

# **Wildlife Institute of India**

**An Autonomous Institution of the Ministry of  
Environment & Forests**

**Annual Report**

**1990-91**

**New Forest, Dehra Dun**

## DIRECTOR'S NOTE

The bounties of nature are a treasure we hold in trust for the coming generations, much as we were handed down from those preceding ours. But are we aware that our track record of the stewardship of this living and life giving heritage will generally go down as a highly irresponsible and short sighted one? In a bizarre mix of greed and need we have created a mess and have trapped ourselves in a vicious cycle, driven by burgeoning populations of those on the course of marginalisation on the one hand, and by the urge of those 'privileged' few who seem impelled to live it off.

The plunderous onslaught on nature, especially since the turn of the century, could hardly be stalled by the knee-jerk

response of the late 60s by way of a species oriented enforcement approach restricted to a small number of national parks and sanctuaries. Project Tiger in the 70s, with its ecosystem approach, sobered this and provided a lesson that while protection had to be ensured from people it had little chance of succeeding if it was at their cost. The National Wildlife Action Plan of 1983 and the new National Forest Policy of 1988 have recognized this and prescribed a people friendly approach to conservation. Of late, environmental security and conservation of biological diversity seem to be finding better acceptance as essential ingredients of a strategy to 'care for the earth'.

Wildlife Institute of India set up in 1983 out of the imperatives of the National Wildlife Action Plan to have a centre for training and research, has derived its mandate in this evolving scenario of aggravating problems and growing realism towards problem solving. Its programmes, steadily geared in tempo and steered to meet emerging needs of the field reflect this, they indeed do in this year under report.

*As would be expected in a young scientific institution, the year saw the tempo and range of academic and developmental activities growing.*

## AT A GLANCE

The year 1990-91 was the fifth year of WII's autonomy and also of its intensive institutional development phase. As would be expected in a young scientific institution, the year saw the tempo and range of academic and developmental activities growing. Integrated forest management for biodiversity conservation attracted much concern and led to new initiatives in research and consultancy as well as orientation of various training courses. Grasslands, very important but the much neglected ecosystems, received special attention in management training and research. Effective management of buffer zones and eco-development in the surrounds of protected areas received planning inputs for new courses on the anvil.

WII's two regular training programmes for in-service personnel of the state wildlife wings completed this year with 19 and 16 trainees, strived to provide scientific professionalism with awareness and ability in management that keeps human concerns at the centrepiece. Our second Masters course in wildlife science with seven students is nearing completion, shaping young scientists to be able to completely handle biological problems in the complex and challenging field conditions. A new short term

course in zoo management was initiated this year in order that over 300 of our zoos and captive wildlife facilities are managed more humanely while promoting awareness for conservation among people. A UNESCO sponsored training workshop in buffer zone management was conducted with 32 participants from nine countries of the region.

Topical subjects of workshops/seminars this year included high altitude ecology, integrated forest management and of course our annual research seminar which reviewed all our research projects, now numbering over twenty, spanning ecological, management and human aspects of wildlife conservation.

WII's research, guided by its Research Advisory Committee, addresses field problems in different ecological and geographic regions of the country. Research is also seen as a means of keeping the faculty up to date with the field milieu and technological advances. Development of professionalism in the faculty in specialized subject areas by learning modern technology and adapting it to Indian conditions comprised the thrust of the collaborative WII-US Fish & Wildlife Service



project, now in its second year. Similar inputs came from the UNDP assisted FAO project in its last year by way of strengthening the M.Sc. programme in wildlife biology. Both the projects also added modern scientific equipment. To further support this development, the faculty took part and made scientific presentations in a number of national and international conferences.

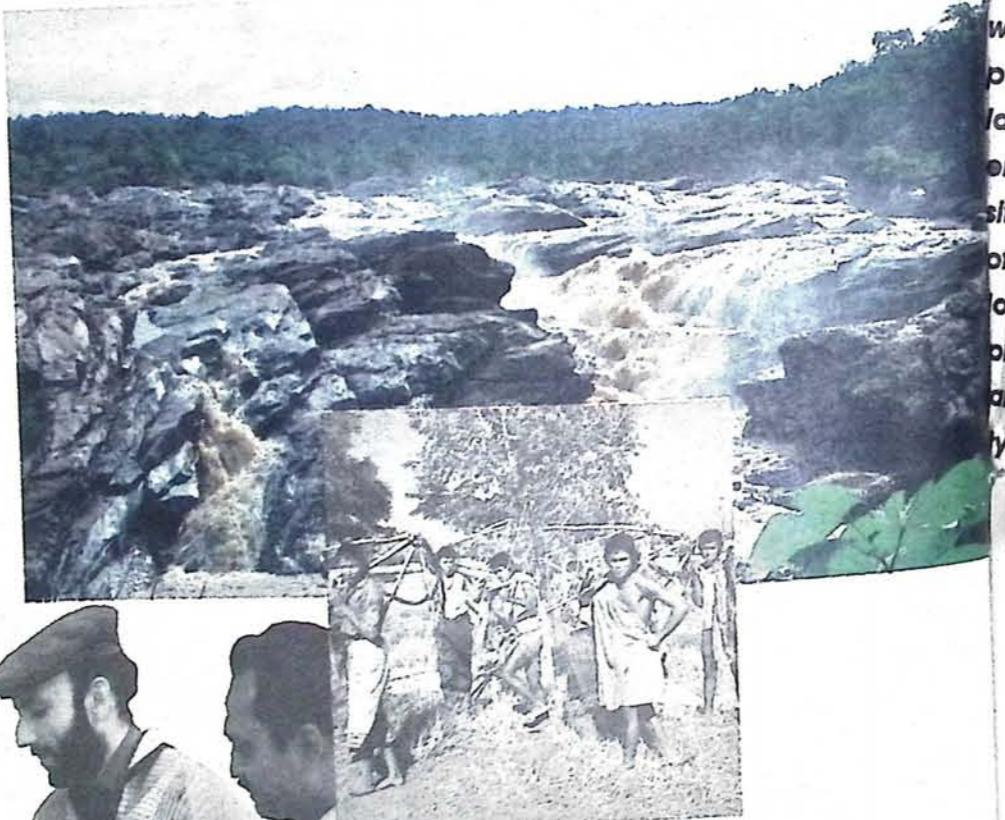
Consultancy services were provided to some institutions and state wildlife organisations on various issues related to wildlife and environment. Important among these were: (i) management of feral

cattle, (ii) problem of man-lion conflict, (iii) translocation of barasingha, (iv) environmental impact assessment in relation to wildlife, and (v) management of protected areas.

A Manual of Wildlife Census Techniques was published besides four technical reports arising from research findings. WII's quarterly Newsletter was brought out and disseminated in a wider circle in the states and institutions.

Significant additions took place to the facilities of computer, library, documentation, laboratory, and herbarium. The construction work of WII's new campus Chandrabani, Dehra Dun has also progressed towards culmination, though at a suboptimal pace.

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## INTRODUCTION

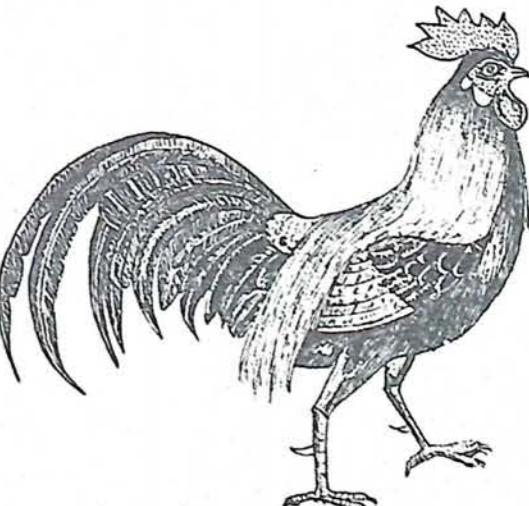
**C**onservation of Biodiversity : **Vital for human welfare** - The importance of biological diversity or biodiversity as a developing futuristic economic resource of great global potential hardly needs to be emphasised. For any one nation in the world India has perhaps the largest array of environmental situations by dint of its tropical location, varied physical features and climatic types. We thus have the widest variety of biomes, an attribute further enhanced by the meeting of three major biogeographic realms in our domain. India owes its unique biodiversity to this unmatched interspersion of biogeographic and environmental values.

However, like all developing countries we also are in the grip of a self-perpetuating vicious cycle with mounting pressures accelerating the cumulative shrinkage and degradation of natural areas and vice versa. While development projects continue to take their toll of the wilderness, the marginalised forest-living people are becoming hapless tools of insurgency, which does not solve any problem but does queer the pitch. Such impoverishment of people and the all-pervasive degradation have provoked concerns for the development of man-

agement strategies and techniques, which would help conserve natural areas and their biodiversity, while providing for compatibly sustainable welfare of people inhabiting the wilderness regions.

In order to be able to effectively meet these concerns we need researched information, trained manpower and rationally-visualised integrated management programmes holistically addressing large landscapes spanning protected areas, other forests and habitations.

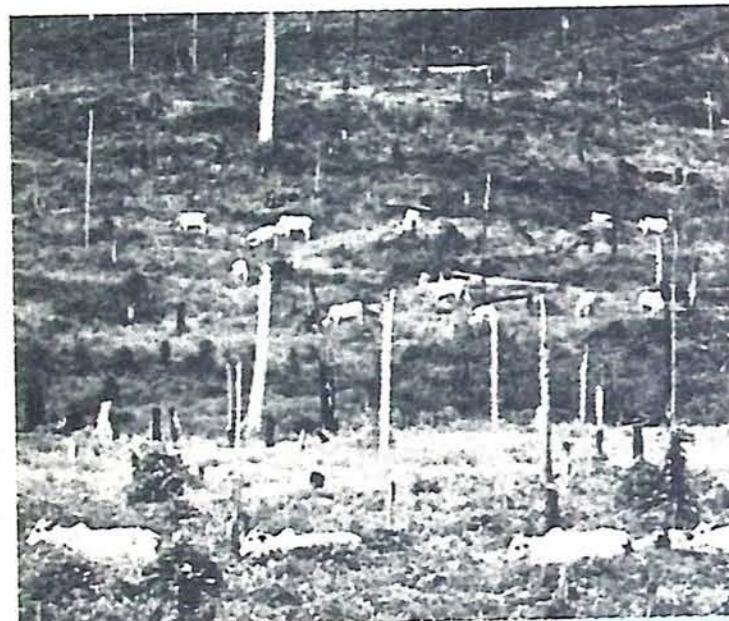
Wildlife Institute of India has fully geared itself to meet these imperatives. WII's report on the network of protected areas is based on its self-developed biogeographic classification, that also lends itself to planned *in situ* conservation, through a representative network of protected areas. Implementation of the proposals contained in this report is a ready means of a cogent nature conservation endeavour. The Institute's training programmes produce trained



wildlife ecologists and managers. Its research effort emphasises applied aspects with *prioritization*, taking into consideration the various ecological, biological and socio-economic problems encountered in the field. Its new initiatives cover ecodevelopment planning, as applied to protected area surroundings, and management planning for protected areas. To achieve integrated landscape management, it has

launched action to develop site-specific guidelines, covering biodiversity conservation and forest management with due regard to the dependence of local people. Research and training programmes also address special measures for endangered species, including captive breeding and release/reintroduction. All these programmes are supported by an upcoming wildlife database.

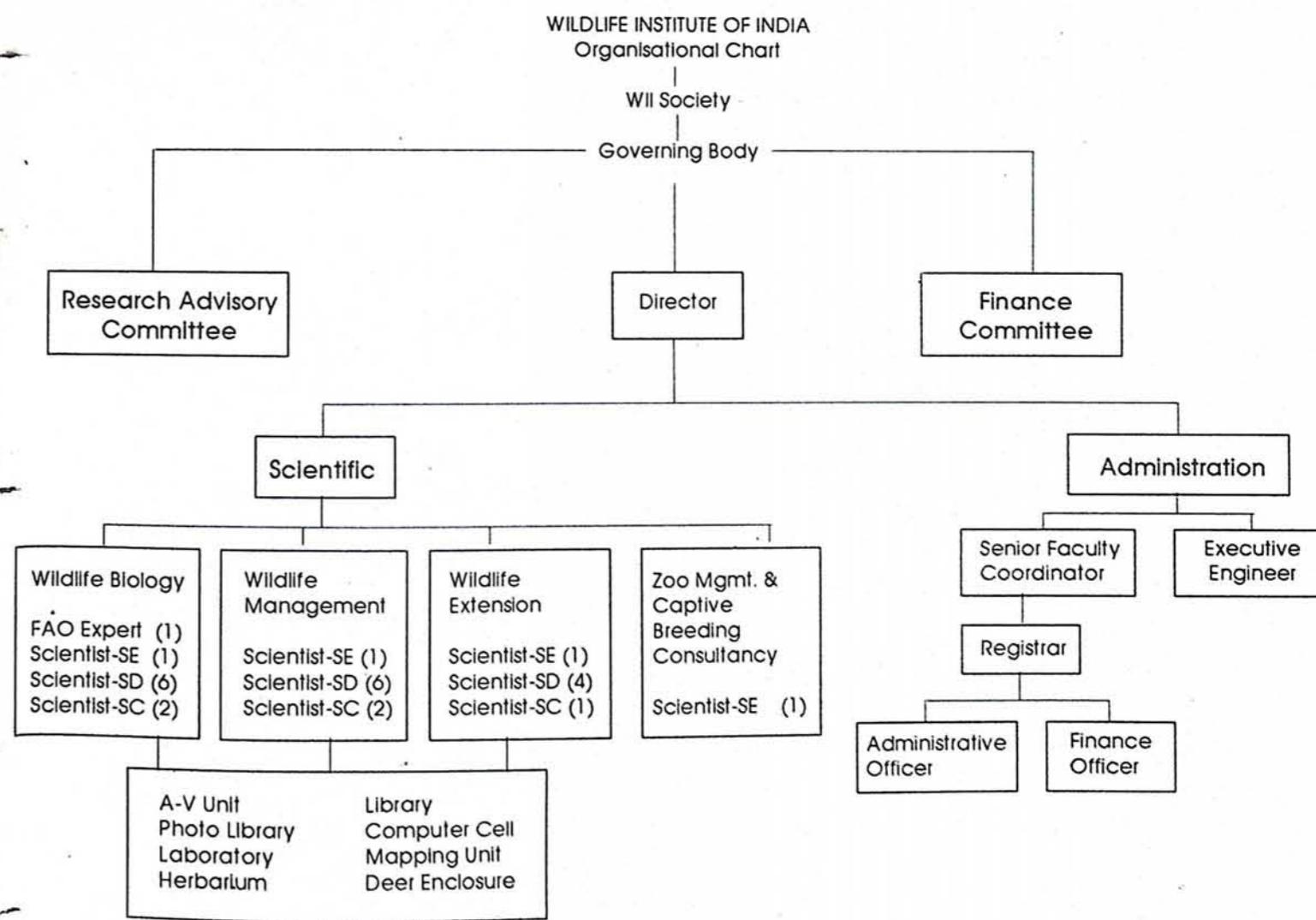
In the following, we review the progress of the Institute's hectic academic and developmental activities during 1990-91.



## OBJECTIVES

The major objectives of the Institute are:

1. Training managers and biologists for protected area management and wildlife research;
2. Training education and extension specialists for protected areas to get public support for wildlife conservation;
3. Providing orientation courses for those involved in land-use management;



## INSTITUTIONAL STRUCTURE

**Shortage of trained personnel in the state wildlife organisations continues to constrain proper scientific management of wildlife and its habitats. Hence, the development of a cadre of trained managers and researchers continues to be the foremost priority of the Institute.**

**W**ildlife Institute of India is organised into three scientific faculty divisions, viz. Wildlife Biology, Wildlife Management and Wildlife Extension. An organisational chart, showing these divisions and other wings of the Institute, is given on page 17. Each faculty division is headed by a Scientist-SE and the administration division by a senior faculty coordinator, who has the Registrar to assist him. Out of the sanctioned strength of 28 faculty posts in the scientists' category, 25 are currently in position, including the Director. In addition, there are 22 researchers. Of the 25 technical posts, 19 have been filled up. In the administrative category, 41 out of 50 positions have been filled up and against 42 maintenance level posts, 37 incumbents have been recruited. Furthermore, a developing library, laboratory and computer facilities provide the needed support to the Institute's scientific activities.

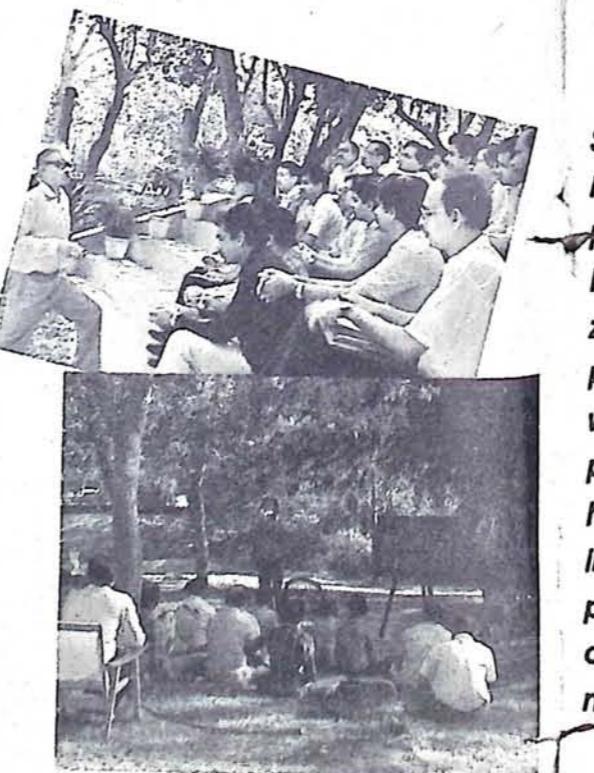
### THE ACTIVITIES

In order to achieve the desired objectives, the various activities of the Institute are geared toward the development of a cadre of trained personnel, in the field

of wildlife management and creating a pool of researchers, including wildlife biologists and socio-economists. Shortage of trained personnel in the state wildlife organisations continues to constrain proper scientific management of wildlife and its habitats. Hence, the development of a cadre of trained managers and researchers continues to be the foremost priority of the Institute. The various programmes of the Institute are so designed as to accord with the field situations, and take into account the different ecological, economic and social aspects in the surrounds of wilderness areas. Relevance to present day to day at the field level is, therefore, a thumb rule in the planning and organisation of various programmes.

An overview of the Institute's various activities during the year 1990-91 is presented under the following three broad groups:

- Academic
- Organisational
- Developmental



**Special emphasis is laid on preparing them to handle the buffer zones of our protected areas, where wildlife-people and habitat-people interface conflicts pose the greatest challenge to managers.**

## ACADEMIC

**T**raining programmes have been developed and are conducted through a number of short-term and long-term courses for in-service management personnel and biologists. For the all important training of in-service personnel of the state forest departments and wildlife wings, in the field of wildlife management, two regular long term training programmes in wildlife management were organised, viz. a Post-graduate Diploma Course in Wildlife Management for Park Managers, and a Certificate Course in Wildlife Management for the subordinate officers at the level of Range Forest Officer.

**The Post-graduate Diploma Course in Wildlife Management** of 9-months duration, imparts training in management planning, strategies, and techniques that are most appropriate to today's conservation situations and needs. A curriculum involving both the theoretical and the practical aspects of management of wildlife and protected areas is followed. The course includes field visits to representative wildlife areas in different parts of the country to get a first hand experience of management problems and remedial measures. Special emphasis is laid on preparing them to handle the

buffer zones of our protected areas, where wildlife-people and habitat-people interface conflicts pose the greatest challenge to managers. The legal aspects of protected area management, including the enforcement of wildlife and forest laws, constitute another important area of instruction. A major part of the course is devoted to training these officers in the preparation of management plans for protected areas. For this, a field exercise of six-week duration, in an appropriate national park or sanctuary, is conducted.

**The 3-month Certificate Course in Wildlife Management** is meant for the personnel at the field executive level, i.e. Range Forest Officer. The course curriculum is quite similar to that of the Diploma Course, but the emphasis here is more on the practical aspects of wildlife management than on theory. The course thus aims at preparing the Range Officers so that they may be able to properly translate the prescriptions given in the management plan, into practice. The participants of this course, too, spend a considerable time on field tours and exercises.

Realizing the fact that the number of protected areas in India is quite large, and the Diploma and the Certificate Courses put together cannot turn out enough trained officers at the desired level, the capsule Course and subject specific workshops are organised. Thus, in addition to the above mentioned two regular courses, a number of short term courses, i.e., the Capsule Course and Training Workshops were

**This programme aims at producing qualified field biologists and ecologists who could pursue a career either in research with the State Wildlife Wings/Forest Departments or other research organisations, or in teaching at the various Universities.**

conducted to meet specific training needs of different target groups. Most of these are of one to two week duration.

#### Education Programme

The Institute started its education programme in 1987-88 with the introduction of an M.Sc. Course in Wildlife Science. This programme aims at producing qualified field biologists and ecologists who could pursue a career, either in research with the State Wildlife Wings/Forest Departments, or other research organisations, or in teaching at the various Universities which are setting-up new courses in wildlife biology, ecology, etc. This course is of 2-year (four semester) duration. The M.Sc. course has a strong field bias and devotes nearly half of the total course time to field tours, including six months of field projects, to enable them to write dissertation.

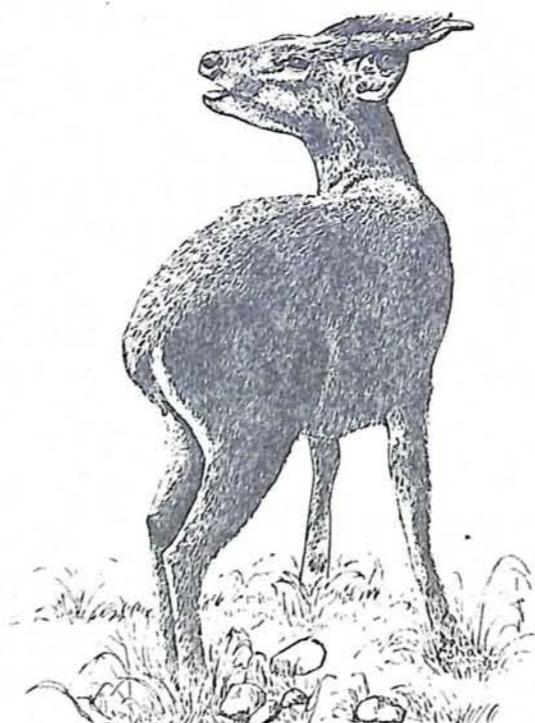
Saurashtra University at Rajkot, Gujarat awards the Master of Science, wildlife degree and for this purpose, the WII is recognised as a Centre for Post Graduate Teaching and Research.

The faculty also provides, inputs in training in wildlife biology and management, to the Indira Gandhi National Forest Academy, and the State Forest Service College at Dehra Dun, as well as, to the visiting classes, comprising researchers/students/trainees of universities, research organisations and forestry institutions.

### REGULAR COURSES IN 90-91

#### M.Sc. Wildlife Science:

The second batch of the 2-year M.Sc. Wildlife Science Course, which started in July 1989, is successfully nearing completion. During the first three semesters seven students have gone a number of field trips to different protected areas interspersed with classroom teaching and laboratory demonstrations. The performance of these students during the first three semester examinations, comprising theory papers and practicals, was adjudged to be of high standard. External examiners were impressed by the aptitude of these students for the emerging field-based discipline. The students are currently conducting field research in three protected areas, namely, Rajaji National Park, Sariska Tiger Reserve, and Keoladeo National Park for their dissertations, which is the major exercise during the final and



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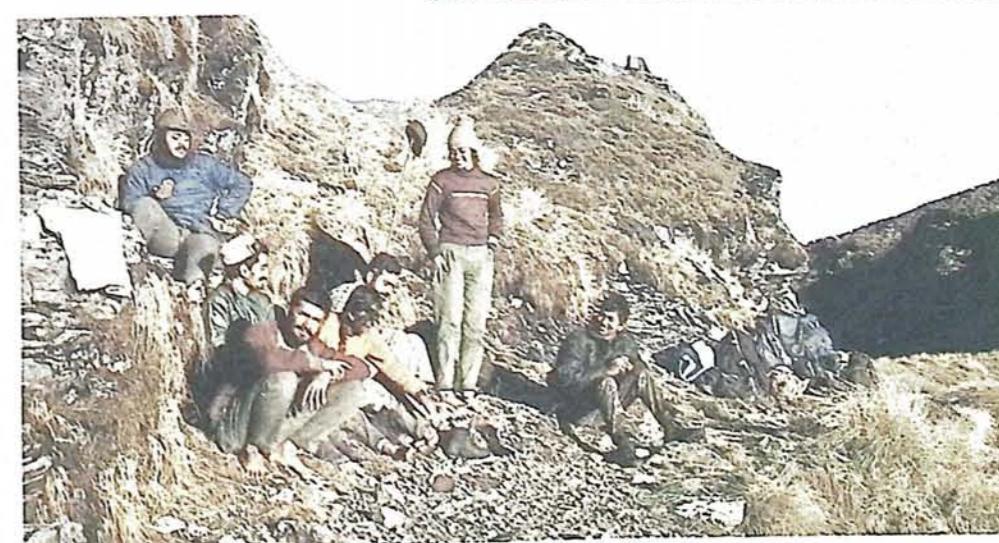
fourth semester of the course. The students will write the dissertations based on data collected by them during their six-month field stay. The aim of this exercise is to provide, both research training, and exposure to working independently. Following is the list of dissertation topics assigned to students, keeping in view their respective aptitude and interest:

- Factors influencing the dial activity pattern of Indian Python (*Python molurus molurus* Linn.) at the Keoladeo National Park.
- Habitat use by chital, sambar and nilgai in Sariska.
- Habitat utilisation and activity patterns of wild pig (*Sus scrofa cristatus*) in Sariska Tiger Reserve.
- Non-breeding bird communities of the Rajaji National Park with special reference to mixed foraging flocks.

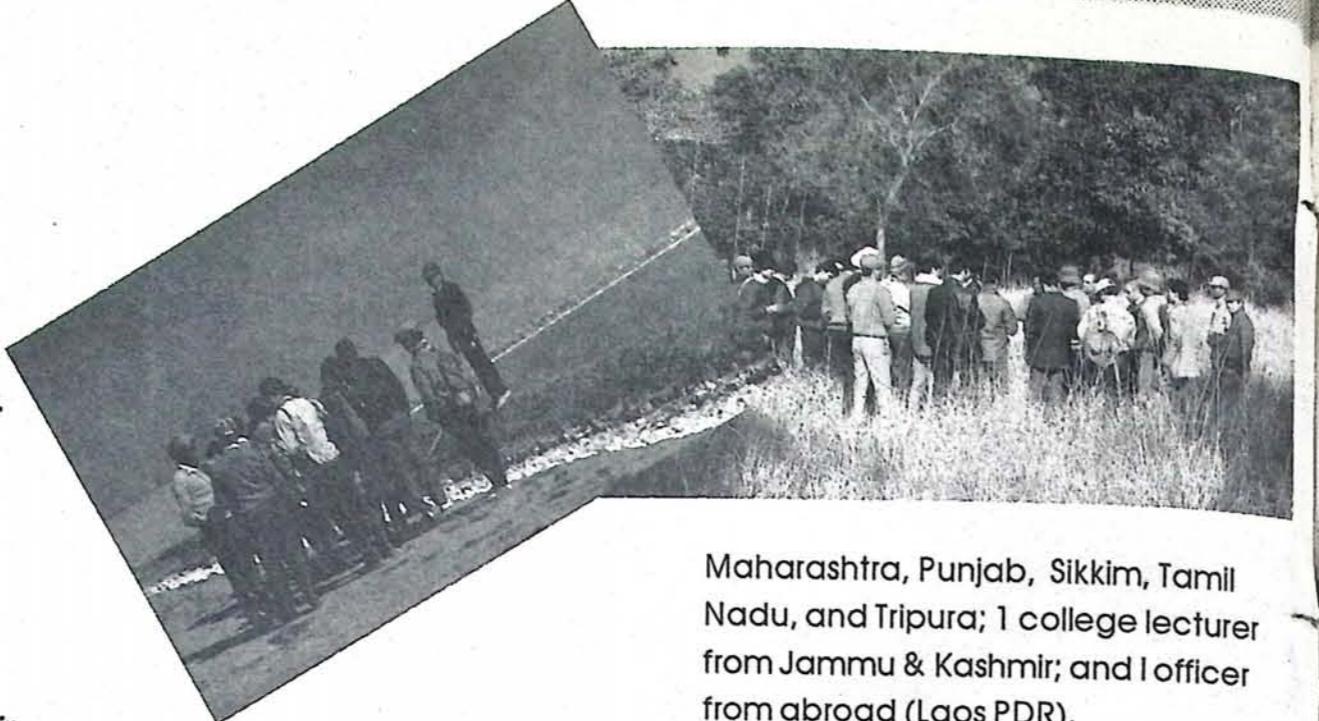
- Feeding behaviour of Hanuman langur (*Presbytis entellus*) in Rajaji National Park.
- Ranging behaviour of Hanuman langur (*Presbytis entellus*) in Rajaji National Park.
- Habitat preference by sambar (*Cervus unicolor*) in Rajaji National Park.

These short-term assignments, not only serve as a research training to the students, but also augment the scarce literature on India's wildlife.

The third batch of the M.Sc. Course will join the Institute in July 1991. The groundwork for admission to this forthcoming course, through a national test, is underway.



The Diploma class visited Rajaji National Park on the Orientation Tour. The officer trainees were introduced to animal signs, tracks, vegetation, wildlife and their habitats, bird watching. Issues related to park management, local people (Gujjars) and their rehabilitation schemes were also discussed.



#### XI Diploma Course in Wildlife Management

The XI Diploma Course in Wildlife Management concluded on 30th April, 1990 as per scheduled activities, at the Institute, and in the field during various tours. Eighteen officer trainees, representing thirteen Indian States, and one from abroad (Laos PDR), participated in the course. Three officer trainees, qualified for and were awarded the Honours Diploma, while the only lady officer trainee from Sikkim in the course, was awarded the Institute's Gold Medal as the Top Trainee.

#### XII Diploma Course in Wildlife Management:

The XII Diploma Course started on 1st August 1990 and will conclude on 30th April 1991. This course has 19 officers: 17 in-service forest officers (ACFs and DCFs), representing 12 States/UTs, namely, Andaman & Nicobar Islands, Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Kerala,

Maharashtra, Punjab, Sikkim, Tamil Nadu, and Tripura; 1 college lecturer from Jammu & Kashmir; and 1 officer from abroad (Laos PDR).

The course curriculum included 15 weeks programme at the Institute, mainly devoted to theory sessions, practicals, seminars, and writing exams, and five field tours of 14 weeks duration, to different protected areas. The Diploma class visited Rajaji National Park on the Orientation Tour. The officer trainees were introduced to animal signs, tracks, vegetation, wildlife and their habitats, and bird watching. Issues related to park management, local people (Gujjars) and their rehabilitation schemes were also discussed. Problems faced by the North-Western elephant population received due concern.

This was followed by a Wildlife Techniques Tour to Sariska Tiger Reserve, Keoladeo National Park, National Museum of Natural History, and National Zoological Park.

The various management issues, encompassing a wide spectrum of wildlife species in diverse habitats, tourism in protected areas,

people's needs and their dependency on forest resources and the need for ecodevelopment, were deliberated, upon during the first Management Tour to the Corbett National Park, Dudhwa Tiger Reserve, Gir National Park, Velavadar National Park, Wild Ass Sanctuary, Marine National Park, and Nalsarovar Wildlife Sanctuary. The class also visited the Centre for Environmental Education, Ahmedabad and GEER Foundation, Gandhinagar. During the second Management Tour, the class visited Kanha Tiger Reserve and each officer trainee was allotted a specific management-oriented topic for writing of a Term Paper. These assorted topics were related to the management of endangered swamp deer; management of vegetation, including weeds; fire as a management tool; wildlife damage problems; evaluation of past village relocation programme; management of buffer zone; tourism and park interpretation; tribals and ecodevelopment scheme.

The class visited Melghat Tiger Reserve on the Management Plan Tour. This exercise called for developing an understanding of the area's significance, objectives and problems, so as to visualise the management strategies. This was followed by data collection, analysis and finally, the synthesis for writing the plan, based on the entire learning absorbed during the course. Each trainee will submit a comprehensive management plan that seeks integration of all natural resources related issues, on different scales, and the aspirations of the local people.

Inputs through guest lectures by prominent professionals, in the field of forest and wildlife management and environmental issues, both from within and outside the country, was a notable activity during the course. Furthermore, the trainees took active part in a number of in-house seminars, group discussions on varied wildlife conservation and management themes, as well as, subject-matter workshops and the Institute's Annual Research Seminar.

#### VII Certificate Course in Wildlife Management:

The VII Certificate Course in Wildlife Management commenced on 1st May 1990 with sixteen officer trainees of Range Forest Officer and equivalent levels. They represented ten States and one foreign country. The training was spread over thirteen weeks, out of which eight weeks were spent for theory sessions, practicals, seminars,



**The Orientation-Techniques tour was conducted In the Rajaji National Park, the trainees were oriented to Interpret animal evidences, behaviour, and trained in the methods of data collection and keeping field diaries.**

field demonstrations and five weeks were for field tours. The teaching inputs were supported by practical demonstrations, group discussions, film shows, video clips and slide projections.

An integral part of the course curriculum was two field tours, namely, the **Orientation-cum-Techniques Tour and the Management Tour**. The tours provided direct demonstration of use of field techniques, in practice in wildlife management. The Orientation-Techniques Tour was conducted in the Rajaji National Park. During this tour the trainees were oriented to interpret animal evidences and behaviour, and trained in the methods of data collection and keeping of field diaries. Various field methods like animal capture, animal census, habitat evaluation and impact assessment were demonstrated. In addition to these, trainees were also exposed to different methods for estimation of crop density, vegetation and habitat mapping, assessment of weed problem, recognition and quantification of animal feeding signs on vegetation. The use of remote sensing and aerial photography, in the context of wildlife management, was also explained to them. They were also exposed to various wildlife damage problems and other conflict areas. Use, construction and maintenance of modern wildlife barriers, such as electric fence, was demonstrated. Radio-telemetry for determining elephant movement pattern and habitat utilization, as part of WII's management oriented research, was

shown to the trainees. The corridor aspect, in context of elephant movement, by showing Motichur-Chilla forest linkages was discussed. Aspect of human activities in forests and pressure assessments were also discussed.

During the management tour to different protected areas in States of Uttar Pradesh and Rajasthan, trainees familiarized themselves with various problems of national parks and sanctuaries, and had a comparative overview of the management approaches adopted for their solution. Trainees also interviewed villagers and staff of the protected areas to get a first hand feeling of the problems related to peripheral areas. Management problems viz. man-killing, cattle lifting, crop damage and rehabilitation of villagers came up for discussion. Studies related to the management aspects of the swamp deer and reintroduced rhinos in the Dudwa Tiger Reserve were discussed. At the National Zoological Park, New Delhi, techniques used in the captive breeding programmes were shown. The aspects of wetland management at the Keoladeo National Park and



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habitat management, anti-poaching operations, wireless network and interface conflicts at Sariska Tiger Reserve were emphasized. After each tour the trainees wrote their tour journals and these were evaluated for course credits. The course concluded on 31st July 1990.

#### **Short-term Courses in 1990-91:**

During the reporting period, in addition to a Capsule Course in Zoo Management, three training workshops in (i) Wildlife in Managed Forests, (ii) Integrated Forest Management and (iii) Buffer Zone Management, were conducted. Details of these are as follows:

#### **First Capsule Course in Zoo Management:**

Although zoo management in India is one hundred & thirty six years old and there are, at present, one hundred & seven zoos and more than two hundred captive wildlife facilities in the country, it was ironical that till now, no formal training in management of wildlife in captivity was available in the country.



The zoo personnel have been left to gain working knowledge through practical experience by trial and error, over a period of time. In the absence of any formal training, in the specific area of zoo management, the development of zoos has suffered. Lack of perspective planning, inability to keep pace with the new techniques and modern concepts of zoo management, in other parts of the world, have been the main constraints. Also the quality and management performance of zoos, and their objectives widely differ from institution to institution in the absence of any policy or guidelines. Furthermore, the concept of zoos has changed radically during the last three decades. There has been a phenomenal shift in the objectives of zoo management, and an analogous qualitative and quantitative development of new technologies. The Government of India and the Indian Board For Wildlife have long been concerned about the status of management and development of zoos in the country. One of the major constraints is the dearth of trained personnel, who can plan and implement scientific management of zoos, along modern concepts and objectives.

In view of this, the Institute has developed a 2-week capsule course for zoo professionals. The first such course was conducted at the Nandankanan Biological Park, Bhubaneshwar, from 26th November to 8th December 1990.

The objectives of the course were: (i) to understand the redefined objec-

**The objective of the seminar was to discuss the ways and means of integrating forest and wildlife management in the light of the National Forest Policy, 1988. Discussions also centred on how to integrate the ecodevelopment programme into biodiversity project.**

tives and modern approaches to zoo management; (ii) to understand the essential components of zoo management, so as to attain a minimum level of standard for upkeep of wild animals in captivity; and (iii) to make the participants aware of modern techniques and measures to improve the standard of zoo management.

Twenty eight participants representing 13 States and Union Territories attended the course. Nine of them were directors of zoological parks and one of a national park. Rest included wildlife wardens, curatorial-level zoo officers, as well as, some forest officers. Majority of the course curriculum was covered by the Institute faculty. However, significant support from guest speakers was also obtained. The theory sessions included lectures on: history of the zoo movement in the world and in India, objectives and functions of zoos and present status of management of wild animals in captivity, criteria for the selection of site for setting up a new zoo, zoo layout and landscaping, zoo organisation and their supporting units, proce-

dures and policies regarding the procurement of animals, quarantine screening, prophylactic measures and assessment, provision of basic needs of new arrivals, diseases of zoo animals, strategies for developing educational activities and programmes, techniques of marking animals for identification, maintenance of stud books and need for cooperation with international agencies and exchange of animal.

Short field visits to the Turtle Research Centre and Chilka Wildlife Sanctuary were also organised. The officer trainees were also taken to the National Informatics Centre (NIC), where the process of developing a software package for maintenance of zoo animal records and stud books was explained.

At the end of the course a feedback from all the participants, through a course-evaluation-questionnaire was obtained. The overall response was encouraging. Participants also made suggestions for further improvement in the course. These suggestions are being incorporated.

**A Seminar on Wildlife in Managed Forests, Satpura Hills Biodiversity Project** was held at the Institute from 24-26 September 1990 as a part of the WII-US F&WS collaborative project. This was organised as a preparatory seminar for the future national and international workshops envisaged under the collaborative project. The seminar was attended by the representatives of the forest/wildlife depart-

***The workshop focussed on key issues of values, objectives, problems, and practices in which people related aspects - means of accomplishing sustainable use of forest based resources, the need of and direction to ecodevelopment planning featured prominently.***

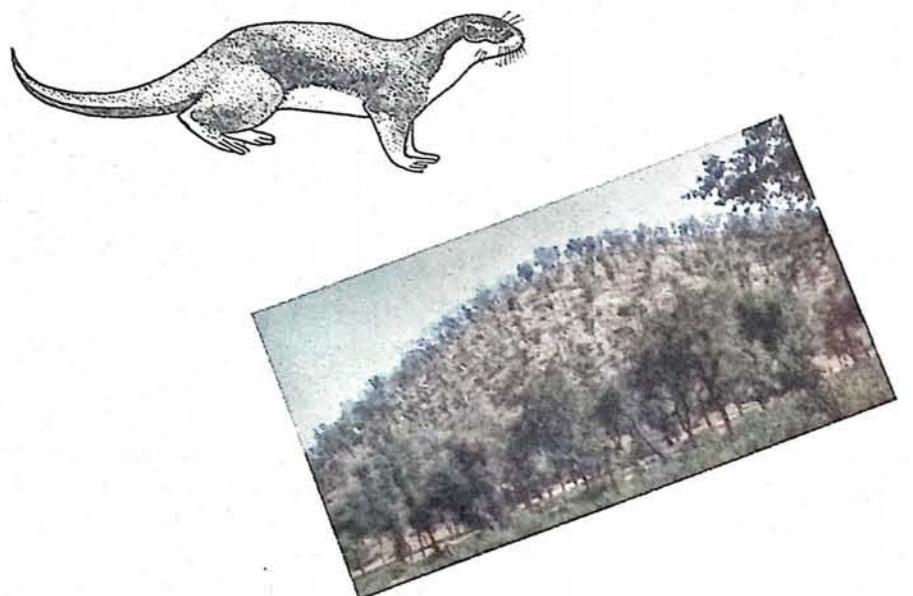
ments of States of Madhya Pradesh and Maharashtra and many of the WII faculty and researchers. A few faculty members from the Indira Gandhi National Forest Academy, Dehra Dun also participated. An US forest scientist attended the seminar. The objective of the seminar was to discuss the ways and means of integrating forest and wildlife management in the light of the National Forest Policy, 1988. The seminar was covered in four different sessions. Papers were presented by the WII/IGNFA faculty, US visiting scientist, forests officers and wildlife managers. Discussions also centred on how to integrate the ecodevelopment programme into a biodiversity project.

**A National Workshop on Integrated Forest Planning And Management**, as part of the WII-USF&WS-US Forest Service Collaboration Project, under the component of 'Wildlife in Managed Forests (WMF)', was conducted at Pachmarhi, Madhya Pradesh from 21-27 January 1991. The WMF initiative is most pertinent in context of the new mandate of foresters in India under the National Forest Policy, 1988. The Workshop had set two objectives: (i) to transfer understanding of the concepts related to biological diversity, and (ii) to demonstrate methods of planning, conservation of biodiversity and integrated forest management. The field visits and demonstrations were organised in some of the localities falling under the Satpura Conservation Area (SCA), comprising of Satpura National Park, Pachmarhi Wildlife Sanctuary, Bori Wildlife Sanctuary, Melghat Tiger

Reserve and intervening Betul Forest Division. A panel of Indian faculty and US experts conducted the workshop. The panel of Indian faculty was headed by the Director, WII and included senior forest and wildlife managers from state forest departments, WII faculty, researchers and a sociologist. WII's FAO Wildlife Expert later joined the workshop. Including the workshop faculty, in all there were 65 participants representing forest departments of eleven States.

The workshop business was spread over 8 sessions. Four sessions were devoted to introduction to overall biodiversity planning concepts and relating these to the existing system of planning processes and practices. Managers working in the Satpura areas, in Madhya Pradesh and Melghat in Maharashtra, presented management case studies. The workshop focussed on key issues of values, objectives, problems, and practices in which people-related aspects - means of accomplishing sustainable use of forest- based resources, the need of and direction to ecodevelopment planning-featured prominently. The workshop emphasized the strong need for adopting emerging new approaches leading to integrated forest planning and management, thereby ensuring the integrity and productivity of forest ecosystems. All agreed that this would need considerable readjustment in existing forestry practices with an especial emphasis on people-related issues. The new direction given by the workshop to professional thinking was appreciated.





**WII-UNESCO Regional Training Workshop On Protected Areas' Buffer Zone Management** - With the assistance of UNESCO the Institute organised and conducted a Regional Training Workshop on Protected Areas' (PA) Buffer Zone Management for the countries in the Central and South-Asian region in Dehra Dun from 18-23 February 1991. There were 32 participants from 9 countries, including India, and 2 participants from Tanzania (College of African Wildlife Management). The latter were funded by the IUCN. Indian participants included 13 officers of the state forest and wildlife departments and representatives from non-governmental organisations, and other institutions including the WII. Resource persons responsible for conducting the seminar came from several institutions and agencies within the country and three from abroad. UNESCO provided travel, board and lodging support to the foreign participants and resource persons, as well as, support towards organisational expenses of the work-

shop. The WII provided the services of its faculty and other infrastructural facilities required for the organisation and conduct of the workshop.

The objectives of the Workshop were: (i) to highlight the redefined concept of PA buffer zone and to discuss potential strategies for their effective management; (ii) to consider criteria and methods for assessing adequacy of buffer zones; (iii) to review buffer zone management efforts through case study presentations and to identify their strengths and weaknesses; (iv) to identify initiatives for active buffer zone management as essential ingredients of effective PA conservation; (v) to underscore the need for people's participation and the role of voluntary agencies in this effort; and (vi) to identify training and research needs, and promote cooperation among the countries of the region.

The workshop included a mix of lectures, panel discussions, case-history presentations and field visits. Field visits were made to Rajaji National Park and the joint forest management project areas in Haryana. The programme was organised into 4 main sessions. Material distributed to the participants, included a manual containing introductory statements and other background information on each session and a compilation of key references relevant to the subject. Overall, the workshop received a good response from the participants who were unanimous that such regional training efforts should be continued in future.

*The RAC was unanimous in appreciating the quality of presentations and acknowledged a distinct improvement as compared to previous ARS.*

## WORKSHOPS, CONFERENCES, SYMPOSIA:

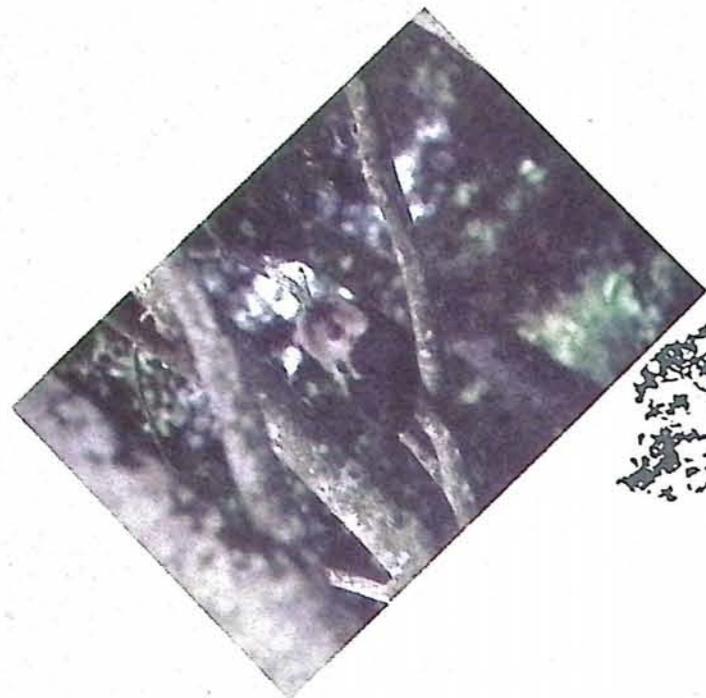
**A Workshop On High Altitude Ecology** was organised by the Institute at Dehra Dun from 3-5 July 1990 as part of the WII - US Fish & Wildlife Service Collaborative Project under its High Altitude Ecology component. The workshop was attended by 68 participants, 31 from within the Institute and 37 from different universities, scientific institutions, forest and wildlife departments and NGOs. Four foreign participants also attended.

The workshop has served to point at: (i) deficiencies in our knowledge of wildlife distribution and abundance in the Himalaya, (ii) appreciation of the information needs in developing a system of protected reserves in the region, (iii) the necessity of communication among the various wildlife researchers and managers, (iv) the need for using consistent survey and research techniques throughout the region, and (v) the need for increased awareness and investigation of the human factor in wildlife conservation in the Himalaya.



**The Institute's Annual Research Seminar (ARS)** was organised at Dehra Dun from 16-18 August 1990. ARS is being organised every year since 1987. The ARS was attended by the members of the Research Advisory Committee (RAC), some members of the Governing Body and a few Chief Wildlife Wardens of States/UTs. Twenty one research presentations, covering sixteen ongoing projects of the Institute, were made. These presentations were spread over in six sessions. Abstracts of all presentations were compiled and circulated to all participants. The RAC was unanimous in appreciating the quality of presentations and acknowledged a distinct improvement as compared to previous ARS. As per the earlier decision of the RAC, this time also, the best five presentations were judged for awards. Besides a merit certificate, the award included a prize for each winner worth Rs.500/- in the form of books on wildlife and related subjects.

**A faculty member participated in the V International Congress of Ecology (INTECOL -90)** on invitation, and presented a paper on the 'Ecology and conservation of large fields in India', in August, 1990 at Tokyo, Japan. This presentation came under the session "Ecology and management of large Asian mammals". As part of INTECOL-90 an International Symposium on Wildlife Conservation was also organised from 21-23 August 1990, where nearly 100 participants from all over the world assembled and presented papers related to the conservation of wildlife. The faculty from the Institute



presented a poster paper "Elephant conservation in Rajaji National Park" co-authored by another faculty and a researcher. A field trip to Nikko National Park was also made. Ongoing studies on serow in Nikko were discussed. Opportunity to observe badger (*Melis melis*) and raccoon dog (*Nyctereutes procyonoides*) were also availed of alongwith the University students.

**The III International Symposium on Lion-Tailed Macaque (*Macaca silenus*)** was organised by the San Diego Zoological Society at the San Diego Zoo from 23-25 May 1990. This symposium was held in the background of tremendous advances in captive breeding of the lion-tailed macaque (LTM), especially in the US zoos, since the first symposium on the species at Baltimore in May 1982. The symposium was attended by representatives from most of the American, European and Japanese zoos which have captive colonies of the LTM but there was nobody from Indian zoos. However, one of the Institute's

faculty members, alongwith two other Indian researchers, attended the symposium.

WII faculty presented a paper titled "Ecology and Distribution of the Lion-tailed Macaque: Scope for Active Management". Tracing the major factors affecting the natural density of LTM, it became evident that two areas in India require more active conservation attention. The first area is southern Karnataka (Makut, Mundrote, Bhagamandla and Sampaje Forest Ranges), which has excellent rain forest but very low densities of LTM. Hunting is probably the major reason accounting for this low density. The second area is the medium elevation rain forest in the Anamalais, and probably in Cardamom Hills too. Here the habitat has been reduced to small fragments thus isolating small populations of LTM. Problems of managing such small isolated populations were discussed.

A round table discussion on "Forging Cooperative Strategies for Conserva-

tion of the LTM" took place on the last day of the symposium. The following areas of immediate action were identified: (i) Feasibility studies on translocation of LTM. These should start with demographic and ecological studies in southern and northern Karnataka. Zoos could actively assist such field studies, (ii) Better exchange between American and Indian zoos, especially with an idea to enhance capabilities of the latter in captive breeding of LTM, and (iii) Explore possibilities for exchange of excess animals from American zoos to Indian zoos.

**The 10th Meeting of the IUCN Crocodile Specialist Group at Gainesville, Florida** was attended by one number of the faculty. This was attended by over 350 delegates. All of them had a common interest, i.e., "Conservation of crocodilians". This was the second participation of WII faculty in such a meeting. On the earlier occasion, the gradual expansion of Indian crocodile conservation programme was highlighted, while at this meeting, the presentation dealt with the increasing number of crocodiles, whose future we are uncertain of - there being too many of them with too little habitat. The concept of protecting and at the same time harvesting the same species may seem a contradiction, but this strategy has proved itself in managing the crocodiles as a renewable natural resource. Based on deliberations and field visits to American Alligator Farms, the visiting faculty concluded that "the emphasis today is on scientific management, legal

harvest and economic incentive that profits both people and wildlife conservation. The American Alligator is a classic leather with an equally classic conservation story". However, in the present Indian situation, where natural habitats are under pressure, this approach is not applicable.

**The International Conference On Conservation Of Tropical Biodiversity** was organised by the Malayan Nature Society and co-sponsored by the National Science Foundation, USA, UNESCO-MAB and other international organisations from 12-16 June 1990 at Kuala Lumpur. A faculty member attended this conference. There were 11 scientific sessions. The participating faculty got an opportunity to discuss various aspects related to tropical biodiversity and its management with other delegates.

**The XIX World Congress Of International Union For Forestry Research Organisations (IUFRO)**, held in Montreal, Canada from 5-11 August 1990 was aimed at bringing the urgency of forestry research to the attention of the international scientific community. Over 2500 participants from 105 countries and 700 affiliated institutions attended this week-long Congress.



which marked the completion of 100 years of the Union's existence. The global theme of the Congress was "Science in forestry and the research needs for the next century". The Congress had strong technical programmes organised into three main areas - special plenary sessions, scientific plenary sessions and technical sessions, supplemented by technical tours.

A faculty member participated in the Congress and presented a paper, as one of the six speakers in the session on "Wildlife Habitats". The session looked at different evaluation tools used for wildlife habitat evaluation in different parts of the globe, and also focused on some of the case studies that successfully employed the scientific tools, standardized in different countries. The WII faculty presented a paper entitled "Wildlife habitat evaluation in India". Scientific information on current evaluation procedures involving use of GIS, remote sensing, habitat capability, suitability index models and aerial surveying/sampling was exchanged during the session. The faculty also participated in the Congress tours and post-Congress excursions.



**Wildlife Study Tour In India and Nepal**  
On the request of the Smithsonian Institution, Washington D.C., one faculty member accompanied their study team on a wildlife study tour in India and Nepal from 15 January to 7 February 1991.

**A Seminar on Information Economics** was held at the Documentation Research and Training Centre (DRTC), Indian Statistical Institute, Bangalore from 12-14 March 1990. A paper entitled "Managerial Approach to Economics of Information" was presented by the Documentation Officer of the Institute. The seminar was attended by about 100 participants. The seminar was spread over twelve different sessions.

## RESEARCH

**W**ildlife Science is a developing discipline in India. It is essentially field based, multidisciplinary and applied in nature. The interspersion of human habitation through the forests all over the country and pressures of local demands on them add a new and important dimension to this science, both in relation to protected areas, as well as, wildlife outside the protected area system.

One of the prime activities of the Institute is to conduct research, in selected priority fields, pertaining to wildlife. The Institute is also being increasingly looked upon as an important centre contributing to development of wildlife science, in the country and the region. WII attempts to meet this objective through its several research projects, and to some extent also by interacting with various universities and other research organisations, both in India and abroad. The merit of in-house research projects is seen as a means of development of the faculty, and keeping the latter abreast of field situations, so that their teaching remains contemporarily relevant at all times.

The Institute's Research Advisory Committee (RAC) helps in ensuring that WII's research conforms to the national priorities, and also coordinates the procedures of screening and evaluation of research projects. It has eminent conservationists, academics and representatives of scientific organisations as its members. A list of RAC members appears later herein. During the period, the composition of RAC was strengthened by the addition of the Additional IGF (WL), Ministry of Environment and Forests.

The Committee had two meetings during the reporting period. It considered and approved four major projects. These were:

(i) The ecological and genetical studies on *Capra ibex sibirica*. The project relates to an endangered species in the fragile high altitude ecosystem in Pin Valley National Park of Himachal Pradesh. No detailed study of Himalayan ibex has so far been made and this would provide an opportunity for comparison with



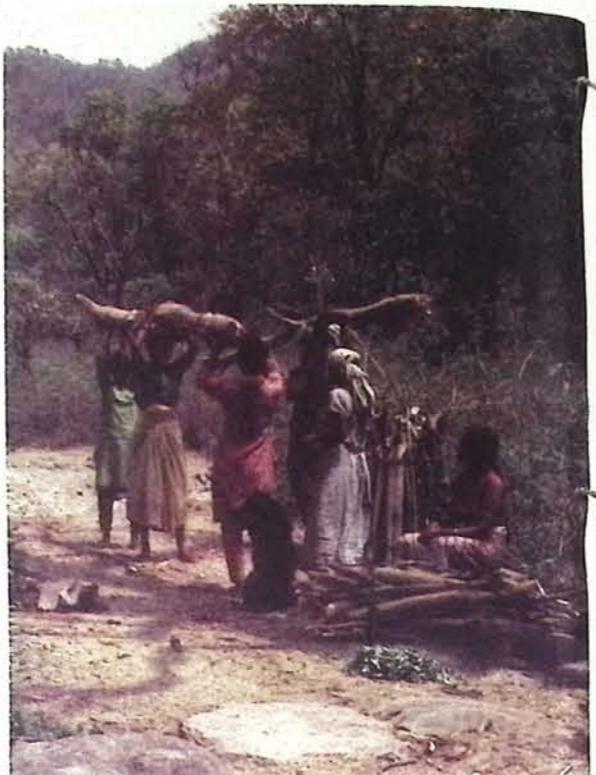
detailed studies, conducted elsewhere on sister species and subspecies in Europe and Middle East. The study also involves isozyme analysis in order to clarify the disputed background for ecological consideration. The study will generate scientific information of use in conservation/management of the species and its habitat.

(ii) The second approved project relates to the second phase of elephant study in Rajaji National Park and having an aim to generate information on movement and habitat utilisation patterns, based on tracking of radio-collared elephants.

(iii) The third approved project was related to the creation of a laboratory facility at WII to standardise the methods for determination of carnivores' diet.

(iv) The fourth approved project was a long desired one to study the impact of protection, drought, grazing, lopping and fire on the structure and composition of vegetation in Gir forest.

In addition to this the Committee approved three short term special



surveys. These surveys were: (i) Takin Survey in Arunachal Pradesh, (ii) Survey of straying lions from Gir into neighbouring unhabited areas, and (iii) Survey of livestock-induced diseases among wild ungulates and carnivores.

The Committee reviewed the progress of eighteen on-going projects and also attended the Annual Research Seminar (ARS).

A brief summary of progress under each of the study projects is as follows:

**I) Ecology of Endangered Grizzled Giant Squirrel (*Ratufa macroura*):** Field work for this project was done from February 1986 to May 1989 in Alagarkoil Valley, Tamil Nadu. Methods involved quantification of vegetation,

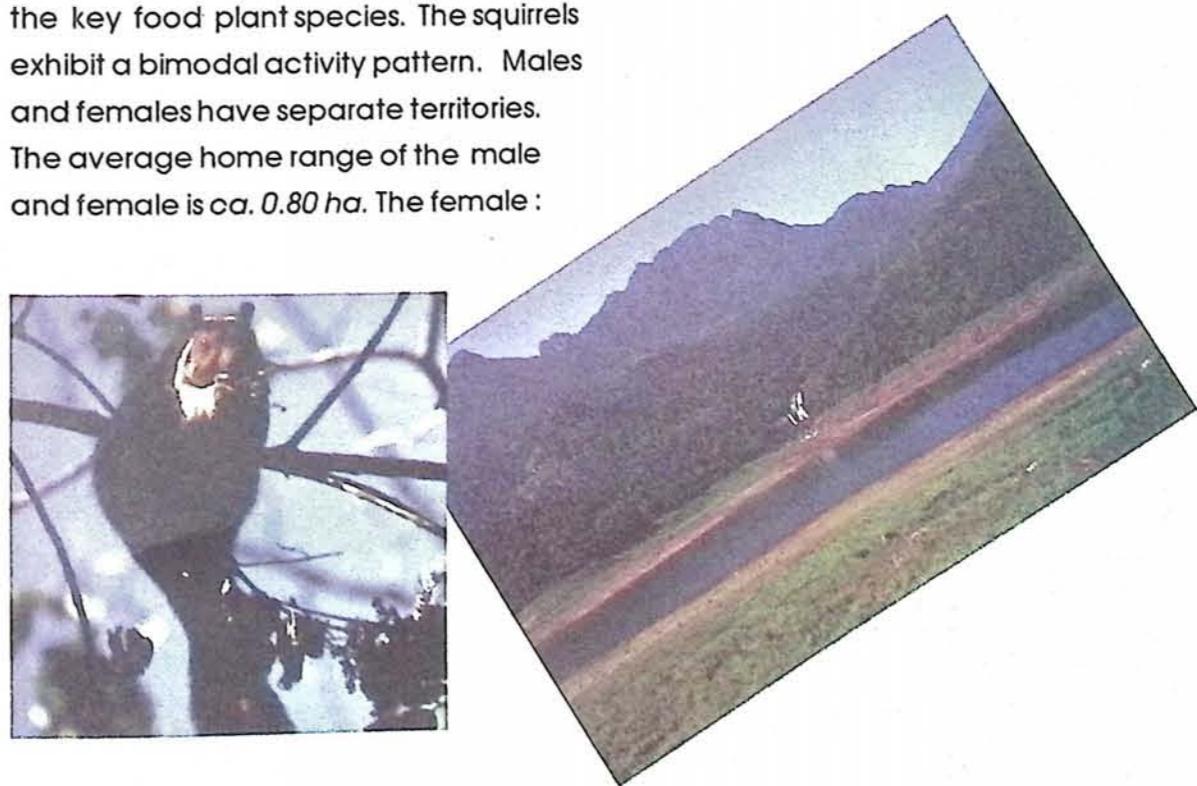
*Immediate and strict protection needs to be given to the squirrel habitats to ensure the long-term survival of this species.*



phenology studies, population count and behavioural studies of squirrels and survey of the squirrel population in its range in South India. Survey and population estimation indicate that the squirrels occur in 8 places and have a total population of about 300 animals. The only large population of 120 occurs in Alagarkoil Valley. In addition to Alagarkoil Valley, the Grizzled Giant Squirrel Wildlife Sanctuary has five more places where the squirrels occur. The other two places are the Kudiraiyar Dam in Palni hills in Tamil Nadu and Chinnar Wildlife Sanctuary in Kerala. The squirrels prefer riverine habitat. *Tamarindus indica* is the key food plant species. The squirrels exhibit a bimodal activity pattern. Males and females have separate territories. The average home range of the male and female is ca. 0.80 ha. The female :

young ratio is 100:31. This species has all the problems of an endangered species; small isolated populations, disturbed island habitats and low female: young ratio. Immediate and strict protection needs to be given to the squirrel habitats to ensure the long-term survival of this species. An interim report was submitted and writing work of the final report was in progress.

**II) Ecology of Endangered Nilgiri langur:** The study was conducted on Mundanthurai plateau (180 m asl) in Kalakadu-Mundanthurai Tiger Reserve, Tamil Nadu, from February 1984 - June 1988. On the plateau two study sites Tambiraparani (5 ha) and Servalar (7 ha) were selected. Methods involved quantification of vegetation, phenology, demography, feeding and range behaviour and biotic disturbances. Tambiraparani study site has a high diversity of shrubs and climbers but a low diversity of tree species as compared to Servalar. A total of 69 plant species were recorded as Nilgiri langur

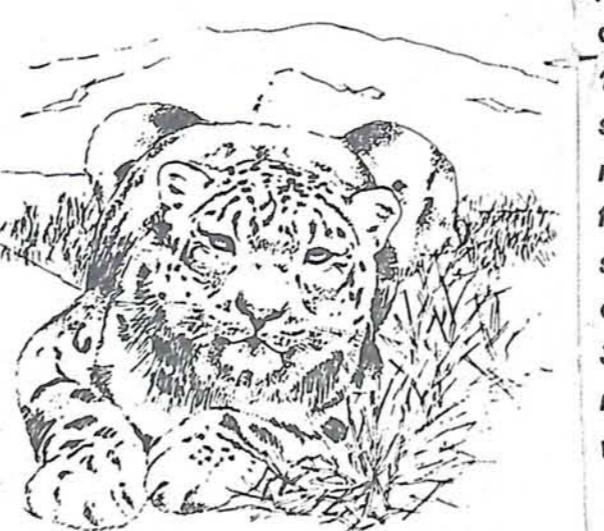


**Due to wood cutting 23% of trees and 55% of canopy cover were lost in a 1.5 ha area selected for 18 months monitoring. A significant difference in birth and death rates among less, moderate, and highly disturbed areas was observed.**

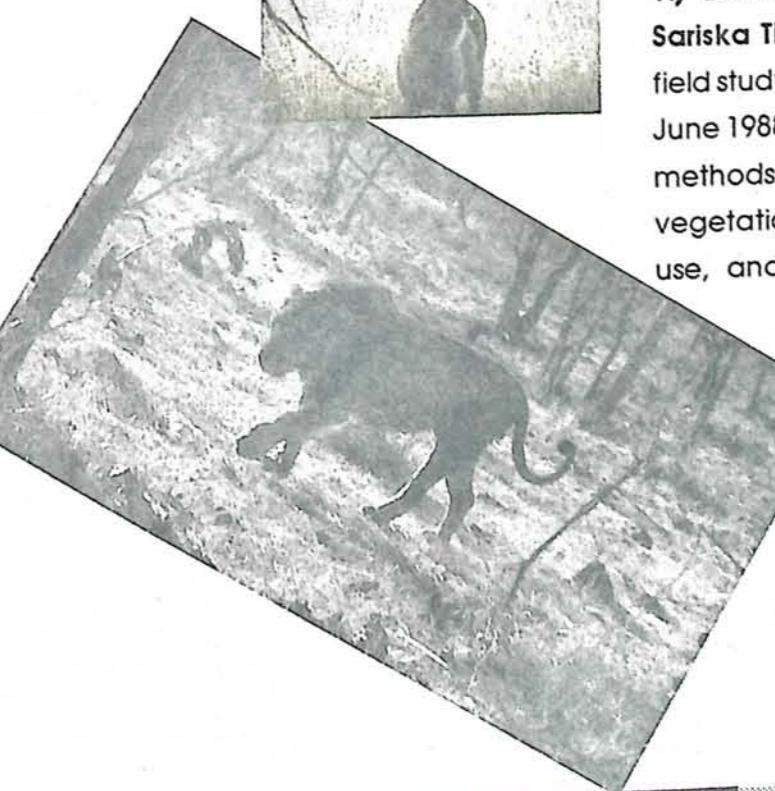


food plants. Of the total feeding time, time spent feeding on young leaves was 39%. Patterns of use of food resources were intimately related to the phenological activity of food plants. Adult females spent 48% of their time feeding, sub-adults (44%) and adult male (42%). Home range size and mean day range length of Servalar group (23 individuals) and Tambiraparani group (8) was 6.29 ha, 1.22 sq km and 3.8 ha, 0.98 sq km respectively. On the plateau group size, varied between 5 and 24 with a mean of 10.02. Sex ratio in adults was in favour of females 100:40. Female-infant ratio was 100:59. The study population showed two birth peaks (May and November). Gross average birth and death rates were 0.52 and 0.15, respectively. Due to wood cutting 23% of trees and 55% of canopy cover were lost in a 1.5 ha area selected for 18 months of monitoring. A significant difference in birth and death rates among less, moderate, and highly disturbed areas was observed. Total protection of the Nilgiri langur habitat (riverine) is crucial for the long term survival of this endangered primate in this low altitude habitat. During the reporting period an interim report of the project was submitted. The Ph.D. dissertation of the researcher and the final project report are nearing completion.

**iii) The ecological studies of snow leopard and its associated prey species in Hemis National Park:** This project started in November 1988 and field work was completed in January 1990. The progress of the project during the reporting year is as follows: (i) The SPOT Satellite data for the study area were analysed and subsequently *ground truthing* was done in field. Based on the findings a paper entitled "Remote sensing snow leopard habitat in the Trans-Himalaya of India using spatial models and satellite imagery: Preliminary results" was presented in the Resource Technology Symposium held at Washington DC, USA during October 1990, and (ii) Data on the vegetation, snow leopard habitat use, and blue sheep have been analysed and the final report is under preparation.



**Data on home range and habitat use were collected on five radio-collared animals (2 chital, 2 sambar and 1 nilgai) during summer, monsoon, post monsoon and winter 1990. 1,040 chital, 548 sambar and 1253 nilgai were classified into age and sex classes. 36 chital food plants, 37 sambar and 52 nilgai food plants were identified.**



**v) Ungulate-habitat ecology in Gir:** Field work for the ungulate-habitat ecology component of the Gir Lion Project ended in May 1989. The revised and final 214 page report titled "Gir Lion Project: Ungulate - Habitat Ecology in Gir" was submitted. The census results indicate a significant increase in the population of wild ungulates from about 6,000, estimated in 1970, to about 43,000; with chital showing the maximum increase. The chital population is presently estimated to be around 38,000. The analysis showed that the sanctuary west had more chital compared to the national park and sanctuary east. The protection provided to habitat is the main cause for such an increase in the population. High plant mortality due to drought was recorded during the study. The implications of this high mortality could be disastrous as certain species have very low regeneration in Gir. The study also revealed that the teak regeneration was severely affected as the fire periodicity increased.

**vi) Ecology of large ungulates in Sariska Tiger Reserve, Rajasthan:** The field study was conducted in Sariska from June 1988 to December 1990. The methods involved quantification of vegetation, phenology, feeding, habitat use, and density estimation of wild

**Major problems threatening the wild ass habitat are migrant livestock grazing, fuel wood collection, salt farming and Intense agriculture.**



ungulates in the various areas of the Tiger Reserve. Data on home range and habitat use were collected on five radio-collared animals (2 chital, 2 sambar and 1 nilgai) during summer, monsoon, post-monsoon and winter of 1990. 1,040 chital, 548 sambar and 1253 nilgai were classified into age and sex classes. 36 chital food plants, 37 sambar and 52 nilgai food plants were identified. 20 pellet groups, each of chital, sambar and nilgai have been collected during summer, winter and monsoon for two successive years, from their feeding areas for micro histological analyses. 30 lower jaws of nilgai, 15 sambar and 25 chital have been collected and 235 tiger scats, 213 leopard, 95 jackal, 25 hyena and 61 jungle cat scats have been collected to find out the percentage of different prey constituents in the diet of carnivores. The data analysis is in progress.



**vii) Ecology of Indian wild ass (*Equus hemionus khur*) in Rann of Kutch:** The study on wild ass was initiated to collect baseline data on animal distribution, sex and age structure of population, ranging pattern, habitat use, and identifying major factors threatening the wild ass habitat, to provide information for improved management of the species. Major problems threatening the wild ass habitat are migrant livestock grazing, fuel wood collection, salt farming and intense agriculture. Two mares from two different herds were successfully chemically immobilized using 2.5 ml immobilon and radio-collared. Because of the transmitter, it has been possible to collect vital information on ranging pattern and habitat use during night when crop raiding usually occurs. Such information would allow us to plan strategies for mitigating the problem of wild ass damage to crops. Data analysis revealed that water is the strongest limiting factor for the animal, as most of permanent water sources to animals are in human habitation, outside the sanctuary. Maps of land use pattern around the sanctuary have

*The wetland habitats in KNP were further classified based on depth, extent of bank area and of short grasslands, thus identifying 12 different habitat types.*

been prepared, which would enable us to plan ecodevelopment programmes around the sanctuary.

**viii) Ecology and population genetics of the Asiatic wild buffalo (*Bubalus bubalis*)**

**In Assam:** A project on wild buffalo was initiated in February 1989 in Kaziranga National Park (KNP), Assam. Four distinct categories of buffaloes have been identified in and around KNP, based on morphological characteristics (body size/weight, horn size and presence/absence of chevron markings); aggressive behaviour and the place of the occurrence (within park, cattle camps situated on northern periphery and in villages located on the southern park boundary). These categories are designated as **wild, feral, hybrid and domestic**. Morphometric studies using a photographic method is being developed to identify these categories. This method involves taking photographs of buffaloes in head-on and lateral view. Later on these photographs are used to measure the various dimensions of the horns and conducting a statistical analysis to segregate different categories.



Blood samples were collected from calves of hybrid and domestic buffaloes. These were analysed for biochemical polymorphism using polyacrylamide electrophoresis. No significant differences were observed between these two categories for haemoglobin, whereas for total serum proteins the laboratory protocol is being standardized.

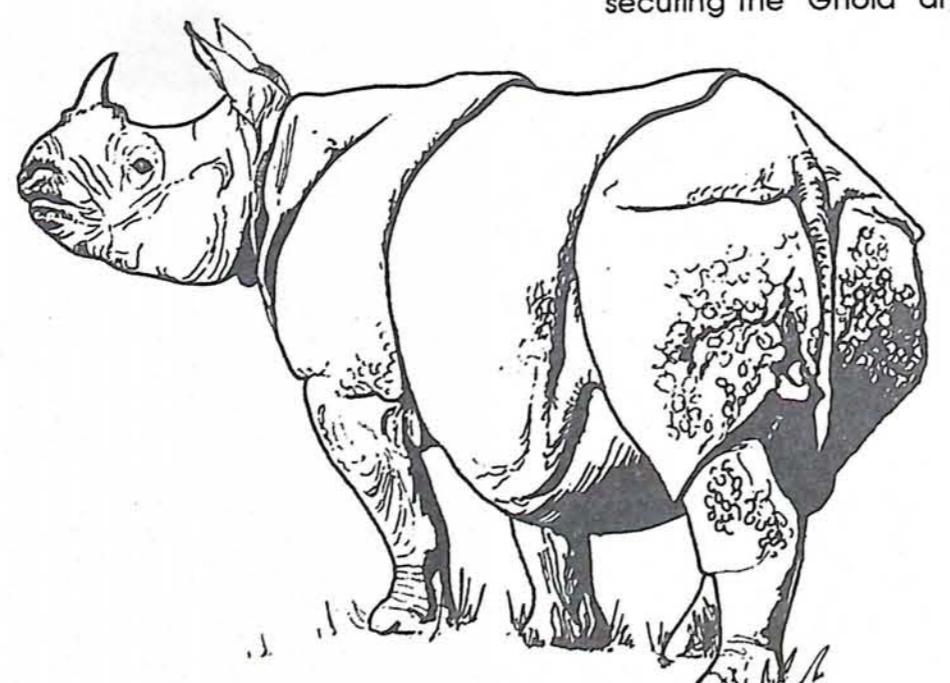
Data on population structure of all categories was collected. An ecological and vegetation description for the study area is being developed. The wetland habitats in KNP were further classified, based on depth, extent of bank area and of short grasslands, thus identifying 12 different habitat types. Data of animal sightings of five wild herbivores (elephant, rhino, wild buffalo, swamp deer and hog deer) were correlated to these different wetland habitats. Herbivores, in general, showed preference for large extents of short grasslands. Three distinct wetland habitat use patterns were observed amongst the five wild herbivores, viz., elephants preferred shallow wetlands, rhinos and wild buffaloes preferred medium-depth, whereas swamp deer and hog deer preferred deep wetlands.

Data collection on ecological parameters would continue. A field trial is being planned to be conducted on immobilization of hybrid buffaloes, maintained in cattle camps, before an attempt is made on wild buffaloes. Collection of data on habitat-herbivore relationships, morphometry and analysis of blood samples will be continued in coming seasons.

to complete the survey of potential rhino habitat in Dudwa, within the existing sanctioned budget of the Project.

**ix) Monitoring of rhinoceros reintroduced in Dudwa National Park:** Observations on the parameters relating to habitat use by rhinos, health conditions and management requirements continued. At regular intervals grass samples from classified community types were collected to assess seasonal variation in biomass and nutritive values. The Kateraniaghata Wildlife Sanctuary, near Dudwa, was visited in March 1991 to assess habitat potential to support rhinos and rhino-related crop damage problems. A few rhinos sighted here seasonally range over areas in Indian and Nepalese territories. A maximum of four rhinos have been sighted. The project was accorded three months extension in the field, beyond its scheduled date of completion at the end of March 1991.

**The Kateraniaghata Wildlife Sanctuary near Dudwa was visited in March 1991 to assess habitat potential to support rhinos and rhinos related crop damage problems. A few rhinos sighted here seasonally range over areas in Indian and Nepal territories.**



**x) Management and ecology of swamp deer (*Cervus duvaucell duvaucell*) in Dudwa Tiger Reserve:** Studies on habitat utilisation, ranging behaviour, effects of fire on habitat and herbivores, and swamp deer demography continued. Swamp deer dispersal areas outside the park boundaries were mapped. The maximum distance from the park boundary was 8 km. While relatively large patches constituted the critical fawning and rutting areas, smaller patches of grass and swamp provided escape and shelter requirements. Food in these patches mainly consisted of new shoots of sugar cane and paddy. Samples of soil, herbivore droppings, tiger scats and vegetation continued to be collected for analysis. On the recommendations of the project team, critical habitats for rutting and fawning, outside the protected area, are now being provided protection through patrolling parties and the presence of staff. However, the matter of securing the 'Ghola' and 'Gajraula'

*A reconnaissance survey of the proposed submergence area of Narmada Sagar and its surrounding areas has been conducted.*

grasslands, which have a status of protected forests, is yet to be resolved by formally bringing them under the park management.

**xi) Habitat ecology of the Kedarnath Musk Deer Sanctuary:** In the penultimate year of study, a survey of different parts of the sanctuary was conducted to assess the abundance and conservation status of major mammals including musk deer, tahr, goral and sambar. The results of the study have led to the identification of localities of vital wildlife and conservation value that need immediate management attention. These major localities include Manini, Rudranath, Madh Maheshwar and Tungnath areas. We also now have evidence of the presence of brown bear in the sanctuary, which was not reported so far. Similarly, the absence of blue sheep is confirmed by both, field work, and an analysis of temporal high resolution satellite imagery. Apart from the surveys, regular studies have been conducted for the third year in succession. Plant and fecal samples were also collected for chemical analyses.

**xii) Study of impact of the Narmada Sagar Project on flora and fauna with attendant human aspects:** The study of impacts of Narmada Sagar Project upon flora and fauna alongwith attendant human aspects is under progress. On the basis of data collected during the first year of the project, scientific information on the following compo-



nents of the study has been obtained (1) vegetation and wildlife habitat, (2) status of large mammals in terms of abundance, distribution and habitat utilisation, (3) ornithological evaluation, and (4) socio-economic conditions of the people in and around the project area.

A reconnaissance survey of the proposed submergence area of Narmada Sagar and its surrounding areas has been conducted, on the basis of which, representative areas (1 X 1 km grid) within the study area were identified. Approximately 20% of the total project area has thus been delineated for vegetation and wildlife habitat studies. Data on phytosociological parameters (density, diversity, species composition, GBH and height) and forage volume has been collected for winter season in all the grids representing the study area. Wildlife habitat evaluation has been integrated in each of the selected grids. Qualitative and quantitative information

**A study on the use and effectiveness of electric fence in preventing movement of nilgai into crop areas at Nahar has been initiated.**



on habitat parameters (topography, slope terrain, water, cover, erosion, fire, weed, forestry operations, lopping and dung count) has been collected to assess the habitat quality for wildlife species, and also the level of impacts of human pressures on different habitat types. Regeneration potential and phenological information on important plant species occurring in the study area, are being monitored for their significance in seasonally altering the forest and habitat quality. Information on ethnobotanical importance of plant species is being collected to evaluate wildlife values of the area.

Survey of the study area to estimate present status of large mammals in terms of abundance, distribution and habitat utilisation is underway. The

habitat quality for some selected species is being documented through Habitat Suitability Index Models being developed for selected ungulate species. Ornithological evaluation approach has also been taken as one of the components of wildlife assessment in the study area. Population and species diversity of birds are being determined in the study area using Line Transect Census. A total of 170 species of birds representing 47 families have been identified in the proposed submergence area.

An attempt is being made to assess natural resource use and socio-economic condition of the people, of all 242 villages within the study area, through structured interview schedules and secondary sources. The resettlement programme offered by the project authority will be evaluated in terms of its suitability to provide requirements of the people, as evaluated through our survey technique, so that a final correlation with bio-habitats can be established.

The data generated so far, on different components of the study, is being analysed to provide specific information outlined in the objectives. Field work in Omkareshwar impact areas will be initiated in the second phase.

**xiii) Ecological studies to evaluate crop damage by nilgai and blackbuck in Haryana and to formulate mitigation strategies:** The field work of the ongoing research study, aiming to understand the mechanics, nature and extent of crop damage by nilgai and blackbuck, and

*The bull was in musth during December 1990 to February 1991. During this period he was seen at least with 8 different family groups and every third or fourth day he moved 10-15 km possibly looking for estrous females.*



associated socio-economic aspects at Nahar and Kairu areas of Rohtak and Bhiwani districts, respectively, is being continued. Data collection on social structure, habitat use, activity pattern, food and feeding, and reproductive biology of nilgai and blackbuck was undertaken. The relative abundance of nilgai using transect methods in Rohtak, Bhiwani and Mahendragarh districts was assessed. Qualitative assessment of damage to rabi crops, namely, wheat, mustard, gram, and kharif crops, namely, bajra, and jowar, is being done using fenced and unfenced plots in the crop areas.

A study on the use and effectiveness of electric fence in preventing movement of nilgai into crop areas at Nahar has been initiated. Eight-strand electric fence with running length of 1.8 km has been erected around bajra and jowar crop fields, and the data to evaluate its effectiveness is being collected.

#### **xiv) Movement and habitat utilisation of elephant in North-Western Uttar Pradesh:**

One year data collection on the activity pattern and habitat use by an elephant herd, by traditional tracking and scan sampling, was completed in June '90. This data has been analysed and report writing is in progress.

In November 1990, one bull and two cow elephants were radio collared in Chilla Wildlife Sanctuary. One of the cows collared was the one with the defunct collar, which was tracked from July 1989 to June 1990. She is known as the collared female. The other female could not be tracked from end of December 1990 to June 1991. Malfunctioning of the radio-transmitters is proving to be a major handicap in locating the animals.

The bull was in musth during December 1990 to February 1991. During this period he was seen at least with 8 different family groups and every third or fourth day he moved 10-15 km, possibly looking for estrous females. During winter he also used areas outside the sanctuary. In summer the bull largely used the sal forest on hills. He rested in the sal forest during the hot hours of the day, came down to the waterhole in late evening and foraged throughout the night. He ate largely the bark of *Shorea robusta*, *Ehretia*, *Mallotus* and *Ougenia* trees and atleast 200 trees have been recorded pushed by him.

The collared female herd showed almost the same pattern of movement as in the previous year. The group used sal and mixed forest during winter. During summer the group used mostly



Various hair parameters like width, medulla width/total width ratio, cuticular pattern and medullary pattern were used as criteria for species identification.



sal forest on flat terrain. Barks of *Shorea robusta*, *Ehretia* and *Mallotus* were the food in summer. All their locations were close to water. In late summer (June 1991) they moved to Shyampur area outside the park, to feed on *Dendrocalamus strictus* and *Helicterus*. Radio tracking will be done till January 1992. Data collection on other aspects, such as group composition, identifying individual elephants and collection of plant parts for chemical analysis, is also in progress.

#### xv) National Wildlife Database Project:

The active data collection and feeding of information in the computer was initiated in January 1990 when two

Research Assistants were hired on contract basis. Following is the progress of work done during the reporting period: (i) The updating of information on Biogeographic Zones and Protected Area (PA) distribution were undertaken in the light of revised Biogeographic classification, (ii) Data on animal distribution has been revised and confirmed in various Biogeographic zones, (iii) Over 5,000 references have been added to the Bibliographic collection, and (iv) The vegetation map of the country was prepared and area under each potential vegetation types (climatic climax) was calculated, using Leaf Area Perimeter method. The information on the PAs has been updated as per schedule.

#### xvi) Creation of a laboratory facility at Wildlife Institute Of India to standardise methods to determine carnivore diet:

The study, commenced in January 1991, aimed to develop appropriate techniques for scat analysis which are accurate and efficient for determining predator diet, and to impart training to laboratory technicians. Various hair parameters like width, medulla width/total width ratio, cuticular pattern and medullary pattern were used as the criteria for species identification. Examination of hair medullary pattern is more accurate for locations and age classes, unlike the cuticular pattern. A minimum of 20 hairs per scat are required to be examined for determining the diet of large cats by scat analysis.

*The demography, socio-economic set up and resource dependency pattern of Masinagudi village were studied. In all the 770 households, head of each family was interviewed and information on human and cattle population, main occupation of villagers, landuse practice, cropping patterns and crop damage, and their biomass needs were recorded in computer compatible formats. All along the village boundary, 9 entry points to the surrounding sanctuary and reserve forests were monitored every month, 9 times each, for counting head loads of fuel fodder, non-wood forest products and livestock. Selected 18 families of the village, belonging to the Scheduled Tribes and having dependency on the forest were monitored regularly, to gather information on the collection of MFP, time and pattern of collection, labour involved and market value of each collected item. Data revealed that 85% families in the village are landless, 38% possess 2700 cattle, of which 90% are unproductive and raised mainly for manure. Less than 1% families own 80% of the cultivated land, of which 40% is irrigated. 93% farmers reported crop damage by wild herbivores. The economy of 2% families is totally based on selling of MFP.*

**xvii) Study of the ecosystem of Masinagudi village In the Mudumalai Wildlife Sanctuary, with a view to evolving a model ecodevelopment plan to ensure compatibility between the village and the sanctuary:** The demography, socio-economic set up and resource dependency pattern of Masinagudi village were studied. In all the 770 households, the head of each family was interviewed and information on human and cattle population, main occupation of villagers, landuse practice, cropping patterns and crop damage, and their biomass needs were recorded in computer compatible formats. All along the village boundary, 9 entry points to the surrounding sanctuary and reserve forests were monitored every month, 9 times each, for counting head loads of fuel fodder, non-wood forest products and livestock. Selected 18 families of the village, belonging to the Scheduled Tribes and having dependency on the forest were monitored regularly, to gather information on the collection of MFP, time and pattern of collection, labour involved and market value of each collected item. Data revealed that 85% families in the village are landless, 38% possess 2700 cattle, of which 90% are unproductive and raised mainly for manure. Less than 1% families own 80% of the cultivated land, of which 40% is irrigated. 93% farmers reported crop damage by wild herbivores. The economy of 2% families is totally based on selling of MFP.



**xviii) Study of Interrelationships between the village ecosystem and elephant corridor habitat, In the forest linking Rajaji and Corbett National Parks, with a view to devising compatible management strategies:** All the households of each village, around the corridor forest, were studied for demography and socio-economic set-up, and some selected households for the demand and supply pattern of biomass resources, in two developed and two less-developed villages along the Northern and Southern boundaries of the corridor forest. It was found that in all the villages, the proportion of forest fodder in the diet of cattle was higher in the months of January-February (32%), and also in May-June (30%). It was lower in March-April (8%), and July (10%), when agricultural byproducts and grass from agricultural fields predominated the total fodder consumption. In the Northern villages 36% of the fodder requirement was being met by forest fodder, while in case of the Southern villages it was only 13%. The proportion of agricultural



**The headloads of fodder and fuelwood entering the villages peaked in the month of May when people were free from agricultural activities. This was lowest in the month of April when villagers were busy in the harvesting of crops.**



byproducts and grass from agricultural fields was 35% and 87% in the Northern and Southern villages, respectively. The headloads of fodder and fuelwood, entering the villages, peaked in the month of May (mean 53 headloads/day), when people were free from agricultural activities. This was lowest (11 headloads/day) in the month of April when villagers were busy in the harvesting of crops.

The factors that could prevent elephant groups from using the area east of Gwalgod Sot were also studied. The factors quantified were vegetation, biotic pressures and topography. The difference in the vegetation density was evident only when the three top ranking food tree species, *Dendrocalamus strictus*, *Mallotus philippinensis* and *Shorea robusta*, were compared between areas used by the group and avoided. More people and livestock used the areas avoided by the elephant group. Terrain in the area avoided was also steeper. It was concluded that due to a greater level of disturbance and steeper terrain, elephant groups do not use the area east of Gwalgod Sot. If

biotic disturbances are reduced, possibly more elephants may use the corridor area both east and west of Gwalgod Sot, which would enhance genetic exchange between the elephant populations on either side of Khol river.

#### xix) Ecology of aquatic mammals in National Chambal Sanctuary:

As envisaged in the project, four smooth Indian otters (*Lutra perspicillata*) of different age and sex (adult male, sub-adult female, juvenile male and female) were radio-implanted and tracked for a varying length of time in the Chambal river. The maximum home range length of the adult female was estimated as 6.5 km along the riverine stretch. The adult male has already been utilizing the same 6.5 km stretch within six months following release, whereas the juveniles have been utilizing 1.5 km stretch of the river. Effort was not made to determine the minimum home range polygon, as would be customary for terrestrial mammals. The maximum exploitable area of 1.9 sq km within the adult home range was estimated. The centre of activity ranges within 500-1,000 m of the den sites and largely depends on the availability of resting and feeding sites. The mean maximum seasonal movement was observed in early summer followed by monsoon and winter. The seasonal movement appears to be influenced by breeding season, food availability, fluctuation in water level and disturbance.

## CONSULTANCY SERVICES

### B

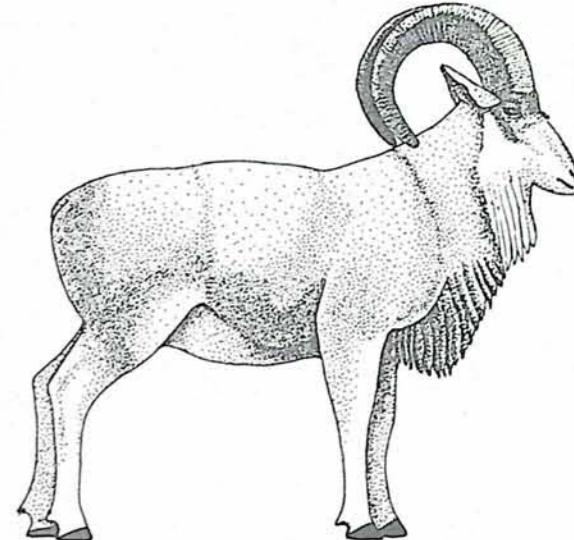
**ogeography Project:** Based on the comments on WII's first report on the biogeographically representative national

network of protected areas, and based on WII's own further investigations, the network proposals are being improved upon. The revision of the report, currently underway, is also incorporating gazettement of new protected areas. As a part of WII's interaction with the states on the implementation of this report, meetings were held with Tamil Nadu and Karnataka Forest Departments.

**A practical structure of a central coordination and monitoring unit, proposed as the 'Central Authority for Zoos' was worked out and submitted to the Ministry of Environment and Forests, Government of India.**

**II) Study on the Management of Wildlife In Captivity, including Captive Breeding and Rehabilitation of Threatened and Endangered Species, and the Design and Management of Zoos:** During the year a database was developed based on the information collected from 30 zoos. Information from other zoos is being collected.

**A practical structure of a central coordination and monitoring unit, proposed as the 'Central Authority for Zoos' was worked out and submitted to the Ministry of Environment and Forests, Government of India.**



The curriculum for imparting short-term training to zoo professionals was developed, and the first 15-day Compact Course in Zoo Management was conducted at the Nandankanan Biological Park, Bhubaneshwar, from 26 November to 8 December 1990. Similarly, planning for conducting a short-term training course for zoo technicians, during the next year, is being done.

On the recommendations of the Project Monitoring Committee the draft standards/guidelines for Indian Zoos was prepared. This will be placed before the Committee, in its third meeting, for consideration.

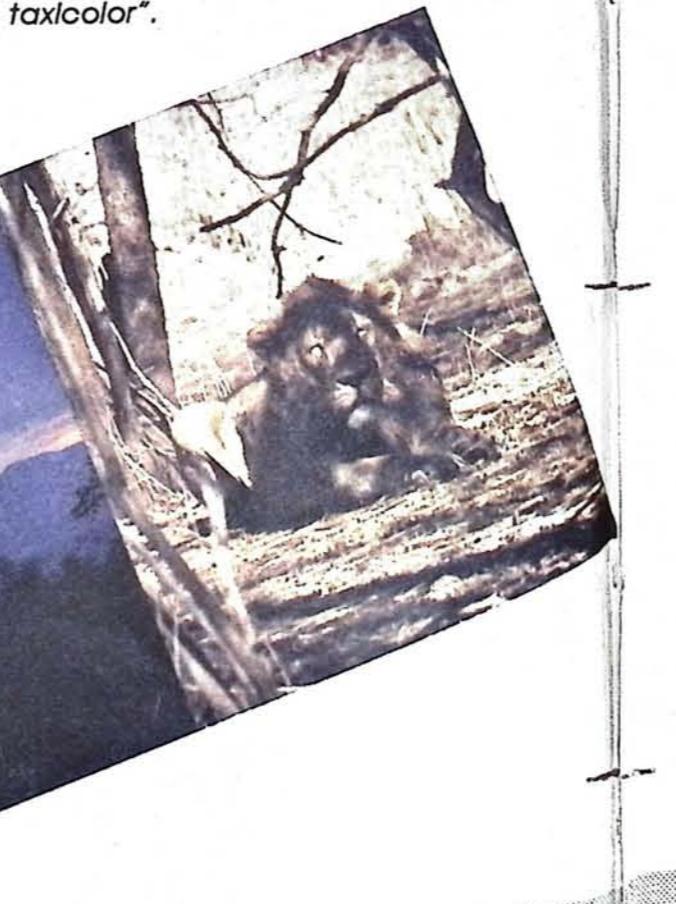
**iii) Participation of Institute's team In Lion Census:** Two faculty members, a Senior Research Fellow, and M.Sc. students visited Gir, in May 1990, to participate in wildlife census conducted by the Gujarat Forest Department, once every five years. The visiting team worked in three groups, alongwith the forest officials, to cover central, eastern

and western zones of Gir. Lions located in each zone were classified into different age and sex categories. This exercise has helped in understanding the population structure of lions inhabiting the three different zones, and also the overall population composition.

**iv) Study of lion-human conflicts in and around Gir forests:** A brief 8-month study during January-August 1990 was carried out in Gir forest and the adjoining areas, to investigate the prevailing problem of lion-human conflict. Forest Department records on lions located outside the limits of the protected areas, capture of lions outside and release inside the protected area, cases of lion attacks on people, and information of cattle killing by lions were analyzed. People in and around the Gir Wildlife Sanctuary were also interviewed to understand the local population's perception of the prevailing conflict. A 66 page report entitled "Lion-human conflicts in Gir forest and adjoining areas" was submitted in September 1990. WII is also assisting an expert committee, appointed by the Government of Gujarat, to study this

problem and suggest measures for population and habitat management on a short and long-term basis.

**v) Takin Survey In Eastern Arunachal Pradesh:** A survey to assess the conservation status of large mammals, particularly takin, (*Budorcas taxicolor taxicolor*) was conducted in eastern Arunachal Pradesh from January to March 1990. Siang, Dibang Valley and Lohit districts were surveyed. The study revealed that the annual hunting by tribals is not a threat to takin, which will survive in sizeable numbers. However, the large force of working labourers, brought from outside the State for developmental projects, especially road construction, indulge in all forms of animal poaching and this can pose a greater threat to the takin. Immediate measures required for conservation were suggested in the study report entitled "Wildlife Survey in Arunachal Pradesh, with special reference to Takin, *Budorcas taxicolor*".



**On the advice of Maharashtra Forest Department, NEERI requested WII to examine the project proposal, determine feasibility of such studies and provide necessary inputs in developing suitable methodologies for conducting the environmental impact assessment.**

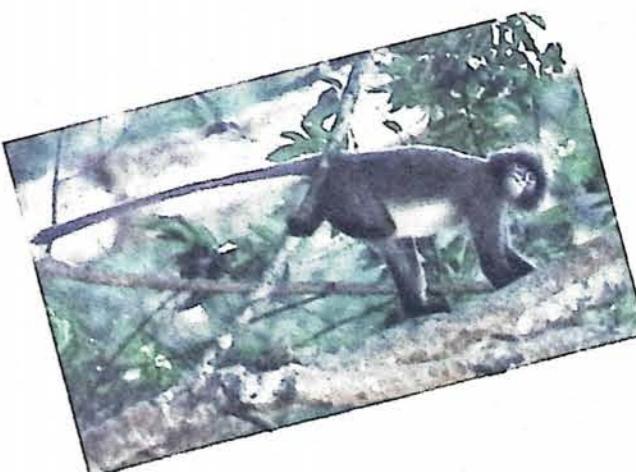


**vi) Suggestions for the newly-created Tiger Reserve:** A faculty member visited several places in Kalakadu-Mundanthurai during 10-24 June. His report on improving management of the newly-created Tiger Reserve, to the Tamil Nadu Forest Department, has been sent. The suggestions made in the report cover: (i) immediate measures to be accomplished within a year; (ii) measures to be accomplished within two years; and (iii) actions related to habitat management, protection and patrolling, and promotion of awareness among public. The Tamil Nadu Forest Department is favourably considering the suggestions.

**vii) Technical advice to NEERI:** The National Environmental Engineering Research Institute (NEERI), Nagpur, proposes to establish an experimental ecosystem on the campus and undertake investigations on behaviour of select herbivores and birds in environmentally modified ecosystems. On the advice of Maharashtra Forest Department, NEERI requested WII to examine the project proposal, determine feasibility of such studies, and provide necessary inputs in developing suitable methodologies for conducting the envi-

ronmental impact assessment (EIA) studies as outlined in the project proposal. The Institute helped NEERI in planning of the above study by deputing a faculty member who evaluated the potential of the NEERI campus for introduction of spotted deer and peafowls, identification of suitable areas for a wildlife enclosure and designing of the enclosure and water points as well as suggested methodologies for observing and recording data on various parameters. An evaluation report in this behalf has been sent to NEERI and to the State Forest Department.

**viii) Assistance to the IGNFA in revising IFS training syllabus:** In its first meeting held in February 1990, the Indira Gandhi National Forest Academy (IGNFA) Board emphasised the need for changing the syllabus for training of Indian Forest Service Probationers, in keeping with the changing field realities and management priorities. The Director worked as a member of the Committee, constituted for the revision of the syllabus, while a senior faculty member served as a member on the Consultative Working Group. Through a series of meetings and written comments suggestions have been made to give greater importance to ecology, maintenance of natural



**The annual hunting by tribals is not a threat to takin. However, the large force of working labourers brought for developmental projects especially road construction, indulge in all forms of animal poaching and this can pose a greater threat to the takin.**

Since straight-forward culling of bulls was not acceptable, being a sensitive issue, a few bulls were initially castrated but more were sterilized by using 'Talsur', a drug developed by the National Institute of Immunology.



forests, biodiversity and wildlife orientation to forestry operations, for incorporation in the syllabus.

**ix) Technical Assistance to Park authorities for population control of feral cattle in Keoladeo National Park:** In April 1990, concerned at overgrazing by an increasing feral cattle population (800-900 animals) the Keoladeo National Park authorities approached WII to help them control the cattle population.

Since straight-forward culling was not acceptable, being a sensitive issue, chemical capture and sterilization of bulls was the only alternative. Although a few bulls were initially castrated, more were sterilized by using 'Talsur', a drug developed by the National Institute of Immunology, Delhi. This drug, when administered in cauda-epididymus of the testicular region, causes sterilization, while maintaining libido in the males. Necessary demonstration and know-how were provided to the park authorities by the Institute faculty members so as to enable them to continue such operations.

**x) Translocation and reintroduction of barasingha in Kanha National Park:** At the request of the Madhya Pradesh Forest Department, the WII assisted park authorities in February 1991, in Kanha National Park, in the translocation of hard-ground barasingha from the western to the eastern part of the Park. Five female and three male barasingha were immobilised and translocated. Before release all the animals were marked so that adaptation to the new habitat and breeding success in the new habitat could be monitored.

**xi) Development of training facilities to support biodiversity conservation in Papua New Guinea:** On the invitation of the FAO and World Bank, the Director visited PNG in April 1990 and helped finalise a proposal for development of training facilities for wildlife and biodiversity conservation in PNG, as well as for higher education and training overseas, including at WII.

## PUBLICATIONS

The quarterly WII Newsletter entered its fifth year of publication. Its circulation now covers all Chief Wildlife

Wardens, managers of all major national parks, sanctuaries and zoos, all alumni of WII, besides a large number of non-governmental organisations, and individuals within the country and abroad. The publication is being well received.

During the period **A Field Manual of Techniques For Wildlife Census in India** has been published in response to a long-standing expectation of wildlife managers and biologists, from WII, for information on census methodology. The manual has been well received as a practi-

cal guide in the field. A technical report on the **Ungulate-Habitat Ecology in Gir National Park and Sanctuary** has been published as the final report of a research project of WII. Interim reports of several completed research projects were brought out by the concerned researchers and project supervisors and final reports are in various stages of completion. Technical reports of a few short term consultancy projects, undertaken by the Institute, were also finalised and made available for circulation. These were:

- Lion-human conflicts in Gir forest and adjoining areas
- Wildlife Survey in Arunachal Pradesh, With Special Reference to Takin, *Budorcas taxicolor*

Over 35 papers by the Institute faculty, researchers and students were published during the year. A list of these publications is appended.



## ORGANISATIONAL

**T**he 35 member WII Society, presided over by the Minister for Environment and Forests has a varied membership comprising Forest Ministers of some States, Members of Parliament, Members of the U.P. Legislative Assembly, officials of concerned Ministries, and non-officials, including representatives of NGOs connected with wildlife conservation. No meeting of the Society could be held in the year. The Institute functions under a 14 member Governing Body, chaired by the Secretary, Ministry of Environment and Forests. The Governing Body, normally meets once every 3-4 months. Some of its functions, have been delegated to Sub-Committees, in matters such as research and building construction.



## DEVELOPMENTAL

### Faculty and other recruitments:

Two IFS officers, one each from the States of Madhya Pradesh and Kerala joined the Institute as faculty on deputation. In addition, four each of technical and ministerial posts were filled up.

*The project is aimed at enhancing the professional competence of the Institute's faculty in diverse fields of frontier technology, through an exchange of scientific personnel and acquisition of hi-tech equipment.*

### WII-FWS Project:

**T**he five year project on specialised faculty development, initiated in May 1989, in collaboration with the US Fish and Wildlife Service, entered its second year in May 1990. The project is aimed at enhancing the professional competence of the Institute's faculty in diverse fields of frontier technology, through an exchange of scientific personnel and acquisition of hi-tech equipment, so as to upgrade the quality of various training and research activities of WII.

Developments under the project, this year, covered the fields of Wildlife in Managed Forests, Systems Analysis, GIS, High altitude ecology (Trans-Himalayas), Field Research Methods, Wildlife Interpretation and Extension, Animal Damage Control, Wildlife Health and Captive Breeding of Birds. The Institute exchanged scientific personnel on these subjects, held an Integrated Planning Workshop (IPT) under systems analysis component, in Ranthambore National Park, held a regional seminar on Integrated Forestry Planning and Manage-

ment under the Wildlife in Managed Forests component. In all 14 experts from the US visited WII while 6 WII members availed training fellowships in the USA.

## FAO-UNDP PROJECT

The two-year FAO-UNDP Project titled "Assistance to WII", which started in July 1988, was successfully completed in July, 1990. However, the computer expert could join the Institute only in August 1990, and would continue upto August 1991, under a partial extension of the project. The project has made an invaluable contribution to the Institute's development of the M.Sc. course, its teaching and the Institute's research programmes. The project supported five faculty members for fellowship training in USA during the year.



## FACULTY TRAINING ABROAD

Under FAO-UNDP and the WII-FWS Project, six faculty members undertook visits to specialised training institutions, in different subject areas, in USA during the year:

i) Two faculty members received training in the Systems Analysis technology from 4th April to 11th June 1990, in the USA, at several reputed institutes, viz., University of Maryland, University of California, and US Fish and Wildlife Service's National Ecology Research Center at Fort Collins. The training has helped them acquire capabilities in using Systems Analysis as applied to research, planning and training activities of the Institute.

ii) One member of the faculty was on fellowship to various institutions in three countries from 28th March to 17th June 1990, to learn GIS Technology. He visited GIS facilities at FAO Headquarters—Rome, various institutions located in the US and at the Asian Institute of Technology, Bangkok.

iii) One faculty member from the Wildlife Extension Faculty availed FAO-UNDP Fellowship to US from 4th May to 12th July 1990. He visited interpretation facilities in many national parks, training institutes, interpretive designs and development centres and also attended seminars and workshops on the subject in USA.

**The training has helped them acquire capabilities in using Systems Analysis as applied to research, planning and training activities of the Institute.**

iv) Another faculty member was on FAO-UNDP fellowship to the US from 4th March to 3th May 1990 to study animal damage control technology and practices being used by the US scientists and managers. He visited several institutions and also visited research stations in this behalf. He also attended a couple of conferences on pest control and productivity management.

v) Under the wildlife health component, the Institute's veterinarian was under training in the US from January to September 1990.

vi) One of the faculty members availed a 18-month FAO-UNDP fellowship at the Animal Ecology Research Group, University of Oxford, UK. During the reporting period he worked on refining methods for collection and collation of ecological data for the national wildlife database being set up at the WII, and developed statistical models on the ungulate-habitat relationships, based on the field studies carried out earlier in Tadoba, Sariska and Kanha National Parks. He was also awarded a Doctorate degree by the University of Oxford on the thesis "The ecological interaction between habitat composition, habitat quality and abundance of some wild ungulates in India". He also presented research papers at the University of Saarbrucken, Germany and the University of Austria. He was also invited to present a paper "Ecological impacts of livestock grazing on wild ungulates in Sariska National Park" during the IV

*Various laboratory techniques are being used by the Institute's faculty in their research work, while the park managers availed the assistance of Institute's laboratory facilities.*

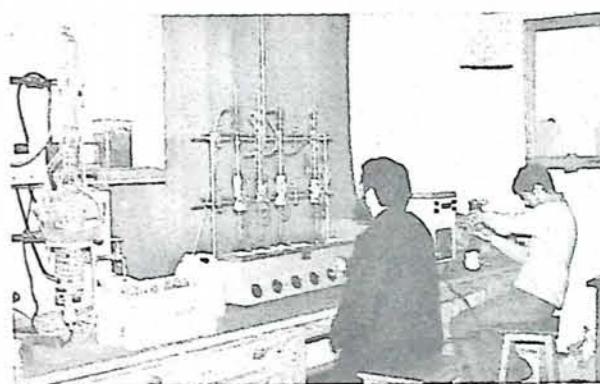
International Rangelands Congress, held in France. A paper entitled "Ecological monitoring in protected areas in India" was presented by him at the International Conference on the Science and Management of Protected Areas, organised by the Acadia University, Halifax, Canada.

## Computer facility:

The major activity of the Institute's computer cell during the year was planning for the computer facility at the new campus. The hardware and software configurations were decided upon after elaborate discussions involving one FAO expert, Lal Bahadur Shastri Academy of Administration and all the major vendors. The Novell Netware 3.11 based network was decided upon. A 486-EISA file server and 25 nodes (286/AT) on thin Ethernet was set as the initial hardware configuration. Major vendors were invited for presentation of their solutions. This was followed by demonstrations by eight vendors with a model of their solutions, and running a few major application softwares. Based on this M/s Zenith Computers Ltd were selected. It is hoped that the new computer facility would become operational by the end of year 1991.

## Laboratory:

During the reporting period various techniques have been developed in the Institute's wildlife laboratory. These were related to: determination of the quality of plant material foraged by herbivores, identification of prey constituents in carnivore diet, soil—physical and chemical analyses and age estimation of ungulates by evaluating the dentures of their lower jaws. These techniques are being used by the Institute's faculty, researchers, and M.Sc. students in their research work, while the park managers availed the assistance of the Institute's laboratory facilities in getting poached and confiscated wildlife species identified.



## Library and Documentation (L & D) facility:

Academic activities are backed up by a rapidly developing library service, comprising text and reference books, research journals, reprints and a documentation facility.



Over 910 new books were added to the library this year, bringing the total collection of books to 10,700. The library also subscribes to 140 national and



international scientific journals. For easy retrieval of information the computerization work of the library facilities has been initiated by installing a PC/AT computer, and by procuring necessary software. Apart from the usual lending and reference services some of the new services introduced are:

(i) **Article Alert Service:** This service was started in October 1990 to channel new items and current information, from the latest periodicals/articles received by WII L&D Centre, for the attention of its users.

(ii) **Retrospective Search Services:** CD-ROM (Compact Disc Read Only Memory) was installed in February 1991. Two diskettes are available on CD-ROM.

These are: (a) **Wildlife and Fish Worldwide** - this CD-ROM of over 2,00,000 citations is the electronic database of wildlife research publications during the period 1971 to 1990. The database can be searched by any one or a combination of the fields, viz, title, author, keywords, taxonomic names, geographic identifiers, publication year, source, and (b) **Biological Abstracts (BA)** - this CD-ROM is the leading abstracting and indexing reference publication for life sciences. These abstracts are drawn from approximately 9,000 journals.

(iii) **Bibliographical Service:** For available reprints in the collection of wildlife literature database, computerized bibliographic service is also being provided.

(iv) **Inter Library Loan Services:** The WII L&D Centre has maintained close and cordial relations with the other libraries in Dehra Dun.

#### Teaching Aids:

The AV unit of the Institute has procured one 16 mm film camera, a video camera, a Nikon SLR camera, VCR and a portable TV-14" for supporting training and seminar activities. Dark room facilities were also improved by obtaining a dehumidifier, dissolve unit equipment, processing equipments and slide-copying adapter. Nearly 500 slides on different themes related to environmental abuse, biological diversity, wildlife conservation and park management were also added to the vast slide collection, through contributions made by faculty, researchers, officer trainees and students.

#### Herbarium:

The WII herbarium houses about 12,500 specimens of vascular plants (ferns, gymnosperms and angiosperms). The specimens, usually collected by the students, researchers, officer trainees and faculty members, during their various field visits to different protected areas, are contributed to the Institute's collection. The herbarium sheets are arranged in alphabetical order of their respective family and generic names, in order to facilitate easy access.

During the reporting period plants collected from Pin Valley National Park (100 specimens), Satpura National Park and Pachmarhi Wildlife Sanctuary (60 specimens), and Narmada Sagar Submergence Area (over 200 specimens) were added to the herbarium. In addition to this, some occasional collections from frequently visited areas viz., Rajaji National Park, Sariska Tiger Reserve were also made. In all about 500 specimens were collected, processed, identified and added to the existing collection, this year.

#### Campus Development:

The work of the new campus at Chandrabani, Dehra Dun (comprising of administrative, teaching and library block, hostels, 20 faculty houses, and 32 staff houses including water supply, sanitary, installation and internal roads) was started in August 1988. The construction work of an over-head tank has been started in December 1990. The work of land-scaping was started

departmentally, during the year, when the lowest contractor backed out after being awarded the work. The construction work of walk ways also was started in December 1990. The external electric work was also initiated. Now the structure work of most of the buildings has been completed and the finishing work is in progress. Tenders for the guest house have been received and the construction is expected to start early next year.

#### Deer Enclosure:

The Institute has a small deer enclosure. In all 22 spotted deer, one barking deer and one chinkara are being reared in captivity. Data collection on these animals, on various morphometric, biochemical, physiological and veterinary aspects is being done. These captive animals are also being used for demonstrating field techniques of chemical immobilization, and collection of blood samples and morphological data to students.



The envisaged work programme is reflected in the chart below, while an appraisal follows it.

### THE MAIN WORK PROGRAMME FOR 1990-91

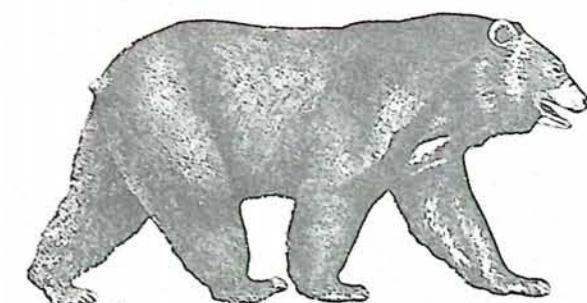
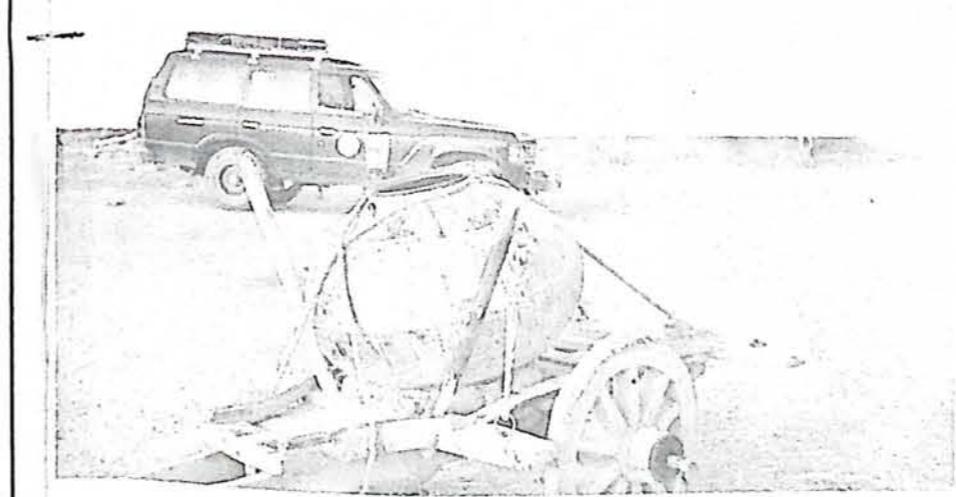
| Sl.<br>No. | Activity  | Month of<br>Commencement |      |
|------------|---|--------------------------|------|
|            |   | 1990                     | 1991 |
| 1.         | <b>Regular Courses:</b><br>9-month Diploma Course in WL Management  | AUG                      |      |
| 2.         | 3-month Certificate Course in WL Management                         | MAY                      |      |
| 3.         | Second Year of second batch of 2-year<br>M.Sc. Wildlife Biology.    | On-going                 |      |
|            | <b>Other Activities:</b>  |                          |      |
| 4.         | Overseas Fellowships for Faculty                                    | APR/MAY                  |      |
| 5.         | High Altitude Ecology Workshop                                      | JUL                      |      |
| 6.         | Annual Research Review Seminar                                      | AUG                      |      |
| 7.         | Regional Seminar on Integrated Forestry<br>Planning and Management. | SEP                      |      |
| 8.         | One week Course for IFS officers<br>(Compulsory Training)           | OCT                      |      |
| 9.         | SAARC Seminar on WL Management                                      | DEC                      |      |
| 10.        | National Workshop on Integrated<br>Forestry Planning and Management | JAN                      |      |
| 11.        | UNESCO Buffer Zone Management Workshop                              | FEB                      |      |
| 12.        | 4 New Field Research Projects                                       | AUG/<br>SEP/<br>DEC      | JAN  |
| 13.        | FAO-UNDP Project on P.A Management &<br>Eco-development Planning.   |                          | JAN  |
|            | <b>Campus Development:</b>  |                          |      |
| 14.        | Construction of guest house   | AUG                      |      |
| 15.        | Land acquisition  | SEP                      |      |
| 16.        | Interiors & Furnishing  | OCT                      |      |
| 17.        | Air-conditioning of Library & Computer rooms.                       | JAN                      |      |
|            | <b>Publications:</b>  |                          |      |
| (i)        | Guidelines for Management Plan                                      | MAY                      |      |
| (ii)       | Census Techniques Manual  | MAY                      |      |
| (iii)      | Research Project Reports  | JAN<br>FEB<br>MAR        |      |

***Underutilization  
of WII's training  
capacity in  
wildlife  
management  
courses for in-  
service officers  
continues to be  
a cause of worry.***

To the regular WII course offerings, a new course in zoo management was added, taking the tally to four. The XI Post-Graduate Diploma Course (18 trainees) concluded in April 1990, and the XII in the series commenced in August 1990, with 19 trainees. The VII Certificate Course was conducted from May to July 1990 as scheduled and had just 16 trainees, including two from Laos. The II M.Sc. Wildlife Course with seven students entered the second year and progressed satisfactorily.

Under utilization of WII's training capacity, in wildlife management courses for in-service officers, continues to be a cause of worry. Despite persuasion by the Ministry, and of course, WII, there has hardly been any improvement. This persisting situation is frustrating because in the field, parks and sanctuaries continue to be looked after by officers having little aptitude and training. Very few protected areas have scientific management plans worth the name, because very few trained

officers are available for such work, as even those trained are frequently posted on other forestry jobs. There would be no justifiable objection to the wildlife-trained officers being posted to non-wildlife jobs, provided officers with sound wildlife background are available for managing protected areas. It is felt that unless the wildlife sector gets adequate allocations in the Central and State Plan Budgets, and grants are tied to preparation of systematic management plans, the situation may not improve. Similarly, a large number of protected areas require basic research and monitoring support, which can help improve their management. Although trained wildlife biologists have now started becoming available from the post-graduate and research programmes at WII, universities and other institutions, e.g. BNHS and I.I.Sc., the field cannot make use of them in absence of any enabling programmes in the states. Thus, while WII is fulfilling its objective of training personnel, under utilization of its training facilities and inappropriate utilization of the trained personnel, on the management side, as well as, non-utilization of trained personnel, on the research and monitoring side, raises questions as to whether the objectives are really met.



The one-week capsule course for IFS officers, slated for October 1990, could not be conducted for want of nominations, understandably because of the economy drive. Instead, a short course in Zoo Management was conducted by the Institute. This new course, meant for Director and Curator-level personnel of zoological parks, was well received. It will become a regular offering of the Institute. Another course in Zoo Management and Captive Breeding, at the technician level has been finalised and will be offered next year. The training activity on the short courses was, however, not allowed to suffer by undertaking a UNESCO-supported Buffer Zone Management Workshop, and one regional and one national Workshop, supported by WII-FWS project on integrated forestry planning and management, aimed at biodiversity conservation. Together, all these four courses and workshops had over 120 participants, including nine foreigners.

In the field of wildlife research, two new field projects, related to impact of management practices on lion and ungulate habitat in Gir, and another on laboratory study on carnivore diet were initiated. A few new research

projects, although otherwise ready for the launch, will be undertaken next year in consideration of the faculty time needed for their supervision.

Two major initiatives were due for launch in 1990-91. The first of these, the Satpura Biodiversity Project, was launched as scheduled. This led to a training and planning workshop, involving forest officers and protected area managers of the concerned regions in Maharashtra and Madhya Pradesh, the faculty of WII and IGNFA, as well as, a few selected scientists of the US Forest Service. The envisaged work under the project is to develop an integrated forest management plan for a large tract in the Satpuras, encompassing two national parks, three sanctuaries, a large extent of valuable teak, mixed and bamboo forest, as well as, a significant population of forest dependent people. The good progress so far registered under this programme requires considerable enlargement, for which the inputs from the US Forest



Service need to be procured either by a major revision of the ongoing Indo-US project, or by taking up a new project on Integrated Forest Management.

The progress of the other components, under the WII-FWS project, in the area of specialized faculty development was satisfactory and as planned.

The second new initiative was to take up training courses in protected area management planning, and in eco-development planning for the surrounds of the protected areas. This was to be a UNDP assisted project. While clearances of Government of India have been given, the project is still awaiting clearance from UNDP. The counter part Indian funds, and sanctions for the posts from the Ministry also are awaited. Hopefully, this important training project would commence in 1991-92.



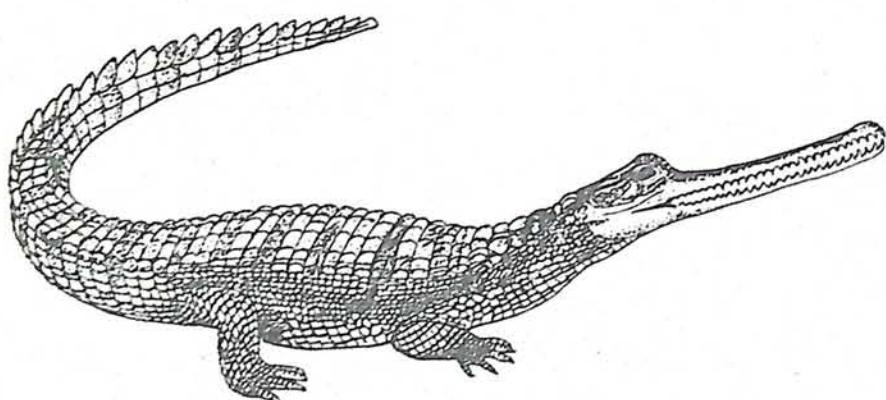
In response to the need, in the field, the Institute helped out in the resolution of lion-human conflicts around Gir, and translocation of swamp deer in Kanha. The Biogeography Project made further headway with the reconciling of data on existing protected areas, for the different states, and a review of the WII proposals, in the light of comments received. Work is underway for the publication of a revised and updated version of WII's Biogeography Report on the representative network of wildlife protected areas in the country.

The progress under the WII-FWS project aimed at faculty development in specialised subject areas, made a satisfactory headway. The subjects covered include wildlife in managed forests, systems analysis, GIS, high altitude ecology, field research methods, wildlife interpretation and education, animal damage control and wildlife health. As regards the second phase of the FAO-UNDP project directed at broad-based institutional development, it culminated in July, 1990. This project proved to be of major help in the development of faculty, formulation and conduct of academic programmes and in adding modern equipment to the computer section, laboratory and field research. In all seven WII faculty members availed of training facilities in specialised subject areas, during the year, from the combined resources of these two externally aided projects.

**WII had geared itself to provide training support for new initiatives in systematic management planning of protected areas and in the eco-development planning around protected areas.**

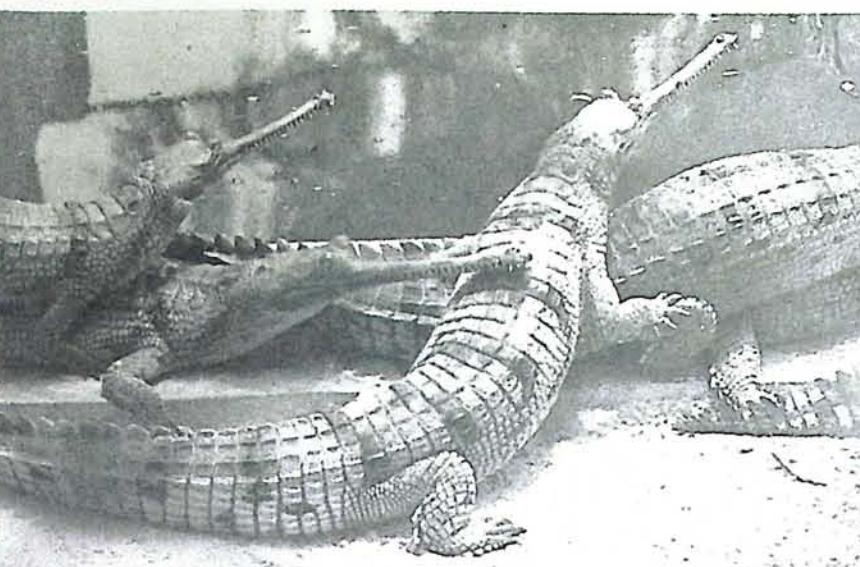
Progress on the new campus development continued to be sub-optimal. The considerable escalation and disruption caused by disturbed conditions, on account of various agitations, added to the inherent adversity because of the low-rated main contract. Despite concerted effort, UP Government has also not been able to fulfill its commitment for the approach road, bulk water supply and power supply at the new campus site. Special efforts were made to ensure that the contractor completes the work and it is some measure of satisfaction to see that this nearly impossible contract will somehow get completed, without compromising quality, next year. The progress of landscaping has been quite satisfactory, including in terms of quality, and the campus with its compatible architecture of buildings shows the makings of a decent complex fully at home in its natural environment.

A large number of scientific papers were published by the faculty and researchers. WII's publications also include a manual for wildlife census techniques, research reports on lion-human conflicts in Gir and on the wildlife survey in Arunachal Pradesh.



Institute's Newsletter, which now has a wider circulation, is being received well in the field and among the alumni of the Institute. Summing up, it may be stated that while there is some worry on account of under-utilisation of training facilities of WII in wildlife management for inservice officers by state wildlife organisations, the progress in other programmes has been quite satisfying. It is hoped that in the VIII Five-Year Plan, with greater emphasis and resources for wildlife conservation, the training situation will also improve.

**Perspective for 1991-92:** Conservation of biological diversity, environmental security and effective management of forests in general, and wildlife protected areas in particular, continues to be plagued by inadequacy of resources, on the one hand, and aggravation of the interface conflicts in the field, on the other. While the concern on this account continues to be voiced, it is not reflected in concrete programmes, in any case to the extent required. WII had geared itself to provide training support for new initiatives in systematic management planning of protected areas, and in the eco-development planning around protected areas. This could, however, not be taken up in 1990-91, but will hopefully commence in 1991-92, if the required financial resources and administrative clearances become available. As for the training in zoo man-

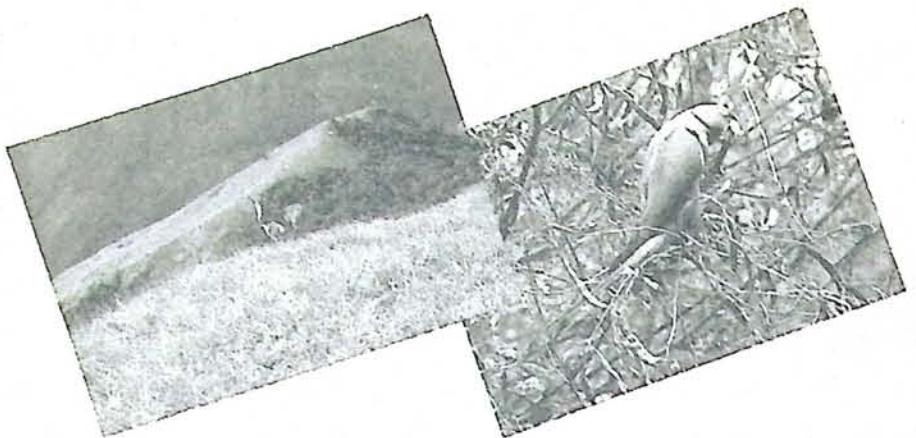


agement and captive breeding, the new course this year will be for technician-level zoo staff.

The short courses in the coming year would include two 1-week capsule courses for IFS officers in October, 1991 and February, 1992 and another one for officers of IAS and Central Services in November, 1991. In response to the demand from the states, the training workshop on Chemical Restraint Techniques is planned for December, 1991. A training workshop in interpretation and conservation education, with participants from state wildlife and zoo organisations, as well as defence services and NGOs, is planned for September, 1991. It is proposed to hold a mobile training seminar with the support of UNESCO for protected area professionals from the Central and South-East Asia region. This training workshop, addressing all aspects of protected area management, is slated for March, 1992.

Besides, the Annual Research Seminar to be conducted as usual in August 1991, an international seminar on integrated forestry planning and management for South and South East Asia region is to be held in January 1992, at Melghat addressing integrated forestry planning and management.

WII's regular courses will be initiated and conducted as per their normal schedule. Thus the 3-month Certificate Course will commence in May 1991, and the 9-month P.G. Diploma Course in August 1991. The III course of the 2-year M.Sc. programme will be taken up from July, 1991. In the field of multi-disciplinary wildlife research, in addition to the 14 ongoing projects, 6 new research projects will be launched in accordance with the priority ordained by field conditions. Thus the new projects will cover study of montane grasslands in the high altitude areas of the Himalayas and of the Western Ghats, integrated forest management in Satpura region, and two studies on wildlife health addressing ungulates and small carnivores, viz., canids, viverrids and mustelids. On the endangered species side ecological studies and surveys will cover the Indian wolf. Three projects,



**The new computer equipment will include a 486-EISA (File Server) and a 25 node 286-AT, besides a SUN Sparcstation 2 and a large digitizing platform. All these computer facilities will be networked through a local area network in the new campus.**

supported by external funds but involving Indian students under WII, will address the Himalayan ibex, the giant squirrel, and the frugivorous birds in tropical rain forests of Arunachal Pradesh. Yet another project, with FWS assistance and involving research staff under WII, will undertake a conservation status survey of turtles and tortoises, with a view to planning specific action plans for field conservation of the species requiring such assistance. The National Wildlife Database programme will enter its second phase and will lead to the development of a centre for conservation evaluation for the protected areas in the country.

The work on the new campus development, in its first phase, is expected to culminate in the coming year. This will mean that the two academic-cum-administrative blocks, the library block and the hostel block will become ready, in addition to 20 houses for faculty and 32 for staff. In view of the growth of the academic activities, and concomitant increase in the strength of staff, the Phase-II work of campus development under the VIII Plan programme is also expected to commence next year. This would include addition of a 30-room hostel, one more institutional block and some houses for faculty and staff. The

commitment of providing an approach road, bulk water supply and power supply by the Government of UP remains to be completed and this has become a cause of worry. Special effort will have to be made to realise these commitments, as without these, functioning at the new campus will not be possible.

While the addition of books and papers respectively to the library and documentation facility will continue, computerization of both these services will be carried forward. The Institute's computer division will be considerably strengthened with inputs from Institute's own resources and those from the WII-FWS project. The new equipment will include a 486-EISA (File Server) and a 25 node 286-AT, besides a SUN Sparcstation 2 and a large digitizing platform. All these computer facilities will be networked through a local area network in the new campus. Likewise the laboratory facilities at the new campus will include a teaching laboratory for the M.Sc. and P.G. graduate diploma trainees, and a research laboratory for research work, in addition to a wildlife health laboratory.

In order to meet the growing needs of training and research programmes of WII, a few more faculty positions will be filled up, some against the new programmes for training in Eco-development Planning, and Management Planning and the needed expansion under the VIII 5-year plan. With these additional and well-coordinated inputs and facilities in the new campus, the WII will be much better equipped to handle its programmes from next year onwards.

## MAIN WORK PROGRAMME FOR 1991-92

| Sl. No.                 | Activity   | Month of Commencement 1991 | Month of Commencement 1992 |
|-------------------------|--|----------------------------|----------------------------|
| <b>Regular Courses</b>  |  |                            |                            |
| 1.                      | 9-month Diploma Course In WL Management  | AUG                        |                            |
| 2.                      | 3-month Certificate Course In WL Management  | MAY                        |                            |
| 3.                      | III Batch of 2-year M.Sc. Wildlife Biology   | JUL                        |                            |
| <b>Other Activities</b> |  |                            |                            |
| 4.                      | SAARC Seminar on Wildlife Management   | APR                        |                            |
| 5.                      | Annual Research Review Seminar   | AUG                        |                            |
| 6.                      | Conservation Education Workshop  | SEP                        |                            |
| 7.                      | Short Course In Zoo Management   | NOV                        |                            |
| 8.                      | Capsule Course In WL Management for IFS Officers.  | OCT                        |                            |
| 9.                      | Capsule Course In WL Management for IAS and Central Services.  | NOV                        |                            |
| 10.                     | Workshop In Chemical Restraint Techniques  | DEC                        |                            |
| 11.                     | International Seminar on Integrated Forestry Planning and Management.  | JAN                        |                            |
| 12.                     | Capsule Course In WL Management for IFS officers.  |                            | FEB                        |
| 13.                     | WII-UNESCO Mobile Training Seminar In PA Management.   |                            | MAR                        |
| 14.                     | Ten New Field Research Projects  | AUG/ OCT/ NOV/ DEC         | JAN                        |
| 15.                     | UNDP Project on Eco-development Planning & Management Planning for PAs. Campus Development Phase I Constructions | OCT                        |                            |
| 16.                     | Guest House Phase II Constructions Academic Block Hostel Block Faculty & Staff Houses                            | JUL                        | JAN                        |
| 17.                     | Interiors & furnishings In Phase I Buildings.  | OCT                        | JAN                        |
| 18.                     | Air-conditioning of Library & Computer rooms.  | JUL                        | JAN                        |
| <b>Publications</b>     |  |                            |                            |
| (I)                     | Revised & Updated Biogeography Report.   |                            | MAR                        |
| (II)                    | Manual of Chemical Restraint Techniques.   |                            | JAN                        |
| (III)                   | Guidelines for Management Planning   |                            | MAR                        |
| (IV)                    | Research Reports   |                            | FEB                        |
|                         |  |                            | MAR                        |

## GOVERNING BODY

|  |               |   |                  |
|--|---------------|---|------------------|
| 1. Secretary<br>Ministry of Environment & Forests<br>Government of India<br>Paryavaran Bhawan, 'B' Block<br>CGO Complex, Lodi Road<br>NEW DELHI - 110 003                    | Chairman      | 8. Director,<br>Wildlife Preservation,<br>Ministry of Environment & Forests,<br>Government of India,<br>Paryavaran Bhavan, CGO Complex,<br>Lodi Road, NEW DELHI - 110 003 | Member           |
| 2. Inspector General of Forests<br>Ministry of Environment & Forests<br>Government of India<br>Paryavaran Bhawan, 'B' Block<br>CGO Complex, Lodi Road<br>NEW DELHI - 110 003 | Vice-Chairman | 9. Joint Secretary & Financial Advisor,<br>Ministry of Environment & Forests,<br>Paryavaran Bhavan, CGO Complex,<br>Lodi Road, NEW DELHI - 110 003                        | Member           |
| 3. Shri Duleep Matthai,<br>Sorrento, 7th Floor,<br>B, Hire Marg, BOMBAY  | Member        | 10. Director General,<br>Indian Council of Forestry Research &<br>Education, P.O. New Forest,<br>DEHRA DUN - 248 006  | Member           |
| 4. Prof. L.M.Nath,<br>Professor of Community Medicine,<br>All India Institute of Medical Sciences,<br>Ansari Nagar, NEW DELHI - 110016                                       | Member        | 11. Joint Secretary (Education),<br>Ministry of Human Resource Development,<br>Shastri Bhavan, NEW DELHI- 110 003   | Member           |
| 5. Prof. R.Misra,<br>C/O Dr. (Mrs.) Gopa Pandey,<br>Divisional Forest Officer,<br>CHINDWARA (Madhya Pradesh)   | Member        | 12. Chief Wildlife Warden,<br>Govt. of Uttar Pradesh,<br>17, Rana Pratap Marg,<br>LUCKNOW (U.P.)<br>(Nominee of Chief Secretary, U.P.)                                    | Member           |
| 6. Shri J.C.Daniel,<br>Curator, Bombay Natural History Society,<br>Hornbill House, Shaheed Bhagat Singh Road,<br>BOMBAY - 400 023  | Member        | 13. Shri S.K.Mukherjee,<br>Additional Director,<br>Wildlife Institute of India,<br>P.O. New Forest, Dehra Dun- 248 006  | Member           |
| 7. Shri M.A. Parthasarthy,<br>'Hamsini'<br>1, 12th Cross, Rajmahal,<br>BANGALORE - 560 080   | Member        | 14. Director,<br>Wildlife Institute of India,<br>P.O. New Forest, Dehra Dun - 248 006   | Member-Secretary |

**RESEARCH ADVISORY COMMITTEE**

|  |          |                  |
|--|----------|------------------|
| 1. Dr. M.K.Ranjitsinh,<br>Additional Secretary (E),<br>Ministry of Environment & Forests,<br>Government of India,<br>Paryavaran Bhawan, CGO Complex,<br>Lodi Road, NEW DELHI - 110 003 | Chairman |                  |
| 2. Additional Inspector General<br>of Forests (Wildlife),<br>Ministry of Environment & Forests,<br>Paryavaran Bhawan, CGO Complex,<br>Lodi Road, NEW DELHI - 110 003                   | Member   | Member           |
| 3. Shri V.B.Singh,<br>Ex-Addl. Chief Conservator of<br>Forests (Wildlife),<br>LUCKNOW (Uttar Pradesh)  | Member   | Member-Secretary |
| 4. Shri J.C.Daniel,<br>Curator, Bombay Natural History Society,<br>Hornbill House, Shaheed Bhagat Singh Road,<br>BOMBAY - 400 023  | Member   |                  |
| 5. Prof. J.V.Ramana Rao,<br>Department of Zoology,<br>Osmania University,<br>HYDERABAD (Andhra Pradesh)  | Member   |                  |
| 6. Director,<br>Indian Institute of Forest Management,<br>Nehru Nagar, BHOPAL (Madhya Pradesh)   | Member   |                  |
| 7. Director,<br>Zoological Survey of India,<br>CALCUTTA (West Bengal)  | Member   |                  |
| 8. Director,<br>Botanical Survey of India,<br>P - 8 Brabourne Road,<br>CALCUTTA (West Bengal)  | Member   |                  |
| 9. Prof. Ishwar Prakash,<br>Professor of Eminence,<br>Central Arid Zone Research Institute,<br>JODHPUR (Rajasthan)   | Member   |                  |
| 10. One representative of WII faculty  | Member   |                  |
| 11. Director,<br>Wildlife Institute of India,<br>P.O. New Forest,<br>Dehra Dun - 248 006   |          |                  |

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#### AUDIT CERTIFICATE

I have examined the accounts and the Balance Sheet of Wildlife Institute of India, Dehra Dun for the year ending 31st March, 1991. I have obtained all the informations and explanations that I have required and subject to the observations in the appended Inspection Report, I certify, as a result of my audit, that in my opinion these accounts and Balance Sheet are properly drawn up so as to exhibit a true and fair view of the state of affairs of the Institute according to the best of my informations and explanations given to me and as shown by the books of the organisation.

Sd/-

Principal Director of Audit (SD)  
A.G.C.R. Building, New Delhi.

Dated: 10.9.91  
Place: Dehradun.

PERMANENT ASSETS AS ON 31.3.1991

| S.No.         | Particulars                         | Opening stock         | Addition during the year | Total                 |
|---------------|-------------------------------------|-----------------------|--------------------------|-----------------------|
| 1.            | Land                                | 31,89,465.00          | 48,43,330.00             | 80,32,795.00          |
| 2.            | Trees                               | 24,32,709.00          | —                        | 24,32,709.00          |
| 3.            | Avenue Plantation                   | 1,81,340.65           | 1,02,824.00              | 2,84,164.65           |
| 4.            | Furniture & Fixture                 | 7,81,318.89           | 98,503.00                | 8,79,821.89           |
| 5.            | Lab Equipment & Chem                | 9,70,184.07           | 1,45,524.00              | 11,15,708.07          |
| 6.            | Office Equipment                    | 7,68,895.90           | 1,13,386.00              | 8,82,281.90           |
| 7.            | Training Equipment                  | 17,59,181.24          | 2,41,875.00              | 20,01,056.24          |
| 8.            | Camp Equipment                      | 2,78,430.34           | —                        | 2,78,430.34           |
| 9.            | Photographs & photographic material | 2,67,840.20           | 76,623.00                | 3,44,463.20           |
| 10.           | Educational films                   | 8,39,714.35           | 28,577.00                | 8,68,291.35           |
| 11.           | Library Books                       | 16,37,819.78          | 4,23,166.00              | 20,60,985.78          |
| 12.           | Journals & periodicals              | 8,01,415.73           | 4,15,966.37              | 12,17,382.10          |
| 13.           | Materials & Supply                  | 16,06,651.95          | 51,000.00                | 16,57,651.95          |
| 14.           | Vehicles & Trailors                 | 17,89,178.91          | 2,10,276.00              | 19,99,454.91          |
| 15.           | Campus development                  | 1,29,063.31           | 84,046.00                | 2,13,109.31           |
| 16.           | Boundary Wall Block I               | 14,46,200.59          | —                        | 14,46,200.59          |
| 17.           | Boundary fencing II & III           | 8,17,934.93           | —                        | 8,17,934.93           |
| 18.           | Construction of Building            | 89,93,354.99          | 1,07,87,955.67           | 1,97,81,310.66        |
| 19.           | Architectural competition           | 1,50,000.00           | —                        | 1,50,000.00           |
| 20.           | Architectural fee & Supervision     | 11,93,059.00          | 4,95,148.85              | 16,88,207.85          |
| <b>Total:</b> |                                     | <b>3,00,33,758.83</b> | <b>1,81,18,200.89</b>    | <b>4,81,51,959.72</b> |

WILDLIFE INSTITUTE OF INDIA : DEHRA DUN

BALANCE SHEET AS ON 31ST MARCH 1991

|     | FUND'S & LIABILITIES                | ASSETS            |                   |                   | As on 31.3.90   | Addition during 1990-91   | As on 31.3.91          | As on 31.3.90     | Addition during 1990-91                              | As on 31.3.91                                     |   |  |
|-----|-------------------------------------|-------------------|-------------------|-------------------|---|---|------------------------|-------------------|--|---|---|--|
|     |                                     | Amount<br>Rs. Ps. | Amount<br>Rs. Ps. | Amount<br>Rs. Ps. |   |   |                        |                   |  |   |   |  |
| 1.  | Land                                | 31,89,465.00      | 48,43,330.00      | 80,32,795.00      |   |   |                        | Land              | 31,89,465.00   | 48,43,330.00                                      | 80,32,795.00                                  |  |
| 2.  | Trees                               | 24,32,709.00      | —                 | 24,32,709.00      |   |   |                        | Trees             | 24,32,709.00   | —   | 24,32,709.00                                  |  |
| 3.  | Avenue Plantation                   | 1,81,340.65       | 1,02,824.00       | 2,84,164.65       |   |   |                        | Avenue Plantation | 1,81,340.65  | 1,02,824.00                                       | 2,84,164.65                                   |  |
| 4.  | Furniture & Fixture                 | 7,81,318.89       | 98,503.00         | 8,79,821.89       |   |   |                        |                   |  |   |   |  |
| 5.  | Lab Equipment & Chem                | 9,70,184.07       | 1,45,524.00       | 11,15,708.07      |   |   |                        |                   |  |   |   |  |
| 6.  | Office Equipment                    | 7,68,895.90       | 1,13,386.00       | 8,82,281.90       |   |   |                        |                   |  |   |   |  |
| 7.  | Training Equipment                  | 17,59,181.24      | 2,41,875.00       | 20,01,056.24      | Excess of Income over expenditure 1990-91                 | 2,34,60,570.87  | Campus Development     | 1,29,063.31       | 84,046.00  | 2,13,109.31                                       |   |  |
| 8.  | Camp Equipment                      | 2,78,430.34       | —                 | 2,78,430.34       | Equipment Furniture & Fixture, Vehicle, Library book etc. | 24,47,340.70  | —                      | 24,47,340.70      | Lab Eqpt. Furniture & Fixture, Vehicle Library books | 9,70,184.07 7,81,318.89 17,89,178.91 16,37,819.78 | 1,45,524.00 98,503.00 2,10,276.00 4,23,166.00 | 11,15,708.07 8,79,821.89 19,99,454.91 20,60,985.78 |
| 9.  | Photographs & photographic material | 2,67,840.20       | 76,623.00         | 3,44,463.20       |   |   |                        |                   |  |   |   |  |
| 10. | Educational films                   | 8,39,714.35       | 28,577.00         | 8,68,291.35       |   |   |                        |                   |  |   |   |  |
| 11. | Library Books                       | 16,37,819.78      | 4,23,166.00       | 20,60,985.78      |   |   |                        |                   |  |   |   |  |
| 12. | Journals & periodicals              | 8,01,415.73       | 4,15,966.37       | 12,17,382.10      |   |   |                        |                   |  |   |   |  |
| 13. | Materials & Supply                  | 16,06,651.95      | 51,000.00         | 16,57,651.95      |   |   |                        |                   |  |   |   |  |
| 14. | Vehicles & Trailors                 | 17,89,178.91      | 2,10,276.00       | 19,99,454.91      |   |   |                        |                   |  |   |   |  |
| 15. | Campus development                  | 1,29,063.31       | 84,046.00         | 2,13,109.31       |   |   |                        |                   |  |   |   |  |
| 16. | Boundary Wall Block I               | 14,46,200.59      | —                 | 14,46,200.59      |   | C/F 2,59,07,911.57<br>B/F 2,59,07,911.57                        |                        |                   |  |   | C/F 2,06,09,597.50<br>B/F 2,06,09,597.50      |  |
| 17. | Boundary fencing II & III           | 8,17,934.93       | —                 | 8,17,934.93       |   |   | Material & Supplies    | 16,06,651.95      | 51,000.00  | 16,57,651.95                                      |   |  |
| 18. | Construction of Building            | 89,93,354.99      | 1,07,87,955.67    | 1,97,81,310.66    |   |   | Training Eqpt.         | 17,59,181.24      | 2,41,875.00  | 20,01,056.24                                      |   |  |
| 19. | Architectural competition           | 1,50,000.00       | —                 | 1,50,000.00       |   |   | Boundary               | 14,46,200.59      | —  | 14,46,200.59                                      |   |  |
| 20. | Architectural fee & Supervision     | 11,93,059.00      | 4,95,148.85       | 16,88,207.85      |   |   | Wall Block-I           |                   |  |   |   |  |
|     | Total:                              | 3,00,33,758.83    | 1,81,18,200.89    | 4,81,51,959.72    |   | Amount transferred 2,19,64,244.13 1,32,74,870.89 3,52,39,115.02 | & Gate to capital fund | 8,17,934.93       | —  | 8,17,934.93                                       |   |  |

**OUTSTANDING LIABILITIES**

|                                      |   |                       |              |  |              |  |                |
|--------------------------------------|---|-----------------------|--------------|--|--------------|--|----------------|
| Security deposit                     | 6,32,478.00<br>7,200.00                   | 1,76,392.00           | 8,16,070.00  | Chandrabani Campus building complex                    | 89,93,354.99 | 1,07,87,955.67                           | 1,97,81,310.66 |
| Income Tax                           | 50.38                                     | -                     | 50.38        |  |              |  |                |
| Sundry Credit Balance                | 55,347.93<br>(-)40,301.75<br>(+)11,327.00 | 26,373.18             |              | Architectural competition                              | 1,50,000.00  | -  | 1,50,000.00    |
| Architect. fee & Supervision charges | 11,93,059.00                              | 4,95,148.85           | 16,88,207.85 |  |              |  |                |
| Withheld amount                      | 4,25,000.00                               | 4,00,000.00           | 25,000.00    | Fixed deposit (Sales Tax)                              | -            | 1,52,217.28                              | 1,52,217.28    |
|                                      |   |                       |              | Training cost Accrued not received                     | 83,800.00    | (-)70,350.00<br>(+)2,24,600.00           | 2,38,050.00    |
|                                      |   |                       |              | Advance to conduct trainees tour, workshop and seminar | 1,01,000.00  | (+)19,000.00                             | 1,20,000.00    |
|                                      |   |                       |              | Advance to staff (for expenses)                        | 2,97,670.14  | (-)14,837.33                             | 2,82,832.81    |
|                                      |   |                       |              |  |              | C/F 4,89,45,059.81<br>B/F 4,89,45,059.81 |                |
|                                      |   |                       |              | Loan & Advances to staff                               | 6,07,604.20  | 3,40,304.00                              | 9,47,908.20    |
|                                      |   |                       |              | To Sundry Debtors                                      | 19,51,262.00 | +5,66,874.00                             | 25,18,136.00   |
|                                      |   |                       |              | To closing stock of steel, cement and wood             | 11,24,432.18 | +21,11,185.11                            | 32,35,617.29   |
|                                      |   |                       |              | <b>CASH AND BANK BALANCES</b>                          |              |  |                |
|                                      |   |                       |              | With U.B.I Dehra Dun (Trainees A/C)                    |              | 84,799.35                                |                |
|                                      |   |                       |              | With U.B.I Dehra Dun.                                  |              | 1,66,20,131.34                           |                |
|                                      |   |                       |              | With S.B.I. Dehra Dun                                  |              | 1,06,130.00                              |                |
|                                      |   |                       |              | Cash in hand   |              | 22,242.16                                | 1,68,33,302.85 |
| <b>Grand Total-</b>                  |   | <b>7,24,80,024.15</b> |              | <b>Grand Total-</b>                                    |              | <b>7,24,80,024.15</b>                    |                |

The above balance sheet to the best of our belief contains a true account of the Funds, Liabilities, Property, and Assets of the Institute.

Finance Officer

Director

Pr. Director of Audit (SD)  
New Delhi

**WILDLIFE INSTITUTE OF INDIA, DEHRA DUN**  
**INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 1991.**

| <b>EXPENDITURE</b>                                 |                  | <b>INCOME</b>   |                               |
|--|------------------|---|-------------------------------|
| To salaries and allowances (including LTC)         | 39,99,380.75     | By Grant-in-aid Deptt. of Env., Forests & WL., New Delhi. | 3,69,50,000.00                |
| To Leave Salary & Pension Contribution             | 1,67,836.00      | Less transfer to Capital expenditure                      | 1,81,18,200.89 1,88,31,799.11 |
| To Bonus   | 86,061.00        |   |                               |
| To Honorarium                                      | 4,282.00         |   |                               |
| To Fellowship                                      | 3,65,219.00      | By Training Cost 9-months Dip. Course                     | 2,37,700.00                   |
| To Wages   | 6,32,330.00      | 3-months Cert. Course                                     | 1,06,200.00                   |
| To Travel Expenses                                 | 6,87,099.45      | Other receipts  | 12,719.70 3,56,619.70         |
| To Newspapers & Magazines                          | 13,411.00        |   |                               |
| To Publicity & Advertisement                       | 1,91,861.00      | By Training Cost accrued but not received                 | 2,24,600.00                   |
| To Operational Expenses                            | 4,66,636.50      |   |                               |
| To Stationery                                      | 2,94,055.00      | By Interest on Bank Deposits                              | 2,82,370.70                   |
| To Maintenance of animals (Deer Park)              | 58,997.00        |   |                               |
| To Rent for Hired Buildings                        | 2,28,165.00      |   |                               |
| To Postage & Telegrams                             | 75,421.00        |   |                               |
| To Sports Goods                                    | 3,633.00         |   |                               |
| To Uniforms  | 24,312.75        |   |                               |
| To Telephone & Trunk calls                         | 2,57,566.65      |   |                               |
| To Conveyance                                      | 15,611.10        |   |                               |
| To Electricity & Water charges                     | 63,368.05        |   |                               |
| To Entertainment                                   | 13,784.25        |   |                               |
| To Printing & Binding                              | 1,44,996.00      |   |                               |
| To Repair & Maintenance of Office equipment        | 1,05,628.00      |   |                               |
|  | C/F 78,99,654.50 |   | C/F 1,96,95,389.51            |
|  | B/F 78,99,654.50 |   | B/F 1,96,95,389.51            |
| To Seminar & Workshops                             | 1,73,325.00      | By Workshops & Seminars                                   | 1,53,000.00                   |
| To Insurance (Research Fellow and Faculty Members) | 4,455.00         | By Interest on Mobilisation Advance                       | 87,188.00                     |
|  |                  | By Misc. Receipts   | 58,489.12                     |
| To Stipend   | 77,400.00        | By IUCN Scholarship                                       | 1,89,248.00                   |
| To Food Allowance                                  | 900.00           |   |                               |

|                                     |                |
|-------------------------------------|----------------|
| To Legal Expenses                   | 2,500.00       |
| To CPF Contributions (WII shares)   | 1,19,189.00    |
| To Training Programme               | 4,55,745.72    |
| To Repair & Maintenance of vehicles | 2,88,825.00    |
| To Vehicle Insurance                | 26,445.00      |
| To POL for vehicles                 | 2,74,580.60    |
| To interest on CPF                  | 772.00         |
| To interest on GPF                  | 760.00         |
| To Audit Fee                        | 14,230.00      |
| To Minor Works                      | 62,589.00      |
| To Sales Tax                        | 66,735.36      |
| To Final payment of CPF             | 3,002.00       |
| To Awards                           | 5,495.00       |
| To Lab chemicals                    | 3,588.00       |
| Excess of income over expenditure   | 1,07,03,123.45 |
| Total                               | 2,01,83,314.63 |

**RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 1991.**

| RECEIPTS   | PAYMENTS                                  |                  |
|--|---|------------------|
| To Opening Balance:  |   |                  |
| Cash in Hand 13,687.06   | By salaries 39,95,415.75                  |                  |
| Cash in Bank 96,92,216.82  | By Leave Salary & Pension 1,71,801.00     |                  |
| Contribution   | By Bonus 86,061.00                        |                  |
| Balance in   | By Honorarium 4,282.00                    |                  |
| Training Account 1,32,575.37   |   |                  |
| To Grant-in-aid  |   |                  |
| Department of Environment, 3,69,50,000.00  | By Fellowship 3,65,219.00                 |                  |
| Forests, New Delhi   | By Wages 6,32,330.00                      |                  |
| To Training Cost   | By Travel Expenses 6,87,099.45            |                  |
| 9-months Diploma Course 2,37,700.00  | By Newspaper & Magazines 13,411.00        |                  |
| 3-months Certificate Course 1,06,200.00  | By Publicity & Advertisement 1,91,861.00  |                  |
| Other receipts 12,719.70   | By Operational Expenses 4,66,636.50       |                  |
| Training cost accrued last year 70,350.00  | By Stationery 2,94,055.00                 |                  |
| but received this year 2,82,370.70   | By Maintenance of Deer Park 58,997.00     |                  |
| To Interest Credited by Bank   |   |                  |
| To Workshop & Seminar 1,53,000.00  | By Rent for hired Building 2,28,165.00    |                  |
| To Interest on Mobilisation Advance 87,188.00  | By Postage & Telegrams 75,421.00          |                  |
| To Recovery of Mobilisation Advance 4,55,775.00                                      | By Sports Goods 3,633.00                  |                  |
| To Recovery of Income Tax from Contractor 2,36,269.00                                | By Uniforms 24,312.75                     |                  |
| To Recovery of Sales Tax from Contractor 2,34,870.00                                 | By Telephone & Trunk calls 2,57,566.65    |                  |
| To Recovery of Security Deposits from Contractor 1,76,392.00                         | By Conveyance Charges 15,611.10           |                  |
| To Recoveries from Pay Bills to be remitted to Govt. Deptts./other bodies. 11,327.00 | By Electricity & Water Charges 63,368.05  |                  |
| Fellows & Faculty Members 4,455.00   | By Entertainment 13,784.25                |                  |
|  | By Printing & Binding 1,44,996.00         |                  |
|  | By Repair of Office Equipment 1,05,628.00 |                  |
|  | By Seminar & Workshop 1,73,325.00         |                  |
|  | By Insurance of Research                  |                  |
|  | C/F 4,88,52,640.65                        | C/F 80,77,434.50 |
|  | B/F 4,88,52,640.65                        | B/F 80,77,434.50 |
| To Refund of Advance for Expenses 12,78,228.00                                       | By Stipend 77,400.00                      |                  |
| To Refund of Advance for Expenses (Training) 1,01,000.00                             | By Food Allowance 900.00                  |                  |
| To Recovery of cost of steel and cement 29,98,797.00                                 | By Legal Expenses 2,500.00                |                  |
|  | By CPF Contribution by WII 1,19,189.00    |                  |

|                                   |                    |  |                    |  |                |
|-----------------------------------|--------------------|--|--------------------|--|----------------|
| To Miscellaneous Receipts         |                    | By Training Cost   | 4,55,745.72        |  |                |
| I) Sale of Tender documents       | 4,800.00           | By Minor Work  | 62,589.00          | By Refund of with-held amount of contractor    | 4,00,000.00    |
| II) Guest House Charges           | 1,208.00           | By repair and  | 2,88,825.00        | By Campus Development                          | 84,046.00      |
| maintenance of vehicle            |                    |  |                    |  |                |
| III) Miscellaneous                | 52,481.12          | By Vehicle Insurance   | 26,445.00          | By Construction & Architectural Management Fee | 4,95,148.85    |
|                                   |                    | By POL for Vehicle   | 2,74,580.60        | By Secured Advance                             | 6,87,114.00    |
| To Received from IUCN Scholarship | 1,89,248.00        | By Purchase of Vehicle   | 2,10,276.00        | By Cash in hand                                | 22,242.16      |
| Audit Fee                         | 34,230.00          | By Journals & Periodicals  | 3,28,976.37        | By Bank Balance with UBI                       | 1,66,20,131.34 |
|                                   |                    | By Scientific Publication  | 86,990.00          | By Bank balance with SBI                       | 1,06,130.00    |
|                                   |                    | By Audiovisual, Computers & Training Equipment                       | 2,41,875.00        | By Cash with UBI (Trainees Account)            | 84,799.35      |
|                                   |                    | By Laboratory Equipment  | 1,45,524.00        |  |                |
| To Recovery of Secured Advance    | 3,24,688.00        | By Laboratory chemicals  | 3,588.00           |  |                |
|                                   |                    | By Office Equipment  | 1,13,386.00        |  |                |
|                                   |                    | By Photographs & Photographic materials                              | 76,623.00          |  |                |
|                                   |                    | By Educational Films   | 28,577.00          |  |                |
|                                   |                    | By Furniture & Fixtures  | 98,503.00          |  |                |
|                                   |                    | By Material & Supplies   | 51,000.00          |  |                |
|                                   |                    | By Library Books   | 4,23,166.00        |  |                |
|                                   |                    | By Avenue Plantation   | 1,02,824.00        |  |                |
|                                   |                    | By Advance for Expenses  | 12,63,390.67       |  |                |
|                                   |                    | By Advance for Expenses (Training)                                   | 1,20,000.00        |  |                |
|                                   |                    | By Awards  | 5,495.00           |  |                |
|                                   | C/F 5,38,03,090.77 |  | C/F 1,27,20,032.86 |  |                |
|                                   | B/F 5,38,03,090.77 |  | B/F 1,27,20,032.86 |  |                |
|                                   |                    | By CPF final payment   | 3,002.00           |  |                |
|                                   |                    | By Interest on GPF   | 11,287.00          |  |                |
|                                   |                    | By Interest on CPF   | 72,464.00          |  |                |
|                                   |                    | By Motor Car Advance   | 33,000.00          |  |                |
|                                   |                    | By Housebuilding Advance   | 93,333.00          |  |                |
|                                   |                    | By Scooter and cycle advance   | 68,311.00          |  |                |
|                                   |                    | By Festival Advance  | 520.00             |  |                |
|                                   |                    | By Computer Advance  | 1,45,140.00        |  |                |
|                                   |                    | By Fixed deposit (Sales Tax)   | 1,52,217.28        |  |                |
|                                   |                    | By CGEIS payment   | 40,301.75          |  |                |
|                                   |                    | By purchase of land  | 48,43,330.00       |  |                |
|                                   |                    | By Remittance of Income Tax deduction from Contractor                | 2,36,269.00        |  |                |
|                                   |                    | Bills  |                    |  |                |
|                                   |                    | By Remittance of Sales Tax deduction from Contractor                 | 3,26,110.40        |  |                |
|                                   |                    | Bills  |                    |  |                |
|                                   |                    | By Procurement of Cement, Steel & Wood                               | 63,14,719.78       |  |                |
|                                   |                    | By Construction of Building (including escalation and Advertisement) | 1,02,43,441.00     |  |                |

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