve these species by various conservation techniques in corresponding areas already mentioned elsewhere in the report.

In all the above vegetation types, where the land belongs to the community the conservation work would essentially be done by the community the Forest Department will only act as the facilitator providing the technical knowledge where and if required.

1.4.1.14 Rare and endangered plant species of the state

S. Kumar (2001) has listed rare and threatened species of the state which are economically important and need special attention for conservation. These plant species are given below: **Table 1.5**

Name of the species	Status	Name of the species	Status
1. Boswellia serrata	I	14. Justicia quinqueangularis	I
2. Caesulia axillaris	I	15. Lepidagathis hamiltoniana	I
3. Centaureum centaurioides	I	16. Manilkara hexandra	I
4. Cochleria	I	17. Mimosa hamata	I

cochlearioides			
5. Cordia dichotoma	I	18. M. himalayana	I
6. Crotolaria mysorensis	R	19. Pentanema vestitum	R
7. Cythocline purpurea	I	20. Pogostemon benghalensis	V
8. Erigeron asteroides	R	21. Pueraria tuberosa	R
9. Erythrina suberosa	R	22. Pulicaria angustifolia	I
10. Exacum pedunculatum	R	23. Terminalia arjuna	I
11. Hemigraphis latebrosa	R	24. Trema politoria	R
12. Hoppea dichotoma	I	25. Wattakaka volubilis	V
13. Iseilema prostratum	I		

I= Indeterminate V= Vulnerable R= Rare

2.0. Brief history.

At the time of carving of Haryana state, natural forests between 3 – 4 % of total land area came to state's share. Rest of the area happened to be agricultural, owned by private peasants. As on today the apportionment of land amongst various users is as under.

Table 1.6 Land use in Haryana

Land use	Area in '000 ha.	Percentage
Total geographical area	4424	
Reporting area for land utilization	4399	100.00
Forests	143	3.2
Not available for cultivation	481	10.93
Permanent pasture and other grazing lands	24	0.55
Land under misc. Tree crops and groves	4	0.10
Culturable wasteland	23	0.52
Fallow land other than current fallows	a	0
Current fallows	137	3.11
Net area sown	3615	82.18

a: less than 500 ha. **Source**: Land use statistics At a Glance.

3.0. Current range and status of bio diversity

3.1 State of natural ecosystems and plant / animal species

Details have already been given under Ecological profile item (iv) of Profile of area. In most of the eco-systems the state of affairs are less than optimal for continued existence. Pressure owing to population and cattle is so surmounting that many systems profiled above are threatened with irreversible damage.

4.0. Statement of Problems Relating to Bio-diversity

4.1. Proximate causes of the loss of bio-diversity

Name of Region — Cause of loss of bio-diversity

1. Shiwalik hills -
   i. Precarious agricultural practices.
   ii. Encroachment of forest land.
   iii. Poaching of trees and wild animals.
   iv. Forest fires, deliberate and accidental.
   v. Habitat destruction and conversion.
   vi. Precarious animal husbandry practices such as scrub cattle rearing.
   vii. Indiscriminate collection of NTFP to the detriment of regeneration of species.

	viii. Most important is excess of human population
2. Aravalli hills	i. Precarious agricultural practices. ii. Encroachment of community land. iii. Poaching of trees and wild animals. iv. Habitat destruction and colonization by builders. v. Precarious animal husbandry practices such as scrub cattle rearing. vi. Indiscriminate collection of NTFP to the detriment of regeneration of species. Eg., Browsing of Dhao. vii. Most important is excess of human population. Viii. Quarrying high silica sand called as Badarpur bajri and building stones. Also large quantity of slates, quartizites and schists are removed from Aravalli hills. ix. Firewood collection for domestic use and sale.
3. Indo-Gangetic plains	i. Agriculture- overuse of irrigation water for paddy- paddy wheat rotation. ii. Excessive chemical fertilizer use. iii. Excessive use of plant protection chemicals namely, insecticides and fungicides. iv. Use of dung cakes for domestic energy. v. Loss of biodiversity on agricultural fields owing to mechanized agricultural practices, leading to destruction of valuable tree species such as Prosopis

cineraria, Azadirachta indica, Salvadora oleoides,
Ficus religiosa, Ficus benghalensis, Ficus infectoria,
Crataeva religiosa etc., as rootstock interfered with agricultural operations.

vi. Faulty natural drainage further deteriorated by lines of communications, waterways network.

vii. Habitat loss owing to conversion.

viii. Introduction of exotic species like Eucalyptus,
Populus species and monoculture.

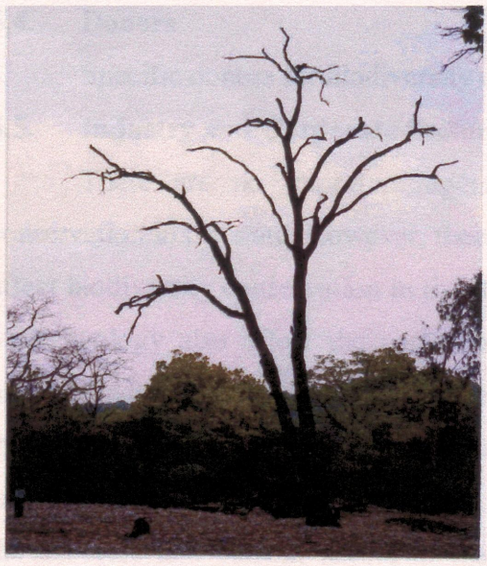
4.2 Root causes of loss of biodiversity

The habitat forests or forests that have natural vegetation have been reduced to 1.38% of total land area of the state. Much of the land was diverted to agricultural use during last three and a half decades of the existence of the state. No doubt Haryana is one of grain baskets of the country but the progress in agriculture has been done at cost of natural ecosystems. To support agriculture irrigation system was laid out. For speedy transportation of agricultural produce roads were built. All of these are assaults on natural ecosystems. Net work of roads is impeding drainage also extravagant use of water for agriculture has adversely affected about 20% of total agricultural land, damage is continuing. Unsustainable model of agricultural development is the root cause of loss of biodiversity.



One of the most important ecological precipitating factors that has very long range impact on soil health is use of cow dung cakes as domestic fuel. Having

exhausted firewood and even while agroforestry produces firewood, that is committed to commercial purposes. Not less than nine months cow dung production is used as domestic fuel. This robs soil of very valuable nutrients such as nitrogen, sulfur and phosphorus that get released to atmosphere and also cause pollution. Absence of organic carbon in the form of humus adversely affects soil fertility and agricultural soils are rapidly loosing their structure and productivity. Soils that used to produce known weight of grain using 1 unit of chemical fertilizer after about 30 years of use under intensive agriculture require 1.3 units of fertilizer for producing same weight of grains. Soil alkalinisation, salinisation, water logging, residual effect of plant protection chemicals on life



support systems are combinedly deteriorating overall productivity. Damage done by over drawal of resources and indscriminate use of chemicals and water is seriously damaging basic resource. The hurt is more evident in vunerable pokets than others cannot be denied but creeping effect of damage is slowly making itself felt all over the state.

5.0. Major actors and their current roles relevant to biodiversity

5.1. Governmental: Forest Department

i. Rehabilitation of degraded forests.

ii. Rehabilitation of waste- lands of Aravalli hills.

iii. Rehabilitation of waste- lands of Shivalik hills (Kandi project).

iv. Establishment of protected area net - work in the form of sanctuaries and national park.

V. Implementation of vanaspati van project at Morni.

Are some of the important schemes and projects that are being implemented in Haryana state that have an impact on biodiversity conservation.

5.2. Citizens Group and NGOs

There are few NGO groups especially in the southern part of the state. Village Forest Committees (VFC), Hill Resource Management Societies (HRMS), Village Resource Management Committees (VRMCs) are involved in promoting the JFM.

5.3. Local Communities Rural and urban

Hill Resource Management Committees (HRMS) in Shivalik hills and village Forest Protection Committees (VFPC) in Aravallis are doing social fencing activity. Together they number about 350 institutions. The break up is 45 in Panchkula, 12 in Yamuna Nagar rest in Gurgaon, Faridabad, Rewari, Mahendergarh and Bhiwani.

5.4. Donors

Specific donors for biodiversity conservation are yet to be identified.

5.5. Industry and Corporate Sector

There are no important agencies showing interest in the bio-diversity conservation in the state. However, their requirements of the biological resource does affect biodiversity conservation in the state. Opening up of the economy and change of technology also affect the conservation. The cheap availability of pulp in the international market has stopped the local purchase of bhabbar and other grasses by the paper mills. This industry is now promoting planting of high yielding eucalyptus and poplars clones on large scale in agro-forestry sector. Similarly the availability of the asbestos and cement sheets in the rural areas associated with the increased purchasing power of the rural population the use of Saccharum(kanna) grass in thatching of the roof tops has reduced considerably.This has resulted into standing of the thatch grass unharvested.

The mining and quarrying for stones, slates and minerals in the Aravalli hills destroys even the existing degraded vegetation. The plantation of the species other than those of naturally occurring species, as compensation, changes the species composition once for all and results into the loss of biodiversity.

Introduction of high yielding varieties and cultivars lead to dumping of the indigenous varieties as uneconomical and become extinct through disuse. In fact most of the 'developmental activities' in the sectors dealing with the biological resource,or therwise, unless associated with conscious efforts to conserve the biodiversity, lead to the depletion of the species and genetic diversity of the indigenous vegetation.

6.0. Ongoing Biodiversity - related initiatives. (Including official assessment)

6.1. Governmental

In sanctuaries and National Park, i.e., protected area net work, during last three years there is complete ban on commercial exploitation of forest area. Wasteland afforestation scheme of Aravallis did carry out 39400 ha. of plantation and wasteland afforestation of Kandi is doing water-harvesting works that is benefiting villagers. Biodiversity conservation is incidental to above main frame activities. A separate precisely targeted biodiversity project is yet to come up.

6.2. NGOs

In JFM in the Shiwaliks, 57 HRMSs are actively involved in management of forests. Similarly, VFCs and VRMCs are managing natural resources in the Aravalli areas and in the Community Forestry project villages respectively.

6.3. Communities and peoples movements

As has been stated elsewhere in the document HRMSs and VFPC have been established in Shiwalik Hills and Aravalli Hills respectively. They are doing much needed community participation work in preserving forest areas kept under their management.

7.0 Gap Analysis

7.1 Gaps in Information

Botanical Survey of India is conducting survey of higher plants and have listed 1062 species so far. But, the other plant groups like pteridophytes, bryophytes, algae, fungi, animal species of all varieties are required to be surveyed.

Owing to agricultural pressure most of the land is sown, about 83% constitutes the sown area. Rest of the area has canals, roads and rails that are scrupulously kept clean of vegetation. Only about 1% of the total land supports

natural plants and in that land also for economic reasons more of monoculture has spread leading to decimation of species. There are however some good areas of natural vegetation left in some areas such as Morni, Panchkula, Pinjore, Kalesar, Jhir forest, Nimbi Duloth, Sohlabuddin which are to be further preserved and extended along scientific lines in consultation and involvement of people.

7.2. Gaps in vision

Agricultural affluence acquired over a period of last 50 years, helped by assured market owing to sustained demand has almost blunted the vision of policy makers and planners. The visible symptoms of secondary salinization and water logging and loss of soil structure are superficially analyzed and ad hoc efforts are made to redress them. Of recent reduction of demand is forcing farmers to rethink. Further accentuation of this problem is expected during the next decade, during which, policy makers are likely to listen to sane advice.

7.3 Gaps in policy and legal structure

State level land use policy is not there for major land using departments such as Agriculture, Horticulture, Forest, Fisheries and Animal Husbandry. Land being sheet anchor of agrarian societal placement in rural Haryana, constitutional guarantee is there for right to property. Being a populist democracy, none of the political parties intend to regiment land use purely on merits of scientific land use system.

7.4 Gaps in institutional and human capacity

An integrated land use policy of the state, supported by an integrated apex organization to oversee implementation is the urgent need. It has to evolve with personnel drawn from various line departments who can hold together as a team.

8.0 Major strategies to fill these gaps, and to enhance/strengthen ongoing measures.

- Demonstrate that in the long run sustained land use is desired social objective compared to high input high out put exploitive use of land.

- Integrated management of land is more beneficial as per land capability classification.

- Biodiversity conservation is very important from integrated planning of rural health services using Ayurveda system of medicines. Unless herbal medicinal plant varieties are conserved physical basis for practice of Ayurveda suffers irreparable loss. Owing to excess load on allopathic system it is showing signs of collapse to resuscitate the system off loading is necessary.

- Sustained development of agriculture and other natural resource utilization aspects is to be ensured.

- To reduce the demands on natural forestry systems, promotion of agro-forestry on private ands and plantation of fuel-wood species and grasses on community lands under social forestry need to be revitalized.
  Availability of fuel-wood, now generally required by landless and small farmers, will help release of cow-dung necessary for organic farming and improving soil.

- To reduce dependence of the local communities on the forests, income-generating activities need to be promoted.

- Survey and current status of various NTFP items be carried out and the utilization of these items be linked to the production potential.
- Joint Forest Management system needs to be further strengthened by creating a cell in the Forest Department to oversee it's working. Forest protection mechanism against fire encroachment, illicit felling, needs to be revamped.

- Standardization of Nursery techniques of lesser-known species which are endangered requires to be done.

9.0 Required actions to fill gaps, and enhance/strengthen on going measures

9.1 Action 1: Conservation and sustainable use of (where relevant) natural ecosystems, and wild plant and animal diversity

Category: High priority

Details:

- Creation of preservation plots of suitable size in all the named natural eco-systems and habitats under the control of Forest Department during the project period of, four or five years or multiples of four or five years each.
- Management of such areas with community participation. Where the ownership of the area rests with the community the major responsibility would lie with the community , the Forest Department only providing the technical guidance where and if required.
- New kind and nature activities to be established after suitable trial & error hence require higher doses of expenditure per hectare.
- An area 6005 Ha or it's multiple to be taken up for bio-diversity action plan related works depending on the availability of funds.
- Execution of works through existing staff and so, no recruitment of any personnel.

Responsibility: Forest Department, Haryana.

Time frame: 20 year

Resources required: The total cost at present rates is Rs. 1498.75 or say 1500 lakhs. Nursery work Rs 421 lakh and training Rs. 13. 75 Lakh is proposed. In addition to this Rs. 390.00 lakh are proposed to be spent on unique area conservation during first five years and in multiples there after. This adds to Rs. 2324.75 lakh in the first five years and depending on availability of funds in multiples of five years each, upto 20 years with appropriate appreciation to account for cost escalation. Escalation of

appropriate percentage linked to whole sale prices of commodities prices may be made commencing from the end of base year of 2001-2002.

Table : 1.7 Proposed area under biodiversity conservation and estimated expenditure

Sr.No.	Name of Natural Ecosystem	Area proposed to be treated (Ha.)	Cost per Ha (Rs.)	Total expenditure (Rs. in lakhs)	Remarks
1	**Forest Eco-systems** Transitional Sal forests of Kalesar Valley in Yamuna Nagar district Hill ecosystem	1000	25000	250	*Shorea robusta* is a important timber species of tropical deciduous forests & has many associated plant and animal species preservation is ecologically desirable by fire conservation and regeneration. Eco tourism spot. Wildlife sanctuary.
2.	Chir pine forests of Morni hills-Panchkula district. **Mountain ecosystem**	1000	30000	300	*Pinus roxburghii* is the source of rosin and turpentine and is a valuable timber. Grows as a primary colonizer in hill slopes with moisture It adds to beauty of landscape in northern aspects. Eco tourism spot.
3.	*Anogeissus pendula* forests of Jhir area in Firozepore-Zhirka of Gorgon District. **Semi-arid ecosystem**	250	25000	62.5	*Anogeissus pendula* is also known as Axle wood is very good quality firewood known for its high calorific content. One of the best patches of natural forest accessible by Delhi is present in this area. Eco tourism spot.

4.	*Terminalia chebula* forests of Mandhna, Udhon and Sahlyon of Morni, Panchkula. **Hill ecosystem**	200	25000	50	Fruit is used in Ayurveda as a decongestant and laxative and reputed to be cure for three dosas of 'Vata', 'Pitta' and Kafa. Only about 1000 trees grow in Haryana and they require propagation and preservation.
5.	Bans forests of Thadugarh-Panchkula District.	250	25000	62.5	Called as poor man's timber the bans plant naturally grows on the hillsides of Thadugarh and is very valuable.
6.	Jaal forests of Nimbi-Duloth-Mahendergarh District. **Desert ecosystem**	200	20000	100.0	*Salvadora oleoides*-Jal *Capparis aphylla*-Teent *Acacia senegal*-Gum senegal Have a grass land ecosystem with occasional growth of trees, habitat of birds and small mammals for 10 year.
7.	Guggal forests of Madhogarh-Mahendergarh District and Sohna Gurgaon District. **Semi-arid ecosystem**	50	30000	15.00	Guggal is used in medicine and preparation of incense. It is endangered plant, nursery activity and regeneration to assist plantation would be done.
8.	*Stereculia urens* and *Acacia senegal* in Khol of Rewari District. **Panchayat land**	50	20000	10.00	There is only one forest area in the state of Haryana where this species grows and requires to be preserved.
9.	Phoenix forest of Faridabad plains ecosystem **Panchayat land**	50	10000	200.00	Gregariously growing old phoenix trees of great beauty and bird food value. A special ecosystem of genetic

					diversity; 10 year.
10.	Jund and Senegal forests of Sohlabuddin Mohendergarh District **Desert ecosystem**	500	20000	100.00	Jund is an important desert tree and can be grown under agricultural situations also and it improves fertility of soil. Acacia senegal is a tree of desert hills and yields gum.
11.	Chal, Jhingan, Khair forests of Shiwalik hills	1000	25000	250.00	Chal is an important winter fodder in Shiwalik hills. Jhingan is packing case timber. Khair yields Katha and timber.
12.	**Grass Land Ecosystems** Anjan grasslands of Duloth forest Mohendergarh District.	50	25000	12.50	Cenchrus ciliaris is a nutritious palatable natural grass.
13.	Munj grass lands of Sahhabudin Mohendergarh Forest with Neem trees.	50	20000	10.00	Preservation of valuable raw material for cottage industry for muda making, rope making.
14.	Kans grass lands of streambeds of Sahibi.	50	20000	10.00	Preservation of thatching material.
15.	Dholu grass lands of Mandhana & Raipur Rani.	100	20000	20.00	Preservation of locally used grass variety and also landscape.
16.	Bhabbar grass lands of Morni & Yamuna Nagar.	1000	25000	250.00	Used in rope making and also manufacture of good quality paper.
17.	**Wetland Ecosystems** Sultanpur Wetland ecosystem.	140	25000	10.00	A national park has been established and Wildlife Preservation Department is doing the job.
18.	Bhindawas	160	25000	40.00	-do-

	Wetland ecosystem.				
19.	Chilchila	5	25000	1.25	-do-

9.2 Action 2: Training and Employment of Resource Persons for Skill upgradation

Category: High priority.

Details:

- Training for skill upgradation of forestry personnel and staff from the line departments on raising and maintaining less known plant species that are threatened.The local community knowledge will be utilized and the community participation ensured in the process.
- Training of village community for imparting knowledge and upgrading their traditional skills on these species.

Responsibility: Forest Department, Haryana.

Time frame: 5-10 Years

Resources required: Rs. 76.5 lakh

Table 1.8 Proposed community training programme

Sr. No.	Year	Item of activity	Quantity/ number	Expenditure per unit	Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)
1.	Ist year	(i) Survey and documentation (ii) Awareness generation meetings (iii) Selection of 5 trainees per village preferably 3 office bearers of HRMS/ VFPC and two women participants office bearers of Panchayat or HRMS/ VFPC (iv) Employment of consultants and other resource persons.	100 villages 100 villages 500/trainees 500/trainees 200/Resource person Man days	1000/village 10,000/ village @ Rs.125 per day for two days=250 1,500 (including training)	100000 1000000 1,25,000 3,00000
					15.25 x5 =76.25

9.3 Action 3: Standardization of Nursery Techniques for One Hundred Lesser Known Species

Category: Medium priority.

Details:

- Standardization of nursery techniques for 100 lesser known species out of 1062 angiosperms.The species found in the state and declared 'Rare' and 'Vulnerable' will be as a matter of fact considered first.
- Ethno botanical surveys before commencing standardization of nursery techniques to determine the species that require such an effort. In this process the involvement of the local community, of men and women, will be ensured to determine the priorityof the species.
- Nursery technique standardization for medicinal plants on priority basis.

- Sufficiently large number of plants not less than 10,000 each to be raised for successive period of three years for confirming artificial regeneration.
- Publicity and extension through pamphlets for all above important species.
- Stream lining processing, post harvest technology and marketing of medicinal plants.

Responsibility: Forest Department, Haryana and CCS HAU, Hisar with the involvement of the Department of Women and Child Development and the Department of Rural Development.

Time frame: 10 year

Resources required: Considering possible errors the projected work is time sequenced as under:

Table. 1.9 Standardization of nursery techniques for lesser-known species

S. No.	Year	Species to be tried	Qtm of operation	Cost of operation per plant Rs	Total cost (Rs. lac)	Remarks
1.	1.	100	Survey of plant species to determine their importance.	1000	10000	Cost of Books, periodicals, field visits, photographs.
2.	2.	25	Collection of seed, plant material and raising of seedlings Nursery 10,000.	3/seedling	7,50,000	Nursery work
3.	3.	25 25 50	-do- Planting of 500000 seedlings	-do- 12/seedling	15,00,000 6000000	Nursery work Plantation
4.	4.	25 25 25 75	Nursery Planting		22,50,000 9,00,0000	Nursery Plantation
5.	5.	25 25 25 75	Nursery Planting		22,50,000 9,00,0000	
6.	6.	25	Nursery		22,50,000	

		25 25 75	Planting		9,00,0000	
		100 spp.	Preparatory Nursery Planting Total		100000 9000000 33000000 42100000	

9.4 Action 4: Promotion of agro-forestry

Category: Medium to high priority.

Details:

- Promotion of agroforestry through supply of improved clones or planting stocks to farmers for their economic improvement.

Responsibility: Forest department, Haryana.

Time frame: 10 year.

Resources required: It is proposed to supply 50 lakh plants @ Rs. 2/- each to farmers, and for plantation in other rural areas every year for next 10 years continuously. Total estimated cost would be Rs. 100 lakh annually and Rs. 1000 lakhs over 10 year.

9.5 Action 5: Promotion of silvi-pasture on community lands

Category: Medium priority

Details:

- Planting of tree species for fuel wood purposes along with fodder grasses on 200 ha in every district on an average with 300 plants per ha and grass in between.

Responsibility: Forest Department, Haryana with the involvement of the Departments of Social Welfare and Women and Child Development.

Time frame: 20 years.

Resources required: With average cost per ha at Rs. 6000/- the total cost over next 20 years would be Rs. 4500 lakhs.

9.6 Action 6: Income generating activities

Category: Medium priority.

- Implementation of income generating activities to reduce the dependence of rural community on forest on 300 villages around the Aravalli hills and 400 villages elsewhere including the Shiwaliks.

Responsibility: Forest Department, Haryana. (The experince gained by the other agencies in such work elsewhere shall be utilized) .

Time frame: 5 year.

Resources required: With an approximate grant of Rs. 2 lakh per village for next five years the project would costs Rs. 1400.00 lakh.

9.7 Action 7: Survey of non-timber Forest produce

Category: Medium priority.

Details:

- Survey of NFP and studying their production potential in the Shiwaliks and the Aravalli Hills of 100 lesser-known species.

Responsibility: Forest Department, Haryana .Punjab University and other Universities of the State

Time frame: 5 year

Resources required: Rs. 100.00 lakh.

9.8 Action 8: Promotion of JFM

Category: High priority

Details:

- JFM promotion and strengthening of forest protection mechanism.

Responsibility: Forest department, Haryana

Time frame: 20 year

Resources required: Rs. 500 lakh over 20 years, @ Rs. 25 lakh per year.

9.9 Action 9: Protection of forests from fire

Category: Medium priority

Details: Fire conservation measures in the fire prone natural forests in the Shiwalik hills.

- Extension work to elicit people's partition in forest-fire prevention works.

Responsibility: Forest Department, Haryana

Time frame: 20 years.

Resources required: Rs. 1000 lakh.

9.10 Action 10: Soil and moisture conservation

Category: Medium priority.

Details:

- Soil and moisture conservation activities in Shiwalik hill region and other areas in order to improve soil moisture regime and to reduce soil erosion.

Responsibility: Forest Department, Haryana

Time frame: 10 year

Resources required: Rs. 1000 lakh.

9.11 Action 11: Research

Category: Medium priority.

Details:

- Studies on suitable plant species, clones, or varieties for different agro-climatic zones or in agro-forestry systems; on various aspects of silviculture; also on tree growth parameters.

Responsibility: Forest Department, Haryana

Time frame: 20 year

Resources required: Rs. 20 lakh every year for a period of 20 years.

9.12 Action: Operational changes in the working of forest.

Category: High priority

Details:

- In case of plantations mixture of various species should be planted instead of monoculture.

- No felling of trees other than those planted on large scale.
- In afforestation phenotypic and genotypic variation will be considered to preserve the genetic diversity and also to take care of air pollution.
- While undertaking plantations jungle clearance will be kept to the minimum.
- Incorporation of these recommendations in the working plans of the department.

Responsibility: Forest Department, Haryana

Time frame: 5 year

Resources required: Nil

9.13. Actions: To achieve equitable decision-making

Category : High priority

Details:

1 It is a state level initiative mostly restricted to forest areas, time scaled between 5 to 20 years depending on availability of resources.

2 The Forest Department through involvement of people would do implementation. Hill Resource Management Societies, Village Forest Protection Committees are community institutions that are to be involved.

3 Conservation activities are concrete and implementable. Ecosystem in hills particularly Shivalik hills, followed by Aravallis and plain is the order of priority.

4 In some habitats instead of preservation artificial regeneration can be taken up.

5 People's empowerment and equity, ensuring wide spread participation and gender related biodiversity conservation initiatives are already part of Joint Forest Management that is being successfully being practiced in Haryana. However, as is evident from the out come of public hearings at Chicken and Bodla more needs to be done and JFM needs to be further strengthened in the state.A special unit/ cell to over-see the work of JFM in the state needs to be established.

In the villages and Panchayats the decisions even when taken by the community the voice of the real users of the biological resource ie, the poor people, especially the women is rarely heard.To know the views of the real users their views be obtained in a separate group meeting and be represented in the village/ P anchayat meeting by the group leader of the under priviledged .

Responsibility: Forest Department, Haryana/ Govt. of Haryana.

Time frame: 5 year

Resources required: Nil

Action 14: Strengthening the land use policy measures

Category: High priority.

Details:

- A Land use Board exists in the state which needs to be further strengthened by adopting experts from different land using agencies .
- Making the Board more effective and making its recommendations mandatory under appropriate statute.
- Making biodiversity conservation a mandate of the Board through appropriate land use policy measures.

Responsibility: Government of Haryana

Time frame: 5 year

Resources required: Nil

11. Follow up

Follow up would be done similar to other projects that are being implemented in Haryana.

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Annexure 1

In a Work Shop that was organised by Forest Department at Firozpur Zirka , Gurgaon following plants were reported to be of special use:

1. Azadirachta indica, Neem or Margosa tree. Insecticide. Febrifuge. Cures skin ailments.
2. Ficus benghalinsis, Bargad. Cures skin ailments. Helps foetal retention in women prone to abortion.
3. Ficus religiosa, peepal, Fruits are used as laxative. Dried bud powder as general purpose tonic.
4. Ocimum basilicum. Tulasi, Sacred basil, Febrifuge. Cures skin ailments.
5. Acacia nilotica, Kiker or Babul, Gum used as food additive to tone up muscles after child birth.
6. Moringa oleifera, Suhanjana, Leaves and flower buds reputed to be source of Iron, mildly aphrodisiacal in function. Used as vegetable and pickling of fruits.
7. Aloe barbadensis, Ghrit Kumari. Hemicellulose of leaf used in activating pelvic circulation. Supposed to be rejuvenating women and enhancing their beauty.
8. Ailanthus excelsa, Ulloo Neem. Leaves and bark used in skin ailments and also against flatulence.
9. Vinca rosea, Sadabahar, contains an bitter alkaloid used in dressing wounds.
10. Triblus terristris, Gokharu, Tincture is used as diuretic.
11. Capparis decidua, Kair, tender fruits used in pickling reputed to be laxative and digestive.
12. Zizyphus jujuba, Bar ber, stomach disorders.
13. Commiphora wightii, Guggal , one of the very usual ingredients of many Ayurvedic preparations restorative in function.
14. Barleria prionits, kala bansa, tincture used as lung expectorant.
15. Cordia rohtii, for ulsers of mouth.
16. Ricinus communis, erand, dependable safe laxative, reduces rheumatic pains.

Wildlife & animal life

Wildlife

1.0 Profile of the Area

1.1 Geographical profile

The general description of the size of the state, location, latitude and longitude has been detailed in the earlier general chapter. From the wildlife diversity point of view the state can be divided into the following geographical regions, the description of which is given in brief:

1.1.1 Shivalik and outer Himalayan Region



The northern part of the state in Panchkula, Ambala and Yamunanagar districts fall in this category. The general topography of the region is undulating to steep hilly slopes with loose geological formation.

The Shivalik hill system at places merges with the Himalayan Hills. This region is very rich in flora and fauna of the general Shivalik system. The main vegetation type in this region is of Sal (*Shorea robusta*) forests in the Kalesar valley, Darpur, Chiken, Nagli khol, Meharniwala and is of scrub in Sunder Bahadurpur forests. Sal in this region is found on gently sloping and valley parts. The steep hilly and undulating areas have mixed miscellaneous forests of *Anogeissus latifolia* and *Lannea coromandelica* species. In the flatish undulating terrain the main animal found is Cheetal, in parts Black buck, Red jungle fowl and Wild boar. In the hilly and steep miscellaneous forests, the combination of Sambhar, Kakkar, Wild boar, Leopard with Red jungle fowl, Kaleej pheasants is found. The area is rich in wildlife and the habitat in the last 20 years has not depleted any significantly. If at all, it has improved may be because of the Joint Forest

Management adopted in the state. Wild dogs were found in Kalesar forests, which were exterminated under Govt. orders on public demand.

1.1.2 The Indo-Gangetic Plains

Vast area of the state falls in this category. The land is highly productive. The terrain is flatish and is predominantly under agricultural use. The original forest vegetation comprise Dhak, Shisham, *Acacia leucophloea*, *Acacia nilotica* with thorny shrub vegetation of *Capparis horrida* . Most of this area has been brought under cultivation. Lower parts of Ambala with the entire districts of Yamunanagar, Kurukshetra, Karnal, Panipat, Sonepat, Faridabad and northern part of Jhajjar and Jind districts fall in this category. This area was once rich in wild animals, which are now confined only to very small pockets of forest vegetation left. Notable wild animal of this region is Black buck in Karnal, Panipat, Sonepat districts, even up to Jind district. Hog deer is found only in Saraswati Wildlife Sanctuary in the state. Nilgai is present throughout the state especially in and around block forests. The excessive use of pesticides in this agriculturally prosperous belt has adversely affected the wild animal population, especially the bird population.

1.1.3 The Thar Desert Region

Parts of Jhajjar district and the districts of Rewari, Mahendergarh, Hisar, Sirsa, Bhiwani fall in this category. The terrain basically is undulating and the soil is sandy. The vegetation comprises *Acacia nilotica*, *Prosopis cineraria*, *Acacia leucophloea* with shrubs of *Capparis aphylla*, *Calotropis procera*, *Zizyphus mauritiana* and *Salvadora oleoides*. The typical animal association of this region is of Chinkara and Monitor lizard. This area once supported a sizable lion population. The record of hunting of lions in Hisar are available.

1.1.4 The Aravalli Hill System

The northwestern tail of Aravalli hills is in Delhi. A sizable part of this hilly system (estimated to around 60,000 hectare) falls in Haryana. The rocky hills of Aravallis which once supported a good forests of *Anogeissus pendula* have been highly degraded. Some stock of this vegetation is available even now. Some protection has been afforded to this vegetation during the project period of Aravalli

Afforestation Project. These hills which now support some Hyena, Jackal and Fox population had once supported Tiger population. The Panthers as well as tigers occasionally visit the area from the adjoining hills in Rajasthan.

1.2 Socio-economic Profile

1.2.1 In the Shivalik region, there are pockets predominantly inhabited by the Muslim community and Gujjars. Since the area does not support good agriculture, dependence of the local community on the forest and wildlife resources is probably the maximum in the state. The Gujjars rear cattle and practice grazing of animals in the forest. Some people indulge in illicit felling of Khair and other trees. The practice of construction of dams for harvesting of water and use of water for irrigation of agricultural lands in the gently rolling hills and adjoining plainer areas is transforming the local economy . In pockets in this region also live the people belonging to 'Deh', 'Bangale', 'Shikligar', 'Bawaria' community who indulge in wild animal offences. These communities traditionally lived by hunting of wild animals, big and small.

Wild boar occurring in the forest causes damage to agriculture crop in this area. The people of this region have been representing and agitating to allow hunting of wild boar to prevent the damage to agricultural crops. However, if any such permission is issued to local people other animals will also be vulnerable to killing. Hence no such decision to allow hunting of wild boar has been taken in the state.

1.2.2 The Indo-Gangetic plain areas belong predominantly to Hindu and Sikh communities. The main occupation of these people is agriculture. Damage to agricultural crops by Nilgai, which is found throughout the state, is viewed seriously and these people have been largely responsible for putting pressure on the Govt. for taking the decision for allowing hunting of Nilgai.

1.2.3 The Thar Desert Region: These areas are dominated by Hindu community who have largely been against killing of animals. Notable amongst these are the Bishnois who are known to protect trees and animals. Because of the protection afforded by these people Black bucks, Chinkaras and other animals are still seen moving openly in the agricultural fields in these areas. Although these people complain about the loss to agricultural crop by Nilgai they have never come forward for killing of the animal any

significantly. The 'Saperas', 'Bawarias' and people belonging to such smaller communities indulge in capturing of 'Goh' (Monitor lizard) and hunting of Sandas (Spiny tailed lizard) and also of Partridges which are supplied to Delhi.

1.2.4 In the Aravalli hills especially in Gurgaon district, the predominant community is of Meos who are generally Muslims. These people indulge in hunting of Nilgai and capturing of migratory birds and other small animals. Agriculture being not-a-very prosperous occupation in this region, the dependence of the local community on natural resources is substantial.

1.3 Political Profile

As in any other state of the country, the state has a regular mechanism of governance by elected members, Judiciary and Executive departments.

Because agriculture has been the main stay of economy, agriculture and allied sectors have relatively larger say in the governance of the state. Agriculture, irrigation, electricity, road network, health and education are important sectors of the state economy. Being poor in the natural resources, forests and wildlife have much less say in the governance of the state. However, because of the presence of Bishnoi community whose population is relatively more especially in the south, southwestern part of the state conservation of trees and animals is generally not ignored in the state. The general local population in the state being vegetarian the status of protection to the animals in the state is much better compared to that in many other states.

1.4 Ecological Profile

The various ecosystems and the type of floral and faunal association occurring in the state are enumerated below: (an attempt has been made to make this list as exhaustive as possible but possibility of findings some other smaller associations can not be ruled out).

1.4.1 Forest Eco-system

1.4.1 a) The Shivalik Sal forests of Kalesar Wildlife Sanctuary is characterized by Panther-Cheetal-Wild boar- Sambhar - Barking deer- Red Jungle Fowl-Peafowl - Blue jay – Hornbill – Treepie - Woodpeckers.



1.4.1 b) Chir Forests of Morni areas characterized by Panther-Wild boar-Barking deer-Red Jungle Fowl-Peafowl-Blue jay-Hornbill-Treepie-Woodpeckers.

1.4.1 c) Northern tropical mixed deciduous forests of Panchkula and Yamunanagar districts are characterized by Leopard-Sambhar-Barking deer- Ghoral-Wild boar- Nilgai- Jackal- Hare- Fox- Reptiles.

1.4.1 d) *Anogeissus pendula* forests of Aravalli hills in Gurgaon district are characterized by Panther (rare)- Hyena-Nilgai- Common langur-Hare-Jackal.

1.4.1 e) The Bamboo forests of Thadugarh forests in Panchkula district are characterized by Leopard-Sambhar- Barking deer- Wild boar- Porcupine-Red Jungle Fowl- Kaleej Pheasant.

In additions, Langur, Monkey, Porcupine, Partridges, Quails etc are common in these places.

1.4.1 f) *Salvadora* forests of Nimbi-Duloth of Mahendergarh district with Capparis aphylla and Acacia senegal are characterized by Chinkara-Desert cat- Fox- Spiny tailed lizard .

1.4.1 g) *Comiphora* forests of Madhavgarh in Mahendergarh district are characterized by Chinkara- Nilgai- Fox- Jackal- Hare- Monitor lizard-Spiny tailed lizard, Sandgrouses- Partridges, Quails.

1.4.1 h) *Sterculia* and *Acacia senegal* forests of Khol of Rewari district are characterized by Chinkara- Nilgai- Fox- Hare- Spiny tailed lizard – Partridges- Quails-Green pigeons- Peafowl.

1.4.1 i) *Phoenix* forests of Faridabad district characterized by Hyena-Nilgai- Jackal- Hare- Partridges- Quails.

1.4.1 j) *Prosopis cineraria* and *Tamarix articulata* forests of Mahendergarh district are characterized by Chinkara-Hyena-Nilgai- Hare- Jackal- Fox – Partridges- Quails- Peafowl.

1.4.1 k) *Acacia Jacquemontii- Gymnosporia - Bauhinia* –Bhood scrub forests in the foothills of Aravallis are characterized by Nilgai- Chinkara-Hare.

1.4.2 Grass Land Eco-systems

Kans and Munj grass lands in the stream bed of Tangri in Panchkula-Ambala districts and in the stream bed of Sahibi river in Rewari district are characterized by Black buck-Partridges-Hare and Reptiles.

1.4.3 Wetlands Ecosystems

1.4.3 a) Wetland ecosystem of Sultanpur in Gurgaon district is the home of bird migration in Haryana. Pelicans, Flamingos, Comb ducks, Shovellers, Ibises, Geese and a large number of other water birds visit this Park in winter. Sarus crane breeds here.



1.4.3 b) Wetland ecosystem of Bhindawas in Jhajjar district is characterized by large number of migratory birds .



1.4.4 Desert Ecosystem

These are semi arid ecosystems like those in Bhiwani, Rewari and Mahendergarh districts. These are characterized by the presence of Chinkara-Desert fox-Hyena.

1.4.5 Mountain Ecosystem

This has been covered under forested hill ecosystems.

1.4.6 Riverian Ecosystem

This is present along the Yamuna and Ghaggar rivers and is characterized by Otters (now rare), Tortoise- Black buck.

1.5 Brief history of changes in land use

The state of Haryana was formed after the trifurcation of the erstwhile Punjab state. The south and south-eastern part of the erstwhile Punjab came into existence as Haryana state on Ist November, 1966. This part of the erstwhile Punjab was relatively under-developed. And therefore, the efforts of the early administration of the state was to develop the state in all the sectors of the economy. These developments have brought about a lot of change in the land use and water resource consumption and have changed the face of the earlier landscape. These changes have had negative impact on the biodiversity of the state.

1.5.1 For the development of agriculture sector, large scale conversion of waste lands was undertaken. The reduction in the waste lands have meant reduction of biodiversity, both floral and associated faunal diversity, in the state. For improving the agricultural

production especially under the green resolution, a wide network of canal was laid out in various parts of the state. The construction of this canal network and the embankments have changed the natural flow of water resulting into changes in the floral and faunal diversity. Because of the seepage through these canals especially in the sandy areas, the area under water logged conditions in a narrow belt along these canals has increased over years. The construction of Hathni Kund Barrage and channeling of river water causing reduced flow through the river bed of Yamuna have meant the consequent changes in the floral and aquatic life along the Yamuna river in the state.

1.5.2 The availability of better technology for irrigation in the form of sprinkler irrigation have resulted into the conversion of substantial extent of area in the south and south-western sandy part of the state into agricultural fields. This conversion of waste lands in the desert conditions have adversely affected the flora and fauna of the desert part of the state. Further, because of the available irrigation large areas in the foothills of Aravallis, which are basically undulating sandy deposits have been bulldozed either for converting these areas into agricultural fields or for human habitation (especially near Gurgaon) . This loss of undulating sandy dunes in the foothills of Aravalli hills has especially resulted into the loss of habitat of the endangered Chinkaras in the state.

1.5.3 The colonization of Aravalli hills has been greatly responsible for the loss of biodiversity in the region. Faridabad and Gurgaon have come under the expanding population pressure of the metropolis of Delhi resulting into colonization and habitat destruction of the fringe of Aravallis in the state.

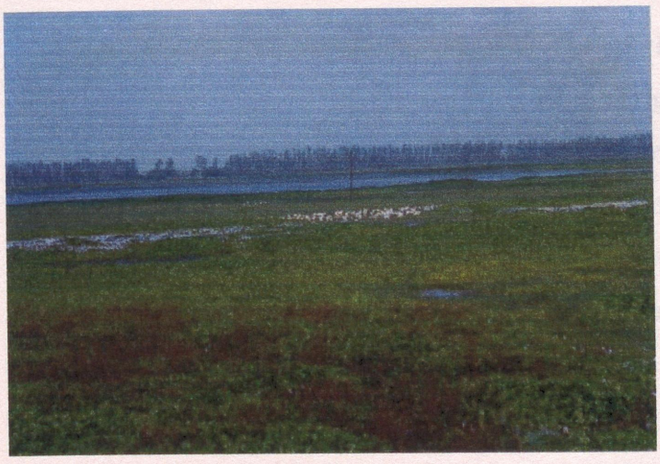
1.5.4 In the Shivalik hills the increasing pressure of population from Chandigarh and adjoining areas have resulted into the ingress of human population into the adjoining forest areas. Whereas the people have been sensitized towards forest protection through the mechanism of Joint Forest Management especially through the construction of water harvesting dams in the foothills, they are relatively less sensitive towards the protection of wild animals. Forests may have survived in the vicinity of this population but the increasing human pressure is reducing the wild animal population. Otters which were common in Ghaggar near Panchkula about 20 years ago, are very rare to be found anywhere in the state (There are unconfirmed reports of the presence of Otters in the

Jansui Head Works near Ambala). With the increasing population of Chandigarh and the increasing demand for facility of forest recreation the adjoining forests are under great pressure and time is not too far when the animal population in the forests near Panchkula would be greatly depleted.

1.5.5. For increasing the area under cultivation the small depressions which used to accumulate water during monsoons and which used to attract a host of migratory birds during winter have been leveled. Because of the large scale developmental activities in the catchment area of Sultanpur National Park the run-off to the lake from the catchment has practically becomes zero resulting into the drying of the lake (Some efforts have been made to rejuvenate the lake system by putting 60 cm. diameter pipe line from Kaliawas to Sultanpur lake and recharging the lake for attracting winter migratory birds).

The Jhajjar sub- branch which used to feed the Khaparwas water body (a wildlife sanctuary) has been abandoned making the water body a dry depression. The area under the water bodies in the state has reduced considerably and conservation of these wetlands in the future appears gloomy.

1.5.6 The village common lands, Shamlat and Panchayat lands in the vicinity of the villages also used to harbor a host of wildlife. The Banis (the tree vegetation of *Salvadora* species) which used to harbor reptiles have disappeared under the developmental activities. Large areas of these common lands have been brought under cultivation for giving 'Pattas' to the poor to generate income to the panchayat lands.



A substantial part of these common lands has also been brought under plantation by the Forest Department.

1.5.7 Quarrying and mining for silica sand, Badarpur sand and stones from the Aravallis especially between Gurgaon and Faridabad area and the associated increase in the human and machine population in the area have for all practical purposes destroyed the ecosystem and impaired the floral and faunal diversity beyond repair.

2.0 Current range and status of Biodiversity

For the conservation of wildlife in the state, there is one National Park and nine wildlife sanctuaries, which are listed, in the 'ongoing initiatives of the state'. The status of the plant and animal species in the various ecosystems described in the earlier chapter is given below:

2.1 Forest Eco-system

2.1.1 The Shivalik Sal forests of Kalesar Wildlife Sanctuary

The Sal forests of Kalesar are well protected and are a good habitat for wild animals. Apparently there are no signs of any degradation. However, there are reports of little damage to Sal trees by Sal borer (Hoplocerambyx spinycornis). The Forest Research Institute of India, Dehradun was requested to study the extent of damage or attack of this borer to the Sal crop. The preliminary report submitted by FRI, Dehradun says that the damage is low of intensity . They have suggested taking up of manual trapping of the insect for the conservation of the Sal forests. The list of plant species of the area and also of the animal species found has been given in the Working Plan of the area. A detailed report on the evaluation of the availability of food during the pinch period was studied by Sh. R.C. Trigotra, a forest officer of the state. The report is available in this office. The detailed survey of the animals found in the sanctuary has not been carried out.



2.1.2 Chir Forests of Morni areas

The resin tapping of Chir crop was stopped by the Forest Department in 1983. The health of these forests has improved because of this. However, with the gradual increase of human population the wild animal population is showing the sign of depletion. The Chakore, which used to be found in Bhoodi areas of Morni is very rare to be sighted.

2.1.3 Northern tropical mixed deciduous forests of Panchkula and Yamunanagar districts



Although there has not been any significant depletion of these forests, the areas in the vicinity of human habitation have degraded under human pressure.

2.1.4 Anogeissus pendula forests of Aravalli hills

The Dhok forest of Aravallis have suffered the maximum in the last three decades The EEC Aided Aravalli Afforestation Project carried out extensive plantation in these hills. The main species planted are *Prosopis juliflora, Acacia Senegal, Acacia leucophloea* etc. Although the vegetation has improved the original crop composition stands destroyed. The animal population is reported to have increased and the small animals like Hare, Jackal and Hyena are reported from the area.

2.1.5 *Sterculia and Acacia senegal* forests of Khol of Rewari district

Mining of slates is done this area. This has increased the human and machine presence and have a degrading effect on the animal habitat.

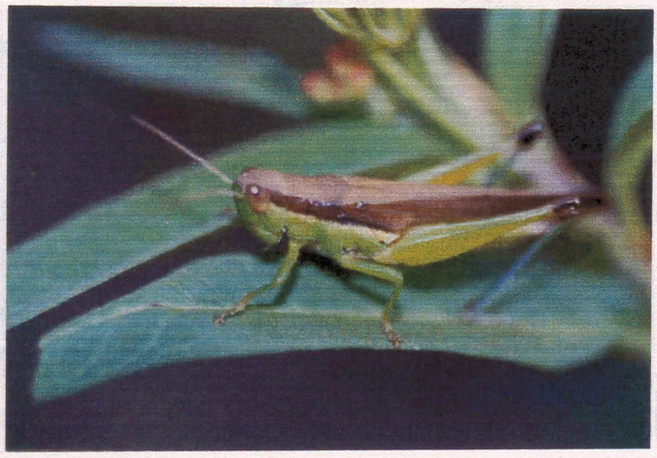
2.1.6 *Prosopis cineraria and Tamarix articulata*

The increased human population and the availability of irrigation through sprinkler sets, the wastelands have been converted into agriculture lands.

2.1.7 Acacia Jacquemontii-Gymnosporia-Bauhinia

The colonization of Aravallis and the foothills have resulted into the destruction of habitat of the animals.

2.2 Grass Land Eco-systems



The Kans and Munj grass lands have not degraded significantly but the animal population of Hare, Partridges and Reptiles etc. in these areas has reduced.

2.3 Wetlands Ecosystems

The destruction of wetland ecosystem in the state has been elaborated earlier. Although a check list of birds found in Sultanpur and Bhindawas is available, there is no seasonal classification. The monitoring of the birds population is not done.

2.4 Desert Ecosystem

There is little information on the status of vegetation or animals in the desert ecosystem and the Riverian ecosystems of the state.

2.5 Census of animal population

The census of Tiger, Leopard and ungulates carried out in 1997, gave the following figures:

Name of area	Chital	Sambhar	Barking deer	Wild boar	Ghoral
Kalesar	65	222	175	263	802
Kalsia	26	108	79	121	103
Morni	-	247	302	1606	1022
Raipur Rani	50	-	-	-	-
Bir Shikargah	35	46	38	214	49

Khol Hai Raitan	-	125	75	434	200

Aravalli Hills	Neelgai	- 5232
	Chinkara	- 422

3.0 Statement of problems relating to Biodiversity

Causes of the loss of the biodiversity:

Some of problems related to the loss of biodiversity in the state have been discussed in para 1.5 under brief history of changes and land use. These reasons alongwith others have been enumerated below:

3.1 Habitat destruction

3.1.1 Conversion of waste lands for agriculture use.

3.1.2 Colonization of large extent of areas in Aravallis under pressure of Delhi population.

3.1.3 Ingress of human habitation into the forested hills in Shivalik areas.

3.1.4 Conversion of village common lands for other developmental purposes, agriculture and afforestation .

3.1.5 Quarrying and mining of the hills for minerals like silica -sand and for stones.

3.1.6 Construction of roads, canals, drains, bandhs etc fragmenting original habitat.

3.2 Use of Pesticides



Green revolution was achieved through the cultivation of hybrid varieties of wheat which require irrigation and fertilizers. To control the insect pests on these hybrid varieties, increasing amount of pesticides are used by the farmers. The increased utilization of pesticides also kills large number of insects which are consumed by small animals and birds.

The bio accumulation of these pesticides and the related toxic effects have resulted into the decreased population of small animals and birds. Recently, large scale mortality of peacocks was seen in the rural areas of the state. Investigations by Haryana Agriculture University, Hisar revealed that the mortality of peacocks was because of the consumption of seed treated with Chloropyriphos. Whereas the recommended quantity for the treatment of seed is 1.5 ml. of the pesticide per kg. seed in actual practice the quantity of pesticide used by the farmers was more than four to five times the required doze. The sudden disappearance of vultures, however, is attributed to the suspected viral disease.

3.3 Hunting of the animals by man

Around 1888 lions were hunted by the then rulers in Hisar. Record to this effect is available.

The last remaining tiger in Haryana was shot in the forests between Berwala and Mandhana in Panchkula district. There is no resident tiger population in the state now. The Kalesar forests had resident wild dog population. During the period 1968 to 1970, a campaign under the title "shooting of wild dogs in Kalesar reserved forests", and "annihilation of wild dogs" was taken up and as per the record available in the Govt. office, the last dog was shot in February, 1970.

In 1963, the Secretary Forests, Himachal Pradesh declared award of cash incentives to encourage public in killing of wild animals. Each panther fetched Rs. 50/-, Hyena Rs. 15/-, Black bear Rs. 15/-, Jackal & Wild cats Rs. 5/- each, Monkey Rs. 3/-, Langur Rs. 5/-, Fox , Falcons, Baj & Shikaras Rs. 3/- each.

There has been a total ban on the hunting of all wild animals throughout the country, which has come into effect after 1991 amendment to Wildlife (Protection) Act. Despite this ban and fairly good implementation on the ground, instances of poaching do take place.

There are some communities, especially, Deh, Banjare, Shikaligar and Bawaria etc. who indulge in small game offence on a regular basis. These people catch Hare, Monitor lizards, Partridges, Quails and such other small animals. Earlier these people

used to go for hunting and bring their catch openly. After the stricter implementation these people now bring their catch not on cycles but change the mode of transportation at the nearest transport head.

The local communities also indulge in the hunting of wild animals for various reasons. The survey of some villages in Gurgaon, Rewari and Mahendergarh districts reveal that the wild animals are used for their various medicinal value. As revealed by the survey the following animals are used for the purpose mentioned.

3.3.1 Porcupine : The flesh of the animal is used to control Foot and Mouth disease of the cattle.

3.3.2 Blue Rock Pigeon: The blood is used in the treatment of Paralysis and also in the treatment of Asthma.

3.3.3 Green Pigeon: The flesh of this bird is used to control Polio.

3.3.4 Peacock: The leg and the toes are used to treat the burn injuries . The eggs of this bird are used in the treatment of the diseases of cattle.

3.3.5 Black Partridges: The flesh is used to treat Tuberculosis .

3.3.6 Fox: The fat removed from the brain of the animal is used as medicine.

3.3.7 Frog: The whole animal used in the treatment of certain infection in human beings.

3.3.8 Owl: The flesh and feathers are used in the treatment of diseases of children. The flesh is also used to treat the Foot and Mouth disease of cattle.

3.3.9 Jackal: The flesh is used in the treatment of Foot and Mouth disease of cattle and also in the treatment of mouth ulcers.

3.3.10 Hare: The blood is used in the treatment of diseases of children, as an antipyretic, in the treatment of eczema . The blood is also to cure pneumonia in children.

3.3.11 Tortoise: The flesh is used to treat Tuberculosis.

3.3.12 Snakes: The bones are oven in the form of a necklace and is supposed to cure jaundice. The skin is used in the preparation of eye liner . The black snake poison is used by the 'Sapera' community in the preparation of eye liner.

3.3.13 Monitor lizard : The fat is used in the treatment of arthritis.

4.0 Major actors and their current roles relevant to Biodiversity

4.1 Governmental

The Forest department has been entrusted with the responsibility of conservation of wildlife in the state. The Forest Department is the custodian of the forests, areas notified or declared as forests under various sections of the relevant Act. The conservation of forests and its management is oriented towards the protection of wild animals through habitat management in the protected areas -areas which are declared as wildlife sanctuaries and National Parks. The wildlife wing implements the provisions of the Wildlife (Protection) Act, 1972 both in the Protected Areas and outside the forest areas.

To advise the Govt. on the conservation of wildlife in the state an Advisory Board has been constituted in the state.

Inter departmental Co-ordination Committee has been constituted in the state to enforce the provisions of Wildlife (Protection) Act and specifically to prevent the trade in wildlife and wildlife products. Similarly Inter-departmental District Co-ordination Committees have been constituted to strengthen the protection mechanism at the district level.

4.2 Institutions

Wildlife Institute of India has been helping the state in technical matters. In the early nineties, this institute conducted an exhaustive study on Neelgai and its control mechanism to prevent crop damage. They have also been helping the department by training of the field staff in various fields.

4.3 Citizens Groups and NGOs

Non governmental organizations or citizen groups, which are doing some related job, are mentioned below:

4.3.1 WWF Chandigarh chapter

The World Wide Fund for Nature- India has a chapter located at Chandigarh. This organization is working in the state for the cause of biodiversity conservation. Creating public awareness, especially in the school children, is one of their main activities.

4.3.2. All India Jeev Raksha Bishnoi Sabha

This organization has been active in the state especially in the south and south-western part of the state where there is a significant population of Bishnoi community. Although they are not doing anything significantly towards the development of wildlife habitat but have extended protection to all animals against killing. They have also been sensitizing the local population and have taken steps to prevent hunting of wild animals. Through their efforts they also influence Govt. policy to some extent.

4.3.3. Bombay Natural History Society

This internationally known voluntary agency has come forward recently for the conservation efforts of the dwindling vulture population. They have also been voicing their concern on the decision of the State Govt. of allowing hunting of Neelgai to prevent agricultural crop damage.

4.3.4 The Environment Society of India has been active in increasing the awareness of conservation of nature. However, their activities are confined basically to Chandigarh and adjoining parts in Haryana.

4.3.5 There are few individuals who are active in wildlife conservation efforts. The check-list of birds of Haryana has been compiled by Mr. S C Sharma (resident of Sonepat) and Mr. Bill Harvey.

4.4 Local communities: rural and urban

4.4.1 Although the issues of forests, wildlife and environment are acknowledged by the educated urban communities, there is very little contribution from them in conservation of forests and wildlife in the state. The wildlife wing has been making continuous efforts to create awareness among rural communities particularly school and college students about the importance of wildlife conservation. Community involvement is also sought for the protection of wildlife whenever required. However, it will be a time taking process to sensitize the rural communities so as to secure their spontaneous actions and co-operations in conservation efforts. The contribution of the Bishnoi community in the protection of plants and animals needs special mention .The protection of plants and animals is one of the twenty nine principles of living. But for their strong belief in the

protection of the wild animals, their population in the country side especially in the south and south–west of the state would have been vastly depleted.

There are few other individuals in the state who are making efforts in the conservation of wild animals, especially birds.

4.4.2 Rural Communities

a) There are some communities who have been indulging in wildlife offences. They are Deh, Banjara, Bangale, Shikligar , Bawaria and are found throughout the state.

b) The bird trappers of Ambala: They indulge in the trade of birds in Ambala district. Besides these, there are no major actors in the conservation efforts in the State.

5.0 Ongoing initiatives

5.1 Governmental efforts

5.1.1 In-situ conservation efforts

Besides protecting wild animals found anywhere in the state under Wildlife (Protection) Act, the State Government has declared one National Park and nine wildlife sanctuaries in the state for the development and conservation of wildlife. Brief description about the National Park and wildlife sanctuaries is given below:-

LIST OF NATIONAL PARK AND WILDLIFE SANCTUARIES

Sr.No.	National Park/ Wildlife Sanctuary.	Tehsil/ District	Wild animals which are found.	Area (in acres)
(A)	**National Park**			
1.	Sultanpur National Park.	Gurgaon	Water birds.	359.51
(B)	**Wildlife Sanctuary**			
1.	Bhindawas Wildlife Sanctuary.	Jhajjar	Water birds, Black buck, Blue bull, Black & brown Partridges.	1016.94
2.	Nahar Wildlife Sanctuary.	Kosli (Rewari)	Black buck, Blue bull, Black & brown Partridges.	522.25
3.	Chhilchhila Wildlife Sanctuary.	Kaithal	Water birds.	71.45
4.	Bir Shikargah Wildlife Sanctuary.	Kalka (Panchkula)	Chital, Wild boar, and Red Jungle Fowls.	1896.00
5.	Abubshehar Wildlife Sanctuary.	Dabwali (Sirsa)	Blue bull, Partridges and Black buck.	28492.00
6.	Saraswati Plantation Wildlife Sanctuary.	Guhla-Cheeka Kaithal/Kurukshetra	Black buck, Hog deer and Wild boar.	11003.00
7.	Khaparwas Wildlife Sanctuary.	Jhajjar	Water birds.	204.36
8.	Bir Bara Ban Jind Wildlife Sanctuary.	Jind	Blue bull, Monkeys, Hare, Black & brown Partridges.	1036.00
9.	Kalesar Wildlife Sanctuary.	Chhachhrauli (Yamunanagar)	Leopard, Bear, Chital, Sambhar, Wild goat, Barking deer, Wild boar & Red jungle fowl.	25001.65

For the development of these protected areas for promoting the wildlife therein various developmental works are taken up which are briefly described below:-

5.1.1 a) Sultanpur National Park

Because of the urbanization and related developmental activities in the catchment of this protected area the run off to the lake has greatly been impeded . To augment the supply of water, tubewells were dug in the early and mid nineties. However, when these tubewells started throwing saline (brackish) water, they were disconnected. For three years the lake remained totally dry. In 1999-2000, a pipe line connecting Gurgaon water supply channel to the lake was laid at a cost of around 50.00 lacs. However, the water supply through Gurgaon water supply scheme may become a problem in coming years because of the increasing population of Gurgaon. A museum and a Salim Ali Centre are constructed to give the visitors information on the bird life.

5.1.1 b) Bhindawas Wildlife Sanctuary

This water body wildlife sanctuary depends essentially on the water flow from the escape canal during the power failure period. With the improvement in the power situation in the state water supply to the lake by way of failure of power will be stopped and therefore, water to the lake needs to be supplied .

Water hyacinth has become a problem in this lake since last 5-6 years. The Govt. has taken up a project of biological control of weed through the release of two American weevils and a mite. This project is being taken up in collaboration with PDBC under ICAR Bangalore.

5.1.1 c) Kalesar Wildlife Sanctuary

At present there are no major developmental works being undertaken in Kalesar. However, improved protection, deployment of more wildlife guards and plantation of fruit trees besides need to be undertaken.

Sal has been affected with the borer at low intensity in some compartments. The operation of trapping of beetle need to be taken up continuously to prevent mortality of Sal in the area.

5.1.1 d) Bir Shikargah Wildlife Sanctuary





In this wildlife sanctuary, provision of some more water bodies especially to cater to the requirements during peak summer need to be taken up. The existing plantation of Eucalyptus and Khair need to be phased out and planted with fruit trees. This, however, can be taken up only after seeking permission from the Hon'ble Supreme Court.

5.1.1 e) Saraswati Plantation wildlife sanctuary

This sanctuary basically has Eucalyptus, Kikar and Mesquite plantation. The only important wildlife in this sanctuary is Hog deer. To develop and propagate the animal in the sanctuary pockets of marshy areas having Kikar, Mesquite plantation need to be protected and depressions should not be allowed to be filled up for any purpose. If the depressions get silted up over years they would need desilting. There is a proposal of the Forest Department to denotify this sanctuary in lieu of the notification of equivalent area in the Shiwaliks . However, it is recommended to convert this area as a 'Conservation Reserve' with a view to afford adequate protection to Hog deer found only in this area.

5.1.1 f) Bir Bara Ban Jind Wildlife Sanctuary

Since the area is relatively small and has only Eucalyptus and some other species plantations, there is hardly any scope for the development of this area as a better wildlife area. No developmental works are being taken up in this sanctuary.

5.1.1 g) Nahar Wildlife Sanctuary

This is a reserved forests in Rewari District. Unfortunately, to fill up the grassy blank, the territorial wing has planted *Prosopis juliflora* .The area, which once supported a local population of Black bucks, is almost devoid of this population now. The management by way of removal of this *Prosopis juliflora* and sowing of Anjan grass need to be taken up. Trees of *Prosopis cineraria* and Jal be planted in the area.

5.1.1 h) Abubshehar wildlife sanctuary

The area has relatively larger population of Bishnoi community and therefore, wildlife has the protection of the local people. Since the wildlife sanctuary comprises private area, human habitations and such other rural areas the strict implementation of Wildlife (Protection) Act is not possible. Such areas are better managed as community reserves and be notified as such as and when the Wildlife Protection Act ,after amendments, allows such conversion.

5.1.1 i) Chhilchhila wildlife sanctuary

This is a small depression on a community land with less potential for the development. In view of the people's objections on the continuation of the area as wildlife sanctuary there is little scope for the future development. The status of this sanctuary also needs to be changed to 'community reserve' as and when the Act allows such conversion.

5.1.1 j) Khaparwas wildlife sanctuary

This is a small depression surrounded by embankment. This water body used to get its supply of water from Jhajjar-sub-branch canal, which has been abandoned and therefore this water body has dried up. The future of this area as a wet land (water body) as a sanctuary is uncertain.

5.1.1 k) There is a proposal of the state to notify the natural forests area lying between Berwala and Mandhana on Panchkula-Morni road as wildlife sanctuary in lieu of de-notification of Saraswati Reserved Forest Plantation Wildlife Sanctuary and Bir Bara Ban Reserved Forest Plantation Wildlife Sanctuary . These two plantation wildlife sanctuaries are not good habitats whereas the proposed area is quite rich in wildlife. The proposed

Morni areas be developed to protect the biodiversity of typical Shiwalik hill forest biodiversity.

5.1.2 Ex-situ conservation units

5.1.2 a) At the Pheasant Breeding Centre, Morni, Red jungle fowl has been successfully bred and released in the forest. Even Kaleej pheasant was bred and released. The efforts to breed Cheer pheasant and Chakore have not succeeded for various reasons.

5.1.2 b) At Bhaur Saidan, breeding of crocodiles was started earlier. Now there are a large number of crocodiles in the lake which are facing the problem of over population.

5.1.3 c) Chinkara Breeding Centre at Kairu is a 58 acres fenced area in village Kairu in Bhiwani District. The animals here are in their near natural environment, and for all practical purposes this can be called as in-situ conservation effort.

5.1.2 d) There are two zoos in the state, one at Rohtak and the another at Pipli. Both these zoos are small and as per Central Zoo Authority guidelines fall in the category of mini zoos. Although they serve the local population, their role as conservation centres is only limited.

5.1.2.e) There are two deer parks one at Hisar and one at Meham.

5.1.3 Wireless Communication

All the protected areas are connected with wireless communication with the district headquarters. The frequency of wireless communication in Haryana is the same as that of Uttar Pradesh, Himachal Pradesh and Punjab and therefore communication between the states for local exchange of information has improved.

5.1.4 Provision of Arms

Three Inspectors posted at Panchkula, Morni and Yamunanagar have been provided with revolvers and a total of six 12 bore, DBBL guns have been provided to wildlife guards for the protection in the Shivalik areas.

5.1.5 Vehicles

Fifteen Inspectors in the state have been provided with motorcycles. There is one jeep, which is used for protection, and publicity works in the state. The position of vehicles is highly inadequate. The apprehension of poachers and their further proceedings become difficult in the absence of Govt. vehicles.

5.1.6 a) Education, training camps are organized for the farmers, school children and teachers. However, this activity is constrained for the want of adequate resources and trained manpower.

b) Rural extension

To educate the rural community about the provisions of Wildlife (Protection) Act and to generate appropriate awareness meetings at the village/panchayat levels are held regularly.

5.1.7 Eco-clubs

The Department of Environment, Govt. of Haryana has initiated a programme of constituting Eco clubs in the state. At present about 100 Eco-clubs are functioning with differing enthusiasm in every district. The school children are given necessary environmental education through these Eco clubs.

5.2 NGOs and other people movements

As explained earlier there are few NGOs or voluntary agencies working in the state. The WWF (Chandigarh chapter) and Environment Society of India are working for creating general awareness about nature conservation. Bombay Natural History Society has recently started some activities in the state.

6.0 Gap Analysis

6.1 Gaps in information

6.1.1 Although the wildlife wing has been protecting and developing wildlife and wildlife areas there is hardly any scientifically collected information on the wildlife resources of the state. The information on the animals found, the status of their habitat and adequacy of the developmental works is far from satisfactory. A check list of birds as prepared by Mr. SC Sharma and Mr. Bill Harvey is available but their local/seasonal availability and their status is not known.

6.1.2 As explained earlier a 200 km. long road and rail transport from the north, northwestern Himalayan region connecting the metropolis of Delhi passes through Haryana and, therefore, because of strategic location effective control by way of intersection can be undertaken within the state. However, the nature and content of illegal trade in wildlife through Haryana has not been studied.

6.1.3 At the vision and policy level the appreciation of the importance of biodiversity conservation is not satisfactory. For the stricter implementation of the Wildlife (Protection) Act, the local infrastructure is also inadequate.

6.1.4 There is no sanctuary in the southern region for the protection of the biodiversity of the Aravalli Hill system and of the sandy desert region. Some protected areas in the regions, therefore, need to be established.

6.2 Gaps in institution and human capacity

6.2.1 Traditionally, the staff of the erstwhile Wildlife Department had been responsible only for areas outside forest boundaries and therefore the need for training of the wildlife staff from forestry and habitat management point of view has been inadequate. And, therefore, the implementation of section 33 of the Wildlife (Protection) Act even if desired and required is not possible with the staff of wildlife wing alone.

6.2.2 The departmental infrastructure has not kept pace with the improved sophistication in the methods adopted in the trade of wildlife and wildlife products. The work of intelligence gathering, apprehension of offenders and poachers, prosecution and interrogation is very weak.

6.2.3 Because of the existence of the wildlife department as a separate department in the state earlier , the state forest officials had been alienated from the working of the wildlife department. Moreover, in the training of forest officials, generally, the training inputs on wildlife conservation are relatively less.

6.2.4 Wildlife Institute of India although provides technical training inputs to the state it is felt that this National level institute needs to be further strengthened to cater to the specific requirements of the state.

6.2.5 With the growing importance of biotechnology, genetic engineering, genetic manipulation there is a need to educate the state bureaucracy and the forest administration including the wildlife staff on the importance of resources under their possession.

6.2.6 The wildlife extension service is weak and needs further strengthening.

7.0 Strategies for the conservation of the wildlife in Haryana

For the conservation of wildlife and biodiversity of the state, eight-pronged strategy, as suggested, both short term and long term need to be adopted. Although at the moment some work on these strategies is being implemented a concentrated effort on further strengthening various activities and undertaking newer activities is required.

7.1 Forested Ecosystem

Protected areas representing the Aravalli Hill system and the sandy desert system need to be strengthened.

The forested ecosystems need to be further developed so that they can support a greater population of wild animals by improving the habitat. Plantation of fruit species and provision of water especially during the pinch period need to be undertaken.

To reduce the pressure on the protected areas, Eco-development works for raising the fuelwood and fodder and other income generating activities in areas outside the PA have to be taken up. At the state level promotion of agro-forestry, and production of fuel fodder on community lands i.e. social forestry needs to be revived on a larger scale.

7.2 Wet land

With the development in all other sectors the wetlands in the state are fast disappearing. Provision of water to the wetlands and their protection should be done and sustained efforts needed for maintaining them in future. The catchment area of Sultanpur national park needs to be notified under the provisions of appropriate Act to prevent any further construction creating obstruction to the free flow of run-off to the lake.

7.3 Community land

For the conservation of wildlife outside protected areas amendments to the Panchayat Act is required to be done so that 25 to 30 % of the community land is kept under tree cover. Where existing, the communities and the panchayat should be prevented from further appropriating the area for other developmental activities.

7.4 Wildlife Trade

Prevention of trade in wildlife and wildlife products from within the state and passing through state should be prevented for which the protection mechanism needs to be strengthened.

7.5 Creating awareness

For all these efforts to be sustained in future and for creating the awareness for the conservation in the people, nature education and conservation awareness programmes should be continued with full support and adequate Govt. funding.

7.6 Capacity building

To enhance the capability of the department and to sensitize the associated personnel, staff should be trained and sensitized for various skills in the wildlife management.

7.7 Baseline Surveys

Base line survey of wild animals and other organisms should be undertaken and the status of each and every of these should be monitored continuously periodically.

7.8 Small animal offences

A long term plan to wean away the community involved in wildlife offences be drawn up.

8.0 Action Plans

In order to translate all these strategies into various specific actions, the following actions are suggested. The time frame for these actions have been mentioned along with each of these actions:-

8.1 Action 1: Habitat improvement of forested eco-systems

Category: High priority

Details:

- Plantation of fruit species namely Gullar, Amla, Ber, Harad, Bahera, Bar, Pipal to be taken up in Kalesar, Bir Shikargah, Saraswati, Jind wildlife sanctuaries.
- Replacement of Khair and Eucalyptus crops in Bir Shikargah in a phased manner by these plantations.
- Removal of lantana.

- Provisions of water in Kalesar, Bir Shikargah wildlife sanctuaries to be further improved so that the wild animals do not feel the pinch of water during summer period.
- Development of Morni area (the proposed sanctuary) to afford adequate protection to biodiversity of Shiwalik system.

Responsibility: Wildlife wing of the Forest Department.

Time frame: 5-10 year.

Resources required:

- The total area of Kalesar, Bir Shikargah, Jind, Saraswati wildlife sanctuaries works out to about 15600 hectares . At the rate of 20 plants per hectare a total of 3,12,000 plants need to be planted in these four sanctuaries . At Rs. 100/- per tall plant the total expenditure towards habitat improvement works out to 3,12,00,000/- rupees for next 10 years.
- For providing water one water body or one water point for 5 Kms. square area 62 water points at 50,000/- rupees per point the total expenditure would be around Rs. 31.00 lacs for next 10 years.

8.2 Action : Establishment of Protected Areas in the Aravalli Hills and the Sandy Deserts of the state to conserve biodiversity of these regions.

Category: Medium to high priority

Details:

- Establishment of Protected Area in Aravalli Hill system-- The Bhaundsi area of Gurgaon District could be notified as a Community Reserve and developed as a center of eco-tourism to create awareness among the people of the region and also to protect biodiversity of Aravalli Hill system.
- Establishment of a Protected area in the sandy area of the state.

Responsibility: Forest and Wildlife Department, Haryana.

Time frame: 0-5 years

Resources required: The notification of the areas as protected area does not require resources but for developing Bhaundsi area as eco-tourism area a separate project needs to be prepared

8.3 Action 3: Improvement of Wetlands

Category: High priority

Details: Provision of alternate source of water to Sultanpur lake and Bhindawas through a Government level decision as the quantum of water supply is gradually reducing. Simultaneously efforts shall be made to notify the catchment area of the national park under the provisions of appropriate act to prevent construction activity which creates obstacles in the free flow of water to the lake.

Responsibility: Wild life wing of the Forest Department

Time frame: 15-20 year

Resources required:

- To bring water from around 50 Km. distance an estimated cost of 5.00 crores may be required for period between 10-20 years.
- Bhindawas lake is silting up and it may be necessary to desilt the lake. An estimated cost of Rs. 50.00 lacs for desiltation is proposed for next 10-20 years.

8.4 Action 4: Improvement of community lands

Category: Medium to high priority

Details:

- Amendments to Panchayat Act to bring that 25% to 30% of the community land to be kept under natural vegetation or as 'Gauchar' in order to protect the biodiversity and the animal life in the community waste lands.
- Bar on appropriating the community land for any other developmental activity.

Responsibility: Development and Panchayat Department and the State Government.

Time frame: As early as possible.

Resources required: No expenditure is envisaged.

8.5 Action 5: Regulation of Wildlife Trade and control over poaching.

Category: High priority

Details:

- Building a control mechanism of intelligence gathering, checking of trade, organizing raids for the prevention of illegal trade in wildlife and wildlife products, for Haryana being in the strategic location.
- Establishment of wildlife stations, provisions of arms and better means of communication; two stations one at Ambala and one at Gurgaon; two vehicles, four guns and with wireless communication.

Responsibility: Forest and Wildlife Department, Haryana.

Time frame: Within the next five years.

Resources required: The estimated expenditure would be of the order of Rs. 50.00 lacs.

8.6 Action 6: Awareness creation

Category: Medium to high priority

Details:

- Arranging sensitization programmes for the benefit of the senior government functionaries of all the technical departments and other bureaucrats
- Creating awareness among all sections of people in the state through publicity and exhibition.
- Strengthening existing nature education scheme in the state scheme for arranging nature camps.
- Purchase of two publicity vehicles one for the north and one for the south for facilities to screen films in addition to holding of nature camps for different categories of people is envisaged.

Responsibility: Forest and Wildlife Department, Haryana in collaboration with Education , Women and Child Development, Rural Development, and Social Welfare Departments.

Time frame: 10 year

Resources required: A capital expenditure of Rs. 20.00 lacs alongwith recurring expenditure of Rs. 4.00 lacs annually is proposed for next 10 years. Total amount required towards this is Rs. 60.00 lacs.

8.7 Action 7: Capacity Building

Category: Medium priority

Details:

- Training of the staff to enhance the capability of the department and to enhance the skills of staff.
- Training required in the field of zoo management, wildlife and wildlife breeding.

Responsibility: Forest and Wildlife Department, Haryana

Time frame: 20 year

Resources required: Annual expenditure of the order of 2.00 lacs per year for next 20 years is estimated. The total amount required is Rs. 40.00 lacs.

8.8 Action 8: Baseline Survey

Category: High priority, long term action plan

Details:

- Extensive survey by the universities of their area of influence on the existing status of the fauna district-wise and also on the basis of the habitats like aquatic and terrestrial fauna including micro-organism.
- Each university to survey different areas under its influence as a first step by getting the financial assistance to strengthen the existing infrastructure and man power specific for this enormous task.
- Each university of the state to take up the following projects in first phase of implementation of this project to develop a check list of the fauna of the state of Haryana. The local community will be involved in the inventory of the biodiversity of every area under study.

i) systematics, incidence of occurrence, seasonal variation and environmental effects on the aquatic fauna of Haryana state.

ii) Systematics, incidence of occurrence, seasonal variations and environmental effects on the terrestrial fauna of Haryana state.

This study should include protozoans, coelenterates, annelids, crustaceans, insects, archnids, mollusks, fishes, amphibians, reptiles, birds and mammals for their systematics upto species level. The incidence of occurrence and reasons for variations along with existing environment around their habitat should be made an the important component of this study as it would identify the causes of the depletion or abundance of a species. This would help in working out the future strategies in conserving it.

Responsibility: Punjab University, IMTECH Chandigarh and other Universities in the state

Time frame: 5- 10 year

Resources required: Rs. 200 lakh

8.9 Action 9: Research

Category: High priority

Details:

- Study of biology of available fauna both in the vertebrates and invertebrates whose biology is not known and show the signs of depletion or extinction.
- Studies in captivity or in natural environment for their biology or reproductive potential. Cyto-genetic record of the fauna for identifying the species and establishing inter and intra specific relationship between different species.
- Nucleotides sequence study through genomic mapping in order to establish the link between the present stock and ancestral stock that would help in preserving the germplasm of the state.
- Establishment of a separate state agency to monitor and coordinate the research and survey works under the name "Biodiversity monitoring Agency" headed by a Chief Coordinator.

Responsibility: Punjab University and other Universities in the state

Time frame: 5-10 year

Resources required: Rs. 500 lakh. This includes studies to be undertaken by the universities and the Bombay Natural History Society.

8.10 Action 10: Small animal offence prevention

Category: Medium to high priority

Details: Income generation activities matching with the activities of the Department in order to wean away the community involved in wildlife offence.

Responsibility: Forest and Wildlife Department, Haryana.

Time frame: 10 year

Resources required: It is proposed to start the income generation activity for the community at the rate of 5.00 lakh rupees per district i.e. Rs. 95.00 lacs per year for next 10 years. The total cost of the project would be of the order of Rs. 9.5 crores.

8.11 Action 11: Breeding of animals and birds

Category: Medium to high priority

Details:

- Breeding of rare and endangered animals found in the state like Cheer Pheasant, Chakore, Black partridges, Otters, small animals like Pangolin, Red desert fox, Caracal etc.

Responsibility: Forest and Wildlife Department, Haryana.

Time frame: 15-20 year

Resources required: An estimated cost of Rs. 15.00 lakh per year is required to be spent on this activity. The total cost is estimated at Rs. 300 lakh.

9.0 Follow up

9.1 Once the action plan has been approved and the funds are made available through appropriate agency a state level co-ordination committee would be set up to oversee the implementation of the action plan. Although the action plan and the proposed activity could be got approved by the Wildlife Advisory Board, a committee comprising Commissioner & Secretary. , Forests and Wildlife, Principal Chief Conservator of Forests, Chief Wildlife Warden, Territorial Conservators of Forest and representative of Finance Department would be set up for the purpose.

9.2 Monitoring mechanism:

The state level co-ordination committee set up to oversee the implementation of action plan will also monitor the implementation of the state action plan under the overall guidance of State Wildlife Advisory Board.

* ~~Ro~~ PS - Possibility of raising funds to digitise the PA ~~of~~ files. (NCL ?) - NP will get in touch

* Have a 1 hrs day meeting — about a standalone doc centre.

IV. JPAM - Bhimeshankar - sail joins on 1st June 07
follow up on permission.
The initial ~~part~~ funding for
June 07 - Dec 07 & they
will send in bigger proposal by Feb 08.

~~AK~~ NP - to call up Nagnundar (CWW)
- for Permission to work.

---

* Set - a date to put together proposal.

~~CLI~~ C & L Programme.

17/5/2007.

I. LAW & POLICY.

Matrix:
(NTFP Case)

1. AK - to ask ~~R~~ Ritwick - the latest on NTFP case? filed?
2. Another case on BRT?
3. Once the hearing starts - giving inputs to the cases etc?
4. ~~ab~~ PS - when things start happening - a lot to do
   → it will be good to have something in Delhi.
   (Maybe Seema).
5. NP - can we get a fellow - who could follow up with NTFP ban - & follow it up with Ritwick. - Funds will have to be got, and find a good person (imp. for field work).
6. Have an open ended discussion with Sourabh Phadke (NTFP follow up)

~~NV - in PAs and Development - 6 weeks →~~
~~NV →~~

* Funds for CCA - ~~Printing~~ Directing - Printing.
  (Simone - GFC).
  * Send a sample - along with proposal.
  * 26th Saturday meeting →

III → PA update - proposal to WWF.

Nagaland brochure - Send out to IBA - NE
PA update - NE.
(Non-Nagaland States)

~~Saili to give list.~~
- WWW - NE latest Director
- IBA - NE - director
- PA update NE - ~~directory~~ ~~two~~.
- ~~Forest dept. NE - P~~
- ~~WTI - Webs~~
- WTI - website.
- PA - Manager - NE →

} look at 8 States

What responsibility do we ~~get~~ take for experts.
(Be clear - that this is not a recommendation).
- Resource Person - defns.